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LIST OF ABBREVIATIONS

AMEX : American Share Exchange

AP: accounts payable

AR: accounts receivable

ATA: average total assets

CA: current assets

CAPM: capital asset pricing model

CASH: cash and cash equivalents

CL: current liabilities

COA: current operating assets

COL: current operating liabilities

DEBT_D: net non-interest cash distribution to debt holders

DEBT_EQ: net cash distribution to equity holders

DEP: depreciation

EFH: earnings fixation hypothesis

EMH: efficient market hypothesis

FIN: net non-cash financial assets

FINL: financial liability

ICAPM: intertemporal capital asset pricing model

INV: inventory

JSE: Johannesburg Stock Exchange

LTI: long-term investment

MEM: Mishkin Econometric Methodology

NCO: non-current operating accruals

NCOA: non-current operating assets

NCOL: non-current operating liabilities

NYSE: New York Stock Exchange

OCA: other current assets

OCL: other current liabilities

OLS: ordinary least squares

PB: price-to-book ratio

PE: price-to-earnings ratio

PEAD: post-earnings announcement drift

PS: price-to-sales ratio

R&D: research and development

ROA: return on assets

SENS: Stock Exchange News Service

STI: short-term investment

SUE: standardised unexpected earnings

TA: total assets

UK: United Kingdom

US: United States (of America)

VWAP: volume-weighted average price

WC: non-cash working capital

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Over 300 years ago, Isaac Newton studied a phenomenon referred to as momentum. *Momentum* is defined as "a quantity expressing the motion of a body, equal to the product of the mass of a body and its velocity" (OxfordDictionaries. Not Dated). Defined as such, momentum has a direction as well as a magnitude, and therefore it can be used to predict the resulting direction of objects as they collide with one another. Today, momentum is widely used both in the discipline of physics, as well as in other disciplines such as financial analysis.

The study examines the momentum in the fundamentals of companies over time and whether the information content in the momentum of the fundamentals improves the understanding of the long-standing price momentum and earnings momentum anomalies on the Johannesburg Stock Exchange (JSE). Since the initial work of Samuelson (1965:41-49) and Fama (1965:34-105), a vast body of literature has been dedicated to the debate about the efficient market hypothesis (EMH) and to a consideration of whether capital markets behave in an efficient manner, or whether anomalous behaviour disproves the EMH theory. An anomaly presents unexpected price behaviour in stock markets, which investors can potentially exploit to earn abnormal returns (Zacks, 2011:1).

The notion that share prices reflect all available information is referred to as the EMH. Thus, it is not possible to earn abnormal returns given the information currently available. There are three forms of efficient markets: (1) weak form; (2) semi-strong form; (3) strong form. The weak form EMH asserts that share prices reflect all past publicly available information. The semi-strong form EMH asserts that share prices reflect all past and current publicly available information and prices instantly change to reflect new information about the prospects of a company. The strong form EMH asserts that share prices reflect all information, including insider information (Bodie, Kane & Marcus, 2003:265).

Fama (1998:304) defends the EMH, where numerous anomalies are rebutted. However, he concedes that the post-earnings announcement drift (PEAD), first reported by Ball and Brown (1968:169-171) and Jegadeesh and Titman’s (1993:76) continuation of returns, pose problems for the EMH.

The first anomaly mentioned above, PEAD, refers to the continued appreciation of a share price of a company which has reported unexpectedly high earnings relative to companies reporting unexpectedly low earnings, resulting in abnormal returns. The PEAD anomaly was initially described by Ball and Brown (1968:169-171) and has since been referred to as ‘earnings momentum’. The term *earnings momentum* is very misleading due to the fact that it is often misunderstood as the momentum in the earnings of a company, as opposed to the momentum of the share price as a result of an earnings surprise. Understanding the difference between the two interpretations is critical. Depending on the study, the outperformance of companies reporting unexpectedly high earnings lasts for varying lengths of time. Typically, earnings momentum is a short- to medium-term phenomenon.

The second anomaly, price momentum, is the strategy that buys past winners and sells past losers, earning abnormal returns for the period of up to one year after the execution of the strategy (Jegadeesh & Titman, 1993:76). Again, the length of the abnormal returns depends on the study in question. Price momentum is a medium-term phenomenon which has been found on stock markets around the world.

Price and earnings momentum studies have taken place over varying time frames. Some studies looked at short-term and long-term price reversals (De Bondt & Thaler, 1985:793-805; Lehmann, 1990:1-28; Poterba & Summers, 1988:27-59), while others looked at medium-term price momentum (Hoffman, 2012:21-41; Hong, Lim & Stein, 2000:265-295; Jegadeesh & Titman, 1993:65-91). For the purpose of the study, *short term* refers to one month or less, *medium term* refers to one to 12 months and *long term* is any period of time longer than one year. The terms *short term* and *short run*, *medium term* and *medium run*, and *long term* and *long run* may be used interchangeably.

Based on the classical physics definition, *fundamental momentum* is also defined as a quantity expressing the motion of the fundamentals of a company. The mass of fundamental momentum is the change in the fundamental from one period to the next and the velocity is the rate of that change. Therefore, fundamental momentum does not only illustrate whether the fundamentals of a company are increasing or decreasing over time, but whether they are increasing or decreasing at an increasing rate or a decreasing rate.

Given the above explanation, *fundamental momentum* is defined as the difference between the change of a fundamental variable over consecutive time periods. In other words, it is the rate of change of a fundamental variable.

From an academic and practical point of view, if fundamental momentum is found to play an important role in explaining the underlying driver of earnings momentum and/or price momentum strategies, a significant step will have been taken in improving the understanding of the continuation of share price movements, as defined in the anomalies above, while at the same time having very real practical effects for investors.

A raft of literature over the years has been dedicated to providing an explanation for both the earnings and price momentum anomalies. The current body of literature can be divided into two schools of thought; a risk-based explanation and a behavioural-based explanation. Risk-based explanations state that the profitability of momentum strategies is a result of compensation for taking on additional risk (Bernard & Thomas, 1989:17; Conrad & Kaul, 1998:503; Grundy & Martin, 2001:55-69). The other school of thought, behavioural explanations, states that momentum profits arise due to either an initial underreaction to information, resulting in the price of a security lagging its fundamental value, which is later corrected, or a delayed overreaction to information that pushes the price of a security above its fundamental value. The early pioneers of behavioural explanations include Barberis, Shleifer and Vishny (1998:307-343), Daniel, Hirshleifer and Subrahmanyam (1998:1839-1885) and Hong and Stein (1999:2143-2184). The tendency of people to underreact or overreact was first shown in De Bondt and Thaler’s (1985:799) influential study. They found that over the long run, people overreacted to unexpected news and this overreaction affected share prices by way of price reversion.

Under- and overreaction to information which is freely available run contrary to the EMH, and therefore, points to the fact that either the market does not initially understand the information or it does not understand the ramifications that the information has on the future earnings of the company in question.

Focusing on the fundamentals of companies as an explanation, Sloan (1996:289) states that investors tend to fixate on the bottomline earnings number of the financial statements, failing to reflect fully on the information contained in the financial statements which contribute to the bottomline earnings number. This is evidenced by the failure of share prices to anticipate the persistence of future earnings based on past financial information available today.

Examining the accrual and cash components of earnings is shown to significantly enhance the predictability of future earnings, but it appears that this information is not fully reflected in share prices timeously (Sloan, 1996:306). Accruals represent the non-cash component of a company’s earnings (Zacks, 2011:26). Accruals allow other financial information, as opposed to purely cash transactions, to be incorporated into the financial statements of a company. Accruals include important business activities such as revenue based on credit and future liabilities.

Taking fundamental analysis a step further, increasing or decreasing fundamentals at increasing or decreasing rates over time may provide further insight into the persistence of future earnings, thereby improving the ability of share prices to fully reflect the true fundamental value of companies. It is through momentum in fundamentals over time that the understanding of the different momentum strategies may possibly be enhanced.

1.2 PROBLEM STATEMENT

Despite the efforts of researchers over the years, the momentum effects, defined above, remain quite pervasive and unlikely to be defined by risk, according to Jegadeesh and Titman (2001:701). Chan, Jegadeesh and Lakonishok (1996:1683-1684) attempt to fill the gap in a definitive explanation for the continuation in share prices over the medium term, and their evidence suggests that the two momentum variables, namely price and earnings, each carries separate explanatory power for future returns, and thus, one strategy does not subsume the other. Again, risk-based explanations are rejected. Finally, they argue that the success of price and earnings momentum strategies draws from the market's underreaction to these different pieces of information, resulting in the two unexplainable EMH anomalies.

It is the pervasiveness of a definitive answer to these momentum anomalies that has motivated this study. It is the view of the author that in the short to medium term, a company's share price may be driven by speculation or sentiment. However, in the long term, the company's fundamentals should drive the value of the company. Therefore, combining a company's fundamentals with the momentum phenomenon, in the form of fundamental momentum, may present a new body of literature that helps to enhance the understanding of the market's inability to correctly price available information, which is evident in the form of a number of anomalies[1].

Several studies have focused on the ability of various fundamental factors to predict future share returns. Following on from Sloan (1996:289-315), Chan, Chan, Jegadeesh and Lakonishok (2006:1041) focus on the quality of earnings by looking at other operational indicators as opposed to purely bottomline earnings. They found that there was reliable information in accruals as a predictor of future earnings. Piotroski (2000:7-10) attempts to identify a fundamental analysis strategy that, when applied to a broad portfolio of high book-to-market shares, can shift the distribution of returns. Although his study focuses solely on high book-to-market shares, the outcome reveals that fundamental analysis has the ability to use information about a company which the market either does not understand or fails to price correctly.

In the context of the studies mentioned in the preceding paragraph, it is evident that fundamental analysis, going further than focusing on the earnings number alone, has the ability to enhance the predictability of earnings persistence and future abnormal returns. Focusing on the momentum or trend in these fundamentals over time, and whether the

[1] The anomalies include the price momentum anomaly, earnings momentum anomaly and accrual anomaly, which are discussed in this study.

market correctly prices the information content of this fundamental momentum, will enhance the understanding of the efficiency of the market, and perhaps shed some light on the underlying driver of price and earnings momentum.

Therefore, the main purpose of the study is to determine whether momentum in a company's fundamentals carries information about the future earnings of the company, and whether or not the market, as represented by the JSE, prices this information timeously. This may lead to a growing body of literature regarding the underlying drivers of the price and earnings momentum anomalies.

1.3 RESEARCH QUESTIONS

The study will answer the following five specific research questions:

1. Is the price momentum strategy, in the form of the continuation of price movements over the medium term, profitable on the JSE?
    a. Is price momentum explained by a size effect?
    b. Is price momentum explained by a value effect?

2. Is the earnings momentum strategy, in the form of abnormal returns due to post-earnings continuation of price movements over the medium term, profitable on the JSE?
    a. Is earnings momentum explained by a size effect?
    b. Is earnings momentum explained by a value effect?

3. Is the fundamental momentum strategy, in the form of fundamental momentum in earnings over the short to medium term, profitable on the JSE?
    a. Is fundamental momentum explained by a size effect?
    b. Is fundamental momentum explained by a value effect?

4. Is fundamental momentum in earnings explained by fundamental momentum in the underlying components of earnings?

5. In the event that fundamental momentum in earnings is found to be mispriced on the JSE, and price and earnings momentum is found to be present on the JSE, then is price and/or earnings momentum a manifestation of fundamental momentum?

1.4 IMPORTANCE AND BENEFITS OF THE STUDY

Similar to the international literature, the South African literature remains mixed about the efficiency of the JSE (Jefferis & Smith, 2004:685). It has been shown that liquidity plays a vital role in enhancing the efficiency of a share market (Chordia, Roll & Subrahmanyam, 2008:263), therefore inferring that markets in developed economies which are more liquid than their developing counterparts may also be more efficient.

As a result of the likelihood of developing economies' stock markets being less efficient, the underreaction to freely available information, as witnessed in the North American context, according to the majority of the above-mentioned studies, is likely to be further exacerbated in the domestic setting. Griffin, Ji and Martin (2003:2519) showed that abnormal returns due to employing a price momentum strategy were not only prevalent in South Africa during the period from September 1990 to December 2000, but that abnormal returns were also earned from the same strategy on stock markets in a number of developed economies, albeit that the abnormal returns tended to be slightly smaller. In addition, similar to the international literature, it is possible to earn abnormal returns on the JSE from buying companies that beat earnings expectations, while selling short those that do not (Ssali, 2012:2). Therefore, the evidence indicates that both price momentum and earnings momentum are found on the JSE.

Turning attention to research focusing on fundamental analysis on the JSE, it becomes evident that in-depth research into the fundamental drivers of future earnings and returns on the JSE is limited, at best. Hoffman (2012: 29) found that a number of anomalies which were well researched on larger stock markets around the world, including the momentum anomaly, the accrual anomaly and book-to-market anomaly, were also prevalent on the JSE.

In order to improve the understanding of the momentum anomalies on the JSE, the information content of company fundamentals, and more importantly, the momentum of these fundamentals, will be examined. The relationship, if there is one, between momentum of the fundamentals and future earnings needs to be understood, and determining whether or not the market has the ability to price this information timeously is critical in enhancing the knowledge of the momentum anomalies on the JSE.

As noted above, fundamental momentum presents a gap in the current body of literature. It may present additional information about the future earnings of a company, and perhaps about its longer-term prospects. The ability of the market to price this information will give insight into the efficiency of the JSE, while perhaps enhancing the knowledge of the underlying driver of the price and earnings momentum anomalies.

1.5 CONTRIBUTION OF THE STUDY

The study contributes to the existing literature in a number of ways. The existing literature on price momentum and earnings momentum in South Africa will be greatly enhanced; particularly for earnings momentum, which is a well-known anomaly, yet it remains underresearched in South Africa. A new trading strategy based on the fundamental momentum of earnings will be tested. Fundamental momentum of earnings as a trading strategy has yet to be defined, as a result, it has not been researched prior to this study. Fundamental momentum in terms of the underlying components of earnings will also be researched in an attempt to understand what drives fundamental momentum of earnings. The final contribution of this study is the two-way analysis of price momentum and fundamental momentum, and earnings momentum and fundamental momentum. The two-way analysis is undertaken to determine whether the trading strategies subsume one another, and thus, whether fundamental momentum is able to improve the understanding of the long-standing anomalies of price and earnings momentum.

1.6 DELIMITATIONS

There are a number of delimitations to the study. The first is that the focus of the study will not be on financial ratios, such as the price-to-earnings (PE) ratio, price-to-book (PB) ratio, and price-to-sales (PS) ratio. The intention is not to determine whether companies are over- or undervalued based on financial ratios, but rather to determine whether changes in a company's fundamentals over time carry information about future earnings of the company, and whether the market correctly prices this information.

The next delimitation of the study is that the study is not trying to disprove market efficiency. The finding of a relationship between an explanatory variable and future share returns is not *prima facie* evidence of market inefficiency (Richardson, Sloan, Soliman & Tuna, 2005:411). Rather, the study aims to enhance the knowledge of what drives share market prices, and therefore, enhance the efficiency of the market.

The final delimitation is that price momentum and earnings momentum on the JSE are tested solely for the purpose of determining whether fundamental momentum is an underlying driver of the price and earnings momentum anomalies. Price momentum and earnings momentum are not the primary focus of the study.

1.7 ASSUMPTIONS

The study makes certain assumptions about the efficiency of the JSE, the reliability of the data collected, the representativeness of the data sample and the role fundamentals play in driving share returns.

First, the JSE is assumed to be semi-strong efficient. Thus, share prices on the JSE fully reflect all past and current publicly available information. This assumption is decisive or there would be no justification for this research. It is also important to remember that because an anomaly to the efficient market hypothesis may be found, it does not necessarily mean that the market is inefficient, as there may well be a plausible explanation for the anomaly. Going hand in hand with the semi-strong efficiency assumption is the assumption that shares on the JSE follow a random walk.

The second assumption is that the data sample collected from INET BFA is representative, and the data provided is reliable and accurate. Information regarding the capabilities of INET BFA and the data the company is able to provide is discussed in Chapter 5.

A couple of assumptions are made in the development of the model in Section 5.4.4. First, the assumption of mean reversion of earnings is taken to be true. This assumption forms the basis for the model, and without it, the model fails to hold true. Due to the critical nature of this assumption, it is tested in Chapter 10. The second assumption is that accruals and cash flows, and their underlying components are all accurately measured. Managerial manipulation of earnings may render this assumption false. However, such manipulation is beyond the scope of the study.

The integral role that fundamentals play in driving share returns over the long run is the third assumption. Over the short term, sentiment often plays the dominant role in driving share prices up or down, with little regard to fundamentals. This is often referred to as 'noise'. Time and again the question has been raised about the role that fundamentals play. The assumption in this study is that while sentiment plays a role in the shorter term, fundamentals are still the main driver, and share prices should revert towards the fundamental fair value over the longer term (Chen, Pantzalis & Park, 2013:180).

1.8 STRUCTURE OF THE STUDY

The remaining chapters of the study are structured as follows: Chapters 2, 3 and 4 present an overview of the literature. Chapter 2 reviews the literature on the long-standing price momentum and earnings momentum anomalies. Chapter 3 reviews the literature on the accrual anomaly and fundamental analysis. The majority of literature focuses predominantly on developed markets, and specifically on the US market. Thus Chapter 4 reviews the literature pertaining to the anomalies reviewed in Chapters 2 and 3 in the South African context.

Chapter 5 outlines the data and research methodology. This chapter begins with a brief description of the properties of panel data. This is then followed by an overview of the data, including the source, the sample size and collection and processing procedures. The final part of the chapter outlines the methods employed in the current empirical research.

Chapter 6 focuses on the theoretical expectations of the empirical results of fundamental momentum. The chapter begins with building the theoretical expectations of whether the fundamental momentum of earnings is accurately and timeously priced by the market. Turning attention to the explanation of fundamental momentum of earnings, both the reliability and the value relevance of accounting information are reviewed in order to gain insight and to develop theoretical expectations.

Chapters 7, 8, 9, 10 and 11 present the results of the empirical findings of the five research questions. Chapter 12 presents the conclusion of the study on fundamental momentum. The chapter concludes with recommendations for future research on this topic.

CHAPTER 2

OVERVIEW OF PRICE MOMENTUM AND EARNINGS MOMENTUM

2.1 INTRODUCTION

The concept of *fundamental momentum*, as defined in this study, is a new concept in the field of capital market finance. Therefore, it is not surprising that no prior literature directly related to the subject is available. However, dividing the topic up into its two separate components, namely fundamentals and momentum, yields an extremely vast body of literature, which focuses on a number of anomalies related to the topic.

Unexpected price behaviour in equity markets can potentially be exploited by investors to earn positive risk-adjusted returns. A share with zero risk-adjusted returns provides a fair return for the risk an investor takes on. A share with positive (negative) risk-adjusted returns provides a return that more than (less than) compensates the investor for the risk taken (Zacks, 2011:3). Such behaviour is termed an *anomaly* and is seen as a deviation from the prediction of the EMH (Fama, 1965:98). However, given the fact that a replacement theory for the EMH, which better explains capital markets, has not been found, leads one to conclude that share prices should always trade at their fair value, thus providing investors with a fair return, or alternatively, a zero risk-adjusted return. However, the anomalies discussed in this chapter prove that this is not always the case (Ball & Brown, 1968:169-171; Jegadeesh, 1990:883).

The EMH theory has been vigorously debated since it was first published in 1965, and countless research papers have been produced over the years to uncover EMH anomalies in attempts to disprove the EMH theory. Researchers have attempted to uncover a wide range of anomalies, which range from seasonal anomalies (Lakonishok & Smidt, 1988:403-425) to anomalies as far-fetched as the effect that the sporting success of a rugby team has on the stock market (Boyle & Walter, 2003:225-235). The vast majority of such research has proved to be futile attempts to dispel the EMH theory.

For an anomaly to be real, investors need to be able to profitably exploit the anomaly in order to earn statistically reliable and positive risk-adjusted returns. Therefore, it is imperative that in identifying an anomaly, the researcher needs to ensure that the risk of the investment strategy is correctly measured, that the returns are statistically reliable and that the anomaly persists out of sample, in other words, no data mining took place (Zacks, 2011:10).

A large body of literature has focused on either explaining away these anomalies or attempts to explain the existence of such anomalies. Several potential anomalies have been explained once appropriate risk and statistical corrections have been made; however, a number of anomalies have not, and thus explanations for these anomalies are highly sought after. Brav and Heaton (2002:575-606) explore competing theories of financial anomalies and they put these anomalies down to a breakdown in one of two assumptions associated with the EMH. The first assumption assumes that investors know the factors of the pricing equation for all securities; and the second assumption assumes that all investors have homogeneous opinions about these factors, thus investors behave rationally and are unbiased. It is difficult to distinguish between mispricing caused by a violation of the one assumption, as opposed to the other (Brav & Heaton, 2002:597).

This chapter reviews earnings momentum and price momentum literature. Earnings momentum is the longest-standing anomaly, having been described in 1968, and is more of a short-term to medium-term phenomenon. Price momentum is the most widely researched and accepted anomaly around the world. Price momentum is a medium-term phenomenon.

2.2 PRICE MOMENTUM ANOMALY

Technical analysis has a long history in finance, with its roots being traced back to the 17th century when some aspects of technical analysis began to appear in Joseph de la Vega's accounts of the Dutch markets. *Price momentum* is one of the many trading strategies that have developed as a result of technical analysis and is defined as the strategy that buys past winners and sells past losers, earning abnormal returns for the period of up to one year after the execution of the strategy (Jegadeesh & Titman, 1993:69).

2.2.1 Brief history of price momentum

The tendency of people to overreact to information led to De Bondt and Thaler's (1985:793-805) study, which investigated whether such behaviour affected market prices. They showed that over a three- to five-year holding period, shares that performed poorly over the previous three to five years outperformed shares that performed well over the same formation period, and vice versa. De Bondt and Thaler (1985:797) sorted shares into deciles based on their previous 36-month returns, with the best-performing shares over the past 36 months forming the winners decile portfolio and the worst-performing shares over the past 36 months forming the losers decile portfolio. The returns of the winners and losers portfolios were then examined over the following 36 months. De Bondt and Thaler (1985:799) found that over the subsequent 36 months, the losers portfolio significantly outperformed the winners portfolio. A similar result was found for a strategy that formed winners and losers portfolios based on five-year formation and holding periods. The conclusion drawn was that investors overreact to negative (positive) information, pushing share prices down (up) to bargain (exorbitant) levels. The later correction results in strong positive (negative) abnormal returns.

Two aspects of the results are worth mentioning. First, the losers portfolio outperforms by a far larger margin than the winners portfolio underperforms, leading De Bondt and Thaler (1985:799) to conclude that the reversal effect is asymmetric, given that it appears to be much larger for losers than for winners. The second interesting aspect of the results is that the reversal of fortunes of the winners and losers portfolio is much larger over the second and the third years, thus suggesting that the reversal in fortunes mostly occurs over longer periods (De Bondt & Thaler, 1985:799).

Following the De Bondt and Thaler (1985:793-805) research, a substantial amount of literature focused on contrarian strategies over the long, medium and short term. Poterba and Summers (1988:27-59) found a similar pattern to share price reversals over the long term; however, they also found that share prices tend to exhibit positive autocorrelation over shorter time periods, specifically less than one year.

Using monthly data over the period 1929 to 1982, Jegadeesh (1990:883) conducted serial autocorrelation tests on monthly share price returns and found that over the short term, the first-order autocorrelation was negative and statistically significant, while over longer lags, it was positive. This result indicates that over the short term, share price returns revert, while over longer periods, they exhibit price momentum. To ensure the robustness of the results, Jegadeesh (1990:892) conducted the same test of serial autocorrelation across different time periods, as well as after controlling for size, and taking the bid-ask spread and thin trading into account. By all accounts, the results remained unchanged.

Lehmann (1990:1-28) undertook a similar study where he set out to determine whether predictable variation in equity returns might reflect either predictable changes in expected returns, or market inefficiency and stock price overreaction. Lehmann (1990:12) tested market efficiency by sorting shares into winners and losers portfolios based on their one-week return over the previous week, previous four days (to mitigate bid-ask spread bias), and on the one-week returns two, three, four, 13, 26 and 52 weeks ago. Profits on the portfolios were reported on for one-, four-, 13-, 26- and 52-week holding periods.

The results of Lehmann (1990:25) strongly indicate rejection of the EMH over the short term. The winners portfolios formed using the previous week's returns typically had negative returns the following week, while the losers portfolios formed using the previous week's returns typically had positive returns the following week. Two further interesting findings were as follows: first, similar to De Bondt and Thaler (1985:799), the reversal effect was found to be asymmetrical, thus, the losers portfolio tended to outperform by a far larger margin than the winners portfolio; second, the winners portfolio only had negative returns in the subsequent week, and had positive and increasing returns over the next month. Similarly, the losers portfolios' positive returns in the subsequent week diminished over the following month (Lehmann, 1990:18). Due to the lack of persistence of the results, these results indicated that share price predictability occurred over the short term in the form of price reversals, and that over longer horizons, equity markets were efficient.

Despite Poterba and Summers' (1988:48) finding, Jegadeesh and Titman (1993:65-91) are largely accredited for having been the first to document trading profits as a result of a medium-term strategy of buying past winners and selling past losers. However, the very beginning of price momentum strategies, over the medium term, can be traced back to Levy (1967:595-610). Levy (1967:598) developed a trading rule which profited by buying shares with prices higher than their 27-week average price. Jensen and Bennington (1970:469-470) dismiss Levy's strategy as a result of selection bias. They point out that 68 trading strategies were examined and that Levy's (1967:600) results failed to hold out of sample.

Jegadeesh and Titman (1993:68) tested for price momentum profits by sorting shares in winners and losers decile portfolios for holding periods over one, two, three and four quarters based on past returns of one, two, three and four quarters. The end result was that 16 different strategies were examined, again raising suspicion that their results may suffer from the same flaw as that of Levy (1967:600), namely data mining. Perhaps the most notable aspect of their results was that the length of the formation period or the holding period did not seem to matter. The decile portfolios could be formed using one, two, three and four quarters of past returns and the winners portfolios would consistently outperform the losers portfolios over the following one, two, three and four quarters. This performance was also consistent when controlling for size and using risk-adjusted returns.

In attempting to avoid the data mining criticism, Jegadeesh and Titman (1993:78) tested their price momentum strategy across numerous sub-samples in their 1965-1989 sample period. Interestingly, most of the abnormal returns earned in the zero-cost portfolios formed in the study were due to the continued strong performance of the winners portfolio, rather than from the continued underperformance of the losers portfolio. Thus, it is more of a case of what to own rather than what to avoid. This finding contrasts with the findings of De Bondt and Thaler (1985:803), whose study showed that the reversal of the losers portfolio drove the performance of the zero-cost portfolio. To support their original study, Jegadeesh and Titman (2001:704) showed that their price momentum strategies continued to be profitable out of their original sample, by testing their strategies using data from January 1990 to December 1998. While their study shows that profits dissipate over holdings periods of longer than a year, which is consistent with the findings of studies that look at the long-term reversals of share prices as alluded to above, the profits of holding periods of less than a year are robust.

Hong, Lim and Stein (2000:265-295) undertook a similar study to that of Jegadeesh and Titman (1993:65-91); however, rather than constructing a hedge portfolio based on the top and bottom deciles, they constructed their portfolios by using the top and bottom 30th percentiles. They tested for price momentum profits using a six-month holding period based on six months' past returns, and got similar results to those studies that have gone before them. Hong *et al*. (2000:274) then controlled for size, by sorting the shares based on their market capitalisations. They found that price momentum profits were virtually non-existent for small-caps and large-caps, but were significantly positive for medium-caps. Another interesting finding from their study was that price momentum profits tended to come from the losers portfolio underperforming, rather than the winners portfolio outperforming. This finding is in stark contrast to that of Jegadeesh and Titman (1993:79, 2001:704) who showed the winners portfolio to outperform. Hong *et al*. (2000:280) also sorted the shares based on analyst coverage and found that price momentum tended to be more prevalent in shares with low analyst coverage. The authors state that these findings are consistent with the notion that price momentum is a result of the slow dissemination of information.

Given the studies mentioned above, through the 1990s and early 2000s, the evidence of the profitability of a price momentum strategy over the medium term became fairly compelling. Continuing through to more recent times, the price momentum strategy continues to be profitable both in developed markets (Asness, Moskowitz & Pedersen, 2013:940; Cakici & Tan, 2014:188) and emerging markets (Cakici, Fabozzi & Tan, 2013:59; Sehgal & Jain, 2015:806).

However, depending on which study one refers to, there is little consensus on whether the continued strong outperformance of the winners contributed more to the zero-cost portfolio's performance than the continued underperformance of the losers. Agreement on competing theories explaining the source and reason for the existence of price momentum strategies is also a contentious point.

Fama and French (1996:68) concede that after having controlled for risk, returns from long-term price reversals become less significant, while the shorter-term price momentum strategies' profits remain. Therefore, the Fama and French three-factor model cannot explain the price momentum anomaly, ruling out the possibility of size and/or the value-growth phenomenon as an explanation. Thus, an explanation for the price momentum anomaly needs to be found elsewhere.

2.2.2 Explaining the price momentum anomaly

Many research papers have explored alternative explanations and the results of the De Bondt and Thaler (1985:799) paper are still being debated today. In a follow-up study, De Bondt and Thaler (1987:557-581) attempted to dispel a number of other explanations for the reversal of performance of previous winners and losers. Such explanations included size and turn-of-the-year effects, as well as risk effects.

One popular view is that the profits arising due to long-term contrarian strategies, as well as medium-term price momentum strategies, are a result of the cross-sectional variation of unconditional expected returns being large relative to the variation in unexpected returns. Conrad and Kaul (1998:498) empirically decomposed the realised return of a share into two components, the unconditional expected return and the unexpected return, in order to test the hypothesis that price momentum and contrarian profits are due to cross-sectional variation of expected returns as opposed to any time series dependence in return. Their evidence indicates that cross-sectional variance in mean returns plays a non-trivial role in determining the profitability of momentum strategies, while the case for contrarian strategies is not as clear cut (Conrad & Kaul, 1998:513). The profitability of contrarian strategies was found to be neutralised, in part, by the losses due to the cross-sectional variance in the mean returns of the shares that were included in the strategy. These losses occur because a contrarian strategy involves purchasing low-mean securities from the proceeds of the sale of high-mean securities (Conrad & Kaul, 1998:514).

Expected returns of individual shares are not observable, therefore, one has to estimate expected returns from past realised returns. As a result, the cross-sectional variation in the explanation of unconditional expected returns makes theoretical sense, given that past winners are likely to consist of shares with high expected returns, and past losers are likely to consist primarily of shares with low expected returns, which implies that for a momentum strategy expected returns are positive (Jegadeesh & Titman, 2002:156). However, in reality, the contribution due to the variation in cross-sectional returns is likely to be quite small. Jegadeesh and Titman (2002:156) point out that the cross-sectional variation in unconditional expected returns is small relative to the variation in realised returns, and that the realised return of a share over any period provides very little information regarding the share's unconditional expected return. Thus, the unconditional expected returns of winners are unlikely to be significantly different from that of losers, in reality. Jegadeesh and Titman's (2002:151) empirical results support their theory.

Regarding the other school of thought, Jegadeesh and Titman (1993:89) state that the profitability of price momentum strategies may be due to delayed price reactions to company-specific information. Jegadeesh and Titman (1993:84) examined the monthly returns of the zero-cost portfolio over the three years following the formation date and they found that with the exception of the first month, the portfolio realised positive returns in each of the first 12 months. However, the longer-term performance indicated that half of the winners' abnormal returns dissipate within the following two years. Taking it a step further, in order to confirm their behavioural hypothesis, Jegadeesh and Titman (1993:88) also examined the returns of the shares in the zero-cost portfolio around their earnings announcements over the course of three years following the portfolios' formation. Shares in the winners portfolio were found to realise significantly higher returns than shares in the losers portfolio around their quarterly announcement. However, this only held true for the first few months. Returns around the announcement date were significantly higher for shares in the losers portfolio eight to 20 months following the formation date.

Jegadeesh and Titman (1993:90) provide two plausible interpretations for the results found in their study mentioned above. Their first interpretation is that investors who buy past winners and sell past losers move share prices away from their intrinsic values temporarily and therefore cause prices to overreact. Alternatively, they state that it may be due to the market underreacting to information regarding the short-term prospects of the company, while overreacting to information regarding the long-term prospects of the company.

The intrinsic value of a company is the perceived underlying value of the company as a going concern. It includes all aspects of the company in terms of tangible and intangible factors. The share price does not always accurately reflect the intrinsic value of the underlying company.

As mentioned in the previous section, Jegadeesh and Titman (2001:711) show, by way of an out-of-sample test, that price momentum is not due to data mining. Therefore, the explanation for the source of profits reverts to one of either mispricing due to market under- and overreaction or a risk-based explanation. The three hypotheses presented by Jegadeesh and Titman (2001:707) are: (1) an underreaction to information which later corrects; (2) a delayed overreaction and subsequent price reversal; (3) compensation due to cross-sectional variation in expected returns.

Examining the post-holding period returns differentiates the three hypotheses. A post-holding period return which remains positive is confirmation of the risk-based explanation. This is due to the fact that if an investor is being compensated for risk, following the medium-term holding period, the share price momentum is expected to continue, provided the additional risk remains. However, if the post-holding period return is negative, it is supportive of the overreaction hypothesis, given that the overreaction would have pushed the share price above the company's intrinsic value for winners and thus the share price is expected to revert back to the company's intrinsic value. Last, if the post-holding period return is flat, the underreaction hypothesis is supported. The underreaction hypothesis would cause the share price to fall below the company's intrinsic value and while the share price catches up to the intrinsic value of the company, market observers would be witness to share price momentum. Once the share price is equal to the intrinsic value of the company, the share price momentum should dissipate. The evidence presented by Jegadeesh and Titman (2001:711) is inconsistent with Conrad and Kaul's (1998:512) risk-based explanation, and, at best, the evidence suggests that the behavioural models provide a partial explanation.

Chan, Jegadeesh and Lakonishok (1996:1681-1713) attempted to fill the gap in the glaring lack of explanations for price momentum. The obvious place to start is to look at a company's earnings as an explanation. Therefore, Chan *et al.* (1996:1684) investigated whether earnings momentum and price momentum subsume one another. They found that each momentum variable had separate explanatory power, and therefore, one strategy did not subsume the other. This finding indicates that by incorporating an earnings momentum strategy into a price momentum strategy, abnormal returns will be enhanced.

Chordia and Shivakumar (2006:627-656) extended the Chan *et al.* (1996: 1681-1713) paper by studying whether price momentum was related to the systematic component of earnings momentum as opposed to individual share earnings surprises.

Earnings momentum contains a systematic and non-systematic component. The systematic component relates to the macroeconomy and every company is exposed to such a risk factor, while the non-systematic component is company specific. Chordia and Shivakumar (2005:539) show that earnings momentum is a result of the systematic component of earnings momentum, which is due to investors not anticipating the impact of inflation on future earnings growth.

Following up their 2005 study, Chordia and Shivakumar (2006:644) argue that if price momentum is related to the systematic component of earnings momentum, firm-specific announcements would be insufficient to capture price momentum, as Chan *et al.* (1996:1706) found. Chordia and Shivakumar (2006:655) conclude that price momentum is primarily subsumed by earnings momentum; however, the converse is not true. The inference of this is that given earnings momentum is due to investors underestimating a systematic component of earnings in the form of inflation (Chordia & Shivakumar, 2005:539), it is this systematic component of earnings that drives price momentum in portfolios which are constructed on past share price returns.

In order for this finding to hold true, portfolios formed on the back of past share price returns would need to be well diversified across industries. The problem with this is that because a portfolio consists of a large number of shares, it does not necessarily result in a well-diversified portfolio that is representative of the market. Very often companies making up specific industries or sectors will perform in line with each other. Thus, if one constructs a portfolio based on past performance, the portfolio may very well end up with a large exposure to a specific industry. In such a case, the portfolio will not be well diversified. This indicates that price momentum could be industry driven.

Numerous studies in the literature have suggested that price momentum may be industry driven. Moskowitz and Grinblatt (1999:1279) found that price momentum over the medium term was stronger by industry rather than individual shares, and thus concluded that momentum in individual shares was driven by industry momentum. O'Neal (2000:37-49) and Lewellen (2002:533-563) agree with Moskowitz and Grinblatt (1999:1286); and similarly to Chordia and Shivakumar (2006:655), Lewellen (2002:561) concludes that momentum returns cannot be attributed to company-specific returns given that the portfolio-based analysis eliminates company-specific risk, and thus price momentum is due to macroeconomic factors.

A more recent study by Friesen, Weller and Dunham (2009:1089-1100) offers an explanation for the price momentum anomaly through the use of a theoretical model which introduces a single cognitive bias, namely that of confirmation bias. Once investors have taken a decision to purchase a share, they tend to overweight any subsequent good news, while underweighting any subsequent bad news about the company. This is done in order to confirm what the investor originally thought prior to purchasing the company's share. Their model suggests that trading strategies based on past prices will therefore be profitable.

Intuitively though, price momentum and earnings momentum are expected to be related, given that stock markets are widely accepted as lead indicators of economic activity. This point is evidenced by the fact that price movements do anticipate earnings growth, but what remains pervasive is the explanation of why price momentum remains after the announcement of an earnings surprise.

2.2.3 Alternative price momentum strategies

As a result of a lack of concrete evidence of what actually causes price momentum strategies over the medium term to be profitable, in more recent years, researchers have attempted to improve upon and enhance the initial formation technique, as introduced by Jegadeesh and Titman (1993:68), in the hope that alternative explanations will materialise.

Using a technical analysis, Park (2010:420) advises a trading rule that forms winners and losers portfolios based on a 50-day/200-day moving average ratio. Park (2010:446) concludes that, on a risk-adjusted basis, the moving average ratio is the strongest predictor of future returns. It was also immaterial to the results whether one-, five-, 20- or 50-day moving average was used in the short term, or whether 200- or 250-day moving average was used in the long term.

Another technical analysis technique preceding that of Park (2010:415-447) was that of George and Hwang (2004:2145-2176), who used a ratio based on the current price and the 52-week high to form winners and losers portfolios. The authors of this study state that their ratio is a more superior predictor of future returns than Jegadeesh and Titman's (2001:702) six-month trailing return. However, probably the most interesting finding of George and Hwang's (2004:2161) study is that there is no reversal in performance over the long term.

Moving away from technical analysis and focusing on company-specific information that may explain price momentum returns, Vassalou and Apedjinou (2004:18) show that there is a strong relationship between price momentum and corporate innovation. *Corporate innovation* is defined as the proportion of change of a company's gross profit margin that is not explained by growth in labour or capital. Portfolios sorted on the basis of corporate innovation were found to have very similar properties to those sorted on the basis of historic returns.

Using idiosyncratic volatility of share prices as a proxy for underreaction to firm-specific information, Arena, Haggard and Yan (2008:168) found that price momentum strategies were most profitable when winners portfolios consisted of high idiosyncratic volatility shares, and losers portfolios consisted of low idiosyncratic volatility shares. Arena *et al.* (2008:170) examined other risk factors to ensure that it was idiosyncratic volatility which was driving the price momentum returns they found in their study. They reached the conclusion that price momentum profits were due to shares that exhibited high idiosyncratic volatility, which leds to a behavioural explanation of why price momentum strategies were profitable.

Widening the net in an effort to enhance the understanding of the price momentum anomaly is clearly evident from the above studies, and while there remains a wide array of explanations, behavioural explanations appear to be the most widely cited, while firm-specific events also hold weight in the literature.

2.2.4 International evidence

Finally, price momentum is widely accepted as a global phenomenon. While in its infancy, price momentum was found only in the US, however, a vast amount of literature has since shown it to be prevalent in markets around the globe. Rouwenhorst (1998:267-284; 1999:1439-1464) was the first to examine price momentum in markets outside the US. His original paper in 1998 studied 12 European markets, while his follow-up paper in 1999 studied price momentum in 20 emerging markets. Price momentum was evident in all 12 European markets, as well as the majority of the emerging markets. Griffin, Ji and Martin (2003:2519) made similar findings while examining price momentum strategies across 39 non-US markets. Interestingly, they found that price momentum profits only weakly co-moved across these markets, suggesting that macroeconomic factors were not likely to be driving momentum.

A large number of studies have researched the price momentum anomaly in the European market. Following the Jegadeesh and Titman study (1993:65), Doukas and McKnight (2005:313) undertook a similar study that not only focused on 13 markets across Europe, but also tested whether price momentum was due to the gradual dissemination of firm-specific information and whether investors failed to update their beliefs sufficiently when they observed new public information. Of the 13 markets they tested, evidence of price momentum was found in eight, and they concluded that the gradual diffusion of firm-specific information and investors' psychological conservatism was the cause of the price momentum identified.

Regarding Asian markets, Chui, Titman and Wei (2000:1-47) examined price momentum across eight Asian markets with the focus on ownership structure, legal systems and valuation uncertainty. With the exception of Japan, price momentum was identified across the various markets. Weak evidence suggests that foreign ownership can influence the price momentum effect in Japan (Chui *et al.,* 2000:23). The results of their study also indicate that price momentum profits dissipate after nine months and that price reversals become evident (Chui *et al.,* 2000:13). Confirming the lack of price momentum in Japan, Liu and Lee (2001:323) also report price reversals in Japan, but no evidence of price momentum was found. In another study, Sehgal and Jain (2015:806) found that a price momentum strategy in India based on six months previous returns and a six-month holding period was profitable.

As a result of the evidence above, it becomes apparent that the price momentum anomaly is not isolated to the US, but rather that it is a global phenomenon that holds across markets and over time.

2.3 EARNINGS MOMENTUM ANOMALY

The ability of earnings to predict future returns has been an area of considerable interest since the late 1960s. Following the seminal paper of Ball and Brown (1968:159-178), the concept of share prices drifting in the direction of earnings surprises has been well documented and researched, given that it remains at odds with the EMH. Earnings momentum, which is also commonly referred to as PEAD, implies that one can produce superior returns to the market by taking minimal risk and ranking companies based on the magnitude of their earnings surprises. PEAD remains the oldest continuing market anomaly.

2.3.1 Brief history of earnings momentum

Ball and Brown (1968:169-171) were the first to document the PEAD anomaly, also referred to as earnings momentum. Their research showed that not only do companies reporting the highest earnings, or positive earnings surprises, in a year also have the highest share returns in that year, as one would expect, but also that the share prices of those companies continue to outperform the markets in the three months after the earnings announcement.

Ball and Brown’s (1968:159-178) study spanned a two-decade period from 1946 to 1966. Their study focused on companies listed on the New York Share Exchange (NYSE). The conclusion they reached was that the PEAD did exist, and that of all the information that became available for a specific company in a year, at least one half of it was captured by the earnings number (Ball & Brown, 1968:176). This finding is open to debate, for two reasons: first, many sources of information about a company are presented over the course of a year, which the market prices as and when this information becomes available; second, this suggestion appears to be at odds with the evidence presented in their study. Most of the information contained in the earnings number is anticipated by the market in the year leading up to the day that the annual results are released, thus the market clearly obtains most of its information elsewhere. This is evidenced by the share price movements in the year prior to the announcement. Therefore, information about future earnings is found in many places other than past earnings alone. One such centre of information is the Stock Exchange News Service (SENS). The JSE provides a service that allows investors access to company announcements that will have a direct impact on a share's price movement. Such announcements include mergers, takeovers, rights offers, capital issues, cautionaries and trading updates. All of these announcements carry information about future earnings.

Following Ball and Brown's (1968:159-178) work on PEAD, a number of studies were undertaken in an attempt to either confirm the PEAD anomaly or dispel it. Foster, Olsen and Shevlin (1984:574-603) and Bernard and Thomas (1989:1-36) did early work on the PEAD anomaly, which confirmed Ball and Brown's (1968:159-178) work. Both studies report that PEAD exists up to a period of 60 days following company quarterly earnings announcements. Further to this conclusion, the studies also show that the spread of returns earned between companies announcing positive earnings surprises and negative earnings surprises is larger for smaller companies. This indicates that smaller companies have a higher PEAD due to the fact that their future earnings may be less predictable given that they are not as well covered by analysts as larger companies are. A number of more recent studies have since confirmed that the PEAD anomaly continues to exist today (Efendi, Park & Smith, 2014:1102-1103; Hung, Li & Wang, 2015:1253-1254). While the PEAD anomaly continues to exist, Chordia, Subrahmanyam and Tong (2014:50) show that with an increase in liquidity and trading volume, the profits earned from following a PEAD strategy are diminishing. Unlike the accrual anomaly discussed in Chapter 3, while the magnitude of the drift varies from study to study, the existence of PEAD in the US market does not.

The persistence of the PEAD has been shown to vary from a couple of days after the earnings announcement up to a few years. Bernard and Thomas (1989:14) show that the ability of earnings surprises, or extreme earnings, to predict future share price returns extends beyond the original 60 days originally documented, and is still evident up to 24 months after the earnings announcement. They show that 13% (20%) of the drift occurs in the first five days for small (large) companies, and that 53% (76%) of the drift occurs in the first quarter for small (large) companies. Thus, most of the drift takes place within the first quarter following an earnings announcement, and the fact that the drift is still evident 24 months following the earnings announcement may suggest that this drift is due to subsequent earnings announcements. Fundamental momentum in earnings will be investigated as a possible explanation for this finding.

Building on the finding of Bernard and Thomas (1989:1-36), which shows the persistence of PEAD, Doyle, Lundholm and Soliman (2006:860) found evidence of PEAD persisting up to 36 months following the earnings announcement. Doyle *et al.* (2006:860) show that over 12 months, the hedge portfolio, which consists of going long a portfolio of companies reporting high earnings surprises and short a portfolio of companies reporting low earnings surprises, returns 13.95%. Over 24 and 36 months, the hedge portfolio returns 19.89% and 23.69% respectively. This result illustrates that most of the PEAD takes place within the first 12 months, but that it continues for a period of up to 36 months. Bernard and Thomas (1989:29) state that perhaps historical earnings surprises predict future earnings surprises, and thus the fact that PEAD persists for long periods of time following the earnings announcement may be due to the autocorrelation in earnings surprises. The persistence of the results shown in the study of Doyle *et al.* (2006:860) strengthens the case of autocorrelation in earnings surprises, because it is highly unlikely that an earnings surprise from 36 months ago continues to influence share price movements today.

A final interesting finding of Doyle *et al.* (2006:860) is that the portfolio with the highest earnings surprise produces 67.17% of the performance of the hedge portfolio over 12 months, 75.06% over 24 months and 60.19% over 36 months. Therefore, roughly two-thirds of the hedge return comes from the portfolio of companies producing the highest earnings surprise.

2.3.2 Measuring earnings surprises

The definition of what constitutes an *earnings surprise* varies widely across studies. A simple definition is the difference between reported earnings and expected earnings. Measuring expected earnings is problematic in itself given the various methodologies that have been employed over the years and across studies.

Ball and Brown (1968:161) estimated expected earnings by breaking company earnings into two components, an economy-wide component and a company-specific component. The economy-wide component was estimated using the knowledge that in the past, the earnings of a company was related to the earnings of other companies, and thus the earnings of such companies in the present year would yield an expectation for the present earnings of the company. The company-specific component was estimated based on the assumption that company decisions were reflected in the average change in earnings over time. Using ordinary least squares (OLS) regression analysis, the future expected returns were estimated.

Over the years, a number of more sophisticated methodologies have been employed in order to estimate the earnings surprise more accurately. Foster, Olsen and Shevlin (1984:582) employed four different methodologies to test whether the results of the PEAD anomaly differed across methodologies. Two of the models used a very simple assumption, namely that earnings of the corresponding quarter of the prior year are related to earnings of the present quarter. Such methodologies are referred to as seasonal random walks. The one method calculates the earnings surprise variable using the change in earnings relative to four quarters ago, divided by the standard deviation of unexpected earnings over the preceding eight quarters. This has been commonly referred to as the standardised unexpected earnings (SUE) methodology, which remains very popular today (Chordia *et al.,* 2014:43). The other two methodologies assume that earnings surprises are captured by share price movements before and around the announcement date. While the magnitude of the results differed across the methodologies, the conclusion on the existence of PEAD remained the same (Foster *et al.,* 1984:587).

The concerns about the methodologies employed by Foster *et al.* (1984:582) lie in their simplicity. Companies are subject to a large number of exogenous factors and/or shocks, as well as industry-specific and company-specific factors, which may vastly affect expected earnings. Under such circumstances, the assumption that the previous year's earnings number will imply the present year's earnings may result in a very large earnings surprise. Similarly, using share price movements before and around the earnings announcement date may result in information other than the earnings surprise being captured.

One of the more popular methodologies in estimating expected earnings and earnings surprises is the use of consensus analyst forecasts and the resultant errors upon the earnings announcement. Abarbanell and Bernard (1992:1187) employed this methodology in determining whether analysts underreacted or overreacted based on prior earnings announcements. Similarly, Brown, Griffin, Hagerman and Zmijewski (1987:175) show that analyst forecasts are a more superior measure of earnings surprises than historical time series. The shortcoming of this method, particularly in smaller less liquid stock markets, is that smaller companies tend not to be covered by analysts and hence there are no consensus earnings forecasts. Another concern regarding using analysts forecasts to estimate future earnings is that analysts either overestimate future earnings (De Bondt and Thaler, 1990:55), or they anchor too heavily on the seasonal random walk by placing too much emphasis on past earnings (Mendenhall, 1991:178). Besides the human nature factor that De Bondt and Thaler (1990:57) correctly point out, a common theory about the reason for such behaviour is that analysts do not want to disintermediate themselves from company management, which may hinder their future ability of obtaining information from management about the company, thus it is beneficial to remain overly optimistic about a company's future. Ababanell and Bernard (1992:1205) conclude that analysts' forecasts share some of the properties of the naïve random walk forecast, suggesting that too much emphasis is placed on past earnings when trying to determine future earnings.

Therefore, it would appear that for larger companies which are followed by analysts, using analyst forecasts may be the superior measure of earnings surprises, which, in turn, leads to improved predictability of PEAD. However, Lerman, Livnat and Mendenhall (2007:70) show that return predictability can be further enhanced by combining both analyst forecasts and the SUE as a measure of earnings surprise. Preceding this study, a similar study showed that PEAD is evident regardless of the earnings surprise calculation (Livnat & Mendenhall, 2006:189).

2.3.3 Explaining the earnings momentum anomaly

Ball and Brown (1968:173) failed to explain why the PEAD anomaly existed. Three less than satisfactory explanations were put forward in their study, causing a substantial gap in the knowledge to be filled by future research. Only recently have the underlying causes of the PEAD anomaly begun to be better understood (Chordia & Shivakumar, 2005:521-556; DellaVigna & Pollet, 2009:709-749; Garfinkel & Sokobin, 2006:85-112; Hirshleifer, Lim &

Teoh, 2009:2289-2325; Sadka, 2006:309-349;), despite the fact that this is an incredibly robust anomaly, which has been documented on markets around the world over the course of four decades.

Similar to explanations for other anomalies, the explanations can be divided into those that attempt to explain the anomaly by way of risk and those that use behavioural-based explanations. Neither set of explanations is particularly compelling, suggesting that further research is needed in this area. Bernard and Thomas (1989:1-36), Chordia and Shivakumar (2005:521-556), Garfinkel and Sokobin (2006:85-112) and Sadka (2006:309-349) present risk-based explanations, while Hirshleifer, Lim and Teoh (2009:2289-2325) and DellaVigna and Pollet (2009:709-749) present the usual investor overreaction/underreaction hypothesis, based on investors not having the information-processing ability to immediately process earnings information.

In order for risk-based explanations to hold true, companies with positive earnings surprises that go on to outperform the market in the months following the announcement, need to be riskier than firms announcing earnings surprises which are smaller in magnitude. A large body of literature examines a wide variety of risk factors that potentially play a role in improving the understanding of the anomaly (Bernard & Thomas, 1989:1-36; Chordia & Shivakumar, 2005:521-556; Garfinkel & Sokobin, 2007:85-112; Sadka, 2006:309-349).

A risk factor that is always at the forefront of researchers' minds when testing anomalies is size. Smaller firms that tend to be underresearched by analysts, and which may endure large transaction costs, need to be shown not to be the underlying cause of the earnings momentum anomaly. Bernard and Thomas (1989:1-36) undertook a study that attempted to determine whether PEAD was a result of investor behaviour or a risk premium. Smaller companies were found to have larger PEAD than larger companies, but all companies had PEAD to some degree, thus dispelling the theory that PEAD is due to a size risk factor (Bernard & Thomas, 1989:11).

It is not only company-specific risk factors that need to be taken into account, but macroeconomic factors are another risk factor that needs to be considered. In their study, Chen, Roll and Ross (1986:383-403) tested a number of macroeconomic factors in an attempt to determine whether the stock market rewarded systematic risk factors. They found that there was evidence of a relationship between a number of their factors and future expected share returns. Bernard and Thomas (1989:19) show that the systematic risk factors found to influence expected stock market returns in Chen *et al.* (1986:383-403) do not explain PEAD and the earnings momentum anomaly. The study of Chordia and Shivakumar (2005:521-556) states that a macroeonomic risk factor is the reason for stocks which exhibit PEAD. The sensitivity of earnings growth relative to inflation is shown to vary monotonically across shares which are sorted based on the SUE. Taking account of the inflation illusion hypothesis, which states that investors fail to take into account inflation in forecasting future earnings growth, and therefore, undervalue companies whose earnings growth rely more on inflation, Chordia and Shivakumar (2005:532) show that lagged inflation predicts future earnings growth and PEAD for SUE sorted shares.

Building on the theory that divergence in investor's opinion is another factor that ought to be considered as a risk factor, Garfinkel and Sokobin (2006:85-112) posit that this risk factor may help understand the earnings momentum anomaly. The volume of shares traded is commonly used as a proxy to measure the divergence in investor opinions on earnings announcement, and following this methodology, Garfinkel and Sokobin (2006:97) found that PEAD increased as trading volume increased around the earnings announcement date, indicating that the divergence of investor's opinions plays a part in explaining PEAD.

Turning attention to behavioural explanations, Bernard and Thomas (1990:338) contend that investors are naïve when evaluating company earnings and fail to recognise the full implications of a company's earnings for its future. Similarly, Brennan (1991:70) points out that market participants fail to appreciate what current earnings imply for future earnings. These statements indicate that less sophisticated investors help drive PEAD. Bartov, Radhakrishnan and Krinsky (2000:59) found evidence supporting this theory. A related line of research indicates that investors fail to recognise the implications of a company's earnings announcement timeously. Hirshleifer *et al.* (2009:2291) present the investor distraction hypothesis, which states that extraneous news inhibits investors' ability to react timeously, and therefore, on days with many concurrent earnings announcements, the PEAD is far larger than on days with few concurrent earnings announcements (Hirshleifer *et al.*, 2009:2308). In a similar study, DellaVigna and Pollet (2009:709-749) tested investor responsiveness to earnings announcements on days when investor inattention was more likely. Investors showed the propensity to have a lower immediate response and a higher delayed response on Fridays, as opposed to other days in the week, due to the distraction from work-related activities (DellaVigna & Pollet, 2009:709-720).

Some recent research has begun to explore the theory that PEAD could potentially be driven by investor uncertainty of how to interpret information released at company earnings announcements (Caskey, 2009:3596-3627), as well as sentiment in the market at the time of the earnings announcement (Livnat & Petrovitis, 2008:1-35). Investor uncertainty is related to the ability to process information timeously. However, the theory is that uncertainty with regard to the quality of the information being released in the earnings announcement causes investors to underreact, and as the uncertainty is resolved, investors begin to react appropriately and PEAD is created (Caskey, 2009:3613). The work of Francis, Lafond, Olsson and Schipper (2007:403-433) were the prelude to this theory. Companies reporting earnings surprises that have higher degrees of information uncertainty, as measured by the quality of their earnings (Francis *et al.,* 2007:410), have more muted initial reactions that later correct causing PEAD (Francis *et al.,* 2007:423).

The level of sentiment in the market at the time of the earnings release is another recent theory that has been researched in an attempt to understand why the market is slow to react to earnings surprises. Companies announcing positive earnings surprises in a market of pessimistic sentiment results in higher levels of outperformance than companies announcing positive earnings surprises in a market of optimistic sentiment (Livnat & Petrovitis, 2008:15). Therefore, depending on the level of optimism or pessimism in the market at the time of the earnings announcement, the degree of PEAD may vary. The interpretation of this result is that when sentiment is low and a company produces a positive earnings surprise, investors tend to overreact to the ‘good’ news and the drift following the announcement is positive and large. While helping to explain the difference in the degree of PEAD, the level of sentiment in the market does little to help understand what actually causes the PEAD. However, it gives more insight into what determines investor behaviour.

Bird, Choi and Yeung (2014:45-73) bring the theories of information uncertainty and market sentiment together in a more recent effort to understand PEAD. At one extreme, in a situation of low information certainty and low market sentiment, which means investors have difficulty in interpreting company earnings announcement at a time when they are in a pessimistic frame of mind, PEAD tends to be negative for both positive and negative earnings surprises, but it is more negative for negative earnings surprises. At the other extreme, when information uncertainty is low and sentiment is high, PEAD is positive for both positive and negative earnings surprises, but it is higher for positive earnings surprises (Bird *et al.*, 2014:61).

A differentiating factor for the study undertaken by Bird *et al.* (2014:45-73) is that unlike the previous studies mentioned above, which researched market uncertainty and sentiment at the time of the earnings announcement, Bird *et al.* (2014:65) found that market uncertainty and sentiment played a much larger role in explaining PEAD over the post-announcement period, as opposed to at the time of the earnings announcement. Furthermore, Bird *et al.* (2014:65) demonstrate that PEAD is prevalent in both small- and large-cap shares, as well as value and growth shares. However, it was shown that PEAD was more prevalent in small shares as opposed to large shares, as well as growth shares as opposed to value shares. The size of the shares was determined based on market capitalisations, while shares were split into value and growth shares based on their price-to-book ratios.

While not an exhaustive list of possible explanations, the above literature demonstrates the wide array of attempts at explaining the long-standing earnings momentum anomaly, and clearly closure has not been reached on what factors drive the continued existence of PEAD.

2.3.4 Alternative earnings momentum strategies

There is a large body of literature which shows that returns can be enhanced by combining the PEAD strategy with other earnings-based or non-earnings-based strategies. An obvious starting point would be to understand the relationship between the accruals anomaly and the PEAD anomaly, given that managers have the ability to manipulate earnings through adjusting accruals, and therefore causing earnings surprises. Collins and Hribar (2000:101-123) attempted to close the link between the accrual anomaly and the long-standing earnings momentum anomaly, as represented by PEAD. The behavioural explanations of the PEAD literature indicate that the market underreacts to earnings surprises, while the accrual literature indicates that the market overreacts to earnings that contain a large accruals component. And given that earnings are equal to the sum of the accruals and cash flow component, managers are able to use the accrual component of earnings to manipulate the sign and magnitude of earnings surprises (Collins & Hribar, 2000:102). Therefore, their study attempted to determine whether the underweighting of earnings surprises represented the same mispricing phenomenon as the overweighting of accruals.

Sorting the market into quintiles based on the SUE methodology and the accrual component of earnings provides evidence that both the earnings momentum and the accrual anomaly occur on a quarterly basis, but that the combination of the two strategies is more profitable than the separate individual strategies alone. Companies with high unexpected earnings surprises, accompanied by a low level of accruals component of earnings, significantly outperform companies with high unexpected earnings surprises and a high level of accruals (Collins & Hribar, 2000:116). Similar to this finding, Francis *et al.* (2007:427) show that firms with low quality earnings, as measured by high levels of accruals, have a high degree of PEAD. Therefore, it appears that it is not the case that the earnings momentum phenomenon is the same mispricing anomaly as the overweighting accruals anomaly.

Building on the behavioural-based explanations, as explained above, disaggregating a company's earnings into its accrual component can enhance PEAD. Therefore, aggregate earnings surprises mask the differential information that is contained in the cash flow and the accrual components. Given that a lower level of accruals enhances PEAD, one would expect that a higher level of cash flow would enhance PEAD. Cash flows have a greater association with future cash flows and earnings (Sloan, 1996:301), and thus if investors underreact to earnings announcement that results in PEAD, the underreaction will be larger for the cash flow component, causing the mispricing to be larger and the resultant PEAD to be greater. Shivakumar (2006:16) confirms this hypothesis in his study that tested whether PEAD trading strategies would be enhanced by disaggregating earnings surprises into their accrual and cash flow components.

Another way that managers can manipulate the earnings surprise is by manipulating analyst forecasts. It is not uncommon for managers to be conservative in their outlooks in order to manipulate the analyst's expectations, thereby making it easier to produce positive earnings surprises. Richardson, Teoh and Wysocki (2004:911) found that companies with greater forecast pessimism tended to have higher insider selling subsequent to the quarter when they produced a positive earnings surprise. This indicates that management have an incentive to reduce expectations in order to produce positive earnings surprises and thereby increasing the share price so that share sales can be undertaken at the higher prices. Thus, the ability of management to manage their earnings and company earnings expectations gives management the ability to manage earnings surprises, which, in turn, can lead to PEAD.

Turning attention to non-earnings-based strategies, several studies show that earnings can be enhanced by combining the PEAD anomaly with non-earnings information (Chan *et al.*, 1996:1681-1713; Chordia & Shivakumar, 2006:627-656; Gervais, Kaniel & Mingelgrin, 2001:877-919).

Chan *et al.,* (1996:1681-1713) attempted to find out whether price momentum was due to the market's underreaction to past earnings announcements, and therefore, whether price momentum and earnings momentum were the same anomaly. They found that returns could be enhanced by combining earnings momentum with price momentum, and thus that the one anomaly did not subsume the other (Chan *et al.,* 1996:1696). Chordia and Shivakumar (2006:627-656) questioned the validity of this finding, by questioning whether earnings momentum was distinct from price momentum. Chordia and Shivakumar (2006:644) conclude that returns earned by the price momentum strategy are explained by the systematic component of earnings momentum, and that price momentum is merely a manifestation of earnings momentum. However, the reverse is not true. In other words, the earnings momentum strategy subsumes the price momentum strategy. This is the only evidence of the price momentum strategy being explained by another anomaly.

Other non-earnings-based information that has been shown to complement earnings momentum is the volume traded of companies reporting earnings surprises. Gervais *et al.* (2001:889) found a significant positive correlation between abnormal trading volume over short periods and the subsequent returns, which they referred to as the high-volume return premium. Gervais *et al.* (2001:892-893) put forward two plausible explanations for the high-volume return premium. The first explanation is based on short-term price reversals and the second explanation is based on medium-term price momentum.

Lerman, Livnat and Mendenhall (2008:1-41) questioned whether the high-volume return premium continued to exist following the earnings announcement. Their conclusion is that PEAD is enhanced when combining high announcement period volume with high positive earnings surprises (Lerman *et al.*, 2008:17), indicating that the high-volume premium continues to exist following the announcement.

The above-mentioned complementary strategies, while not exhaustive, assist in the understanding of the earnings momentum strategy in the sense that they discard a number of theories that have been put forward in an attempt to explain earnings momentum. If earnings momentum were subsumed by one of these strategies, it would mean that the strategy was capturing the same effect as earnings momentum, but this is not the case.

2.3.5 International evidence

The earnings momentum anomaly has been widely researched in the US, and while having been one of the more robust market anomalies, very little earnings momentum research has been undertaken outside the US. Of the few research studies of the earnings momentum anomaly outside the US, the conclusions reached in the studies are ambiguous in determining whether earnings momentum is a global phenomenon, or whether it is unique to the US (Griffin, Kelly & Nardari, 2010:3225-3277; Hung *et al.,* 2015:1242-1283).

Various studies have shown that PEAD exists in countries such as the United Kingdom (UK) (Hew, Skerratt, Strong & Walker, 1996:283-293), Spain (Forner & Sanabria, 2010:775-815) and New Zealand (Truong, 2010:139-157), while there are also a number of studies that found little evidence of PEAD existing in countries such as Belgium (Van Huffel, Joos & Ooghe, 1996:693-713) and Singapore (Ariff, Loh & Chew, 1997:17-29). Therefore, while the evidence across the world is unconvincing, when looked at on a case-by-case basis, a more comprehensive study was undertaken by Griffin *et al.* (2010:3225-3277), which tested market efficiency across 28 emerging markets and 28 developed markets.

The conventional wisdom is that emerging markets are less efficient than their developed market counterparts, and thus market anomalies are expected to be more prevalent in emerging markets. Griffin *et al.* (2010:3241) found that 16 out of 25 developed market portfolios and 12 out of 14 emerging market portfolios with positive earnings surprises earned higher returns than those with negative earnings surprises. They conclude that the PEAD strategy yields similar returns across developed and emerging markets, despite the notion that emerging markets are less efficient. In a similar study that looked at how improved financial reporting quality affected PEAD on markets around the world, Hung *et al.* (2015:1255) found that PEAD was present in 18 out of the 30 countries that were included in their study.

Therefore, while recent studies have undertaken more comprehensive research into the earnings momentum anomaly around the world, the conclusion that can be drawn is similar to that which can be drawn from the individual country studies mentioned above. The evidence is mixed and it appears that earnings momentum is not a universal anomaly over time.

2.4 SUMMARY

This chapter provided a review of the price momentum and earnings momentum anomalies. Following the initial work of Samuelson (1965:47-48) and Fama (1965:90), it was not long before literature challenging the implications of the EMH began to appear.

Price momentum remains the most robust anomaly, globally. Given the pervasiveness of the anomaly, it is puzzling that no definitive explanation for this anomaly has been provided. The two dividing schools of thought on an explanation are behavioural-based explanations and risk-based explanations. Both schools of thought provide plausible explanations, but neither has produced the holy grail. Price momentum comes in various forms. Traditionally, price momentum portfolios are formed based on the momentum in share prices over the past three to 12 months. However, other portfolio formation methodologies produce similar results. These include using ratios of moving day averages, volatility in share prices and 52-week highs and lows. International evidence indicates that price momentum is a global phenomenon.

Earnings momentum is the longest-standing anomaly. There are a number of proxies indicating an earnings surprise; however, the most commonly used proxy is the SUE. Explanations for the earnings momentum anomaly are similarly divided into behavioural-based and risk-based explanations. Neither is particularly compelling, resulting in further work being required. The earnings momentum anomaly is not as widely prevalent in markets around the world as the price momentum anomaly.

The next chapter continues the literature review of anomalies, focusing on the accrual anomaly and fundamental literature.

CHAPTER 3

OVERVIEW OF THE ACCRUAL ANOMALY AND FUNDAMENTAL DATA LITERATURE

3.1 INTRODUCTION

This chapter reviews the literature of the accrual anomaly initially documented by Sloan (1996:289-315) and a wide array of fundamental literature. The accrual anomaly is closely related to the fundamental literature given that it is a manifestation of fundamental analysis. The accrual anomaly is the most robust, researched and perhaps only fundamental anomaly. A large body of literature focuses on different aspects of fundamental analysis, claiming to have discovered different fundamental anomalies. These include but are not restricted to aggregating fundamental signals to predict future share price returns, calculating probabilities of bankruptcy using fundamental data and testing the implications of the different uses of free cash flows. Fundamental analysis has provided significant insight into what drives future earnings and it is this insight that is critical in understanding what drives fundamental momentum of future earnings.

The remainder of this chapter is structured as follows: Section 3.2 reviews the accrual anomaly literature. A brief history of the anomaly is discussed in Section 3.2.1. This is followed by Section 3.2.2 defining the accrual component of earnings, which has evolved over time. Sections 3.2.3 and 3.2.4 review the literature and discuss possible explanations of why the anomaly has not been arbitraged away. Section 3.2.5 discusses whether the accrual anomaly is prevalent in markets around the world. Section 3.3 reviews literature on fundamental analysis, which has made significant contributions to understanding the drivers of future earnings.

3.2 ACCRUAL ANOMALY

In its simplest form, accrual accounting allows a company to record expected future cash flows or expenses in the current financial period. A company’s earnings are therefore divided into two parts – an accrual component, which is an estimate of future cash flows accounted as earnings today, and a cash flow component, which shows the portion of earnings that were actually brought in by way of cash receipts. Given that the accrual component is an estimate of future cash flow, the reliability of the accuracy of the estimate is questionable. For this reason, Sloan (1996:289-315) undertook a study to test the persistence of future earnings given varying compositions of accruals and cash flows in current earnings. While the results of the study indicated that the level of persistence of earnings was lower as the accrual component of earnings increased, what was more fascinating was that investors appeared to be ignorant of this fact, and thus the accrual anomaly was discovered. Over the years, as investors have become more aware of the accrual anomaly, it is argued that the anomaly has been arbitraged away (Green, Hand & Soliman, 2011:803).

3.2.1 Brief history of the accrual anomaly

The accrual anomaly is largely credited to Richard Sloan following his 1996 research paper. Sloan (1996:289-315) initially set out to test the hypothesis that investors fixate too heavily on earnings and fail to take into account information contained in the accrual and cash flow component of a company's earnings. This is what has subsequently become known as the earnings fixation hypothesis (EFH). To test this hypothesis, the level of earnings persistence needed to be tested based on the composition of the earnings. Therefore, Sloan (1996:291) first tested the hypothesis that the accruals of companies with soaring inventory and receivables turn out to be worth less than their original carrying value, which, in turn, results in their earnings being of lower quality and, therefore, less likely to persist into the future.

To test the hypothesis that earnings driven by accruals are of lower quality than those driven by cash flows, Sloan (1996:301) first ranked companies and placed them into decile portfolios based on their level of earnings. He then tested to see whether earnings were persistent around the ranking year by comparing the earnings in the five years leading up to the ranking year and the five years following the ranking year. The results of the event-time plot show that earnings are persistent in the sense that, if a firm produces a high (low) level of earnings, on average, this year, they are likely to have produced a high (low) level of earnings in recent years, and are likely to continue to produce a high (low) level of earnings in the near future.

Next, Sloan formed two more sets of decile portfolios by ranking stocks on their level of accruals and their level of cash flows, and then compared the persistence of the earnings of the highest and lowest ranked decile portfolios on a time plot. Again, while a high (low) level of earnings remained persistent for both sets of portfolios, they were far more persistent when the high (low) level of earnings were accompanied by a high (low) level of cash flows as opposed to high (low) level of accruals.

The outcome of the study indicates that the accrual component of earnings results in future earnings which are less persistent than they otherwise would have been if they were attributable to the cash flow component. Thus, while both components of current earnings are shown to contribute to future earnings, future earnings are less likely to persist if they are primarily attributable to the accrual component as opposed to the cash flow component (Sloan, 1996:301).

The critical part of Sloan's (1996:289-315) research, which is discussed in Section 3.2.3, was determining whether the EFH was accepted or not, because it was this hypothesis that determined whether there was an anomaly or not. Suffice it to say that the accrual anomaly was found to exist.

Over the years following Sloan's original research, a great deal of interest in the accrual anomaly has been generated. To name but a few, the definition of accruals has been expanded beyond that of working capital only; the anomaly has been tested across markets around the world; the different components of the accruals have been researched to try and understand which component accounts for the majority of Sloan's (1996:301) findings and whether the anomaly is actually profitable in practice.

3.2.2 Defining *accruals*

Depending on which research paper one reads, the definition and calculation of accruals vary. Tracing the definition back to Healy (1985:86), *accruals* were originally defined as the difference between reported earnings and cash flows from operations. Perhaps a slightly more informative, yet very broad, definition of *accruals* states that accruals account for future expected cash flows that will flow as a result of net assets that are currently held or owned. Sloan (1996:293) uses a narrower definition in that the definition includes net operating assets only, and excludes non-operating assets, non-operating liabilities and financial assets and liabilities. Accordingly, Sloan (1996:289-315) defines the term *accruals* as follows:

$$Accruals_t = \Delta CA_t - \Delta CL_t - DEP_t \qquad (3.1)$$

where $\Delta X_t = X_t - X_{t-1}$

ΔCA_t = change in current assets excluding cash;

ΔCL_t = change in current liabilities excluding taxes and debt;

DEP_t = depreciation.

