

# **An Investigation into Momentum Trading: Evidence from the Australian Stock Market**

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**This dissertation is submitted in partial fulfilment of the requirements for the  
Degree of Masters in Business Studies, Waterford Institute of Technology**

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**Submitted to Waterford Institute of Technology**

**August 2012**

# **Chapter One**

## **INTRODUCTION**

### **1.1 Chapter Overview**

This preliminary chapter provides details of the background and context for the study together with a brief introduction into the momentum effect and an outline of the research including a rationale for the study. Also justification as to why this study is being carried out will be discussed, including the significance of this finance area and the contribution of trading strategies to the wider area of business. Finally the limitations to the study will then be specified and the chapter will conclude by providing an insight for the reader into the layout of the thesis.

### **1.2 Background to the study**

The objective of this study is to test whether or not momentum trading is profitable for investors. Trading strategies stem from the way in which investors making trading decisions regarding their investments. Within the world of finance, investors can base their trading decisions on considering various factors such as; risk, profitability, returns, volatility etc. There are two main styles of trading that investors may use in order to execute their strategies such as; <sup>1</sup>fundamental analysis or <sup>2</sup>technical analysis. Additionally investors may watch market trends, react to news or analyst coverage, follow trends and aim to predict market returns.

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<sup>1</sup>. Research to predict stock value that focuses on such determinants as earnings and dividends prospects,

expectations for future interest rates, and risk evaluation of the firm.

<sup>2</sup>. Research to identify mispriced securities and focuses on recurrent and predictable stock price patterns. This analysis does not consider the fundamental variables.

The foundation of this study is based upon the efficiency of markets and how financial investors attempt to predict the direction of the market and effectively earn abnormal returns based on their trading strategies. How these strategies are decided upon and implemented are of major significance for many traders globally and this study aims to examine stocks listed on the Australian Securities Exchange. Furthermore the concept of whether or not the stocks that win keep on winning and those that lose keep on losing will be investigated, essentially allowing traders to predict market returns and subsequently earn profits based on the momentum-style trading strategy.

### **1.3 The Momentum Effect**

Although stock markets may appear efficient they do pitch occasional <sup>3</sup>anomalies. The Momentum effect is one of the most renowned anomalies within the world of behavioural finance. <sup>4</sup> Since the 1980s academic studies have frequently shown generally that stocks which have performed well recently remain doing so for some time. Longer-term reports have confirmed that this “momentum” effect has been apparent for much of the past century. Subsequently in an imperative study, **Narasim Jegadeesh and Sheridan Titman (1993)** document the existence of a momentum effect. Since its discovery, it has been apprehensively positioned within the theory of market efficiency both the existence and sources of the momentum effect have been the focus of analysis over the years. However since its introduction there is a mounting body of literature surrounding the stock market anomaly. To date there has been an abundance of research displaying the existence of momentum such that academics no longer doubt its significance. The theory of momentum suggests that stocks which display an upward or downward trend over a certain period will continue this trend over a similar period, i.e. gathering momentum and maintaining this trend.

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3. Market inefficiency: Price/return falsification on financial markets. Contradicts the Efficient Market Hypothesis (EMH)

4. The Economist (2010). ‘Momentum in Financial Markets: Why Newton was wrong’.

This trading strategy is used by trend followers who buy on upward momentum and short-sell on downward momentum. It is essentially based on the concept that stocks and securities which have exceeded the market average in the past (winners) will continue to perform this well in the future, and additionally this can be the case in reverse form whereby a stock which has been falling below the market average in the past (losers) will continue to do so and the stock will underperform the stock market in the future.

#### **1.4 Rationale for the study**

The purpose of this study is to further contribute to our understanding of the efficiency of stock markets and how they operate. The notion of determining whether future stock market prices can be predicted is an on-going debatable topic amongst many practitioners and researchers and will remain an area for research into the foreseeable future. Bearing this in mind, the key aim of this paper is to examine the prospect of generating abnormal returns by utilising a momentum-based trading strategy, which is of significant importance to traders and investors.