The obvious shortcoming of Sloan's (1996:289-315) research lies in the narrow definition of accruals, given that many accruals which relate to non-current operating assets, non-current operating liabilities, non-cash financial assets and financial liabilities are omitted (Richardson *et al.,* 2005:445). Without accrual accounting, the only balance sheet item would be cash and thus Richardson *et al.* (2005:446) expanded on Sloan's original definition of *accruals*, by employing a far more comprehensive definition, which includes those previously excluded line items. Excluding such items from the definition removes the future benefits that would otherwise accrue to a company as a result of the balance sheet items. This is an erroneous oversight given the fact that they all form part of the accrual accounting process.

Richardson *et al.'s* (2005:446) definition of *accruals* consists of three sub-components, forming a complete decomposition of the balance sheet. The first sub-component focuses on the nature of the underlying business activity, reported by the change in non-cash working capital. The second sub-component is the change in non-current operating accruals, consisting of the change in non-current assets less the change in non-current liabilities. This sub-component of accruals has been ignored in the literature up to this point. The final sub-component is the change in net-financial assets excluding cash. Thus, their definition of *accruals* is as follows:

$$Accruals_t = \Delta WC_t + \Delta NCO_t + \Delta FIN_t \tag{3.2}$$

where $\Delta X_t = X_t - X_{t-1}$

ΔWC_t = change in non-cash working capital;

ΔNCO_t = change in net non-current operating assets;

ΔFIN_t = change in net financial assets.

The first term of Richardson *et al.'s* (2005:446) definition is the core of Sloan's (1996:293) definition discussed above. The three terms of Richardson *et al.'s* (2005:446) definition are further decomposed into their asset and liability components. However, this is discussed in Chapter 5.

A further improvement was proposed by Hirshleifer, Hou, Teoh and Zhang (2004:303), who argue that a better measure of earnings quality is produced by aggregating accruals over the life of a company. The methodology of Richardson, Sloan, Soliman and Tuna (2006:727) disagrees with Hirschleifer *et al*.'s (2004:303) definition, given that their methodology requires aggregate accruals in the current year to be divided by aggregate accruals in previous years, which is essentially the same as measuring accruals over one year, given that the denominator and numerator will cancel each other out. Richardson *et al.* (2006:727) found that earnings quality was best measured by aggregating accruals over the past two years. The vast body of literature recording the accrual anomaly is proof that despite the definition employed, the accrual anomaly persists.

Despite the numerous definitions of accruals that have been employed over the years, the results and conclusions drawn from the various studies discussed do not deviate substantially from one another. Thus, despite the definition, the persistence of earnings is stronger when those earnings are backed by a high degree of cash flow, as opposed to accruals, and are thus higher quality earnings.

3.2.3 Accruals and the anomaly

Investors need to be able to profitability exploit the accrual and cash flow findings of Sloan's (1996:289-315) research in order for it to be termed an anomaly, otherwise it remains interesting research from an accounting perspective, with no real-world implications for capital market theory. Therefore, the second hypothesis of Sloan's (1996:289-315) research involved testing whether market participants understood the impact of accruals on the persistence of future earnings, and whether or not it was accurately reflected in share prices.

Share price returns are susceptible to a large number of factors over the short to medium term; however, it is widely accepted that the underlying driver of share price returns in the long run is earnings. Therefore, if investors are aware that companies with a high level of accruals today are likely to have a lower level of future earnings, they should be pricing this information timeously so that there are no abnormal future returns when the lower level of future earnings materialises. Likewise, for companies with a high level of cash flows, future earnings are expected to be more persistent, which should be reflected in current share prices to avoid future abnormal returns. Persistent failure to recognise the accrual and cash flow effects on future earnings will result in abnormal future returns and, in turn, what researchers refer to as an 'anomaly'.

Sloan (1996:292) developed three sub-hypotheses under the hypothesis, questioning whether share prices fully reflect the information contained in accruals and cash flows. The first sub-hypothesis deals with whether earnings expectations embedded in share prices reflect the persistence of earnings based on the level of accruals and cash flows. The second sub-hypothesis tests whether abnormal share returns can be generated by forming a hedge portfolio by going long on shares with a low level of accruals, while simultaneously, going short on shares with a high level of accruals. The final sub-hypothesis tests whether the abnormal returns are clustered around earnings announcement dates.

The results of the above three sub-hypotheses unequivocally indicate that share prices do not reflect the information contained in accruals and cash flows and their subsequent effect on future earnings (Sloan, 1996:303), that a hedge portfolio constructed on the level of accruals generates abnormal returns (Sloan, 1996:306) and that over 40% of the abnormal return is generated around the earnings announcement (Sloan, 1996:312).

Following from Sloan's research, perhaps the most significant contribution in building on the accrual literature and anomaly was that of Richardson *et al.* (2005:437-485). Given that they extended the early findings by improving the definition as discussed in Section 3.2.2, they also tested each of the various sub-components of accruals in order to determine whether components that were more reliably measured led to greater persistence of earnings, and then whether investors fully anticipated this information.

The results of Richardson *et al.* (2005:461) corroborate Sloan's original results. Accruals are shown to have relatively low persistence coefficients, indicating that the higher the level of accruals, the lower the level of future earnings persistence. However, the most telling contribution of the research was the results indicating the level of persistence due to the different sub-components of accruals. As predicted, given that the change in non-cash working capital and the change in non-current operating assets are estimated with a high degree of subjectivity and a low degree of reliability (Richardson *et al.,* 2005:465), the persistence coefficients of those components are significantly lower than those of the third sub-component of accruals, the change in net financial assets, which is measured with a greater deal of reliability. Therefore, while the level of accruals plays a significant role in the persistence of future earnings, it is important to understand which component of accruals is driving the overall level of accruals.

Decomposing the accrual components even further, Richardson *et al.* (2005:465) found that it is the current operating assets and non-current operating assets of the non-cash working capital and the change in non-current operating assets, respectively, that account for the majority of the low level of persistence, as opposed to the liabilities of the those sub-components. Their findings rest on the theory that the less reliable the measurement of a component of accruals is, the more likely it is that that component will erroneously predict future cash flows resulting in a lower level of earnings persistence (Richardson *et al.,* 2005:442). This theory is further discussed in Chapter 6.

In accordance with determining whether share prices reflect the various degrees of reliability with which accrual components are measured and, in turn, whether there is an anomaly, Richardson *et al.* (2005:474) undertook both regression analysis and sort analysis to determine the relationship between accruals and future share price returns.

Consistent with the findings of the different accrual components discussed above, Richardson *et al.* (2005:474) conclude that future share price returns are negatively related to accruals and that this negative relation is stronger for less reliable accruals.

While Sloan (1996:289-315) is credited with being the pioneer of the accrual anomaly and Richardson *et al.* (2005:437-485) were instrumental in corroborating and improving the understanding of the anomaly, the works by these authors are by no means an exhaustive list of studies that research the anomaly.

A different perspective, and perhaps a more pertinent angle of attack, on the accrual anomaly is to test whether investment or accounting professionals are aware of the effect of accruals on future earnings and whether they are able to profitably take advantage of the anomaly. Bradshaw, Richardson and Sloan (2001:45-74) and Lev and Nissim (2006:193-226) did precisely this by testing whether sell-side analysts and auditors, and institutional investors, respectively, were able to identify information carried in the accrual component of earnings, and whether they communicated this information to investors.

With regard to sell-side analysts, the results show that their earnings forecast error is larger for companies with higher than average accruals. However, the magnitude of forecast error declines as the year progresses. This indicates that analysts are unaware of the implications of accruals originally, but gradually appear to realise them as the year progresses (Bradshaw *et al.,* 2001:63). A similar conclusion is reached with regard to auditors, whose job it is to provide a qualified opinion that the published results fairly represent the results of the underlying operations (Bradshaw *et al.,* 2001:70).

A more recent study focusing on the accrual anomaly questions whether analysts are able to identify and mitigate the accrual anomaly (Gordon, Petruska & Yu, 2014:61-90). The accrual anomaly was found to exist in markets around the world. However, the overestimation of the accrual component of earnings was shown to be less pronounced for companies that were covered by analysts (Gordon *et al.*, 2014:77-78).

These findings not only give further insight into the accrual anomaly, but also give insight into the effectiveness of analysts and auditors as financial intermediaries. Two potential reasons for why analysts fail to identify the implications of a high level of accruals are that either they lack the necessary sophistication to understand the implications of accruals or they collude with management to inflate earnings expectations (Bradshaw *et al.,* 2001:46). The reasons for auditors' failure to identify and communicate the implications of accruals may be the same as the two reasons mentioned above, alternatively, they may identify and understand the implications; however, they are under no obligation to communicate these to investors (Bradshaw *et al.,* 2001:47).

Lev and Nissim (2006:196) expect sophisticated investors in the form of institutional investors to exploit what they describe as a seemingly simple strategy of investing long in low accruals companies and short in high accruals companies, and as a result, expect the anomaly to dissipate and ultimately vanish. In contrast to analysts and auditors, it appears that institutional investors are aware and react to the information contained in accruals. However, the anomaly does not appear to dissipate over time as expected (Lev & Nissim, 2006:213). The reason could be that while institutional investors react to information in accruals, their reaction is very small in relation to the normal trade, and thus has little or no effect on counteracting the anomaly (Lev & Nissim, 2006:214). Studies which corroborate the notion that institutional investors pay attention to the level of accruals include that of Ali, Chen, Yao and Yu (2008:1-26) and that of Collins, Gong and Hribar (2003:251-276).

A vast array of research and evidence on the persistence of the accrual anomaly was undertaken in the early 2000s. For example, the studies of Collins and Hribar (2000:101-124), Xie (2001:356-373) and Zach (2003:1-44) provide evidence that the accrual anomaly is robust over different time periods in the US. More recently though, efforts have been concentrated on determining whether the anomaly is persistent across different geographies and not just focused on the US. Some of these studies are discussed in Section 3.2.5.

3.2.4 Explaining the accrual anomaly

The accrual anomaly was originally met with much interest and opposition, particularly among academics who clung to the belief of the EMH. This led researchers to try and extend the findings in an attempt to produce better measures of earnings quality. Alternatively, many researchers have attempted to explain the accrual anomaly in an attempt to try and preserve the EMH. After 1996, returns earned through exploiting the accrual anomaly have gradually become more mixed. Green, Hand and Soliman (2011:797-816) argue that the accrual anomaly is likely to have been arbitraged away, as investors became more aware of it due to Sloan's original work. However, based on more recent work (Doukakis & Papanastasopolous, 2014:256-277; Gordon *et al.*, 2014:61-90), this appears not to be the case and, in turn, much research has been focused on trying to explain the persistence of the anomaly.

As is common in explaining anomalies, there generally tends to be a number of competing theories, and the accruals anomaly is no different. The usual risk-based explanations suggest that shares with predictable higher returns, which are essentially companies with higher quality earnings, are associated with higher risk. This would seem counter-intuitive given that one would expect companies with higher quality earnings to be associated with a lower level of risk. Risk-based explanations attempt to explain the existence of the anomaly as opposed to accepting the anomaly and trying to identify its causes.

A different approach to explaining the accrual anomaly is to accept that the anomaly exists and then try and understand why it exists and identify what the underlying cause is. Studies that adopt this approach provide explanations that range from management manipulation of earnings (Chan *et al.*, 2006:1041-1082) to identifying which components of accruals (from a balance sheet perspective) account for the mispricing (Thomas & Zhang, 2002:163-187), or whether the accruals are discretionary or not (Allen, Larson & Sloan, 2013:113-129).

One study that attempts to explain the accrual anomaly is that of Kraft, Leone and Wasley (2006:297-339), by suggesting that Sloan's (1996:305) research design is faulty due to a lack of robustness tests. Removing the extreme future share returns from Sloan's study would result in the accrual anomaly disappearing (Kraft *et al.*, 2006:308). Arriving at a conclusion such as this seems nothing short of absurd given that they do not remove data errors, but rather actual data points where companies had spectacular returns. While outliers are likely to always be present in study samples, the outliers need to be dealt with accordingly as opposed to simply removing them in fear of them influencing the overall result of the research.

Other studies that attempt to explain the anomaly focus on the fact that the accrual anomaly is due to differences in risk which are not being accounted for in the analysis. The work of Khan (2008:55-77) suggests that once risk has been controlled for, the economic and statistical significance of the accrual anomaly is diminished. In an attempt to explain the cross-sectional variation in returns for portfolios constructed on their respective level of accruals, Khan (2008:63) employs five different risk factor models. Of the five models, four are unable to account for the variation in returns, while one model is able to. The model that is accepted is a four-factor model, which uses a size factor, a value factor and two news factors. One news factor deals with news regarding future expected returns on the market, while the other is about future expected cash flows from the market. To confirm the results, descriptive statistics of the economic and financial characteristics of the accrual portfolios are examined, and it is shown that firms with low (high) accruals also have a high (low) bankruptcy risk (Khan, 2008:67).

The results of Khan (2008:55-77) are contentious for two reasons: first, only one out of the five risk models could explain the variation in returns across the accrual portfolio; second, it makes very little sense that a company with a low level of accruals, which, in turn, implies that the earnings are backed by cash flows and are therefore of a good quality, would be a higher bankruptcy risk than a firm whose earnings are backed by substantially more accruals.

The work of Hirshleifer, Hou and Teoh (2012:320-335) is another study that sets out to test whether the accrual anomaly reflects mispricing in the market, or whether it can be captured by identifying the priced risk factors in share returns. Employing the Fama-French three-factor model, Hirshleifer *et al's.* (2012:327) conclusion supports the hypothesis that investors have misperceptions of the quality of a business's earnings which are supported by accruals, causing companies with high levels of accruals to be mispriced, rather than the returns which are associated with the accrual anomaly representing a premium for bearing additional risk.

Another interesting conclusion drawn from Hirshleifer *et al.* (2012:334) is that, similar to Green *et al.* (2010:797-816), it appears that following the publication of Sloan (1996:289-315), the mean return earned on the accrual-based hedge portfolio reduced significantly indicating that perhaps investors are becoming more aware of the accrual anomaly and arbitraging the strategy's profits away.

Given that there is no convincing evidence that the accrual anomaly is explained away by some form of risk that is not accounted for, one has to understand why the accrual anomaly exists rather than trying to prove that it does not exist.

In trying to understand what causes the accrual anomaly, Thomas and Zhang (2002:163-187) examined the individual balance sheet components to test which component produced the largest size-adjusted return and hence accounted for the majority of the accrual anomaly. Inventory was identified as the balance sheet component which was primarily responsible for the accrual anomaly (Thomas & Zhang, 2002:166).

Based on results from prior research, Thomas and Zhang (2002:168) constructed three theoretical hypotheses to explain their results. All three explanations are based on the fact that changes in inventory are correlated with these factors. The first theory states that there is a negative relationship between capital expenditure and future share price returns. Highly profitable companies in one period generates more free cash flow, which is subsequently invested in negative net present value capital expenditures, resulting in reduced future profitability and negative share price returns. Thus, while not directly related to accruals, this explanation suggests that inventory rises with capital expenditure, which, in turn, results in lower future share price returns. The second explanation suggests that working capital accruals which, in turn, are positively related to net operating assets, are negatively related to future profitability. The third and possibly the most plausible explanation is that increasing levels of accruals follow periods of high growth, and as a result, the market erroneously extrapolates these growth rates into the future. When growth rates mean revert, share prices decline.

Investigating all three explanations that they formulated, Thomas and Zhang (2002:168) conclude that the evidence is inconsistent with all of them. However, they did uncover some irregularities, which point to the possibility of management interference (Thomas & Zhang, 2002:181).

Confirmation of the above finding is found in Chan *et al.* (2006:1077), who undertook similar research and similarly identified inventory, along with changes in accounts receivable, as the balance sheet component which has the most robust relation with the accrual anomaly. Chan *et al.* (2006:1043) also provide three explanations for their findings. The first explanation builds on the irregularity mentioned above that management have the ability to interfere with earnings. One possibility is by recording sales prematurely, which, in turn, increases receivables. Alternatively, they may understate current liabilities, both of which will temporarily increase earnings by increasing the accrual component of earnings. Therefore, a high level of accruals is associated with poor quality earnings, which are not expected to persist. On the other hand, when a large portion of current earnings is made up of cash earnings, it suggests that the earnings are of a high quality and likely to persist for a longer period of time, due to cash earnings being far less susceptible to management manipulations.

A second explanation provided by Chan *et al.* (2006:1043) is that accruals increase with increases in working capital due to growth in sales. Therefore, a higher level of accruals is a reflection of past growth in sales. Managers and investors alike extrapolate historic growth and returns too far into the future, and thus overestimate future growth rates based on past growth rates, and in doing so, future returns are likely to disappoint.

Chan *et al.'s* (2006:1043) third explanation is that accruals pick up early signs that sales may be slowing. Various components of accruals, such as inventories and receivables, may begin to increase as sales begin to slow or credit difficulties increase. Thus, although the current bottom line earnings number remains healthy, the increase in accruals may signal that difficult times lie ahead.

Returning to Richardson *et al.* (2005:465), they theorised that the higher the degree of subjectivity in accounting for the various accrual components, the more likely that that component would play a larger role in explaining the accrual anomaly. Chan *et al.'s* (2006:1043) explanations conform to this theory.

Accruals can also be separated into a discretionary and non-discretionary component. The non-discretionary component is due to the growth in economic activities and falls outside the realm of management's discretion. The discretionary component, however, is more likely to be misstated in an effort to manage earnings and largely pertains to changes in the working capital of a company.

Xie (2001:358) decomposes accruals into 'normal' accruals and 'abnormal' accruals. Normal accruals are attributed to growth in sales, while abnormal accruals are unrelated to sales growth. He finds that the component of accruals that can be manipulated at management's discretion, the abnormal component, is less persistent than the normal component, and that both components are less persistent than cash (Xie, 2001:363).

Chan *et al.* (2006:1066) provide similar findings, showing that the discretionary component carries the bulk of the explanatory power, and this stems from changes in inventory and accounts receivable. An example of a non-discretionary component of accruals would be accounts payable, where the amount is accurately measured and not up to management's discretion to manipulate. Chan *et al*. (2006:1073) show that the accrual anomaly is more evident in industries where working capital is a more important component of total assets.

The one explanation which is cited across numerous studies is that managers have the ability to manipulate the discretionary component of accruals. Through making discretionary adjustments to these sub-components, management have the ability to temporarily disguise a slowdown in earnings, for instance, by adjusting the level of inventory or perhaps an increase in accounts receivables. The problem, however, is that manipulating earnings through the use of adjusting the discretionary accrual component is not sustainable and in the fullness of time, the earnings will reflect the economic reality. The limitation of this explanation is that not all increases in discretionary accruals are "bad" accruals. The discretionary component of accruals may increase for perfectly acceptable reasons.

A more recent study improves on the above explanations by recognising that the discretionary component of accruals can correctly measure temporary fluctuations in working capital (Allen *et al.*, 2013:116). In their study, Allen *et al.* (2013:116) distinguish between accruals that are positively serially correlated and accruals that are negatively serially correlated. Positively serially correlated accruals could potentially fall into either category of discretionary or non-discretionary. As an example, inventory could be positively serially correlated if a company is growing their sales over time and inventory that is sold needs to be replaced. As companies grow, their working capital requirements grow, and thus the new inventory that is replacing the inventory which was previously sold may exceed the previous inventory level. Negative serially correlated accruals also need not be bad accruals if there is a temporary fluctuation in working capital, which is later reversed out. This suggests that not all accrual reversals, or lack of persistence, are evidence of management manipulation and that rather there are times when there is a valid reason for a fluctuation in accruals, which is not persistent.

Allen *et al.'s* (2013:116) results confirm their hypotheses. Larcker (2003:100) points out that accounting data is characterised by more than one underlying process and failing to recognise this, results in an overly simplistic explanation of the accrual anomaly. Allen *et al.* (2013:128) confirm this statement. While not only acknowledging that accounting data accounts for a number of complex processes that are required in managing a company, the results also highlight that a reversal of accruals may indeed not be a result of management massaging a company's earnings.

The consequence of Allen *et al.'s* (2013:113-129) research is that one needs to be careful to apply a blanket argument for why an anomaly exists. In the case of the accrual anomaly, the overarching argument appears to be that there is a subjective, discretionary component of accruals that is open to manipulation. With this in mind, one ought to be wary of simply assuming that a fluctuation in this component of accruals is due to management trying to manage earnings. It is common that working capital requirements due vary from time to time.

3.2.5 International evidence

As with many studies before, the accrual anomaly was discovered in the United States (US) and it therefore follows that the majority of research has predominantly focused on US markets. However, more recent research has begun to focus on studying whether the accrual anomaly is solely a US phenomenon or whether it exists in other markets around the world.

In the first published research to document the accrual anomaly in a market outside the US, as part of their robustness checks, Chan *et al.* (2006:1074) explored whether the accrual anomaly existed in the United Kingdom (UK). The UK was chosen due to the similar accounting conventions to the US. The results confirmed an association between accruals and future returns (Chan *et al.,* 2006:1075).

Pincus, Rajgopal and Venkatachalam (2007:169-203) undertook a study to test whether the accrual anomaly existed in 20 countries and thus whether it was a global phenomenon or a local manifestation in the US. Their results are slightly ambiguous in the sense that depending on the methodology employed, the results vary significantly.

From an earnings persistence point of view, Pincus *et al.* (2007:179) found that in addition to the US, 13 other countries with high accruals in the current year had lower earnings in the subsequent year, relative to the contribution of cash flows to future earnings. This finding appears to corroborate the early accrual research of Sloan (1996:289-315). However, the regression analysis used to test whether share prices over- or underweight the information in accruals and cash flows is less convincing. Of the 20 countries tested, only four countries appeared to misprice accruals (Pincus *et al.*, 2007:179). The four countries were the US, UK, Australia and Canada.

Employing a different, but very common, methodology of forming zero-cost portfolios, Pincus *et al.* (2007:189) produced slightly different results. The zero-cost portfolios are formed by going long on a portfolio of shares with low accruals and shorting a portfolio of high accruals. Of the 20 countries, 11 are shown to produce statistically significant abnormal returns (Pincus *et al.,* 2007:191). In addition to the four countries mentioned above, Denmark, France, Germany, Italy, Japan, Malaysia and Thailand produced abnormal returns.

Abnormal returns as a result of underweighting the cash flow component of accruals, as opposed to overweighting the accrual component, are perhaps the reason why the hedge returns indicate that the accrual anomaly is more prevalent in markets around the world than the regression analysis suggests (Pincus *et al.*, 2007:191).

Leippold and Lohre (2012:509-535) tested the mispricing of accruals in 26 markets around the world. Similar to the findings of Pincus *et al.* (2007:169-203), the results presented in the study of Leippold and Lohre (2012:524) are not convincing of the fact that the accrual anomaly is a truly global phenomenon. Depending on the level of significance, only 10 or 12 out of the 26 countries exhibited positive and significant abnormal returns.

A number of reasons were put forward by Leippold and Lohre (2012:528) for why the accrual anomaly was confined to only a few markets. The manipulation of earnings again comes to the fore. Given that the US accounts for the largest stake in worldwide equity issuances, it is suggested that accrual accounting is used for window dressing US public equity offerings. Another explanation that is consistent with that of Pincus *et al.* (2007:200) is that common law countries may allow for more discretionary use of accruals as opposed to other countries.

Literature focusing on countries outside the US tends to apply a blanket approach to a number of countries without specifically focusing on a single stock market. While there is nothing wrong with such an approach, perhaps focusing on a single stock market may enhance the research by increasing the number of observations, the quality of the data and the length of the study. This would purely be a function of increased knowledge of the market that the researchers are researching, given that they most likely live in the country and work in the respective stock market, along with improved data availability.

Sehgal, Subramaniam and Deisting (2012:49-59) examined the accrual anomaly in the Indian stock market, and Vivattanachang and Supattarakul (2013:63-79) examined the accrual anomaly in the Thailand stock market. Both studies found evidence contrasting Sloan’s (1996:289-315) original research.

Sehgal *et al*. (2012:55-56) found that earnings persistence was more attributable to cash flows than accruals. However, accruals were underpriced and cash flows overpriced. Therefore, accruals were positively related to future abnormal returns. Similarly to the work of Sloan (1996:289-315), Vivattanachang and Supattarakul (2013:75-76) showed that the cash flow component of earnings was more persistent than the accrual component, but in contrast to Sloan (1996:289-315), and similar to the Indian evidence, accruals were found to be underpriced.

Given the international evidence above, the accrual anomaly does not appear to be a global phenomenon, and it would appear that it is more of a developed market anomaly, where there is greater discretion in the use of accruals, along with markets that are more efficient and liquid.

3.3 FUNDAMENTAL DATA ANALYSIS

Fundamental data analysis involves analysing a business's financial statements in order to try and determine a fair value for the business. It includes analysing the health of the business, its management, competitive advantages and the industry and environment in which it operates. The purpose of fundamental analysis, as Penman (1992:480) points out, is to predict future accounting earnings, as opposed to trying to explain future share price returns. It follows that if future earnings are predictable, it should be possible to earn abnormal returns, if this information is not priced timeously. The EMH states that share prices should reflect all available information timeously, and thus it should not be possible to earn positive risk-adjusted returns. This definition extends to include the analysis of fundamental information.

The accrual anomaly is one particular fundamental data anomaly that continues to produce abnormal returns when following an accrual strategy, despite the anomaly having been widely researched and published. Therefore, because of the anomaly being instrumental in developing this research, the accrual anomaly was covered separately in Section 3.2. All other reviewed fundamental data anomalies are covered in this section.

The underlying theme in all of the literature pertaining to fundamental data analysis and the accrual anomaly is that the information contained in financial statements can be used to better forecast future earnings, because earnings are the underlying driver of share prices over the medium to long term. And as it currently stands, it appears that investors do not fully understand the ability of fundamental analysis to predict future earnings, thus investors misprice the information.

3.3.1 Aggregating fundamental analysis

Looking further afield than the accrual literature discussed in Section 3.2, much time has been spent researching the ability of fundamental analysis to enhance investors' returns, by better anticipating future earnings. A very popular methodology in using fundamental analysis to anticipate earnings and returns is by first testing the relevance of the individual fundamental, and once shown to significantly affect future earnings, to construct an aggregate fundamental score based on all of the fundamentals by assigning a specific value to each, depending on whether the fundamental depicts a positive or negative signal.

The study by Ou and Penman (1989:295-329) is one of the earlier studies to combine a large set of fundamental variables into a single summary measure, which would, in turn, indicate the direction of future earnings. The methodology followed was to identify financial statement attributes that were correlated with future share price returns, and then to combine those into a single measure, which could, in turn, be used as a strategy to predict the probability of a company increasing its earnings in the following year (Ou & Penman,1989:297).

The problem with Ou and Penman's (1989:297) approach is that the inclusion of the fundamental variables was based on correlations as opposed to an underlying theoretical explanation. Thus, there might have been other factors that were driving the share prices which were not considered, yet because of a correlation between the share price and the fundamental variable, variables that had little influence over future earnings and share prices could potentially have been included.

The study by Lev and Thiagarajan (1993:210) was one such study that constructed an aggregate fundamental score based on 12 fundamental variables that were identified as useful to evaluate a business's performance and to estimate future earnings. All 12 fundamental variables were identified through reading published research that was explained by some form of theoretical framework (Lev & Thiagarajan, 1993:191-198). The aggregate fundamental score was constructed by assigning a value of either 1 or 0 to each signal and then summing up the total. The lower the aggregate total was, the higher the quality of the earnings. Businesses with high quality earnings were shown to have higher growth of future earnings, and their share price returns were higher than the share price returns of the businesses with low quality earnings, based on the aggregate fundamental score (Lev & Thiagarajan, 1993:212).

In an attempt to improve on Lev and Thiagarajan (1993:190-215), Abarbanell and Bushee (1997:1-24) studied the relationship between the individual fundamental signals and future earnings in an effort to be more direct in testing the theoretical validity of the signals, as well as allowing the study to test the robustness of each signal's explanatory power. Nine fundamental variables were tested, and while the results supported the use of fundamental signals to forecast future earnings, not all the results supported the arguments used to motivate the inclusion of the fundamental variables (Abarbanell & Bushee, 1997:7).

Similar to Lev and Thiagarajan (1993:210), Abarbanell and Bushee (1997:7) also constructed an index by assigning values to each of the fundamental signals[2]. They found that the coefficient of the index in their regression analysis was statistically significant, when testing the index on both one- and five-year future earnings growth. However, the R^2 of the model is no different from an earnings mean reversion model (Abarbanell & Bushee, 1997:8). The hypothesised reasoning for this is that equal weights are assigned to all fundamental signals in the formation of the index, even though some signals are more strongly related to future earnings growth than others (Abarbanell & Bushee, 1997:8).

Following up their 1997 study, Abarbanell and Bushee (1998:19-45) set out to test whether the fundamental signals, which were shown to be useful in predicting future earnings growth, could also yield significant abnormal returns. The findings indicate that information contained in the fundamental signals begins to be resolved after the signals are disclosed to the market, and it takes the market a year to correctly price the information (Abarbanell & Bushee, 1998:29-31). Thus, the market underreacts to the information when it is originally released onto the market. Price corrections as a result of the initial underreaction lead to

[2] The fundamental variables and the theoretical framework for their inclusion in the study are discussed in more detail in Chapter 6.

abnormal returns over the following year. However, the evidence indicates that the information is correctly priced after one year as abnormal returns no longer persist in the years following the first year (Abarbanell & Bushee, 1998:28).

A further two studies that employed similar methodologies to those discussed above are those of Piotroski (2000:1-41) and Mohanram (2005:133-170), who developed two complementary trading strategies that were based on aggregating fundamental signals. Piotroski (2000:1-41) undertook a study of the value of fundamental analysis in low price-to-book ratio shares or value shares, while Mohanram (2005:133-170) examined the value of fundamental analysis for growth companies. Both studies followed a similar methodology in that they appointed a score of either 1 or 0 to each factor depending on whether that factor was improving or deteriorating. Combining the explanatory fundamental signals/scores results in either the F-score (Piotroski, 2000:10), which is a score out of 9 fundamental signals, or alternatively, the G-score (Mohanram, 2005:137-140), which is a score out of 8 fundamental signals.

Piotroski (2000:2) focuses on high book-to-market shares, or value shares, as he argues that it is more beneficial to use value shares to study the ability of simple fundamental analysis to differentiate businesses. The reasons put forward include the fact that value shares tend to be neglected, thinly followed by analysts, have a lower level of investor interest and given this, their financial statements are the most reliable and accessible information source regarding the businesses for investors (Piotroski, 2000:2).

Using the same framework but viewing it from a different angle, Mohanram (2005:134) focuses on growth shares, because he is unsure whether fundamental analysis will be effective for growth shares. Not dissimilar to Piotroski, the reasons given include the fact that growth shares attract attention from all market participants, and thus one would expect the companies' fundamental signals to be priced correctly. Another reason is that growth shares may have many sources of information disclosures, as opposed to financial statement only. A third reason is that growth shares' rapid rate of growth may make fundamental analysis less important (Mohanram, 2005:134).

Three areas of a company's financial condition are studied in Piotroski (2000:7): profitability, financial leverage and operating efficiency. However, Mohanram (2005:138) focuses on measures tailored for growth companies, such as earnings stability, growth stability and intensity of research and development (R&D), as well as earnings and cash flows. Constructing a long-short portfolio using either strategy has been shown to earn positive risk-adjusted returns. Both these studies illustrate the importance of grounding a fundamental-based trading strategy in a theoretical framework.

Mohanram (2005:133-170) set out to test the validity of using fundamental analysis as a strategy to produce abnormal returns in growth shares. However, tailoring the fundamental signals for growth shares seems counter-intuitive given that while the fundamental variables may, and did, prove useful in constructing market-beating portfolios, it does not answer the question of whether fundamental analysis is an effective strategy for growth shares. Perhaps a more direct way of answering the question would have been to use the same fundamental signals as presented in Piotroski (2000:1-41), but to use growth shares as opposed to value shares.

A further shortcoming of the above two studies, and any other study that aggregates the fundamental signals, is that combining the signals into a single summary measure obscures each of the individual signal's contribution to future earnings, thereby limiting the extent of the knowledge gained by the fundamental analysis (Abarbanell & Bushee, 1998:22).

Many of the fundamental signals studied by both Piotroski (2000:14) and Abarbanell and Bushee (1998:24) consist of working capital, suggesting that perhaps their studies may be related to the accrual anomaly documented earlier by Sloan (1996:303). Abarbanell and Bushee (1998:23) state that their results are not impacted by other previously reported anomalies. However, given that there is a large overlap of explanatory variables in the accrual anomaly literature and the financial analysis literature, suspicion will remain.

3.3.2 Cash flow analysis

The accrual-based literature documented in Section 3.2 focused solely on the accrual component of earnings. However, future earnings also consist of a cash flow component, which is equally important in understanding the impact of today's fundamentals on future earnings. Dechow, Richardson and Sloan (2008:537-566) attempted to enhance the understanding of the persistence of future earnings and the market's efficiency in pricing these future earnings based on the cash flow component of earnings.

Dechow *et al.* (2008:538) define the *cash component of earnings* as free cash flow, which is represented by the excess cash generated from operations after taking into account cash needed for investments. A company generating free cash flow has only three uses for the cash. Either the company distributes the cash to shareholders by way of dividends or share repurchases; alternatively, it can distribute the cash to debt holders by paying back debt over and above the interest payments; otherwise, it can hold onto the cash for future use (Dechow *et al.,* 2008:539).

Three hypotheses are stated by Dechow *et al.* (2008:544-545). The first is that the cash component of earnings that is retained by the company is less persistent than when otherwise distributed to equity or debt holders. The second hypothesis states that the cash component of earnings that is distributed to equity holders is more persistent than the cash component of earnings that is distributed to debt holders. The final hypothesis is that the market fails to price the lower persistence of earnings that are due to companies retaining cash or paying down debt as opposed to distributing free cash to shareholders.

The theoretical explanations of the above hypotheses include the fact that companies tend to be poor allocators of capital, thus companies which retain cash very often waste it on profit-reducing projects (Dechow *et al.,* 2008:543). In terms of distributing cash, debt repayments are typically made according to a pre-set schedule and are thus non-discretionary, while distributing cash to shareholders is discretionary. Therefore, distributing cash to shareholders carries a much more valuable signal about management's confidence in the company's ability to produce future earnings (Dechow *et al.*, 2008:544).

The findings of the study confirm the above hypotheses. Earnings attributable to accruals and an increase in retained cash signal sustained future declines in earnings, while earnings attributable to distributions to equity holders signal sustainable future earnings (Dechow *et al.,* 2008:563). Perhaps the most critical finding of the paper is that investors overestimate both the persistence of earnings due to the accrual component and free cash flow component. The overestimation of the accrual component is, however, much larger, indicating that investors distinguish between the accrual and cash flow component of future earnings (Dechow *et al.,* 2008:556).

A final word on the Dechow *et al.* (2008:539) study is that the findings have four implications for future studies. First, the explanation provided by Sloan (1996:290) that investors fixate on earnings is not the complete explanation for the accrual anomaly. Dechow *et al.* (2008:556) found that investors anticipated the lower persistence of cash that was distributed to debt holders rather than to equity holders. Second, the study builds on the explanation that the accrual anomaly reflects a misunderstanding of the effect of retained cash, which is poorly allocated, on future earnings. Third, the study rebuts the commonly held belief that companies which raise new capital are associated with poor future share returns. Rather, the study found that the critical determinant of future earnings and share returns was how the proceeds of the capital raising were used. Fourth, a common method of corporate valuation is to discount the expected free cash flows generated by a business. An implicit assumption of this model is that the use of the cash is irrelevant. The findings of their study indicate otherwise, and they recommend forecasting how much free cash will be retained by the firm and deducting this amount from the measure of free cash flows (Dechow *et al.,* 2008:540).

Such a methodology may be overly conservative, given that not all cash retained by a business is poorly allocated, and thus perhaps a discount factor is more appropriate as opposed to discounting all of the cash flow.

The theory about the effects of cash flow on future earnings, and hence share price returns, is discussed in greater detail in Chapter 6.

3.3.3 Distress tests

The objective of reviewing literature on financial distress tests is to understand the theoretical reasoning behind the inclusion of the fundamental data that is used as input in the calculation of the distress tests scores. It is this fundamental data that may perhaps help in understanding what drives fundamental momentum.

Fundamental analysis is not only about finding the 'winners' but equally important is avoiding the 'losers'. Over many years, distress tests have been developed that attempt to identify companies that have a high probability of either going bankrupt or defaulting on their debt repayment, through the analysis of the company's fundamentals. Therefore, while not directly trying to forecast the persistence of future earnings, these distress tests indirectly forecast future earnings, as it is ultimately, future earnings that prevent a business from going bankrupt, or allow a business to meet its debt obligations.

The Altman (1968:589-609) research paper is one of the pioneering research papers in this field of developing credit rating models. Still to this day, the Altman Z-score, named after Edward Altman, is probably the most well-known stress test. Altman (1968:589-609) was by no means the first researcher to test the bankruptcy potential of businesses, in fact, research in this area of finance can be traced back to the 1930s. However, Altman (1968:591) points out that earlier research was susceptible to faulty interpretation and was potentially confusing because of the fact that the methodology employed placed emphasis on individual signals, as opposed to taking the bigger picture into account. An appropriate extension of these earlier models was to combine a number of fundamental variables into the bankruptcy model (Altman, 1968:591).

Five fundamental factor ratios were incorporated into the AltmanZ-model, which are working capital, retained earnings, profitability, debt and sales (Altman, 1968:594). Each factor is given a weight, depending on the significance of the factor, and an aggregate score is calculated. Studies measuring the effectiveness of the Altman Z-score have shown the model to be accurate with greater than 70% reliability (Eidleman, 1995:52). Given this accuracy, the Altman Z-score has gained acceptance by auditors, management accountants, courts and database systems used for loan evaluation (Eidleman, 1995:52).

Merton (1974:449-470) developed a slightly more complex credit rating model that applies an option-theoretic approach, which shows how the probability of default can be inferred from the market valuation of a business. By explicitly modelling a business's market value, market value volatility and liability structure over time using contingent claims analysis, the Merton model defines a firm as defaulted when the firm's value falls below its debt. This is in contrast to the model of Altman (1968:589-609), which largely uses fundamental analysis, placing little emphasis on market fluctuations. Given the different approaches and use of different data, these two models complement one another.

A similar model to the Altman Z-score was developed by Ohlson (1980:109-131), known as the O-score. Ohlson (1980:110) identified a few shortcomings in earlier studies that he attempted to overcome in the O-score research. The one shortcoming was the narrow set of observations that were used in previous studies, and the second shortcoming was the timing around the release of the financial information and the date of bankruptcy. Ohlson (1980:110) argues that in certain instances it is possible that bankruptcy occurred prior to the release of the financial information.

Ohlson (1980:110) state that there are four basic factors that are statistically significant at predicting bankruptcy. These four factors are size, a measure of financial structure, a measure of performance and a measure of liquidity. All four factors seem fairly intuitive.

Dichev (1998:1139) examined the relationship between the Z-score and the O-score, and the subsequent share returns. It is of interest that distressed companies are shown to earn lower returns than those companies which are not distressed. Modern financial theory states that firms associated with higher risk should produce larger returns, given the risk-return profile. This does not seem to be the case with businesses that are associated with a high probability of bankruptcy. While no meaningful explanation is presented, what this result highlights is that the size and value effects are unlikely to be due to a distress factor related to bankruptcy risk, as has often been hypothesised (Dichev, 1998:1146).

A more recent study by Campbell, Hilscher and Szilagyi (2008:2899-2939) examines the determinants of corporate failure and pricing of distressed businesses. The study indicates that bankrupt firms have higher market-to-book ratios and are generally smaller in size than the average firms. However, this would make sense given that a firm that is financially distressed would often have the book value of its equity eroded, along with a depreciating share price (Campbell *et al.* 2008:2909). However, this is a result of a firm being financially distressed rather than a cause. More importantly though, while testing the determinants of corporate failure, among the other fundamental variables mentioned in earlier studies, the level of cash holdings is shown to also indicate future financial distress (Campbell *et al.* 2008:2908).

The factors that have been found to be relevant in predicting future bankruptcy in the various studies and models discussed above will be examined in more detail in Chapter 6.

3.3.4 International evidence

Similar to the majority of anomalous research, the early academic literature related to fundamental analysis focused specifically on the US market, with little application to the rest of the world. Over time, fundamental variables that were shown to have predictive power for future earnings and hence share returns in previous studies in the US have been tested in many other countries around the world, with varying degrees of success.

Mukherji, Dhatt and Kim (1997:75-80) undertook a fundamental analysis of Korean listed shares, while Swanson, Rees and Juarez-Valdes (2003:875-902) undertook a similar study in Mexico. Using fundamental ratios, Mukherji *et al.* (1997:78) found that book value, turnover and leverage were useful predictors of future share price returns in Korea. Swanson *et al.* (2003:886) show that inventory, accounts receivable, gross margin, operating costs and tax rates all play significant roles in determining future earnings growth in Mexico. Altman, Iwanicz-DrozdowskaLaitinen and Suvas (2014:1-47) undertook a study to test the Altman Z-score across 33 non-US countries. The results showed that while a general international model worked reasonably well, country-specific estimation, with the use of additional variables, might be required to improve the accuracy of the model (Altman *et al*., 2014:16-19).

Therefore, while only scratching the surface with regard to international evidence on emerging markets, similar results are found in developed markets. Skogsvik (2008:795-817) used Swedish data to determine whether fundamental analysis was useful in predicting return on equity (ROE) and subsequently, whether trading strategies based on such predictions were profitable. The fundamental variables used in the model included operating income, inventory, cost of goods sold, accounts receivable, revenue, cash, total assets, interest-bearing debt, interest expenses and dividends. It was shown that a simple mean reversion model using past ROE to predict future ROE performed better than the model incorporating the fundamental variables (Skogsvik, 2008:805). In addition to the lack of convincing evidence regarding the ability of the fundamental variables to predict future earnings, the conclusion regarding the ability of a trading strategy based on these fundamental variables producing abnormal returns is also not clear cut, with some periods producing abnormal returns while others not (Skogsvik, 2008:811).

A comprehensive study of the ability of fundamental analysis to predict future earnings in countries outside the US was undertaken by Seng and Hancock (2012:32-46), who incorporated data from 33 countries. The fundamental variables used were the same as in the study of Lev and Thiagarajan (1993:190-215); however, they included a mean reversion variable in the form of change in current earnings. In contrast to Skogsvik (2008:805), they found that the model could explain more of the variation in future earnings changes by including both the fundamental variables and the mean reversion term in their model (Seng & Hancock, 2012:39).

Therefore, while some of the international evidence is mixed, overall, the results indicate that information contained in fundamental data is useful and relevant in predicting future earnings and subsequently, share price returns, given the fact that earnings are the main underlying driver of share price returns over the longer term.

3.3.5 Evaluating fundamental data anomalies

As with all research that attempts to uncover some form of anomalous behaviour on stock markets, there will always be a number of detractors that will defend the EMH, and fundamental analysis is no exception. One of the main concerns about any potential anomaly is the concern about data mining. Holthausen and Larcker (1992:405) stop just short of stating that Ou and Penman’s (1989:2950329) results were due to data mining. They show that while the strategy works in one sub-sample period, it does not work in another. However, Holthausen and Larcker (1992:408) conclude that their results support the contention that fundamental analysis can be used to gain insight into future share price movements.

In a literature review of recent anomaly and fundamental analysis research, Richardson, Tuna and Wysocki (2010:411) identify six attributes which they believe to be essential for any fundamental analysis research. The attributes are: (1) developing an alternative hypothesis that has a sound theoretical foundation; (2) using robust explanatory power (in and out of sample); (3) treating risk correctly to ensure that a risk-based explanation is also not consistent with the empirical relation; (4) taking into account transaction costs; (5) adding to pre-existing accounting attributes researched; (6) incorporating non-price-based tests to strengthen inferences made.

Applying these six attributes to an analysis of the literature reviewed in this study, it becomes evident that most of the accrual anomaly and fundamental analysis literature contains attributes (1), (2), (3) and (5). There is an abundance of fundamental analysis literature (not reviewed here) that does not build an alternative hypothesis based on a sound theoretical framework. However, both Piotroski (2000:1-41) and Abarbanell and Bushee (1998:19-45) set their studies in solid theoretical foundations, as does the accrual literature presented here. Over time, the explanatory power of the studies have proved to hold out of sample, while the in-sample explanatory power is evident in the conclusions of the various studies. Risk-based explanations can be ruled out by the methodologies employed in testing the hypotheses, such as the Fama and MacBeth (1973:607-636) regressions. Transaction costs are very often ignored and while detracting from the results, are more critical in smaller, less liquid markets, than opposed to transaction costs in larger, developed markets, which are generally more liquid. Building on pre-existing research is an attribute which is evident across all the studies reviewed in this section. And finally, non-price-based tests tend not to be employed or documented. Such tests may be used to supplement price-based tests of market inefficiencies. For example, sell-side analysts' earnings forecast revisions may be used to determine how accurate the use of financial statement information is (Richardson *et al.*, 2010:423).

What is clearly evident in the current research is that the information contained in financial statements is not being fully exploited, which can only be due to investors' lack of confidence in the current body of literature.

Therefore, it is evident that while no theory is yet to displace the EMH theory, there are a number of fundamental-based strategies that appear to be anomalous relative to the EMH theory.

3.4 SUMMARY

This chapter provided a review of the accrual anomaly and a wide array of fundamental analysis literature that is relevant to help understand the driver of future earnings. The chapter discussed the literature indicating that investors' fixation on the bottomline earnings number, as opposed to understanding the various cash flow and accrual components of that earnings number, results in the failure to account for all relevant information timeously. Following the initial documentation of the accrual anomaly, the definition of accruals was shown to have evolved substantially over time to beyond that of working capital accruals only. This gave further insight into the drivers of future earnings. A number of explanations were provided of why earnings backed by accruals tended to be lower quality earnings, resulting in lower persistence of earnings going forward. International evidence was also discussed, indicating that the accrual anomaly might be more susceptible to developed markets as opposed to emerging markets.

A wide array of fundamental data analysis was reviewed. First, this included aggregating fundamental signals to calculate a fundamental score that indicates financial strength. Secondly, cash flow analysis was reviewed and whether different uses of free cash flow affected future earnings. Thirdly, a couple of distress tests which indicate the probability of bankruptcy were discussed. Fourthly, the focus was on the international evidence outside the US. And finally, the credibility of the fundamental analysis was discussed.

The next chapter presents the South Africa literature that relates to the anomalies discussed in Chapter 2 and Chapter 3.

CHAPTER 4

OVERVIEW OF THE SOUTH AFRICAN MARKET AND RELEVANT LITERATURE

4.1 INTRODUCTION

The JSE is currently ranked the 19th largest stock exchange in the world by market capitalisation (Ghosh & Aserkoff, 2015:5) and is the largest stock exchange in Africa by market capitalisation and value traded. Having been established in 1887 following the first South African gold rush, the exchange joined the World Federation of Exchanges in 1963 and upgraded to an electronic trading system in the early part of the 1990s. The JSE Limited listed on its own exchange in 2005. Today, it provides primary, secondary and post-trade services and technology services. It also sells market data and regulates primary and secondary markets.

The JSE has a total market cap of R10.743 trillion as at 31 December 2015 (ShareData.co.za, 2015), which is often argued is not a true reflection of the South African economy. In 2011, a decision to alter the listing rules of foreign domiciled businesses was taken, allowing foreign companies to be treated as domestic listings. This ruling has resulted in a number of very large multinational businesses having recently listed on the bourse. A *multinational business* is defined as a business that derives the majority of its revenue from outside South Africa. Of the top six listed businesses on the JSE, which account for 42% of the JSE’s total market capitalisation, only one is South African domiciled, Naspers, while all of them are multinational businesses. There are a total of 352 listed companies.

The JSE consists of three main super-sectors, namely resources, financials and industrials. Historically, resource companies dominated the JSE by market capitalisation. In 1990 (the starting period for this study), resources made up 44% of the JSE’s total market capitalisation, while financials and industrials made up 14% and 42% respectively. Today, according to official data from the JSE, resources only account for 15% and financials and industrials are now both larger than the resource sector, constituting 20.7% and 64.3% respectively.

The JSE remains a very fragmented stock exchange given that the top 40 companies by market capitalisation constitute 84% of the total market capitalisation of the JSE. Furthermore, these companies contribute an equal amount in terms of value traded.

The remainder of this chapter reviews stock market anomalies which have proved to be real anomalies on foreign stock markets and which are relevant to this study. Specifically, these anomalies include the accrual anomaly, the post-earning announcement drift anomaly, fundamental data anomalies and the price momentum anomaly.

4.2 RELEVANT LITERATURE

Accounting convention and standards in emerging markets are often characterised as inferior in quality to their developed market counterparts. Furthermore, emerging market stock markets differ from their developed market counterparts in the sense that they are smaller in market capitalisation, as well as the number of listed companies tends to be fewer. The result is that emerging market stock markets are not as thoroughly researched, by both academics and analysts, giving rise to the issue of market efficiency. Furthermore, given that accounting convention is interpreted as being inferior, it may also give rise to difficulty in valuing businesses accurately, which, in turn, may result in share price behaviour that is at odds with that found in more developed markets. The markets are also invariably less liquid than larger stock markets, which has the potential to exacerbate anomalies that have been uncovered elsewhere in the world. And finally, given the size of the companies listed, the ownership of companies is much thinner, which may be a cause of the liquidity issue (La Porta, Lopez-de-Silanes, Shleifer & Vishny, 2002:1147-1170; Shleifer & Vishny, 1997:737-783). For these reasons, it is important to test anomalies in emerging markets, which have been shown to exist in other, more developed stock markets. However, the World Economic Forum's Global Competitive Report continuously rates the regulation of the JSE and the quality of the country's auditing and accounting standards as among the best in the world.

The South African market is relatively underresearched in comparison with the world's larger stock markets, and thus the literature on the relevant anomalies that were discussed in Chapter 4 is not as plentiful.

4.2.1 Price momentum anomaly

The price momentum anomaly is without doubt the most robust anomaly that has been researched, and as a result, it is the most researched anomaly on the JSE. The majority of research that has been presented confirms that price momentum as a strategy is profitable on the JSE. However, the formation and holding periods vary widely across the different studies.

In a study that analyses the profitability of momentum investing in market indices around the world, Chan, Hameed and Tong (1999:1-29) present evidence that a price momentum strategy on the JSE as a market as a whole is profitable. Their analysis included using a relative strength strategy that bought winner countries and sold loser countries. The results indicate that momentum profits are statistically significant for short holding periods of less than four weeks (Chan *et al.,*1999:9). So while it appears that price momentum is a profitable strategy in the South African market, one needs to interpret these results with caution given that the analysis uses a relative strength strategy which incorporates other market indices that may account for most of the price momentum profits.

Page and Way (1992:35-49) present early evidence on the market's overreaction to historic share price movements. Their research indicates that prior winners (losers) based on a 36-month formation period underperform (outperform) the market over the following 36-month period. In line with international evidence, the abnormal returns are accumulated after 12 months following the formation period (Page & Way, 1992:44). This indicates that the return reversals witnessed over 36 months are not evident within the initial 12-month period, where price momentum is most prevalent.

Noteworthy studies focusing on price momentum on the JSE include those of Fraser and Page (2000:25-35), Van Rensburg (2001:45-60), Van Rensburg and Robertson (2003:7-15), Hoffman (2012:21-41), Page, Britten and Auret (2013:56-73) and Muller and Ward (2013:1-16).

Fraser and Page's (2000:26) study was restricted to the industrial sector and investigated momentum based on 12-month formation periods and one-month holding periods. Although the conclusion of the study was that price momentum was evident on the JSE, questions about the definition of price momentum did arise. A one-month holding period is far too short a time frame for two reasons. First, given the illiquidity of small- and micro-caps on the JSE, very large bid-ask spreads will result, which will invariably eliminate any realistic gains made from a one-month price momentum strategy. Related to the first reason, the second is that transaction costs are ignored in the study. A one-month trading strategy will incur very large transaction costs. This is a common problem in the South African literature.

Van Rensburg (2001:55) undertook a study to investigate the style factors that could help explain returns of the industrial sector. The conclusions drawn from this study were that three style factors form a parsimonious representation of style-based risk on the JSE (Van Rensburg, 2001:53). The three style factors were value, size and price momentum. Price momentum was found to be most robust when momentum over the previous 12 months was used to form the portfolios. Past returns over one, three, six and 24 months were also used in the research. However, the 12-month strategy was the most profitable. The holding periods were for one month only, which raises similar concerns to those of Fraser and Page's (2000:25-35) study.

Van Rensburg and Robertson (2003:9) conducted a similar study to that of Van Rensburg (2001:45-60), which tested a number of risk factors in an effort to help explain market returns. The study took place on the JSE over the period 1990 to 2000, which has a significant overlap with the study of Van Rensburg (2001:45-60), of which the study period was from 1983 to 1999, and yet the results of the study of Van Rensburg and Robertson (2003:10) showed that price momentum as a strategy was not profitable on the JSE. This brings into question the out-of-sample results of Van Rensburg (2001:45-60), alternatively, the methodology of the studies may need further interrogation.

Not specific to South Africa, Griffin *et al.* (2003:2515-2547) studied price momentum for numerous countries around the world. The study tested price momentum over a six-month formation and holding period by dividing the market up into quintiles, and then short selling the loser quintile and buying the winner quintile. Based on this strategy, they were able to prove that price momentum was undoubtedly evident on the JSE (Griffin *et al.,* 2003:2519).

Among the anomalies that Hoffman's (2012:21-41) study investigated, price momentum was one. Similar to the accrual analysis above, the profitability of the price momentum strategy on the JSE was investigated for big, small and microbusinesses. The analysis used a 12-month formation period, and both a one-month and 12-month holding period returns were analysed. Both equal-weighted and value-weighted portfolios were used in the study.

The initial indications of the study pointed to a small but positive correlation between future returns and past share performance (Hoffman, 2012:30). An interesting finding, though, was that the correlations between the one-month and 12-month holding periods were very similar. This indicates that the return persistence may, in fact, be somewhere between one month and 12 months.

Another interesting finding from the study was that price momentum did not appear to hold for micro-cap shares in the equal-weighted portfolio. Micro-cap shares which performed the worst over the previous 12 months performed the best of the following 12 months (Hoffman, 2012:35). The reason for this observation may lie in the fact that the formation period is 12 months and the holding period is equally long, while the trend in micro-caps may be over a shorter period of time (Hoffman, 2012:37).

Page *et al.* (2013:63) and Muller and Ward (2013:13) showed in more recent studies that price momentum was a profitable strategy on the JSE.

4.2.2 Earnings momentum anomaly

The earnings momentum anomaly is the least researched anomaly in South Africa that is reviewed in this section. Until very recently, there was no research that specifically dealt with PEAD and the only available research included related research which investigated the market's reaction to announcements made by listed businesses regarding returning cash to shareholders through some form of dividend, management buyout or share repurchases (Bhana, 1997:35-44; Bhana, 1998:5-15; Bhana, 2005:19-30; Bhana, 2007:25-36).

Bhana (1995:45) investigated whether investors on the JSE responded rationally to listed businesses reporting positive and negative earnings. Having classified businesses based on whether they reported positive or negative earnings, the 12-month share price return following the earnings announcement was investigated to see whether the market over- or underreacted to the new information. For positive earnings announcements, it was shown that the following 12-month share price return was negative, while for those announcing negative results, the following 12-month share price was positive (Bhana, 1995:51). This finding is consistent with investors overreacting to earnings announcements.

A possible explanation was provided by Bhana (1995:51) by investigating the earnings change in the two years leading up to the test year and the two years following the test year. For businesses announcing positive (negative) earnings announcements, in the two years leading up to the test year, there was a steady increase (decrease) in earnings. However, in the two years following the earnings announcement, there was a steady decrease (increase) in earnings. Thus businesses that report negative earnings tend to return to profitability in the following year and the market does not foresee this possibility, resulting in an overreaction to the negative earnings announcement pushing the share price down initially. The share price recovery over the preceding 12 months is indicative of this.

More recently, Swart and Hoffman (2013:17-34) undertook the first study in South Africa that solely focused on the PEAD anomaly. Their use of an unconventional method in calculating the earnings surprise and the survivorship bias that is due to the inclusion of only listed companies at the end of the sample period (Swart & Hoffman, 2013:20) are two shortcomings of their research. Earnings surprises were calculated using two methods. The first method used the previous year’s earnings per share as the expected earnings per share number in the current year. This is clearly a very naïve assumption to make. The second method calculated the market’s reaction to the earnings announcement over the two days following the earnings announcement, and used this as a proxy for the earnings surprise. The second method is more appealing, yet it will capture systematic risk as well as share-specific risk. Nevertheless, the research gives some invaluable insight into the PEAD anomaly on the JSE.

Following the construction of equal-weighted portfolios, the main conclusion of Swart and Hoffman (2013:23) was that there was PEAD on the JSE. Share price returns were calculated for 120 trading days (six months) following the earnings announcement. Given that PEAD is a result of an initial underreaction to an earnings surprise that later corrects itself, this finding is in contrast to that of Bhana (1995:45), who states that the positive earnings announcements are followed by underperforming share price returns over the following 12 months, due to the overreaction of share prices to earnings announcements.

Swart and Hoffman (2013:25-29) also investigated whether PEAD might be capturing another anomaly in the form of the size effect, the value effect or the momentum effect. Their analysis indicates that this is not the case, and that the PEAD anomaly is not a manifestation of another anomaly.

An analyst research report documenting the PEAD anomaly of the JSE was issued by Ssali (2012:2). The research report presented evidence of PEAD on the JSE. However, a very narrow set of observations was used, compounded by a fairly short holding period. The empirical validity of the result is questionable, perhaps only presenting anecdotal evidence at best.

Given the limited research on the PEAD anomaly undertaken in the South African context, there is definitely a case for continued future research in this area. This study will add to that body of literature. However, the current body of literature gives early indications that the PEAD anomaly exists on the JSE.

4.2.3 Accrual anomaly

Following the Fama and French (2008:1653-1678) study, which dissected the anomalies on the NYSE and AMEX, Hoffman (2012:21-41) undertook a similar analysis, which tested various anomalies, including the price momentum and accrual anomaly, on the JSE. The comprehensiveness of the study was enhanced by the use of three techniques to test the anomalous relationships, namely time series and cross-sectional correlations, cross-section regressions, and sorted returns. The reason for using the three techniques was a lack of uniformity in methodology that has been employed by previous researchers to investigate the relationships that are potentially indicative of anomalous share returns (Hoffman, 2012:21). Both equal-weighted and value-weighted portfolios were formed. This last point is critical in the South African context given the nature of the JSE, which is dominated by a small number of large-cap shares. The study covered the period 1985-2010. The explanatory variables of interest are the price momentum and accrual variables, although a total of seven anomalous relationships were investigated. In analysing the anomalies, Hoffman (2012:36) also separated the market based on size to minimise the micro-cap and large-cap effects in equal-weighted and value-weighted portfolios.

The accrual anomaly results of Hoffman (2012:21-41) are extremely ambiguous, and not convincing, with regard to whether the accrual anomaly is exploitable on the JSE. The first test undertaken was a simple time series and cross-sectional correlation matrix between accruals and future returns. Future returns were measured for both one month and 12 months. The correlation coefficients had opposite signs for the time series and the cross-sectional correlations over both return periods (Hoffman, 2012:29). While the time series correlation coefficients were positive, indicating that a higher level of accruals translates into higher future returns over one and 12 months, the cross-sectional correlation coefficients were negative, which indicates that the magnitude of variation in one and 12 returns is negatively related to the change in the level of accruals. Quite clearly, these results contradict one another and indicate that the accrual anomaly is inconsistent on the JSE.

The cross-section regression analysis presented by Hoffman (2012:33) is equally puzzling. The regression coefficient for the total sample indicates that an increase in the level of accruals reduces future share returns over a 12-month return period. This finding is consistent with evidence presented in Section 3.2, which shows that higher levels of accruals result in the lower persistence of future earnings, which, in turn, results in lower future share price returns. However, the problem with Hoffman's (2012:33) results is that when the sample observations are separated by size, big and small-sized businesses have a positive regression coefficient, while microbusinesses have a negative regression analysis. Again, this shows an inconsistent statistical relationship, which indicates that the accrual anomaly is not exploitable on the JSE in the absence of a satisfactory explanation.

Hoffman's (2012:34-35) final test consisted of sorting the sample into quintiles based on their level of accruals and determining whether the returns of the sorted quintile portfolios statistically varied. For both the equal-weighted and the value-weighted quintile portfolios, there was not a material difference in return, leading Hoffman (2012:39) to conclude that there was a weak relationship between accruals and future share returns on the JSE.

A related area of research to the accrual anomaly is that of earnings management. Because the accrual anomaly is so thinly researched in South Africa, some insight is provided when reviewing the earnings management literature, which includes accruals, given that accrual accounting is one method through which management can manipulate a business's earnings.

Despite the high quality auditing and accounting standards, along with the well-regulated stock market, South Africa is considered an "insider economy" by Leuz, Nanda and Wysocki (2003:519), which is characterised by smaller stock markets, high ownership concentration, weaker investor protection, lower disclosure levels and weak enforcement. As a result of this, South African-listed businesses have a higher probability of earnings management or manipulation (Leuz *et al.,* 2003:519).

Rabin and Negash (2015:1-34) examined the pricing of earnings management on the JSE. Specifically, the study looked into whether investors valued the book value, earnings and discretionary accruals differently for businesses suspected of managing their earnings.

The study of any anomaly can be divided into two categories, those that look at the longer-term results and those that focus more on the immediate result or reaction based on some observable variable, action or shock.

Rabin and Negash (2015:3) focused on the short-term market reaction to firms that used earnings management by manipulating the discretionary component of accruals. The problem with focusing on short-term market reactions is that it tells one very little about the underlying fundamental driver of share price returns, namely earnings. A longer-term study which allows one to witness the share price over many months may not necessarily indicate the effect the earnings management has had on future earnings. However, it gives the market sufficient time to digest the information giving insight into the market's anticipated future earnings level.

Rabin and Negash (2015:10) split their sample into two groups based on whether the business was suspected of earnings management or not. Earnings management is determined by analysing the frequency of earnings for a discontinuity around zero. Management have an aversion to announcing losses or decreases in earnings, and thus investors suspect firms that have managed their earnings to have a more than the expected number of observations above zero and fewer below (Rabin & Negash, 2015:10).

In businesses suspected of earnings management and those that were not, investors were found to react negatively to evidence of earnings management in the short term (Rabin & Negash, 2015:20). This finding is in contrast to the accrual anomaly literature, which suggests that investors are oblivious to earnings management through accrual manipulation and, in turn, share prices behave anomalously in the future.

The evidence supporting the accrual anomaly on the JSE is mixed at best. There is a clear lack of evidence which supports the accrual anomaly on the JSE, and the very thin quantity of literature may be one reason for the lack of conviction either way. This is an area for future research in order to gain a better understanding of whether the accrual anomaly exists on the JSE.

4.2.4 <u>Fundamental data analysis</u>

The importance of fundamental data anomalies in the South African context is to understand the fundamental drivers of profitability and hence share price returns on the JSE. The fundamental analysis literature reviewed in Section 3.3 follows a general pattern of identifying signals in financial statements that are then used, either individually or by aggregating the signals, as an indicator of the persistence of earnings into the future. A number of South African studies have replicated those studies on the JSE, while other studies have researched the usefulness of individual signals in predicting future earnings and/or share price returns.

The allocation of excess cash held by businesses was researched by Dechow *et al.* (2008:537-566) and their findings indicate that shareholder value is enhanced by the discretionary use of cash in the form of returning the cash to shareholders by either paying dividends or repurchasing shares, as opposed to the non-discretionary payment of interest, or by holding the cash for future allocation. The evidence in the South African market is similar to that found in other markets (Bhana, 2007:30).

Managers can use excess cash to repurchase shares, which intuitively indicates that they believe the share price to be undervalued. Therefore, given that managers have more information than the general public, a repurchase should be a positive indication of future prospects. Bhana (2007:30-31) shows that in the days leading up to the share repurchase, shares underperform the market. However, following the share repurchase, the outperformance of the shares is very persistent, up to a period of three years. This result is similar to the evidence obtained for US share repurchases.

Looking at the issue of share repurchases from a different perspective would be to study the effect of issuing more shares on future share price returns. Hoffman (2012:30) undertook such a study, where various factors were researched in an effort to understand their effect on share price returns. One of the factors that were included in the study is the net issue of shares. The results show that shares are penalised from a return point of view following share issues and are rewarded subsequently to share repurchases.

Another use for excess cash, as pointed out by Dechow *et al.* (2004:537-566), is to allocate it to either existing or new projects in the form of capital expenditure. The literature pertaining to the benefits of capital expenditure in advanced economies is mixed, with some indicating that shareholder wealth is positively affected (McConnell & Muscarella, 1985:413; Woolridge, 1988:357), while others showing evidence to the contrary (Dechow *et al.,* 2008:543).

It appears that the strength of the market reaction to capital expenditure announcements depends on the reason for the capital expenditure, the type of capital expenditure and whether the business has diversified revenue streams or not (Bhana, 2008:55). The JSE reacts positively to capital expenditure announcements; however, the strength of the response is stronger for businesses announcing capital expenditure that is focused in the same line of work, as opposed to diversifying into areas outside their core competencies (Bhana, 2008:57).

The market reaction to capital expenditure announcements says little of the longer-term effects of capital expenditure on the earnings of the businesses. However, the implicit assumption is that because the JSE reacts positively to capital expenditures, historically, capital expenditure must have been earnings enhancing. Furthermore, capital expenditure that remains focused in the business's core competency is assumed to have a greater earnings impact than that of a company which diversifies outside its core competency.

With an abundance of research having been undertaken in determining the indicators of financial success for US businesses, De Wet and Erasmus (2011:152) tested whether the same factors were applicable to South African companies. The factors that were included, and tested independently of one another, included sales growth, five-year average return on assets, the capital structure as measured by the level of indebtedness, the liquidity of the balance sheet, the cash conversion cycle, the variation in historic profits, and the research and development expenditure. The financial success of a business was measured by the market reaction, as well as the economic value added, rather than the more traditional accounting profitability.

De Wet and Erasmus (2011:159) found that only sales growth, return on assets and the capital structure of the business impacted future success of the business. As expected, sales growth and return on assets are positively correlated with the future success of the business. However, the level of indebtedness is negatively correlated with future earnings. The fact that the higher levels of debt indicate lower future success indicates that businesses are poor allocators of capital, given that debt should only be taken on to improve earnings rather than destroy value. If economic profits are reduced by higher levels of debt, it indicates that the use of that debt results in returns that are lower than the cost of the debt. This has implications for the funding of capital expenditures, which will be discussed in Chapter 7.

Much of the South African research reviewed in this section has focused on how fundamental factors affect share price returns and economic profits, which gives an indication of the effect on earnings. However, a direct test on earnings is a superior measure of future success. Erasmus (2010:2-10) did exactly this by testing various components of working capital and their effect on return on assets. Factors included in the study were the net trade cycle, sales growth, level of indebtedness and liquidity of the balance sheet. The net trading cycle is a measure of working capital management that includes inventory, accounts payable and accounts receivable.

Similar to the study of De Wet and Erasmus (2011:159), the conclusion of Erasmus (2010:9) indicates that debt levels are an important indicator of future earnings, and that the level of debt is negatively correlated with future earnings. More importantly, though, is that managers need to focus on their working capital management, because a lazy balance sheet that has underutilised net working capital destroys shareholder wealth (Erasmus, 2010:8-9).

The method of aggregating fundamental factors into a single score and testing their effectiveness in anticipating the persistence of future earnings or the probability of bankruptcy was undertaken in the US by Piotroski (2000:1-41) and Altman (1968:589-609) respectively. Attwood (2012:1-55) examined whether the application of the Piotroski F-score to companies listed on the JSE was feasible and whether or not the distribution of returns shifts through the use of screen based on the score. Marais, Soni and Chitakunye (2014:451-469) undertook a similar study in which they tested whether the application of the Altman Z-score to companies listed on the JSE was capable of predicting the relative level of financial success.

The resultant outcome of Attwood's (2012:1-55) study was somewhat ambiguous on whether the F-score was a good predictor of future share price returns. While a relationship was evident between the F-score and future returns, the relationship was neither consistent nor robust, and hence was not statistically significant. However, low F-score portfolios were shown to materially underperform both high F-score portfolios and the market over all the investment horizons (Attwood, 2012:40). The findings of Attwood (2012:1-55) were severely hampered by the lack of available data, which resulted in a very narrow data sample. Increasing the data sample is an area where this research could be enhanced to gain further understanding of the effectiveness of the F-score in the South African context.

A similar result is evident from the study of Marais *et al.* (2014:451-469), which yielded inconclusive results. Again the study was very narrow in scope, with only 13 companies included in the research. Furthermore, the study took place during the global financial crisis, which could be considered as an outlier given the volatile economic environment that companies would have been subject to over this time period. Nevertheless, the results indicated that in some years, the Altman Z-score was a good predictor of future earnings, while in other years, the relationship was insignificant (Marais *et al*., 2014:464). Further research is required to draw on more conclusive results.

Given the above research, it is evident that there are some similarities in the ability of fundamental analysis and its ability to predict future earnings and share returns between the South African context and that of the US and other international studies. However, given the differing liquidity, size and efficiency of emerging market stock markets compared with those of larger developed market stock markets, it is unsurprising to see that certain factors appear to have relationships of varying significance in the South Africa context compared with elsewhere in the world.

4.3 SUMMARY

This chapter provided a review of literature and research undertaken testing the price momentum anomaly, earnings momentum anomaly, accrual anomaly and fundamental data analysis in the South African market.

Price momentum is commonly accepted to be a global phenomenon and the South African literature conforms to this finding. Earnings momentum literature in South Africa is thin; however, earlier indications are that earnings momentum as a strategy in the South African context is profitable. The accrual anomaly literature is mixed, along with the fundamental analysis literature.

In conclusion, the research documenting price momentum, earnings momentum or the PEAD anomaly, and the accrual anomaly on the JSE, along with fundamental data analysis research, is less than convincing and fairly inadequate given the lack of depth. Therefore, there is potential for future research in these areas on the JSE.

The next chapter will present the methodology followed in this thesis.

CHAPTER 5

RESEARCH DESIGN AND METHODS

5.1 INTRODUCTION

This chapter begins with a brief description of the properties of panel data, which is the type of data used in the study. This is then followed by an overview of the data, including the source, the sample size and collection and processing procedures. The final part of the chapter outlines the methods employed in the current empirical research. The empirical research was divided into five parts in order to deal with each research question separately:

- The first question of the study involves testing whether the price momentum anomaly exists on the JSE.
- The second question of the study involves testing whether the earnings momentum anomaly exists on the JSE. This will be done by estimating earnings surprises using a technique called standardised unexpected earnings (SUE).
- The third question of the study involves testing whether fundamental momentum of earnings is priced timeously in the market, or whether investors can earn abnormal returns by buying shares in companies with a high degree of fundamental momentum of earnings.
- The fourth question of the study involves testing whether fundamental momentum of the underlying components of earnings is able to help explain future fundamental momentum of earnings.
- The final question of the study attempts to determine whether fundamental momentum of earnings may help explain the price and earnings momentum anomalies.

For each part of the study, this chapter develops and describes the models that are required to be tested. Alternative methods are discussed and explanations are given of why certain methods were not used. All variables and line items are explained and defined as necessary.

5.2 NATURE OF PANEL DATA

A panel data set is one that follows a given sample of observations over time (Hsiao, 2014:1). Therefore, the data set is a pool of cross-sectional data over time, resulting in both space as well as time dimensions (Gujarati, 2003:636).

Panel data can be either balanced or unbalanced. An unbalanced panel will have a number of observations that may be missing for certain time periods. For example, shares may list or delist during the sample period, thus the time series of observations may not be complete for the entire period of the study. As such, the panel data used in the study is unbalanced.

Gujarati (2003:638) highlights a number of advantages of panel data that are relevant to the study. These advantages include giving more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency as a result of combining times series of cross-section observations. Panel data is also better suited to study the dynamics of change over time. Finally, by making data available for a vast number of observations, panel data can minimise the bias that might otherwise result if individual observations were aggregated into broad aggregates.

The above observations highlight that panel data can enhance empirical analysis in ways that would not be otherwise possible if only cross-section or time series data was used.

5.3 DATA

5.3.1 Data sources

Where possible, all market and financial data used in this research was drawn from the INET BFA database (http://www.inetbfa.com). INET BFA is the leading financial and market data provider in South Africa, having been established in 1965. The database contains both market data and financial data for all listed and delisted companies on the JSE from 1972 to date. More recently, the database has been expanded to include data from African share markets, South African parastatals and unlisted South African companies. The financial data includes both published audited annual financial statements, as well as preliminary nonaudited annual financial statements, along with interim financial statements. Annual standardised financial statements are also available, allowing for meaningful comparisons between the results of different companies. A comprehensive list of financial ratios emanating from the financial statements is also available. INET BFA also provides all market data available for listed and delisted companies on the JSE.

Where required, adjustments are made for financial data by INET BFA. For example, financial statements for companies reporting in foreign currencies are translated into rand terms by INET BFA, using the appropriate exchange rate. INET BFA calculates a total return series for every listed share, which incorporates all corporate transactions and dividends. However, for delisted shares, INET BFA only calculates the same total return series from 2002 onwards. Therefore, prior to 2002, the market data provided needs to be adjusted for any corporate transactions, as well as taking into account dividends paid in order to calculate a total return series for each share that delisted prior to 2002. INET BFA keeps a record of all corporate transactions through the archiving of the SENS notices. Manual adjustments will be made to market data where necessary to account for such corporate actions. In addition to the SENS notices, the JSE monthly bulletins from 1990 to 2002 will also be used to ensure accuracy of the market data. This is the only other source of market data apart from INET BFA.

This research will use the published audited annual financial statements and the unaudited interim financial statements. Given that investors have this information available to them at the time of making their investment decisions, it was deemed that these are the appropriate financial statements to use.

5.3.2 Sample

Consistent with Fraser and Page (2000:26), the sample target is all companies listed in the industrial sector on the JSE between the years 1990 and 2013. The study excludes companies listed in the financial sector, which includes property companies and investment holding companies. Mining companies listed in the resource sector will also be excluded from the study, as well as development (venture) capital companies. The total data sample consists of 804 JSE-listed businesses.

Financial companies are excluded from the study due to the fact that they are subject to special accounting conventions. Fama and French (1992:42) argue that financial companies ought to be excluded from their analysis because of the capital structure of such companies. They argue that a high degree of financial leverage indicates that a non-financial company may be under financial distress; however, the same does not apply to a financial company. The reason for excluding listed property companies and investment holding companies is that both sets of companies do not have operating assets, but rather their assets consist of fixed property and investments in other companies. In addition, property companies pay out all of their earnings to shareholders, retaining no earnings for future capital expenditure, thus making it difficult to analyse their ability to allocate capital. For these reasons, it is very difficult to draw conclusions regarding the effects of fundamental momentum on future earnings, as well as whether fundamental momentum is priced in the market. Thus, it was decided to exclude such companies from the analysis.

Mining companies are excluded from the study for three reasons. First, a large number of mining companies are exploratory businesses, as opposed to operational mines. Exploratory mining companies earn income through the sale of resources, in the form of potential mines, rather than by operationally earning an income by mining a specific mineral resource. Second, resource companies tend to be very capital expenditure heavy, thus a large portion of their earnings are ploughed back into the business in order to maintain, and further develop, the mine. Third, mining companies are heavily geared towards the commodity cycle, which will make analysing the fundamental momentum of those companies very difficult given that their financial results are often driven by commodity prices regardless of their operational results. For these three reasons, from an operational perspective, mining companies are very different companies from industrial companies and it was therefore decided to exclude them from the study.

Development (venture) capital companies are also excluded from the study. The reason for their exclusion is that these companies tend to be very small companies, which results in their shares being very illiquid, increasing transaction costs substantially, rendering a profitable trading strategy useless. A second reason is similar to that of the investment holding companies in that development capital companies merely invest in young start-up businesses and do not manage operational assets of their own.

Data collected includes financial data as reported by companies in their published audited annual financial reports and unaudited interim financial statements. This data is found in the statement of comprehensive income, the statement of financial position and the statement of cash flow. Non-financial data that is used includes share market data that was provided by the JSE and sourced by INET BFA. All data that is used in this study, along with the definitions, is listed and explained in Section 5.4.

The utmost care has been taken to ensure the reliability and the integrity of the data, and any company that had missing, or questionable, data is excluded from the study.

5.3.3 Data collection and processing

5.3.3.1 *Sort analysis versus regression analysis*

The most common methods employed to identify share market anomalies are either sort or cross-sectional regression analysis in the form of Fama and MacBeth (1973:607-636) style regressions. Sort analysis entails sorting shares into portfolios based on the variable being researched, and identifying whether such a sort results in a portfolio that outperforms the market. Regression analysis entails regressing the explained/regressand variable on the explanatory/regressor variable/s in order to infer a relationship between the two variables.

The main disadvantage of both sort and regression analysis, as pointed out by Fama and French (2008:1654), is that by undertaking market-wide sorts or regressions, one may fail to capture the size effect that could influence the results.

The problem of potentially failing to capture the size effect can be rectified by conducting separate sorts and regressions on small-caps, mid-caps and large-caps. This is a feasible solution for large stock markets where there are a sufficient number of listed shares to conduct separate tests. However, this may not be a solution for smaller stock markets, where the number of traded companies is too small to provide an acceptable number of observations.

A further two disadvantages of sort analysis pointed out by Fama and French (2008:1654) involve the inability of sorts to draw inferences about which anomaly variables carry unique information about future returns, along with their inability to examine the functional form of the relation between the anomaly variable and future returns.

The second documented problem with regressions is that there is the potential for individual shares to heavily influence the results because returns of individual shares can be extreme (Fama & French, 2008:1655). The obvious solution to this problem is to winsorise the extreme values.

Fama and French (2008:1655) advise that both sort and regression analysis should be used in tandem to cross-check one another. If the two methods indicate opposite results or relationships, influential observations in the regressions, as described above, are the likely culprit.

Given the size of the JSE in terms of the number of listed and delisted companies over the time frame of this study, it is not possible to conduct separate sorts and regressions. This is due to the total sample size of the companies being too small. As a result, the number of observations that would need to be included in each sort or regression for Questions 2 and 3 would be too small. However, if the study were to focus solely on price momentum, there is an argument to conduct sorts based on different size categories. This is one advancement that could be taken to improve the results of Question 1. Therefore, in order to ensure that a size effect is not driving the results, size is introduced as a risk factor, along with value risk factors, to test whether the anomalies are being driven by some other factor as opposed to the variable under scrutiny.

5.3.3.2 *Equal-weighted portfolios versus value-weighted portfolios*

A final problem which needs consideration when conducting sort analysis is how to construct the portfolios. An equal-weighted portfolio is a portfolio that places equal weight on each of the shares making up the portfolio, whereas, a value-weighted portfolio allocates the weight to each share in the portfolio according to the share's market capitalisation. Most of the literature constructs equal-weighted portfolios, while value-weighted portfolios are also an option. Often both variants are applied. The problem with equal-weighted portfolios is that micro-caps tend to dominate since they make up a large portion of the total number of shares on a market, yet they make up a tiny portion of the market cap. The opposite problem is true for value-weighted portfolios, where large-caps dominate the results, resulting in an unrepresentative picture of the anomaly (Fama & French, 2008:1654).

Similar to the size effect problem in sort and regression analysis, the obvious solution is to divide the market into three equal-sized buckets; small-caps, mid-caps and large-caps, and then construct both equal-weighted and value-weighted portfolios.

Again though, the size of the JSE prevents the study from constructing portfolios based on their size. And given the fact that the JSE is very heavily influenced by a small number of very big large-cap shares, this study will only construct equal-weighted portfolios when using sorts analysis.

A third weighting option when constructing sort portfolios is to allocate weight based on past returns (Conrad & Kaul, 1998:493; Lehmann, 1990:8). Such an approach assumes that a share's past performance is supposed to be informative about its future performance. In the case of testing the price momentum anomaly, this construction methodology appears to get ahead of itself by making the assumption that the research is setting out to test. In the case of testing other anomalies, constructing the portfolio using this approach is likely to introduce a momentum effect, which may influence the overall results. This weighting mechanism is not commonly used in research.

Following the methodology of Fama and French (2008:1658) and Hoffman (2012:27), this study employs the equal-weighted methodology in the construction of the portfolios. The equal-weighted return for each portfolio is calculated as follows:

$$E \qquad W \qquad ht\,R \qquad = \frac{1}{N}\sum_{n=1}^{N} R \quad (n)$$

where Ret(n) is the return of the n-th share, and N is the total number of shares in the portfolio.

5.3.3.3 *Survivorship bias*

A very common problem facing financial researchers, particularly in emerging markets, is the lack of a reliable and comprehensive data set. Historic fundamental and market data is very often incomplete, especially in the case of delisted companies. The unfortunate consequence of excluding delisted companies due to a lack of historic data when conducting historical research is survivorship bias in results.

The presence and potential effects of survivorship bias have been researched extensively since the early 1970s. Initial tests attempted to determine whether results from previous studies were robust given that the requirements for inclusion in the studies were that the share had to have survived a certain period of time (Ball & Watts, 1979:197; Salamon & Smith, 1977:1795). Both Ball and Watts (1979:205) and Salamon and Smith (1977:1801) concluded that survivorship bias was a potential concern to conclusions reached in past studies. The first comprehensive tests of survivorship bias took place later (Banz & Breen, 1986:785; Davis, 1996:365; McElreath & Wiggins, 1984:73). These studies all tested the implications of survivorship bias when using the COMPUSTAT tapes, which is a data provider for US-listed securities.

McElreath and Wiggins (1984:74) showed that the majority of businesses that had delisted were as a result of mergers, with other NYSE-listed companies, as opposed to bankruptcy or liquidation. For this reason, they suggest that survivorship bias may be limited due to much of the data from the merged firms being encompassed by studies. Banz and Breen (1986:785) tested the implications of survivorship bias by conducting the same set of tests on two different data sets. The one data set contained survivorship bias, while the other did not. They concluded that the low PE effect, which resulted in subsequent high returns, was a result of survivorship bias, and when this bias was removed, the low PE effect disappeared. A similar study with contradicting findings was undertaken by Davis (1996:365). He tested the effect of survivorship bias on the explanatory power of the PB ratio, the PE ratio and the cash flow yield with respect to realised share returns. His findings indicate that while survivorship bias attenuate the explanatory power of the variables, they remain significant.

The presence of survivorship bias in studies using data for the JSE has not been as widely studied as for the US market. It became apparent when collecting data from the 1990s that there clearly was a survivorship problem in the South African data. Gilbert and Strugnell (2010:31) examined the effects of the survivorship bias on the mean reversion of stock returns on the JSE, and similar to Davis (1996:365), they found that the outcome of the study was not materially affected. However, they eluded to the fact that by including delisted shares, the results reached could be materially different.

Every effort has been made to ensure that the data sample in this study does not contain survivorship bias. Data availability through INET BFA for businesses that were delisted prior to 2002 is very thin and only market data for a very small percentage of those companies is available. The financial data and total returns will be collected and calculated using SENS announcements and the JSE monthly bulletins to ensure a complete data set that is removed from any uncertainty about survivorship bias.

5.3.3.4 *Total return*

In calculating a total return for share prices over any given period, it is necessary to include all relevant corporate actions in this calculation. The following corporate actions are therefore included in the calculation: cash dividends, share consolidations, capital payments, special dividends, interest payments, scrip dividends, stock splits, rights offers and unbundlings.

The methodology used to calculate the total return for a share starts with assuming ownership of 100 shares on 1 January 1990. The 100 shares are then adjusted with each corporate action on the effective day. As an example, if a dividend is declared, the dividend is re-invested on the payment day by buying additional shares to the value of the dividend. All other corporate actions will be treated in a similar way by buying additional shares with the value created resulting from the corporate action or the number of shares is split in the event of a stock split.

The adjusted number of shares will then be multiplied daily with the normal volume-weighted average price (VWAP) in accordance with the JSE, resulting in an adjusted value for the original 100 shares, which may be materially more or less than 100 following the corporate actions. The return for each share will then be calculated by using this adjusted total value. The return quantified in this way then not only represents the movement in the share price itself, but also the additional value created for the shareholder by way of all relevant corporate actions.

The total return for each share is calculated as follows:

$$To \quad R \qquad (n_{t-i}) = \frac{T_{\ t} - T_{\ t-i}}{T_{\ t-i}}$$

where TRI is the total return index for each share, and *i* represents the number of months over which the total return is calculated.

5.3.3.5 ***Abnormal returns***

Abnormal returns are returns that are generated by a given security that is in excess of the expected rate of return. Historically, the expected rate of return is calculated using an asset pricing model that incorporates the risk associated with the security, as measured by volatility.

Van Rensburg and Robertson (2003:9) employed the capital asset pricing model (CAPM) as a tool to determine whether the return earned by securities on a risk-adjusted basis was superior to that which was explained by its systematic risk, measured by the market beta. If there is a difference between the actual return and the expected return as calculated by the CAPM model, it is concluded that there is excess risk-adjusted returns.

The CAPM of Sharpe (1964:425-442) and Lintner (1965:13-37) marked the birth of capital pricing theory. The CAPM is intuitively appealing from both a practical and theoretical point of view, given that it describes a simple linear model for estimating the expected return of a security in terms of its systematic risk (Ward & Muller, 2012:1). However, the empirical evidence in support of the CAPM is at best weak.

The study of Fama and French (2004:35) as well as more recent literature highlights the shortcomings of the CAPM model. Much of the evidence points to the fact that the variation in expected return is unrelated to market beta. A theme in the contradictions of the CAPM appears in the form of ratios that have information about future share returns, which are completely missed by their betas. Among these ratios are the price-to-earnings, price-to-book and debt-to-equity ratios. A size effect is also evident (Fama & French, 2004:36). Based on this evidence, Fama and French (1993:3-56; 1996:55-84) proposed their three-factor model, which is widely used across empirical research. However, it is worthwhile pointing out that the three-factor model is not without its faults, as it does not capture all the market anomalies, specifically price momentum and earnings momentum (Fama & French, 2004:40).

In his book, Montier (2009:19-28) questions the lack of evidence supporting the CAPM, and the upgraded version, the intertemporal CAPM (ICAPM). Montier (2009:19-28) points to the assumptions of the CAPM as the cause for its own demise, singling out the assumptions that investors can take any position in any share in any size without affecting the market price, and that investors view shares only in mean-variance space (using Markowitz's optimisation model). Without needing further elaboration, both of these assumptions are far removed from reality.

Ward and Muller (2012:1-12) present the most recent evidence of the empirical usefulness of the CAPM on the JSE. Following previous research which argues the validity of the CAPM on the JSE, their findings are no different. In fact, their results provide a complete contradiction of the CAPM by finding that a monotonic, inverse relationship between beta and returns exists (Ward & Muller, 2012:6).

Given the above limitations of the CAPM and its inability to capture expected returns, Fama and French (2008:1658) and Hoffman (2012:27) employed hedged portfolio returns that calculated whether portfolios based on various risk factors could produce abnormal returns.

The abnormal returns were calculated by going long on the portfolio at the one extreme, based on the risk factor, while going short on the portfolio at the other extreme. In these studies, the size and value risk factors that had been widely identified to influence future returns were taken into account using matching portfolios.

For the same reason, this study does not incorporate the CAPM, but rather calculates abnormal returns following a similar methodology to that of Fama and French (2008:1658) and Hoffman (2012:27). In reality, going short on all shares in the market is not possible, and thus instead of calculating abnormal returns using hedge returns, this study calculates abnormal returns based on an equal-weighted market return.

Monthly abnormal returns are calculated by taking the monthly equal-weighted return for each portfolio at the end of each month and subtracting from it the monthly equal-weighted return of all investable shares in the sample. The sample is representative of the market, where all systematic risk is removed, and thus returns in excess of returns that are derived from the equal-weighted market return are due to non-systematic factors.

5.3.3.6 *Matching portfolios and factor loadings*

The size effect and value effect are well documented in the literature, and thus numerous models have been developed in an attempt to remove these effects such that the effect that other less studied explanatory variables have on share returns can be studied and understood.

Following Fama and French (1993:3-56), Fama and French (2008:1658) employed matching portfolios to test whether there were other factors that influenced future returns outside the value and size effect. The matching portfolios are calculated by dividing the universe of shares into 25 different portfolios based on their market capitalisation and PB ratios. Shares are then matched to the respective portfolio that they belong to and the difference in returns is calculated, resulting in an abnormal return. The matching portfolios account for the size and value effects. The problem with such a methodology in studies conducted in the South African market is that the number of observations for any given time period is too narrow to construct 25 different portfolios that are diversified enough to use as matching portfolios.

As a result of the limitations in using matching portfolios to assess the ability of other explanatory variables to explain future returns, the factor loadings of value and size variables are calculated to assess the degree to which the return results are influenced by the size and value effect. Factor loadings are the time series regression slopes of the market, value and size factors, which represent the sensitivity of the results to those risk factors.

Fama and French (1993:19) developed the three-factor model which calculates the factor loadings of the market excess return, the value effect and the size effect, for excess stock returns. Their model calculates the factor loadings using cross-section regression that models the excess return of an asset relative to the risk-free rate on the market's excess return relative to the risk-free rate, a value factor and a size factor. The market return is calculated using the equal-weighted return methodology of all investable shares at that point in time. The factor loadings that are calculated model the shares excess return relative to the risk-free rate on the same dependent variables as used by Fama and French (1993:19), but the value and size effects are measured by the natural logs of both the price-to-book ratio and the market capitalisation respectively. This follows from Fama and French (2008:1667), who points out that these two variables are more timely proxies for loadings on the size and book-to-market factors of the Fama and French three-factor model.

To calculate the factor loadings, Fama and Macbeth (1973:616) cross-section regressions are used. The regressions are estimated monthly for all shares in each specific quintile, using the forward excess 12-month return relative to the risk-free rate. By calculating the mean and the standard deviation of the time series of the explanatory regression coefficients that were extracted over the entire period, it is possible to calculate the statistical significance of the factor loadings, and whether they played a role in explaining the results.

The cross-section regression model is as follows:

$$(RS_{t+i} - RF_{t+i}) = \beta_0 + \beta_1(RM_{t+i} - RF_{t+i}) + \beta_2(PB\ Ratio_t) + \beta_3(Market\ Capitalisation_t) + \varepsilon_{t+1}$$

where i represents months used in calculating the returns; RS represents the return of the share; RF is the return of the risk-free rate; and RM is the equal-weighted return of all investable shares.

The quintile portfolios are expected to be well diversified given that all available shares in a given time period are included in at least one portfolio. Therefore, β_1 is not expected to be materially different from one. β_1 is a measure of the exposure the portfolio has to market risk, typically referred to as beta. However, it is important to bear in mind that this beta is slightly different from the beta calculated in the capital asset pricing model (CAPM) due to the added value and size risk factors.

To determine whether either the value or risk factor helps explain the anomaly under scrutiny on the JSE, the loadings on each factor, which are given by the coefficient for each independent variable, need to be compared across the quintile portfolios.

If the value factor or size factor were to help explain an anomaly, the expectation for either risk factor, as measured by β_2 and β_3 factor loadings, would be that the loadings should be negative and statistically significant. The more negative the factor loadings are, the stronger the evidence that the factor helps explain the respective result. Thus, for the winners portfolios, the factors would be expected to be more negative and less negative for the losers quintiles. Thus, all the loadings across the various quintile portfolios should be negative, the Quintile 1 portfolio should have the lowest loading (most negative) and the Quintile 5 portfolios should have the highest loading (least negative).

Having said that, the size and value effects are not expected to help explain the price or the earnings momentum anomaly.

5.3.3.7 *Sharpe ratio*

To allow a comparison of the returns across the sorted portfolios on a risk-adjusted basis, the Sharpe ratio is also calculated. The Sharpe ratio is calculated as follows:

$$Sha \quad R \quad = \frac{R_{\ t} - R_{\ t}}{S \qquad t}$$

where RP is the return of the portfolio over the sample period; RF is the risk-free rate return over the sample period; and StdDev is the standard deviation of returns over the sample period.

5.3.3.8 *Liquidity*

To avoid the issue of illiquidity, a tradaebility filter was applied to all shares over each month of the study. All shares in the sample were ranked based on their value traded over the month, and the most thinly traded shares that cumulatively accounted for 5% of total monthly value traded were omitted. The 5% cut-off level ensured that all of the shares included in the study had traded during each month of the sample period. This method follows from Van Rensburg (2001:51).

5.3.3.9 *Volume-weighted average price (VWAP)*

Volume-weighted average price is used as opposed to the closing price on each day. VWAP is a more accurate measure of the price of a share that was traded on a particular day, as opposed to the closing price. This is of particular importance for less liquid stocks that can have material bid-ask spreads. Jegadeesh and Titman (1993:69) examined the effect of the bid-ask spread by forming two sets of portfolios. The one set of portfolios was formed immediately following the observed formation period, while the second set of portfolios was formed one week following the observed formation period. The bid-ask spread was found not to have a material effect on the results (Jegadeesh & Titman, 1993:69).

The volume-weighted average price is assigned a value of zero if no trades took place, as opposed to using the closing price from the previous day, which many data providers use. Therefore, volume-weighted average price helps to deal with the problem of the bid-ask spread, as well as removing shares that were not traded in a given period, thus helping to eliminate the liquidity problem.

Volume-weighted average price is calculated as follows:

$$\text{Volume} - \text{weighted average price} = \frac{\sum(Q * P)}{V}$$

where Q is the quantity of shares bought; P is the price paid for the transaction and Vol is the total volume of shares bought.

5.3.3.10 *Annualising line items*

In instances where a business changed its year-end, financial line items which measure a value that is accumulated over a specific period will be factored up or down, in order to be consistent with all other companies. This applies to the statement of comprehensive income line items and the statement of cash flow line items. The statement of financial position line items, however, are excluded given that they measure a variable at a point in time, as opposed to a value that is accumulated over a specific period.

If the change in year-end results in the number of months being less than 12 months, the relevant line items are proportionally factored upwards to reflect 12 months. Likewise, if the change in year-end results in the number of months being more than 12 months, the relevant line items are proportionally factored downwards to reflect 12 months.

5.3.3.11 *Outliers*

To control for the effect of outliers in financial statement line items, the first and 99th percentiles of all explanatory variables have to be omitted. While this reduces the number of sample observations slightly, it controls for the effect of outliers (Collins & Hribar, 2000:110).

Given that the total return data for the share price is meticulously calculated and cleaned, it is not necessary to remove outliers from this data sample. Removing outliers based on total return using Collins and Hribar's (2000:110) method may result in removing the best-and worst-performing shares, based purely on that fact and not because there is a problem with the underlying data.

5.3.3.12 *Delisted shares*

To avoid the survivorship bias that has potential implications for the empirical results, shares that subsequently delisted are included in the sample. Including delisted shares requires a methodology to deal effectively with returns after delisting. While data availability for delisted shares is available, the reason for delisting is often difficult to find, and is therefore collected by hand by going through the JSE monthly bulletins. The reason for delisting is very important in order to determine how to deal with the returns after delisting. There are three reasons why a business will delist from an exchange. The first is a merger with another business, the second reason is bankruptcy and the third is share cancellation for whatever reason, with the business surviving. Another form of quasi-delisting which needs to be incorporated is when a share is suspended. For the period of suspension, a suspended share is viewed as a delisted share due to the fact that investors are not able to realise any return for the period that the share is suspended.

Returns due to the various momentum trading strategies from delisted shares vary, depending on why they delisted. The methodology used to calculate returns following a delisting in some literature is too simplistic, in that the market return is replaced with the return earned by the delisted share (Chan *et al.,* 1996; 1686). Although this is a common practice in the literature, it does not deal with the true returns of delisted shares effectively.

Huynh and Smith (2014:11) calculate returns of delisted shares based on a case-by-case analysis. The methodology they employed is replicated in this study. If distributions were made to shareholders upon delisting, the distributions were reinvested and earned the money market rate of interest for the remaining period of the strategy. Distributions upon delisting are made in the cases where businesses are merged, or where shares delist but the business continues to survive. In the case where businesses went bankrupt, the returns earned were -100%, given that the share price goes to zero. If a share is suspended following portfolio formation but prior to the end of the holding period, the return assigned to it is also -100%, given that no value can accrue to the momentum strategy as the share has become untradeable.

Table 5.1 illustrates the number of companies that were included in the study each year. The data in the table is separated into market data and fundamental data. There are a few instances where the fundamental data is missing, yet there is market data available for the same shares. In such instances, the shares are incorporated into the price and earnings momentum research, and are omitted from the fundamental research. Therefore, there are a few small discrepancies between the number of shares included in the study across the market and fundamental data. The first two years of the fundamental data are excluded. This is due to the fact that two years of fundamental data are required before a share can be included in the fundamental research. Thus, the fundamental research only begins in 1992.

Table 5:1 Research methodology: total number of shares and companies included in the research per year. The data for each year is separated into market data and fundamental data and then further separated into the number of listed shares and delisted shares

Total Companies Included by Year				
	Market Data		Fundamental Data	
Year	Listed	Delisted	Listed	Delisted
1990	67	346	-	-
1991	69	327	-	-
1992	71	305	70	293
1993	71	287	70	260
1994	77	270	76	255
1995	85	260	84	251
1996	91	273	90	266

1997	98	298	96	289
1998	117	331	116	320
1999	125	342	124	336
2000	129	309	128	307
2001	130	269	129	266
2002	132	209	131	207
2003	133	160	132	159
2004	137	131	136	130
2005	142	105	141	104
2006	159	87	158	85
2007	196	89	195	76
2008	204	64	203	63
2009	207	57	206	56
2010	210	46	210	45
2011	215	40	215	39
2012	220	31	217	29
2013	221	17	220	16

5.4 CURRENT RESEARCH

The main purpose of the research is to determine whether momentum in a company's fundamentals carries information about the future earnings of the company, and whether or not the market, as represented by the study's sample, rationally prices this information. The final question involves determining whether price momentum and/or earnings momentum is a manifestation of fundamental momentum.

Five research questions were asked in Section 1.3. In an attempt to achieve the objectives of the study, these research questions are transformed into their respective null hypotheses. Each of the null hypotheses as well as the methodology used in determining whether the null hypotheses are rejected or accepted is explained in this section.

5.4.1 Price momentum

Hypothesis 1: The price momentum strategy, in the form of the continuation of price movements over the medium term, is not profitable on the JSE.

Hypotheses 1a: Price momentum is not explained by a size effect.
Hypotheses 1b: Price momentum is not explained by a value effect.

The first hypothesis sets out to test whether the price momentum anomaly and a price momentum strategy yield abnormal returns on the JSE. Fraser and Page (2000:31) show that the price momentum strategy produces abnormal returns on the JSE for a holding period of one month, based on 12-month past returns.

Since the influential work of De Bond and Thaler (1985:793-805) and Jegadeesh and Titman (1993:65-91), a standardised approach has been followed for investigating price momentum. Stocks are sorted into portfolios based on their past returns and the performance of the portfolios over different time periods is evaluated. Therefore, in following the literature conducted on larger stock markets around the world, price momentum strategies will be tested using a sort methodology over a number of different holding period returns and past observable returns, which will be longer than one month.

Jegadeesh and Titman (1993:69) conducted a comprehensive test for price momentum by analysing holding periods of one to four quarters, based on past returns over one to four quarters. While it may be argued that such a method could be considered data mining, past research has shown that price momentum can be viewed over a number of different months, and can occur simultaneously over different periods at the same time. Thus, price momentum is not mutually exclusive to one specific period at any one point in time. For example, it is possible that price momentum is evident over both a six-month and a 12-month holding period.

Jegadeesh and Titman (2001:699) dealt with the data mining criticism they faced following their original paper on price momentum in 1993. They showed that the price momentum held over different time periods, as well as in an out-of-sample test.

5.4.1.1 *Method*

The purpose of determining whether price momentum is found on the JSE is secondary to this study, and only done so in order to determine whether fundamental momentum may help in understanding the price momentum anomaly. Therefore, a comprehensive study of price momentum on the JSE is not required. For this reason and in order to determine whether price momentum is found on the JSE, a simple sort analysis is conducted.

Similar to past studies, some of which have already been discussed in this study, the strategies considered in this study select shares based on their returns over the past three, six, nine and 12 months. Similarly, the holding periods for the shares will be over the following three, six, nine and 12 months. As a result, a total of 16 trading strategies will be examined.

For each examined strategy, there is a formation period and a holding period. The formation period refers to the number of months that the past returns were observed and used to form the portfolio, and the holding period refers to the number of months that the shares are held for. Longer formation and holding periods in the form of quarters are used, rather than shorter periods in the form of months, in an effort to reduce transaction costs, which exist in the real world, and thereby produce results which are more realistic.

Shares will be ranked in descending order according to their past returns and placed into quintiles on a monthly basis. Quintiles are used, as opposed to deciles, due to the breadth of the market. The use of quintiles follows from Fama and French (2008:1658) and Hoffman (2012:26). Equal-weighted quintile portfolios, referred to as sub-portfolios, are formed using the shares in each quintile at the end of each month. Quintile 1 will contain the shares with the highest returns over the observed period, while Quintile 5 will contain the shares with the lowest returns over the observed period.

As a result of the holding periods being quarters, as opposed to months, the portfolios will have overlapping holding periods. If the number of months for the holding period is *K* months, the total portfolio will consist of *K* sub-portfolios (Jegadeesh & Titman, 1993:68).

A strategy that selects shares based on the past *J* months and has a holding period of *K* months, will be known as a *J*-month/*K*-month strategy, and will be constructed as follows: At the beginning of each month *t*, the shares will be ranked in descending order and placed into their respective quintiles, based on their returns over the past *J* months. An equal-weighted sub-portfolio is formed using the shares from each quintile. In each month *t,* the sub-portfolio formed that month is included in the portfolio, and is held for *K* months, while the sub-portfolio initiated in month *t-K* is removed from the portfolio. As a result, the weights of *1/K* of the shares in the portfolio are revised on a monthly basis, while the shares which were included in month *t-K-1* and earlier will be left unchanged.

5.4.1.2 *Return comparisons*

For each J-month/k-month strategy, the return across each of the five quintile portfolios is computed. The standard approach in the literature, as discussed in Section 5.3.3.5, is to construct zero-cost portfolios by going long the Quintile 1 portfolio and short the Quintile 5 portfolio. The idea behind the zero-cost portfolio is that no capital is required upfront to construct the portfolio, and if a positive return is earned through the price momentum strategy, the evidence indicates that price momentum is a profitable strategy. The problem with zero-cost portfolios is that, in reality, the structures are costly, and shorting shares also comes with a cost, which very often removes the abnormal returns earned. This is particularly pertinent in the case of the South African market, the JSE. Furthermore, in reality, it is not possible to short smaller shares on the JSE.

For the above reason, zero-cost portfolios will not be constructed, but rather the performance of the five quintile portfolios will be compared with that of the market as a whole. The market will be measured by constructing an equal-weighted portfolio of all the shares in the sample for the particular period in question. If the past winners, which will make up the Quintile 1 portfolio, consistently outperform the market portfolio, the price momentum strategy would be profitable. The t-statistics and p-statistics will be computed to determine the level of significance of the results.

The Sharpe ratios will also be calculated for each quintile portfolio to allow for a risk-adjusted comparison across the portfolios.

5.4.1.3 *Risk considerations*

Fama and French (1996:56) concede that their three-factor model, which includes both a size and a value factor, cannot explain the continuation of short-term returns first documented by Jegadeesh and Titman (1993:70), or what this study refers to as price momentum. Therefore, while the expectations are that investors are not getting rewarded from taking on additional risk by following a price momentum strategy, it is nevertheless important to ensure that this is the case.

Following the division of the sample into their respective sub-portfolios, some basic descriptive statistics will be calculated for comparison purposes. Each portfolio's average and median market capitalisation will be calculated to determine whether a size effect could possibly play a role in the price momentum strategy. In addition to the market capitalisation, each portfolio's average and median PE ratio and PB ratio will also be calculated in order to determine whether a value factor may play a part in the results. While the PE ratio is a suitable value factor proxy given that the sample is industrial companies where the value of the companies is predominantly driven by the earnings generated as opposed to the value of assets in place, it is prudent to include another value factor as a sanity checker. For this reason, the PB ratio is also examined.

To determine whether a size or value effect explains price momentum, the average size and value factors will be calculated for each sub-portfolio at the beginning of every month. The average for each quintile will then be calculated to determine whether there is any pattern that may suggest whether either a size or value effect influences the results or not. The medians of the size and value factors will also be calculated and examined in the same fashion as the averages in order to ensure that there are not a small number of outliers influencing the results.

Although calculating the average and medians of the various factors of the portfolio gives insight into whether a size or value effect may possibly explain price momentum, regression analysis is required to determine whether the effects are statistically significant in explaining price momentum. Following the Fama and French (1993:19) methodology, multi-variable regression analysis is conducted to calculate the factor loadings of the three factors explained in Section 5.3.3.6. The factor loadings of each risk factor and their respective level of significance will be reported to determine whether any risk factor materially influences price momentum.

Given the statement by Fama and French (1996:56), it is expected that value factors cannot explain price momentum.

5.4.2 Earnings momentum

Hypothesis 2: The earnings momentum strategy, in the form of abnormal returns due to post-earnings continuation of price movements over the medium term, is not profitable on the JSE.

Hypothesis 2a: Earnings momentum is not explained by a size effect.
Hypothesis 2b: Earnings momentum is not explained by a value effect.

The second hypothesis deals with the issue of whether earnings momentum, as measured by PEAD, is profitable on the JSE. Earnings momentum on the JSE is identified by Ssali (2012:2); however, most of the PEAD reported in Ssali's research paper took place over the first week. Coupled with this, the analysis ended two months after the announcement date. Similarly, the analysis began only 10 days prior to the announcement date. In their study, Swart and Hoffman (2013:23) showed that PEAD is found on the JSE. Their study tested for PEAD up to a period of six months following the earnings announcement. Ball and Brown (1968:169) showed that while PEAD occured over a period of about six months following the announcement date, the price began to adjust to either of the positive or negative earnings surprises 12 months prior to announcement and most of the price movement occured in this 12-month period. Therefore, extending Ssali's (2012:1-15) and Swart and

Hoffman's (2013:17-34) studies, earnings momentum in the 12 months leading up to the announcement date, as well as up to 12 months following the announcement date, will be investigated.

5.4.2.1 *Estimating earnings surprise*

Earnings surprise is defined as the difference between reported earnings and expected earnings, and while the earnings surprise is of vital importance in testing PEAD, a definition of reported earnings and expected earnings needs to be provided. As stipulated by the governing accounting standard, companies report a variety of earnings numbers, some of which include profits from discontinued operations, profits attributable to minorities, and the sale of assets, to name but a few. In the South African investment community, the most commonly used reported earnings number is referred to as headline earnings. Headline earnings accounts for earnings excluding profits or losses from the sale or terminations of discontinued operations, fixed assets or related businesses, as well as the permanent impairment of their values. Therefore, the term *headline earnings* refers to earnings from the core operations of the business, which are expected to continue going forward. Regardless of the earnings definition employed, what is more important is that the application of the definition used is consistent for reported earnings and expected earnings, otherwise an element of the earnings surprise will consist of the difference in the definition.

In order to test whether an earnings momentum strategy is profitable on the JSE, the earnings surprise, which leads to PEAD, needs to be estimated. As discussed in Section 2.3.2, a number of methods have been employed in previous research papers in an effort to estimate the earnings surprise and these include changes in analysts' forecasts of earnings, the cumulative abnormal share return around the most recent announcement date of earnings and calculating the SUE (Chan, Jegadeesh & Lakonishok, 1996:1685). In the South African literature, Swart and Hoffman (2013:20) employed two different methods to calculate earnings surprises. The first method used the previous year's earnings per share as the expected earnings per share number in the current year. The second method followed the abnormal return around the recent announcement date.

The first method mentioned above, the changes in analysts' forecasts of earnings, is difficult to employ in the South African market given that the breadth of analyst coverage is very narrow. This would result in a severely restricted sample. The second method, the cumulative abnormal share return around the earnings announcement date, is problematic for two reasons. First, Chan *et al.* (1996:1685) point out that the abnormal returns around the announcement captures the market's views about earnings over only a few days around the announcement, as opposed to a longer period, which the other methods do. The second problem is that this method does not measure actual earnings surprises, but rather, it measures the market's view regarding earnings announcements, with abnormal returns as the proxy. The SUE method has been the most popular method and does not have the shortcomings mentioned above. Therefore, this study will employ the SUE methodology.

1.4.2.1.1 Standardised unexpected earnings (SUE)

The SUE for share *i* in month *t* are defined by Equation 5.1 below:

$$SUE_{it} = (e_{it} - e_{it-2}) / \sigma_{it} \qquad (5.1)$$

where e_{it} = earnings per share at time t for share *i*;

e_{it-2} = earnings per share 2 periods ago for share *i*;

σ_{it} = standard deviation of unexpected earnings, $e_{it} - e_{it-1}$, over the preceding four periods.

Listed businesses on the JSE are required to report interim and financial year-end results, as opposed to reporting quarterly earnings, as is the custom on many developed market exchanges. Therefore, while the SUE are calculated using quarterly earnings over the past two years in the literature, this study will calculate the SUE using interim and year-end results over the past two years. Thus, given that financial results are reported every six months, a period as mentioned above, refers to a six-month period. The earnings per share, which will be used in the calculation of the SUE, are therefore, trailing 12-month earnings. The standard deviation of unexpected earnings, at time *t*, is calculated by taking the standard deviation of the difference between the 12-month trailing earnings at time *t* and time *t-2*, *t-1* and *t-3*, *t-2* and *t-4*, and *t-3* and *t-5*.

The SUE will be used to rank the companies, and place them into portfolios to test whether earnings momentum is a profitable strategy on the JSE.

5.4.2.2 *Method*

As is the case with price momentum, the sole purpose of determining whether earnings momentum is found on the JSE is to determine whether fundamental momentum may help in understanding the earnings momentum anomaly. Therefore, a comprehensive study of earnings momentum on the JSE is not required. For this reason, a simple sort analysis is undertaken.

The SUE will be calculated on a monthly basis for every company, and ranked in descending order from the highest SUE to the lowest. The reason for calculating the SUE on a month-by-month basis, when earnings are only reported twice a year, is to ensure that the SUE for businesses that do report earnings in a given month are captured timeously. According to the JSE's regulations, financial results have to be released within three months of their year-end or interim year-end. Therefore, without having to worry about when a company's year-end or interim year-end is, by capturing earnings every month, the latest earnings available to investors are captured. The common method in the literature is to capture earnings three months after the period end, whether it is year-end or quarter end. The problem with this is that if a company is very efficient in reporting, and reports its results within one or two months, the earnings captured and the share prices used in the research are arguably late. To negate this issue, given that the SUE for a business will be stable until a new earnings number becomes available, businesses with stable SUE are not included for that particular month. A changing SUE are a signal that financial results were released that month and the share will then be included in the ranking process.

Once the shares are ranked, similar to the price momentum method employed above, they are placed into quintiles and equal-weighted quintile sub-portfolios are formed. Quintile 1 represents the companies with the highest positive earnings surprise, while Quintile 5 represents the companies with the lowest earnings surprise.

Portfolio returns for holding periods of three, six, nine and 12 months will be examined, while the returns of the portfolios of three, six, nine and 12 months prior to portfolio formation will also be calculated in an effort to determine whether the market anticipates earnings surprises.

Similar to the price momentum methodology, as a result of the holding periods being quarters, as opposed to months, the portfolios will have overlapping holding periods. If the number of months for the holding period is *K* months, the total portfolio will consist of *K* sub-portfolios.

The portfolios are constructed as follows: At the beginning of each month *t*, the shares will be ranked in descending order and placed into their respective quintiles, based on their SUE. An equal-weighted sub-portfolio will be formed using the shares from each quintile. In each month *t,* the sub-portfolio formed that month will be included in the portfolio, and will be held for *K* months, while the sub-portfolio initiated in month *t-K* is removed from the portfolio. As a result, the weights of *1/K* of the shares in the portfolio will be revised on a monthly basis, while the shares which were included in month *t-K-1* and earlier will remain unchanged.

5.4.2.3 *Return comparisons*

Following the same reasoning as mentioned in Section 5.4.1.2., zero-cost portfolios will not be constructed, but rather the performance of the five quintile portfolios will be compared with that of the market as a whole. The market will again be measured by constructing an equal-weighted portfolio of all the shares in the sample for the particular period in question. If the Quintile 1 portfolio consistently outperforms the market portfolio, the earnings momentum strategy would be profitable. The t-statistics and p-statistics will be computed to determine the level of significance of the results.

The average monthly abnormal return of the portfolios relative to the equal-weighted market returns will also be calculated on a month-by-month basis in the 12 months leading up to portfolio formation. In reality, the shares making up the portfolios will not be known prior to the portfolio formation date, but with the benefit of hindsight, by calculating the performance of these shares in the months leading up to their inclusion in the various portfolios will allow the study to determine whether the market anticipates the fundamental momentum in earnings. The same methodology will be followed in calculating the average monthly abnormal returns in the 12 months following portfolio formation. This event-time plot allows one to compare the magnitude of the performance of the shares both pre- and post-formation. It will also give insight into the market's forward-looking ability.

The Sharpe ratios will also be calculated for each quintile portfolio to allow for a risk-adjusted comparison across the portfolios.

5.4.2.4 *Earnings surprise as a proxy for earnings growth*

The one-year earnings growth will be calculated for every share that is included in an earnings momentum portfolio. This gives insight into whether businesses announcing positive earnings surprises are growing their earnings, or whether the earnings surprise is a once-off event. If the earnings surprise is a once-off event, it indicates that the market overreacts to short-term earnings announcements and the share price would be expected to mean revert following the PEAD. If businesses announcing earnings surprises, on average, continue to grow their earnings over the year ahead, it would indicate that an earnings surprise is a good proxy for future earnings growth.

5.4.2.5 *Risk considerations*

Along with the continuation of short-term returns, Fama and French's (1996:56) three-factor model cannot explain PEAD, or earnings momentum as it is referred to in this study. Therefore, it is important to ensure that earnings momentum is not due to investors taking on some form of risk.

Following the division of the sample into their respective sub-portfolios, some basic descriptive statistics will be calculated for comparison purposes. The methodology here is a copy of the methodology employed in Section 5.4.1.3.

Each sub-portfolio's average and median market capitalisation will be examined to determine whether a size effect does not play a role in the earnings momentum strategy. In addition to the market capitalisation, each sub-portfolio's average and median PE ratio and PB ratio will also be examined in order to determine whether a value factor may play a part in the results. While the PE ratio is a suitable value factor proxy given that the sample is industrial companies where the value of the companies is predominantly driven by the earnings generated as opposed to the value of assets in place, it is prudent to include another value factor as a sanity checker. For this reason, the PB ratio will also be examined.

To determine whether a size and value effect explains earnings momentum, the average size and value factors will be calculated for each sub-portfolio at the beginning of every month. The average for each quintile will then be calculated to determine whether there is any pattern that may indicate whether either a size or value effect influences the results or not. The medians of the size and value factors will also be calculated and examined in the same fashion as the averages in order to ensure that there are not a small number of outliers influencing the results.

Although calculating the average and medians of the various factors of the portfolio gives insight into whether a size or value effect may possibly explain earnings momentum, regression analysis is required to determine whether the effects are statistically significant in explaining price momentum. Following the Fama and French (1993:19) methodology, a multi-variable regression analysis will be conducted to calculate the factor loadings of the three factors explained in Section 5.3.3.6. The factor loadings of each risk factor and their respective level of significance will be reported to determine whether any risk factor materially influences earnings momentum.

Given the statement by Fama and French (1996:56), it is expected that value factors do not explain earnings momentum.

5.4.3 Pricing fundamental momentum

Hypothesis 3: The fundamental momentum strategy, in the form of fundamental momentum in earnings over the short to medium term, is not profitable on the JSE.

Hypothesis 3a: Fundamental momentum of earnings is not explained by a size effect.
Hypothesis 3b: Fundamental momentum of earnings is not explained by a value effect.

The third hypothesis sets out to test whether the market anticipates and correctly prices fundamental momentum of earnings. The purpose of determining whether fundamental momentum is found on the JSE is done so in order to determine whether fundamental momentum helps in understanding the price and earnings momentum anomalies.

Fundamental momentum is a new concept and hence no prior research is available to form expectations, or to explain how to estimate fundamental momentum. Following the methodologies in Sections 5.4.1 and 5.4.2, however, abnormal returns will be calculated and the influence of risk factors taken into account.

5.4.3.1 *Defining and calculating fundamental momentum*

As explained in Chapter 1, *fundamental momentum* is defined as the difference between the change of a fundamental variable over consecutive time periods. Therefore, fundamental momentum calculates whether a company's fundamentals are increasing or decreasing, at an increasing or decreasing rate, over time.

A business with an entrenched competitive advantage and one that is able to protect that competitive advantage is more likely to sustain positive fundamental momentum for a longer period of time than a business that operates in a highly competitive industry. Given the competitive advantage, and the ability to protect it, such a business has a better chance of earnings increasing at increasing rates over time. If a business is unable to protect its competitive advantage, it would be expected that earnings increase but at a decreasing rate as the advantage is eroded. This would be an example of negative fundamental momentum.

In order to calculate fundamental momentum, the fundamental variables need to be deflated by a contemporaneous variable in order to take into account any corporate transaction that may either inflate or deflate the fundamentals of a business by ways other than organic growth. This is common procedure in similar fundamental research (Richardson, Sloan, Soliman & Tuna, 2005:452; Sloan, 1996:294).

The standard approach in accounting research is to deflate accounting variables by the average total assets, for example, when testing the relationship of a variable to the persistence of earnings. Therefore, if one were to test the relationship between variable X_t and future earnings, the standard approach would be to calculate the change in the variable over a time period, and then divide the change by the average total assets for that period. Equation 5.2 illustrates the standard approach.

The standard approach:

$$\Delta X_{ti} = (X_t - X_{t-i})/ATA_{ti} \qquad (5.2)$$

where X_t = *accounting variable at time t;*

ATA_t = *average total assets at time t.*

Average total assets at time t are calculated by taking the average of the total assets at time t and total assets at time t-1. Equation 5.3 illustrates how average total assets have been calculated in this study:

$$ATA_{ti} = (TA_t - TA_{t-i})/2 \qquad (5.3)$$

where TA_t = *Total assets at time t.*

This standard approach has its limitations, because it will only illustrate the nominal change in the accounting variable from one period to the next. Therefore, as long as the accounting variable is increasing, it appears that the variable is growing. The standard approach does not give insight into how the accounting variable of the business, or the business's fundamentals are changing over time. This is important in understanding the sustainability of a business's growth, and thus whether a business has the ability to increase shareholder value over time.

The approach used in this study is slightly different from the standard approach described above. Instead of calculating the change in the nominal value of a variable, fundamental momentum calculates the relative rate of change of a variable. To calculate fundamental momentum, the change in an accounting variable is initially calculated and then deflated by average total assets, in terms of the standard approach. The difference of this result is then calculated over consecutive time periods in order to determine whether a company has positive or negative fundamental momentum. In the case of fundamental momentum, a time period is 12 months.

Fundamental momentum is calculated using the rate of change in the relative level of an accounting variable deflated by a contemporaneous total, such as average total assets. Equation 5.4 illustrates the calculation of fundamental momentum for variable X_t.

Fundamental Momentum:

$$FM(X_t) = (X_t - X_{t-1})/ATA_t - (X_{t-1} - X_{t-2})/ATA_{t-1} \tag{5.4}$$

where X_t = *change in accounting variable;*

ATA_t = *average total assets over period t-1 to t*

Although subtle, this change in approach results in a material change in what is being measured. The standard approach described above calculates a nominal change in variable X_t and tests the relationship, for example, between that change in X_t and the persistence of future earnings. However, the method used in this study tests the rate of change in the relative level of an accounting variable, and not the nominal change. Therefore, the variable has positive/negative fundamental momentum if it grows at a faster/slower relative rate over a specified period of time. An example is shown in Table 5.2.

Table 5:2 Research methodology: comparing the calculation of fundamental momentum relative to the standard approach

Variable	t	t-1	t-2	t-3
X	11	10	9	7
ΔX	1	1	2	

Total Assets	120	100	100	90
Standard Approach	=(11-10)/110 =0.009	=(10-9)/100 =0.01	=(9-7)/95 =0.021	
Fundamental Momentum	=1/110-1/100 =-0.001	=1/100-2/95 =-0.011		

The above example illustrates that while the nominal value of variable X grows consistently from time t-3 to time t, the rate of relative growth actually decreases. Therefore, the standard approach would result in a positive growth value for X at time t; however, there is negative fundamental momentum present in X at time t because X grew at a slower relative rate in the time period t-1 to t than over the time period t-2 to t-1.

A company has positive fundamental momentum when either the variable in question increases over a specified time period at an increasing relative rate, or when the variable decreases over the specified time period at a decreasing relative rate. Similarly, negative fundamental momentum is present when the variable either increases at a decreasing relative rate over the specified time period, or when it decreases at an increasing relative rate over the specified time period.

5.4.3.2 *Method*

Sort analysis

A simple sort strategy will be employed to determine whether buying shares with high fundamental momentum of earnings produces abnormal returns. As described above, fundamental momentum of earnings will be calculated in three steps. First, the change in earnings over a 12-month period needs to be calculated. This number is then deflated by total average assets. The final step is to calculate the rate of the relative change in earnings, which is done by calculating the difference in the change of earnings over consecutive time periods. Once the fundamental momentum of earnings is calculated, the companies will be ranked and placed into quintiles, as was done in Sections 5.4.1 and 5.4.2.

The fundamental momentum of earnings will be calculated twice a year for each share, based on a trailing 12-month earnings number, given that earnings are reported twice a year. The fundamental momentum calculation for a specific company will take place within three months following the company's year-end and interim end, due to the fact that companies have to report results within this period of the financial period end.

The fundamental momentum of earnings is calculated over a 12-month period. Fundamental momentum of earnings at time t is calculated as the difference between the change in earnings at time t (calculated as the difference between earnings at time t and earnings at t-12 months), and the change in earnings at t-12 months (calculated as the difference between earnings at t-12 months and t-24 months). Therefore, the fundamental momentum of earnings calculation stretches over a 24-month period.

Holding periods of three, six, nine and 12 months after the fundamental momentum of earnings will be calculated and considered. Returns of the portfolios for 12 months prior to portfolio formation will also be calculated, using the same time periods, in an effort to determine whether the market anticipates companies with positive fundamental momentum.

Similar to the price and earnings momentum methodology, as a result of the holding periods being quarters and years, as opposed to months, the portfolios will have overlapping holding periods. If the number of months for the holding period is *K* months, the total portfolio will consist of *K* sub-portfolios.

The portfolios are going to be constructed as follows: At the beginning of each month *t*, the shares that have reported financial results during the course of the month will be ranked in descending order and placed into their respective quintiles, based on their fundamental momentum of earnings. An equal-weighted sub-portfolio will be formed using the shares from each quintile. In each month *t,* the sub-portfolio formed that month will be included in the portfolio, and held for *K* months, while the sub-portfolio initiated in month *t-K* will be removed from the portfolio, while the shares which were included in month *t-K-1* and earlier will remain unchanged.

Regression analysis

A one-factor linear regression analysis will be undertaken to determine the relationship between fundamental momentum of earnings and future returns. The explanatory variables used will be the quintile bins that each respective share is placed in at time t. Using quintile bins as opposed to the actual fundamental momentum of earnings has two advantages: first, all outliers are removed from the sample given that outliers in either direction will be included in the extreme quintiles; second, the quintile bins are normally distributed, thus removing biases from the estimated coefficients. The dependent variable will be future abnormal returns relative to the equal-weighted market return at time t.

$$Return_{t+i} = \beta_0 + \beta_1(FM\ Quintile_t) + \varepsilon_{t+1} \qquad (5.5)$$

where i = *3, 6, 9, 12 months*

5.4.3.3 *Return comparisons*

Following the same reasoning as mentioned in Sections 5.3.3.5 and 5.4.1.2, zero-cost portfolios will not be constructed, but rather the performance of the five quintile portfolios will be compared with that of the market as a whole. The market will again be measured by constructing an equal-weighted portfolio of all the shares in the sample for the particular period in question. If the Quintile 1 portfolio consistently outperforms the market portfolio, this would indicate that the earnings momentum strategy is profitable. The t-statistics and p-statistics will be computed to determine the level of significance of the results.

The average monthly abnormal return of the portfolios relative to the equal-weighted market returns will also be calculated on a month-by-month basis in the 12 months leading up to portfolio formation. In reality, the shares making up the portfolios will not be known prior to the portfolio formation date, but with the benefit of hindsight, by calculating the performance of these shares in the months leading up to their inclusion in the various portfolios, the study will be able to determine whether the market anticipates the fundamental momentum in earnings. The same methodology will be followed in calculating the average monthly abnormal returns in the 12 months following portfolio formation. This event-time plot allows one to compare the magnitude of the performance of the shares both pre- and post-formation. It also gives insight into the market's forward-looking ability.

The Sharpe ratios will also be calculated for each quintile portfolio to allow for a risk-adjusted comparison across the portfolios.

5.4.3.4 *Risk considerations*

Following the division of the sample into their respective sub-portfolios, some basic descriptive statistics will be calculated for comparison purposes. The methodology here is a copy of the methodology employed in Sections 5.4.1.3 and 5.4.2.3.

Each sub-portfolio's average and median market capitalisation will be examined to determine whether a size effect does not play a role in the fundamental momentum of earnings strategy. In addition to the market capitalisation, each sub-portfolio's average and median PE ratio and PB ratio will be examined in order to determine whether a value factor may play a part in the results. While the PE ratio is a suitable value factor proxy given that the sample is industrial companies where the value of the companies is predominantly driven by the earnings generated as opposed to the value of assets in place, it is prudent to include another value factor as a sanity checker. For this reason, the PB ratio will also be examined.

To determine whether a size effect or value effect explains fundamental momentum of earnings, the average size and value factors will be calculated for each sub-portfolio at the beginning of every month. The average for each quintile will then be calculated to determine whether there is any pattern that may suggest whether either a size effect or value effect influences the results or not. The medians of the size and value factors will also be calculated and examined in the same fashion as the averages in order to ensure that a small number of outliers do not influence the results.

Although calculating the average and medians of the various factors of the portfolio gives insight into whether a size or value effect may possibly explain price momentum, regression analysis is required to determine whether the effects are statistically significant in explaining fundamental momentum of earnings. Following the Fama and French (1993:19) methodology, multi-variable regression analysis will be conducted to calculate the factor loadings of the three factors explained in Section 5.3.3.6. The factor loadings of each risk factor and their respective level of significance will be reported to determine whether any risk factor materially influences fundamental momentum of earnings.

Given the statement by Fama and French (1996:56), it is expected that value factors do not explain earnings momentum.

5.4.3.5 *Sustainability of fundamental momentum*

It is important to understand not just how quintile portfolios based on fundamental momentum perform relative to one another and the market, but also whether businesses can sustain fundamental momentum over a number of years, and if these businesses can also produce abnormal returns. To do this, the sample will be divided up based on whether the observations have positive fundamental momentum over one, two, three, four or five consecutive years.

Fundamental momentum will be calculated over a 12-month period. A business that has fundamental momentum over n consecutive years, would have positive fundamental momentum in year t, year t+i and year t+n, where i = 1 to n-1.

The percentage of observations that have positive fundamental momentum over consecutive years will also be calculated. This gives insight into the strike rate of businesses that can produce sustainable fundamental momentum of earnings against those that cannot.

The average abnormal returns will be calculated for shares representing businesses that produce sustainable fundamental momentum over a number of years. The returns will be calculated over a three-, six-, nine- and 12-month holding period. Returns will be annualised for comparative purposes. The abnormal returns will be calculated relative to the market return. The market return is calculated based on an equal-weighted market portfolio of all the tradeable shares at the point in time of the return calculation for the individual share.

To illustrate, if a business produced three years of historical consecutive positive fundamental momentum of earnings at time t, then the share returns for the business over the following three, six, nine and 12 months are calculated. These returns are compared with the market returns, forming abnormal returns. The abnormal returns for all such businesses in the sample are calculated, and the average is presented. Returns for each of the holding periods will be presented, as well as the annualised returns.

5.4.3.6 *Dummy variable regression models*

To gain further insight into the return profile of shares that produce consecutive years of positive fundamental momentum, single-factor regression analysis using dummy variables will be employed.

Dummy variable regression models are used in the case where the dependent variable may be influenced by a variable that is not quantitative in nature, but is rather either qualitative or nominal scale (Gujarati, 2003:297). Therefore, to quantify such variables, artificial variables are constructed, which are assigned a value of either one or zero. These variables are referred to as dummy variables. A dummy variable is thus a device to classify data into mutually exclusive categories (Gujarati, 2003:298).

Constructing dummy variable regressions requires one to be careful regarding perfect collinearity within the dummy variables. If the explanatory variable has m categories, m-1 dummy variables must be introduced into the regression model. The category for which no dummy variable is assigned is known as the control category. All comparisons are made in relation to the control category. The intercept will then represent the mean value of the control category. The dummy variable coefficients are known as the differential intercept coefficients because they represent how much the value of the intercept that receives the value of one differs from the intercept coefficient of the control category (Gujarati, 2003:298).

To interpret a dummy variable regression model, the intercept represents the mean value of the dependent variable when the dummy variable takes on a value of zero. The sum of the intercept and the differential intercept coefficients will represent the mean value of dependent when the dummy variable takes on a value of one.

In the case of consecutive fundamental momentum of earnings, there are only two explanatory categories. The explanatory variable either has fundamental momentum over n consecutive years, or it does not. Therefore, the regression will include a single dummy variable that takes the value of one if there was fundamental momentum over n consecutive years, otherwise, it takes the value of zero. The regression analysis will use abnormal returns over a three-, six-, nine- and 12-month period as the dependent variable. The explanatory variable will use fundamental momentum over one, two, three, four and five years. In total, there are 20 dummy variable regression models.

The regression model is as follows:

$$Abnormal\ Return_{t+i} = \beta_0 + \beta_1(Dummy\ Variable_n) + \varepsilon_{t+1} \qquad (5.6)$$

where $i = 3, 6, 9, 12$ *months*

$n = 1, 2, 3, 4, 5$ *years*

Dummy Variable = 1 if fundamental momentum is positive over n consecutive years

= 0 otherwise

5.4.4 Explaining fundamental momentum

Hypothesis 4: Fundamental momentum of forward earnings is not related to the fundamental momentum of the underlying components of current earnings.

The fourth hypothesis determines whether fundamental momentum of earnings is due to fundamental momentum of the underlying earnings components. The purpose of understanding the underlying driver of fundamental momentum of earnings is to be able to identify and anticipate beforehand whether a business is more likely to deliver positive or negative fundamental momentum of earnings.

In order to identify the underlying drivers of fundamental momentum of earnings, the historical earnings of a business need to be broken up into their respective components. Focusing on how the various components of earnings change over time, and the effects of these changes on future earnings, will help one understand what drives fundamental momentum of earnings.

5.4.4.1 *Decomposing earnings*

The foundation for the fundamental momentum model which will be used to test the relationship between the fundamental momentum of the underlying earnings components and the fundamental momentum of future earnings is found in prior research that investigated the persistence of future earnings based on the historical accrual and cash flow components of earnings. Such research includes the work of Sloan (1996:289-315), Chan *et al.* (2006:1041-1082), Dechow, Richardson and Sloan (2008:537-566) and Richardson *et al.* (2005:427-485).

Following from Sloan (1996:297), current earnings consist of two separate components; the accrual component and the cash flow component. Accruals measure the difference between a business's earnings and its underlying cash flow. It is computed using information from the balance sheet and income statement. Sloan's (1996:293) definition of accruals can be traced back to Healy (1985:86), who defines *accruals* as the change in non-cash working capital less depreciation expense. The definition of accruals is represented in Equation 5.7:

$$Accruals_t = \Delta CA_t - \Delta CL_t - DEP_t$$
$$= (\Delta AR_t + \Delta INV_t + \Delta OCA_t) - (\Delta AP_t + \Delta OCL_t) - DEP_t \qquad (5.7)$$

where $\Delta X_t = X_t - X_{t-1}$

ΔCA_t = change in current assets;

ΔCL_t = change in current liabilities;

DEP_t = depreciation;

ΔAR_t = change in accounts receivable;

ΔINV_t = change in inventories;

ΔOCA_t = change in other current assets;

ΔAP_t = change in accounts payable;

ΔOCL_t = change in other current liabilities.

Richardson *et al.* (2005:445) expand Sloan's (1996:293) original framework. They state that Sloan's definition of *accruals* omits accruals relating to non-current operating assets, non-current operating liabilities, non-cash financial assets and financial liabilities.

Using this expanded definition of *accruals* results in Equation 5.8:

$$Accruals_t = \Delta WC_t + \Delta NCO_t + \Delta FIN_t \qquad (5.8)$$

where ΔWC_t = change in non-cash working capital;

ΔNCO_t = change in non-current operating accruals;

ΔFIN_t = change in net non-cash financial assets.

Equations 5.8a-5.8c break down the sub-components of accruals in Equation 5.8 further:

$$\Delta WC_t = \Delta COA_t - \Delta COL_t \qquad (5.8a)$$

where ΔCOA_t = change in current operating assets;

ΔCOL_t = change in current operating liabilities.

$$\Delta NCO_t = \Delta NCOA_t - \Delta NCOL_t \qquad (5.8b)$$

where $\Delta NCOA_t$ = change in non-current operating assets;

$\Delta NCOL_t$ = change in non-current operating liabilities.

$$\Delta FIN_t = \Delta FINA_t - \Delta FINL_t \qquad (5.8c)$$

where $\Delta FINA_t$ = change in financial assets;

$\Delta FINL_t$ = change in financial liabilities.

Regarding the cash component of earnings, following from Dechow *et al.* (2008:538), the cash component of earnings in this study is *free cash flow*, defined as the excess cash generated from operations after taking into account cash required for investments.

A company generating positive free cash flow has three options for deciding what to do with the cash:

1. Distribute to shareholders through dividends or share buybacks.
2. Repay outstanding debt.
3. Retain the cash for future use.

Therefore, the cash component of earnings can be broken into its sub-components as illustrated in Equation 5.9:

$$Cash\ Flow_t = \Delta CASH_t + DEBT\_D_t + DEBT\_EQ_t \qquad (5.9)$$

where $\Delta CASH_t$ = change in cash and cash equivalents;

$DEBT\_D_t$ = net non-interest cash distributions to debt holders;

$DEBT\_EQ_t$ = net cash distributions to equity holders.

Separating earnings into its two underlying components, accruals and cash flow, results in Equation 5.10:

$$Earnings_t = Accruals_t + Cash\ Flow_t \qquad (5.10)$$

Expanding the definition of *accruals* in Equation 5.10, earnings can be specified by Equation 5.11:

$$Earnings_t = \Delta WC_t + \Delta NCO_t + \Delta FIN_t + Cash\ Flow_t \qquad (5.11)$$

Finally, combining Equation 5.11 with Equations 5.8a to 5.8c and 5.9, the decomposition of future earnings is arrived at. The decomposition is represented by Equation 5.12:

$$Earnings_t = \Delta COA_t - \Delta COL_t + \Delta NCOA_t - \Delta NCOL_t + \Delta FINA_t - \Delta FINL_t + \Delta CASH_t + DEBT\_D_t + DEBT\_EQ_t \qquad (5.12)$$

5.4.4.2 *Descriptive statistics*

The analysis begins by presenting univariate statistics and pair-wise correlations for the various components of earnings. Statistics for the initial decomposition of total accruals and cash flows, as well as the extended decomposition through to Equation 11 will be presented. The univariate statistics to be presented will include the mean, the median, the standard deviation and the distribution of the variables. These measures allow one to see the average percentage of each variable relative to total assets, as well as the variation of each of these variables.

The correlations show how two variables move in relation to one another. It is important to remember that correlation does not imply causation, but rather it indicates a predictive relationship, which one may be able to exploit. There are two distinct methods of calculating the correlation between two variables, namely the Pearson correlations and the Spearman correlations.

The most common form of correlation is the Pearson correlation, which measures the linear relationship, or statistical dependence, between two variables. The correlation varies between values of -1 and 1. A result of -1 means that there is a perfect negative correlation between the two variables, while a result of 1 means that there is a perfect positive relationship between the two variables. A result of 0 indicates that there is no relationship between the two variables.

The Spearman correlation, or the rank correlation as it is often referred to, is the non-parametric measure of statistical dependence between two variables. It is non-parametric because there is no requirement of normality. Spearman correlations are used to test the strength of a monotonic relationship between paired data. The Spearman correlation is calculated by first ranking the variables, and then testing the correlation between the ranked variables, as opposed to their nominal values.

Correlation coefficients are useful in helping to understand how the different sub-components of earnings relate to one another. For the purpose of the study, it is only necessary to calculate the Pearson correlation due to the fact that only the linear relationship between the earnings components is required.

5.4.4.3 *Fundamental momentum model*

A regression model is developed to test the relationship between the fundamental momentum of the components of earnings, as illustrated in Equation 5.12, and the fundamental momentum of earnings.

Due to the fact that the magnitude of all the sub-components of earnings, as described in Equation 5.12, depends on the size of the company's balance sheet, each item is deflated by average total assets, as is the standard approach in the accounting literature. Barth and Kallapur (1996:530) show that by deflating regression coefficients, biases may be introduced into the regression equation if the deflator measures the true underlying scale variable with error. While such biases may be present in these results, there is no reason to believe that such biases would materially alter the final results.

5.4.4.3.1 Fundamental Momentum Model 1

Sloan (1996:298) confirms prior research that earnings are mean reverting over time, suggesting that future earnings are a function of past earnings, and thus conform to Equation 5.13.

$$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + \varepsilon_{t+1} \qquad (5.13)$$

where $0 < \alpha_1 < 1$

Equation 5.13 is known as an autoregressive model. An autoregressive model is a model of which the explanatory variable or variables are lags of the dependent variable. Thus, the dependent variable is a function of its previous values and a disturbance term.

Combining Equation 5.10 and 5.13 produces Equation 5.14:

$$Earnings_{t+1} = \beta_0 + \beta_1 Accruals_t + \beta_2 Cash\ Flow_t + \varepsilon_{t+1} \tag{5.14}$$

In order to test the fundamental momentum relationship between the explanatory variables and future returns, as measured by *Earnings*$_{t+1}$, the fundamental momentum methodology is applied to Equation 5.14. This results in Equation 5.15:

$$FM(Earnings_{t+1}) = \beta_0 + \beta_1 FM(Accruals_t) + \beta_2 FM(Cash\ Flow_t) + \varepsilon_{t+1} \tag{5.15}$$

β_1 measures the persistence of the fundamental momentum of accruals on the fundamental momentum of future earnings, while β_2 measures the persistence of the fundamental momentum of cash flow on the fundamental momentum of future earnings. A positive β_1 illustrates that positive fundamental momentum of accruals results in positive future fundamental momentum of earnings. Therefore, if the rate of relative growth in accruals increases, the rate of relative growth of future earnings will increase. The same reasoning applies to cash flow in this case.

5.4.4.3.2 Fundamental Momentum Model 2

The natural expansion of the regression Equation 5.15 is to decompose the accrual components into their underlying components. This decomposition will allow one to test the fundamental momentum of the various underlying components of accruals and cash flow, and to what extent they influence the fundamental momentum of future earnings.

The first step is to decompose the accrual component into its underlying components, as was done in Equation 5.11. This will result in the following regression equation:

$$\begin{aligned} FM(Earnings_{t+1}) = {} & \beta_0 + \beta_1 FM(\Delta WC_t) + \beta_2 FM(\Delta NCO_t) + \beta_3 FM(\Delta FIN_t) \\ & + \beta_4 FM(Cash\ Flow_t) + \varepsilon_{t+1} \end{aligned} \tag{5.16}$$

Interpreting the results of Equation 5.16 will result in determining whether there are individual underlying components whose fundamental momentum has a higher level of persistence on the fundamental momentum of future earnings than others. If β_1, for instance, is positive, it implies that the fundamental momentum of the working capital component of earnings results in the relative rate of growth of future earnings increasing. Similar inferences can be drawn regarding the other underlying components.

By comparing the magnitude and significance of β_1, β_2, *and* β_3, one will be able to determine which components of fundamental momentum of accruals have a stronger relationship with the fundamental of future earnings.

5.4.4.3.3 Fundamental Momentum Model 3

The final iteration of estimating the fundamental momentum model will be to decompose the accrual and cash flow components in terms of Equation 5.12, resulting in Equation 5.17:

$$\begin{aligned} FM(Earnings_{t+1}) = {} & \beta_0 + \beta_1 FM(\Delta COA_t) - \beta_2 FM(\Delta COL_t) + \beta_3 FM(\Delta NCOA_t) \\ & - \beta_4 FM(\Delta NCOL_t) + \beta_5 FM(\Delta FINA_t) - \beta_6 FM(\Delta FINL_t) \\ & + \beta_7 FM(\Delta CASH_t) + \beta_8 FM(DEBT\_D_t) + \beta_9 FM(DEBT\_EQ_t) + \varepsilon_{t+1} \end{aligned} \tag{5.17}$$

The results of Equation 5.17 will be interpreted in the same fashion as those of Equations 5.15 and 5.16.

5.4.4.4 *Variables*

This section defines the accounting variables that were used in calculating the underlying components of earnings. The statement of financial position provides a systematic categorisation of accounting accruals, and likewise does the statement of cash flow categorise cash for financing obligations, distributions to shareholders and retained cash. The definitions of the accounting line items used come from the Oxford Dictionary of Accounting **(**OxfordDictionaries.com**).**

Total assets: Sum of all current and non-current assets that a company owns.

Current assets: Cash and other assets that are expected to be converted into cash within a year.

Total liabilities: The aggregate debt and financial obligations owed by a business at any specific point in time.

Current liabilities: The aggregate debt and financial obligations owed by a business within the next year.

Cash and near cash: Available cash in the bank and liquid assets that are convertible into cash upon request.

Short- and long-term loans: The act of giving money, property or other material goods to another party in exchange for future repayment. The short term is typically one year or less, while the long term is longer than one year.

Long-term non-interest-bearing debt: Long-term debt for which there is no documented requirement for the borrower to pay the lender any rate of interest.

Long-term interest-bearing debt: Long-term debt for which there is a documented requirement for the borrower to pay the lender any rate of interest.

Convertible debentures: A type of loan issued by a company that can be converted into stock by the holder.

Preference shares: A share which entitles the holder to a fixed dividend, of which the payment takes priority over that of ordinary share dividends.

Short-term interest-bearing debt: Short-term debt for which there is a documented requirement for the borrower to pay the lender any rate of interest.

Ordinary dividends paid: The amount paid to shareholders on a periodic basis that typically is generated through profits.

Change in share capital: The amount if share capital can change through either issuing new shares or buying back shares from the market. Share capital refers to funds raised by issuing shares.