The rationale behind choosing the Australian Securities Exchange (ASX) relates to both economic and personal reasons. Firstly the Australian stock market has been chosen because it has been coming more to the fore recently due to the strength of the economy.<sup>5</sup> Australia has been the best performing equity market over the last 111 years since 1990 displaying a real return of 7.4% per annum. This nation is topical now more than ever as it is such a buoyant, resilient, and unique market. According to the Credit Suisse Yearbook it is often described as “the Lucky Country” in relation to its natural resources, prosperity, weather, and detachment from problems elsewhere in the world.

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5. Credit Suisse Yearbook 2011

Secondly, on a more personal note, having plans to travel to Australia in the future with the intention of employment, gaining a better insight into trading on this stock exchange would be hugely beneficial.

The approach taken for this study involves gathering quantitative data from a reliable source of historical stock prices, namely Thomson One Banker, and conducting an analysis in order to investigate whether the winners keep on winning and the losers keep on losing, essentially leading to generation of abnormal returns. Furthermore, this paper will examine the two most predominant industries within this index, specifically companies from the banking and mining sector. The rationale behind the chosen industries is due to the fact that these two sectors combined represent over half of the Australian index; <sup>6</sup> (28%) and mining (23%). As these are two of the most prevailing industries within the index, examining the effect these companies have on the stock exchange, it is suggested that this may be ideal for investors to understand the most profitable investment strategy to undertake.

The main contribution of this study is to add to previous studies and literature in this relevant and hugely topical financial subject.

As there have been a limited amount of research papers conducted in this particular stock market, for the chosen time period and focusing on these two particular industries, it is suggested that perhaps a potential gap in the literature may be filled. Therefore this study intends to further contribute to prior findings and empirical studies.

Although there is potential to contribute to existing studies, it is important to consider the limitations to the research paper. Firstly regarding the timeframe chosen, many previous studies have analysed a longer time period so this may limit the results from the findings. Similarly the study is based merely on one stock exchange from the Asia-Pacific region which doesn't allow room for comparison with another index as has been documented by various academics.

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6. Credit Suisse Yearbook

Finally, in contrast to other analyses, the companies chosen do not represent the wide range of stocks which are listed on the Australian index and provides the reader with an insight into companies within just two sectors.

However, despite these limits, the purpose of the paper is to focus on the chosen index and hence attempt to provide valuable results for the reader by conducting a quantitative analysis of the <sup>7</sup> worlds' sixth-largest stock exchange.

### **1.5 Thesis Structure**

The remainder of this dissertation is laid out in the following sections. Chapter Two provides the reader with an insight into the theoretical framework of the study by underpinning the research followed by an overview of alternative stock market anomalies and also an insight into the concept of Behavioural Finance.

Chapter Three provides a critique of the details of the key empirical studies to date surrounding the Momentum effect across different continents and time frames, in order to set the scene for this research paper.

Details of the data used and methodology employed is then outlined in Chapter Four along with details of the research objectives and analysis undertaken to establish whether momentum investing is profitable.

The findings are presented and discussed in Chapter Five. Finally Chapter Six will provide conclusions from the overall study along with some limitations and recommendations for future research.

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<sup>7</sup> Credit Suisse Yearbook

## **Chapter Two**

### **LITERATURE REVIEW: Theoretical Framework**

#### **2.1 Chapter Overview**

This chapter introduces the theory underpinning momentum trading by providing a summary of the foremost themes in professional literature such as; the Efficient Market Hypothesis (hereafter EMH), stock market anomalies and the concept of Behavioural Finance. This study is based upon the efficiency of stock markets which deals with one of the most fundamental issues in finance; why prices modify in the markets and how these changes occur. This hypothesis advocates that above average returns can be gained by identifying stock market anomalies. There are many anomalies existent in the marketplace besides the momentum effect which will be outlined in this chapter. Additionally, one of the most topical issues which have come to the fore more recently in the world of finance is the notion of Behavioural Finance which relates to the behaviours of traders, and this concludes the theoretical framework chapter which precedes the forthcoming empirical evidence.

#### **2.2 Market Efficiency**

The EMH is one of the most extensively debated issues in modern finance. It suggests that financial markets reflect all available information and assets are fairly priced, thus arbitrage opportunities are not present in the market and therefore no deviations from this exist. It implies that prices respond quickly and precisely to relevant information. The EMH is popularly known as the <sup>8</sup>‘Random Walk Theory’ which posits that stock market prices behave randomly.

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<sup>8</sup> RWT; Following an examination of twenty-two security and commodity price series, the main conclusion was that “data behaves almost like a wandering series”. Kendall (1953)

The hypothesis of market efficiency was first discovered by Bachelier (1900) whom concluded that commodity prices varied randomly with widely available information. However, the key theory was then recognised many decades later by Eugene Fama (1970) who further developed this concept by adopting three different kinds of information that influence the value of securities.

These three forms include; weak: the current price fully incorporates information only contained in the past history of prices, semi-strong: proposes that the current price fully integrates all publicly available material including past prices or returns and has been perhaps the most controversial form, thus has enticed the most attention, and lastly the strong form: declares that the current price fully incorporates all existing information both public and private - also known as 'insider information'.

### **2.2.1 Alternative Anomalies of the Efficient Market Hypothesis**

Since the inception of EMH, numerous studies have tested its existence and departures from it which are commonly known as anomalies or 'falsifications'. The rejection of the EMH is based on a number of anomalies, which aim to find some strategies to forecast stock market returns, therefore earning above average returns. Stock market anomalies have been existent in financial economics for decades causing widespread curiosity, controversy and debate amongst many. There are many different types of stock market anomalies with those at the forefront being; the January effect (Rozeff and Kinney, 1976), the Weekend effect (Cross, 1973), the Winner-Loser effect also referred to as the Contrarian effect/ Reversal effect (De Bondt and Thaler, 1985), along with the most widely publicised Momentum effect (Jegadeesh and Titman, 1993). These anomalies can be classified into two distinct areas namely; <sup>9</sup>calendar and <sup>10</sup>fundamental anomalies.

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<sup>9</sup>. Calendar: anomalies related to a specific period of the calendar year. <sup>10</sup>. Fundamental: relates to the behaviours and feelings of an investor.



The January effect is arguably one of the most celebrated of the calendar anomalies. Since its detection, there has been an abundance of research completed on the anomaly and is a well-known phenomenon prevalent in the financial markets. **Rozeff and Kinney (1976)** were the first to identify the January effect having carried out an investigation on NYSE for period 1904-1974 and identified larger returns in January than in other months. It is basically associated with stocks which have historically tended to exhibit higher mean stock returns in the last few days of December and the first week of January.

The Weekend effect or also called the Monday effect is associated with an apparent systematic decline in the daily return rate on some stocks or securities between Friday closing and Monday opening. **Cross (1973)** first discovered the Weekend effect and this anomaly attempts to exploit the substantial difference in price performance on Fridays and Mondays. Historically, stock prices tend to perform significantly better on Fridays in comparison to Mondays.

The Winner/Loser effect also referred to as the Contrarian effect/ Reversal effect was discovered following a seminal research carried out by **De Bondt and Thaler (1985)** which involved conducting a study by taking thirty five of the most extreme 'winners' and 'losers' based on monthly return data from the NYSE over a five year time period between January 1926 and December 1932 and formed two distinct portfolios of the companies' shares. They followed these companies for five years, and then repeated this by progressing the start date by one year each time. The authors discovered price reversals within the portfolios, with the winner's portfolio decreasing by 10% and the loser's portfolio increasing by 30%, and the returns on these stocks also mean reverting, i.e. a price decrease is followed by a price rise, and vice versa. This was effectively published as the Winner/Loser effect.

The Momentum effect is an anomaly which is in stark contrast to the Contrarian effect and first came to light following a study conducted by Jegadeesh and Titman 1993. The authors' explored the US stock markets; NYSE and AMEX during the period 1965-1989 and discovered that strategies employed which buys stocks that have performed well in the past and sell those securities that have formerly performed not so well create substantial positive returns over a 3-12 month time period.