Net interest paid: The difference between the interest generated on loans owing to the company and the interest generated on the debt owed by the company.

Preference dividend paid: The amount accrued and paid on a company's preferred shares. Claims to preference dividends take precedence over claims to ordinary dividends.

Change in cash: The increase or decrease in cash and cash equivalents from the beginning of the year to the end of the year.

Earnings: An indicator of a company's profitability.

5.4.4.5 *Definition of earnings components*

The underlying earnings components are decomposed into their simplest form as expressed by Equation 5.12. The equations below show the variables used in the calculation of each of the components. All earnings components are scaled by average total assets when incorporated into the fundamental momentum models.

COA = current assets – cash and near cash

COL = current liabilities – short-term debt

NCOA = total assets – current assets – investments at cost/market value – long-term loans

NCOL = total liabilities – current liabilities- long-term non-interest-bearing debt – long-term interest-bearing debt.

FINA = cash and near cash + investments at cost/market value

FINL = long-term non-interest-bearing debt + Long-term interest-bearing debt + debentures + preference shares + short-term debt

ΔCash = change in cash

DEBT_D = net interest paid + preference share dividend paid

DEBT_EQ = dividends paid – change in share capital

Earnings = profit attributable to shareholders

5.4.5 Fundamental momentum, price momentum and earnings momentum

Hypothesis 5a: In the event that fundamental momentum of earnings is found to be mispriced on the JSE and price momentum is found to be present on the JSE, then price momentum is not a manifestation of fundamental momentum.

Hypothesis 5b: In the event that fundamental momentum of earnings is found to be mispriced on the JSE, and earnings momentum is found to be present on the JSE, then earnings momentum is not a manifestation of fundamental momentum.

The final research hypothesis involves investigating whether the earnings momentum and/or price momentum anomalies are distinct from fundamental momentum. If the market misprices the information content of fundamental momentum, and this mispricing is distinct from earnings momentum and/or price momentum, it should be possible to form a trading strategy that capitalises on both fundamental momentum and either earnings momentum or price momentum.

Chan *et al.* (1996:1695) and Collins and Hribar (2000:114) conducted a two-way analysis where the earnings momentum and price momentum strategies, and the earnings momentum and accrual anomaly were compared respectively.

5.4.5.1 ***Method***

To test whether fundamental momentum subsumes either the price momentum or earnings momentum anomaly, a two-way analysis similar to that of Chan *et al.* (1996:1695) and Collins and Hribar (2000:114) will be conducted. The methodology requires that the price momentum strategy and the earnings momentum strategy be tested separately. As was done in Sections 5.4.1 and 5.4.2, price momentum and earnings momentum quintile portfolios are constructed using a 12-month formation period and the SUE respectively. Each quintile is then further subdivided based on the level of fundamental momentum of earnings. As was done in Section 5.4.3, fundamental momentum is calculated as the rate of change of earnings over the past 12 months. The sub-division based on the fundamental momentum will be done based on whether the business in question has a fundamental momentum of earnings that is either higher or lower than the median value of fundamental momentum of earnings at that point in time.

The sub-division based on the fundamental momentum of earnings will not be done by quintiles, given that the resultant portfolios would have too few shares/observations in them. This is of particular importance for the case of earnings momentum, where businesses only report twice a month, and therefore, the earnings momentum portfolios have much fewer shares in them in comparison with the price momentum portfolios.

Equal-weighted portfolios will then be constructed, and each share is going to be held in the portfolio for a 12-month holding period. The result is 10 equally weighted portfolios, five portfolios based on price or earnings momentum, and then two sub-portfolios in each of the five portfolios.

The difference between the returns of the portfolios that will be subdivided based on fundamental momentum of earnings and the portfolio that is purely constructed on either price momentum or earnings momentum will be calculated. The significance of this difference indicates whether fundamental momentum subsumes either price momentum or earnings momentum.

If performance in the quintile portfolios is not enhanced by further dividing the portfolios based on fundamental momentum, the suggestion is that price momentum and/or earnings momentum may not be a distinct anomaly from fundamental momentum, and by employing either of those strategies fundamental momentum is also captured.

As a sanity checker, and to give further confirmation to the results, a simple regression model has been developed in order to regress the price momentum quintile or the earnings momentum quintile for each share on its respective fundamental momentum quintile. The sample regression equations are shown in Equations 5.18 and 5.19:

$$PM\ Quintile_t = \alpha_0 + \alpha_1(FM\ Quintile_t) + \varepsilon_{t+1} \tag{5.18}$$

$$EM\ Quintile_t = \alpha_0 + \alpha_1(FM\ Quintile_t) + \varepsilon_{t+1} \tag{5.19}$$

where $PM\ Quintile_t$ = price momentum quintile;

$FM\ Quintile_t$ = fundamental momentum quintile;

$EM\ Quintile_t$ = earnings momentum quintile.

5.4.5.2 *Risk considerations and comparisons*

Given that risks in the form of the size and value effect were taken into account when testing the profitability of the price and earnings momentum strategies, as well as when testing whether the market rationally prices fundamental momentum, there is no need to test for such risks in this two-way analysis.

5.5 SUMMARY

This chapter outlined the methodology employed across the five research questions. The first two questions have been vastly researched across stock markets around the world. As a result, the methodologies employed were borrowed from previous research. The third and fourth questions, which involved the fundamental momentum trading strategy, and understanding whether fundamental momentum of the sub-components of earnings help explain the fundamental momentum of forward earnings, have not been researched before. Hence, the methodologies employed were developed in this chapter. The final research question's methodology was again borrowed from previous research, given that two-way analysis has been widely tested when trying to determine whether one trading strategy subsumes another.

The next chapter forms theoretical expectations for the results of the five questions. In particular, literature and theory are required to try and understand the outcome of the fourth question.

CHAPTER 6

THEORETICAL EXPECTATIONS

6.1 INTRODUCTION

This chapter focuses on the theoretical expectations of the empirical results of fundamental momentum. While there is no direct literature from which to draw, there is related literature which gives insights and helps in understanding the results.

The chapter begins with a brief overview of the size and value effects, and the factor-loading expectations, should they prove to be statistically significant. The next section develops the theoretical expectations of whether the fundamental momentum of earnings is accurately and timeously priced by the market. One particular area of interest is the mean reversion of earnings. Given that the mean reversion of earnings is well understood and commonly accepted, this literature gives insight into the pricing of fundamental momentum of earnings.

Turning attention to the explanation of fundamental momentum of earnings, both the reliability and the value relevance of accounting information are reviewed in order to gain insight and to develop theoretical expectations. Most of the prior research focusing on financial statement analysis pays specific attention to the value relevance of accounting numbers with little emphasis on the reliability of the accounting numbers (Richardson *et al.*, 2005). The less reliable the accounting numbers, the more their usefulness in determining future profitability will be compromised. Thus, while the value relevance of accounting numbers are critical in grounding the research in a theoretical background, it is equally important to have a solid understanding of which accounting line items may be susceptible to management or auditing biases.

The chapter concludes with the summary.

6.2 SIZE AND VALUE FACTORS

Historically, the CAPM, developed in the 1960s, was the pre-eminent model that described the risk-return relationship in financial markets. The risk an investor took on was captured by the correlation between returns of the share and the market. A violation of this model was considered an anomaly. Two of the longest-standing anomalies violating the CAPM are the size and value effect.

The evidence regarding the role that size and value factors play in explaining the variation in cross-section returns of shares has been well documented over many years. Banz (1981:11) was among the first to document empirical contradictions of the CAPM. Small capitalisation shares were shown to have average returns that were too high to be explained by their beta estimates. In an earlier study, Basu (1977:667) documented a similar finding with regard to shares with low PE ratios. Low PE portfolios have returns that are superior to those of their high ratio counterparts (Basu, 1977:668).

A full literature review is beyond the scope of this study; nevertheless, it is important to understand the scope of the size and value effects on the JSE in order to understand the possible risk factors that could potentially explain the results.

Early evidence on the JSE indicated that firm size played no role in explaining share price returns. De Villiers, Lowlings, Pettit and Affleck-Graves (1986:191-195) and Page and Palmer (1991:63-73) found no evidence of a small-cap effect. Van Rensburg and Robertson (2003:8) state that these findings could be the result of smaller capitalised shares having been excluded from studies due to their illiquid nature.

Through the use of a sort methodology, Van Rensburg and Robertson (2003:10) showed that both a size effect and a value effect were present on the JSE. The proxy for the value effect was the PB ratio. Their findings showed that these two effects operated independently of one another.

Focusing specifically on the PB ratio, Auret and Sinclaire (2006:34) conclude that the PB ratio can be used as a proxy for the size and PE ratio model developed by Van Rensburg and Robertson (2003:7-16). Thus, the PB ratio plays a strong role in explaining share price returns, and the smaller the PB ratio, the higher the returns are expected to be (Auret & Sinclaire, 2006:34).

The results of Van Rensburg and Robertson (2003:7-16) were further scrutinised by Strugnell, Gilbert and Kruger (2011:1-17) to establish whether they were robust and generally valid. Clear evidence was found supporting the persistence of the size effect proving that it was not just an artefact of the sample previously used (Strugnell *et al.,* 2011:7). Therefore, all indications are that the size and value effects are as prevalent on the JSE as they are on other markets around the world.

The Fama and French three-factor model, which was developed to explain the size and value effects, however, does not explain the price momentum and earnings momentum anomalies, as mentioned in Chapter 2. Therefore, the expectations are that a similar finding will be shown in the case of the JSE. If the size and/or value effects are found to play a role in explaining price or earnings momentum, the expectation would be that the coefficients of the risk factors in the Fama and French three-factor model should be negative, and they should be more negative for the quintile portfolios with higher price and earnings momentum, as explained in Section 5.3.3.6.

6.3 PRICING FUNDAMENTAL MOMENTUM OF EARNINGS

A number of academic studies report that earnings are mean reverting. Earlier studies indicating mean reversion of earnings include Penman (1991:237-238), Lipe and Kormendi (1994:37) and Fama and French (1995:136). Mean reverting earnings suggest that unusually high positive changes in earnings tend to be followed by negative changes, while unusually high negative changes in earnings tend to be followed by positive changes in earnings. Therefore, the expectation is that there is a mean earnings growth rate across businesses and industries that a single business's earnings growth rate should revert to.

Fama and French (2000:161) point out that standard economic principles justify the mean reversion of earnings. In competitive markets, businesses with extraordinarily high levels of earnings will attract competitors, which, in turn, will erode the competitive advantage which allowed such high earnings. Similarly, businesses with low levels of earnings will attempt to improve in order to avoid failure.

With regard to the timing of the mean reversion of earnings, Sloan (1996:301) shows that mean reversion takes place over a prolonged period of time. Following a similar methodology to that employed by Sloan, this study deflates the earnings of a business by average total assets. Therefore, earnings are represented by return on assets (ROA). Using return on assets, Sloan (1996:301) shows that mean reversion of earnings results in ROAs reverting to the long-term mean. His conclusion is that the speed of reversion is dependent on whether earnings consist of cash flow earnings or accrual earnings.

The implication of mean reversion of earnings for fundamental momentum of earnings is two-fold: first, mean reversion of earnings gives insight into market expectations following an unusually high or low change in earnings; second, the initial expectation is that mean reversion of earnings suggests that fundamental momentum of earnings is not sustainable. However, on closer inspection this is not necessarily the case.

The underlying driver of the market value of a business, and, in turn, the share price, is the ability of a business to generate earnings which, in turn, produces cash flows. The market expectations for a business that produces unusually high or low earnings would be for the earnings of that business to revert to the mean growth rate over time. In the case of market efficiency, as described by the EMH, share prices should reflect all available information, and thus there should be no opportunity to earn abnormal returns by investing in shares that are backed by businesses that earned historically high or low earnings.

The second implication of mean reversion of earnings for fundamental momentum of earnings is that it should not be possible for a business to produce positive fundamental momentum of earnings over a sustained period of time. Sloan (1996:301) shows that while the mean reversion takes place over a number of years, the process of mean reversion begins immediately following sorting businesses based on their level of earnings.

Sloan (1996:301) ranked and assigned businesses in equal numbers to decile portfolios based on the level of earnings in year t. The mean earnings of the high and low earnings portfolio were graphed over a period of 10 years, showing the level of earnings in the five years prior to year t and the five years following year t. In the years leading up to year t, businesses in the high earnings portfolio, on average, generated earnings that increased year on year, while businesses in the low earnings portfolio, on average, generated earnings that decreased year on year. In the years following year t, businesses in the high earnings portfolio generated earnings that decreased year on year, and businesses in the low earnings portfolio generated earnings that increased year on year.

Sloan (1996:299) points out that the speed of reversion depends on whether earnings are made up of cash flows or accruals. Earnings backed by cash flows revert over a much longer period than earnings that largely consist of accruals. However, one cannot rule out that fundamental momentum of earnings may be sustainable for certain businesses as indicated by earnings either increasing at an increasing rate, or decreasing at a decreasing rate, over a number of consecutive years.

Provided a business is not at the peak of its earnings cycle, positive or negative fundamental momentum of earnings may continue for a number of years. Positive (negative) fundamental momentum of earnings may also potentially continue for businesses coming off a low (high) earnings base.

Given that the mean reversion of earnings is widely accepted, if markets follow the EMH and all earnings mean revert, there should be no opportunity to earn abnormal returns by sorting and constructing portfolios based on historical fundamental momentum of earnings. The reason for this is that fundamental momentum of earnings, theoretically, should not be sustainable. Thus, businesses with positive (negative) fundamental momentum of earnings in one period would be expected to have negative (positive) fundamental momentum of earnings at some point in the near future.

If a trading strategy based on fundamental momentum of earnings is shown to be profitable, and fundamental momentum of earnings is found to be sustainable, these findings would be a direct contradiction of the theory of mean reversion of earnings.

6.4 EXPLAINING FUNDAMENTAL MOMENTUM OF EARNINGS

Predicting accounting earnings rather than share returns is the central task of fundamental analysis. Therefore, while it is important to test whether fundamental momentum of earnings is a profitable investment strategy, it is of equal importance to understand and theorise why a business has positive or negative fundamental momentum of earnings. This section aims to build theoretical expectations of why fundamental momentum of earnings exists based on the reliability and value relevance of the underlying components of earnings.

6.4.1 Reliability

Reliability is an essential characteristic for accounting information in order for accounting information to be useful for decision-making. In his decomposition of earnings into the accrual component and cash component, Sloan (1996:291) points out that the key differentiator between accruals and cash flows is their degree of subjectivity. The accrual component of earnings incorporates future cash flows based on current estimates, which will always be subjective. Therefore, it was unsurprising to see Sloan (1996:311) reach the conclusion that the accrual component of earnings is negatively correlated with future earnings persistence.

Richardson *et al.* (2005:437-485) tested the theory that less reliable accruals resulted in lower earnings persistence and they found that empirical tests generally confirmed this. Based on their findings, this study builds its expectations of whether the factors of Equation 5.11 in Section 5.4.4.1 will positively or negatively influence the persistence of future profitability based on the reliability of the underlying accounting numbers. Richardson *et al.* (2005:448) provide the explanations to their findings of which components of Equation 5.11 are subject to reliability issues. These are discussed below.

Decomposing Equation 5.11 of Section 5.4.4.1 into its underlying components, Equation 5.8a illustrates that the change in non-cash working capital constitutes the difference between the change in current operating assets (ΔCOA) and the change in current operating liabilities (ΔCOL). The two main underlying assets driving ΔCOA are trade receivables and inventory. Both of these line items are measured with low reliability. Trade receivables are susceptible to manipulation from management in an effort to smooth earnings (Dechow *et al.*, 2008:541). This can be achieved, for example, through the premature recognition of revenue. Inventory is equally susceptible to manipulation from management as there are numerous ways to subjectively allocate costs to inventory. Additionally, it is at management's discretion when old inventory gets impaired, thus affecting earnings.

The two major underlying liabilities driving ΔCOL are trade payables and tax payables. Payables tend to be measured with a high degree of reliability. Trade payables and tax payables are financial obligations that a company has to pay its creditors in order to continue as a going concern. There is no estimation of the amount that is due to be paid as it is recorded at face value.

The second category of accruals in Equation 5.11 is non-current operating accruals, which are measured as the difference between the change in non-current operating assets, net of equity investments and advances (ΔNCOA), and the change in non-current operating liabilities, net of long-term debt (ΔNCOL). The major underlying assets of ΔNCOA are property, plant and equipment and intangibles and goodwill. There is a high degree of subjectivity in the estimation of these accruals given that management need to initially decide whether to expense them through the income statement or to alternatively capitalise the cost. The following decision on how to depreciate and amortise the assets is also subjective. Intangibles and goodwill are subject to similar estimation biases to the underlying assets of ΔCOA, given that it is at management's discretion which value they place on such assets.

The components of ΔNCOL in this study are deferred taxes and other non-current operating liabilities. Long-term payables, such as deferred taxes, are reliably measured as again they are financial obligations of the company which need to be paid to the company's debtors. However, there is a high degree of uncertainty in estimating certain other non-current operating liabilities, such as pension liabilities.

The final component of accruals in Equation 5.11 is net non-cash financial assets. This component is measured as the difference between the sum of the change in long-term investments and change in short-term investments, and the change in financial liabilities

(ΔFINL). Short-term investments and ΔFINL are expected to be measured with a high degree of certainty. Short-term investments are investments which consist of securities that have observable market values and can be converted into cash quickly. ΔFINL consists of both short-term and long-term debt, as well as debentures, preference shares and the like. Similar to ΔNCOL and ΔCOL, ΔFINL are obligations that a company has to pay in order to continue as a going concern. Companies are not allowed to book a provision for its own non-payment of debt, thus there is little subjectivity in measuring ΔFINL.

Similar to ΔCOA and ΔNCOA, there is a high degree of uncertainty in measuring long-term investments. The major underlying assets include long-term investment and long-term loans, which are susceptible to the same measurement errors that ΔCOA and ΔNCOA are susceptible to. However, if a long-term investment is invested in a marketable security with a readily available price, it can be measured with a high degree of reliability.

The final component of Equation 5.11 deals with the uses of cash after having taken into account the cash used for working capital, capital expenditure and investments. This cash can be used in three ways. Either it is paid out to shareholders; paid out to debt holders to reduce debt; or alternatively, it is retained by the company as cash (Dechow *et al.*, 2008:539). Cash paid out to shareholders and debt holders can be reliably measured due to the fact that it has to be physically transferred cash. As a famous investor once pointed out, there are only two numbers you can believe in a company's financial statements, the one is dividends and the other is the page number. The cash balance on the balance sheet, however, is a bit more subjective in its measurement. The cash balance at the time of releasing financial results is a picture of the balance sheet at a point in time, and is not a period review as in the instance of an income statement or cash flow statement. Thus, it is open to manipulation by management to prop up the cash balance, for example, by delaying payments for a few days.

In summary, assets excluding short-term investments are expected to be of low reliability, and hence the use of ΔCOA, ΔNCOA and long-term investments in the calculation of ΔFINA in trying to determine the persistence of current earnings into the future will be diminished. On the other hand, the liability components of accruals are generally measured with a high degree of reliability, along with short-term investments, and thus one can expect a high degree of persistence in future earnings based on current changes in these components of accruals. Similarly, one can expect a high degree of persistence of future earnings based on the reliable information contained in cash flows to shareholders and debt holders, while cash retained on the balance sheet is not expected to be a reliable indicator of earnings persistence given its measurement subjectivity.

While the degree of reliability with which an accounting variable can be measured gives insight into the effect on the persistence of future earnings and thus the quality of the earnings, it does not give insight into whether the accounting variable has a positive or negative impact on earnings. To see the directional impact of the accounting variables, the value relevance of the variables needs to be reviewed. This is done in the next section.

6.4.2 Value relevance

It is important to note that while the reliability of measuring financial statement items is important in assessing the usefulness in understanding the persistence of current information into the future based on current and historical financial statement items, it is the value relevance of financial statement information that explains the relationship and correlations between the fundamental momentum factors and future profitability.

Sloan (1996:300) shows that the accrual component of earnings is less persistent than the cash flow component of earnings. This finding has been confirmed in a number of studies since, most recently in the study of Allen, Larson and Sloan (2013:124). Due to this level of persistence and the fact that earnings are expected to mean revert, the expectation is that the fundamental momentum of the accrual components of earnings is more negatively related to the fundamental momentum of future earnings than the fundamental momentum of the cash flow component of earnings is. However, while the relationship of the fundamental momentum of accruals and cash flow to that of the fundamental momentum of earnings follows from Sloan’s earlier findings, it is the underlying components of accruals and cash flow that are of interest in this section.

As a reminder, the relationship between the fundamental momentum of the components of earnings and the fundamental momentum of earnings is of importance. Such an approach allows one to build a theoretical framework, upon which the results will rest. If there is no theoretical intuition behind the relationships identified, the results may be regarded as spurious and coincidental.

6.4.2.1 *Non-cash current operating accruals*

Thomas and Zhang (2002:163-187) studied the components of non-cash current operating accruals in order to identify and understand the accrual measure that was primarily responsible for the accrual anomaly discovered by Sloan (1996:289-315). Their study found that changes in current assets were more important relative to changes in current liabilities and depreciation, in terms of their impact on future earnings and share returns. And while this is an important finding, it is shown that inventory is the major driver of current assets, and their effect on future earnings. The market is shown to assume that the earnings impact of inventory changes is substantially more permanent than it actually is.

Companies that increase their inventory in a specific year have generally been profitable companies with growing earnings over the previous five years (Thomas & Zhang, 2002:164). Managers tend to extrapolate past demand and earnings to the future. As a result of the demand increase in the prior year, inventory at year-end decreases. In the following year, management increase inventory due to the anticipation that the demand will continue. However, Thomas and Zhang (2002:181) show that due to demand shifts, businesses that increase their inventory following years of high demand and profitability tend to have profitability reversals, as a result of anticipated demand not meeting expectations.

A second explanation of why current inventory is deemed to be a major driver of future earnings is the management of earnings (Thomas & Zhang, 2002:181). The cost of goods sold is equal to the opening inventory balance plus inventory inflows minus the closing balance of inventory. Therefore, overstating the closing inventory balance understates the cost of goods sold, which, in turn, overstates profitability. The overstatement of inventory would need to be reversed in subsequent periods, resulting in profitability declining (Thomas & Zhang, 2002:181).

Further theoretical work that helps understand the relationship between the current operating components of accruals and future earnings was undertaken by Ohlson (1995:661-687), Feltham and Ohlson (1995:689-731) and Fairfield, Whisenant and Yohn (2003a:353-371). A business's future profitability and hence book value have been shown to depend on growth in net operating assets (NOA) as well as current profitability (Feltham & Ohlson, 1995:717; Ohlson, 1995:664). Up to this point, the persistence of future earnings depended on whether current earnings were backed more by accruals or by cash flows. However, future earnings do not only depend on current earnings, they also depend on operating assets currently in place. And given that accruals form part of both current earnings and net operating assets (Fairfield *et al.,* 2003a:354), it is debatable whether the lower persistence of earnings due to accruals, as documented by Sloan (1996:289:315), is due to its role as a component of earnings, or alternatively, as a component of growth in NOA.

Fairfield *et al.* (2003a:364) argue that the lower persistence of earnings is due to the negative relationship between future profitability and growth in NOA. Their study confirms the negative relationship and the two explanations put forward are diminishing marginal returns on investment and conservative accounting.

Diminishing marginal returns on investment, which was originally documented by Stigler (1963:72-91), arise when companies exploit their most profitable investment opportunities before undertaking less profitable investments. On the other hand, when divesting, companies tend to divest from their least profitable investments first. Thus, for each additional rand invested, the additional incremental benefit received in terms of profitability, as measured by earnings divided by total assets declines.

Conservative accounting is when managers employ accounting methods and estimates that keep the book values of net assets relatively low. This has the effect of not only compromising the quality of the numbers on the balance sheet, but also the quality of the earnings on the income statement (Penman & Zhang, 2002:238). *High quality earnings* are defined by Penman and Zhang (2002:237) as earnings that are good indicators of future earnings. In other words, sustainable earnings are considered to be high quality earnings.

Conservative accounting can be practised in many forms, and ultimately, they result in poor quality earnings. Examples of conservative accounting include, but are not limited to, increasing provisions for bad debt, impairing assets too quickly and expensing assets to the income statement rather than capitalising and depreciating them over time. All such methods result in lower current earnings; however, an unrecorded reserve is created which provides managers with the flexibility to report more income in the future, and hence increasing future profitability (Penman & Zhang, 2002:241).

One can therefore expect that increasing NOA in either the accrual component or the long-term net operating assets component will result in lower incremental increases in future profitability. NOA can be increased in one of two ways: either operating assets are increased, or operating liabilities are reduced. Translating this expectation into the fundamental momentum framework, an increase in the fundamental momentum of ΔCOA or a decrease in the fundamental momentum of ΔCOL should result in future earnings mean reverting more quickly. As a result, the fundamental momentum of forward earnings should be negatively correlated with the fundamental momentum of ΔCOA and positively correlated with the fundamental momentum of ΔCOL.

Raising leverage in the form of external capital is often seen as a signal that a company has the inability to generate sufficient internal funds. Furthermore, increased debt places additional constraints on a company's financial flexibility (Piotroski, 2000:8), thus one may expect that additional leverage would be detrimental to future earnings, and therefore, total liabilities would be negatively correlated with future profitability. Nissim and Penman (2003:544) confirm this theory; however, they conduct further research into operating liabilities and financial liabilities, and produce slightly different findings.

Leverage is typically thought of as arising from financing activities in the form of a company borrowing cash. However, an additional form of leverage arises, for example, from operating activities in the form of suppliers offering credit. Financial liabilities (FINL) are traditionally traded in well-functioning capital markets where issuers tend to be price takers, whereas operating liabilities (COL & NCOL), such as trade payables and deferred tax involve trading in less efficient markets, and thus companies are able to add value in operations. Nissim and Penman (2003:545) found that leverage from operating liabilities typically levered profitability more than financing leverage.

Biais and Gollier (1997:904) and Petersen and Rajan (1997:688) see suppliers as having more inside information about their client's companies as opposed to banks or the bond market, and thus their willingness to provide favourable operating liabilities, in the form of trade payables, may be a positive signal for future profitability. However, rising operating liabilities may be indicative of a company that is having difficulties paying its creditors.

The evidence in Nissim and Penman (2003:531-560) indicates that companies with profitable operating assets have more operating liability leverage and less financial leverage, confirming the theory that creditors are more willing to provide favourable terms given their inside information than an investor in the form of a bank or bond market would otherwise offer. In addition, they suggest that profitable companies generate positive free cash flow, and use it to pay back debt, reducing financial leverage.

The evidence in Nissim and Penman (2003:545) confirms the fact that total leverage is negatively correlated with future profitability, and this correlation is solely due to financial leverage. Operating leverage is found to be positively correlated with future profitability. This confirms the above explanations. Thus, similar to the NOA expectation above, the fundamental momentum of future earnings is expected to be positively correlated with the fundamental momentum of ΔCOL.

6.4.2.2 *Non-current operating accruals*

The non-current operating accruals component of earnings consists of non-current operating assets, excluding financial assets, and non-current operating liabilities, excluding financial liabilities. Therefore, the asset component predominantly consists of two items, namely property plant and equipment, and intangible assets. The intangible line item includes goodwill and intellectual capital. Goodwill is a measure of expected future benefits that flow to earnings. Generally, goodwill increases upon an acquisition.

The liability component predominantly consists of deferred taxes and pension liabilities. From a fundamental momentum point of view, deferred taxes and pension liabilities are not expected to play a material role in influencing future fundamental momentum of earnings, given that, from a nominal point of view, these line items should not vary widely, but instead are expected to be fairly stable. Therefore, the focus of the influence of net non-current operating assets on fundamental momentum of earnings will be on the asset components.

Trying to disentangle the accrual anomaly, Fairfield, Whisenant and Yohn (2003b:240) hypothesise that businesses with low or negative cash flows might dispose of non-current operating assets in order to provide further liquidity. Understanding this hypothesis indicates that businesses that are unable to generate sufficient cash flow try and compensate for the lack of liquidity by selling off non-current operating assets. Thus, such companies replace a lack of good quality earnings by selling down non-current operational assets.

Writing down the value of an asset is not dissimilar to increasing liquidity through the sale of non-current operating assets. While no cash flows into the business through a write-down, the implication is that the non-current operating asset component of accruals is reduced. Dechow, Ge and Schrand (2010:355) allude to prior research that tested the implications of write-downs on future share price returns and earnings. The literature appears to be mixed with regard to how the market reacts to write-downs. The contrasting results potentially stem from the impact that write-downs have on future earnings (Dechow *et al.,* 2010:356). Their conclusion is that if businesses make large once-off write-downs, they set themselves up for healthy earnings rebounds. However, if they make small incremental write-downs, future returns and earnings could continue to decline. Thus, reducing non-current operating assets in large, once-off write-downs should be positive for future earnings.

Intangible assets make up the large majority of the balance of non-current operating assets. Intangible assets primarily consist of two items: goodwill and intellectual capital. Both assets are complex to correctly value on the statement of financial position. Over-valuing them will reduce the persistence of future earnings, while undervaluing them will result in improved future earnings, as their true value exceeds their carrying value. Valuation aside, Chen, Cheng and Hwang (2005:164) undertook a study that tested whether companies with greater intellectual capital generated superior earnings. Their findings indicated that greater intellectual capital was related to higher profitability, revenue growth and employee productivity (Chen *et al.,* 2005:170).

With regard to goodwill, provided it is valued correctly, it should naturally result in improved future earnings. However, overvalued goodwill will ultimately result in impairments and write-downs, not dissimilar to those mentioned above. The net result is a negative impact on earnings in the period of the impairment. However, it is important to understand the effect on future earnings. Li, Shroff, Venkataraman and Zhang (2011:745-778) undertook a study to determine whether impairment of goodwill was negatively correlated with future growth in sales and operating profits. Li *et al.* (2011:773) point to prior research when suggesting that businesses often overpay for a target. This is the reason why goodwill is overstated on the statement of financial position, and hence why goodwill has to be impaired from time to time. Their conclusion is that the impairment of goodwill has a negative correlation with sales growth and operating income over the subsequent two years (Li *et al.,* 2011:771). The explanation is based on the fact that impairments give insight into management's private information about the company's prospects. Furthermore, if a business overpays for a target, it gives insight into management's ability, or lack thereof.

Based on the literature, forming expectations of fundamental momentum of forward earnings based on the movement in non-current operating assets is not straightforward. It appears that by reducing non-current operating assets through sales or write-downs is positive for future earnings, provided the write-downs are large and once-off. The sale of an asset, by definition, will be once-off. However, impairing intangible assets appears to be negatively correlated with future earnings.

The impact of the net non-current operating asset component of accruals is known, based on the fact that earnings are mean reverting and the accrual component of earnings is less persistent than the cash flow component. The impact of changes in the sub-components of the net non-current operating asset component of accruals on future earnings, and thus the fundamental momentum impact, is ambiguous. Therefore, no formal expectation of the impact on the fundamental momentum of forward earnings due to the fundamental momentum of the underlying sub-components can be put forward.

6.4.2.3 *Financial assets and liabilities*

The third component of accruals is net financial assets. Net financial assets consist of financial assets and financial liabilities. Typically, financial assets are made up of long- and short-term investments, while financial liabilities consist of long- and short-term debt. The focus of this section will be on the liability component, given that it is this component of net financial assets that is likely to vary the most, and hence influence this component of accruals the most.

The diminishing marginal rate of returns phenomenon, explained in Section 6.4.2.1, is expected to hold true for the asset component of net financial assets. Companies will always exploit their most profitable investment opportunities first. Thus, as financial assets continue to increase, their earnings persistence is expected to decline. A negative relationship is therefore expected between ΔFINA and the persistence of future profitability.

Focusing on the leverage component, there is a vast body of literature documenting the negative relation between external financing activities and future share returns. The assumption that earnings are the underlying driver of equity returns allows one to draw the inference that external financing reduces future profitability. Debt raising (Spiess & Affleck-Graves, 1999:45-73) and bank borrowings (Billet, Flannery & Garfinkel, 2001:1-41) result in unusually low share returns in the years following the capital raising. Bradshaw, Richardson and Sloan (2006:53-85) undertook a study that investigated the different sources of external financing and their effects on future profitability.

Bradshaw *et al.* (2006:58) separated external financing into an equity component and a debt component. Summarising Bradshaw *et al.'s* (2006:53-85) results, external financing raised through both debt and equity have equal effects on future share returns. Repurchasing external financing through share buybacks results in positive future share returns, and extinguishing debt has little effect on future share returns. A possible reason for this finding is that companies retiring debt are very often funding it through equity issuances, thus the negative returns following equity issuances cancel out the positive returns following debt retirements (Bradshaw *et al.,* 2006:65).

Turning their attention to profitability, Bradshaw *et al.* (2006:70) show that future profitability deteriorates following capital raising. Focusing only on the debt component, both long-term future profitability, consisting of a four-year period, and short-term future profitability, consisting of a one-year period, are shown to have a negative relation with increasing debt.

The evidence indicating that financial leverage is negatively related to future profitability and share returns is slightly puzzling, given that leverage is common among businesses. Leverage is particularly important for capital-intensive businesses. Without leverage, such businesses would fail to operate at their full potential. For this reason, leverage cannot always be a bad thing.

Caskey, Hughes and Liu (2012:443-471) researched the relation between leverage, profitability, the probability of financial distress, asset growth and future returns. In their study, they distinguish between optimal leverage and excess leverage. Excess leverage comes about due to random shocks that induce distortions from the optimal level of leverage. The evidence shows that the negative relationship between leverage and future returns is due to the excess leverage component of total leverage (Caskey *et al*., 2012:458). However, what is important here is the relationship between leverage and profitability.

Caskey *et al*. (2012:459) conjecture that excess leverage should be negatively related to future profitability, due to overleverage being a consequence of either a negative shock to debt capacity or a decrease in financial slack. Their results indicate that excess leverage is negatively correlated with earnings two years out (Caskey *et al*., 2012:461). Thus, it appears that up to the optimum point of leverage, the relationship is positive, but too much leverage is detrimental to future profitability.

Following from Section 6.4.2.1, the diminishing marginal returns on investment theory would indicate that the fundamental momentum of ΔFINA would be negatively correlated with the fundamental momentum of forward earnings. The ΔFINL sub-component of accruals is not as clear cut. Given the evidence presented above, it appears that as leverage is increased, future profitability diminishes. However, as Caskey *et al*. (2012:461) show, there is a level of leverage that is deemed optimal for a business, and it is only beyond that optimal level that future profitability is diminished. Therefore, based on Caskey *et al*.'s (2012:443-471) study, the fundamental momentum of ΔFINL should be positively related to the fundamental momentum of future profitability up to the optimal level of leverage, and thereafter, it should be negatively related.

6.4.2.4 ***Cash***

When a company generates cash inflows, or outflows, management need to decide what to do with the cash, or alternatively, how to fund the shortfall. Dechow *et al.* (2008:537-566) focus on better understanding the persistence of the cash component of earnings. Their study identified the uses of positive cash flows and the implications of these uses for future earnings. Similarly, when a company invests heavily in its business or has cash outflows from its operating activities, it needs to fund that investment or shortfall, and again the source of funding is shown to have implications for future earnings.

Prior research already discussed has shown that the cash component of earnings is more persistent than the accrual component. The higher persistence of the cash component of earnings is shown to be entirely attributable to cash flow relating to the DEBT_EQ sub-component of cash in Equation 5.9, according to Dechow *et al.* (2008:551).

Loughran and Ritter (1997:1823-1850) present their study showing that activities raising new capital are associated with lower future profitability and share returns, while distributing capital is associated with higher future profitability and share returns. It is shown that businesses issuing equity have higher levels of capital expenditure both before and after issuing the equity. This indicates that managers are optimistic about the existence of earnings-enhancing investment opportunities (Loughran & Ritter, 1997:1835).

Building on from Loughran and Ritter (1997:1823-1850), it appears that it is not only about whether businesses raise new capital through equity issuances, but it is also about what the businesses do with the cash that is raised.

Cash that is retained is shown to be less persistent than distributing cash to shareholders or debtholders (Dechow *et al.,* 2008:554), for two reasons. First, distributing free cash flow, as opposed to retaining it, disciplines managers into justifying future capital expenditures to the capital market, and therefore, reducing the chances of poor capital allocation decisions being taken (Easterbrook, 1984:658). Sitting on large cash piles would increase management’s accessibility to cash to invest in what could potentially be poor capital allocation decisions. A second explanation provided by Dechow *et al.* (2008:540) could be that companies have the ability to window dress the cash line item prior to results. This would inflate the cash line item making it appear that there is more cash available than there actually is. This is easily done through delaying payments. This point highlights the temporary nature of cash balances.

Debt repayments tend to be non-discretionary as they are typically made according to a pre-set schedule. However, distributions to equity shareholders are discretionary and thus are a strong signal of future profitability (Bartov, 1991:277). Likewise, stock repurchases are an equally strong signaller. Open-market repurchase announcements not only convey information about future earnings, but also about the changes in stock risks (Bartov, 1991:277). Transitory increases in cash are therefore more likely to be used to repay debt than to distribute it to shareholders.

A company’s management will have superior knowledge of the future outlook of their particular business. So while any form of returning cash to shareholders is seen as a positive signal for future performance, perhaps stock repurchases and special dividends may be a better signaller as opposed to ordinary dividends. Companies usually have a dividend policy in place, which management invariably try to defend. Cutting a dividend is generally seen as a negative effect, while maintaining the dividend would be seen as business as usual. A special dividend or a share repurchase, which does not follow a predefined policy, will therefore be a far stronger signal regarding management’s optimistic outlook. Alternatively, a stock repurchase may also indicate that management believe their shares are undervalued. However, the cash still needs to be paid out to shareholders selling shares in this case, which indicates management are comfortable with their cash reserves.

It has been shown that a positive relationship between investment and cash flow exists (Hubbard, 1998:197). There are currently two explanations for this relationship. First, the positive relation is a manifestation of the agency problem, where managers’ objectives differ from those of shareholders (Easterbrook, 1984:652). Managers have been shown to be poor allocators of cash (Harford, 1999:1969-1997; Goodman, Neamtiu, Shroff & White, 2014:331-365; Jensen, 1986:323-329; Stulz, 1990:3-27), and therefore, in the presence of internally generated free cash flow in excess of that required to maintain existing assets, there is potential for the cash to be squandered on poor investments. The second explanation reflects the imperfections in capital markets where external finance is expensive and companies therefore resort to using internally generated free cash flows to fund investments (Easterbrook, 1984:652; Fazzari, Hubbard & Peterson, 1988:146).

Richardson (2006:159-189) extends previous research such as that of Harford (1999:1969-1997), who found that cash-rich companies were more likely to make acquisitions that resulted in abnormal declines in future profitability, by showing that over-investment of cash flow is a systematic phenomenon across all investment expenditure. Equity holders would ideally like any cash which is deemed surplus to maintaining a company's assets to be paid out to them either in the form of dividends or share buybacks. Managers prefer the freedom that cash affords them in that they do not have to go to the capital market to raise finance to make an acquisition.

Richardson (2006:177) shows that overinvestment is a common problem for companies with positive cash flows, despite the fact that most of the cash flow received by companies is retained in financial assets. Likewise, companies earning negative cash flows tend to fund the deficit through cash raised from shareholders, debt holders or by reducing their financial assets (Richardson, 2006:179). The fact that most of the cash flows are retained creates the potential for this cash to be used for overinvestment in the future.

Richardson (2006:163) provides various reasons for the positive relation between cash flow and investments. It could reflect management spending the cash on self-serving projects rather than distributing it to shareholders. Richardson (2006:163) points to previous research for reasons why management would engage in such decision-making: empire building (Shleifer & Vishny, 1997:737-783); perquisite consumption (Jensen & Meckling, 1976:305-360); diversifying acquisitions (Morck, Shleifer & Vishny, 1990:31-48); and subsidising poorly performing divisions using the cash generated from successful divisions (Jensen & Meckling, 1976:305-360; Lamont, 1997:83-109). An alternative explanation could be that using cash generated from internal operations reduces the cost of capital, and therefore increasing the number of opportunities to invest in, given that the return on investment hurdle rate would be lower.

While it is apparent that the cash component of earnings results in more persistent future profitability, as it is a far more reliable measure of current earnings, what is equally important in determining the effect on future profitability is what is done with the proceeds of that free cash flow. It has been made evident that management tend to be poor allocators of cash, and therefore, using retained cash for investment is expected to result in lower future profitability, while cash returned to shareholders is a very strong signal by management regarding their expectations of future profitability.

Given that cash earnings are more persistent than accrual earnings, the correlation coefficient of all the cash sub-component's fundamental momentum should be closer to zero than the coefficients of all the accrual component's fundamental momentum, when regressed on the fundamental momentum of forward earnings. In terms of the cash sub-components, the expectation derived in this section indicates that the coefficient of the fundamental momentum of DEBT_EQ and DEBT_D should be closer to zero than that of the fundamental momentum of CASH. DEBT_EQ is expected to have a coefficient that is closer to zero than that of DEBT_D, based on the literature discussed in this section.

6.5 INTERPRETING THE FUNDAMENTAL MOMENTUM REGRESSION RESULTS

The objective of determining what drives fundamental momentum of forward earnings is to try and foresee whether a business is going to have improving or deteriorating fundamental momentum of forward earnings. This information will be useful in implementing a fundamental trading strategy, provided that the fundamental momentum trading strategy is shown to be profitable in Chapter 9. In order to test which components of earnings are useful in predicting future fundamental momentum of earnings, a regression analysis is conducted, as described in Section 5.4.4.3.

Interpreting the regression results is not about which component is of a higher quality and thus whether one wants to invest in a share with a higher proportion of earnings that are backed by one component relative to another. Such research has been well covered in the

US market by Sloan (1996:289-315) and Richardson *et al.* (2005:437-485), to name but a few. The interpretation of the results is about whether an increasing or decreasing rate of growth of any component, or sub-component, of earnings affects the rate of growth of forward earnings. The results have little to do with the nominal value of the earnings component, or what percentage of total earnings make up the various components

As already discussed, the persistence of earnings is expected to be higher for earnings backed by cash flow as opposed to accruals. Therefore, when undertaking regression analysis using fundamental momentum, the regression coefficients of cash flows are expected to be closer to zero than those of accruals. To explain the reason for this expectation, if the current fundamental momentum of any component of earnings is positive, naturally, it will positively influence the current fundamental momentum of earnings. However, as assumed, if earnings mean revert, the current fundamental momentum of any component of earnings that contributes positively to current earnings should have a negative correlation with the fundamental momentum of forward earnings. Thus, while both cash flow earnings and accrual earnings contribute positively to current earnings, cash flow earnings are more persistent and are therefore expected to mean revert at a slower rate as opposed to accrual earnings. As a result, the regression coefficient of accrual earnings is expected to be more negative than the cash flow correlation coefficient.

Any component of earnings that improves the quality of a business's earnings is expected to lead to more persistent future earnings, which, in turn, should result in regression coefficients that are closer to zero than components that decrease the quality of a business's earnings.

6.6 SUMMARY

This chapter discussed the theoretical expectations of the empirical results of fundamental momentum. There was no direct literature to draw from; however, insights through related literature allowed a better understanding of what drives future earnings, from which theoretical expectations could be presented.

The first section of the chapter dealt with the well-known and well-researched size and value risk factors. It is always necessary to rule out size effects and value effects, when testing any market anomaly. While size and value effects are global phenomena, they have been shown to not influence the price and earnings momentum anomalies. Therefore, the expectation is that the size and value risk factors should not influence the price and earnings momentum anomalies on the JSE. Given that the fundamental momentum strategy has never been researched before, it is unknown whether the size and risk factors will influence the results.

The next section of the chapter discusses the assumption that the fundamental momentum models are premised on, which is mean reversion. Similar to the size and value effects, mean reversion of earnings is a very well-researched topic. Based on this fact, it should be widely understood by investors, and as a result, a fundamental momentum strategy should not be a profitable trading strategy. If mean reversion exists, the fundamental momentum of earnings should not be sustainable. As a result, if a business has positive fundamental momentum of earnings for the latest reporting period, it is expected to have negative fundamental momentum earnings in the next reporting period, as the earnings start to revert to the mean. The same argument holds for a business with negative fundamental momentum of earnings. Investors should recognise this pattern and therefore not overreact or underreact based on what the current fundamental momentum of earnings are, as it should have no bearing on future fundamental momentum of earnings.

The reliability and value relevance of the earnings components is discussed next. Components of earnings that are measured with a high degree of reliability, and which are not open to manipulation, are deemed to be of a higher quality than those that are measured with a high degree of subjectivity. Generally, liabilities are more reliably measured than assets. Thus, changes in earnings as a result of changes in more reliable earnings components are expected to be more persistent than changes due to changes in less reliable earnings components.

The value relevance expectations are drawn from prior research. The expectations are that the coefficients of the fundamental momentum of cash flow components are expected to be closer to zero than the coefficients of the fundamental momentum of accrual components, when regressed on the fundamental momentum of forward earnings. Within each accrual and cash flow component of earnings, the theory relating to the sub-components is discussed to give a clearer sense and understanding of how each sub-component potentially influences future earnings.

The final section briefly explains the interpretation of the regression coefficients of the fundamental models that will be analysed in Chapter 10.

The results analysis of the five research questions and respective hypotheses begins in the following chapter.

CHAPTER 7

RESULTS ANALYSIS: PRICE MOMENTUM

7.1 INTRODUCTION

This chapter presents the empirical findings of the profitability of price momentum trading strategies on the JSE and the results explained by a particular risk factor. The aim of the chapter is to either reject or accept the null Hypotheses 1, 1a and 1b, presented in Section 5.4.1. The chapter begins by discussing the returns of the 16 different trading strategies across the quintiles, based on the various formation and holding periods as mentioned in Section 5.4.1.1. This is followed by a discussion of the various risk factors for each of the quintiles, before concluding the chapter.

7.2 PROFITABILITY OF PRICE MOMENTUM STRATEGIES ON THE JSE

The average monthly returns across the 16 different price momentum strategies during the period 1990-2013 are shown in Table 7.1. The first column, labelled ‘Strategy’, indicates the formation and holding period. A strategy that selects shares based on the past J months and has a holding period of K months, is referred to as a J-month/K-month strategy. Thus, a strategy labelled 3-3, in the first column of Table 7.1, indicates that the portfolio was formed using a 3-month/3-month strategy. As an example, the 3-month/3-month strategy was formed as follows: At the beginning of each month *t*, the shares are ranked in descending order and placed into their respective quintiles, based on their returns over the past three months. An equal-weighted sub-portfolio is formed using the shares from each quintile. In each month *t,* the sub-portfolio formed that month is included in the portfolio, and is held for three months, while the sub-portfolio initiated in month *t-3* months is removed from the portfolio. As a result, the weights of a third of the shares in the portfolio are revised on a monthly basis, while the shares which were included in months *t-2* and *t-1* are left unchanged.

The remaining columns indicate the average monthly performance for the various quintiles, with Quintile 1 being an equal-weighted portfolio of companies with the highest returns in the formation period, and Quintile 5 the equal-weighted portfolio of companies with the lowest returns in the formation period. The last column, labelled 'Market', is the average return of all the companies in the sample, for that particular strategy. It is calculated using the same holding period as the relevant strategy. This is referred to as the market return.

The returns presented in Table 7.1 are nominal total returns, and are not risk adjusted.

Table 7:1 Price momentum: average monthly returns for the five quintile portfolios across the 16 price momentum strategies, and the respective market return

Average Monthly Returns (percent)						
Strategy	**Quintile 1**	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
3-3	1.64	1.79	1.27	0.87	0.24	1.16
3-6	1.76	1.68	1.22	0.85	0.09	1.12
3-9	1.65	1.59	1.20	0.86	0.17	1.09
3-12	1.61	1.54	1.20	0.85	0.22	1.08
6-3	2.13	1.72	1.25	0.84	-0.09	1.17
6-6	2.03	1.69	1.21	0.83	-0.07	1.14
6-9	1.92	1.64	1.19	0.83	0.03	1.12
6-12	1.78	1.59	1.20	0.86	0.15	1.11
9-3	2.12	1.52	1.23	0.90	0.07	1.22
9-6	2.00	1.46	1.25	0.98	0.07	1.19
9-9	1.86	1.41	1.22	1.06	0.21	1.18
9-12	1.76	1.41	1.21	1.06	0.33	1.17
12-3	1.97	1.50	1.15	0.78	0.13	1.22
12-6	1.83	1.32	1.28	0.96	0.25	1.20
12-9	1.73	1.35	1.23	0.97	0.39	1.18
12-12	1.75	1.47	1.28	0.98	0.48	1.18

On only a single occasion did Quintile 1 not produce the highest average monthly return. The Quintile 2 portfolio of the 3-month/3-month strategy outperformed the respective Quintile 1 portfolio[3]. On the other hand, the Quintile 5 portfolio produced the lowest returns across all the strategies. It follows that the Quintile 1 portfolios outperformed their respective

[3] It is important to remember that when discussing the results, the implications of the results only apply to the sample period of the study, which is 1990-2013.

market portfolios across all the strategies. The Quintile 2 portfolios also consistently outperformed their respective market portfolios across all the strategies. Quintile 4 and Quintile 5 portfolios underperformed their respective market portfolios across all the strategies. Furthermore, not a single Quintile 5 portfolio outperforms any other quintile portfolio across any of the strategies. From an outperformance perspective, the 6-month/3-month strategy produced the strongest results with the Quintile 1 portfolio outperforming the market portfolio more than any other strategy (0.96% per month), and the Quintile 5 portfolio underperforming the market portfolio more than any other strategy (-1.26% per month).

The results become even more convincing when one compares them using annualised figures. Table 7.2 presents the annualised returns for the different price momentum strategies.

Table 7:2 Price momentum: annualised returns for the five quintile portfolios across the 16 price momentum strategies, and the respective market return

Annualised Returns (percent)						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3-3	20.01	22.38	15.13	9.62	1.23	13.60
3-6	21.81	20.82	14.55	9.50	-0.41	13.09
3-9	20.34	19.56	14.27	9.69	0.69	12.78
3-12	19.79	18.97	14.33	9.53	1.33	12.67
6-3	27.14	21.26	14.91	9.35	-2.71	13.76
6-6	25.63	21.01	14.34	9.23	-2.38	13.34
6-9	24.10	20.23	14.15	9.27	-1.08	13.14
6-12	22.07	19.56	14.28	9.71	0.42	13.07
9-3	27.04	18.48	14.45	10.13	-0.80	14.35
9-6	25.33	17.74	14.92	11.32	-0.68	14.05
9-9	23.29	17.18	14.51	12.41	1.17	13.88
9-12	21.90	17.16	14.46	12.39	2.68	13.85
12-3	24.76	18.27	13.53	8.56	0.05	14.45
12-6	22.75	15.92	15.32	11.00	1.58	14.12
12-9	21.42	16.32	14.76	11.15	3.30	13.99
12-12	21.61	17.98	15.39	11.36	4.42	13.95

While the pattern remains the same for the quintiles outperforming as against those underperforming the market, the magnitude of the outperformance and underperformance becomes more apparent. The highest outperformance relative to the market for Quintile 1 is for the 6-month/3-month strategy, which outperformed the market by an average of 13.38% over the sample period. Putting this performance into context, the market returned 13.76% per annum under that specific strategy, indicating that by following a price momentum strategy using a six-month formation period and holding for three months, an investor would have earned nearly double the returns of the market.

Table 7.3 shows the Sharpe ratios for the 16 different price momentum strategies. The Sharpe ratio allows one to measure a risk-adjusted return, by incorporating the risk-free rate and share price volatility. The risk-free rate used was the 10-year government bond yield. The evidence indicates that on a risk-adjusted basis, price momentum remains a profitable strategy.

Table 7:3 Price momentum: Sharpe ratios for the five quintile portfolios across the 16 price momentum strategies, and the respective market return

Sharpe Ratios (percent)						
Strategy	**Quintile 1**	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
3-3	0.41	0.41	0.30	0.15	0.15	0.29
3-6	0.41	0.40	0.27	0.13	0.06	0.27
3-9	0.40	0.38	0.24	0.13	0.09	0.25
3-12	0.40	0.37	0.24	0.12	0.09	0.25
6-3	0.48	0.39	0.26	0.15	0.06	0.30
6-6	0.48	0.38	0.25	0.12	0.05	0.27
6-9	0.47	0.36	0.24	0.13	0.07	0.26
6-12	0.45	0.34	0.24	0.16	0.09	0.26
9-3	0.49	0.37	0.26	0.15	0.06	0.29
9-6	0.49	0.35	0.24	0.14	0.05	0.27
9-9	0.47	0.33	0.23	0.17	0.08	0.26
9-12	0.45	0.32	0.22	0.18	0.11	0.25
12-3	0.50	0.37	0.23	0.12	0.10	0.28
12-6	0.48	0.34	0.22	0.14	0.11	0.26
12-9	0.47	0.31	0.23	0.15	0.13	0.25
12-12	0.44	0.30	0.21	0.17	0.15	0.25

An important finding in the results, as presented by Table 7.1, Table 7.2 and Table 7.3, is that in Quintile 1 and Quintile 2, holding the formation period constant, portfolios that have shorter holding periods tend to outperform portfolios with longer holding periods. There are only two exceptions to this finding. The Quintile 1 portfolio with a six-month holding period outperformed the portfolio with a three-month holding period, where a three-month formation period was employed. And the Quintile 2 portfolio with a six-month holding period and a 12-month formation period underperformed the respective portfolios with nine- and 12-month holding periods.

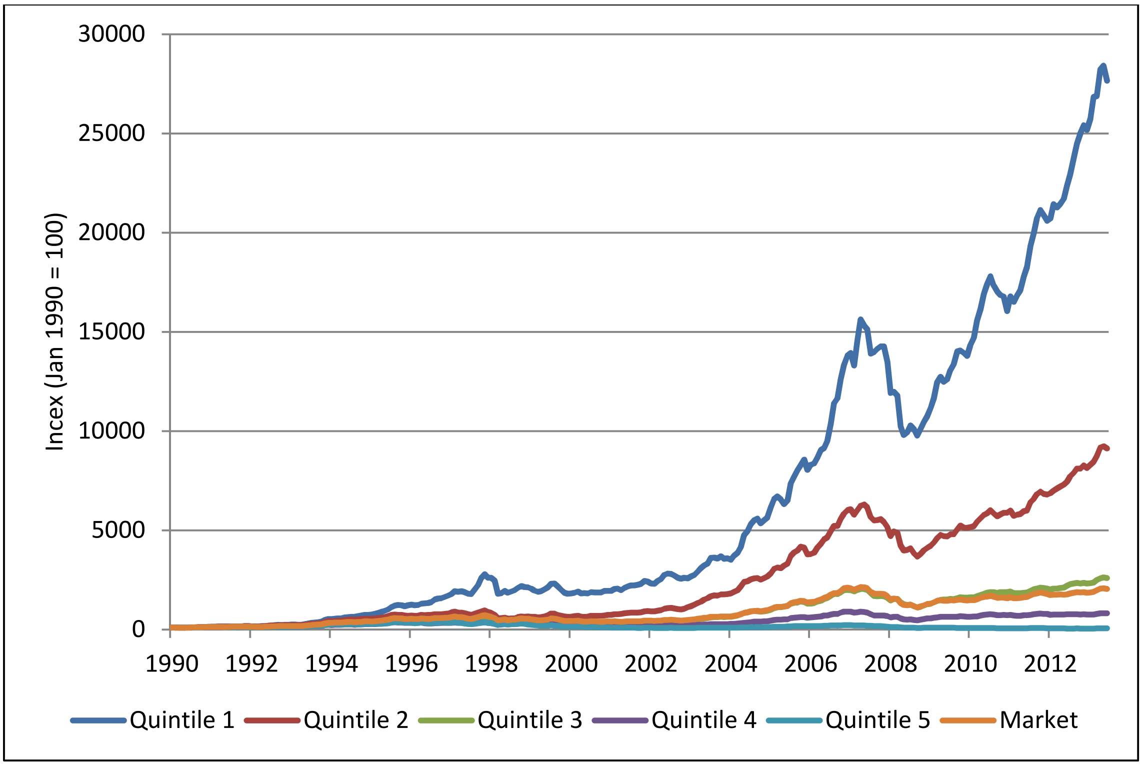
A similar pattern is evident in Quintile 5 where, with the exception of the 3-month/3-month strategy, all of the shorter holding periods underperformed the market by larger amounts than longer holding periods. This finding indicates that the price momentum effect is strongest over the initial months and then slowly dissipates over longer periods.

The fact that the price momentum effect appears to dissipate over longer holding periods supports the underreaction hypothesis as explained by Jegadeesh and Titman (2001:708). As a result of investors underreacting to firm-specific information, share prices lag the intrinsic value of the underlying company. When the share price begins to close the gap between the market value and the intrinsic value of the business, it does so fairly quickly. This results in the share price momentum being stronger over shorter periods and then slowly dissipating over time as the share price catches up to the intrinsic value of the company.

Calculating the total cumulative return over the whole period, the 6-month/3-month strategy outperformed the market by 25,608% over the period January 1990 to December 2013. This highlights the power of compounding returns. The problem with the three-month holding period strategy is that, in reality, transaction costs will be very high due to the portfolios being turned over once every three months. This would severely affect the returns earned by following such a strategy, and needs to be kept in mind when interpreting these results.

Figure 7.1 shows the indexed cumulative return performance of the different quintiles for the 6-month/3-month strategy.

Figure 7.1: Price momentum: indexed cumulative return for three-month formation period and six-month holding period



The evidence, as presented in Table 7.1, Table 7.2 and Table 7.3, indicates that price momentum strategies on the JSE are profitable. One could, therefore, assume that if zero-cost portfolios were constructed, as is done in many previous studies (Chan *et al.,* 1996:1681-1713; Hong *et al*., 2000:265-295; Jegadeesh & Titman, 1993:65-91), with zero construction costs, these strategies would be very profitable by going long Quintile 1 portfolios and short Quintile 5 portfolios. However, in order to reach this conclusion and to reject the null Hypothesis 1, the results need to be statistically significant.

The p-values are calculated in order to test whether the returns produced by the various quintiles are significantly different from those of the market. The null Hypothesis 1 is that the returns are not significantly different from the market. A one-tail test is used to determine whether the returns produced by Quintile 1 and Quintile 2 portfolios are significantly higher than their respective market portfolios. For Quintile 4 and Quintile 5 portfolios, a one-tail test is conducted to determine whether the returns produced by those quintiles are lower than those of their respective market portfolios. A two-tail test is used to determine whether the returns of Quintile 3 portfolios are significantly different, in either direction, from those of their respective market portfolios. The results are presented in Table 7.4.

Table 7:4 Price momentum: P-value indicating the statistical significance of the five quintile portfolios across the 16 price momentum strategies

The p-values					
Strategy	**Quintile 1**	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**
3-3	0.00	0.00	0.03	0.00	0.00
3-6	0.00	0.00	0.03	0.00	0.00
3-9	0.00	0.00	0.02	0.00	0.00
3-12	0.00	0.00	0.00	0.00	0.00
6-3	0.00	0.00	0.12	0.00	0.00
6-6	0.00	0.00	0.13	0.00	0.00
6-9	0.00	0.00	0.11	0.00	0.00
6-12	0.00	0.00	0.05	0.00	0.00
9-3	0.00	0.00	0.45	0.00	0.00
9-6	0.00	0.00	0.19	0.00	0.00
9-9	0.00	0.00	0.24	0.04	0.00
9-12	0.00	0.00	0.24	0.03	0.00
12-3	0.00	0.00	0.26	0.00	0.00
12-6	0.00	0.04	0.17	0.01	0.00
12-9	0.00	0.01	0.26	0.00	0.00
12-12	0.00	0.00	0.12	0.00	0.00

Across all strategies, the outperformance produced by Quintile 1 and Quintile 2 portfolios relative to the market is statistically significant at the 5% level. Likewise, the underperformance of Quintile 4 and Quintile 5 portfolios relative to the market is also statistically significant at the 5% level, across all 16 strategies.

The returns produced by the Quintile 3 portfolios tended to not be significantly different from those of the market, with the exception of the three-month formation period strategy. For the three-month formation strategy, the Quintile 3 portfolios significantly outperformed the respective market portfolios.

The profitability of price momentum strategies on the JSE is real and significant across all 16 strategies that were tested. These results are very much in line with what has been found in the international literature, as well as past research conducted on the domestic market (Fraser & Page, 2000:25-35; Hoffman, 2012:21-41; Van Rensburg, 2001:45-60).

As a result, the null Hypothesis 1 is rejected, and it is not rejected that the price momentum strategy is profitable on the JSE.

7.3 RISK FACTORS AND PRICE MOMENTUM

To ensure that the price momentum results do not capture a size or value affect, the average and median market capitalisation, PE ratio and PB ratio are calculated and tested under regression analysis. These results will lead to the null Hypotheses 1a and 1b either being rejected or accepted.

7.3.1 Size factor

As explained in Section 5.1, the South African market has always been very distorted in terms of a small number of large companies that constitute a very large portion of the market. Therefore, it is worthwhile considering both the average and median market capitalisation for each of the quintile portfolios across the different strategies, otherwise the market capitalisations of the different quintiles may be skewed.

Based on previous findings in the literature, *a priori,* the expectation is that there should be no distinct pattern regarding the average or median market capitalisations of the portfolios across the different quintiles. If there were a recognisable pattern, it would be indicative of another risk factor that affects the results.

Table 7.5 and Table 7.6 illustrate the average and median market capitalisations of the different quintiles respectively.

Table 7:5 Price momentum: average market capitalisation of the shares included in each quintile portfolio and the respective market portfolio across the 16 price momentum strategies

Average Market Capitalisation (Rm)

Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3-3	5 153	8 082	7 289	5 461	1 717	5 541
3-6	5 229	8 180	7 376	5 378	1 730	5 579
3-9	5 174	8 163	7 456	5 359	1 739	5 578
3-12	5 150	8 115	7 516	5 366	1 742	5 578
6-3	5 560	8 671	7 820	4 731	1 349	5 626
6-6	5 548	8 669	7 809	4 770	1 350	5 629
6-9	5 480	8 653	7 851	4 806	1 347	5 627
6-12	5 402	8 685	7 828	4 859	1 356	5 626
9-3	7 241	9 707	6 548	4 180	1 314	5 798
9-6	7 237	9 686	6 676	4 269	1 338	5 841
9-9	7 174	9 690	6 789	4 333	1 357	5 869
9-12	7 109	9 647	6 882	4 406	1 378	5 884
12-3	8 420	7 980	6 163	3 980	1 151	5 539
12-6	8 379	8 058	6 330	4 070	1 180	5 603
12-9	8 288	8 158	6 493	4 170	1 211	5 664
12-12	8 179	8 303	6 586	4 249	1 240	5 711

Across the different quintiles, with the exception of Quintile 1, the average market capitalisations decrease from Quintile 2 to Quintile 5. For the longer formation period strategies, the Quintile 1 portfolio’s average market capitalisation exceeds the Quintile 2 portfolio’s average market capitalisation. The Quintile 5 portfolios have the smallest average market capitalisation, which goes against the findings of Banz (1981:3-18), who showed that smaller shares have higher returns, due to the size effect. The average market capitalisation of Quintile 1 and Quintile 4 is very similar to that of the average market capitalisation of the market, for shorter formation periods. However, as the formation periods get longer, the market capitalisations of the portfolios constituting Quintile 1 and Quintile 4 diverge. Quintile 2 and Quintile 3 portfolios have larger market capitalisations than the market average.

Based on these basic univariate statistics, the evidence indicates that there is no large- or small-cap effect influencing the results. However, to be able to answer this question definitively, one needs to undertake additional statistical tests, which are discussed below.

Comparing the average market capitalisations in a quintile but across the different strategies illustrates two important insights: first, it is evident that the average market capitalisations are similar across the different strategies in each quintile; second, not only are they similar, but for Quintile 1 and Quintile 2, the longer the formation period is, the larger the average market capitalisations become, while Quintile 3, Quintile 4 and Quintile 5 depict the opposite, where the longer the formation period is, the smaller the average market capitalisation becomes.

These findings make intuitive sense. The reason why the average market capitalisations are similar across the different strategies is that shares are expected to remain in the same quintile over different formation periods. To explain this statement, because a specific share is placed in Quintile 1, for example, based on a three-month formation period, it is expected to outperform over the next three months because of the price momentum anomaly, and therefore, one would expect that share to remain in Quintile 1 when forming the portfolio based on a six-month formation period. The same reasoning would apply when forming the Quintile 1 portfolio on a nine-month and 12-month formation period.

A similar logic follows in explaining why the average market capitalisations increase or decrease, depending on the quintile, as the formation periods get longer. Using Quintile 1 as an example, based on the fact that shares in Quintile 1 are expected to outperform the market, and that the shares in Quintile 1 are consistent across formation periods, it follows that the market capitalisations of those shares will increase over longer formation periods. Likewise for shares in Quintile 5, where those shares are expected to underperform the market materially, one would expect market capitalisations to decrease over longer formation periods.

Table 7.6 illustrates the median market capitalisations of each of the quintiles. Similar patterns are evident. The Quintile 1 and Quintile 2 portfolios' median market capitalisations increase over longer formation periods, while Quintile 4 and Quintile 5 portfolios' median market capitalisations decrease over longer formation periods. The one difference is the actual size of the market capitalisations. The median market capitalisations across all the quintiles are materially smaller than the average market capitalisations depicted in Table 7.5. This finding is due to the nature of the JSE, and suggests that the market capitalisations are skewed to the right. Market capitalisations that are skewed to the right indicate that market capitalisations of companies listed on the JSE are not normally distributed, but rather that there are a small number of very large market capitalisation companies that cause the average market capitalisation of each quintile to be above the median market capitalisation.

Table 7:6 Price momentum: median market capitalisation of the shares included in each quintile portfolio and the respective market portfolio across the 16 price momentum strategies

Median Market Capitalisation (Rm)						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3-3	417	1 137	979	662	130	665
3-6	403	1 136	958	627	122	649
3-9	399	1 142	944	620	117	644
3-12	395	1 141	949	616	116	644
6-3	519	1 142	1 157	622	124	713
6-6	514	1 138	1 105	607	116	696
6-9	504	1 140	1 085	594	109	686
6-12	502	1 149	1 090	581	107	686
9-3	793	1 350	1 062	622	117	789
9-6	791	1 308	1 017	597	114	765
9-9	786	1 306	1 018	587	113	762
9-12	758	1 306	1 015	578	111	754
12-3	953	1 313	1 148	595	118	825
12-6	955	1 265	1 094	575	116	801
12-9	918	1 240	1 082	565	115	784
12-12	871	1 236	1 053	549	113	764

7.3.2 Value factor

A number of valuation metrics are considered to be appropriate proxies for value factors. These include the price-to-sales (PS) ratio, the PB ratio and the PE ratio. For the purpose of this study, it was decided that the PE ratio was the most appropriate given that only industrial companies are included in the sample. The PB ratio is included as a value factor due to its historic use in the Fama and French three-factor model. It also serves as confirmation for the PE ratio in the tests to determine whether value factors influence the price momentum result.

It is necessary to compare both average and median PE ratios across the different quintiles and strategies. When a business' earnings collapse and become very small (either positive or negative), what is likely to happen is that the PE ratio either becomes extremely large (if the earnings are small but positive), alternatively, the ratio becomes very small in the sense that it is a very large negative number (if the number earnings become negative). As a result, the average PE ratio of the quintile may be materially affected by a small number of outliers. For a similar reason, it is necessary to compare the average and median PB ratios across the different quintiles and strategies. Given that it takes years for a company to build up its book value, it should not be the case that a book value of a company collapses in a single year, however, it is possible. And while a company's earnings number over 12 months should not significantly affect the book value of a company, there will nevertheless be outliers that will influence the average PB ratio for any given portfolio.

Based on the fact that Fama (1998:304) concludes that the price momentum anomaly is an open puzzle, *a priori,* the expectation is that there should be no distinct pattern regarding the average or median PE ratios and PB ratios of the portfolios across the different quintiles.

Tables 7.7 and 7.8 show the average and median PE ratios of the different quintiles respectively.

Table 7:7 Price momentum: average PE ratio of the shares included in each quintile portfolio and the respective market portfolio across the 16 price momentum strategies

Average PE Ratio						
Strategy	**Quintile 1**	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
3-3	14.35	13.35	12.73	12.04	11.04	12.70
3-6	14.09	13.26	12.66	12.05	11.24	12.66
3-9	13.86	13.19	12.59	12.07	11.42	12.63
3-12	13.69	13.13	12.55	12.06	11.55	12.60
6-3	14.69	13.31	12.57	11.76	11.04	12.67

6-6	14.43	13.15	12.50	11.80	11.35	12.65
6-9	14.20	13.05	12.46	11.84	11.57	12.62
6-12	14.01	12.98	12.44	11.88	11.70	12.60
9-3	14.58	13.00	12.62	11.97	11.29	12.69
9-6	14.30	12.88	12.54	12.02	11.59	12.67
9-9	14.08	12.82	12.48	12.03	11.77	12.64
9-12	13.90	12.77	12.45	12.05	11.90	12.61
12-3	14.45	12.88	12.46	12.23	11.68	12.74
12-6	14.18	12.77	12.38	12.20	11.89	12.68
12-9	13.97	12.70	12.31	12.24	12.03	12.65
12-12	13.81	12.64	12.31	12.27	12.12	12.63

A pattern emerges when comparing the PE ratios across the different quintiles. Quintile 1 has the highest PE ratio across the strategies, and the PE ratios descend as one moves across the quintiles, with Quintile 5 having the lowest PE ratio. This finding indicates that it may be a growth effect that results in Quintile 1 outperforming the other quintiles, as well as the market, across all strategies. This would be in contrast to Fama's (1998:304) conclusion.

The fact that Quintile 1 is priced on the highest PE ratio and Quintile 5 on the lowest PE ratio, indicates that the market expects companies in Quintile 1 to grow their earnings at a faster rate than any other quintile, while Quintile 5 companies are expected to grow their earnings at the slowest rate.

As explained in Section 7.3.1, shares are expected to remain in the same quintile portfolio over different formation periods. Therefore, given that the PE ratio declines in Quintile 1 and Quintile 2, when maintaining the formation period constant but increasing the holding period, it indicates that the earnings of the underlying companies are growing at a faster rate than the price of the shares. The opposite holds true for Quintile 4 and Quintile 5. As the holding period increases while maintaining the formation period constant, the PE ratios increase, indicating that the earnings are growing at a slower rate than the share price, which has already been shown to be growing at the slowest rate across the quintiles. This is a very important finding, as it gives a clear indication that earnings may play a material role in driving price momentum. This is a definite topic for future research.

A large amount of literature has focused on the value effect, and how it influences share price returns. The most common finding is that shares with low PE ratios outperform, while shares with high PE ratios underperform (Chan, Hamao & Lakonishok, 1991:1748; Fama & French, 1992:445; Lakonishok, Shleifer & Vishny, 1994:1548). The reason for this is that shares that are priced on demanding PE ratios, because of the expected earnings growth, tend to disappoint investors as their earnings expectations are seldom met, while shares trading on undemanding PE ratios tend to surprise investors as their earnings often grow at a faster rate than expected. This causes the share prices of companies trading on low PE ratios to outperform, while share prices of companies trading on high PE ratios tend to underperform. Similar to Fama's (1998:304) conclusion that it is not a value effect that explains price momentum, the above finding is in stark contrast to the literature, which suggests that value outperforms growth.

Table 7.8 illustrates the median PE ratios for each of the quintiles. While the pattern remains similar, not all Quintile 1 portfolio PE ratios continue to be the highest PE ratios across the strategies. However, Quintile 5 continues to have the lowest PE ratios. The PE ratios also get smaller as the holding period increases for Quintile 1 and Qquintile 2, while the PE ratios get larger as the holding period increases for Quintile 4 and Quintile 5. These patterns are similar to those shown in Table 7.7.