Each of these anomalies are prevalent in the world of finance and continue to increase in numbers as investors constantly seek new strategies in order to effectively 'beat the market' by analysing these market distortions and finding ways to gain abnormal returns by optimistically predicting the movement of stock markets.

### **2.3 Behavioural Finance**

The much debated EMH reached the pinnacle of its dominance within academic articles during the 1970's however, its conviction has since been eroded due to the discovery of various anomalies, particularly during the 1980's with evidence of excess volatility of returns coming to the forefront in financial economics.

In 1985 De Bondt and Thaler published "Does the Stock Market Overreact?" effectively forming the start of a recent phenomenon known as Behavioural Finance. These authors found that people steadily overreact to unexpected and dramatic news events resulting in weak-form inefficiencies in the stock market, which is surprising but also insightful. Additionally these authors report evidence that supports the overreaction hypothesis in a study published in 1987.

Sewell, 2001 defines Behavioural Finance as "The study of the influence of psychology on the behaviour of financial practitioners and the subsequent effect on markets". He further adds that the topic is of interest because it helps to explain why and how markets might be inefficient.

Since this there has been an abundance of research on behavioural finance amongst a small group of academics from various different backgrounds, e.g. psychology and economics. It is simply derived from a lack of evidence supporting existing theories on the decision-making process. The key focus behind behavioural finance is essentially to uncover investors' sentiments, how decisions are made and how they are influenced by certain psychological preconceptions. Behavioural Finance is informed by three components of psychology namely; <sup>11</sup>cognitive psychology, <sup>12</sup>emotional responses, and <sup>13</sup>social psychology. It has a primary practical aim which is the analysis of decision-making by borrowers, consumers, investors, traders etc. It has a realistic aim which is decision-making analysis. The assumption that markets are fully rational cannot continue, and people who believe that the EMH is functioning are gradually becoming a minority. According to Sewell 2007, since the 1980's the theory has concluded that humans do not only act rational but are in fact influenced by emotions, experience and knowledge, i.e. irrational behaviour.

Behavioural Finance studies financial markets as well as providing justifications for many stock market anomalies, speculative markets, crashes and bubbles. This concept investigates the psychological and sociological factors that influence the financial decision-making process.

The success of Contrarian and Momentum strategies owes principally to psychological factors. The basis of Behavioural Finance is that psychological factors can enhance the effectiveness of investment strategies. The term is also referred to as Behavioural Economics and combines a duo of psychology and economics disciplines to explain how and the reasoning behind apparently irrational decisions in relation to when financiers spend, save, borrow or invest money.

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<sup>11</sup>. focuses upon how the mind works when undertaking the necessary estimates to capitalize on wealth <sup>12</sup>trading intensity and focuses on decision-making being more than a mere estimating process. <sup>13</sup>.recognises the need to find approval and support of decisions. (Lawler, 2009)

Behavioural Finance is essentially formed on two building blocks; Limits to arbitrage and market efficiency which consist of various elements such as; a) fundamental risk and b) noise trader risk.

A central concept in financial markets is the existence of arbitrageurs, i.e. the ability to arbitrage. This may be defined as “the act of simultaneously buying and selling assets or commodities in an attempt to exploit a profitable opportunity”. (Nosal and Wang, 2004).

The ability to arbitrage is seen as being essential in order for the efficient operation of markets. If the market prices do not allow for profitable arbitrage, the prices are said to create an arbitrage equilibrium or arbitrage-free market. When assets are mispriced, the strategy used to modify these may be very risky. The most obvious form of risk stems from any amount of bad news about a stocks' value which may cause a commodity price to fall even further which would hence lead to more losses. The theory behind limited arbitrage signifies that if irrational traders cause deviations from ultimate values, rational traders may be powerless to do anything about it.

Fundamental risk is a risk which the arbitrageur faces in an order to attempt to correct the apparent mispricing whereas noise trader risk relates to an arbitrageur perhaps being influenced by noise in the market. One of the most puzzling facts about contemporary financial markets is the sheer volume of trade that occurs. According to **Fisher Black (1986)**, noise based traders are willing to trade even though they would be better off not trading, from an impartial point of view. Maybe they believe the noise they are trading on is information, or perhaps they just like to trade. In modern finance there apparently there is 'a noise trader born every minute' which provides the enticement to attract informed investors with accurate information about the correct value of the share into the market and hence make financial decisions based on market behaviour.

## **2.4 Summary and Conclusion**

In summary, this chapter introduced the theoretical framework supporting the momentum trading strategy. Since the evolution of the EMH, many other concepts have branched out from this theory and have initiated further research into the wider areas of finance. Since 1970, Fama's prominent article entitled "Efficient Capital Markets" it was generally believed that stock markets were efficient in reflecting information about the stock market in general. However as the years passed, financial economists began to consider that stock markets should at least have some predictability and anomalies began to emerge throughout financial studies as falsifications started to appear and investors became keen on finding ways to predict the market and gain significant returns. A new scientific behavioural concept materialised within the world of finance and today Behavioural Finance can be seen as a separate branch of research which is extremely intriguing to say the least.

## **Chapter Three**

### **LITERATURE REVIEW: Empirical Evidence**

#### **3.1 Chapter Overview**

The purpose of this chapter is to explore and outline the empirical evidence of studies which have previously tested and documented the momentum strategy in various continents and time-periods using varying types of methodology. There are five particular areas which are reviewed in this chapter and will be laid out and each contains various studies summarised including; time-periods, markets examined, methodology used and key findings. To begin, the US is discussed as the momentum strategy has been widely tested and publicised in this market for a number of decades. Furthermore, the European markets have been investigated, in particular the UK. Momentum has also been studied and tested in the Asian markets in various different countries both developed and less developed. Also, the test of a momentum strategy has previously been carried out in Australian markets in a number of ways and by various academics. Finally, some researchers have also tested momentum throughout various different countries and documented international empirical evidence by comparing different markets in contrasting continents. Each of these are outlined throughout the chapter in order to provide the reader with an insight into previous significant studies which have added to the literature and findings of the widespread trading strategy.

#### **3.2 Momentum Investment Strategy**

The most renowned anomaly within the financial markets is the momentum investment strategy, and has been for several decades since its discovery. It has developed into the most widely investigated strategy for traders and investors in order to earn significant abnormal returns.

The idea behind this approach basically recommends <sup>14</sup>. ‘buying past winners, and selling past losers’. As the concept is quite a simplistic one for traders it has been widely examined, investigated and publicised.

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14. ‘Testing Momentum and Contrarian Strategies in the Malaysian Stock Exchange’

### 3.2.1 Momentum in the U.S

The widely renowned investment strategy was first detected by as early back as 1937 by the authors **Cowles and Jones**, whom presented the first published research on momentum when they found evidence of it in stock prices and demonstrated between 1920-1935, stocks which exceeded the average return of all stocks in one year tended to do so the following year. Later **again in (1967)**, literature emerged when **Levy** carried out a technical analysis using weekly data on 200 NYSE stocks arranged into subsections for the five-year period of 1960-1965, it was revealed that stocks which did well in the prior 26 week-periods, also performed well in the subsequent same period of 26 weeks. However it was not until sometime later in the early 1990's that the anomaly effectively 'gathered momentum' and literature began increasing amongst many academics and scholars. The pivotal paper by **Jegadeesh and Titman (1993)** kindled the capture of the significant attention from the literary community. Since this publication, the presence of the momentum effect has been broadly recognised in the US. These authors tested the theory and investigated US stocks throughout the period 1965-1989 using a sample from the NYSE and AMEX indices. The authors tested short-to-medium term historical returns and created portfolios based on the best and worst performing stocks i.e. winners and losers. The authors found that the 6x6 month strategy which was studied in detail generated approx. 12.01% average returns per year. This strategy entails buying stocks based on their last 6 months returns and holding for a period of six months which means that those stocks ranked and held for 6 months earned positive returns.

The overall results depict that those stocks which tend to perform the best or the worst over a 3-12 month period will continue to perform well or poorly over the succeeding time period, finding supporting evidence to the hypothesis which was previously examined.