A clear difference between the average PE ratio and the median PE ratio is the actual size. The median PE ratios across all the quintiles are materially smaller than the average PE ratios depicted. This finding points to the fact that the PE ratios are skewed to the right. Therefore, PE ratios of shares listed on the JSE are not normally distributed, but rather, a small number of very large PE ratios cause the average PE ratio in each quintile to be above the median PE ratio.

Table 7:8 Price momentum: median PE ratio of the shares included in each quintile portfolio and the respective market portfolio across the 16 price momentum strategies

Median PE						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3-3	11.15	11.45	10.86	9.86	7.92	10.25
3-6	10.96	11.39	10.82	9.89	8.07	10.23

3-9	10.78	11.33	10.75	9.89	8.19	10.19
3-12	10.67	11.28	10.72	9.91	8.28	10.17
6-3	11.52	11.46	10.84	9.73	7.80	10.27
6-6	11.33	11.39	10.79	9.70	7.98	10.24
6-9	11.18	11.30	10.75	9.73	8.13	10.22
6-12	11.09	11.24	10.73	9.77	8.24	10.21
9-3	11.88	11.33	10.81	9.78	8.11	10.38
9-6	11.69	11.24	10.75	9.84	8.28	10.36
9-9	11.59	11.19	10.67	9.89	8.42	10.35
9-12	11.53	11.12	10.63	9.93	8.49	10.34
12-3	12.01	11.27	10.74	9.75	8.33	10.42
12-6	11.85	11.18	10.74	9.74	8.49	10.40
12-9	11.74	11.14	10.68	9.80	8.59	10.39
12-12	11.68	11.07	10.63	9.89	8.62	10.38

Table 7.9 illustrates the average PB ratios of the different quintiles. A similar pattern emerges to that of the average PE ratios. Again Quintile 1 has the highest value factor in the form of the PB ratio, and Quintile 5 has the lowest PB ratio, which is in contrast to Fama's (1998:304) conclusion.

The fact that the PB ratios of Quintile 1 are the highest indicates that the market places a premium on the book value of companies placed in Quintile 1 relative to those in the other quintiles. This indicates that the market thinks the books of these businesses are of superior quality, perhaps with the ability to produce superior earnings growth. This is consistent with the higher PE ratios that were shown in Table 7.7.

The other consistent piece of evidence is that the PB ratios decrease as the holding periods get longer, with the exception of the nine-month and 12-month formation periods of Quintile 5. Similar to the PE ratio, this indicates that the book values of the businesses grow at a faster rate than the share price. This makes intuitive sense given that growing earnings will translate into growing book values, provided that all of the earnings are not paid to shareholders.

Table 7:9 Price momentum: average PB ratio of the shares included in each quintile portfolio and the respective market portfolio across the 16 price momentum strategies

Average PB Ratios						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3-3	2.80	2.52	2.28	2.04	1.48	2.22
3-6	2.79	2.52	2.26	2.00	1.47	2.21
3-9	2.79	2.51	2.24	1.97	1.46	2.19
3-12	2.77	2.49	2.23	1.95	1.46	2.18
6-3	3.12	2.40	2.30	1.91	1.32	2.21
6-6	3.12	2.40	2.27	1.87	1.31	2.19
6-9	3.10	2.38	2.26	1.84	1.31	2.18
6-12	3.07	2.37	2.24	1.82	1.32	2.16
9-3	3.31	2.44	2.22	1.78	1.24	2.20
9-6	3.29	2.43	2.22	1.76	1.24	2.19
9-9	3.25	2.41	2.20	1.73	1.26	2.17
9-12	3.21	2.39	2.18	1.72	1.28	2.16
12-3	3.43	2.43	2.16	1.73	1.20	2.19
12-6	3.40	2.42	2.16	1.71	1.20	2.18
12-9	3.36	2.42	2.15	1.68	1.22	2.16
12-12	3.30	2.41	2.13	1.67	1.25	2.15

Table 7.10 shows the comparative median PB ratios for each of the quintiles. The three-month formation Quintile 1 portfolios have lower PB ratios than their respective Quintile 2 portfolios. But for longer formation periods, the Quintile 1 portfolios have the highest PB ratios. The Quintile 5 portfolios have the lowest PB ratios. The PB ratios also get smaller as the holding period increases for the majority of quintiles. The exceptions are for the nine-month and 12-month formation periods of Quintile 5. These patterns are consistent with those shown in Table 7.9.

Again, a difference between the average PB ratio and the median PB ratio is the actual size. The median PB ratios across all the quintiles are materially smaller than the average PB ratios shown in Table 7.9. The Quintile 5 portfolios' median PB ratio is less than 1, which means the majority of shares in Quintile 5 trade at less than book value. This finding gives some very clear evidence of the quality of the companies that constitute Quintile 5. The market clearly does not believe in the book value of these businesses, otherwise they would not be trading on such a discounted PB multiple.

Table 7:10 Price momentum: median PB ratio of the shares included in each quintile portfolio and the respective market portfolio across the 16 price momentum strategies

Median PB Ratios						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3-3	1.57	1.64	1.48	1.24	0.81	1.35
3-6	1.68	1.79	1.55	1.31	0.85	1.44
3-9	1.57	1.64	1.44	1.21	0.81	1.33
3-12	1.56	1.63	1.44	1.21	0.81	1.33
6-3	1.83	1.66	1.48	1.19	0.75	1.38
6-6	1.84	1.66	1.46	1.17	0.75	1.38
6-9	1.82	1.65	1.45	1.16	0.76	1.37
6-12	1.80	1.64	1.44	1.15	0.76	1.36
9-3	2.04	1.68	1.47	1.15	0.71	1.41
9-6	2.03	1.68	1.45	1.14	0.72	1.40
9-9	2.01	1.68	1.44	1.12	0.72	1.40
9-12	1.97	1.67	1.42	1.11	0.73	1.38
12-3	2.17	1.72	1.46	1.11	0.69	1.43
12-6	2.15	1.71	1.45	1.10	0.70	1.42
12-9	2.12	1.70	1.43	1.09	0.71	1.41
12-12	2.09	1.69	1.41	1.08	0.72	1.40

7.3.3 Factor loadings

The factors from the Fama and French three-factor model are employed in order to determine whether price momentum captures these risk factors and if they do, whether these risk factors are statistically significant. To calculate the factor loadings of these factors, Fama and Macbeth (1973:616) cross-section regressions are used. The regressions are estimated monthly for all shares in each specific quintile, using the forward excess 12-month return relative to the risk-free rate. By calculating the mean and the standard deviation of the time series of the explanatory regression coefficients that were extracted over the entire period, it is possible to calculate the statistical significance of the factor loadings, and whether they play a role in explaining the results.

The cross-section regression model is as follows:

$$(RS_{t+i} - RF_{t+i}) = \beta_0 + \beta_1(RM_{t+i} - RF_{t+i}) + \beta_2(PB\ Ratio_t) + \beta_3(Market\ Capitalisation_t) + \varepsilon_{t+1} \qquad (7.1)$$

where i represents months used in calculating the returns, RS represents the return of the share, RF is the return of the risk-free rate and RM is the equal-weighted return of all investable shares.

Table 7.11 contains the factor loadings for each of the risk factors for the three-month formation price momentum strategy quintiles[4]. Each panel shows the risk factor loadings for the various holding period strategies, as well as the level of statistical significance for each of the factor loadings, as depicted by the p-values.

The quintile portfolios are expected to be well diversified given that all available shares in a given time period are included in at least one portfolio. Therefore, β_1 is not expected to be materially different from one. β_1 is a measure of the exposure the portfolio has to market risk, typically referred to as beta. However, it is important to bear in mind that this beta is slightly different from the beta calculated in the capital asset pricing model (CAPM) due to the added risk factors.

Based on historical research, the value and size factors, as measured by β_2 and β_3, are not expected to be statistically significant due to the fact that the Fama and French three-factor model cannot explain the persistence of the price momentum anomaly in the international literature. However, while there does not appear to be a trend for the market capitalisations across the quintile portfolio in Tables 7.5 and 7.6, there appears to be a trend in Tables 7.7-7.10, which may suggest that a value risk factor could potentially explain the results.

Table 7:11 Price momentum: factor loadings for the market, value and size risk factors for all quintile portfolios based on the three-month formation strategy

Factor Loadings - 3 Month Formation Period					
Panel A – 3 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	0.9804	0.9864	0.9490	0.9724	1.0251

[4] The risk factor loadings for the six-, nine- and 12-month price momentum formation strategy can be found in Appendix 1.

p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	0.1858	0.1113	-0.2470	-0.0175	0.4805
p-value	0.45	0.61	0.26	0.94	0.09
B_3 (size)	0.7082	-0.1571	0.0077	0.0952	-0.8981
p-value	0.00	0.12	0.94	0.39	0.00
Panel B - 6 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	1.0430	0.9485	0.9279	0.9524	1.0042
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	-0.0317	0.0191	-0.8282	-0.7774	-0.4765
p-value	0.93	0.95	0.01	0.02	0.20
B_3 (size)	0.8955	-0.0446	0.2159	0.3497	-0.6557
p-value	0.00	0.76	0.14	0.03	0.00
Panel C - 9 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	0.9521	0.9049	0.8857	0.9117	0.9531
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	-0.8985	-0.6480	-1.4836	-1.7148	-0.5522
p-value	0.04	0.10	0.00	0.00	0.21
B_3 (size)	1.6539	0.3204	0.6320	0.7001	-0.0142
p-value	0.00	0.09	0.00	0.00	0.95
Panel D - 12 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	0.9212	0.8546	0.8462	0.8574	0.8804
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	-1.2922	-2.0985	-2.2658	-2.7673	-1.3556
p-value	0.01	0.00	0.00	0.00	0.01
B_3 (size)	2.3667	1.1479	1.2491	1.3932	0.9475
p-value	0.00	0.00	0.00	0.00	0.00

Shorter holding periods, depicted in Panel A and Panel B of Table 7.11, indicate that there are no risk factors driving the underlying price momentum results. This is due to the inconsistency of the factor-loading signals, magnitude and statistical significance. However, the longer holding periods of Panel C and Panel D indicate that other factors may influence the results.

With the exception of the Quintile 2 and Quintile 5 value factor loadings in Panel C, where the value factor loadings are insignificant, the majority of value factor loadings are negative and significant. However, the problem is that Quintile 1 portfolios appear to be less sensitive to the PB ratio risk factor, given the lower absolute magnitude of the coefficient. Therefore, this would indicate that the value risk factor does not explain the price momentum returns.

The size factor loadings in Panel C and Panel D are also ambiguous, given that the sign of coefficients are not consistent with the theoretical expectations. Furthermore, the Quintile 1 size factor loadings are larger than the other quintile factor loadings, indicating that large market capitalisation businesses drive the price momentum results in Quintile 1. This result is contradictory to the results shown in Tables 7.5 and 7.6, where the Quintile 1 portfolio has an average and median market capitalisation that is smaller than that of Quintile 2.

These findings suggest that while it appears that the value and size factors play a role in explaining price momentum over longer holding periods, theoretically, the findings do not make sense and are contrary to expectations. Therefore, an area of future research in the South African market is to further understand the underlying drivers of price momentum.

As a result of a lack of consistency and statistical significance across the factor loadings, along with any real clear evidence from the average and median market capitalisations and value factors in Sections 7.3.1 and 7.3.2, the null Hypotheses 1a and 1b are not rejected.

7.4 SUMMARY

This chapter presented the results obtained when testing whether the price momentum anomaly, which was first described by Jegadeesh and Titman (1993:65-91), was also profitable on the JSE. A number of risk factors that may help understand the underlying cause of the price momentum anomaly were calculated and tested to determine whether they play a role in explaining the anomaly.

Following the strategy used by Jegadeesh and Titman (1993:68), price momentum was found to be profitable on the JSE across all 16 strategies tested. The portfolios tested were constructed using an equal-weighting methodology, and all results were shown to be statistically significant at the 5% level. The best-performing strategy was the six-month formation and three-month holding strategy. The issue with such a strategy though is that transaction costs will materially reduce the performance, given the portfolio is being turned over once every three months. Though, Quintile 1 produced an average annualised return of 22.97%, Quintile 5 produced an average annualised return of 0.58% and the market produced an average annualised return of 13.63%. These returns are evidence of the price momentum anomaly and its profitability on the JSE. As a result, the null Hypothesis 1 was rejected.

In order to ensure that the price momentum anomaly is not being caused by a risk factor, such as size or value, the average and median market capitalisations, PE ratios and PB ratios of the portfolios were calculated. No clear evidence was found indicating that a size factor influenced the results. However, the market capitalisations of Quintile 1 and Quintile 2 did appear to be larger than that of the other quintiles. Across the majority of the strategies, there is no statistical evidence that a size effect influences the price momentum anomaly.

The value factors indicated that price momentum may be due to a growth effect, as a result of high average and median PE ratios and PB ratios for Quintile 1 and Quintile 2 portfolios, while Quintile 4 and Quintile 5 portfolios have low average and median PE ratios and PB ratios. The risk factor loadings, however, provide ambiguous evidence regarding the statistical significance of the factor loadings. But there is no evidence that a size or value effect explains price momentum on the JSE. As a result, the null Hypotheses 1a and 1b were not rejected. Further research is required to understand the drivers of price momentum in the South African market.

A final note on the profitability of price momentum on the JSE is that the value factors give some very interesting insight into the price momentum anomaly. It appears that companies with share price momentum are also priced on higher value multiples than companies with low share price momentum. This finding requires further research in order to understand this result. It suggests that the overreaction hypothesis put forward by Jegadeesh and Titman (1993:90) could be an explanation of the profitability of the price momentum strategy on the JSE. Alternatively, the market could be correct in anticipating strong earnings growth, which ultimately influences future share price appreciation. Furthermore, pricing shares at a discount to their book value suggests that the market either does not believe the book value of the company, or believes the book value of a company is of poor quality with the inability to deliver future earnings growth, and therefore, expects the book value to be written down in the future.

The following chapter deals with the earnings momentum strategy, following a similar methodology to that of this chapter.

CHAPTER 8

RESULTS ANALYSIS: EARNINGS MOMENTUM

8.1 INTRODUCTION

This chapter presents the empirical findings of the profitability of the earnings momentum trading strategy and discusses whether the results may be due to a size or value risk factor. The aim of the chapter is to either reject or accept the null Hypotheses 2, 2a and 2b, presented in Section 5.4.2.

The chapter begins by presenting the returns of following an earnings momentum strategy over the four holding periods, being three months, six months, nine months and 12 months. Returns leading up to the formation of the portfolios, as well as the returns following formation are discussed. This is followed by a discussion of the various risk factors for each of the quintiles. Finally, the factor loadings are calculated and discussed before concluding the chapter.

8.2 PROFITABILITY OF EARNINGS MOMENTUM STRATEGIES ON THE JSE

The objective of an earnings momentum strategy is to determine whether companies that produce earnings surprises, either positive or negative, result in abnormal share returns over the months following the earnings announcement. It is important to remember that earnings momentum does not refer to the momentum of a company's earnings, but rather the term refers to the momentum of a share price following a company's earnings announcement. This is often referred to as PEAD, as originally described by Ball and Brown (1968:169-171).

As discussed in Section 5.4.2.1, earnings surprises are calculated using the SUE methodology as employed by Foster *et al.* (1984:582). Based on their earnings surprises, businesses are divided into quintiles on a monthly basis. At the beginning of each month, a sub-portfolio in each quintile is formed based on an equal-weighted methodology and that portfolio is held for the duration of the holding period. The holding periods vary in order to test the significance of the share price variation over different time periods. Holding periods of three, six, nine and 12 months are examined, and only companies that reported in a particular month are included in the appropriate sub-portfolio for that month. Similar to the price momentum methodology, as a result of the holding periods being quarters, as opposed to months, the portfolios have overlapping holding periods. If the number of months for the holding period is *K* months, the total portfolio will consist of *K* sub-portfolios.

At the beginning of each month *t*, the shares are ranked in descending order and placed into their respective quintiles, based on their SUE. An equal-weighted sub-portfolio is formed using the shares from each quintile. In each month *t,* the sub-portfolio formed that month is included in the portfolio, and is held for *K* months, while the sub-portfolio initiated in month *t-K* is removed from the portfolio. Therefore, shares which were included in months *t-K-1* and earlier are left unchanged.

The observations begin from the date of January 1992 as opposed to January 1990. This is due to the fact that two years are required to calculate a company's SUE, therefore, portfolio formation could only take place from January 1992.

The profitability of following an earnings momentum strategy on the JSE is presented in Table 8.1. The table is divided into four separate panels. Each panel highlights the returns and statistical significance of the four different holding periods following portfolio formation. In each panel, the annualised return, average monthly return and the average monthly outperformance relative to the market return are shown. The p-values are calculated and shown in the last row of each panel. These values are used to test whether the returns produced by the various quintile portfolios are significantly different from the market return. The null Hypothesis states that the returns are not significantly different from the market. A one-tail test is used to determine whether the returns produced by Quintile 1 and Quintile 2 are significantly higher than the market, whereas for Quintile 4 and Quintile 5, a one-tail test is conducted to determine whether the returns produced by those quintiles are lower than those of the market. A two-tail test is used to determine whether the returns of Quintile 3 are significantly different, in either direction, from those of the market.

Table 8:1 Earnings momentum: profitability of the earnings momentum strategy and the statistical significance across the five quintile portfolios and the market

Momentum Profitability and Statistical Significance – Jan 1992						
Panel A – 3 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	15.35	14.54	10.54	10.20	5.81	10.62
Average Monthly Return	1.33	1.27	0.99	0.97	0.65	0.91
Average Monthly Abnormal Return	0.41	0.36	0.08	0.06	-0.26	-
p-Value	0.00	0.02	0.67	0.38	0.16	-
Panel B – 6 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	21.52	21.87	15.70	11.83	9.02	14.40
Average Monthly Return	1.76	1.77	1.35	1.05	0.86	1.19
Average Monthly Abnormal Return	0.57	0.58	0.16	-0.14	-0.33	-
p-Value	0.00	0.00	0.29	0.15	0.07	-
Panel C – 9 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	18.11	19.41	14.01	11.68	10.37	12.84
Average Monthly Return	1.51	1.59	1.21	1.03	0.96	1.07
Average Monthly Abnormal Return	0.44	0.52	0.14	-0.05	-0.11	-
p-Value	0.00	0.00	0.28	0.36	0.30	-
Panel D – 12 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	19.46	19.57	16.03	13.32	11.54	13.82
Average Monthly Return	1.61	1.60	1.36	1.14	1.04	1.14
Average Monthly Abnormal Return	0.46	0.46	0.21	0.00	-0.10	-
p-Value	0.00	0.00	0.07	0.50	0.30	-

Panel A of Table 8.1 shows the return profile for the earnings momentum portfolios with a three-month holding period from January 1992 to December 2013. The Quintile 1 portfolio is constructed by holding the 20% of businesses with the largest earnings surprise, as measured by the SUE, while the Quintile 5 portfolio is constructed by holding the 20% of businesses with the lowest earnings surprise. The market portfolio is formed by holding all the companies that are included in the five quintile portfolios in an equal weight. The annualised return is calculated by annualising the performance of the portfolios from the beginning of the period to the end of the period, while the average monthly return performance is calculated by taking the average month-on-month performance of the portfolios for the duration of the study.

The Quintile 1 and Quintile 2 portfolios outperformed the market over a three-month holding period, as depicted in Panel A of Table 8.1. The Quintile 4 portfolio performed in line with the market. Intuitively, the expectation is that if companies producing the largest positive earnings surprises outperform the market over the following three months, those that produce the largest negative earnings surprise would be expected to underperform the market. This holds true for Quintile 5 though, as this portfolio underperformed the market. Therefore, only companies that produce earnings surprises in the top 60th percentile are expected to produce returns that are significantly greater than the market's return, over the first three months.

Panel B of Table 8.1 shows the return profile for the earnings momentum portfolios with a six-month holding period from January 1992 to December 2013. It is important to understand that at the beginning of each month, shares entering each portfolio under the six-month holding strategy are the same shares that would have entered the respective portfolios under the three-month holding strategy; however, those shares are just held for longer. The implication of this is two-fold. First, the first three months of the six month-holding return is the return of the respective quintile portfolio in Panel A. The second consideration is that the portfolio will contain a higher number of shares, due to the holding period being longer. For this reason, the market performance will be materially different over different holding periods.

The standout feature of Panel B is the magnitude of the returns relative to Panel A. Focusing on annualised returns, it is evident that holding shares that produce the highest level of earnings surprises for longer periods materially enhances the overall level of return. This finding alludes to the fact that the momentum in a company's share price that is in the Quintile 1 or Quintile 2 portfolio continues through to six months following the earnings announcement. Again, the returns of companies in the Quintile 3, Quintile 4 and Quintile 5 portfolios were not significantly different from the market return at the 5% level; however, the returns improved when increasing the holding period to six months.

Panel C and Panel D of Table 8.1 show the return and statistical significance for earnings momentum portfolios over nine- and 12-month holding periods respectively. The annualised return of the Quintile 1 and Quintile 2 portfolios actually decreased in comparison with the returns for three-month and six-month holding periods. Therefore, while the Quintile 1 and Quintile 2 portfolios outperformed the market over nine- and 12-month holding periods, and the outperformance is statistically significant at the 5% level, the outperformance is a result of the strong performance in the first six months as opposed to the continuation of the strong performance over longer holding periods. Therefore, it is important to understand that because of the same shares being held in the same quintile portfolios over different holding strategies, the performance over the longer holding periods is due to the strong performance of the portfolios in the first six months.

A number of studies found that PEAD extends up to periods of between 24 and 36 months following the earnings announcement (Bernard & Thomas, 1989:14; Doyle *et al.,* 2006:860). However, the studies also show that most of the PEAD takes place in the first quarter following the earnings announcement. The findings in this study are consistent with past findings in the sense that most of the PEAD takes place in the first six months, and while this is a longer period, the frequency of earnings announcements needs to be taken into account. The studies mentioned above were undertaken in the US where companies report earnings on a quarterly basis, while in South Africa, businesses are required to report earnings every six months. Thus, a large amount of new information becomes available every six months in the South African context, which will affect the returns of the portfolios in the various quintiles. And the fact that PEAD continues to exist following the business's next earnings announcement confirms the statement that market participants fail to appreciate what current earnings imply for future earnings (Brennan, 1991:70).

In contrast to the performance of Quintile 1 and Quintile 2, the performance of the Quintile 4 and Quintile 5 portfolios over holding periods of nine and 12 months actually improved in comparison with the shorter holding period returns. This result could be due to the new information that has become available following the subsequent earnings announcement.

The performance of the Quintile 3, Quintile 4 and Quintile 5 portfolios is not significantly different from that of the market over nine- and 12-month holding periods.

Table 8.2 shows the Sharpe ratios for the four different holding periods. The evidence indicates that on a risk-adjusted basis, earnings momentum remains a profitable strategy after adjusting for volatility risk. The six-month holding period remains the most profitable on a risk-adjusted basis for the Quintile 1 and Quintile 2 portfolios. The Quintile 4 and Quintile 5 portfolios' risk-adjusted returns increased the longer the holding period.

Table 8:2 Earnings momentum: Sharpe ratios for the five quintile portfolios and the market across the different holding periods

Sharpe Ratios (percent)						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3 Months	0.29	0.27	0.27	0.21	0.13	0.22
6 Months	0.35	0.35	0.31	0.22	0.22	0.27
9 Months	0.30	0.33	0.28	0.23	0.26	0.25
12 Months	0.32	0.33	0.29	0.24	0.27	0.26

The evidence above, and the statistical significance of it, results in the null Hypothesis 2 being rejected. Therefore, an earnings momentum strategy is accepted as profitable on the JSE.

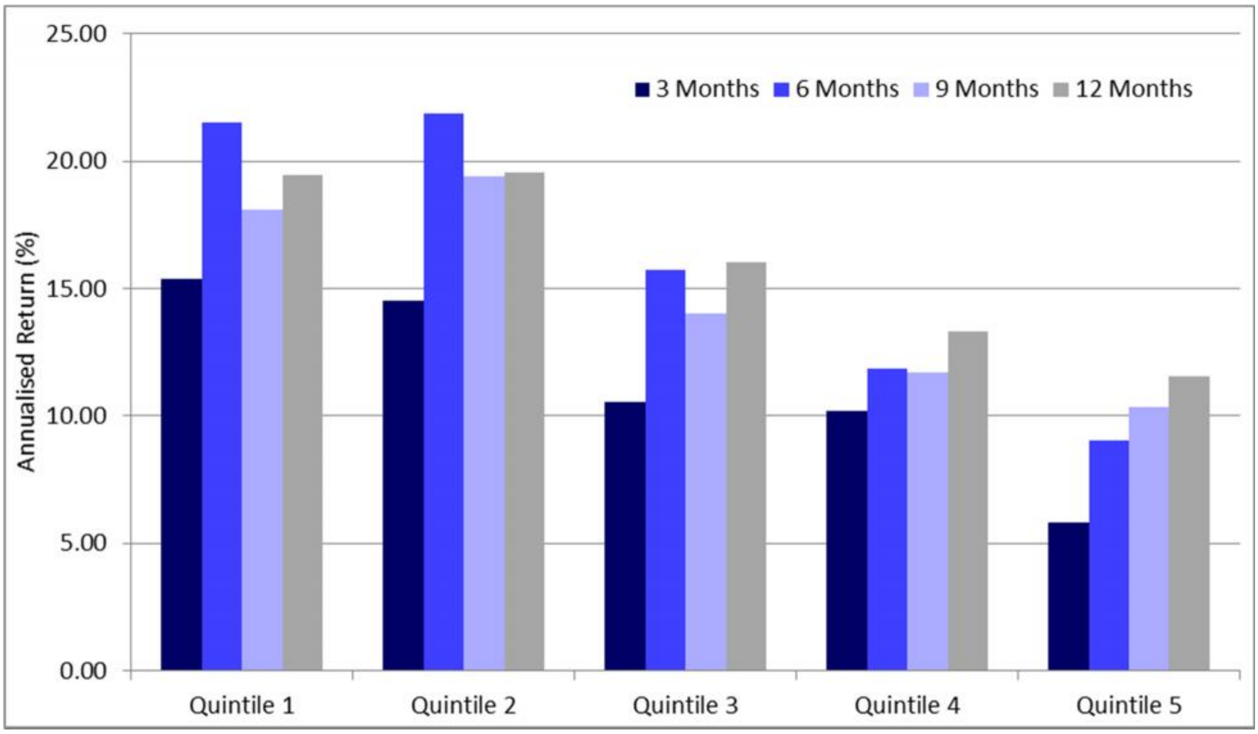
While it is clear that the Quintile 1 and Quintile 2 portfolios outperformed the market, it remains intriguing that the Quintile 2 portfolio outperformed the Quintile 1 portfolio when the holding period increases to six months and beyond. To try and understand the reason for this result, Table 8.3 presents the average annual growth of earnings for all companies in the various quintiles, based on their SUE. It becomes very important to understand that a company with a high or positive SUE does not necessarily have high earnings growth, but rather that there is a high or positive earnings surprise. And it is exactly for this reason that the Quintile 2 portfolio tended to outperform the Quintile 1 portfolio over longer holding periods. Over the three-month period directly following the earnings announcement, Quintile 1 shares outperformed all other quintiles as a result of having surprised the market the most. However, Table 8.3 shows that it is actually the shares in Quintile 2 that had the highest earnings growth over the previous year at the time of announcement. After the initial surprise of the earnings announcement, for which Quintile 1 companies appear to be rewarded over the initial three months, the market places emphasis on the fact that Quintile 2 companies actually produced the most impressive earnings growth. Quintile 4 and Quintile 5 not only produced the lowest earnings surprises, but they also produced very disappointing earnings growth. In order to improve the understanding of the earnings momentum anomaly, a suggestion for future studies would be to look at the future earnings growth of the companies in the various quintiles.

Table 8:3 Earnings momentum: average annual earnings growth in the year leading up to inclusion in the respective quintile portfolio

Average Annual Earnings Growth (%)				
Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
48.73	55.35	12.91	4.88	-33.20

Figure 8.1 is a bar chart that shows the annualised returns for each quintile for the different holding period strategies. The three-month holding strategy produces the lowest return relative to the other holding strategies, across all the quintile portfolios, indicating that although the market responds to earnings surprises on the up- and downside, it does not do so timeously, as further PEAD is evident in the following three months. Theoretically, when a business announces an earnings surprise, the share price should react immediately, with no further opportunity to exploit inefficient pricing. However, what Figure 8.1 depicts is that the market reacts to earnings surprises, but not immediately and rather over the course of the following six months. From an illustrative point of view, returns earned from the nine- and 12-month holding period strategy look similar to the returns earned from the six-month holding period strategy, suggesting that it takes a company’s share price six months to digest and reflect the earnings surprise and thereafter, abnormal returns are no longer likely, as new information becomes available.

Figure 8.1 Earnings momentum: annualised returns for all quintile portfolios over the three-, six-, nine- and 12-month holding periods



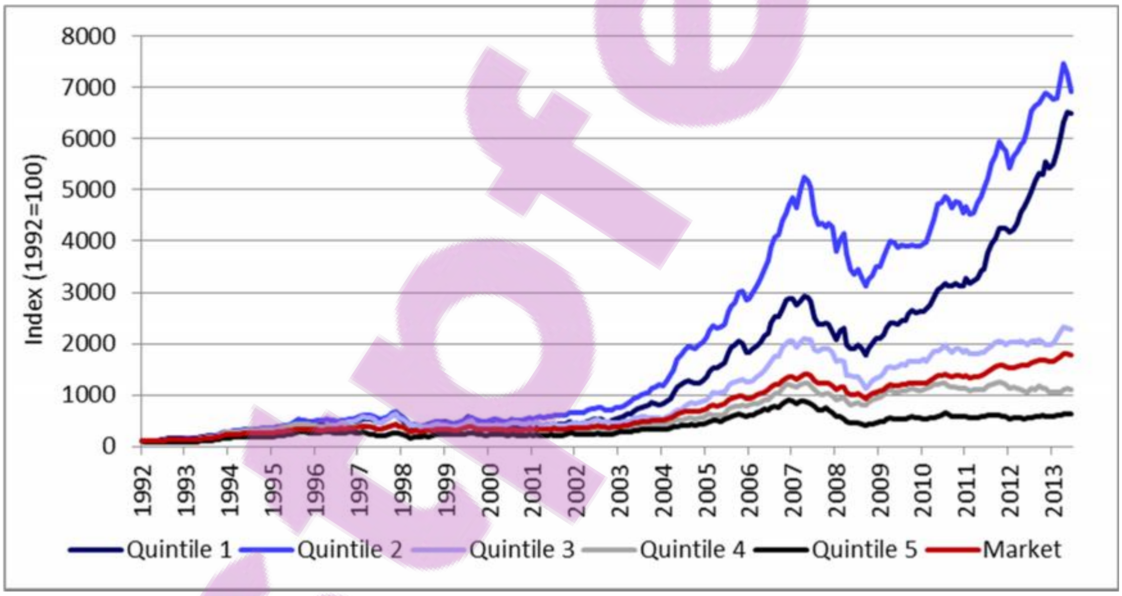
Indexing the monthly performance for the quintile portfolios across the different holding strategies allows one to see the cumulative total return that would have been earned had the respective strategy been followed over the time frame of this study. Figure 8.2 shows the index results for the six-month holding strategy. Figure 8.2 illustrates the results from Figure 8.1 with an indexed graph using the cumulative return series[5].

In conjunction with the indexed cumulative return graphs for the three-, nine- and 12-month holding strategy, found in Appendix 2, Figure 8.2 highlights the high opportunity cost of holding onto a share too long. The analysis shows that the market takes six months to fully reflect all the information contained in an earnings surprise. After the six-month period, no further abnormal gains are to be expected. As explained above, this is due to new information becoming available in the earnings announcement subsequent to the information used in the previous earnings announcement to sort the shares into their

[5] The cumulative return graphs for the remaining holding period strategies appear in Appendix 2.

respective quintiles, based on their SUE. Therefore, as companies report their next earnings announcement, they may no longer be in the appropriate quintile. Thus the optimal strategy should be, and is, to hold a share for six months following a positive earnings surprise and then to rebalance the portfolio based on the next earnings surprise. The analysis also shows that no real damage is done to the portfolio's returns if the shares are held for a longer period of up to 12 months. However, the cumulative index graphs highlight what the opportunity cost of holding the shares past the six-month holding period is. R100 invested in the Quintile 1 portfolio in January 1992 following the six-month holding strategy would have been worth R6,496 in December 2013, while R100 invested over the same time period in Quintile 1 under the nine-month and 12-month strategy, would have been worth R3,535 and R4,505 respectively.

Figure 8.2 Earnings momentum: indexed cumulative return for six-month holding period



While testing what happens in the months following an earnings announcement is important, it is also important to understand whether the market anticipates the surprise prior to the earnings announcement. Figure 8.3 shows what the average of all the share prices of the different quintiles did in the 12 months leading up to the announcement, which is depicted by graphing the average abnormal return of the different quintiles on an event-time plot. The average abnormal return of all the share prices is calculated by taking all of the shares for a given quintile, based on their SUE, calculating the cumulative abnormal return relative to the market portfolio for each of the 12 months prior to time t, when the company's earnings are announced. As an example at time t-12 months, all shares begin with zero abnormal cumulative returns. At time t-11 months, the average one-month abnormal return for all shares in a Quintile 1 portfolio is calculated, over the entire sample period. The same is done for the other four quintiles. The average of the aggregated total for each quintile is calculated. The same method is followed for the remaining months leading up to time t. Each month's average abnormal return is used to compound the previous month's abnormal return. The final result is the average cumulative abnormal return for each quintile, for the 12 months leading up to an earnings announcement. The average cumulative abnormal return depicts the market's anticipation of the earnings surprise.

Figure 8.3 Earnings momentum: average cumulative abnormal return for each of the quintile portfolios for the 12 months preceding the earnings announcement

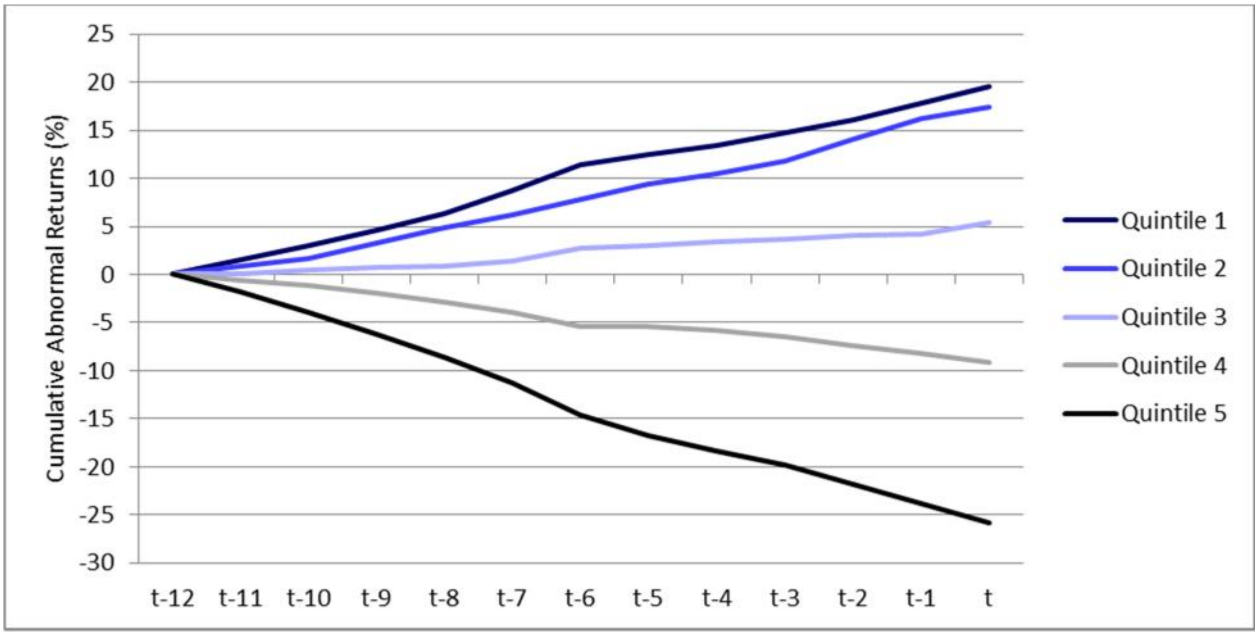
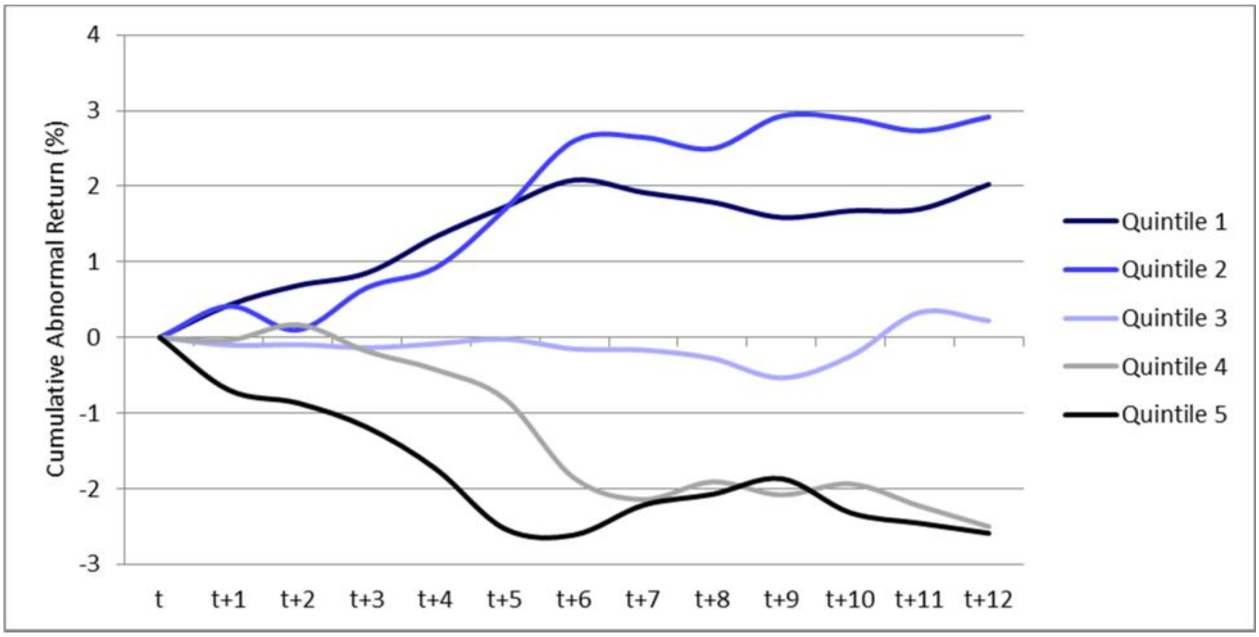


Figure 8.3 illustrates that the market does indeed anticipate positive earnings surprises, as well as negative earnings surprises, as early as 12 months prior to the earnings announcement. On average, shares that constitute the Quintile 1 and Quintile 2 portfolios at time t, produce a cumulative abnormal return of between 15% and 20%. At the opposite end of the spectrum, shares constituting the Quintile 5 and Quintile 4 portfolios, which are the

40% percent of the market that produces the lowest earnings surprises, produce a cumulative abnormal return of about -25% and -10% respectively. This is consistent with previous studies that have shown the market anticipation leading up to the earnings announcement (Bernard & Thomas, 1989:13; Foster *et al.,* 1984:588).

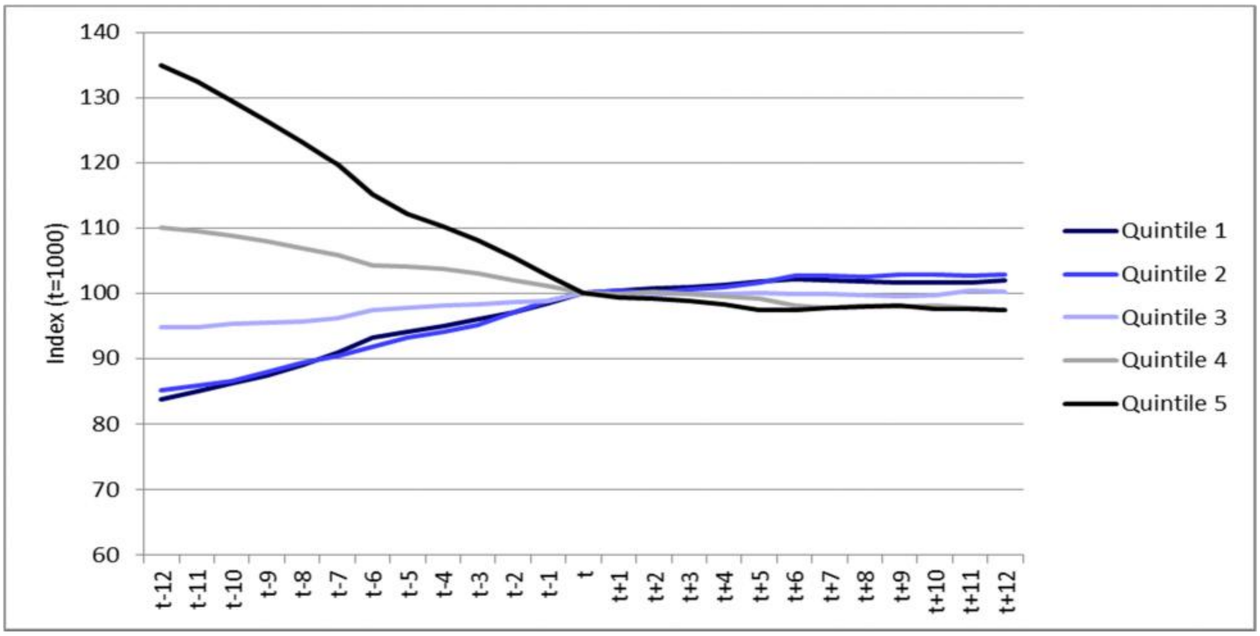
Following the same methodology, Figure 8.4 shows the average abnormal returns for all the shares in a particular quintile for the 12 months following the earnings announcement. The result is again expected and is just another variation of showing the profitability of the earnings momentum strategy on the JSE.

Figure 8.4 Earnings momentum: average cumulative abnormal return for each of the quintile portfolios for the 12 months following the earnings announcement



Comparing Figure 8.3 and Figure 8.4, it becomes evident that the market anticipates the earnings surprises and that the majority of the share price adjustment takes place prior to the earnings announcement, as opposed to after the earnings announcement. Figure 8.5 is an event-time plot illustrating this by combining the 12-month average abnormal return for the 12 months preceding and 12 months following portfolio formation.

Figure 8.5 Earnings momentum: average cumulative abnormal return for each of the quintile portfolios for the 12 months preceding and following the earnings announcement



8.3 RISK FACTORS AND EARNINGS MOMENTUM

Fama and French (1996:56) state that their three-factor risk model cannot explain the earnings momentum anomaly. Therefore, while it is expected that earnings momentum is not a result of investors being compensated for risk in the form of a size effect or value effect, it nevertheless remains important to calculate these risk factors for the sub-portfolios of each quintile, as well as the portfolio as a whole, to ensure that the same finding holds true in the case of earnings momentum on the JSE.

Again, it is necessary to calculate both the median and mean of each risk factor to negate outliers from influencing the results. This is especially important for the size effect, given the nature of the JSE, as discussed previously; however, it is also important to do so for the value factors as well.

8.3.1 Size factor

The average and median market capitalisations for each of the quintile portfolios, across the different holding strategies, are shown in Table 8.4. The market capitalisations of the portfolios are calculated at the end of each month, and then the average and median market capitalisations for each portfolio are calculated over the duration of the study.

In one of the earlier studies that attempted to explain the earnings momentum anomaly, Bernard and Thomas (1989:11) found that smaller shares tended to have larger PEAD, but that all shares had PEAD to some extent. As a result of this finding, and because the Quintile 1 and 2 portfolios outperformed, as shown above, the expectation is that if a size effect is present, the Quintile 1 and 2 portfolio would, on average, hold smaller market capitalisation businesses.

Table 8:4 Earnings momentum: average and median market capitalisation of the shares included in each quintile portfolio for the different holdings periods

Market Capitalisations (Rm)								
	3 Months		6 Months		9 Months		12 Months	
	Average	Median	Average	Median	Average	Median	Average	Median
Quintile 1	11 192	2 233	10 288	1 853	10 120	1 860	9 906	1 826
Quintile 2	9 621	1 382	8 708	930	8 725	973	8 714	973
Quintile 3	6 114	905	5 856	498	5 928	508	5 919	493
Quintile 4	5 008	830	4 640	497	4 659	460	4 551	415
Quintile 5	2 739	400	2 421	284	2 412	274	2 403	255

Unlike price momentum in Section 7.3.1, where there was no pattern or trend evident in the average and median market capitalisations of the portfolios, Table 8.4 shows two clear trends: first, the market capitalisations decline when comparing the quintile portfolios within a specific holding strategy; second, the market capitalisations decline when comparing the three-month holding strategy against longer holding strategies, across all the quintile portfolios. Holding strategies longer than three months have very similar market capitalisations. Both of these patterns are evident when looking at the average or the median market capitalisations. This result is not consistent with previous research where smaller businesses had higher PEAD (Bernard & Thomas, 1989:11).

The median market capitalisations for all quintile portfolios across all holding strategies are significantly smaller than the average market capitalisations. This is expected due to the fact that there are a small number of very large companies that result in the distribution of the market capitalisations being skewed to the right.

The Quintile 1 portfolio has the largest market capitalisation, with the market capitalisations decreasing to the higher the quintile portfolios. The Quintile 1 portfolio, which outperforms the market, goes against the findings of Banz (1981:3-18). Banz (1981:3-18) shows that smaller shares have higher returns, due to the size effect. Because the Quintile 1 portfolio has the largest market capitalisation, and the quintiles are formed based on company earnings surprises as measured by their SUE, by definition, large capitalisation businesses produce the largest positive earnings surprises, and they have the largest PEAD, as shown in Table 8.1. This result is important for two reasons: first, because of the limited analyst coverage across the South African market, the expectation is that large market capitalisation businesses would have relatively small earnings surprises; second, the nature of the South African market where a small number of very large businesses constitute a very large portion of the market results in large institutional managers only being able to invest in large companies. Therefore, given that institutional investors are sophisticated investors, they should react timeously to new information resulting in smaller PEAD in large companies and larger PEAD in small companies, which is in contrast to the findings.

Figure 8.3 gives insight into why market capitalisations for businesses producing the highest earnings surprises are larger than those for businesses announcing the lowest earnings surprises, and that is due to the fact that the market anticipates the earnings surprises, and the share price reacts accordingly in the 12 months prior to the announcement. However, from Figure 8.3, the differences in the average share price returns in the 12 months leading up to the announcement across the quintiles are not divergent enough to explain the difference in the market capitalisations in their entirety. Further work is required to explain this, which is beyond the scope of this study.

The market capitalisations across the different holding strategies remain fairly consistent, which is expected given that the same shares that are selected for the three-month holding strategy will be selected for the six-, nine- and 12-month strategies. The market capitalisations will, however, differ slightly given that the shares are obviously held for different time periods for the different strategies, which will change the composition of the portfolios to a limited extent.

Calculating the average and median market capitalisation gives a sense of whether size helps explain the earnings momentum anomaly; however, it does not allow for a statistically significant conclusion to be reached. In order to reach such a conclusion, regression analysis is required, which will show to what extent market capitalisations affect share price performance, along with the statistical significance of such, and whether or not it is a size effect that explains earnings momentum.

8.3.2 Value factors

The average and median PE and PB ratios for each of the quintile portfolios, across the different holding strategies, are shown in Table 8.5 and Table 8.6 respectively. The ratios for the portfolios are calculated at the end of each month, and then the average and median ratios for each portfolio are calculated over the duration of the study.

The PE ratios in Table 8.5 show no clear evidence that investors are being compensated due to a value factor. Quintile 5 portfolio's PE ratios are materially higher than the other quintile portfolio's PE ratios. A plausible explanation for this finding is that the lower PE ratios are due to the fact that the average earnings growth of the companies in Quintile 5 is negative, according to Table 8.3. This indicates that earnings are actually shrinking, which results in the denominator of the PE ratio declining and, in turn, causing the PE ratio to increase.

As expected, the median PE ratios differ slightly from the average PE ratios, but not materially so. The difference is more exaggerated in Quintile 5 as opposed to the other quintiles. This indicates that there are a small number of companies with very large PE ratios, which are more likely to be the result of earnings having collapsed rather than the share price rising.

Table 8:5 Earnings momentum: average and median PE ratios of the shares included in each quintile portfolio for the different holdings periods

PE Ratios								
	3 Months		6 Months		9 Months		12 Months	
	Average	Median	Average	Median	Average	Median	Average	Median
Quintile 1	13.17	11.87	13.05	11.90	13.00	11.80	12.97	11.76
Quintile 2	11.80	10.43	11.70	10.26	11.70	10.25	11.68	10.21
Quintile 3	12.35	10.36	12.45	10.34	12.51	10.42	12.53	10.38
Quintile 4	12.93	10.53	12.76	10.32	12.76	10.30	12.79	10.35
Quintile 5	15.62	12.06	15.24	11.58	14.99	11.44	14.90	11.38

The PB ratios in Table 8.6 provide a contrasting picture to that of the PE ratios shown in Table 8.5. Quintile 1 portfolios, across the different strategies, have the largest PB ratios. Quintile 5 portfolios have the smallest PB ratios, across the different holding periods. This is in contrast to the literature (Auret & Sinclaire0 2003:35), where shares with low PB ratios are shown to outperform. The book value of a company is built up over many years of retaining earnings and growing assets and is therefore much more stable as opposed to the trailing 12-month earnings of a company. Thus the fact that the PB ratios of Quintile 1 and Quintile 2 portfolios are very high in comparison with the ratios of the other quintiles, indicates that it is price movement that causes the PB ratio to be high, as opposed to collapsing book values. Figure 8.3 confirms this theory given that investors anticipate high earnings surprises in the 12 months leading up to the earnings announcement.

Similar to the PE ratios above, the median and average PB ratios differ slightly, as would be expected. The median PB ratio is smaller than the average PB ratio, which indicates that the distribution of the data is skewed to the right.

Table 8:6 Earnings momentum: average and median PE ratios of the shares included in each quintile portfolio for the different holding periods

PB Ratios								
	3 Months		6 Months		9 Months		12 Months	
	Average	Median	Average	Median	Average	Median	Average	Median
Quintile 1	3.36	2.44	3.40	2.45	3.33	2.40	3.32	2.39
Quintile 2	2.26	1.64	2.32	1.59	2.27	1.56	2.28	1.55
Quintile 3	1.79	1.27	1.78	1.24	1.78	1.22	1.77	1.22
Quintile 4	1.70	1.15	1.73	1.13	1.71	1.12	1.71	1.11
Quintile 5	1.48	0.90	1.44	0.86	1.46	0.88	1.48	0.88

Calculating the average and median value factors gives a sense of whether the value factors help explain the earnings momentum anomaly; however, it does not allow for a statistically significant conclusion to be reached. In order to reach such a conclusion, regression analysis is required, which will show to what extent each of the value factors affects share price performance, along with the statistical significance of the factor, and whether or not these factors explain earnings momentum.

8.3.3 Factor loadings

The factors from the Fama and French three-factor model are employed in order to determine whether earnings momentum captures these risk factors and if they do, whether these risk factors are statistically significant. To calculate the factor loadings of these factors, Fama and Macbeth (1973:616) cross-section regressions are used. The regressions are estimated monthly for all shares in each specific quintile, using the forward excess 12-month return relative to the risk-free rate. By calculating the mean and the standard deviation of the time series of the explanatory regression coefficients that were extracted over the entire period, it is possible to calculate the statistical significance of the factor loadings, and whether they played a role in explaining the results.

The cross-section regression model is as follows:

$$(RS_{t+i} - RF_{t+i}) = \beta_0 + \beta_1(RM_{t+i} - RF_{t+i}) + \beta_2(PB\ Ratio_t) + \beta_3(Market\ Capitalisation_t) + \varepsilon_{t+1} \qquad (8.1)$$

where i represents months used in calculating the returns, RS represents the return of the share, RF is the return of the risk-free rate and RM is the equal-weighted return of all investable shares.

Table 8.7 contains the factor loadings for each of the risk factors for the different quintiles and across the various holding strategies. Each panel shows the risk factor loadings for the various holding period strategies, as well as the level of statistical significance for each of the factor loadings, as depicted by the p-values.

The quintile portfolios are expected to be well diversified given that all available shares in a given time period are included in at least one portfolio. Therefore, β_1 is not expected to be materially different from one. β_1 is a measure of the exposure the portfolio has to market risk, typically referred to as beta. However, it is important to bear in mind that this beta is slightly different from the beta calculated in the capital asset pricing model (CAPM) due to the added risk factors.

Based on historical research, the value and size factors, as measured by β_2 and β_3, are not expected to be statistically significant due to the fact that the Fama and French three-factor model cannot explain the persistence of the earnings momentum anomaly in the international literature. However, there appears to be a trend in Tables 8.4-8.6, which may indicate that another risk factor could potentially explain the results.

Focusing on the factor loadings for the PB ratio, the signs are inconsistent across the various quintile portfolios. Quintile 1 and Quintile 5 portfolios have positive factor loadings, with the exception of Quintile 5 in Panel A. This finding indicates that as the PB ratio increases, returns for those portfolios increase. Theoretically, this does not make sense, and given that, with the exception of Quintile 1 in Panel A, all the factor loadings for the PB ratio are statistically insignificant, the conclusion is that PB does not influence the earnings momentum results.

Table 8:7 Earnings momentum: factor loadings for the market, value and size risk factors for all quintile portfolios

Factor Loadings - Earnings Momentum					
Panel A - 3 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	1.0394	1.1853	1.1399	1.3788	1.0839
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	1.4887	-0.0971	-0.9341	-0.4225	-0.1392
p-value	0.01	0.89	0.17	0.59	0.84
B_3 (size)	-0.9313	0.0396	0.4651	-0.4648	-0.2362
p-value	0.00	0.90	0.13	0.20	0.50
Panel B - 6 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	1.0547	1.3082	1.1180	1.3731	1.0788
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	1.5254	-0.7462	-2.0954	-0.9873	1.9045
p-value	0.10	0.49	0.04	0.37	0.08
B_3 (size)	-1.6478	-1.0990	0.4307	-0.9110	-1.5878
p-value	0.00	0.02	0.35	0.08	0.00
Panel C - 9 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	0.9820	1.2801	1.1468	1.3466	1.0379
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	1.8577	-0.2271	-2.8839	-2.0503	0.2619
p-value	0.11	0.87	0.03	0.11	0.85
B_3 (size)	-1.5110	-1.5031	0.5564	0.1432	-2.1193
p-value	0.00	0.01	0.35	0.81	0.00
Panel D - 12 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	0.9538	1.1993	1.2765	1.2200	1.0257
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	2.2073	-1.9741	-3.9752	-3.8302	0.1431
p-value	0.13	0.22	0.02	0.01	0.93
B_3 (size)	-1.8016	-0.8488	-0.0788	0.3799	-1.4358
p-value	0.01	0.23	0.92	0.60	0.07

The size factor loadings for Quintile 1 and Quintile 5 are negative and statistically significant at the 5% level, except for Quintile 5 in Panel D. The factor loadings for Quintile 1 are lower (more negative) than for Quintile 5, indicating that Quintile 1 is more sensitive to the size risk factor than Quintile 5. However, Quintile 5 is more sensitive to the size risk factor than Quintiles 2, 3 and 4. These results are ambiguous, and not sufficient to conclude that a size effect plays a role in explaining the earnings momentum anomaly.

These findings indicate that no value and size factors influence the earnings momentum anomaly on the JSE. Therefore, both null Hypotheses 2a and 2b are not rejected.

8.4 SUMMARY

This chapter presented the results obtained when testing whether the earnings momentum anomaly, which was first documented by Ball and Brown (1968:169-171), was also profitable on the JSE. Competing theories about the underlying cause of the anomaly were discussed, but testing the statistical significance of these theories is beyond the scope of the study.

Following the strategy used by Foster *et al.* (1984:582), which employed the SUE methodology as a proxy for earnings surprises, earnings momentum was found to be profitable on the JSE for up to 12 months following the earnings announcement. The portfolios tested were constructed using an equal-weighting methodology, and the returns earned on the Quintile 1 and Quintile 2 portfolios were shown to be statistically different from the market portfolio at the 5% level of significance. As a result, the null Hypothesis 2 was rejected. The Quintile 3, Quintile 4 and Quintile 5 portfolios did not produce returns that were statistically different from those of the market portfolio.

Consistent with earlier research, while PEAD was shown to be profitable up to 12 months following the earnings announcement for the Quintile 1 and Quintile 2 portfolios, most of the PEAD took place within the first six months following the earnings announcement. After the initial six months, very little PEAD was evident, and some signs of reversion became evident. While returns of the nine-month and 12-month holding strategies remained statistically higher than those of the market portfolio, the outperformance was due to the PEAD of the portfolio in the initial six months. Therefore, the most profitable earnings momentum strategy is the six-month holding strategy.

The Quintile 1 and Quintile 2 portfolios not only produced the highest SUE, but their earnings growth in the year leading up to the quintile formation was also the highest. Quintile 2's earnings growth though was the highest, which resulted in the Quintile 2 portfolio producing the highest returns.

Investors were also shown to anticipate earnings surprises up to 12 months prior to the earnings announcement. So while PEAD does exist, most of the information contained in the earnings announcement is priced in the share price prior to the earnings announcement. This finding also indicates that companies producing high positive earnings announcement have the highest earnings growth in the year leading up to the earnings announcement, while those with the lowest earnings surprises have the lowest earnings growth. Table 8.3 supports this statement.

In order to ensure that the earnings momentum anomaly is not caused by another factor, such as size or value, the average and median market capitalisations, PB ratios and PE ratios of the portfolios were tested. The size of the portfolios indicated that Quintile 1 portfolios were the largest, across all the holding strategies, while the Quintile 5 portfolios were the smallest. This finding held for both the average and median market capitalisations. The Quintile 5 portfolio had the highest PE ratio across all the holding strategies, while the PB ratio of the Quintile 1 portfolio was the highest. This is puzzling given that they are at odds with each other, and therefore probably indicates that no value effect influences the results.

To test statistically whether a size or value effect explains the earnings momentum anomaly, multivariable regressions were undertaken to calculate the factor loadings on each of the size and value factors. The evidence of the size risk factor was found to be ambiguous, while the value factors were statistically insignificant. As a result, more work is required to determine whether the size effect influences, and helps explain, the earnings momentum anomaly. Therefore, the null Hypotheses 2a and 2b were not rejected.

In conclusion, earnings momentum is a profitable strategy on the JSE; however, further research, which is beyond the scope of this study, is required to better understand the underlying drivers of this earnings momentum, given that it is only profitable for Quintile 1 and Quintile 2 portfolios.

CHAPTER 9

RESULTS ANALYSIS: PRICING FUNDAMENTAL MOMENTUM

9.1 INTRODUCTION

This chapter presents the empirical findings of the profitability of following a fundamental momentum trading strategy and discusses whether the results may be due to a size or value risk factor. The aim of the chapter is to either reject or accept the null Hypotheses 3, 3a and 3b, presented in Section 5.4.3.

The chapter begins by discussing the profitability of a simple sort strategy based on the fundamental momentum of earnings. A single-factor regression analysis is employed to determine the statistical significance of the returns generated by the sort strategy. The size and value risk factors are accounted for to ensure that fundamental momentum does not capture a specific risk factor. The chapter concludes by investigating how sustainable the fundamental momentum of earnings is. The sustainability of fundamental momentum is measured by the consecutive number of years that positive fundamental momentum of earnings is achievable. The profitability of investing in shares backed by businesses that can produce consecutive years of positive fundamental momentum of earnings is also calculated and discussed, before the chapter is concluded. The terms *fundamental momentum* and *fundamental momentum of earnings* are used interchangeably in this chapter.

9.2 PROFITABILITY OF FUNDAMENTAL MOMENTUM STRATEGIES ON THE JSE

Fundamental momentum is defined as the difference between the change of a fundamental variable over consecutive time periods. Therefore, fundamental momentum of earnings calculates whether a business's earnings are increasing or decreasing, at an increasing or decreasing rate, over time. To help the understanding of the empirical results, it is important to remember that sustained positive fundamental momentum of earnings would be a direct contradiction of the widely accepted theory of mean reversion of earnings (Fama & French, 1995:136; Lipe & Kormendi, 1994:37; Penman, 1991:237-238; Sloan, 1996:301).

As a reminder, how the quintile portfolios were constructed, fundamental momentum of earnings over one year was calculated for each business at the month end following the release of the year-end or interim year-end results. All businesses that reported earnings in a given month were sorted based on their fundamental momentum of earnings and placed in the correct quintile portfolio in an equal weight. The holding periods were three, six, nine and 12 months.

The observations began from the date of January 1992 as opposed to January 1990. This is due to the fact that two years are required to calculate fundamental momentum of earnings, therefore, portfolio formation could only take place from January 1992.

The profitability of constructing equal-weighted portfolios based on the fundamental momentum of earnings on the JSE is illustrated in Table 9.1. The table is divided into four separate panels, with each panel highlighting the returns and statistical significance of the various holding periods for the different quintiles, and the market, following portfolio formation. In each panel, the annualised return, average monthly return and the average monthly outperformance relative to the market return are shown. The p-values are calculated and shown in the last row of each panel. These values are used to test whether the returns produced by the various quintile portfolios are significantly different from the market return. The null hypothesis is that the returns are not significantly different from those of the market. A one-tail test is used to determine whether the returns produced by Quintile 1 and Quintile 2 are significantly higher than those of the market, whereas for Quintile 4 and Quintile 5, a one-tail test is conducted to determine whether the returns produced by those quintiles are lower than those of the market. A two-tail test is used to determine whether the returns of Quintile 3 are significantly different, in either direction, from those of the market.

Panel A of Table 9.1 shows the return profile for the earnings momentum portfolios with a three-month holding period from January 1992 to December 2013. The Quintile 1 portfolio is constructed by holding the 20% of businesses with the largest fundamental momentum of earnings, while the Quintile 5 portfolio is constructed by holding the 20% of businesses with the lowest fundamental momentum of earnings. The market portfolio is formed by holding all the companies that are included in the five quintile portfolios in an equal weight. The annualised return is calculated by annualising the performance of the portfolios from the beginning of the period to the end of the period, while the average monthly return performance is calculated by taking the average month-on-month performance of the portfolios for the duration of the study.

Table 9:1 Fundamental momentum: profitability of the fundamental momentum strategy and the statistical significance across the five quintile portfolios and the market

Momentum Profitability and Statistical Significance – Jan 1992 to Dec 2013						
Panel A – 3 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	18.73	9.83	12.72	14.62	2.20	11.81
Average Monthly Return	1.57	0.94	1.13	1.25	0.33	1.03
Average Monthly Abnormal Return	0.54	-0.09	0.10	0.22	-0.71	-
p-Value	0.00	0.28	0.27	0.10	0.00	-
Panel B – 6 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	25.13	16.98	16.38	15.78	5.78	15.99
Average Monthly Return	1.99	1.43	1.37	1.32	0.58	1.33
Average Monthly Abnormal Return	0.66	0.10	0.04	-0.01	-0.75	-
p-Value	0.00	0.19	0.36	0.46	0.00	-
Panel C – 9 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	21.95	14.35	14.81	14.98	5.89	14.39
Average Monthly Return	1.76	1.24	1.25	1.26	0.59	1.22
Average Monthly Abnormal Return	0.55	0.03	0.04	0.04	-0.63	-
p-Value	0.00	0.40	0.35	0.35	0.00	-
Panel D – 12 Months						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**	**Market**
Annualised Return	22.80	16.11	16.03	15.60	7.90	15.66
Average Monthly Return	1.82	1.36	1.34	1.30	0.74	1.31
Average Monthly Abnormal Return	0.52	0.06	0.04	-0.01	-0.57	-
p-Value	0.00	0.28	0.35	0.47	0.00	-

Using a three-month holding period, the Quintile 1 portfolio returned an annualised return of 18.7% over the period of the study. This is in contrast to the Quintile 5 portfolio, which returned an annualised return of 2.2%, using the same strategy. The difference between the annualised returns of the two extreme portfolios is apparent. Both relative to one another and relative to the market, the Quintile 1 portfolio outperformed both by a large margin, while the Quintile 5 portfolio underperformed. The Quintile 2, Quintile 3 and Quintile 4 portfolios' annualised returns present a different trend. The Quintile 3 portfolio and the Quintile 4 portfolio outperformed the market, while the Quintile 2 portfolio underperformed the market.

In terms of the statistical significance of the returns generated by the quintile portfolios, the null Hypothesis 3 states that the returns are not significantly different from the market return. The one-tail tests of the Quintile 1 and Quintile 5 portfolios result in the null hypothesis being rejected in Panel A. The p-values of the Quintile 2 portfolio, Quintile 3 portfolio and Quintile 4 portfolio result in the null hypothesis being accepted. Therefore, statistically, the Quintile 1 portfolio's outperformance relative to the market is statistically significant, along with Quintile 5 portfolio's underperformance.

Panel B of Table 9.1 shows the returns generated by the quintile portfolios for a six-month holding period. The construction strategy of the portfolios in Panel B is identical to the strategy of the portfolios in Panel A. Therefore, shares will be selected for the same quintile portfolios, the only difference being that the shares are now held for longer periods. Given this, the first three months of the return generated over the six-month holding period is the same as that of Panel A. However, as a result of holding the shares for longer periods, and given that shares enter and exit the portfolio on a monthly basis, the portfolios will hold a higher number of shares. Table 9.2 shows the average number of shares held in each quintile portfolio for each holding period over the duration of the study.

Similar to the results of earnings momentum, it is evident from Panel B that holding shares for a period longer than three months materially enhances the overall returns of all of the quintile portfolios, as well as the market. However, despite the difference in magnitude, increasing the holding period to six months does not change the result. The Quintile 1 portfolio again outperformed the market, and this outperformance is statistically significant at the 5% level. The Quintile 5 portfolio underperformed the market, which again is statistically significant at the 5% level.

Table 9:2 Fundamental momentum: average number of shares held per each quintile portfolio across the different holding periods

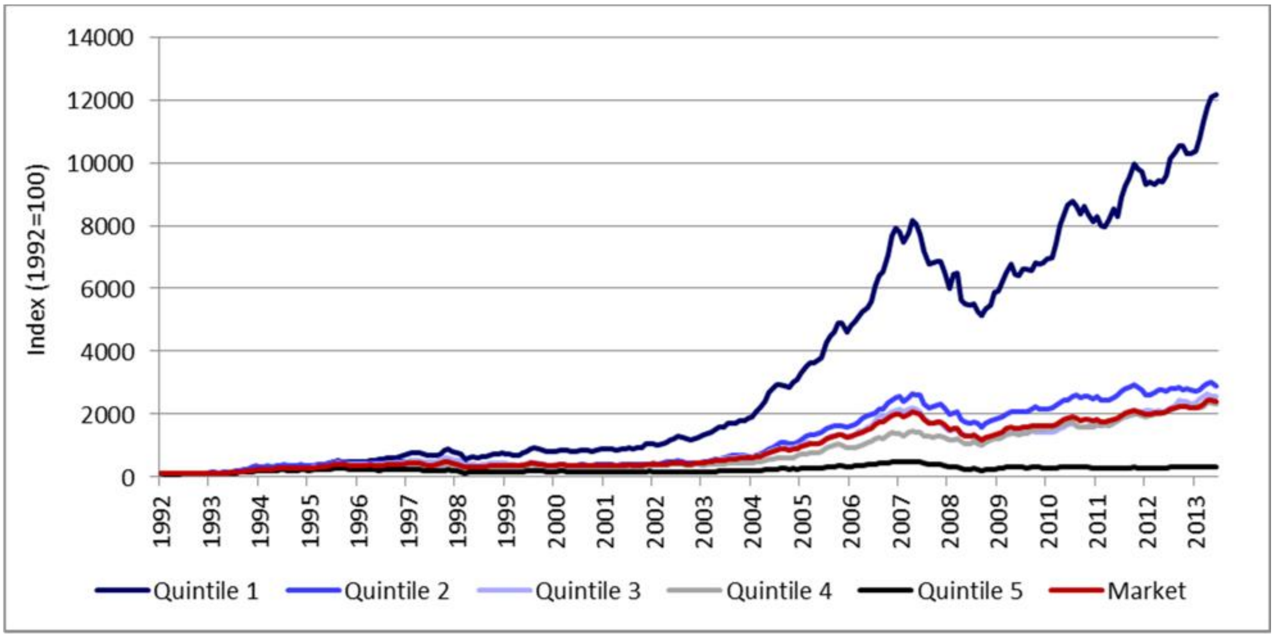
Average Number of Shares Held– Jan 1992 to Dec 2013	
Holding Period	**Average Number of Shares**
3 Months	19.98
6 Months	39.97
9 Months	60.06
12 Months	80.13

Two possible reasons for the increased magnitude of returns that are apparent if shares are held for a longer period than three months are that the market takes time to digest the results after they are announced, and the price momentum that the shares may have enjoyed prior to the earnings announcement continues for a period of up to six months. A delayed price reaction to company-specific information is a potential explanation for price momentum that Jegadeesh and Titman (1993:89) put forward. Jegadeesh and Titman (1993:84) showed that the first month following an earnings announcement, the share prices did not produce returns that were significantly different from those of the market. For this reason, if the first month of the three-month holding period does not produce returns significantly different from those of the market, the three-month holding period returns would be slightly lower than those of the longer six-month holding period. This can clearly be seen by comparing the Quintile 1 portfolio's return over a three-month and a six-month holding period. Over a three-month holding period, the Quintile 1 portfolio produced an abnormal return of 0.55% per month, while over a six-month holding period, this increased to 0.66% per month. Compounding the difference over a long period of time makes a material difference in overall returns generated. This point is highlighted in Figure 9.1, showing the indexed graphs of the nominal cumulative performance following a fundamental momentum strategy and using a six-month holding period[6].

[6] The cumulative return graphs for the remaining holding period strategies are shown in the appendix.

Extending the holding periods further to nine and 12 months, the returns generated are shown in Panel C and Panel D respectively. The overall results do not differ from those of a three- or six-month holding strategy. The Quintile 1 and Quintile 5 portfolios' returns were significantly different from those of the market, and the Quintile 2, Quintile 3 and Quintile 4 portfolios' returns were not significantly different from those of the market.

Figure 9.1 Fundamental momentum: indexed cumulative return for six-month holding period



With respect to the magnitude of the returns, holding periods of longer than six months produce monthly abnormal returns that are more muted than those produced when a six-month holding period is employed. Therefore, Quintile 1 portfolios' returns were lower, and Quintile 5 portfolios' returns were higher than a six-month holding period returns. These results mirror those of the results for earnings momentum. Returns generated by following an earnings momentum strategy were also at their highest over a six-month holding period. The reason posited in Chapter 8 for the six-month holding period being superior to longer holding periods was that earnings are reported every six months, and thus as new information becomes available six months after a share is included in a portfolio, there is new information that begins to influence the share price.

An important feature of the results is the difference in returns generated by Quintile 1 portfolios and Quintile 5 portfolios, across all holding periods. Comparing annualised returns, the difference between the returns generated by the two extreme portfolios for a three-month holding strategy is 16.5% per annum. The differences for a six-, nine-, and 12-month holding strategy are 19.4%, 16.1% and 14.9% respectively. There are no significant differences between the Quintile 2, Quintile 3 and Quintile 4 portfolios' returns and those of the market across all holding periods.