Jegadeesh and Titman also suggested from their study that possibly the market underreacts to short-term information about firms released, and overreacts to long-term information about a firm's performance. However the behavioural element is not concluded in this study and it is just merely an alternative explanation.

There is strong evidence to suggest the success of these trading strategies in the US stock market since this seminal paper was published.

Subsequently Chan *et.al* (1996) conducted a study using the NYSE, AMEX and the NASDAQ indices and monthly

stock data from the period 1977-1993 sourced from CRSP and Compustat. Stocks were ranked based on past returns or earnings news measurement. They found that the momentum effect is different from the previously accepted post-earnings announcement implications, although a large share of these momentum effect returns are often realised within the time frame surrounding earnings announcements.

One of the most significant studies relating to over-reaction and under-reaction has been documented by (Hong and Stein, 1999) who developed a model based on two rational causes; news-watchers and momentum traders. News-watchers monitor private information however, failing to be aware of the information that other investors have access to. Then when investors' private information becomes public, prices adjust to new information and the momentum effect emerges. The theory of continuation then stems from the gradual expansion of information amongst investors, hence it is suggested that if information circulates slowly between people, prices under-react in the short-run. This in turn means that momentum traders can profit by trend-chasing, i.e. following trends.

Reaction to news or analyst reports seems to play a major role in investors' behaviours which is related back to the decision-making analysis as discussed previously, following trends and noise. Despite this being a major factor



documented in the US empirical studies other factors are also considered in momentum investing which will be outlined throughout the chapter.

Various papers have documented <sup>15</sup> seasonality in momentum returns. In 2001, Jegadeesh and Titman also conducted another study to investigate if momentum profits have continued throughout the 1990's. The main aim of this study was to determine if the level of momentum discovered in the NYSE had declined since its discovery eight years previously. Evidence was found indicating that momentum levels were strikingly similar for the two sub-periods which were analysed, suggesting that their original findings were not due to data mining. The basic momentum strategy showed evidence of a 1.55% loss in January whilst earning positive returns in the remaining months of the calendar year. When seasonality is discovered in various studies relating to either the last month of the year (December) or first month of the year (January) there is generally an existence of a financial calendar anomaly as previously mentioned in Chapter Two. What appears in Jegadeesh and Titman's 2001 study is that losses occurred in January, rather than abnormal returns being generated. However, in contrast to this study, Grinblatt and Moskowitz (2004) uphold the theory that momentum profits are at least partially higher than average in December due to tax-loss selling. These authors conducted a study predicting stock price movements from past returns, considering the <sup>16</sup> tax-loss selling hypothesis. Monthly return data was used in this study for every listed security on the Center for Research and Stock Prices (CRSP) for the period August 1963 – December 1999 including stocks from NYSE, AMEX and the NASDAQ. This study also included other variables such as; volume data, and book-to-market equity in order to conduct cross-sectional regression analyses. The results showed that the impact of constant winners is positively correlated with future average returns and that tax-loss selling tends to play a greater role for consistent losers than winners.

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15. A certain period of time in the year where returns are more predominant than others, e.g. January, Summer etc.

16. Theory suggests that investors sell the losing stocks in their portfolio at year-end in order to gain tax benefit

The study continues to propose that there are strong December effects in stock returns, and also tax regimes do in fact have an effect on the relationship between past and expected future returns.

Grundy and Martin (2001) find that momentum strategies have been profitable in the US and have been so since as early as the 1920's. This notion is based on a study carried out over the period of 1926-1995 using a six-month "formation" on stocks listed on the NYSE and AMEX indices. The study reports average monthly return from momentum trading strategies is 0.44% with a t-statistic value of 1.83. The authors also conclude that individual- stock and industry-based momentum are two separate occurrences.

In the subsequent year a study was published by Chordia and Shivakumar (2002) finding that the average momentum for the period of the monthly data is insignificant at 0.27% for the similar time frame of 1926-1994, however this average is impacted upon by the pre-1951 period whereby momentum is found to be very insignificant at a rate of -0.61%. The researchers used the same methodology as Jegadeesh and Titman (1993) but employ a larger sample size. Consistent the findings of Grundy and Martin (2001) relating to the separate momentum phenomena mentioned previously, this study reports similar findings.