The results due to constructing portfolios based on the fundamental momentum of earnings are different in one fundamental way from those found using a price momentum and an earnings momentum construction methodology. Only the two extreme portfolios (Quintile 1 and Quintile 5) of the fundamental momentum portfolios produce results which are significant different from the market. The earnings momentum methodology also produces results that are statistically different from the market in Quintile 2, while the price momentum methodology generates returns that are also statistically different in Quintile 2 and Quintile 4.

Table 9.3 shows the Sharpe ratios for the four different holding periods. The evidence indicates that on a risk-adjusted basis, fundamental momentum remains a profitable strategy after adjusting for volatility risk for the Quintile 1 portfolio, across all holding periods. Likewise, the Quintile 5 portfolio materially underperformed the market after taking risk into account.

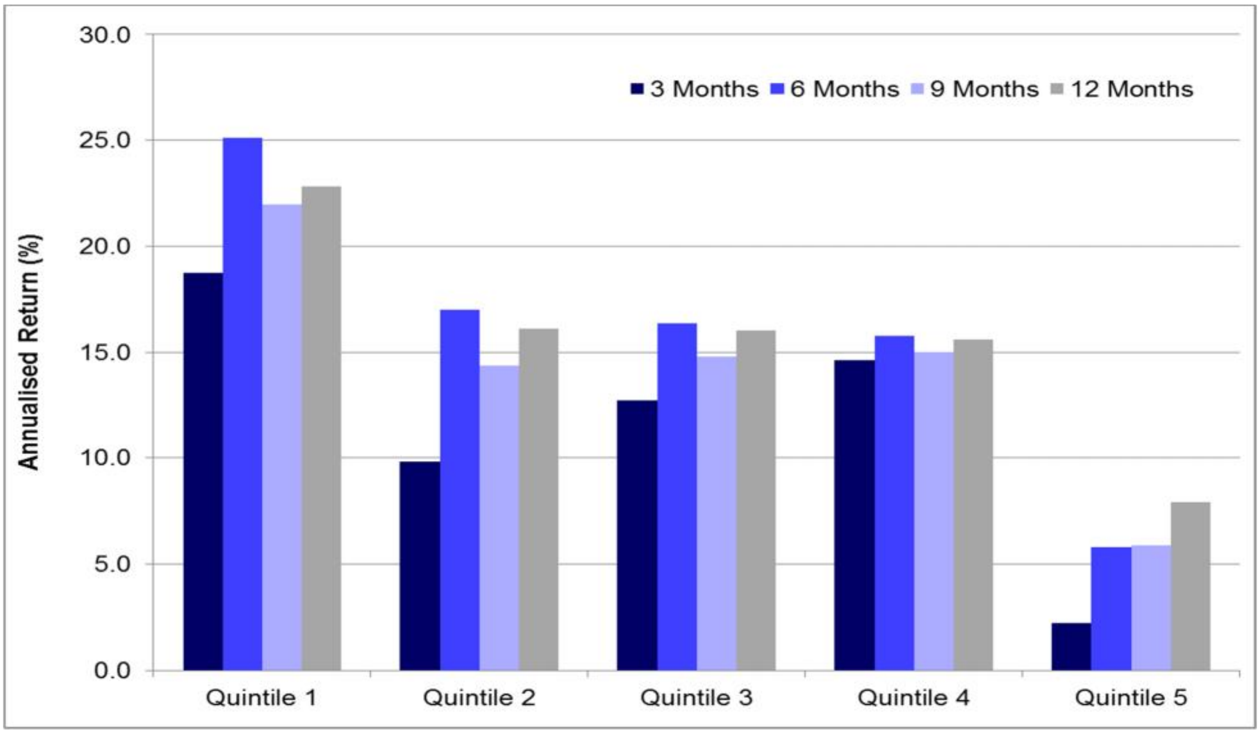
Table 9:3 Fundamental momentum: Sharpe ratios for the five quintile portfolios and the market across the different holding periods

Annualised Returns (percent)						
Strategy	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Market
3 Months	0.34	0.23	0.27	0.26	0.06	0.24
6 Months	0.35	0.27	0.35	0.30	0.15	0.29

9 Months	0.32	0.26	0.33	0.30	0.15	0.27
12 Months	0.33	0.28	0.33	0.31	0.19	0.29

Figure 9.2 is a bar chart that shows the annualised returns for each quintile for the different holding period strategies. As is evident from Table 9.1, the three-month holding strategy produces the lowest return relative to the other holding strategies across all the quintile portfolios. Theoretically, when a company announces earnings, the share price should react immediately, with no further opportunity to exploit inefficient pricing. However, what Figure 9.2 depicts is that the market reacts to fundamental momentum, but not immediately and rather over the course of the following 12 months. From an illustrative point of view, returns earned from the nine- and 12-month holding period strategy look somewhat similar to the returns earned from the six-month holding period strategy, suggesting that it takes a business's share price six months to reflect the information contained in fundamental momentum and thereafter, abnormal returns are no longer likely, as new information becomes available. This is a similar result to that of the earnings momentum strategy.

Figure 9.2 Fundamental momentum: annualised returns for all quintile portfolios over the three-, six-, nine- and 12-month holding periods



Indexing the monthly performance for the quintile portfolios across the different holding strategies allows one to see the cumulative total return that would have been earned had the respective strategy been followed over the time frame of this study.

Figure 9.1 highlights the high opportunity cost of holding onto a share too long. This finding is identical to the same finding in Section 8.2. The analysis shows that the market takes six months to fully reflect all the information contained in fundamental momentum, which is the same finding for earnings momentum. After the six-month period, no further abnormal gains are to be expected. As explained above, this is due to new information becoming available in the earnings announcement subsequent to the previous earnings announcement upon which the shares were sorted into their respective quintiles, based on their fundamental momentum of earnings. Therefore, as businesses report their next earnings announcement, they may no longer be in the appropriate quintile. Thus, the optimal strategy should be, and is, to hold a share for six months following an earnings announcement and then to rebalance the portfolio based on the level of fundamental momentum at the next earnings announcement. The analysis also shows that no real damage is done to the portfolio returns if the shares are held for a longer period of up to 12 months. However, the cumulative index graphs highlight what the opportunity cost of holding the shares past the six-month holding period is. R100 invested in the Quintile 1 portfolio in January 1992 following the six-month holding strategy would have been worth R12,170 in December 2013, while R100 invested over the same time period in Quintile 1 under the 9-month and 12-month strategy would have been worth R7,016 and R8,135 respectively.

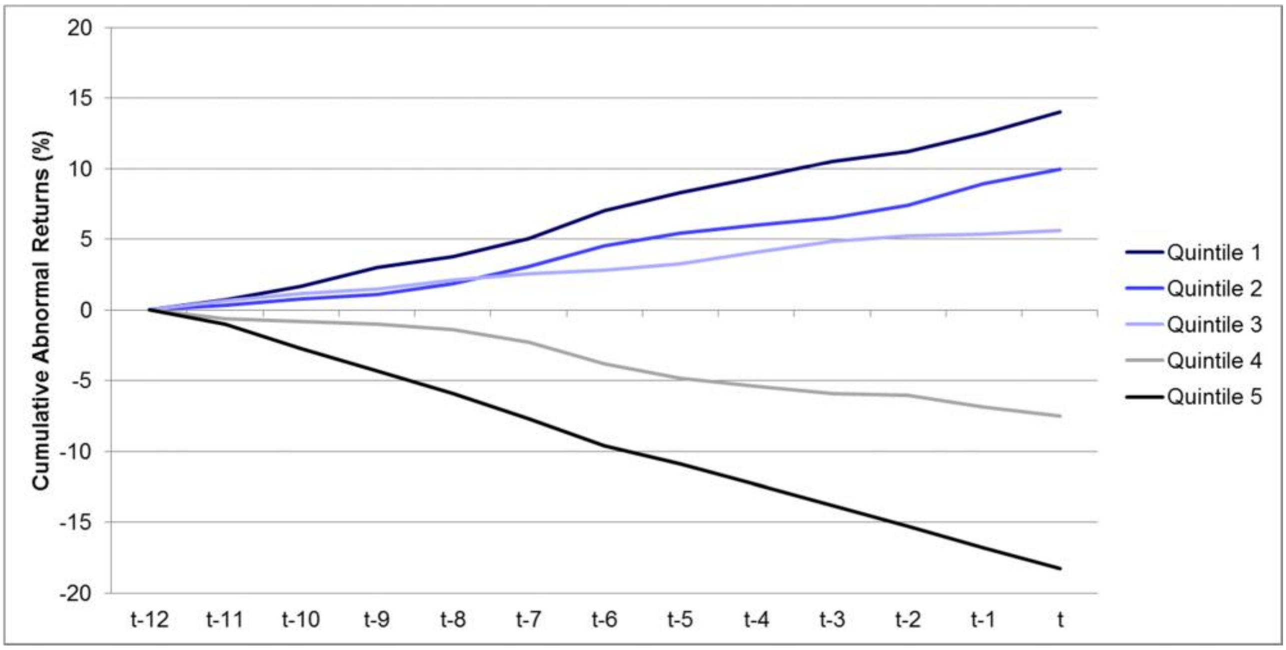
The results due to following a fundamental momentum strategy are very similar to those of the earnings momentum strategy. The difference, however, is the magnitude of the returns generated in the two extreme quintile portfolios. The Quintile 1 portfolio constructed using the fundamental momentum methodology produces a far superior return to that of the Quintile 1 portfolios constructed using the earnings momentum methodology. On the other hand, the fundamental momentum Quintile 5 portfolio underperformed the market by a higher margin than that of the earnings momentum Quintile 5 portfolio.

Figures 9.3-9.5 are event-time plots, which allow one to see whether the market anticipates fundamental momentum in the 12 months leading up to the earnings announcement, and the average abnormal returns following the earnings announcement. Figure 9.3 shows what the average of all the share prices of the different quintiles did in the 12 months leading up to the announcement, which is depicted by graphing the average abnormal return of the different quintiles.

The methodology is exactly the same as the methodology used for the event-time plots in Section 8.2. The average abnormal return of all the share prices is calculated by taking all of the shares for a given quintile portfolio, based on their fundamental momentum, calculating the cumulative abnormal return relative to the market portfolio for each of the 12 months prior to time t, when the company's earnings are announced. As an example at time t-12 months, all shares begin with zero abnormal cumulative returns. At time t-11 months, the average one-month abnormal return for all shares in a Quintile 1 portfolio is calculated, over the entire sample period. The same is done for the other four quintiles. The average of the aggregated total for each quintile is calculated. The same method is followed for the remaining months leading up to time t. Each month's average abnormal return is used to compound the previous month's abnormal return. The final result is the average cumulative abnormal return for each quintile, for the 12 months leading up to an earnings announcement. The average cumulative abnormal return depicts the market's anticipation of fundamental momentum.

Figure 9.3 shows that the market does indeed anticipate positive fundamental momentum, as well as negative fundamental momentum as far as 12 months prior to the earnings announcement. On average, shares that constitute the Quintile 1 and Quintile 2 portfolios at time t, produce a cumulative abnormal return of between 10% and 15%. At the opposite end of the spectrum, shares constituting the Quintile 5 and Quintile 4 portfolios, which are the 40% of the market that have the lowest fundamental momentum of earnings, produce a cumulative abnormal return of about -18% and -8% respectively.

Figure 9.3 Fundamental momentum: average cumulative abnormal return for each of the quintile portfolios for the 12 months preceding the earnings announcement

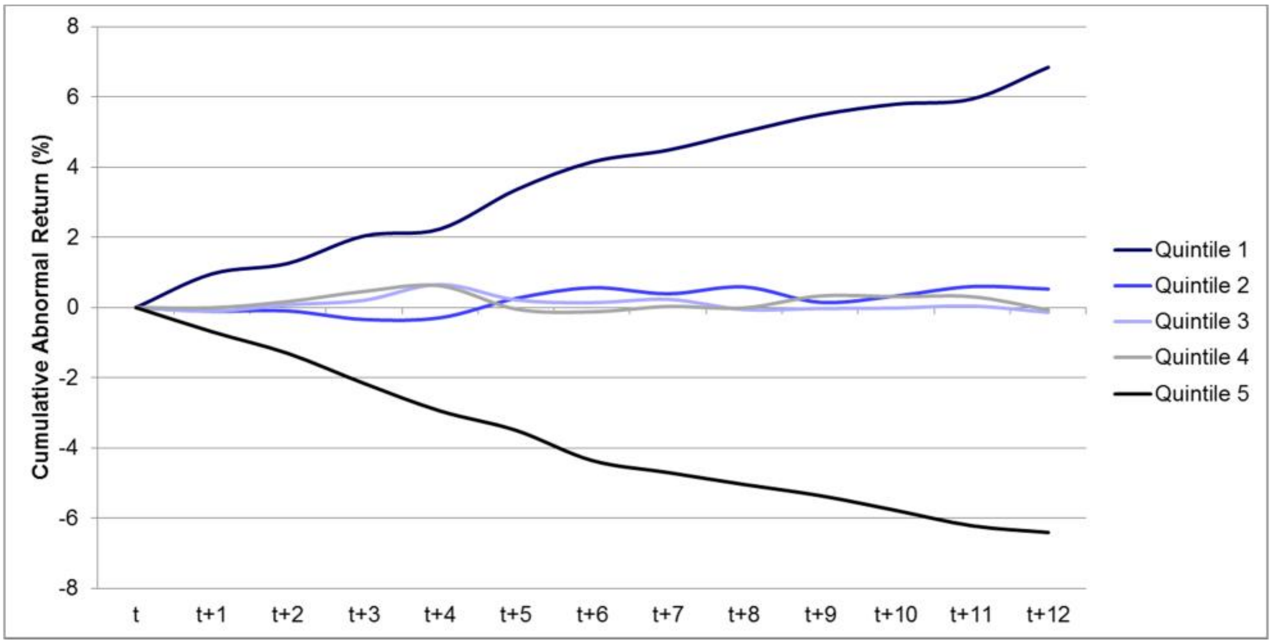


Following the same methodology, Figure 9.4 shows the average abnormal return for all the shares in a particular quintile for the 12 months following the earnings announcement. Comparing Figure 9.3 and Figure 9.4, it becomes evident that the market anticipates fundamental momentum and the majority of the share price adjustment takes place prior to the earnings announcement, as opposed to after the earnings announcement.

The market anticipates fundamental momentum in Quintile 2, Quintile 3 and Quintile 4, prior to the earnings announcement, as evidenced by the abnormal returns generated; however, after the earnings announcement, no further abnormal returns were generated. This is indicative of the market correctly pricing shares in Quintile 2, Quintile 3 and Quintile 4.

Further abnormal returns were earned for the Quintile 1 and Quintile 5 portfolios after the earnings announcement. This is indicative of either a market underreaction prior to the earnings announcement, or an overreaction after the earnings announcement.

Figure 9.4 Fundamental momentum: average cumulative abnormal return for each of the quintile portfolios for the 12 months following the earnings announcement

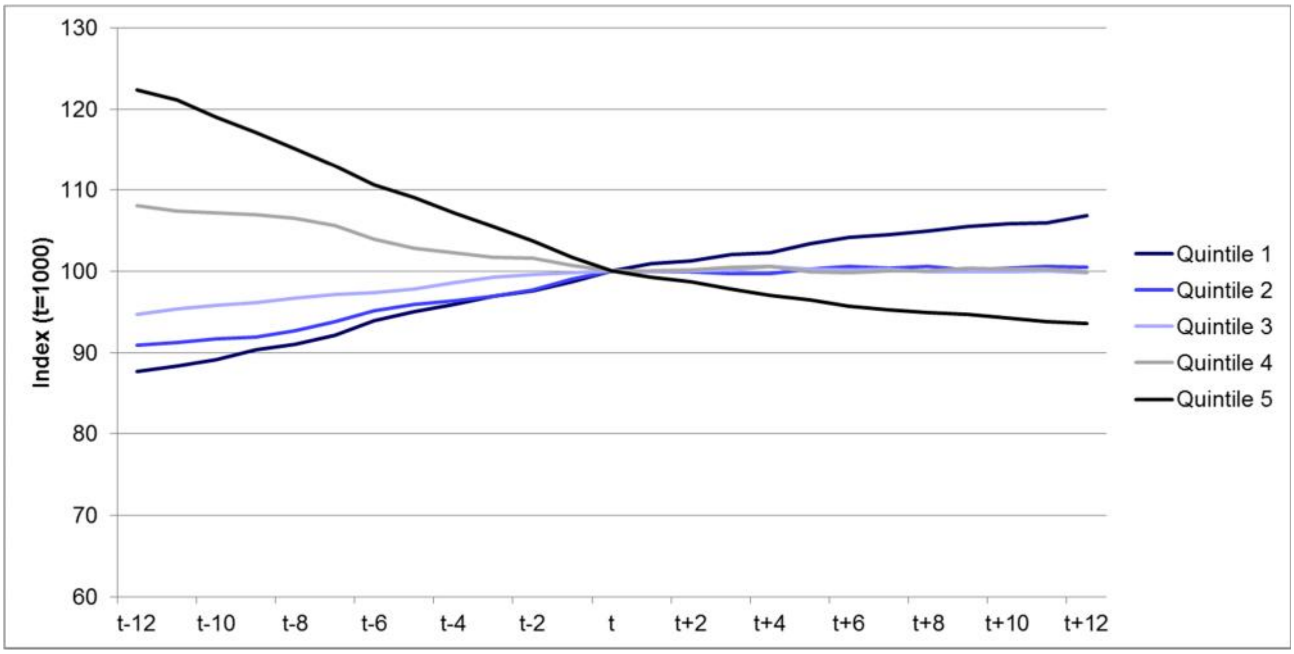


By graphing abnormal returns both before and after the earnings announcement on an event-time plot, the degree of anticipation prior to the earnings announcement relative to the abnormal returns following the earnings announcement becomes evident. Figure 9.5 shows such an event-time plot.

In the absence of capturing a risk factor that is not accounted for, explaining the return results of a fundamental momentum of earnings strategy is challenging. Similar to price and earnings momentum explanations, a behavioural-based explanation is the most obvious. Justifying a behavioural explanation requires an underlying reason for why the market would overreact or underreact to information carried in the fundamental momentum of earnings in the extreme quintile portfolios.

The reason why abnormal returns are earned due to an overreaction is that if the market overreacts to information contained in the fundamental momentum of earnings, the share price will overshoot the intrinsic value of the business following an earnings announcement. Share prices become overpriced when the overreaction is due to positive fundamental momentum of earnings. Alternatively, share prices become attractively priced when the overreaction is due to negative fundamental momentum of earnings. An overreaction results in the shares becoming mispriced after the earnings announcement.

Figure 9.5 Fundamental momentum: average cumulative abnormal return for each of the quintile portfolios for the 12 months preceding and following the earnings announcement

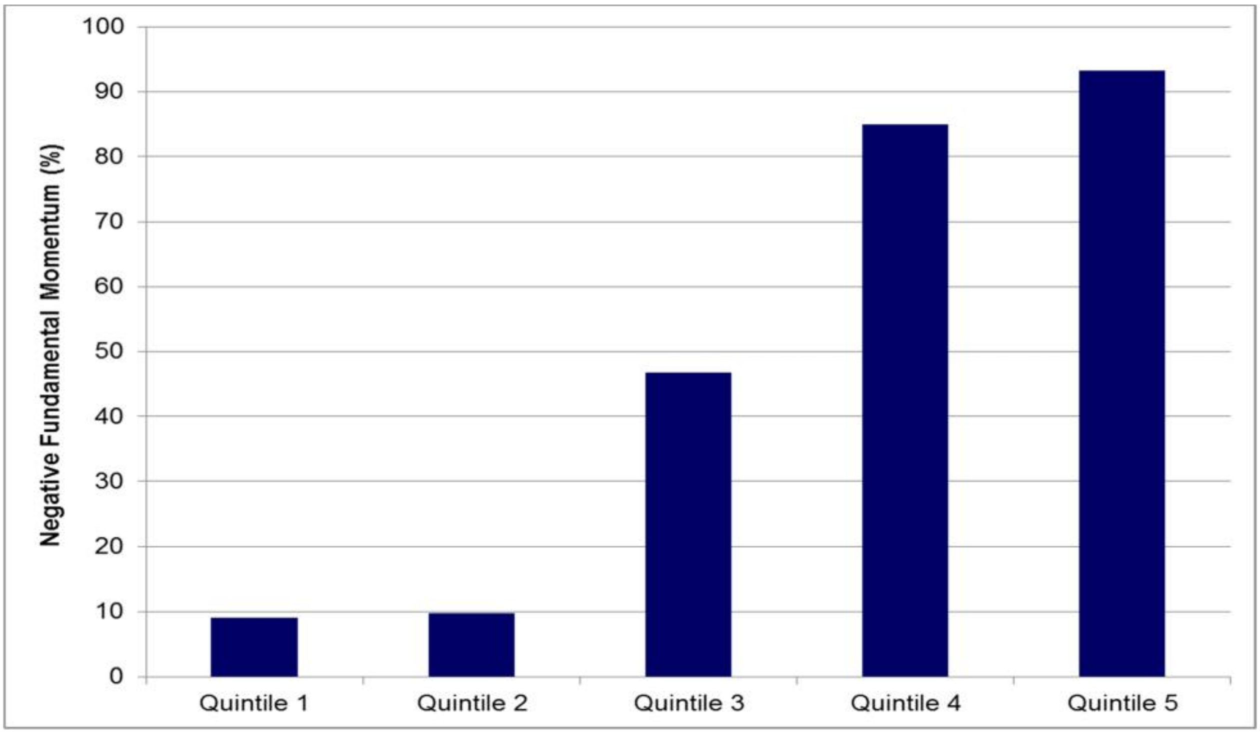


When shares underreact to any information, the share price lags the intrinsic value of the business. At some later stage, they converge again as new information becomes available. The fundamental momentum of earnings may provide the necessary information that is required for the market to counteract the initial underreaction. In contrast to an overreaction, an underreaction results in shares becoming fairly priced following the earnings announcement.

A potential reason for overreacting or underreacting to positive and negative fundamental momentum of earnings is explained by the recent growth in earnings of the business. Furthermore, there are the expectations that are formed due to the magnitude of the change in earnings that are reported, which is captured by the fundamental momentum of the earnings.

Figure 9.6 shows the percentage of shares in each quintile portfolio that have negative fundamental momentum of earnings. A business with negative fundamental momentum of earnings either has positive earnings that are growing but at a decreasing rate, or it has negative earnings that are decreasing at an increasing rate. As expected, the majority of businesses in Quintile 5 have negative fundamental momentum of earnings, while only 9.0% of the businesses in Quintile 1 have negative fundamental momentum of earnings.

Figure 9.6 Fundamental momentum: total percentage of shares in each quintile portfolio that have negative fundamental momentum of earnings



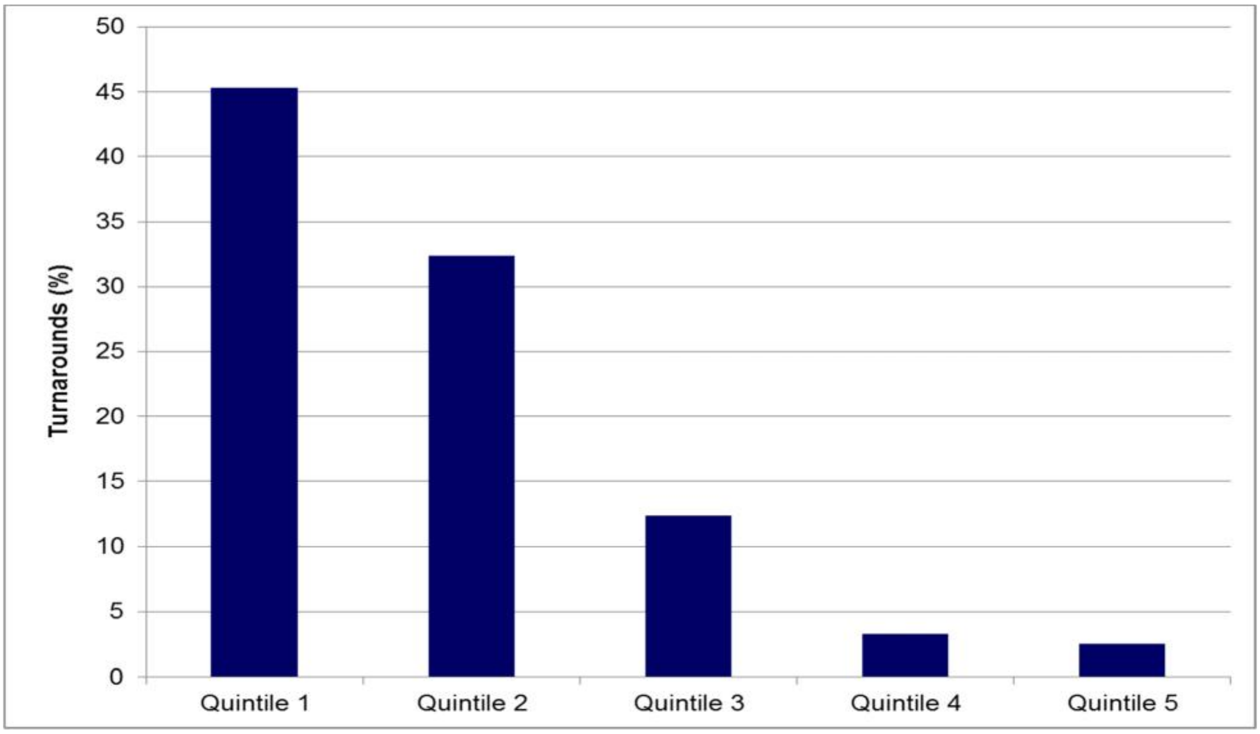
Extrapolating the poor performance of the majority of businesses in the Quintile 5 portfolio, the market's expectations for the businesses may be negative. Whether the expectations result in an overreaction, or alternatively, an underreaction depends on the sustainability of fundamental momentum of earnings. This is discussed in Section 9.4.

Focusing on the Quintile 1 portfolio, as expected, very few businesses have negative fundamental momentum of earnings. Market expectations may therefore be very positive due to either the businesses continuing to do exceptionally well, as evidenced through sustained positive fundamental momentum, or alternatively, businesses turning their fortunes around.

A *turnaround* is defined as a business that has positive earnings and positive fundamental momentum of earnings in time t, yet had decreasing earnings leading up to time t-1. According to this definition, a business is a turnaround business if its earnings were decreasing in the year prior to the past 12 months, and in the past 12 months, the earnings increased and, in turn, positive fundamental of momentum of earnings were generated.

Figure 9.7 shows the percentage of turnaround businesses in the various quintile portfolios over the period of the study. The Quintile 1 portfolio consists of 45.3% turnaround businesses. Quintile 5 consists of 2.5% turnaround businesses.

Figure 9.7 Fundamental momentum: total percentage of shares in each quintile portfolio defined as a turnaround business



The underreaction hypothesis is intuitively appealing for turnaround businesses. If a business has a poor financial performance in a given year, the share price of the business may lag the intrinsic value, and only in the presence of signs of a recovery in the form of fundamental momentum does the market correct the share price. Again, the sustainability of fundamental momentum will help understand the abnormal returns.

Equation 9.1 is the sample regression equation that represents the model describing the relationship between the fundamental momentum of earnings quintile that a business is sorted into, and the subsequent cumulative nominal return over different holding periods. Given the analysis above, the assumption in creating the model is that the quintile bins and the subsequent return are linked by a linear relationship. The Breusch-Pagan test and the

Durbin-Watson statistic are calculated to ensure that neither heteroscedasticity nor autocorrelation is present in the model. As expected, the R^2 for each regression is negligible due to the fact that there are many other factors driving share returns. The purpose of the regression analysis is to determine whether there is a relationship between fundamental momentum of earnings and future returns, as opposed to trying to prove causation. The null and alternate hypotheses for the regression model are stated below:

$H_0 : \beta_1 = 0$
$H_1 : \beta_1 < 0$

$$Return_{t+i} = \beta_0 + \beta_1(FM\ Quintile_t) + \varepsilon_{t+i} \quad (9.1)$$

where $i = 3, 6, 9, 12$ *months*

Table 9.4 shows the regression results for the four different holding periods. All four regressions are statistically significant at the 99% level according to the significance of the F-statistic. The coefficients are all negative, which is to be expected. The lower the level of fundamental momentum of earnings, the higher the quintile bin and the lower the expected returns. The coefficients are also all statistically significant at the 99% level given the p-values. The returns used are nominal cumulative returns, and therefore, the intercept term, which represents the return in the absence of the quintile bins, should be increasing as the holding period increases. The final column shows the number of observations that were included in each of the regressions. The number decreases as the holding period increases given that some shares would have delisted as the holding period was increased.

Table 9:4 Fundamental momentum: regression analysis and results employing quintile bins as the independent variable and nominal returns as the dependent variable

$Return_{t+i} = \beta_0 + \beta_1(FM\ Quintile_t) + \varepsilon_{t+i}$				
Forward Returns	**Intercept**	**Coefficient**	**p-Value**	**Observations**
3 Months	3.852	-0.5987	0.00	8477

6 Months	10.430	-1.277	0.00	8385
9 Months	15.556	-1.840	0.00	8294
12 Months	19.234	-2.215	0.00	8204

The results indicate that the null Hypothesis H_0 is rejected. As a result, and along with the statistical evidence presented throughout this section, the null Hypothesis 3 is rejected. Therefore, it is accepted that a fundamental momentum of earnings strategy is profitable on the JSE. The next section interrogates the risk factors that may help explain the results discussed in this section.

9.3 RISK FACTORS AND FUNDAMENTAL MOMENTUM

It has been discussed that the Fama and French three-factor risk model does not explain the price momentum and earnings momentum anomaly. And while it was shown to be the same case in this study, the three-factor model is again tested to determine whether the results of the fundamental momentum of earnings strategy are being driven by one of the risk factors captured in the model.

Again, it is necessary to calculate both the median and mean of the size and value risk factors to negate outliers from influencing the results. This is especially important for the size effect, given the nature of the JSE, as discussed previously; however, it is also important to do so for the value factors as well.

9.3.1 Size factor

The average and median market capitalisations for each of the quintile portfolios, across the different holding strategies, are shown in Table 9.5. The market capitalisations of the portfolios are calculated at the end of each month and the average and median market capitalisations for each portfolio are calculated over the duration of the study.

Table 9:5 Fundamental momentum: average and median market capitalisation of the shares included in each quintile portfolio for the different holding periods

Market Capitalisations (Rm)								
	3 Months		6 Months		9 Months		12 Months	
	Average	Median	Average	Median	Average	Median	Average	Median
Quintile 1	5 707	999	5 080	613	5 248	603.9	5 292	592
Quintile 2	12 531	1 893	11 898	1 484	11 694	1 476	11 499	1 438
Quintile 3	2 967	388	2 695	318	2 579	310	2 537	302
Quintile 4	4 132	856	3 613	450	3 679	451	3 651	425
Quintile 5	8 922	1 665	8 379	1 302	8 426	1 269	8 344	1 254

A priori, if there is going to be a pattern in the average or median market capitalisations, the expectation is that the Quintile 1 portfolio should consist of relatively small market capitalisation businesses, while Quintile 5 portfolios should consist of relatively large market capitalisation businesses. This expectation is due to the returns generated from each of the extreme quintile portfolios, and the findings of Banz (1981:3-18), who showed that smaller shares have higher returns, due to the size effect.

Table 9.5 indicates that no clear pattern emerges across the various quintile portfolios. As a reminder, the quintile portfolios over different holding periods have the same shares, except that they are now held for longer periods. Given the increased holding periods, at any given time, there will be a higher number of shares in portfolios with longer holding periods. Therefore, for a particular quintile portfolio, the market capitalisations are expected to be similar over the different holding periods, but not materially different. This is evident for both the average and median market capitalisations.

The Quintile 2 portfolio's market capitalisation is materially larger than any other quintile portfolio, and the Quintile 3 portfolio appears to consist of the smallest market capitalisation businesses. This holds for both the average and median market capitalisations, and indicates that size effect does not influence the results.

The median market capitalisations for all quintile portfolios across all holding strategies are vastly smaller than the average market capitalisations. This is a consistent finding across price momentum, earnings momentum and fundamental momentum strategies. This is expected due to the fact that there are a small number of very large companies that result in the distribution of the market capitalisations being skewed to the right.

Calculating the average and median market capitalisations gives a sense of whether size helps explain the earnings momentum anomaly; however, it does not allow for a statistically significant conclusion to be reached. In order to reach such a conclusion, regression analysis is required, which will show to what extent market capitalisations affect share price performance, along with the statistical significance of such, and whether or not it is a size effect that explains earnings momentum.

9.3.2 Value factors

The average and median PE and PB ratios for each of the quintile portfolios, across the different holding strategies, are shown in Tables 9.6 and 9.7 respectively. The ratios of the portfolios are calculated at the end of each month and the average and median ratios for each portfolio are calculated over the duration of the study.

A priori, given the strong performance of Quintile 1 portfolios and the relatively weak performance of the Quintile 5 portfolio, if there is a value risk factor that drives these results, Quintile 1 should have relatively low PE and PB ratios, and Quintile 5 should have relatively high PE and PB ratios. Similarly to the market capitalisations, the PE and PB ratios across the different holding periods should be very similar, given that the portfolios constitute the same shares, and are only held for longer periods.

The PE ratios in Table 9.6 show no clear evidence that there is a material difference between the PE ratios of the different quintiles. The Quintile 1 portfolio's PE ratio is slightly lower than the ratio of the other four quintile portfolios. The median PE ratios are smaller than the average, indicating that there are a few shares with high PE ratios, which influence the average PE ratios.

Table 9:6 Fundamental momentum: average and median PE ratios of the shares included in each quintile portfolio for the different holding periods

PE Ratios								
	3 Months		6 Months		9 Months		12 Months	
	Average	Median	Average	Median	Average	Median	Average	Median
Quintile 1	12.71	10.76	12.57	10.74	12.59	10.75	12.52	10.77

Quintile 2	13.15	10.74	13.05	10.64	13.09	10.63	13.05	10.58
Quintile 3	13.31	10.95	13.07	10.79	13.03	10.71	12.98	10.69
Quintile 4	13.32	11.17	13.10	10.90	13.10	10.91	13.10	10.88
Quintile 5	13.13	10.75	12.95	10.53	12.92	10.56	12.91	10.54

The PB ratios in Table 9.7 are dissimilar across the different quintile portfolios, as opposed to the similarity seen in the PE ratios in Table 9.6. Quintile 5 portfolios have the smallest PB ratios, across the different holding periods. Quintile 1 portfolios have the second smallest PB ratios. The literature (Auret & Sinclairw, 2006:35) suggests that over the short term, shares with low PB ratios outperform shares with high PB ratios. Interpreting the PB ratios in Table 9.7 is challenging, given that Quintile 5 portfolios underperformed the market, and Quintile 1 portfolios outperformed the market. However, based on the average PB ratios, it does not appear to be the case that a value factor drives the results.

Similarly to the PE ratios, the median and average PB ratios differ slightly, as would be expected. The median PB ratio is smaller than the average PB ratio, which indicates that the distribution of the data is skewed to the right.

Table 9:7 Fundamental momentum: average and median PB ratios of the shares included in each quintile portfolio for the different holding periods

PB Ratios								
	3 Months		6 Months		9 Months		12 Months	
	Average	**Median**	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Quintile 1	2.09	1.42	2.07	1.39	2.04	1.39	2.02	1.39
Quintile 2	2.50	1.54	2.55	1.51	2.53	1.49	2.53	1.49
Quintile 3	2.30	1.59	2.30	1.56	2.26	1.54	2.27	1.53
Quintile 4	2.25	1.42	2.26	1.38	2.24	1.37	2.25	1.37
Quintile 5	1.72	1.17	1.70	1.11	1.71	1.10	1.71	1.09

Calculating the average and median value factors gives a sense of whether the value factors help explain the earnings momentum anomaly; however, it does not allow for a statistically significant conclusion to be reached. In order to reach such a conclusion, regression analysis is required, which will show to what extent each of the value factors affects share price performance, along with the statistical significance of the factor, and whether or not these factors explain earnings momentum.

9.3.3 Factor loadings

The factors from the Fama and French three-factor model are employed in order to determine whether fundamental momentum of earnings captures these risk factors and if they do, whether these risk factors are statistically significant. To calculate the factor loadings of these factors, Fama and Macbeth (1973:616) cross-section regressions are used. The regressions are estimated monthly for all shares in each specific quintile, using the forward excess 12-month return relative to the risk-free rate. By calculating the mean and the standard deviation of the time series of the explanatory regression coefficients that were extracted over the entire period, it is possible to calculate the statistical significance of the factor loadings, and whether they played a role in explaining the results.

The cross-section regression model is as follows:

$$(RS_{t+i} - RF_{t+i}) = \beta_0 + \beta_1(RM_{t+i} - RF_{t+i}) + \beta_2(PB\ Ratio_t) + \beta_3(Market\ Capitalisation_t) + \varepsilon_{t+1} \qquad (9.2)$$

where i represents months used in calculating the returns, RS represents the return of the share, RF is the return of the risk-free rate and RM is the equal-weighted return of all investable shares.

Table 9.8 shows the mean of the coefficients calculated over the sample period, along with the p-values, indicating the statistical significance.

Table 9:8 Fundamental momentum: factor loadings for the market, value and size risk factors for all quintile portfolios

Factor Loadings - Earnings Momentum
Panel A - 3 Months

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1 (market)	0.9611	1.0519	0.9747	0.9500	0.9719
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	0.9808	-0.4002	-0.0534	-0.3348	0.4993
p-value	0.12	0.46	0.94	0.61	0.40
B_3 (size)	-0.4130	0.8892	0.0818	0.5003	1.0805
p-value	0.16	0.00	0.80	0.11	0.00
Panel B - 6 Months					
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**
B_1 (market)	1.0469	1.1146	0.9746	0.9214	0.9382
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	1.3953	-1.2663	0.1944	-0.7692	0.8860
p-value	0.18	0.14	0.86	0.45	0.36
B_3 (size)	-1.1963	0.6256	-1.1270	0.1126	0.4450
p-value	0.02	0.13	0.03	0.81	0.32
Panel C - 9 Months					
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**
B_1 (market)	0.9303	1.0620	0.8738	0.8151	0.9334
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	1.2656	-1.5995	2.3574	-1.7853	0.3739
p-value	0.31	0.15	0.06	0.15	0.74
B_3 (size)	-0.8673	1.0062	-0.8155	0.6447	1.2267
p-value	0.14	0.06	0.18	0.28	0.02
Panel D - 12 Months					
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**
B_1 (market)	0.91769	0.954907	0.825339	0.756925	0.83853
p-value	0.00	0.00	0.00	0.00	0.00
B_2 (value)	-0.67321	-1.41734	0.187265	-1.84594	0.225933
p-value	0.65	0.26	0.90	0.23	0.87
B_3 (size)	0.155032	1.90109	0.402814	0.342971	1.437227
p-value	0.83	0.00	0.58	0.64	0.02

The quintile portfolios are expected to be well diversified given that all available shares in a given time period are included in at least one portfolio. Therefore, β_1 is not expected to be materially different from one. β_1 is a measure of the exposure that the portfolio has to market risk, typically referred to as beta. However, it is important to bear in mind that this beta is slightly different from the beta calculated in the capital asset pricing model (CAPM) due to the added risk factors.

The value and size factors, as measured by β_2 and β_3 respectively, are not expected to be statistically significant due to the fact that there is no apparent pattern or trend present in Tables 9.5-9.7 to suggest that there is another risk factor that could potentially explain the results.

Panel A of Table 9.8 illustrates the factor loadings for a three-month holding period. It is apparent that the market risk is not materially different from one for any of the quintiles, which is to be expected given the diversification. The value and size factor loadings, as measured by β_2 and β_3 respectively, are not consistent in their sign across the quintiles, and most are not statistically significant at the 5% level.

Panels B, C and D are similar to Panel A. The market risk factor loading, as measured by β_1, appears to reduce the longer holding period. But there is no clear pattern across the different quintile portfolios in a given holding strategy. The value and size factor loadings are again not consistent across the different quintiles. Furthermore, they are not consistently statistically significant at the 5% level.

The factor loadings in Table 9.8 confirm the results of Tables 9.5-9.7, which indicate that the results generated using the fundamental momentum of earnings strategy are not due to another risk factor having been captured. Therefore, the null Hypotheses 3a and 3b are not rejected.

9.4 FUNDAMENTAL MOMENTUM OVER CONSECUTIVE YEARS

Whether the fundamental momentum of earnings is sustainable over a number of consecutive years, or not, gives insight into what drives the abnormal returns of Quintile 1 and Quintile 5 portfolios.

If there is a high incidence of businesses that can sustain positive fundamental momentum of earnings, it would support the theory that the market underreacts to information regarding the business. If businesses, on average, can only produce a single incidence of positive fundamental momentum of earnings, the market expectation is likely to be one of mean reversion and thus the earnings growth going forward would be expected to revert to some mean growth rate. In an efficient market, the share price should reflect those expectations. However, if businesses can produce consecutive incidences of positive fundamental momentum of earnings as opposed to the growth rates of earnings mean reverting as expected, the share price would need to adjust to reflect the new information.

A scenario where businesses cannot to sustain positive fundamental momentum of earnings over a number of consecutive periods would support the overreaction hypothesis. If a business produces positive fundamental momentum of earnings, the market may react positively with the expectation that earnings continue to grow very quickly. However, if earnings mean revert at the next earnings announcement, the share price is likely to adjust downwards to reflect the new information. The initial overreaction to the earnings announcement would then be reversed.

The same reasoning holds for negative fundamental momentum of earnings, and the resultant over- and underreaction.

The overreaction and underreaction hypotheses are interlinked, and not mutually exclusive of one another. As an example, in time t, if a company produced positive fundamental momentum of earnings and the market overreacted to this announcement, the share price would get pushed higher, earning positive abnormal returns, as is the case in the Quintile 1 portfolio. If at the next announcement, time t+1, the earnings disappoint and negative fundamental momentum of earnings are reported, the share price would adjust downwards after time t+1, to reflect the recent news flow, in turn, producing negative abnormal returns. This price adjustment, which was previously an overreaction to positive fundamental momentum of earnings, would now be viewed as a reaction to the market historically underreacting to previous information and not adjusting the share price accordingly. Thus, the underreaction is actually a result of the initial overreaction in the opposite direction.

Table 9.9 shows the results of investing in businesses that are able to produce positive fundamental momentum of earnings over a different number of consecutive years. The portfolios are constructed using an equal-weighted methodology, and only shares that have positive fundamental momentum of earnings are included in the portfolio. Consecutive fundamental momentum of earnings is calculated for one, two, three, four and five years. For a share to qualify, it needs to have positive fundamental momentum of earnings for each of the years. The holding periods are three, six, nine and 12 months. The market portfolio against which the portfolios of positive fundamental momentum are measured includes all investable shares in the universe at each point in time.

Mathematically, if the portfolio that consists of all shares with positive fundamental momentum of earnings outperforms the market, it implies that collectively, the shares with negative fundamental momentum of earnings have to underperform the market.

Panel A of Table 9.9 shows the abnormal returns generated from shares that have one year of positive fundamental momentum. Therefore, this result is similar to shares that were placed in quintile portfolios in Table 9.1. The difference though is that the quintile bins are not used, and instead, all shares with positive fundamental momentum of earnings are included in the portfolio. The result is very similar to the result in Table 9.1. The three-month holding strategy generates an annualised abnormal return of 2.9%, while the six-month holding strategy generates an annualised abnormal return of 4.3%. Again, the six-month holding strategy appears to be the most optimal. The nine- and 12-month returns are superior to the three-month holding period returns, but are lower than the six-month holding period returns.

Table 9:9 Fundamental momentum: profitability of investing in businesses that are able to produce positive fundamental momentum of earnings over a different number of consecutive years

Consecutive Years of Positive Fundamental Momentum – Jan 1992 to Dec 2013				
Panel A – 1 Year				
	3 Months	**6 Months**	**9 Months**	**12 Months**
Avg Abnormal Return	0.72	2.10	2.51	3.09

Annualised Abnormal Return	2.91	4.25	3.37	3.09
Panel B – 2 Years				
	3 Months	**6 Months**	**9 Months**	**12 Months**
Avg Abnormal Return	1.44	4.39	4.96	5.16
Annualised Abnormal Return	5.90	8.97	6.67	5.16
Panel C – 3 Years				
	3 Months	**6 Months**	**9 Months**	**12 Months**
Avg Abnormal Return	1.72	3.74	4.14	3.74
Annualised Abnormal Return	7.07	7.62	5.56	3.74
Panel D – 4 Years				
	3 Months	**6 Months**	**9 Months**	**12 Months**
Avg Abnormal Return	0.84	0.90	-0.85	-3.89
Annualised Abnormal Return	3.40	1.81	-1.13	-3.89
Panel E – 5 Years				
	3 Months	**6 Months**	**9 Months**	**12 Months**
Avg Abnormal Return	-1.08	1.64	-2.82	-5.81
Annualised Abnormal Return	-4.25	3.30	-3.75	-5.81

Panel B of Table 9.9 shows the abnormal returns generated by businesses that produced positive fundamental momentum of earnings over two consecutive years. The returns generated across all holding periods are superior to the returns generated for the portfolios formed based on a single incidence of positive fundamental momentum of earnings, as shown in Panel A.

In order to theorise whether the abnormal returns generated in Panel B are due to an overreaction or underreaction, it is important to understand what the market expectations would be following an earnings announcement. It is not plausible for a business to maintain sustainable fundamental momentum of earnings forever. To do this, the business would need to grow earnings at a faster rate year on year, which would result in exponential growth rates. Therefore, the market would highly unlikely expect sustained fundamental momentum. This argument forms the basis of the overreaction/underreaction hypothesis.

Following an earnings announcement, irrespective of whether there was positive or negative fundamental momentum, the market's expectations that there is an equal probability of the next earnings announcement containing positive or negative fundamental momentum of earnings. If the following earnings announcement has positive fundamental momentum of earnings, resulting in two consecutive periods of positive fundamental momentum, then according to Panel B, the market would have underreacted to the initial announcement. The share price later corrects itself after the second consecutive announcement of positive fundamental momentum. This is evident by the increase in the positive abnormal returns that are earned after two years of consecutive positive fundamental momentum of earnings, relative to the returns earned in Panel A.

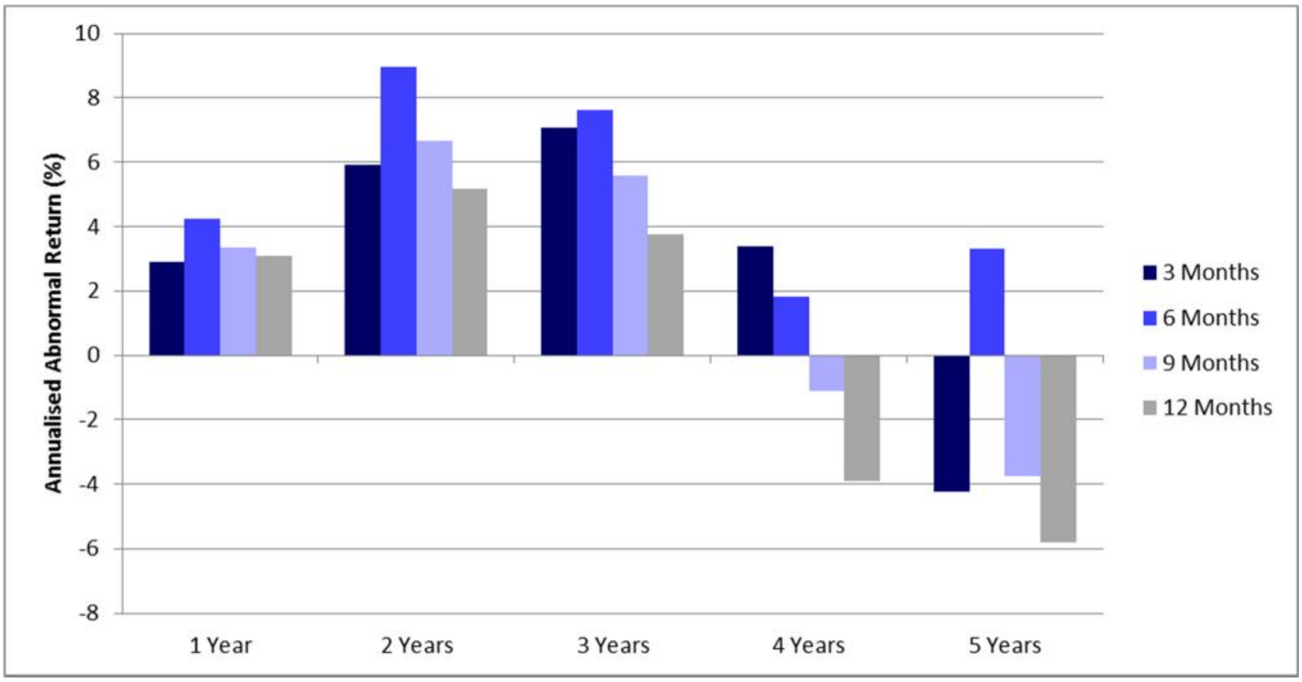
As mentioned above, if the portfolio of positive fundamental momentum generates positive abnormal returns, the remaining shares which generated negative fundamental momentum must collectively underperform the market. This would indicate that the market overreacted to the initial earnings announcement of positive fundamental momentum, pushing the share price beyond the intrinsic value of the respective businesses. Upon the following announcement containing negative fundamental momentum, the market price corrects for the initial overreaction and the share price adjusts accordingly.

The six-month holding period of Panel B remains the best-performing holding period; however, the three-month holding period outperforms the 12-month holding period, which is not the case in Panel A.

The results for shares generating three, four and five years of consecutive fundamental momentum of earnings are shown in Panels C, D and E respectively. The same overreaction/underreaction hypothesis explanation applies to consecutive fundamental momentum of three, four and five years, as it does for that of two years.

Figure 9.8 illustrates the annualised abnormal returns from the various portfolios, as shown in Table 9.9, for the different holding periods. With the exception of the three-month holding period in Panel C, the abnormal returns begin to decrease for the portfolios formed using consecutive positive fundamental momentum of earnings over three years and longer. This does not make intuitive sense, and indicates that the overreaction/underreaction hypothesis does not hold.

Figure 9.8 Fundamental momentum: annualised return for the portfolios consisting of businesses that are able to produce consecutive years of positive fundamental momentum



The key question though is whether these results are statistically significant or not. An important element to the significance of the results is the number of observations included in the sample. In turn, this means: how many businesses can actually produce consecutive years of positive fundamental momentum of earnings in order to produce a sample size that is sufficient to draw significant conclusions from?

The number and percentage of businesses that are able to deliver consecutive years of positive fundamental momentum of earnings are shown in Table 9.10. Based on the overreaction/underreaction hypothesis, it is expected that about 50% of businesses should produce positive fundamental momentum at any given time. According to the data, 49.1% of businesses produce positive fundamental momentum at any given earnings announcement, which is not materially different from the hypothesised number of 50%.

Table 9:10 Fundamental momentum: number and percentage of companies with consecutive years of fundamental momentum

Consecutive Years of Positive Fundamental Momentum – Jan 1992 to Dec 2013					
Percentage & Number of Companies					
	1 Year	**2 Years**	**3 Years**	**4 Years**	**5 Years**
Number of Observations	8738	8265	7871	7447	7035
Consecutive FM – Number	4287	1532	515	166	53
Consecutive FM – Percentage	49.06	18.54	6.54	2.23	0.75

The difficult task of businesses being able to produce consecutive years of positive fundamental momentum is evident in Table 9.10. Only 18.5% of businesses are able to produce two years of consecutive positive fundamental momentum. This number decreases sharply for three, four and five years. As a result, the number of observations included in the sample reduces dramatically, bringing the statistical significance of the results into question. Regression analysis is used to determine the significance.

Equation 9.2 is the sample regression equation, which employs dummy variables to test the significance of the results in Table 9.9.

$$\textit{Abnormal Return}_{t+i} = \beta_0 + \beta_1(\textit{Dummy Variable}_c) + \varepsilon_{t+1} \qquad (9.2)$$

where *i = 3, 6, 9, 12 months*

c = 1, 2, 3, 4, 5 years

Dummy Variable = 1 if fundamental momentum is positive over c consecutive years

= 0 otherwise

The dummy variable is assigned one if the business produces positive fundamental momentum of earnings over the given number of consecutive years. It is assigned zero otherwise.

Given that it is a single-factor dummy variable regression, there is no multicollinearity nor is there heteroscedasticity. Autocorrelation is also not a concern given that the ability of businesses to produce consecutive years of fundamental momentum of earnings is almost random based on Table 9.10, because it shows that only 49.1% of observations will produce positive fundamental momentum at any given earnings announcement.

The null hypothesis of the regressions states that positive and negative fundamental momenta of earnings do not produce abnormal returns. The null and alternate hypotheses are stated below:

H_0 : β_0 & $\beta_1 = 0$
H_1 : β_0 & $\beta_1 \neq 0$

Given the results in Table 9.9 and Figure 9.8, the expectations for the regression coefficients are:

$\beta_0 < 0$
$\beta_1 > 0$
$\beta_1 + \beta_0 > 0$

These expectations indicate that positive fundamental momentum of earnings generates positive abnormal returns. In the absence of positive fundamental momentum of earnings, which indicates negative fundamental momentum of earnings, the abnormal returns are expected to be negative.

Table 9.11 illustrates the regression results for two years of positive fundamental momentum of earnings[7]. As expected, in the absence of positive fundamental momentum, the abnormal returns are negative, as indicated by β_0 being negative for all holding periods. β_1 is positive and greater than the absolute value of β_0 indicating that positive fundamental momentum results in positive abnormal returns over all periods. These results are in line with the expectations and results presented in Table 9.9. Most importantly, the p-values indicate that the null hypothesis for all holding periods can be rejected, and thus the results are statistically significant at the 99% level.

Table 9:11 Fundamental momentum: regression analysis and results using a dummy variable to indicate two years of consecutive positive fundamental momentum

Dummy Regression Coefficients – 2 Years Consecutive Fundamental Momentum

[7] The regression results for one, three, four and five years of consecutive positive fundamental momentum of earnings are shown in the appendix.

Forward Returns	B_0	B_1	p-Value
3 Months	-0.330	1.773	0.01
6 Months	-1.002	5.390	0.00
9 Months	-1.135	6.097	0.00
12 Months	-1.184	6.348	0.00

Over one year, the results are in line with the expectations and results presented in Table 9.9. However, over periods longer than two years, the results begin to become insignificant.

Over three years of consecutive fundamental momentum of earnings, the six- and nine-month holding period results are only significant at the 95% level. The magnitudes of the coefficients become smaller, which is to be expected given the reduction in abnormal returns in Table 9.9.

The results presented due to four and five years of consecutive fundamental momentum are not statistically significant. This is likely due to the fact that there are too few observations available to draw statistically significant results from. Therefore, there is no reason to discuss the coefficients.

9.5 SUMMARY

This chapter dealt presented the results obtained when testing whether fundamental momentum of earnings was a profitable strategy on the JSE. Due to the fundamental momentum strategy having never been tested before, there were no *a priori* expectations regarding whether the strategy would be profitable or not, along with no theoretical explanations.

The results indicated that the fundamental momentum strategy was profitable on the JSE for holding periods of three, six, nine and 12 months following the earnings announcement. The portfolios tested were constructed using an equal-weighting methodology, and the returns earned on the Quintile 1 and Quintile 5 portfolios were shown to be statistically different from the market portfolio at the 5% level of significance. The Quintile 1 portfolio significantly outperformed the market portfolio and the Quintile 5 portfolio significantly underperformed the market portfolio. The Quintile 2, Quintile 3 and Quintile 4 portfolios did not produce returns that were statistically different from those of the market portfolio. Risk-adjusted returns in the form of Sharpe ratios produced similar results. As a result, the null Hypothesis 3 was rejected.

Similar to the earnings momentum findings, the best-performing holding period was six months. The explanation is put down to the fact that financial results are reported every six months. Therefore, at least once every six months, new information is released onto the market that potentially affects investors' expectations and the share prices. As a result, it is beneficial to review the holdings every six months when employing a trading strategy.

There are two possible explanations for the profitability of fundamental momentum. Either fundamental momentum captures a risk factor that drives abnormal returns, alternatively, the profitability of the strategy is due to investor's overreaction or underreaction to available information.

Size and value risk factors appear not to have influenced the results. There is no clear pattern or trend when it comes to the mean and median market capitalisation, PE ratios and PB ratios. The Fama and French three-factor model also indicates that size and the PB ratio do not explain the fundamental momentum results. This was evident in the statistical insignificance of the factor loadings of the market capitalisation and PB ratio coefficients. Therefore, the null Hypohteses 3a and 3b were both not rejected.

Behavioural explanations were explored in more depth. It is evident that the market anticipates either positive or negative fundamental momentum. However, while the market correctly prices the Quintile 2, Quintile 3 and Quintile 4 portfolios, it does not correctly price the extreme portfolios, Quintile 1 and Quintile 5. Following the earnings announcement, the Quintile 1 portfolio continued to outperform the market, while the Quintile 5 portfolio continued to underperform the market. Either an overreaction or underreaction to historical information caused these results.

Given that there is a low level of incidence of businesses having the ability to produce consecutive years of positive or negative fundamental momentum, it appears that the overreaction hypothesis is the more appropriate explanation. The market initially overreacts to both positive and negative fundamental momentum, in the extreme quintiles, pushing the market value away from the intrinsic value of the business. This later corrects itself as new information becomes available following the next earnings announcement. Given that less than 20% of businesses are able to produce two consecutive years of fundamental momentum, the probability is high that fundamental momentum reverts. Therefore, the market corrects for the initial overreaction following the subsequent earnings announcement.

The next chapter focuses on the underlying drivers of fundamental momentum of earnings. The earnings are decomposed into the accrual and cash flow components, and the momentum of those components is calculated. The purpose of the chapter is to gain a better understanding of what drives business's earnings and ultimately, investment returns.

CHAPTER 10

RESULTS ANALYSIS: FUNDAMENTAL MOMENTUM OF THE UNDERLYING EARNINGS COMPONENTS

10.1 INTRODUCTION

This chapter presents the empirical findings of the relationship between the fundamental momentum of the sub-components of current earnings and the fundamental momentum of forward earnings[8]. The aim of the chapter is to either reject or accept the null Hypotheses 4, presented in Section 5.4.4. This is done by decomposing the earnings into their accrual and cash flow components. The fundamental momentum of the earnings components is calculated in order to test the relationship between them and the fundamental momentum of forward earnings. Of greater significance is the difference between the regression coefficients of the fundamental momentum of the various sub-components of current earnings, to determine which components of earnings are relatively more important in understanding and influencing fundamental momentum of forward earnings.

The chapter begins by discussing a few basic univariate and pair-wise correlations of both the nominal numbers and the fundamental momentum numbers of the earnings and their respective underlying components. Regression analysis is then undertaken to test whether the mean reversion of earnings assumption holds. This is followed by regression analysis of the three fundamental momentum models to determine the relationship between the fundamental momentum of the underlying earnings components and fundamental momentum of forward earnings.

10.2 DESCRIPTIVE STATISTICS

The descriptive statistics presented in this section are organised around the earnings decomposition that was used to motivate the empirical analysis in Section 5.4.4.1. While

[8] The term *forward earnings* refers to 12 months' forward earnings.

interpreting the descriptive statistics presented in this section, it is important to recall that each of the variables is deflated by average total assets, and that fundamental momentum is a measure of the rate of change of the variables and not the nominal change of the variables, as is customary in the standard approach.

As a reminder, the earnings decomposition is set out in Equations 10.1 to 10.3:

$$Earnings_t = Accruals_t + Cash\ Flow_t \tag{10.1}$$

$$Earnings_t = \Delta WC_t + \Delta NCO_t + \Delta FIN_t + Cash\ Flow_t \tag{10.2}$$

$$Earnings_t = \Delta COA_t - \Delta COL_t + \Delta NCOA_t - \Delta NCOL_t + \Delta FINA_t - \Delta FINL_t + \Delta CASH_t + DEBT\_D_t + DEBT\_EQ_t \tag{10.3}$$

where ΔWC_t = change in non-cash working capital;

ΔNCO_t = change in non-current operating accruals;

ΔFIN_t = change in net non-cash financial assets;

ΔCOA_t = change in current operating assets;

ΔCOL_t = change in current operating liabilities;

$\Delta NCOA_t$ = change in non-current operating assets;

$\Delta NCOL_t$ = change in non-current operating liabilities;

$\Delta FINA_t$ = change in financial assets;

$\Delta FINL_t$ = change in financial liabilities;

$\Delta CASH_t$ = change in cash and cash equivalents;

$DEBT\_D_t$ = net non-interest cash distributions to debt holders;

$DEBT\_EQ_t$ = net cash distributions to equity holders.

10.2.1 Univariate statistics

Table 10.1 demonstrates the univariate statistics for the nominal decomposition of earnings according to Equations 10.1-10.3. The mean value of earnings is 0.084, indicating that the average business's earnings are 8.4% of average total assets. Said another way, the return on assets for the average business is 8.4%. The mean value of accruals of 0.059 indicates that the average business's accruals are 5.9% of average total assets. This number represents the majority of the mean value of earnings. According to Equation 10.1, earnings consist of two components, namely accruals and cash flows. It therefore follows that the mean value of the cash flow component of earnings is 0.025, or 2.5% of total average assets. Sloan (1996:290) argues and later shows that the accrual component of earnings exhibits lower persistence than the cash flow component of earnings. Earnings backed by accruals are therefore widely accepted as being of lower quality, as opposed to those backed by cash flow. The indications from Table 10.1 are that most of the earnings for industrial companies listed on the JSE between 1990 and 2013 had earnings that were largely backed by accruals.

Table 10:1 Earnings components: univariate statistics for the various components of earnings and the decomposition of those components

Univariate Statistics –Earnings Components							
	Mean	Std. Dev.	25th Percentile	Median	75th Percentile	Maximum	Minimum
Earnings (t)	**0.084**	**0.230**	**0.037**	**0.103**	**0.169**	**2.452**	**-2.912**
Accruals (t)	0.059	0.246	0.003	0.054	0.113	1.937	-2.910
Cash Flow (t)	0.025	0.255	-0.005	0.042	0.099	2.509	-2.620
Accruals (t)	**0.059**	**0.246**	**0.003**	**0.054**	**0.113**	**1.937**	**-2.912**
ΔWC (t)	0.012	0.138	-0.032	0.010	0.061	0.999	-1.945
ΔNCO (t)	0.044	0.212	-0.011	0.022	0.079	1.875	-1.705
ΔFIN (t)	0.004	0.194	-0.069	0.008	0.077	1.981	-1.942
ΔWC (t)	**0.012**	**0.138**	**-0.032**	**0.010**	**0.061**	**0.999**	**-1.945**
ΔCOA (t)	0.050	0.178	-0.009	0.037	0.106	1.630	-1.656
ΔCOL (t)	0.039	0.138	-0.011	0.023	0.078	1.519	-1.257
ΔNCO (t)	**0.044**	**0.212**	**-0.011**	**0.022**	**0.079**	**1.875**	**-1.705**
ΔNCOA (t)	0.049	0.216	-0.007	0.023	0.082	1.875	-1.705
ΔNCOL (t)	0.005	0.063	-0.002	0.000	0.009	0.781	-1.435
ΔFIN (t)	**0.004**	**0.194**	**-0.069**	**0.008**	**0.077**	**1.981**	**-1.942**
ΔFINA (t)	0.023	0.153	-0.020	0.009	0.063	1.984	-1.974
ΔFINL (t)	0.019	0.140	-0.024	0.001	0.055	1.487	-1.438
Cash Flow (t)	**0.025**	**0.255**	**-0.005**	**0.042**	**0.099**	**2.509**	**-2.620**
ΔCASH (t)	0.013	0.130	-0.030	0.003	0.052	1.984	-1.471
DEBT_EQ (t)	-0.008	0.186	0.000	0.012	0.035	1.672	-2.615
DEBT_D (t)	0.020	0.234	-0.040	0.021	0.083	2.556	-2.690

Similar to the study Richardson *et al.* (2005:454), the positive mean value for accruals differs from the negative mean value of accruals documented by Sloan (1996:296). The reason for this difference is the definition of accruals. Sloan's definition of *accruals* subtracts depreciation and amortisation, but does not include the origination of these accruals, resulting in the negative mean value of accruals (Richardson *et al.,* 2005:454).

The remaining univariate statistics account for the variation in the mean numbers and give insight into the distribution of the various components of earnings. The variation in earnings is equally accounted for by accruals and cash flows, given that the standard deviations of both components of earnings are 0.25. Likewise, the distributions seem to be similarly distributed based on the medians, maximums, minimums and 25th and 75th percentiles.

Inspecting the means of the accrual components of non-cash working capital (ΔWC), net non-current operating assets (ΔNCO) and net non-cash financial assets (ΔFIN), it is clear that both ΔWC and ΔNCO have positive means while ΔFIN's mean is very close to zero. Therefore, while the average business grows its net non-cash operating assets, net financial assets remain unchanged. Therefore, given that the net financial assets remain unchanged, the average business either grows its net non-cash operating assets organically, or alternatively, with the use of cash generated from operations or cash received by raising capital through the equity market. The standard deviation of ΔNCO and ΔFIN is higher than ΔWC, indicating that these components account for a relatively large portion of the variation in total accruals.

Given that the mean for both ΔWC and ΔNCO is positive, it follows that the mean value of the change in current operating assets (ΔCOA) and change in non-current operating assets (ΔNCOA) will be larger than the change in current operating liabilities (ΔCOL) and change in non-current operating liabilities (ΔNCOL) respectively. Similarly, the change in non-cash financial assets (ΔFINA) should be more or less equal to the change in non-cash financial liabilities (ΔFINL), given that ΔFIN is close to zero.

There are three uses for the cash flow component of earnings (Dechow *et al.,* 2008:539). A business either retains the cash for later use, alternatively, it is used to pay down debt, or it can be distributed to shareholders. As a result of the average business growing its net non-cash operating assets while the average ΔFIN is zero, it is expected that either the average change in retained cash (ΔCASH) is positive or the average net cash distributions to equity holders (DEBT_EQ) are negative, or both. As can be seen from Table 10.1, the ΔCASH is positive, indicating that the average business retains some cash for future use, which can potentially go towards growing net non-cash operating assets. Likewise, the average business's DEBT_EQ is negative, indicating that the average business raises more cash through equity markets than it pays out to shareholders. The median DEBT_EQ, however, is positive, which makes more intuitive sense. This suggests that the average DEBT_EQ is influenced by a smaller number of businesses that take part in very large capital-raising activities on the equity market causing the mean to be lower than the median.

Table 10.2 demonstrates the univariate statistics for the fundamental momentum of earnings and the fundamental momentum of the underlying components of earnings, as demonstrated in Equations 10.1-10.3. Due to the definition of *fundamental momentum* being the rate of change of a variable, the expected average and median values for all fundamental momentum variables are very close to zero. This is because, on average, across the whole market, it should not be possible for a component of earnings and, in turn, earnings to continue to grow at a materially faster or a slower rate than the year before into perpetuity. If this were the case and the component contributed positively to earnings, the business would grow its earnings at an exponential rate, until the business consumed the whole market and became the economy. Alternatively, if the component contributed negatively to earnings, the business would go out of business very quickly. Therefore, while in some years, the fundamental momentum might be positive and in some years, negative, overall, the average should be close to zero.

As expected and shown in Table 10.2, the average and median fundamental momentum of all earnings components is very close to zero. This indicates that all components of earnings revert to their mean growth rate.

The fundamental momentum data appears to be normally distributed, given the average, mean, 25th and 75th percentiles. However, what is of more interest in Table 10.2 is the standard deviation of the fundamental momentum of the various earnings components. If a fundamental momentum component of earnings is very volatile, it indicates that the change in growth rate of that component is volatile, making it a lower quality component of earnings.

Table 10:2 Earnings components: univariate statistics for the fundamental momentum of the various components of earnings and the decomposition of those components

Univariate Statistics – Fundamental Momentum of Earnings Components							
	Mean	Std. Dev.	25th Percentile	Median	75th Percentile	Maximum	Minimum
FM Earnings (t)	**0.006**	**0.392**	**-0.060**	**-0.002**	**0.051**	**6.599**	**-4.110**
FM Accruals (t)	-0.001	0.579	-0.112	0.000	0.114	8.370	-7.196
FM Cash Flow (t)	0.007	0.583	-0.101	-0.002	0.094	8.240	-9.257
FM Accruals (t)	**-0.001**	**0.579**	**-0.112**	**0.000**	**0.114**	**8.370**	**-7.196**
FM ΔWC (t)	0.000	0.187	-0.063	0.000	0.063	2.098	-2.232
FM ΔNCO (t)	-0.003	0.253	-0.057	0.000	0.058	2.250	-2.157
FM ΔFIN (t)	-0.004	0.257	-0.101	-0.001	0.094	2.092	-2.245
FM ΔWC (t)	**0.000**	**0.187**	**-0.063**	**0.000**	**0.063**	**2.098**	**-2.232**
FM ΔCOA (t)	-0.002	0.226	-0.074	0.001	0.072	3.457	-2.307
FM ΔCOL (t)	-0.002	0.177	-0.059	0.000	0.056	1.482	-1.512
FMΔNCO (t)	**-0.003**	**0.253**	**-0.057**	**0.000**	**0.058**	**2.250**	**-2.157**
FM ΔNCOA (t)	-0.003	0.255	-0.052	0.001	0.054	2.288	-2.233
FM ΔNCOL (t)	0.000	0.092	-0.007	0.000	0.010	1.437	-1.569
FM ΔFIN (t)	**-0.004**	**0.257**	**-0.101**	**-0.001**	**0.094**	**2.092**	**-2.245**
FM ΔFINA (t)	-0.004	0.195	-0.057	0.002	0.060	1.784	-2.099
FM ΔFINL (t)	0.000	0.182	-0.054	0.000	0.062	1.955	-2.059
FM Cash Flow (t)	**0.007**	**0.583**	**-0.101**	**-0.002**	**0.094**	**8.240**	**-9.257**
FM ΔCASH (t)	-0.002	0.173	-0.062	0.001	0.063	1.549	-1.718
FM DEBT_EQ (t)	0.005	0.196	-0.010	0.000	0.013	2.133	-2.392
FM DEBT_D (t)	0.002	0.288	-0.089	-0.003	0.089	2.465	-2.276

The fundamental momentum of earnings is slightly positive, while the fundamental momentum of accruals is negative and smaller than cash flows. The implication of this is that over time, the quality of earnings has steadily improved.

The standard deviation of fundamental momentum of earnings is 0.39, which is lower than both that of accruals and cash flows. Given that, it suggests the fundamental momentum of accruals is negatively correlated with the fundamental momentum of cash flows. The standard deviation of the fundamental momentum of accruals and cash flows is 0.58 for both.

The standard deviation of both the fundamental momentum of accruals and cash flows is larger than all of the standard deviations of the fundamental momentum of their underlying sub-components. This indicates that the sub-components of both accruals and cash flows are positively correlated with one another. As a result, changes in the rates of growth of accruals and cash flows are expected to be amplified and hence more volatile than their sub-components.

Richardson *et al.* (2005:448) surmise that some components of accruals are less reliably measured than others. Typically, the liability components of accruals are more reliably measured than the asset components. Therefore, it would be expected that the standard deviation of fundamental momentum of the liability components of accruals is smaller than that of the asset components. This result can be seen in Table 10.2.

Of the cash flow components of earnings, the fundamental momentum of the cash paid to debt holders is the most variable. This makes intuitive sense given that debt repayments generally follow a predetermined payment schedule. As a result, repayments over and above the scheduled amounts due to excess cash will not be a common occurrence, and thus the volatility of the fundamental momentum of DEBT_D will be very high. Cash distributions to shareholders are expected to follow a more common payment pattern, as given by a dividend policy, share buybacks and special distributions. The volatility of the fundamental momentum of DEBT_EQ is lower than that of DEBT_D. The third component of cash flow is ΔCASH, and this component is the least variable fundamental momentum component of the cash flow component of earnings.

10.2.2 Correlation statistics

The correlation matrix presented in Table 10.3 consists of the Pearson correlations between the different nominal components of earnings. The Pearson correlation is a measure of the linear relationship between two variables. Correlation coefficients denoted with an asterisk (*) in Table 10.3 indicate that the correlation coefficient is not statistically significant at the 5% level.

The correlation matrix sheds more light on the relationship between the various accrual and cash flow components than the univariate statistics presented in Table 10.1. As Richardson *et al.* (2005:448) point out, it is critical to remember that in the accrual components of earnings, the liability component is always subtracted from the asset component. Therefore, if there is a positive correlation between two related asset and liability components of accruals, it indicates that they have offsetting effects on total accruals, and thus earnings.

Focusing on the correlations, it is evident from Table 10.3 that current earnings and forward earnings are positively correlated. Accruals and cash flows are positively correlated with current earnings and forward earnings. However, the correlation with forward earnings is materially weaker than it is with current earnings. The correlation of earnings with forward earnings, along with the weaker correlation of accruals and cash flows with forward earnings in relation to current earnings is indicative of mean reversion of earnings. Given the positive correlation of accruals with current and forward earnings, it is expected that the accrual components, namely ΔWC, ΔNCO and ΔFIN, are all positively correlated with earnings and forward earnings. Similarly, the three uses of cash flows, namely ΔCash, DEBT_D and DEBT_EQ, should also be positively correlated with earnings and future earnings.

Decomposing the three accrual components gives further insight into the correlations between the various accrual components as well as the correlations of the accrual components and earnings. The asset components (ΔCOA, ΔNCOA and ΔFINA) of accruals all have positive correlations with earnings and forward earnings. The liability components of accruals (ΔCOL, ΔNCOL and ΔFINL) do not follow the same uniformity.

Table 10:3 Earnings components: Pearson correlation matrix for the nominal earnings components and the asterisk as an indication of statistical insignificance

Pearson Correlation Matrix

CORRELATION COEFFICIENTS OF NOMINAL VALUES

CORRELATION COEFFICIENTS OF NOMINAL VALUES

	Earnings (t+1)	Earnings (t)	Accruals (t)	Cash flow (t)	ΔWC (t)	ΔNCO (t)	ΔFIN (t)	ΔCOA (t)	ΔCOL (t)	ΔNCOA (t)	ΔNCOL (t)	ΔFINA (t)	ΔFINL (t)	ΔCASH (t)	DEBT_EQ (t)	DEBT_D (t)
Earnings (t+1)	-	0.283	0.200	0.062	0.078	0.136	0.048	0.083	0.029*	0.143	0.030	0.065	0.004*	0.063	0.092	-0.041
Earnings (t)	0.283	-	0.428	0.490	0.197	0.233	0.137	0.128	-0.032	0.231	0.007*	0.155	-0.020	0.143	0.314	0.204
Accruals (t)	0.200	0.428	-	-0.578	0.310	0.655	0.327	0.429	0.242	0.644	0.003*	0.455	0.045	0.271	-0.376	-0.480
Cash flow (t)	0.062	0.490	-0.578	-	-0.122	-0.421	-0.192	-0.298	-0.262	-0.412	0.004*	-0.299	-0.061	-0.132	0.646	0.647
ΔWC (t)	0.078	0.197	0.310	-0.122	-	0.045	-0.368	0.645	-0.170	0.082	0.127	-0.173	0.321	-0.263	-0.105	0.097
ΔNCO (t)	0.136	0.233	0.655	-0.421	0.045	-	-0.290	0.304	0.348	0.956	-0.088	0.012*	0.416	-0.018*	-0.233	-0.262
ΔFIN (t)	0.048	0.137	0.327	-0.192	-0.368	-0.290	-	-0.248	0.048	-0.282	0.011*	0.699	-0.622	0.545	-0.140	-0.400
ΔCOA (t)	0.083	0.128	0.429	-0.298	0.645	0.304	-0.248	-	0.643	0.330	0.105	0.062	0.413	-0.090	-0.269	-0.060
ΔCOL (t)	0.029*	-0.032	0.242	-0.262	-0.170	0.348	0.048	0.643	-	0.344	0.008*	0.254	0.211	0.147	-0.242	-0.174
ΔNCOA (t)	0.143	0.231	0.644	-0.412	0.082	0.956	-0.282	0.330	0.344	-	0.207	0.055	0.451	-0.016*	-0.238	-0.250
ΔNCOL (t)	0.030	0.007*	0.003*	0.004*	0.127	-0.088	0.011*	0.105	0.008*	0.207	-	0.144	0.143	0.005*	-0.032	0.027*
ΔFINA (t)	0.065	0.155	0.455	-0.299	-0.173	0.012*	0.699	0.062	0.254	0.055	0.144	-	0.125	0.570	-0.233	-0.456
ΔFINL (t)	0.004*	-0.020	0.045	-0.061	0.321	0.416	-0.622	0.413	0.211	0.451	0.143	0.125	-	-0.132	-0.061	0.055
ΔCASH (t)	0.063	0.143	0.271	-0.132	-0.263	-0.018*	0.545	-0.090	0.147	-0.016*	0.005*	0.570	-0.132	-	-0.188	-0.548
DEBT_EQ (t)	0.092	0.314	-0.376	0.646	-0.105	-0.233	-0.140	-0.269	-0.242	-0.238	-0.032	-0.233	-0.061	-0.188	-	0.011*
DEBT_D (t)	-0.041	0.204	-0.480	0.647	0.097	-0.262	-0.400	-0.060	-0.174	-0.250	0.027*	-0.456	0.055	-0.548	0.011*	-

ΔCOL has a negative correlation with current earnings and a positive correlation with forward earnings. Therefore, as non-cash operating liabilities increase, current earnings decrease. This result is not statistically significant though. The positive correlation between forward earnings and ΔCOL is statistically significant. This result is expected, because taking on short-term liabilities should improve the capacity and ability of businesses to grow future earnings. ΔNCOL is positively correlated with current and forward earnings. Earnings and forward earnings therefore increase as non-cash operating assets and liabilities increase, as well as when financial assets increase. ΔFINL is negatively correlated with current earnings and there appears to be no correlation with forward earnings. However, the relationship is statistically insignificant for both current and forward earnings. The lack of correlation with forward earnings is not expected, as taking on liabilities today is expected to improve future earnings. In order to understand these correlations, it is important to understand the correlations between the related assets and liability components, given that the liability components are subtracted from the asset components.

ΔWC and ΔNCO are positively correlated indicating that businesses grow their net current and net non-current operating assets together. ΔFIN is negatively correlated with both ΔWC and ΔNCO indicating that businesses finance this growth by either selling down their financial assets or by growing their financial liabilities. ΔWC is negatively correlated with ΔFINA and positively correlated with ΔFINL. ΔNCO is only positively correlated with ΔFINL, and there is no statistically significant correlation with ΔFINA. Therefore, ΔWC is financed by a reduction in financial assets and an increase in financial liabilities, while ΔNCO is typically only financed by an increase in financial liabilities, and not by a reduction in financial assets.

In ΔWC, the subcomponents, ΔCOA and ΔCOL, are positively correlated. Thus they offset one another given that ΔCOL is subtracted from ΔCOA. Current operating liabilities therefore provide a source of funding for current operating assets and, in turn, ΔWC. This makes sense given the nature of working capital consisting of payables and receivables. Similarly, ΔNCOA is positively correlated with ΔNCOL and ΔFINA is positively correlated with ΔFINL.

Cash flows are positively correlated with earnings and forward earnings, therefore, irrespective of the use of the cash flow, the correlation should be positive with earnings and future earnings. This is the case with the exception of the correlation of DEBT_D and forward earnings. The DEBT_D and forward earnings are negatively correlated. However, while being statistically significant, the correlation coefficient is very small, indicating that the correlation is weak.

ΔCASH is negatively correlated with cash flows. This is intriguing as it indicates that an increase in cash flows results in an increase in spending of cash. This is synonymous with the notion that the more one earns, the more one spends. As businesses grow and their cash flow increases, it appears that they spend more to maintain and increase the growth trajectory. This is often to the detriment of the business. While of interest to this study, this is definitely an area of future research. DEBT_D and DEBT_EQ are positively correlated with cash flows. Therefore, as cash flows are increased, more money is returned to both debt and equity holders. DEBT_D and DEBT_EQ are positively correlated with one another. DEBT_D and DEBT_EQ are negatively correlated with ΔCASH. This makes perfect intuitive sense, because as businesses return more cash to shareholders or debtholders, the retained cash will decline.

Table 10.4 shows the Pearson correlation matrix for the fundamental momentum of earnings, forward earnings and the various earnings components. The correlation coefficient denoted by an asterisk (*) indicates that the coefficient is not statistically significant.

In interpreting these results, it is important to remember that fundamental momentum measures the rate of change of a variable over one year, which is synonymous with the change in the growth rate either increasing or decreasing over one year. Therefore, a negative correlation between two variables is indicative of the rate of growth for one variable decreasing while the rate of growth of the other variable is increasing. It does not give insight into whether two variables' growth rates are positively or negatively correlated.

Table 10:4 Earnings components: Pearson correlation matrix for the fundamental momentum of the earnings components and the asterisk as an indication of statistical insignificance

Pearson Correlation Matrix

CORRELATION COEFFICIENTS OF FUNDAMENTAL MOMENTUM

CORRELATION COEFFICIENTS OF FUNDAMENTAL MOMENTUM	Earnings (t+1)	Earnings (t)	Accruals (t)	Cash flow (t)	ΔWC (t)	ΔNCO (t)	ΔFIN (t)	ΔCOA (t)	ΔCOL (t)	ΔNCOA (t)	ΔNCOL (t)	ΔFINA (t)	ΔFINL (t)	ΔCASH (t)	DEBT_EQ (t)	DEBT_D (t)
Earnings (t+1)	-	-0.447	-0.124	-0.177	-0.094	-0.204	-0.019	-0.070	0.010*	-0.200	0.006*	-0.056	-0.033	-0.036	-0.059	-0.154
Earnings (t)	-0.447	-	0.329	0.346	0.061	0.116	0.059	0.048	-0.004*	0.112	-0.009*	0.056	-0.022*	0.076	0.083	0.121
Accruals (t)	-0.124	0.329	-	-0.772	0.148	0.407	0.221	0.197	0.095	0.401	-0.010*	0.251	-0.042	0.242	-0.375	-0.424
Cash flow (t)	-0.177	0.346	-0.772	-	-0.106	-0.326	-0.180	-0.163	-0.096	-0.323	0.004*	-0.212	0.027	-0.189	0.428	0.503
ΔWC (t)	-0.094	0.061	0.148	-0.106	-	-0.018*	-0.474	0.646	-0.231	0.023*	0.114	-0.341	0.303	-0.374	-0.208	0.220
ΔNCO (t)	-0.204	0.116	0.407	-0.326	-0.018*	-	-0.361	0.242	0.328	0.935	-0.164	-0.098	0.403	-0.054	-0.209	-0.241
ΔFIN (t)	-0.019	0.059	0.221	-0.180	-0.474	-0.361	-	-0.363	0.037	-0.349	0.025*	0.705	-0.654	0.569	-0.139	-0.466
ΔCOA (t)	-0.070	0.048	0.197	-0.163	0.646	0.242	-0.363	-	0.594	0.270	0.081	-0.111	0.392	-0.222	-0.318	0.088
ΔCOL (t)	0.010*	-0.004*	0.095	-0.096	-0.231	0.328	0.037	0.594	-	0.319	-0.017*	0.218	0.180	0.111	-0.185	-0.120
ΔNCOA (t)	-0.200	0.112	0.401	-0.323	0.023*	0.935	-0.349	0.270	0.319	-	0.197	-0.050	0.438	-0.054	-0.213	-0.218
ΔNCOL (t)	0.006*	-0.009*	-0.010*	0.004*	0.114	-0.164	0.025*	0.081	-0.017*	0.197	-	0.132	0.105	-0.001*	-0.013*	0.059
ΔFINA (t)	-0.056	0.056	0.251	-0.212	-0.341	-0.098	0.705	-0.111	0.218	-0.050	0.132	-	0.074	0.564	-0.218	-0.455
ΔFINL (t)	-0.033	-0.022*	-0.042	0.027	0.303	0.403	-0.654	0.392	0.180	0.438	0.105	0.074	-	-0.199	-0.036	0.170
ΔCASH (t)	-0.036	0.076	0.242	-0.189	-0.374	-0.054	0.569	-0.222	0.111	-0.054	-0.001*	0.564	-0.199	-	-0.178	-0.629
DEBT_EQ (t)	-0.059	0.083	-0.375	0.428	-0.208	-0.209	-0.139	-0.318	-0.185	-0.213	-0.013*	-0.218	-0.036	-0.178	-	-0.027*
DEBT_D (t)	-0.154	0.121	-0.424	0.503	0.220	-0.241	-0.466	0.088	-0.120	-0.218	0.059	-0.455	0.170	-0.629	-0.027*	-

The fundamental momentum of earnings and forward earnings are negatively correlated. This result indicates that mean reversion of earnings takes place. To explain this statement, if the fundamental momentum of current earnings is positive, it implies that the growth of current earnings compared with the previous year's earnings is higher than the growth of the previous year's earnings compared with the earnings of the year before that. However, the negative correlation implies that the growth of forward earnings compared with current earnings will be lower than the growth of current earnings compared with the previous year's earnings. Therefore, future growth of earnings has to be slower than the rate of growth of current earnings, which is synonymous with mean reversion.

The fundamental momentum of accruals and cash flows are positively correlated with earnings, which is to be expected, given that if the rate of growth of accruals or cash flows increases, then by definition, the rate of growth of earnings must increase. Following from the mean reversion argument, the fundamental momentum of accruals and cash flows is, and would be expected to be, negatively correlated with the fundamental momentum of forward earnings.

Continuing with the mean reversion argument, it follows that the fundamental momentum of ΔWC, ΔNCO and ΔFIN are all positively correlated with the fundamental momentum of current earnings, and negatively correlated with the fundamental momentum of forward earnings. Likewise, the fundamental momentum of the asset components of accruals (COA, ΔNCOA, ΔFINA) that increase accruals as the component increases, are positively correlated with the fundamental momentum of earnings and negatively correlated with the fundamental momentum of forward earnings. The fundamental momentum of ΔCOL and ΔNCOL are negatively correlated with earnings and positively correlated with forward earnings. Therefore, the growth rate of earnings decreases as the growth rate of operational liabilities' increases. But future earnings growth rates increase as operational liabilities growth rates increase. The fundamental momentum of ΔFINL is negatively correlated with the fundamental momentum of both earnings and forward earnings. Therefore, growing financial liabilities at a faster rate not only reduces the growth rate of current earnings, but continues to reduce the growth rate of earnings in the future.

According to Table 10.3, ΔWC and ΔNCO are positively correlated, indicating that businesses grow their net current and net non-current operating assets together. However, there appears to be no correlation between the fundamental momentum of ΔWC and ΔNCO. Thus, although their nominal values are positively correlated, the rate of change is not correlated given the statistical insignificance as illustrated in Table 10.4. As a result, the relationship is expected to be non-linear.

ΔWC is financed by decreasing net financial assets, as illustrated in Table 10.3. Therefore, it is expected that the fundamental momentum of ΔFIN should be negatively correlated with the fundamental momentum of ΔWC. The interpretation of this result is that as the growth of net financial assets slows, the growth of non-cash net current operating assets increases.

The correlation between the fundamental momentum of ΔFINA and ΔWC and the fundamental momentum of ΔFINA and ΔNCO is negative, while the correlation between the fundamental momentum of ΔFINL and ΔWC and the fundamental momentum of ΔFINL and ΔNCO is positive. These results indicate that as the growth rate of non-cash financial assets slows and the growth rate of non-cash financial liabilities increases, the net non-cash operating assets' rate of growth increases.

The fundamental momentum of ΔCOA and ΔCOL is positively correlated, as is the fundamental momentum of ΔNCOA and ΔNCOL. Given that ΔCOL and ΔNCOL are a source of funding for ΔCOA and ΔCOL respectively, this is to be expected.

An observation on ΔNCOL, which confirms the expectation mentioned in Section 6.4.2.2, is that the majority of correlations that include ΔNCOL are not significant. This observation is true for both the nominal and fundamental momentum correlation matrices. Furthermore, the correlation coefficients are close to zero, for the majority of correlations. Thus, as expected, indications are that non-current operating liabilities of a business are fairly stable, and thus are expected to have little influence over future fundamental momentum of earnings.

Given that the fundamental momentum of cash flows is positively correlated with the fundamental momentum of earnings and negatively correlated with the fundamental momentum of forward earnings, it is expected that the fundamental momentum of all the uses of cash flow will be positively correlated with the fundamental momentum of earnings and negatively correlated with the fundamental momentum of forward earnings.

The fundamental momentum of ΔCash is negatively correlated with the fundamental momentum of DEBT_D and DEBT_EQ. Therefore, as the rate of growth of retained cash slows, the rate of growth of cash paid out to shareholders and debtholders increases. The fundamental momentum of DEBT_D has a negative correlation with DEBT_EQ. The correlation coefficient is not statistically significant. However, given that as cash flows increase, the payments to debtholders and shareholders also increase, it is expected that the rate of growth of these payments should be correlated with one another. But this appears not to be the case.

10.3 MEAN REVERSION

The foundation of the earnings decomposition and the fundamental momentum models rests on the assumption of earnings mean reverting, as depicted in Equation 5.13 in Section 5.4.4. The regression results of the mean reversion of earnings are discussed in this section. The following section discusses the fundamental momentum regression results.

Based on prior research and literature, discussed in Section 6.3, it is evident that there is a mean earnings growth rate across businesses and industries that a single business's earnings growth rate should revert to. As a result, the regression coefficient of regressing current earnings on forward earnings should be positive and smaller than one.

Equation 10.4 is the sample autoregressive equation that represents the model describing the relationship between current earnings and forward earnings.

$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + \varepsilon_{t+1}$ (10.4)

where $0 < \alpha_1 < 1$

It is important to remember that the term *earnings* is defined as profit attributable to shareholders divided by average total assets. Therefore, earnings are a stationary variable, which is a condition required by autoregressive models. As a result, α_1 measures the persistence of the rate of the return on assets. As Sloan (1996:297) points out, Equation 10.4 is misspecified because it makes the assumption that the coefficients of the cash flow and accrual components of earnings are equal. Despite this shortcoming, it does allow one to test the basic assumption of earnings mean reversion, which is critical in forming the fundamental momentum regression models. Table 10.5 presents the regression output of Equation 10.4.

Table 10:5 Earnings components: regression analysis and results regressing forward earnings on current earnings to determine whether earnings are mean reverting

Mean Reversion Regression			
$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + \varepsilon_{t+1}$			
	Intercept	$Earnings_t$	Adj. R^2
Mean coefficient	0.022	0.613	0.084
p-value		0.000	

A positive coefficient less than one is indicative of accounting rates of return mean reverting. According to the regression coefficient, α_1 of Equation 10.4, mean reversion of earnings is present in the sample population. This result is in line with the vast body of research and literature that confirms that earnings are slowly mean reverting over time. In this case, the average persistence parameter is 0.613. The p-value indicates that the result is statistically significant. Therefore, the earnings performance is neither transitory nor does it follow a random walk.

Mean reversion is also tested for using the fundamental momentum of earnings. Equation 10.5 presents the fundamental momentum autoregressive model used to test for mean reversion. The model describes the relationship between the fundamental momentum of current earnings and the fundamental momentum of forward earnings.

$$FM(Earnings_{t+1}) = \alpha_0 + \alpha_1 FM(Earnings_t) + \varepsilon_{t+1} \qquad (10.5)$$

where $\alpha_1 < 0$

The definition of *mean reversion of earnings* requires the earnings growth rate to revert to a long-term mean. The definition of *positive fundamental momentum* is an increasing rate of growth. Thus, a business that has positive fundamental momentum is growing earnings in the current period at a faster rate than earnings grew in the previous period. On a sustained basis, positive fundamental momentum of earnings is contrary to the mean reversion of earnings.

The regression coefficient, α_1, of the autoregressive model of Equation 10.5 is expected to be negative. A negative coefficient would indicate that following a year of positive (negative) fundamental momentum of earnings, the rate of earnings growth should decrease (increase) in the following year, and therefore, the fundamental momentum of earnings should decrease (increase).

Table 10.6 shows the output of the autoregressive sample model of Equation 10.5 for the whole sample, as well as for the quintile bins, which are sorted on the fundamental momentum of earnings in time t+1. The Quintile 1 bin incorporates the businesses whose fundamental momentum of forward earnings is greater than the 80th percentile. Therefore, these businesses have the highest fundamental momentum of earnings in year t+1, while businesses falling into Quintile 5 have fundamental momentum of earnings in year t+1, which are lower than the 20th percentile.

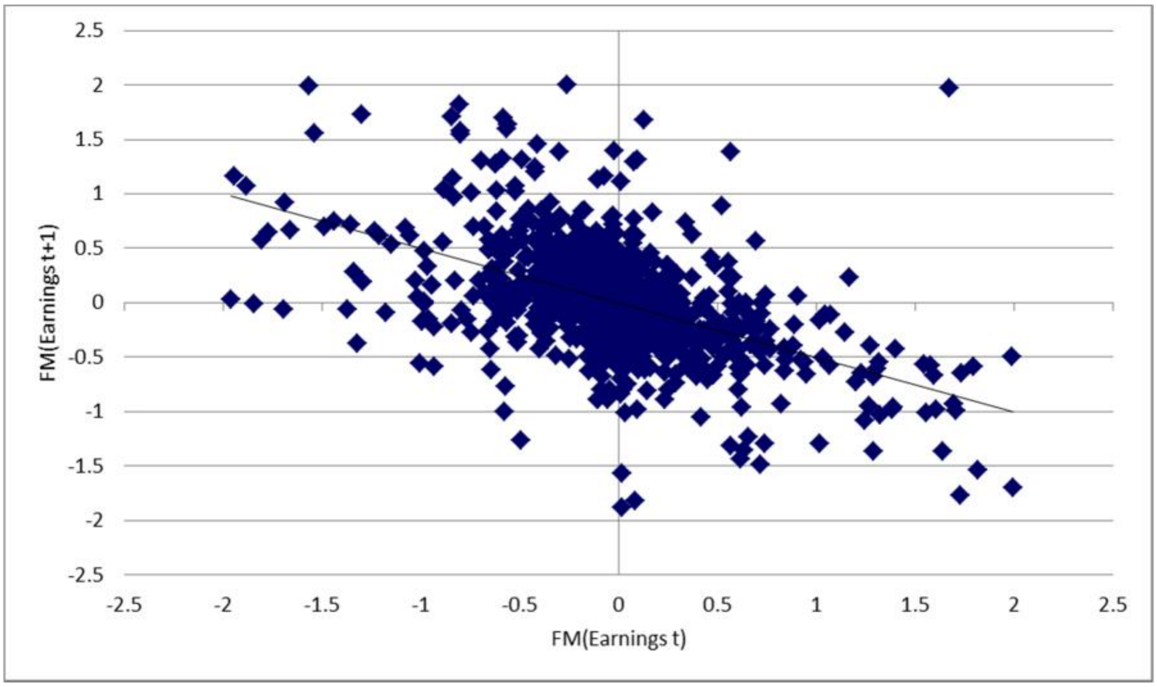
From Table 10.6, mean reversion of earnings is again confirmed using fundamental momentum of earnings. The negative coefficient implies that the fundamental momentum of earnings next year decreases (increases) if the current fundamental momentum of earnings is positive (negative). The extreme quintiles (Quintile 1 and Quintile 5) have a larger regression coefficient, in absolute terms, than Quintile 2, Quintile 3 and Quintile 4. Mean reversion, based on the fundamental momentum analysis, appears to be weak for businesses with weak fundamental momentum. This finding is intuitively appealing given that the change in the rates of growth for businesses in Quintile 2, Quintile 3 and Quintile 4 are low, and therefore, the expectation is that the businesses' growth rates are at, or close to, their means. The results are statistically significant for the total sample, as well as for Quintile 1, Quintile 2 and Quintile 5.

Table 10:6 Earnings components: regression analysis and results regressing the fundamental momentum of forward earnings on the fundamental momentum of current earnings to determine whether earnings are mean reverting

Fundamental Momentum Mean Reversion Regression			
$FM(Earnings_{t+1}) = \alpha_0 + \alpha_1 FM(Earnings_t) + \varepsilon_{t+1}$			
	Intercept	$FM(Earnings_t)$	Adj. R^2
Total Sample	-0.003	-0.476	0.293
p-value		0.000	
Quintile 1	0.232	-0.348	0.139
p-value		0.000	
Quintile 2	0.036	-0.010	0.009
p-value		0.006	
Quintile 3	-0.004	0.001	0.000
p-value		0.818	
Quintile 4	-0.044	-0.008	0.004
p-value		0.099	
Quintile 5	-0.234	-0.345	0.310
p-value		0.000	

Figure 10.1 graphically illustrates the relationship between current and forward fundamental momentum of earnings[9]. The negative relationship is evident. As the current fundamental momentum of earnings increases, the fundamental momentum of forward earnings decreases, indicating that a business that has had an increase in the growth rate of earnings in time t is expected to have a decrease in the rate of growth in time t+1. Most of the observations are crowded around the intersection of the axes. Businesses with very high (low) fundamental momentum of earnings in time t, typically revert in the following period with very low (high) fundamental momentum of earnings in time t+1.

Figure 10.1 Earnings components: scatter plot of the fundamental momentum of earnings and the fundamental momentum of forward earnings



[9] For illustrative purposes only, observations greater than 2 and less than -2 were omitted from the graph.

10.4 FUNDAMENTAL MOMENTUM MODELS

To quantify potential underlying drivers of the fundamental momentum of earnings, the regression analysis results are discussed in this section. Up to this point, the foundation of the earnings decomposition and the fundamental momentum models have rested on the assumption of earnings mean reverting, as depicted in Equation 5.13 in Section 5.4.4. Given that earnings have been shown to mean revert, the regression results of the fundamental momentum models are discussed in this section.

Understanding the relationship between the fundamental momentum of earnings and the fundamental momentum of the one-year trailing components of earnings gives one further insight into what the underlying drivers of fundamental momentum of earnings are. In other words, the question is: on a relative basis, to which sub-components of earnings is the rate of future earnings growth more sensitive? As mentioned, this information would be useful in implementing the fundamental trading strategy presented in Chapter 9. As shown in Section 9.2, the market anticipates the fundamental momentum of earnings in the 12 months leading up to the earnings announcement. Understanding the drivers of fundamental momentum would assist in identifying fundamental momentum of earnings earlier.

10.4.1 Fundamental Momentum Model 1

Fundamental Momentum Model 1 was derived and explained in Section 5.4.4.3.1. Decomposing earnings into its simplest form, earnings consist of an accrual component and a cash flow component. A large amount of research, which was discussed in Section 3.2, has been conducted on whether the accrual or cash flow component of earnings is more persistent, and thus which component is of a higher quality in terms of earnings sustainability. The general conclusion remains that earnings backed by a higher degree of cash flows, as opposed to accruals, are of a higher quality and are more sustainable (Richardson *et al.,* 2005:461; Sloan, 1996:301).

Equation 10.6 shows the sample regression Fundamental Momentum Model 1. The regression describes the relationship between the fundamental momentum of forward earnings and the fundamental momentum of accruals and cash flows.

$$FM(Earnings_{t+1}) = \beta_0 + \beta_1 FM(Accruals_t) + \beta_2 FM(Cash\ Flow_t) + \varepsilon_{t+1} \quad (10.6)$$

B_0 measures the persistence of fundamental momentum in the event that the fundamental momentum of the cash flow and accrual components of earnings are zero. β_1 measures the impact of the fundamental momentum of accruals on the fundamental momentum of forward earnings. β_2 measures the impact of the fundamental momentum of cash flow on the fundamental momentum of forward earnings.

The critical outcome of the regression results is to determine whether there is a material difference between β_1 and β_2. Given that the persistence of earnings is expected to be higher for earnings backed by cash flow as opposed to accruals, the regression coefficient of cash flows is expected to be closer to zero than that of accruals. If the current fundamental momentum of any component of earnings is positive, naturally, it will positively influence the current fundamental momentum of earnings. However, as has been shown, the growth rates of earnings mean revert, and therefore, if the cash flow component of earnings is more persistent, an increasing rate of growth in cash flow today should result in a slower level of mean reversion in the future. Therefore, both coefficients are expected to be negative and β_2 is expected to be greater, or closer to zero, than β_1.

Table 10.7 shows the regression results of Equation 10.6. Similar to Table 10.6, the regression was run on the total sample, as well as on the quintile bins, which were based on sorting the fundamental momentum of forward earnings. Quintile 1 contains businesses with fundamental momentum of forward earnings above the 80th percentile.

The variation between the regression coefficients of the accrual and cash flow components is negligible for the total sample, as well as for the quintile bins. As would be expected, the coefficients are both negative, which indicates that fundamental momentum cannot continue to be positive on a sustainable basis. However, given that cash flows are the more persistent component of earnings, it was expected that the fundamental momentum of cash flows coefficient would have been closer to zero than that of the accruals coefficient. A higher degree of persistence translates into less volatile future earnings, which are more predictable. Therefore, a regression coefficient for cash flows that is closer to zero than the accrual coefficient is would result in future earnings being less volatile and more predictable, because the change in the growth rate of future earnings would be lower.

Table 10:7 Fundamental Momentum Model 1: regression analysis and results regressing the fundamental momentum of forward earnings on the fundamental momentum of accruals and cash flows

Model 1 - Fundamental Momentum Regression				
$FM(Earnings_{t+1}) = \beta_0 + \beta_1 FM(Accruals_t) + \beta_2 FM(Cash\ Flows_t) + \varepsilon_{t+1}$				
	Intercept	$FM(Accruals_t)$	$FM(Cashflows_t)$	Adj. R^2
Total Sample	-0.003	-0.472	-0.479	0.293
p-value		0.000	0.000	
Quintile 1	0.232	-0.337	-0.355	0.141
p-value		0.000	0.000	
Quintile 2	0.036	-0.011	-0.010	0.010
p-value		0.006	0.012	
Quintile 3	-0.004	0.000	0.001	0.002
p-value		0.989	0.595	
Quintile 4	-0.044	-0.010	-0.004	0.011
p-value		0.041	0.398	
Quintile 5	-0.235	-0.355	-0.332	0.313
p-value		0.000	0.000	

The strongest level of reversion takes place in Quintile 1 and Quintile 5, which are businesses with the highest and lowest level of fundamental momentum of forward earnings respectively. This indicates that it is very difficult for businesses which have very high or very low changes in the rate of growth of the underlying earnings component in one year to sustain that level of growth into the future. This finding adds weight to the results of Section 9.2 and the overreaction hypothesis explained in Section 9.4. Only the Quintile 1 and Quintile 5 portfolios had returns that were statistically different from those of the market, which conforms to the findings of the regression results. And the fact that the regression coefficients of fundamental momentum of accruals and cash flow are negative indicates that positive current fundamental momentum of the earnings components is expected to result in the fundamental momentum of forward earnings to be negative. Therefore, investors extrapolate the current fundamental momentum result to the future, ultimately causing the share price to overreact, and causing abnormal returns.

In the absence of fundamental momentum of accruals and cash flows, the positive and negative intercept terms of Quintile 1 and Quintile 5 respectively indicate that fundamental momentum of earnings is sustainable in the extreme quintiles. However, when fundamental momentum of accruals and cash flows is present, future earnings are expected to strongly mean revert in Quintile 1 and Quintile 5.

The interpretation of this result is that neither accruals nor cash flows have a higher degree of influence over the rate of growth of forward earnings. Therefore, while the persistence of future earnings may be higher for earnings backed by cash flows as opposed to accruals, the rate of growth is not expected to increase or decrease at a faster or a slower rate based on changes in the historic rates of growth of cash flows or accruals.

10.4.2 Fundamental Momentum Model 2

The natural expansion of the sample regression Equation 10.6 is shown in Section 5.4.4.3.2. The accrual component of earnings was separated into its underlying components, which results in the sample regression as depicted in Equation 10.7:

$$FM(Earnings_{t+1}) = \beta_0 + \beta_1 FM(\Delta WC_t) + \beta_2 FM(\Delta NCO_t) + \beta_3 FM(\Delta FIN_t) + \beta_4 FM(Cash\ Flow_t) + \varepsilon_{t+1} \quad (10.7)$$

B_0 measures the persistence of fundamental momentum in the event that the fundamental momentum of the respective components of earnings is zero. β_1, β_2 and β_3 measure the impact of the fundamental momentum of the underlying components of accruals on the fundamental momentum of forward earnings. B_4 measures the impact of the fundamental momentum of cash flow on the fundamental momentum of forward earnings.

Interpreting the results of Equation 10.7 will result in determining whether there are individual underlying components of accruals whose fundamental momentum has a higher level of influence on the fundamental momentum of forward earnings than other components do. If β_1, for instance, is materially lower than β_2, it implies that the fundamental momentum of the working capital component of accruals results in a lower change in the rate of growth of forward earnings, resulting in a more persistent level of forward earnings growth. Similar inferences can be drawn regarding the other underlying components.

The coefficient of the fundamental momentum of cash flows is expected to be closer to zero than the coefficients of the fundamental momentum of the accrual components. This expectation would again result in future earnings being less volatile and more predictable when changes in the growth rates of past earnings are due to changes in the growth rates of cash flows as opposed to accrual components.

Given that the mean value of fundamental momentum of earnings is zero, as shown in Table 10.2, the expected intercept coefficient for the total sample is zero. This would indicate that in the absence of fundamental momentum in the underlying components of earnings, the fundamental momentum of future earnings should be close to zero, suggesting that earnings are at their mean growth rate.

Table 10.8 shows the regression results of Equation 10.4. Similar to Tables 10.6 and 10.7, the regression was run on the total sample, as well as on the quintile bins, which were based on sorting the fundamental momentum of forward earnings. Quintile 1 contains businesses with fundamental momentum of forward earnings above the 80th percentile.

Table 10:8 Fundamental Momentum Model 2: regression analysis and results regressing the fundamental momentum of forward earnings on the fundamental momentum of the accrual components and cash flows

Model 2 - Fundamental Momentum Regression						
$FM(Earnings_{t+1}) = \beta_0 + \beta_1 FM(\Delta WC_t) + \beta_2 FM(\Delta NCO_t) + \beta_3 FM(\Delta FIN_t) + \beta_4 FM(Cash\ Flows_t) + \varepsilon_{t+1}$						
	Intercept	FM(ΔWC_t)	FM(ΔNCO_t)	FM(ΔFIN_t)	FM(CF_t)	Adj. R^2
Total Sample	-0.006	-0.562	-0.567	-0.538	-0.224	0.206
p-value		0.000	0.000	0.000	0.000	
Quintile 1	0.230	-0.482	-0.537	-0.472	-0.171	0.195
p-value		0.000	0.000	0.000	0.000	
Quintile 2	0.036	-0.015	-0.008	-0.009	-0.004	0.008
p-value		0.017	0.135	0.096	0.135	
Quintile 3	-0.004	-0.006	-0.003	-0.003	0.000	0.007
p-value		0.090	0.351	0.355	0.958	
Quintile 4	-0.044	-0.014	-0.022	-0.017	-0.004	0.026
p-value		0.050	0.000	0.004	0.271	
Quintile 5	-0.270	-0.275	-0.336	-0.339	-0.124	0.104
p-value		0.000	0.000	0.000	0.000	

The results as shown in Table 10.8 are very much in line with expectations. Focusing on the total sample, the regression coefficients for the fundamental momentum of the three accrual components are more negative than the regression coefficient for the fundamental momentum of cash flow. This finding indicates that the fundamental momentum of forward earnings is more sensitive to the level of fundamental momentum of the three accrual components than they are to the level of the fundamental momentum of cash flows. Therefore, earnings revert to their mean growth rates a lot quicker when the divergence away from their mean growth rate is caused by changes in the rate of growth of the three accrual components, as opposed to changes in the rate of growth of the cash flow component of earnings.

Comparing the regression coefficients for the fundamental momentum of the three accrual components from Equation 10.4 to the regression coefficient for the fundamental momentum of accruals in Equation 10.3, it is clearly evident that all three are more negative than the regression coefficient for the fundamental momentum of accruals in Equation 10.3. Independently, changes to the growth rates of the sub-components of accruals cause earnings to mean revert at a faster rate than changes to the growth rate of the accrual component of earnings as a whole do.

While interpreting the results of the regression analysis, it is also important to recall the correlations between the fundamental momentum of ΔWC, ΔNCO and ΔFIN from Table 10.4. There is no significant correlation between the fundamental momentum of ΔWC and ΔNCO; however, the fundamental momentum of ΔFIN is negatively correlated with both the fundamental momentum of ΔWC and ΔNCO. Thus, as the fundamental momentum of ΔFIN increases, it is expected that the fundamental momentum of ΔWC and ΔNCO decreases. The result indicates that while all accrual components contribute to the earnings growth rate reverting to the mean over time, as evidenced by the correlation coefficients, their correlations dampen the mean reversion effect, due to the fundamental momentum of the components being negatively correlated.

A second observation is that the magnitudes of the regression coefficients across the different accrual components are very similar. Therefore, the rate of mean reversion is equally sensitive to changes across all accrual components. For businesses with no material difference across the fundamental momentum of accruals, focusing on the size of the accrual components and the sustainability of their growth becomes more important when trying to understand the persistence of future earnings.

The regression coefficient of the cash flow component is not only closer to zero than the regression coefficients of the accrual components, but it is also closer to zero than the regression coefficient of the cash flow component in Equation 10.3. This can be explained by the fact that additional factors were included in the regression equation, as a result of the accrual component having been broken down into its underlying components. Introducing additional factors into a regression model will invariably change the regression coefficients of existing factors if there is any form of correlation between the factors. As indicated in Table 10.4, the negative correlation between the fundamental momentum of cash flows and the fundamental momentum of the accrual components is statistically significant.

The final observation from Table 10.8 is the difference in regression coefficients across the different quintiles. Similar to Table 10.7, the strongest level of reversion to the mean growth rate occurs in Quintile 1 and Quintile 5. The intercept terms for Quintile 1 and Quintile 5 are positive and negative respectively. This suggests that in the absence of fundamental momentum of the underlying components of earnings, businesses in Quintile 1 would be expected to grow earnings at a faster rate every year, while businesses in Quintile 5 would be expected to grow earnings at a slower rate every year. This is clearly not possible, thus businesses in Quintile 1 would be expected to have had negative fundamental momentum of the underlying earnings components in the preceding year, while businesses in Quintile 5 would be expected to have had positive fundamental momentum of the underlying earnings components in the preceding year.

The regression coefficients in Quintile 2, Quintile 3 and Quintile 4 are all close to zero and statistically insignificant. Furthermore, the intercept terms are also close to zero. This indicates that in the absence of fundamental momentum of the underlying earnings components, no fundamental momentum of future earnings is expected. Therefore, the earnings growth rates of shares in the Quintile 2, Quintile 3 and Quintile 4 portfolios are expected to be close to their long-term mean earnings growth rate.

10.4.3 Fundamental Momentum Model 3

The final expansion of the initial sample regression Equation 10.3 is shown in Section 5.4.4.3.3. After having expanded the accrual component into the three underlying components, the three accrual components of the sample regression Equation 10.7 are then further separated into their asset and liability components.

The cash flow component is separated into its three sub-components. For the purpose of the study, *cash flow* is defined as the excess cash generated from operations after taking into account cash required for investments. Therefore, a business generating positive free cash flow has three options: the business distributes the cash to shareholders; it pays down debt over and above the required interest payments; it retains the cash for future use. The final sample regression equation is depicted in Equation 10.8:

$$\begin{aligned} FM(Earnings_{t+1}) = {} & \beta_0 + \beta_1 FM(\Delta COA_t) - \beta_2 FM(\Delta COL_t) + \beta_3 FM(\Delta NCOA_t) \\ & - \beta_4 FM(\Delta NCOL_t) + \beta_5 FM(\Delta FINA_t) - \beta_6 FM(\Delta FINL_t) \\ & + \beta_7 FM(\Delta CASH_t) + \beta_8 FM(DEBT\_D_t) \\ & + \beta_9 FM(DEBT\_EQ_t) + \varepsilon_{t+1} \end{aligned} \tag{10.8}$$

Again, when interpreting the results of Equation 10.8, one needs to keep in mind that the liability sub-components of the accrual component of earnings are subtracted from the asset sub-components. As a result, if the regression coefficients of the liability sub-components, β_2, β_4 or β_6, are positive, the inference is that if the fundamental momentum of the respective liability sub-component of accruals increases, the fundamental momentum of that particular accrual component, being ΔWC, ΔNCO or ΔFIN, decreases.

The expectation remains that the regression coefficients for the cash flow components of Equation 10.8 will be closer to zero than those of the accrual components. As explained above, this is due to the fact that the persistence of future earnings is higher when backed by cash flows as opposed to accruals.

Theoretical expectations were developed based on past research in Section 6.4, and drawing from that research, expectations regarding the regression coefficients for Equation 10.8 are met. Each asset and liability sub-component of accruals are discussed separately and then the cash flow sub-components are discussed.

ΔCOA and ΔCOL consist of changes to current operating assets and liabilities excluding cash and short-term debt respectively. Thus, ΔCOA predominantly consists of changes to accounts receivable and inventory, while ΔCOL largely consists of changes in accounts payable. The expectation drawn from Section 6.4.2.1 is that the fundamental momentum of forward earnings should be negatively correlated with the fundamental momentum of ΔCOA and positively correlated with the fundamental momentum of ΔCOL.

ΔNCOA and ΔNCOL consist of changes to non-current operating assets and liabilities. Non-current operating assets largely consist of property, plant, equipment and intangible assets. Non-current operating liabilities generally consist of employee obligations and deferred tax liabilities. Given the insignificant correlation coefficients of ΔNCOL for most of the correlations presented in Tables 10.3 and 10.4, no expectation is presented for the impact of the fundamental momentum of ΔNCOL and the fundamental momentum of forward earnings. With regard to ΔNCOA, prior research discussed in Section 6.4.2.2 is ambiguous when it comes to the impact on future earnings with regard to fixed and intangible assets. However, given the relationship between the fundamental momentum of ΔNCO and the fundamental momentum of forward earnings, the expectation is that the fundamental momentum of ΔNCOA should be negatively correlated with the fundamental momentum of forward earnings.

ΔFINA and ΔFINL consist of changes to financial assets and financial liabilities. Financial assets consist of cash and near cash, and investments at cost or market value, while financial liabilities are made up of both long- and short-term debt, as well as other hybrid debt instruments such as debentures and preference shares. The expectation drawn from Section 6.4.2.3 is that the fundamental momentum of ΔFINA is expected to be negatively correlated with the fundamental momentum of forward earnings. The research presented regarding the relationship between leverage and future profitability was a little more ambiguous. Thus, the fundamental momentum of ΔFINL is expected to be positively correlated with the fundamental momentum of forward earnings, up to the point that the optimal level of leverage for a specific business is reached. Thereafter, the relationship is expected to be negative, as the business becomes overindebted.

The cash flow component of earnings is divided into three sub-components, each representing a different use available to businesses generating free cash flow. The first use is that businesses can decide to retain the cash for future use, which is represented as ΔCASH. The second use is that businesses can decide to return the cash to shareholders, either through dividends or share repurchases. The final use is that the cash can be used to pay down debt. Returning cash to shareholders and paying down debt are represented by ΔDEBT_EQ and ΔDEBT_D respectively.

The overarching evidence from the literature and research reviewed in Section 6.4.2.4 is that businesses tend to be poor allocators of capital. Numerous studies show that, on average, businesses raising capital produce poor share returns. This infers that poorly allocated capital destroys shareholder value by not producing earnings that meet the cost of the capital. Raising capital is similar to building cash reserves through internally generated cash.

On the other hand, the research reviewed indicates that businesses that return cash to shareholders are far more prudent at allocating capital. Returning cash to shareholders also gives insight into management's optimism about the business's ability to return cash to shareholders on a regular basis. When free cash flow is used to pay down debt, the indications are that the cash flow is transitory, and thus it is preferred not to return it to shareholders, given the resultant expectation from shareholders regarding future cash flows.

Regarding the persistence of future earnings, earnings backed by cash flows are more persistent than those backed by accruals. Therefore, the cash flow components are expected to have fundamental momentum regression coefficients that are closer to zero than those of the accrual components. Of the three cash flow components, the fundamental momentum regression coefficients are expected to be lower for DEBT_EQ and DEBT_D than for ΔCASH. Returning cash to shareholders indicates more persistent future cash flows, which translates into more persistent earnings. Thus, the regression coefficient for the fundamental momentum of DEBT_EQ is expected to be closer to zero than the regression coefficient of DEBT_D.

The results shown in Table 10.9 do not indicate a material difference between the regression coefficients of the fundamental momentum of all sub-components of earnings. In absolute terms, the regression coefficients for all sub-components are larger than both Fundamental Momentum Model 1's and Model 2's regression coefficients. This result follows from the result of Model 2, where the regression coefficients of the accrual sub-components were larger, in absolute terms, than the regression coefficient of the fundamental momentum of accruals in Model 1.

The more granular the fundamental momentum components of earnings are, the larger the regression coefficients are, in absolute terms. This applies to both accruals and cash flows. The correlations between the different sub-components of accruals and cash flow dampen the speed of mean reversion of future earnings due to changes in the growth rate of the accrual or cash flow components, relative to the independent changes in growth rates of the sub-components. The result is that the mean reversion of future earnings takes place at a slower rate than what appears to be the case when regressing the underlying sub-components of each of the accruals and cash flow.

The positive regression coefficients of each of the liability components of accruals (ΔCOL, ΔNCOL and ΔFINL) are expected. In the decomposition of earnings as presented in Equation 5.12, each liability component is subtracted from its respective asset component. The positive regression coefficients therefore indicate that the fundamental momentum of the liability components of accruals also causes future earnings to mean revert, despite the positive regression coefficients.

Comparing each of the regression coefficients for the respective asset and liability sub-components, the coefficients are not materially different from one another, on an absolute basis. Table 10.3 and Table 10.4 show that the respective asset and liability components are positively correlated on an absolute basis as well as on a fundamental momentum basis. As an example, when the change in non-cash current operating assets (ΔCOA) increases, so does the change in non-cash current operating liabilities (ΔCOL), indicating that the liability component helps to fund the change in the asset component of accruals. The same applies to the non-current assets and liabilities, and the financial assets and liabilities. Therefore, as the fundamental momentum of the accrual sub-components increases (decreases), the fundamental momentum of future earnings will decrease (increase), irrespective of which sub-component it is. And the change in the fundamental momentum of forward earnings is equally sensitive to all accrual sub-components, across both the asset and liability sub-components.

Regarding the cash flow sub-components, the regression coefficients show a similar result to those of the accrual sub-components. The signs and the magnitudes across the three sub-components are not materially different from one another. Therefore, it appears to be irrelevant for future fundamental momentum of earnings regarding which cash flow component has increasing or decreasing fundamental momentum, given that the regression coefficients are all very similar.

Table 10:9 Fundamental Momentum Model 3: regression analysis and results regressing the fundamental momentum of forward earnings on the fundamental momentum of the accrual components and the cash flow components

Model 3 - Fundamental Momentum Regression

$$FM(Earnings_{t+1}) = \beta_0 + \beta_1 FM(\Delta COA_t) - \beta_2 FM(\Delta COL_t) + \beta_3 FM(\Delta NCOA_t) - \beta_4 FM(\Delta NCOL_t) + \beta_5 FM(\Delta FINA_t) - \beta_6 FM(\Delta FINL_t) + \beta_7 FM(\Delta Cash_t) + \beta_8 FM(DEBT\_EQ_t) + \beta_9 FM(DEBT\_D_t) + \varepsilon_{t+1}$$

	Intercept	FM(ΔCOA_t)	FM(ΔCOL_t)	FM($\Delta NCOA_t$)	FM($\Delta NCOL_t$)	FM($\Delta FINA_t$)	FM($\Delta FINL_t$)	FM($\Delta Cash_t$)	FM(ΔD_EQ_t)	FM(ΔD_D_t)	Adj. R^2
Total Sample	-0.004	-1.150	1.198	-1.211	1.244	-1.161	1.160	-1.112	-1.098	-1.172	0.517
p-value		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Quintile 1	0.106	-1.296	1.318	-1.424	1.423	-1.332	1.281	-1.148	-1.223	-1.342	0.508
p-value		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Quintile 2	0.035	-0.034	0.042	-0.032	0.016	-0.028	0.025	-0.050	-0.035	-0.031	0.514
p-value		0.000	0.000	0.000	0.168	0.003	0.003	0.000	0.000	0.000	
Quintile 3	-0.004	-0.017	0.020	-0.016	0.010	-0.020	0.015	-0.007	-0.014	-0.013	0.018
p-value		0.003	0.015	0.042	0.277	0.013	0.050	0.396	0.081	0.104	
Quintile 4	-0.044	-0.028	0.034	-0.040	0.048	-0.040	0.040	-0.010	-0.017	-0.024	0.040
p-value		0.011	0.005	0.000	0.000	0.000	0.000	0.351	0.074	0.013	
Quintile 5	-0.203	-0.679	0.742	-0.754	1.042	-0.701	0.725	-0.848	-0.640	-0.789	0.375
p-value		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

According to Table 10.3 and Table 10.4, the correlations between ΔCASH and DEBT_EQ and between ΔCASH and DEBT_D are negative, while positive between DEBT_EQ and DEBT_D, for both fundamental momentum and on an absolute basis. If ΔCASH has increasing fundamental momentum, it would be expected that DEBT_EQ and DEBT_D would both have decreasing fundamental momentum and vice versa. Thus, what appears to be the important consideration in determining the fundamental momentum of forward earnings is whether the fundamental momentum of the cash flow component has increasing fundamental momentum, rather than which sub-component has increasing or decreasing fundamental momentum.

The intercept term of the total sample is very close to zero. In the absence of any fundamental momentum in the sub-components of current earnings, it is expected that forward earnings will also have no fundamental momentum. The mean growth rate will have been attained.

The total sample regression is also divided into five quintiles based on the fundamental momentum of forward earnings. Table 10.11 shows how the regression coefficients change across the different sample quintiles. Quintile 1 has the highest fundamental momentum of forward earnings, by definition, and Quintile 5 has the lowest fundamental momentum of forward earnings.

Mean reversion of forward earnings is strongest in Quintile 1, followed by Quintile 5. The regression coefficients of all sub-components of earnings for Quintile 1 are larger, in absolute terms, than those of their respective sub-components in other quintiles. Thus, a change in the current rate of growth of any sub-component will have a larger influence on the fundamental momentum of forward earnings in Quintile 1 than an equal change in another quintile. The regression coefficients of the Quintile 5 sample regression are also relatively large, in absolute terms.

From a statistical significance point of view, all regression coefficients in Quintile 1, Quintile 2 and Quintile 5, along with the total sample regression are statistically significant at the 5% level. And although the regression coefficients are relatively low, most of the regression coefficients in Quintile 3 and Quintile 4 are also statistically significant.

The goodness of fit for the quintile sample regression is also very high as indicated by the adjusted R^2. However, the regression coefficients are substantially closer to zero for Quintile 2, Quintile 3 and Quintile 4 than for Quintile 1 and the total sample. This result can be explained by the fundamental momentum of forward earnings being lower in Quintile 1, and hence more narrowly dispersed, given that, by definition, there are no outliers, thus explaining the goodness of fit of the regression line.

Therefore, while the regression coefficients vary across the different sample quintiles, in each sample regression, the regression coefficients of the fundamental momentum of the sub-components of earnings do not vary materially between one another. This helps confirm the findings from the total sample regression. It is immaterial which sub-component has positive or negative fundamental momentum, they all influence the fundamental momentum of forward earnings equally. The key issue is the size of the sub-components and not the fundamental momentum of the sub-components.

The intercept of Quintile 1 is positive, indicating that in the absence of fundamental momentum of the current earnings' sub-components, future earnings will grow at an ever-increasing rate, as indicated by positive fundamental momentum. This is not possible, therefore, it is expected that there will be both positive and negative fundamental momentum of the earnings components at any point in time. The same argument applies for Quintile 5, where the intercept is negative. Fundamental momentum in the sub-components of current earnings is required to prevent businesses in Quintile 5 having negative fundamental momentum on an ongoing basis, which is not sustainable.

In conclusion, the null Hypothesis 4 is rejected, given that it is evident that the fundamental momentum of the sub-components of earnings influences the fundamental momentum of forward earnings. However, it appears to be immaterial which component of earnings has high or lower fundamental momentum, because the difference in their influence on the fundamental momentum of forward earnings is negligible.

10.5 SUMMARY

The purpose of the chapter was to determine the underlying dynamics of the fundamental momentum of earnings. Following from the results of Chapter 9, understanding the dynamics of fundamental momentum of earnings will help the understanding of what drives the profitable fundamental momentum strategy. Similar to Chapter 9, there is no prior research to build expectations regarding what the results should look like. Previous research has only focused on nominal changes in the underlying earnings components and their effects on future earnings. Studying fundamental momentum is about the rate of change of the underlying earnings components and future earnings, and not about the composition of the earnings.

The chapter began by discussing some simple univariate statistics and correlations between both nominal values of earnings and the underlying components, and the respective fundamental momentum. The average return on assets for the sample was 8.4%, with most of the earnings consisting of accruals as opposed to cash flows. Businesses, on average, also raise more capital on the equity market than they return to shareholders; however, the distribution of the sample is skewed to the left. As a result, it can be concluded that a small number of businesses raised large amounts of capital, causing the median to be positive while the mean is negative.

By definition, the average value of fundamental momentum across the sample should be close to zero. A slight variance in the volatility of fundamental momentum of earnings and the underlying components is observed. However, as expected, on average, fundamental momentum of all earnings and the underlying components are very close to zero.

The key finding from the correlation matrices is that of mean reversion. The fundamental momentum models are developed on the assumption that earnings mean revert. A negative correlation between the fundamental momentum of current earnings and the fundamental momentum of future earnings is indicative of the mean reversion of earnings, which is shown to be the case. As the growth rate of current earnings increases, the growth rate of future earnings declines. Mean reversion of earnings is confirmed through autoregressive analysis using earnings, as well as fundamental momentum of earnings.

Focusing on the three fundamental momentum models, the interpretations of the results are not about which component is of a higher quality and thus whether one wants a higher proportion of earnings to be backed by one component relative to another. The interpretation of the results is to determine whether an increasing or decreasing rate of growth of any component or sub-component of earnings affects the rate of growth of forward earnings, and more importantly, which components have a higher degree of influence. The results have little to do with the nominal value of the earnings components, or what percentage of total earnings consist of the various components.

If the persistence of earnings is expected to be higher when the earnings are backed by one specific sub-component, as opposed to another, the regression coefficient of the fundamental momentum of that sub-component should be closer to zero than that of the fundamental momentum of the sub-component it is being compared with. This is due to the fact that a higher level of persistence results in a slower level of mean reversion. And the closer the regression coefficient of the fundamental momentum of a sub-component of earnings is to zero, the lower the impact of the fundamental momentum of that sub-component will be on the fundamental momentum of forward earnings, and thus the longer it will take for the growth rate to revert to the mean.

The overarching conclusion of the chapter is that there is no component of earnings which has a greater impact on the fundamental momentum of forward earnings than any other component. However, the fundamental momentum of all components and sub-components of current earnings drives the fundamental momentum of forward earnings. This is evidenced by both the regression coefficients and the statistical significance of the coefficients. Therefore, the null Hypothesis 4 was rejected. The interpretation of this result is that management's focus needs to be on the sustainable growth of the various components of earnings, and not in trying to grow earnings as quickly as possible, in an unsustainable fashion. Short-term changes in the growth rates are not sustainable.

Across all three fundamental models, the strongest level of reversion took place in Quintile 1 and Quintile 5, which were businesses with the highest and lowest level of fundamental momentum of forward earnings respectively. This indicates that it is very difficult for businesses which have very high or very low changes in the rate of growth of the underlying earnings component in one year to sustain that level of growth into the future.

The next chapter tests whether the profitable fundamental momentum strategy shown in Chapter 9 captures the price momentum or the earnings momentum effect. If returns are enhanced by combining the fundamental strategy with either of the price or earnings momentum, it would indicate that the fundamental momentum strategy captures a different effect.

CHAPTER 11

RESULTS ANALYSIS: PRICE MOMENTUM, EARNINGS MOMENTUM AND FUNDAMENTAL MOMENTUM

11.1 INTRODUCTION

This chapter presents the empirical findings of the profitability of following a two-way sort analysis incorporating either price momentum or earnings momentum and the fundamental momentum trading strategy. The aim of the chapter is to either reject or accept the null Hypotheses 5a and 5b as presented in Section 5.4.5.

The objective of this chapter is to determine whether price momentum and/or earnings momentum is subsumed by fundamental momentum. In other words, can price momentum and earnings momentum be partly or fully explained by fundamental momentum? This is done by a two-way sort analysis. The portfolios are constructed by first sorting all shares into either price or earnings momentum and placing them into their respective quintiles. The quintiles are further divided by separating each quintile into two equal-weighted portfolios based on whether the fundamental momentum of earnings is higher or lower than the median value at that date. The quintile portfolios are constructed using an equal-weighted methodology and are rebalanced monthly.

The chapter begins by discussing the two-way analysis of the price momentum and fundamental momentum strategy. This is followed by the regression result of regressing the price momentum quintiles on the fundamental momentum quintiles. The next section presents the same content; however, price momentum is replaced with earnings momentum. The chapter concludes with the summary.

11.2 PRICE MOMENTUM AND FUNDAMENTAL MOMENTUM

Similar to Chan *et al.* (1996:1695) and Collins and Hribar (2000:114), a two-way analysis is conducted where first the sample set is divided into quintiles based on 12-month price momentum prior to portfolio formation. The quintiles are further subdivided into two portfolios based on the fundamental momentum of the companies' earnings in the year leading up to portfolio formation. The holding period for the two-way analysis is 12 months.

The purpose of the two-way analysis is to test whether price momentum and fundamental momentum capture the same effect. To put it another way, is price momentum a manifestation of fundamental momentum? By sub-dividing the price momentum quintile portfolios further, based on the fundamental momentum of earnings, if the performances of the subdivided portfolios are significantly different from those of the respective price momentum quintile portfolios, it indicates that fundamental momentum and price momentum capture different effects.

Table 11.1 shows the return profiles of the quintile portfolios and the respective subdivided quintile portfolios. Panel A of Table 11.1 shows the annualised and monthly return of the total Quintile 1 portfolio based on a 12-month formation period and 12-month holding period price momentum strategy. It further shows the results of splitting the Quintile 1 portfolio into two separate portfolios based on whether the shares in the portfolio had fundamental momentum of earnings that were higher or lower than the median fundamental momentum found in the portfolio. It is evident that the high fundamental momentum portfolio outperformed the Quintile 1 portfolio. The low fundamental momentum portfolio underperformed the Quintile 1 portfolio. Both of these results are statistically significant. On average, the high fundamental momentum portfolio outperformed the quintile portfolio by 0.22% per month. The average monthly underperformance for the low fundamental momentum portfolio is -0.11%.

Table 11:1 Two-way analysis: profitability of a 12-month formation period and a 12-month holding period price momentum strategy combined with a 12-month holding period fundamental momentum strategy

Momentum Strategy and Fundamental Momentum – Mar 1992 to Dec 2			
Panel A – Quintile 1			
	Quintile 1	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	21.61	24.63	20.04
Average Monthly Return	1.75	1.97	1.63
Average Monthly Abnormal Return	-	0.22	-0.11
p-Value	-	0.00	0.04
Panel B – Quintile 2			
	Quintile 2	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	17.98	19.46	17.25
Average Monthly Return	1.47	1.59	1.41
Average Monthly Abnormal Return	-	0.12	-0.06
p-Value	-	0.03	0.14
Panel C – Quintile 3			
	Quintile 3	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	15.39	16.37	14.73
Average Monthly Return	1.28	1.35	1.23
Average Monthly Abnormal Return	-	0.08	-0.04
p-Value	-	0.08	0.19
Panel D – Quintile 4			
	Quintile 4	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	11.36	12.18	10.11
Average Monthly Return	0.98	1.05	0.88
Average Monthly Abnormal Return	-	0.07	-0.09
p-Value	-	0.13	0.07

Panel E – Quintile 5			
	Quintile 5	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	4.42	4.44	3.41
Average Monthly Return	0.48	0.51	0.42
Average Monthly Abnormal Return	-	0.02	-0.07
p-Value	-	0.42	0.27

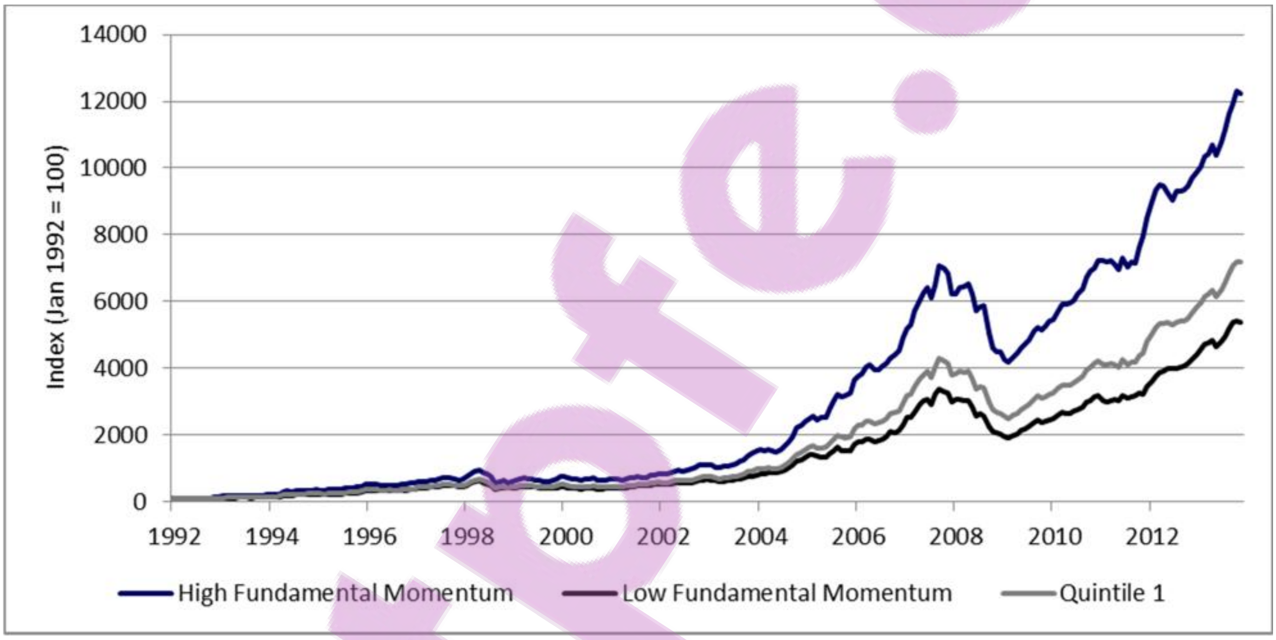
The level of statistical significance of the returns decreases as one moves to lower price momentum quintile portfolios. Panel B of Table 11.1 shows the results for the Quintile 2 price momentum strategy. The high fundamental momentum portfolio outperformed the Quintile 2 price momentum portfolio, and again the result is statistically significant at the 5% level. The returns across all the other high and low fundamental momentum portfolios are not statistically significantly different from their respective price momentum quintile portfolios. However, the outperformance and underperformance of the high and low fundamental momentum portfolios are consistent across all the price momentum quintile portfolios. Therefore, all the high fundamental momentum portfolios outperformed their respective price momentum quintile portfolios, while all the low fundamental momentum portfolios underperformed their respective price momentum quintile portfolios.

A further observation is that for the high price momentum quintile portfolios, as represented by the Quintile 1, Quintile 2 and Quintile 3 portfolios, the high fundamental momentum portfolios outperformed their respective price momentum quintile portfolio by a larger margin than the low fundamental momentum portfolio underperformed it by. The opposite is true for the low price momentum quintile portfolios, represented by the Quintile 4 and Quintile 5 portfolios. Here, the low fundamental momentum portfolios underperformed their respective price momentum quintile portfolios by a larger margin than the high fundamental momentum outperformed them by.

The statistical evidence is not enough to conclusively conclude that price momentum and fundamental momentum of earnings do not capture the same effect. However, it indicates that they are not subsumed by one another.

Figure 11.1 shows the cumulative nominal return for the Quintile 1 portfolio based on the two-way analysis. The compounding effect of the high fundamental momentum portfolio outperforming the Quintile 1 portfolio by 0.22% per month is material. The divergence away from the Quintile 1 portfolio for the low fundamental momentum portfolio is materially smaller than that of the high fundamental momentum portfolio. The graphs for the remaining quintiles can be found in the appendix.

Figure 11.1 Two-way analysis: indexed cumulative return for the Quintile 1 portfolio based on a 12-month formation period and a 12-month holding period price momentum strategy, and the high fundamental Quintile 1 portfolio and the low fundamental Quintile 1 portfolio



As a sanity checker of whether fundamental momentum of earnings and price momentum subsume one another, a sample regression analysis is undertaken. The sample regression regresses the price momentum quintiles on the respective fundamental momentum of earnings quintiles. The sample regression equation is shown in Equation 11.1:

$$PM\ Quintile_t = \alpha_0 + \alpha_1(FM\ Quintile_t) + \varepsilon_{t+1} \quad (11.1)$$

where *PM Quintile*$_t$ = price momentum quintile;

FM Quintile$_t$ = fundamental momentum quintile.

Table 11.2 presents the sample regression output. The low adjusted R^2 and low regression coefficient indicate that the fundamental momentum quintile plays a weak role in explaining the price momentum quintile. However, the regression coefficient is positive and statistically significant. If the coefficient was one, it would indicate that the quintiles change simultaneously with one another, i.e. as the fundamental momentum quintile increases or decreases, so too would the price momentum quintile increase or decrease by the same margin. A regression coefficient closer to one would indicate that the price momentum anomaly is a manifestation of fundamental momentum of earnings. In conclusion, it appears that fundamental momentum does not drive price momentum. They are, in fact, two separate anomalies.

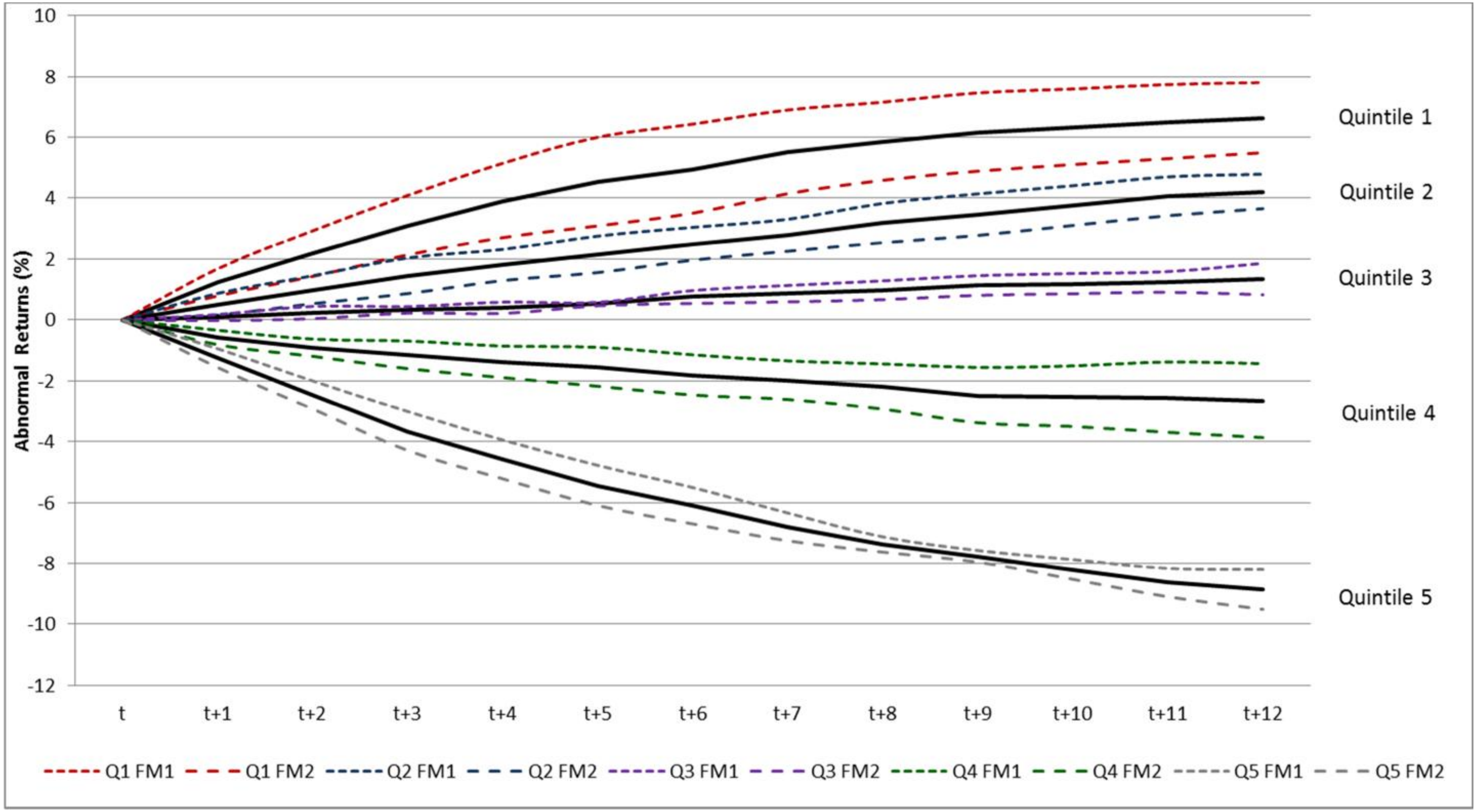
Table 11:2 Two-way analysis: regression analysis and results regressing price momentum quintiles on the respective fundamental momentum quintiles

PM Quintile$_t$ = α_0 + α_1(FM Quintile$_t$) + ε_{t+1}			
PM Quintile$_t$ = α_0 + α_1(FM Quintile)$_t$ + ε_{t+1}			
	Intercept	FM Quintile$_t$	Adj. R^2
Mean coefficient	2.26	0.24	0.060
p-value		0.000	

Figure 11.2 shows the average 12-month forward abnormal return for the price momentum quintiles and their respective high and low fundamental momentum portfolios. The returns were calculated based on their abnormal returns relative to the market. The uniformity of the high fundamental momentum portfolios outperforming and the low fundamental momentum portfolios underperforming the respective quintile portfolios, as shown in Table 11.1, is graphically evident. While the holding period for the sake of this question was 12 months, the graph highlights the fact that it is immaterial how long the holding period is, as over most months leading up to the 12-month holding period, the high fundamental momentum portfolios outperformed their respective quintile portfolios, and the low fundamental momentum portfolios underperformed their respective quintile portfolios.

In conclusion, strong evidence suggesting that the price momentum strategy and the fundamental momentum strategy capture different effects is presented in this section. Therefore, the null Hypothesis 5a is not rejected.

Figure 11.2 Two-way analysis: average 12-month forward abnormal return for the 12-month formation period and 12-month holding period price momentum quintile portfolios and their respective high and low fundamental momentum portfolios



11.3 EARNINGS MOMENTUM AND FUNDAMENTAL MOMENTUM

Following the same methodology as the price momentum two-way analysis, and according to that of Chan *et al.* (1996:1695) and Collins and Hribar (2000:114), a two-way analysis is conducted for the earnings momentum strategy, coupled with the fundamental momentum strategy. The sample is initially divided into quintile portfolios based on the earnings momentum, as measured by the SUE. Following the quintile portfolio construction based on earnings momentum, the quintiles are then further divided based on whether the fundamental momentum of earnings is above or below the median fundamental momentum of earnings for that particular quintile, at that point in time.

The purpose of the two-way analysis is to test whether earnings momentum and fundamental momentum capture the same effect. By sub-dividing the earnings momentum quintile portfolios further, based on the fundamental momentum of earnings, if the performances of the subdivided portfolios are significantly different from that of the respective earnings momentum quintile portfolio, it indicates that fundamental momentum and earnings momentum capture different effects.

Table 11.3 presents the returns for the two-way analysis. The table shows the return performance for the five earnings momentum quintile portfolios, as well as the returns for the sub-division portfolios based on the fundamental momentum of earnings. Panel A of Table 11.3 shows the return results for Quintile 1. A very clear observation is the degree to which the low fundamental momentum portfolio underperforms the Quintile 1 portfolio. On average, the low fundamental momentum portfolio underperforms by -0.38% per month. This result is statistically significant. The high fundamental momentum portfolio outperforms the Quintile 1 portfolio by 0.10% per month. However, this result is not statistically significant. The only other statistically significant result is the high fundamental momentum portfolio of Quintile 5, which is shown in Panel E of Table 11.3. This particular portfolio outperforms the Quintile 5 portfolio by an average monthly return of 0.44%.

Table 11:3 Two-way analysis: profitability of a 12-month holding period earnings momentum strategy combined with a 12-month holding period fundamental momentum strategy

Panel A – Quintile 1			
	Quintile 1	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	19.46	20.39	14.10
Average Monthly Return	1.61	1.71	1.24
Average Monthly Abnormal Return	-	0.10	-0.38
p-Value	-	0.11	0.03
Panel B – Quintile 2			
	Quintile 2	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	19.57	20.06	16.08
Average Monthly Return	1.60	1.69	1.39
Average Monthly Abnormal Return	-	0.09	-0.21
p-Value	-	0.24	0.13
Panel C – Quintile 3			
	Quintile 3	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	16.03	16.47	14.49
Average Monthly Return	1.36	1.39	1.28
Average Monthly Abnormal Return	-	0.03	-0.07
p-Value	-	0.49	0.36
Panel D – Quintile 4			
	Quintile 4	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	13.32	14.30	11.02
Average Monthly Return	1.14	1.26	1.00
Average Monthly Abnormal Return	-	0.12	-0.14
p-Value	-	0.14	0.27

Panel E – Quintile 5			
	Quintile 5	**High Fundamental Momentum**	**Low Fundamental Momentum**
Annualised Return	11.54	17.13	8.52
Average Monthly Return	1.04	1.48	0.82
Average Monthly Abnormal Return	-	0.44	-0.22
p-Value	-	0.00	0.06

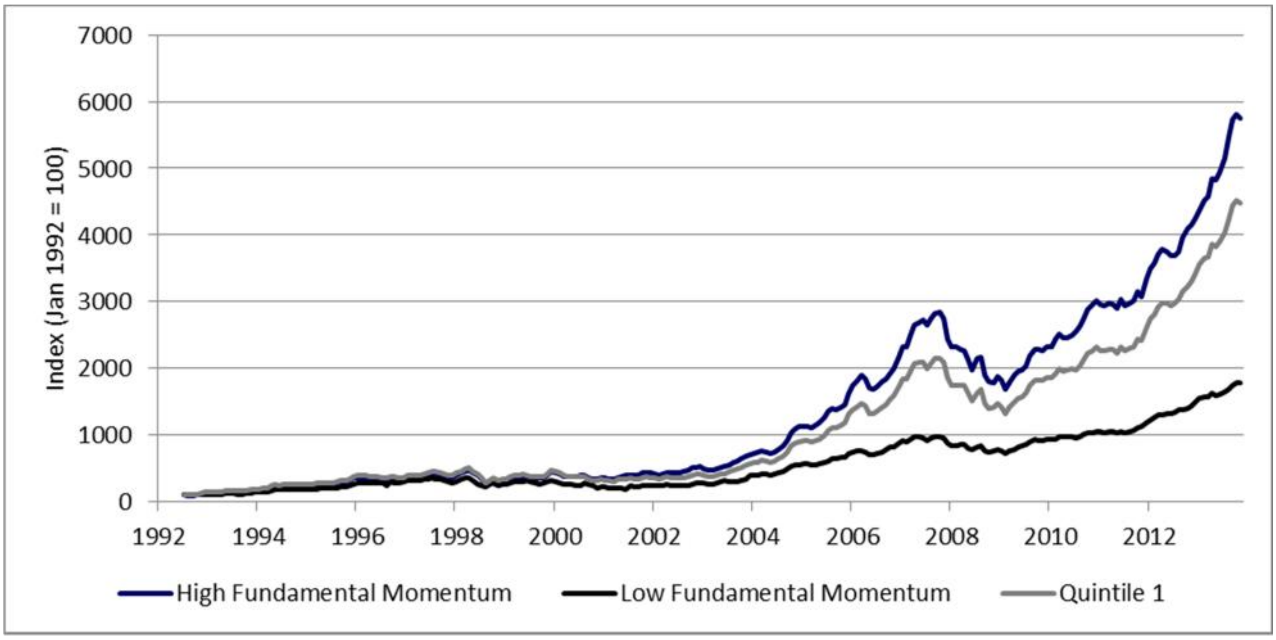
Similar to the price momentum findings, by subdividing the earnings momentum portfolio into high and low fundamental momentum of earnings, the uniformity of the outperformance and underperformance of the returns earned by the high and low fundamental momentum portfolios respectively appears to be evident. The only exception to this is the high fundamental momentum portfolio of Quintile 3, which slightly underperformed the Quintile 3 portfolio. However, the key finding in these results is that with the exception of the high fundamental momentum portfolio of Quintile 5 and the low fundamental momentum portfolio of Quintile 1, the other returns are not significantly different from their respective quintile portfolio returns. This would indicate that earnings momentum and fundamental momentum capture a similar effect. While the benefit of combining both the earnings momentum strategy and the fundamental momentum strategy is apparent, the benefits that accrue are not as significant as those accruing when combining the price momentum strategy and the fundamental momentum strategy.

A plausible explanation of why the two-way analysis of combining the earnings momentum strategy with the fundamental momentum strategy does not generate results that are statistically significant is that both are calculated using a variant of past earnings. This is in contrast to the price momentum and fundamental momentum of earnings, which use a market variable and a fundamental variable.

Although the calculation of the SUE of earnings momentum and that of the fundamental momentum of earnings is different, a material increase or decrease in earnings will influence both calculations. Therefore, while the evidence is still mixed, there is stronger evidence indicating that fundamental momentum of earnings and earnings momentum capture a similar effect, as opposed to the evidence of the two-way analysis incorporating price momentum.

Figure 11.3 shows the cumulative returns generated by the Quintile 1 portfolio, based on a 12-month holding period for the earnings momentum strategy, as well as the respective high fundamental momentum portfolio and the low fundamental momentum strategy. The underperformance of the low quintile portfolio in Panel A of Table 11.3 is highlighted in Figure 11.3. The compounding effect highlights the underperformance of the low fundamental momentum portfolio relative to the outperformance of the high fundamental momentum portfolio. The graphs for the remaining quintiles can be found in the appendix.

Figure 11.3 Two-way analysis: indexed cumulative return for the Quintile 1 portfolio based on a 12-month holding period earnings momentum strategy and the high fundamental Quintile 1 portfolio and the low fundamental Quintile 1 portfolio



A sample regression analysis is used again as a sanity checker of whether fundamental momentum of earnings and earnings momentum subsume one another. The sample regression regresses the earnings momentum quintiles on the respective fundamental momentum of earnings quintiles. The sample regression equation is shown in Equation 11.2:

$$EM\ Quintile_t = \alpha_0 + \alpha_1(FM\ Quintile_t) + \varepsilon_{t+1} \quad (11.2)$$

where E*M Quintile*$_t$ = earnings momentum quintile;

FM Quintile$_t$ = fundamental momentum quintile.

Table 11.4 presents the sample regression output. The adjusted R^2 is materially larger than that of the price momentum regression shown in Equation 11.1. The regression coefficient is also larger indicating that the fundamental momentum quintile plays a larger role in explaining the earnings momentum quintile than it does with regard to the price momentum quintile. The regression coefficient is both positive and statistically significant. The closer to one the regression coefficient is, the stronger the case is that the earnings momentum anomaly is a manifestation of fundamental momentum of earnings. In conclusion, it appears that fundamental momentum plays more of a role in explaining the earnings momentum anomaly than it does for the price momentum anomaly. It is definitely not a complete explanation, though.

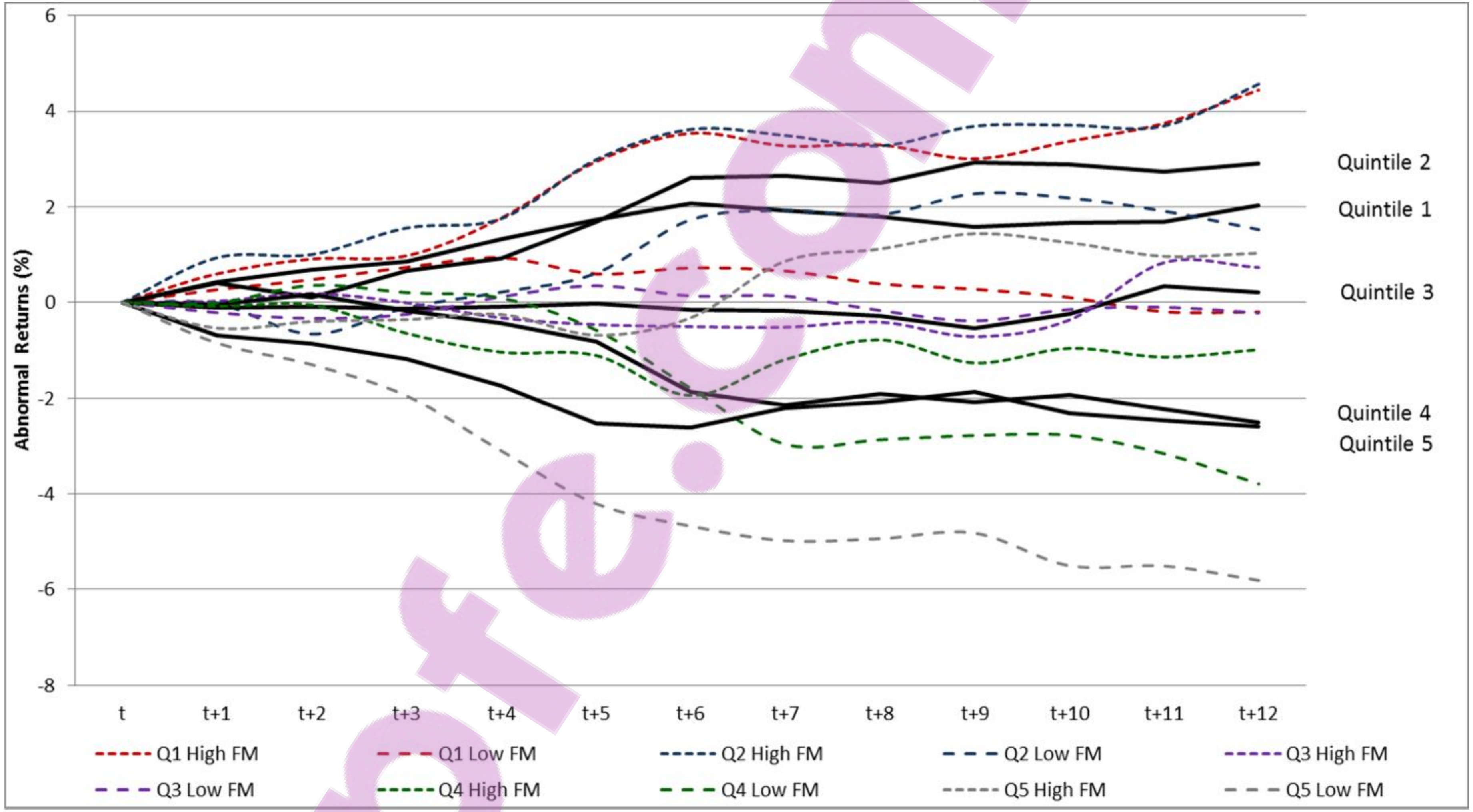
Table 11:4 Two-way analysis: regression analysis and results regressing earnings momentum quintiles on the respective fundamental momentum quintiles

Mean Reversion Regression			
EM Quintile$_t$ = α_0 + α_1(FM Quintile)$_t$ + ε_{t+1}			
	Intercept	FM Quintile$_t$	Adj. R^2
Mean coefficient	1.69	0.44	0.190
p-value		0.000	

Figure 11.4 shows the average 12-month forward returns for the earnings momentum quintile portfolios and their respective high and low fundamental momentum portfolios. In contrast to Figure 11.2, where the uniformity of the high and low fundamental momentum portfolios was evident based on the outperformance over all 12 months and across all the quintiles, this graph shows a very volatile return profile. Over the months leading up to the 12-month holding period, it is clear that there are many instances where the high fundamental momentum portfolio underperformed its respective quintile portfolio and instances where the low fundamental momentum portfolio outperformed the respective

quintile portfolio. It is due to this volatility that the results of the two-way analysis appear to indicate that fundamental momentum may be capturing the same effect as earnings momentum.

Figure 11.4 Two-way analysis: average 12-month forward abnormal return for the 12-month holding period earnings momentum quintile portfolios and their respective high and low fundamental momentum portfolios



Despite the volatility in the 12 months, comparing the returns at the end of the 12-month period, it is evident that all the high fundamental portfolios outperformed their respective quintile portfolios. Likewise, all the low fundamental portfolios underperformed their respective quintiles. The magnitudes of the outperformance and underperformance are also larger for a majority of the quintiles than the magnitudes of the two-way analysis using fundamental momentum and price momentum.

In conclusion, the statistical analysis, in the form of the regression analysis and p-values presented in Table 11.3, indicates that fundamental momentum and earnings momentum may be capturing the same effect. The graphical evidence and return profiles present a counter-argument. However, given that the return profiles are not statistically significant, the null Hypothesis 5b is rejected.

11.4 SUMMARY

This chapter presented the two-way analysis, which brought together the price momentum anomaly and the earnings momentum anomaly with the fundamental momentum strategy, as illustrated in Chapter 9. Following from previous research (Chan *et al.,* 1996:1695; Collins & Hribar, 2000:114), the two-way analysis incorporates constructing portfolios using two strategies. First, quintile portfolios are constructed based on either price momentum or earnings momentum. Then each quintile portfolio is further subdivided based on its fundamental momentum of earnings. If the profitability of the subdivided portfolios differs from that of the original portfolio based purely on either price momentum or earnings momentum, it indicates that the trading strategies capture different effects. The quintile portfolios are constructed in exactly the same manner as was done in Chapters 7 and 8.

The evidence indicates that the price momentum anomaly and the fundamental momentum of earnings do not capture the same effects. This result is concluded based on the fact that the profitability of price momentum returns is enhanced (reduced) by dividing the price momentum quintile portfolios into portfolios with high (low) fundamental momentum of earnings. Although some of the results were not statistically significant, the results were consistent across all the price momentum quintile portfolios. As a result, the null Hypothesis 5a was not rejected.

With regard to the earnings momentum anomaly, the evidence indicates that fundamental momentum of earnings may capture a similar effect to that of earnings momentum. Both strategies use a variant of earnings to construct the quintile portfolios, and thus it is very plausible that they capture a similar effect. Most of the returns of the high and low fundamental momentum portfolios were not significantly different from their respective earnings momentum portfolios. However, over a 12-month period, the high fundamental momentum portfolios all outperformed their respective quintile portfolios. Likewise, the low fundamental momentum portfolios underperformed their respective quintile portfolios. But due to the statistical insignificance of the returns, the null Hypothesis 5b was rejected.

The following chapter concludes the study.

CHAPTER 12

CONCLUSION AND RECOMMENDATIONS

12.1 INTRODUCTION

The main purpose of the study was to investigate whether price momentum or earnings momentum is subsumed by fundamental momentum. Price momentum and earnings momentum are long-standing anomalies that have been widely researched, yet no definitive explanation has been provided in the literature. The objective of the study was to improve the understanding of price momentum and earnings momentum through the analysis of fundamental momentum on the JSE. The study also provided insight into the persistence of fundamental momentum of earnings.

12.2 PRICE MOMENTUM AND EARNINGS MOMENTUM ON THE JSE

Explanations for two of the most-researched anomalies, price momentum and earnings momentum, remain pervasive. The earnings momentum anomaly was initially described by Ball and Brown (1968:169-171) in 1968, while the price momentum anomaly was initially described in 1993 by Jegadeesh and Titman (1993:76). Both anomalies contradict the EMH theory, and while Fama (1998:304) defends the EMH, he concedes that the earnings momentum and price momentum anomalies pose problems for the EMH.

Both the price momentum and earnings momentum anomalies have been extensively studied around the world. The price momentum anomaly on the JSE has been widely researched, but the earnings momentum has not been researched well. This study contributes greatly to both areas of research on the JSE, but perhaps more so for the lesser-studied earnings momentum anomaly.

Following the strategy used by Jegadeesh and Titman (1993:68), price momentum was found to be profitable on the JSE across all 16 strategies tested. The portfolios tested were constructed using an equal-weighting methodology, and all results were shown to be statistically significant at the 5% level. The best-performing strategy was the six-month formation and three-month holding strategy. Though the Quintile 1 portfolio produced an average annualised return of 22.97%, the Quintile 5 portfolio produced an average annualised return of 0.58%, and the market produced an average annualised return of 13.63%. These returns are evidence of the price momentum anomaly and its profitability on the JSE.

With regard to a value or size factor explaining the price momentum anomaly on the JSE, all tests conducted showed that neither factor played a statistically significant role in the price momentum results.

Due to the above results, the null Hypothesis 1A, which stated that the price momentum strategy is not a profitable strategy on the JSE, was rejected. The null Hypotheses 1a and 1b, which state that neither the size risk factor nor the value risk factor explains the price momentum anomaly on the JSE, were both not rejected.

Following the strategy used by Foster *et al.* (1984:582), which employed the SUE methodology as a proxy for earnings surprises, earnings momentum was also found to be profitable on the JSE for up to 12 months following the earnings announcement. The returns earned on the Quintile 1 and Quintile 2 portfolios were shown to be statistically different from those of the market portfolio at the 5% level of significance, while the Quintile 3, Quintile 4 and Quintile 5 portfolios did not produce returns that were statistically different from those of the market portfolio.

The results showed that most of the PEAD took place within the first six months following the earnings announcement. After the initial six months, very little PEAD was evident, and some signs of reversion became evident. While returns of the nine-month and 12-month holding strategies remained statistically higher than those of the market portfolio, the outperformance was due to the PEAD of the portfolio in the initial six months. Therefore, the most profitable earnings momentum strategy was the six-month holding strategy.

Further findings included the fact that Quintile 1 and Quintile 2 had the highest earnings growth in the 12 months leading up to the earnings announcements. Remembering that the portfolios were based on the magnitude of the earnings surprise, this result gave insight into why the Quintile 2 portfolio outperformed the Quintile 1 portfolio over holding periods longer than three months.

Furthermore, investors were also shown to anticipate earnings surprises up to 12 months prior to the earnings announcement. So while PEAD exists, most of the information contained in the earnings announcement appears to have been priced into the share price prior to the earnings announcement.

Similarly to price momentum, the size and value risk factors were not found to play a statistically significant role in explaining the earnings momentum on the JSE.

The null Hypothesis 2A, which states that the earnings momentum strategy is not a profitable strategy on the JSE, was rejected. The null Hypotheses 2a and 2b, which state that neither the size risk factor nor the value risk factor explains the earnings momentum anomaly on the JSE, were both not rejected.

12.3 FUNDAMENTAL MOMENTUM AS A NEW TRADING STRATEGY

The fundamental momentum of earnings trading strategy was introduced in this study as a new trading strategy. This is one of the contributions of the study to the existing body of literature. The trading strategy was based on dividing the sample into equal-weighted portfolios based on the magnitude of the fundamental momentum of earnings.

The fundamental momentum of earnings trading strategy was shown to be profitable on the JSE for holding periods of three, six, nine and 12 months following the earnings announcement, for the sample included in the study. The results of the sort analysis showed that the Quintile 1 portfolio significantly outperformed the market portfolios and the Quintile 5 portfolio significantly underperformed the market portfolio. The Quintile 2, Quintile 3 and Quintile 4 portfolios did not produce results that were significantly different from those of the market. Therefore, the results are equally efficient at indicating to investors which shares to hold and which shares to avoid.

Similar to the earnings momentum findings, the best-performing holding period was six months. This is due to the fact that financial results are reported every six months. Therefore, new earnings information is released onto the market every six months, which potentially affects investors' expectations and the share prices. As a result, it is beneficial to review the holding of a share every six months when employing a trading strategy that is based on the fundamental momentum of earnings.

There are two possible explanations for the profitability of fundamental momentum. Either fundamental momentum captured a risk factor or investors overreacted or underreacted to the earnings announcements. The evidence indicated that the fundamental momentum of earnings strategy did not capture a size effect or value effect. The tests were conducted using both univariate statistics and regression analysis following the Fama and Macbeth methodology. Behavioural explanations were explored in more depth.

The market anticipated both positive and negative fundamental momentum of earnings 12 months prior to the earnings announcement. This is in line with the earnings momentum strategy. The anticipation of the fundamental momentum of earnings resulted in the market correctly pricing shares in the Quintile 2, Quintile 3 and Quintile 4 portfolios. However, the Quintile 1 and Quintile 5 portfolios continued to adjust to the new information after the earnings announcement. It would appear that either an overreaction or underreaction to historical information caused these results.

Focusing on the sustainability of the fundamental momentum of earnings, less than 20% of businesses were shown to produce consecutive years of positive or negative fundamental momentum. Therefore, the overreaction hypothesis is the more plausible explanation. An initial overreaction to both positive and negative fundamental momentum, in the extreme quintiles, pushed the market value away from the intrinsic value of the business. This later corrected itself as new information becomes available following the next earnings announcement. Given that it is unlikely that businesses produce two consecutive years of fundamental momentum, the probability is high that fundamental momentum reverts. Therefore, the market will correct for the initial overreaction following the subsequent earnings announcement.

The findings discussed resulted in the null Hypothesis 3, which states that the fundamental momentum of earnings trading strategy is not profitable on the JSE, being rejected. The null Hypotheses 3a and 3b, which state that neither the size risk factor nor the value risk factor explains the profitability of the fundamental momentum of earnings trading strategy on the JSE, were both not rejected.

12.4 FUNDAMENTAL MOMENTUM OF EARNINGS COMPONENTS

Contributing further to the literature, the study examined the fundamental momentum of the underlying components of earnings. Earnings were decomposed into their accrual and cash flow components, and then further divided into the sub-components of accruals and cash flows. Assuming that the mean reversion of earnings growth held, a regression sample model that tested the relationship between the fundamental momentum of forward earnings and the fundamental momentum of the underlying components of earnings was developed. It remains important to remember that studying fundamental momentum is about the rate of change of the underlying earnings components and future earnings, and not about the composition of the earnings.

Univariate statistics and the Pearson correlations between both nominal values of earnings and the underlying components were presented. The average return on assets for the sample was 8.4%, with most of the earnings consisting of accruals as opposed to cash flows. Businesses, on average, also raised more capital on the equity market than they returned to shareholders. However, the distribution of the sample was skewed to the left. As a result, it can be concluded that a small number of businesses raised large amounts of capital, causing the median to be positive while the mean is negative.

The fundamental momentum models were developed on the assumption that the earnings growth rate mean reverts to a long-term normalised growth rate. The Pearson correlation indicated a negative correlation between the fundamental momentum of current earnings and the fundamental momentum of future earnings. Therefore, as the growth rate of current earnings increased, the growth rate of future earnings declined. This is indicative of mean reversion. The results were confirmed through autoregressive analysis using earnings, as well as fundamental momentum of earnings.

The mean reversion autoregressive model was then expanded into the underlying components of trailing earnings. Interpreting the results was not about which component was of a higher quality and thus whether earnings were high quality or low quality. The interpretation of the results was to determine whether an increasing or decreasing rate of growth of any component or sub-component of earnings affected the rate of growth of forward earnings, and more importantly, which components had a higher degree of influence. The results had little to do with the nominal value of the earnings components, or what percentage of total earnings consisted of the various components.

No component of earnings was found to have a greater impact on the fundamental momentum of forward earnings than any other component. However, the fundamental momentum of all components and sub-components of current earnings had a statistical relationship with the fundamental momentum of forward earnings. This is evident from both the regression coefficients and the statistical significance of the coefficients. The interpretation of this result, and one of the key findings of the study, is that management's focus needs to be on the sustainable growth of the various components of earnings, and not in trying to grow earnings as quickly as possible, in an unsustainable fashion. Short-term changes in the growth rates are not sustainable and will lead to the mean reversion of earnings reverting at a faster pace.

Across all three fundamental models, the strongest level of reversion took place in Quintile 1 and Quintile 5, which were businesses with the highest and lowest level of fundamental momentum of forward earnings respectively. Therefore, it is very difficult for businesses which have very high or very low changes in the rate of growth of the underlying earnings component in one year to sustain that level of growth into the future.

The null Hypothesis 4, which states that the fundamental momentum of forward earnings is not related to the fundamental momentum of the sub-components of current earnings, was rejected.

12.5 FUNDAMENTAL MOMENTUM, EARNINGS MOMENTUM AND PRICE MOMENTUM

The final chapter of the study presented the two-way analysis, which tested whether either price momentum or earnings momentum was subsumed by the fundamental momentum of earnings. This is the study's final contribution to the existing body of literature.

Following from previous research (Chan *et al.,* 1996:1695; Collins & Hribar, 2000:114), the two-way analysis incorporated constructing portfolios using two strategies. First, equal-weighted quintile portfolios were constructed based on either price momentum or earnings momentum. Then the quintile portfolios were further divided based on their fundamental momentum of earnings.

The price momentum anomaly and the fundamental momentum of earnings did not capture the same effects. This result was concluded based on the fact that the profitability of price momentum returns was enhanced (reduced) by dividing the price momentum quintile portfolios into portfolios with high (low) fundamental momentum of earnings. This result was consistent across all the price momentum quintile portfolios.

The earnings momentum and fundamental momentum of earnings could have captured similar effects. Both strategies used a variant of earnings to construct the quintile portfolios. Therefore, it is very plausible that they could have captured a similar effect. Over a 12-month period, the high fundamental momentum portfolios all outperformed their respective quintile portfolios. Likewise, the low fundamental momentum portfolios underperformed their respective quintile portfolios. But these results were not statistically significant.

Based on these results, the null Hypothesis 5a, which states that price momentum is not a manifestation of fundamental momentum, was not rejected. The null Hypothesis 5b, which states that earnings momentum is not a manifestation of fundamental momentum, was rejected.

12.6 LIMITATIONS

The study was limited to industrial companies listed on the JSE between the period of January 1990 and December 2013. Financial companies, resource companies and property companies were excluded from the study. Therefore, the results cannot be generalised to unlisted companies in South Africa. Furthermore, one needs to be cautious in generalising the results to all companies listed on the JSE, given that the capital structures differ across sectors. However, the three trading strategies tested in the study are expected to be profitable across sectors.

The second limitation was that no formal explanation was presented with regard to the profitability of the fundamental momentum of earnings strategy. The overreaction explanation was hypothesised. The evidence presented indicated that the fundamental momentum of earnings could not be explained by a behavioural-based explanation, as opposed to a risk-based explanation. However, similar to price momentum and earnings momentum, no definitive explanation was put forward for the profitability of the fundamental momentum of earnings strategy.

12.7 RECOMMENDATIONS FOR FUTURE STUDIES

Some findings in the study could stimulate a vast amount of future research.

The PE ratios of the price momentum Quintile 1 and Quintile 2 portfolios decreased as the holding period increased. And the PE ratios for the Quintile 4 and Quintile 5 portfolios increased as the holding period increased. Given that the shares were selected based on the formation period, the same shares were held in the portfolios irrespective of the holding period. Therefore, while the share prices increased in the Quintile 1 and Quintile 2 portfolios, the earnings of the shares had to increase at a faster rate in order for the average PE ratio to decrease. Likewise, in the Quintile 4 and Quintile 5 portfolios, while the share prices decreased, the earnings of the shares had to decrease at a faster rate in order for the PE ratio to increase. Further research is required in this regard, but this finding could give some insight into an underlying driver of the price momentum anomaly. Understanding the underlying earnings growth rates of the different price momentum strategies and quintile portfolios would possibly give significant insight into the price momentum anomaly.

A further enhancement of the price momentum research would be to conduct separate sorts based on small-caps, mid-caps and large-caps. While this method has been widely employed in research around the world, it has not been undertaken on the JSE. A possible reason for this is that the perception is that there are not enough observations in the universe. The author disagrees and would argue that there are sufficient observations to undertake such a study. This would give further insight into the price momentum anomaly on the JSE.

The study calculated the average earnings growth of the companies in the 12 months leading up to inclusion in the respective earnings momentum portfolios. Researching the underlying earnings growth rates in the 12 months following the portfolio formation might give insight into the driver of earnings momentum. Earnings growth rates could be shown to be higher or lower for different quintiles or earnings could mean revert at a faster or slower rate across the different quintile portfolios.

Price and earnings momentum were shown to be profitable up to 12 months following portfolio formation. To test whether the portfolios continue to outperform and underperform after the initial 12 months could further validate whether a risk-based explanation is plausible or whether the results are due to investors overreacting or underreacting. This was discussed in Section 2.2.2. The same methodology could be employed to improve the understanding of the fundamental momentum of earnings strategy.

The univariate statistics presented for the earnings momentum portfolios showed that the Quintile 1 portfolio had the highest market capitalisation, while the Quintile 5 portfolio had the smallest market capitalisation. This is the opposite of what was expected if a size effect was present. This is an intriguing result that warrants further research.

A more formal statistical analysis is required to understand what drives the profitability of the fundamental momentum of earnings strategy. Similar to the earnings momentum anomaly, because the fundamental momentum of earnings strategy is based on the earnings component, further research should focus on the underlying earnings both before and after portfolio construction.

The Pearson correlation matrix presented in Table 10.3 showed that cash flow earnings and cash balances were negatively correlated. This indicates that the more cash flow a company generates, the lower the cash balance is on the statement of financial position. This is synonymous with the theory that the more one earns, the more one spends. Further research in this regard will be informative.

The results of Chapter 10 indicated that the fundamental momentum of forward earnings was negatively related to the fundamental momentum of current earnings. Therefore, the earnings were mean reverting. But decomposing the earnings into cash flow earnings and accrual earnings showed that certain components of the cash flow earnings and accrual earnings had stronger impacts on the fundamental momentum of forward earnings, causing reversion to happen at a faster or slower rate. Including this analysis in the fundamental momentum of earnings strategy, by not just forming portfolios based on their fundamental momentum of earnings, but also based on whether they have high or low fundamental momentum in the various sub-components of the cash flow and accrual components, may enhance the profitability of the strategy.

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APPENDICES

Appendix A: Price momentum graphs and tables

Table A.1: Factor loadings for six-month formation strategy

Panel A - 3 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	1.0327	0.9853	0.9561	0.9501	1.0219
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-0.2158	0.2492	-0.0532	-1.0241	0.4470
p-value	0.38	0.25	0.81	0.00	0.12
B_3	0.4996	-0.0651	-0.0422	0.2409	-0.8147
p-value	0.00	0.51	0.68	0.03	0.00
Panel B - 6 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	1.0459	0.9619	0.9215	0.9357	1.0171
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-0.7066	-0.1032	-0.9539	-1.9141	-0.2899
p-value	0.04	0.75	0.00	0.00	0.44
B_3	0.8304	-0.0509	0.0709	0.4394	-0.4863
p-value	0.00	0.73	0.63	0.01	0.02
Panel C - 9 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	0.9755	0.9110	0.8825	0.9052	0.9352
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-1.6496	-0.8552	-2.1556	-2.8879	-0.5015
p-value	0.00	0.04	0.00	0.00	0.26
B_3	1.5811	0.3326	0.4596	0.7719	0.2805
p-value	0.00	0.08	0.01	0.00	0.25
Panel D - 12 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	0.9241	0.8755	0.8600	0.8603	0.8503
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-2.4516	-1.6213	-3.5994	-4.3491	-0.6853
p-value	0.00	0.00	0.00	0.00	0.17
B_3	2.5139	1.0526	1.0647	1.5743	0.9300
p-value	0.00	0.00	0.00	0.00	0.00

Table A.2: Factor loadings for nine-month formation strategy

Panel A - 3 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	1.0002	1.0012	0.9384	0.9520	1.0607
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-0.4867	-0.1193	-0.3331	-0.7779	0.3224
p-value	0.05	0.59	0.14	0.00	0.27
B_3	0.4617	-0.0872	-0.0041	0.0836	-0.6111
p-value	0.00	0.38	0.97	0.46	0.00
Panel B - 6 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	1.0427	0.9682	0.9116	0.9465	1.0234
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-1.4777	-0.7698	-1.4536	-1.8189	0.1423
p-value	0.00	0.02	0.00	0.00	0.71
B_3	0.8751	-0.0135	0.0808	0.2036	-0.4598
p-value	0.00	0.93	0.59	0.21	0.03
Panel C - 9 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	0.9852	0.9131	0.8611	0.9230	0.9490
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-2.1727	-1.6171	-2.8103	-3.7361	0.4860
p-value	0.00	0.00	0.00	0.00	0.28
B_3	1.4515	0.3418	0.6355	0.7947	0.1023
p-value	0.00	0.07	0.00	0.00	0.68
Panel D - 12 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	0.9238	0.8720	0.8440	0.8761	0.8807
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-3.5214	-2.0502	-4.0389	-5.0406	0.2129
p-value	0.00	0.00	0.00	0.00	0.68
B_3	2.6065	0.9367	1.3096	1.4510	0.6934
p-value	0.00	0.00	0.00	0.00	0.01

Table A.3 Factor loadings for 12-month formation strategy

Panel A - 3 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	1.0243	0.9993	0.9435	0.9327	1.0619
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-0.9191	-0.1471	-0.6892	-0.5091	0.4839
p-value	0.00	0.52	0.00	0.04	0.10
B_3	0.2764	-0.0008	0.1058	-0.0943	-0.5695
p-value	0.02	0.99	0.29	0.41	0.00
Panel B - 6 Months					
B_1	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
p-value	1.0382	0.9551	0.9079	0.9692	0.7796
B_2	0.00	0.00	0.00	0.00	0.04
p-value	-1.3912	-0.8473	-2.6234	-1.9471	-0.5800
B_3	0.00	0.01	0.00	0.00	0.01
p-value	0.5403	0.0514	0.4489	0.0541	0.0000
B_1	0.00	0.74	0.00	0.74	0.00
Panel C - 9 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	0.9708	0.9243	0.8544	0.9447	0.9579
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-2.2336	-1.9976	-3.8910	-3.3575	0.9586
p-value	0.00	0.00	0.00	0.00	0.04
B_3	1.2019	0.4839	0.9716	0.5376	-0.0853
p-value	0.00	0.01	0.00	0.01	0.74
Panel D - 12 Months					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
B_1	0.9134	0.8743	0.8182	0.9213	0.8860
p-value	0.00	0.00	0.00	0.00	0.00
B_2	-3.6133	-2.7483	-4.9820	-4.8717	1.0481
p-value	0.00	0.00	0.00	0.00	0.04
B_3	2.2733	1.0849	1.7734	1.2865	0.3436
p-value	0.00	0.00	0.00	0.00	0.23

Appendix B : Earnings momentum graphs and tables

Figure B.1: Earnings momentum index – six-month holding strategy (Jan 1992 – Dec 2013)

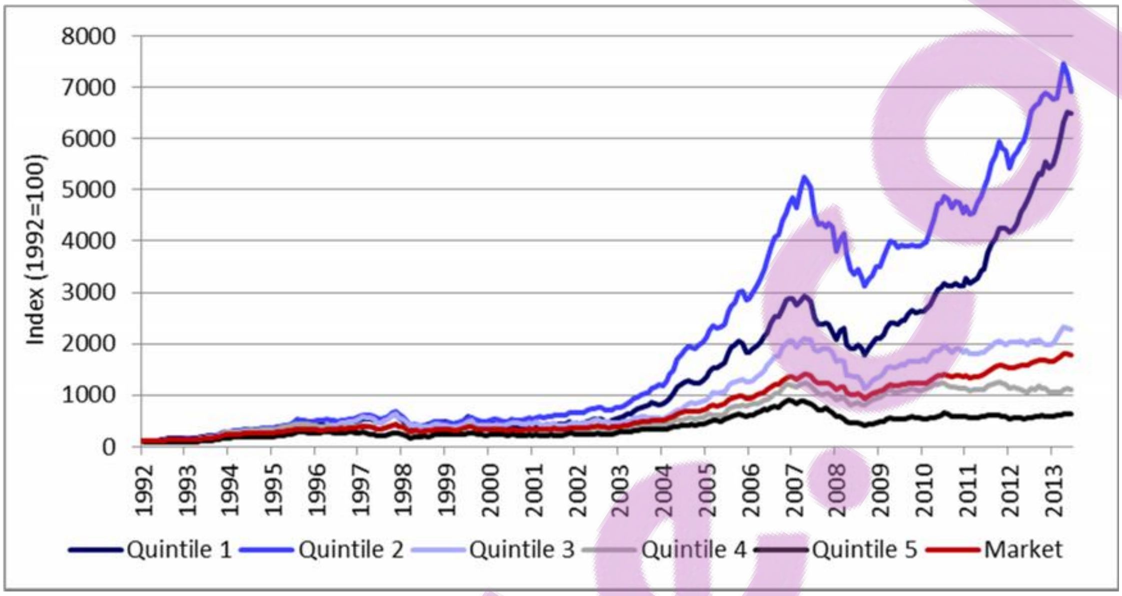


Figure B.2: Earnings momentum index – nine-month holding strategy (Jan 1992 – Dec 2013)

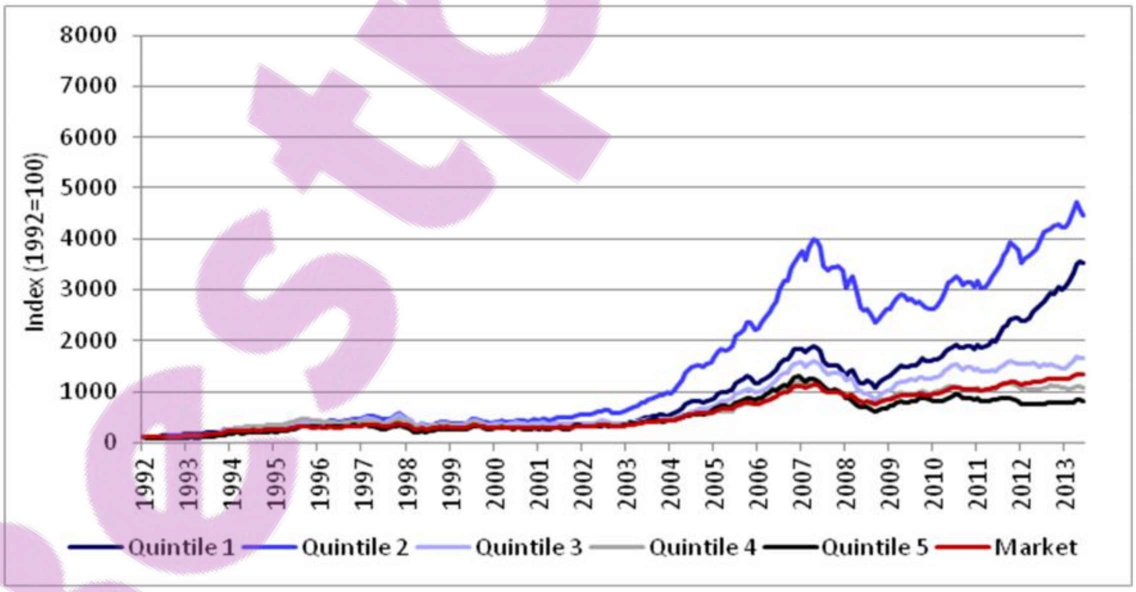
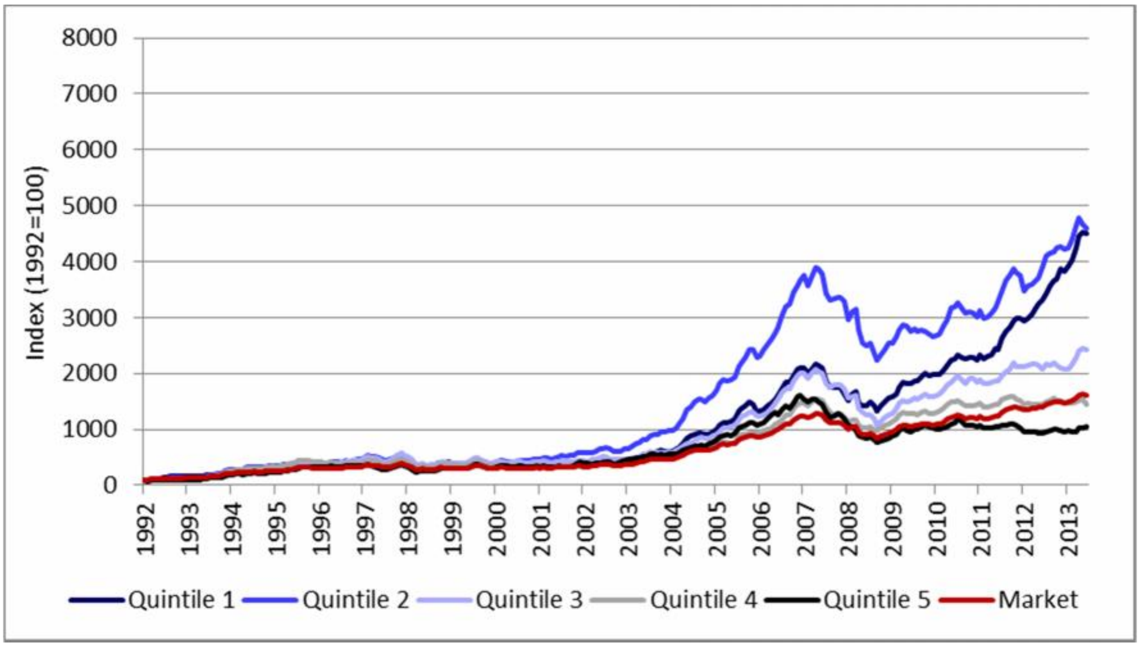


Figure B.3: Earnings momentum index – 12-month holding strategy (Jan 1992 – Dec 2013)


8000
7000
6000
5000
4000
3000
2000
1000
0
Index (1992=100)
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Quintile 1
Quintile 2
Quintile 3
Quintile 4
Quintile 5
Market

Appendix C : Fundamental momentum graphs and tables

Figure C.1: Fundamental momentum index – three-month holding strategy (Jan 1992 – Dec 2013)

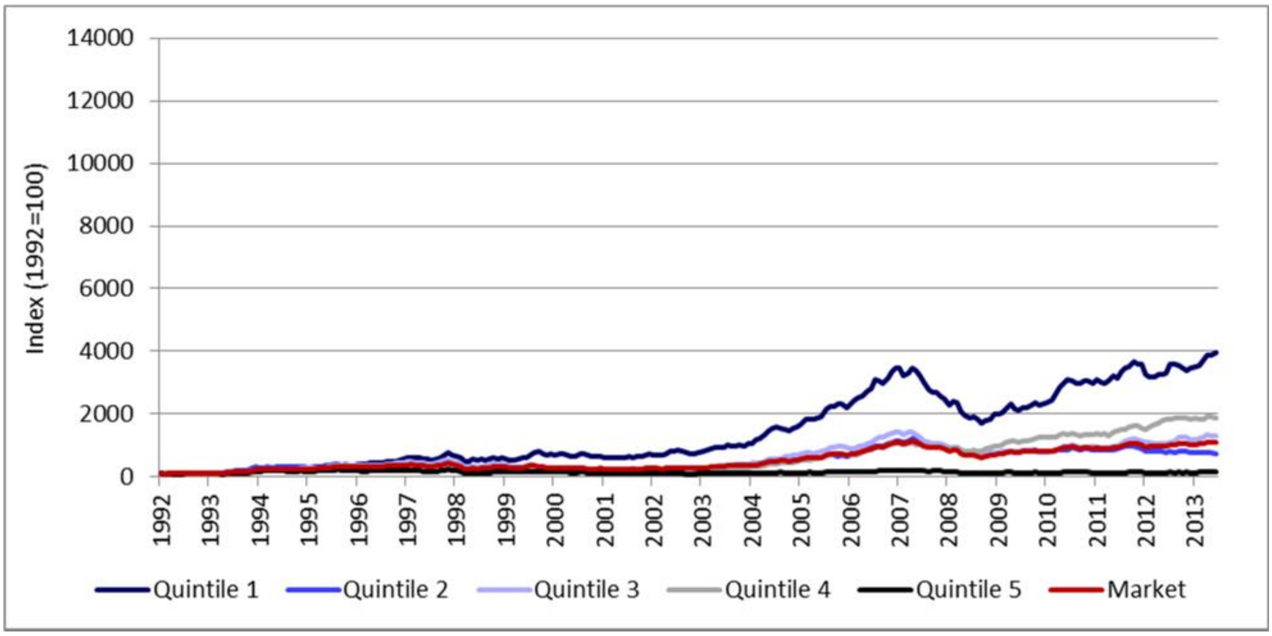


Figure C.2: Fundamental momentum index – nine-month holding strategy (Jan 1992 – Dec 2013)

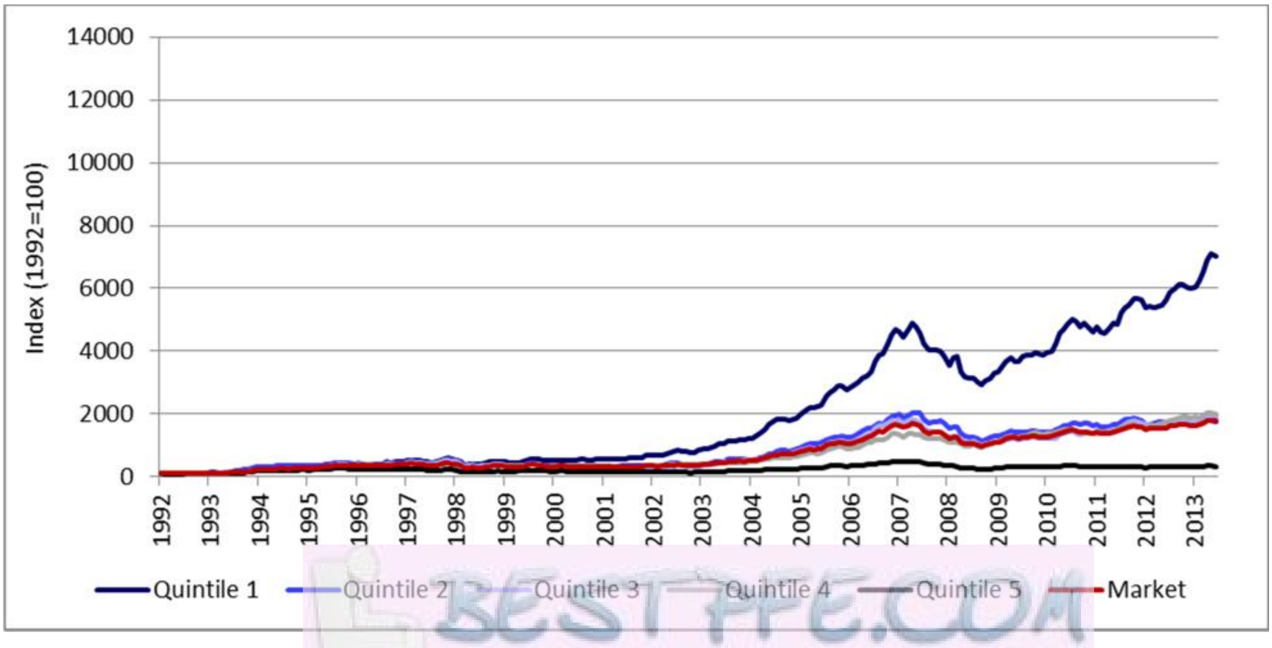


Figure C.3: Fundamental momentum index – 12-month holding strategy (Jan 1992 – Dec 2013)

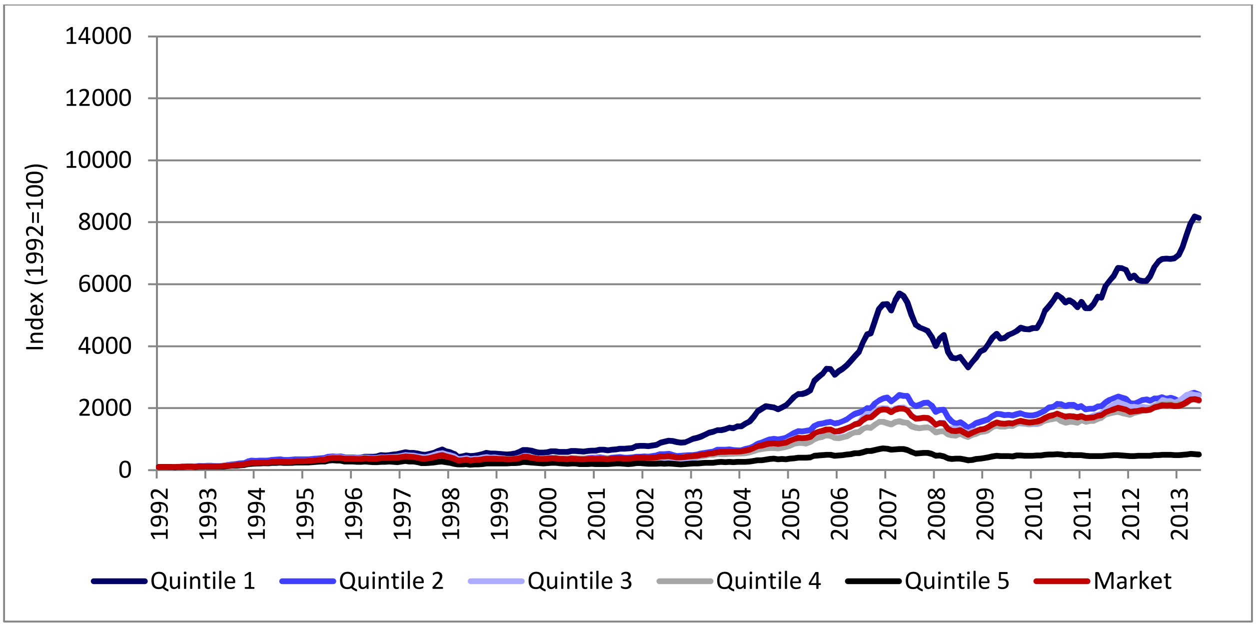


Table C.1: Regression analysis – two years consecutive fundamental momentum

Abnormal Return$_{t+i}$ = β_0 + β_1(Dummy Variable$_c$)+ ε_{t+1}			
Forward Returns	**B_0**	**B_1**	**p-Value**
3 Months	-0.794	1.513	0.01
6 Months	-2.285	4.389	0.00
9 Months	-2.735	5.249	0.00
12 Months	-3.366	6.453	0.00

Table C.2: Regression analysis – three years consecutive fundamental momentum

Dummy Regression Coefficients – 3 Years Consecutive Fundamental Momentum			
Forward Returns	**B_0**	**B_1**	**p-Value**
3 Months	-0.122	1.844	0.10
6 Months	-0.249	3.989	0.02
9 Months	-0.275	4.417	0.04
12 Months	-0.247	3.990	0.15

Table C.3: Regression analysis – four years consecutive fundamental momentum

Dummy Regression Coefficients – 4 Years Consecutive Fundamental Momentum			
Forward Returns	**B_0**	**B_1**	**p-Value**
3 Months	-0.017	0.855	0.66
6 Months	-0.018	0.919	0.75
9 Months	0.017	-0.868	0.82
12 Months	0.081	-3.975	0.40

Table C.4: Regression analysis – five years consecutive fundamental momentum

Dummy Regression Coefficients – 5 Years Consecutive Fundamental Momentum			
Forward Returns	**B_0**	**B_1**	**p-Value**
3 Months	0.007	-1.088	0.75
6 Months	-0.045	1.683	0.74
9 Months	0.012	-2.836	0.66
12 Months	-0.007	-5.802	0.47

Appendix D : Two-way analysis

Figure D.1: Two-way classification index – Quintile 2 12-12 price momentum strategy and fundamental momentum (Mar 1992 – Dec 2013)

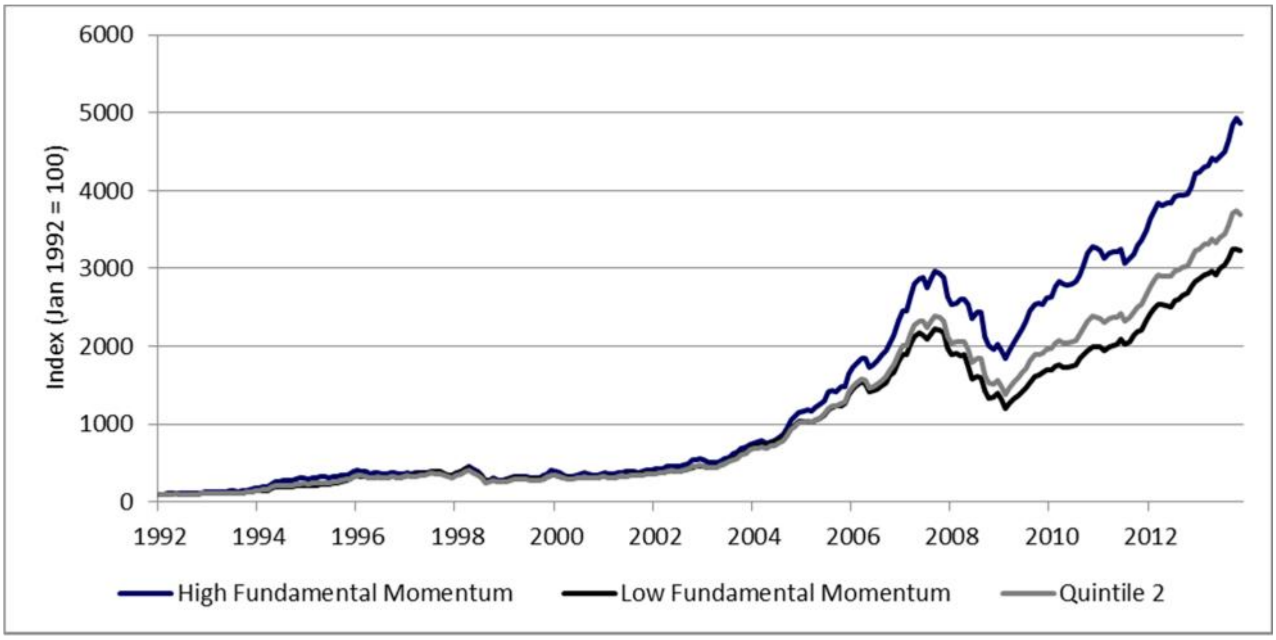


Figure D.2: Two-way classification index – Quintile 3 12-12 price momentum strategy and fundamental momentum (Mar 1992 – Dec 2013)

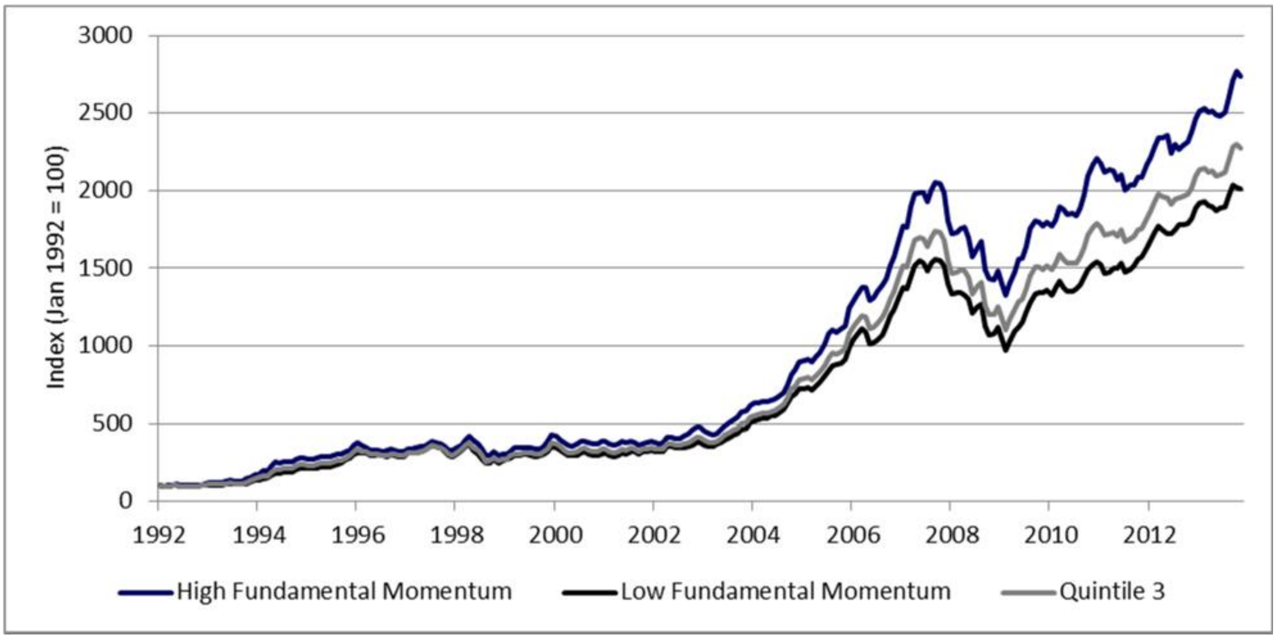


Figure D.3: Two-way classification index – Quintile 4 12-12 price momentum strategy and fundamental momentum (Mar 1992 – Dec 2013)

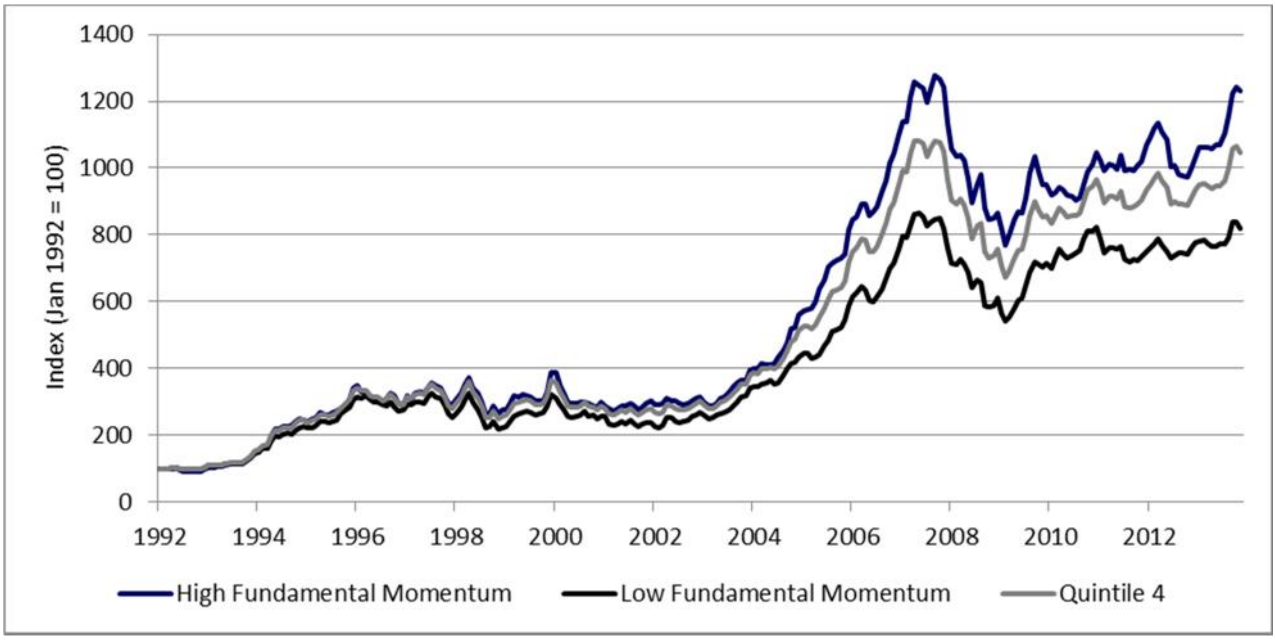


Figure D.4: Two-way classification index – Quintile 5 12-12 price momentum strategy and fundamental momentum (Mar 1992 – Dec 2013)

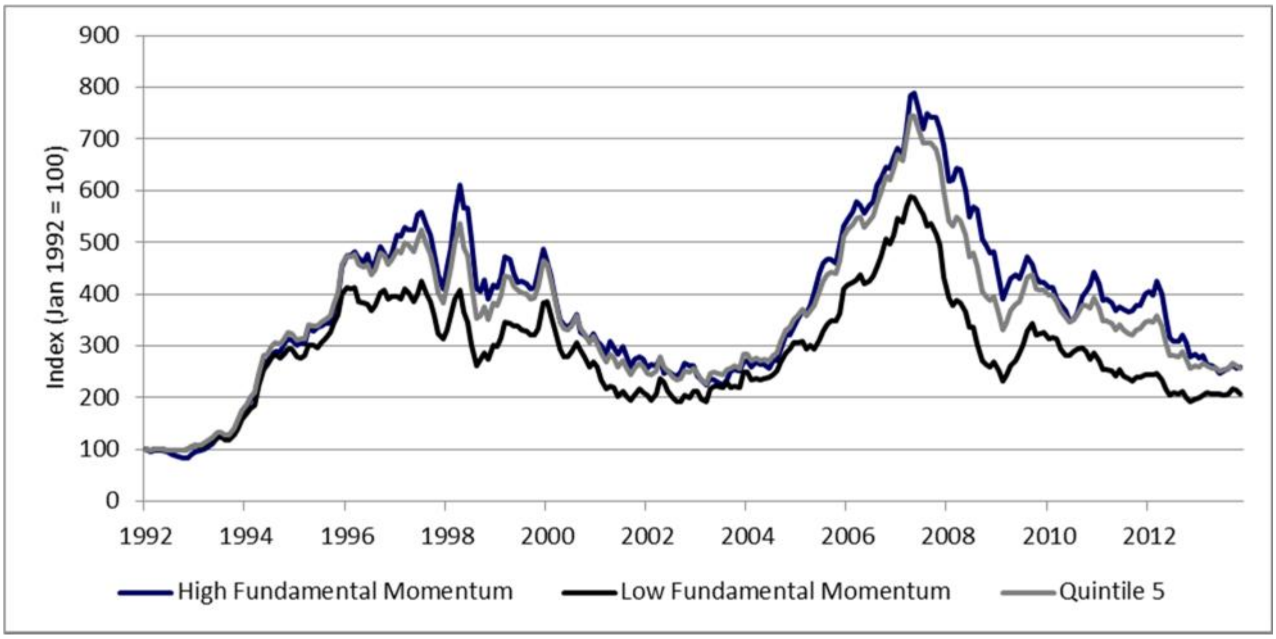


Figure D.5: Two-way classification index – Quintile 2 earnings momentum and fundamental momentum (Mar 1992 – Dec 2013)

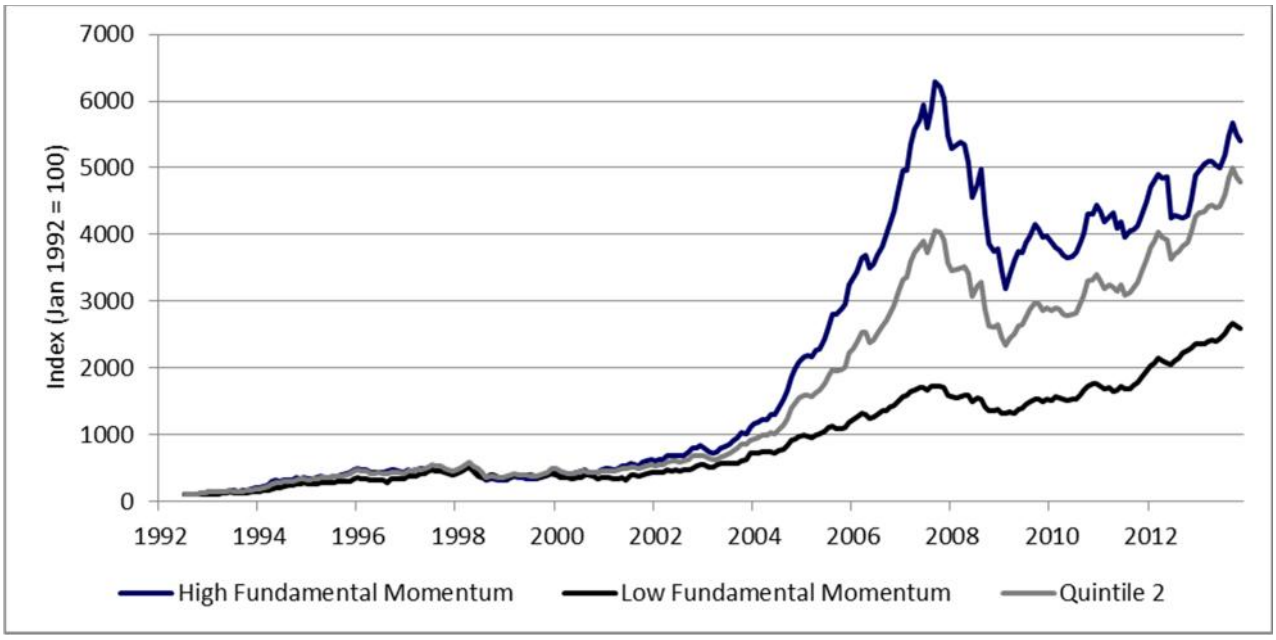


Figure D.6: Two-way classification index – Quintile 3 earnings momentum and fundamental momentum (Mar 1992 – Dec 2013)

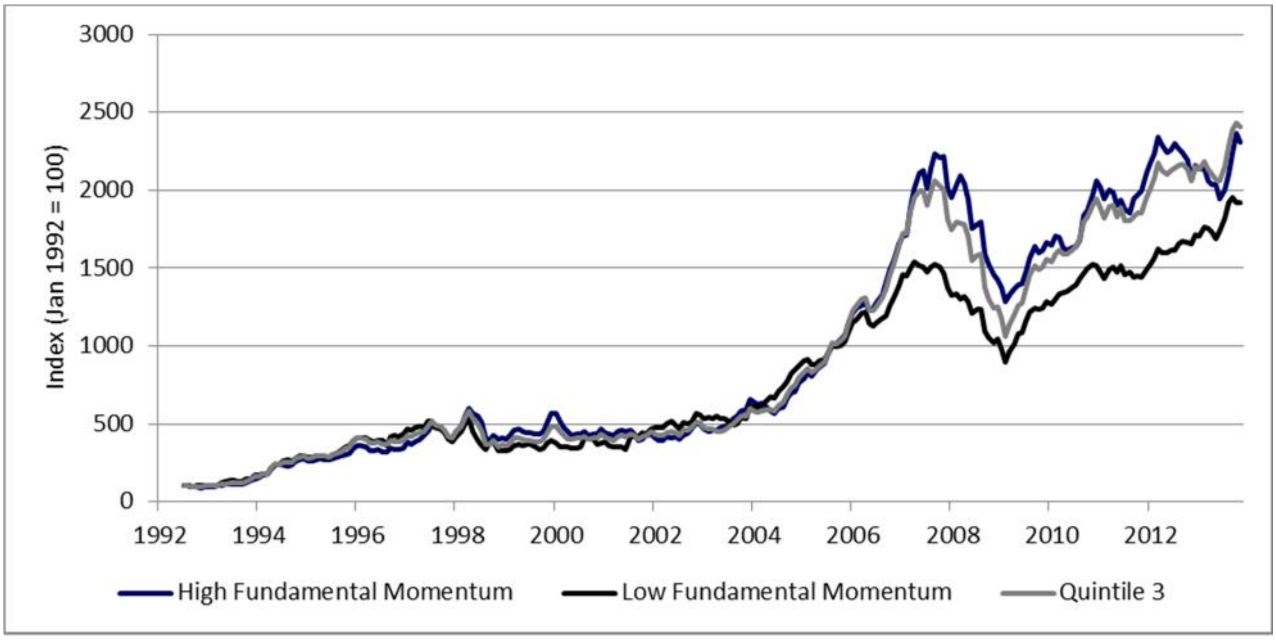


Figure D.7: Two-way classification index – Quintile 4 earnings momentum and fundamental momentum (Mar 1992 – Dec 2013)

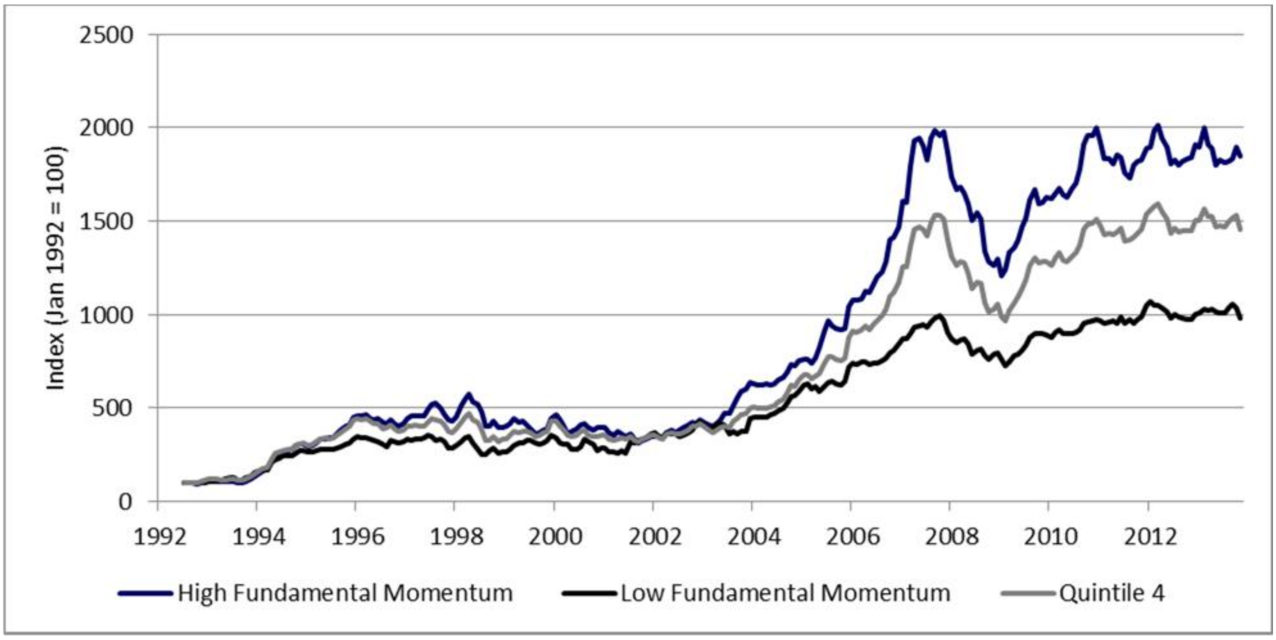


Figure D.8: Two-way classification index – Quintile 5 earnings momentum and fundamental momentum (Mar 1992 – Dec 2013)