### **3.2.2 Momentum in European Markets**

The momentum effect has most certainly not been restricted to just the US market. The anomaly has also been widely publicised in other regions such as Asian, European and Australian markets.

In 1998, a well-known European study published by Rouwenhorst reports a study carried out on the momentum strategy in 12 European countries including (Austria, Belgium, Denmark and France) and found that a portfolio which capitalises in medium-term 'winners' and trades medium-term 'losers' earns on average 1% return per month. This research also showed consistency with the results of Jegadeesh and Titman (1993).

Momentum returns have been discovered with stocks listed on the London Stock Exchange (LSE) during the period of January 1955- December 1996 as recognised by [Hon and Tonks \(2003\)](#). These researchers also followed the Jegadeesh and Titman (1993) methodology and used monthly data sourced from the London Share Price Database (LSPD) to form their portfolios. The study showed that although momentum was revealed on the LSE, it only appears to be a general feature of the UK stock market as it is only apparent over certain time periods. For example it is existent throughout the period 1977-1996, however not in the earlier time-frame of 1955-1976. The overall result depict that there is strong confirmation of a momentum effect over the short-to-medium horizons and that investors take a long position on ‘winning’ portfolios and sell ‘losing’ portfolios.

More recently [Chelley-Steeley and Siganos \(2008\)](#) conducted a study and found that momentum profits are significant on listed companies of the London Stock Exchange (LSE) between October 1957 and October 2001. Monthly return data information was used to conduct the study on 6,000 firms sourced from Datastream. The authors also concluded that momentum profits persist after controlling for size, book-to-market value and risk, as outlined by the CAPM and Fama’s Three-Factor model. However found contrasting results to [Fama and French \(1996\)](#) and [Liu et. al \(1999\)](#) whereby both papers showed that momentum profits do not reduce after controlling for risk. The concluding results of the paper document that momentum is persistent on the LSE using numerous data sets while controlling for many factors which have an influence on share returns.

### **3.2.3 Momentum in Asian Markets**

The presence of the Momentum effect has also been confirmed in Asian markets as [Hameed and Yuanto \(2001\)](#) also provided evidence of momentum returns in such markets. It was discovered that momentum returns in these emerging markets such as South Korea, Taiwan and Thailand were less than those of more developed countries over the period 1979-1994.

Chui *et.al* 2002 investigated the profitability of momentum in eight Asian countries namely; Indonesia, Japan, Korea, Hong Kong, Singapore, Malaysia, Thailand and Taiwan. The study provides evidence that momentum is present in all tested countries except Korea and Indonesia. Additionally it was found that momentum is weak in general amongst the sample countries yet statistically significant for Singapore, Hong Kong, Malaysia and Thailand for the pre-crisis period.

### 3.2.4 Momentum in Australia

The most prominent investigation of the Australian market is that of Hurn and Pavlov (2003) who examined momentum in stock returns using monthly data on the top 200 stocks ranked by their market capitalisation during the period 1973-1998. Evidence was found of short-medium term momentum in Australian stocks.

Also, in the subsequent year a study was published by Demir *et.al* (2004) having investigated momentum for stocks which are Approved Securities on the Australian Stock Exchange (ASE) for the time frame 1990-2001 and all stock included in the All Ordinaries Index (AOI) from 1996-2001. The results depicted that momentum returns are on a greater scale than formerly found in other markets.

However, interestingly inconsistent to these findings, Durand *et.al* (2006) carried out a study examining stocks listed on the ASX using monthly data between the years January 1980-December 2001 and do not find any supporting evidence of the momentum effect on this stock market. In fact, a strong seasonal effect is established related with July which is the first month of the Australian financial year. This perhaps coincides with the renowned January effect and appears to be parallel to the US findings, which is suggested as an explanation to the momentum effect as proposed by Grinblatt and Moskowitz (2004).

In a recent paper by Phua *et.al* (2010), the study finds an existence of the momentum effect in Australian returns. In contrast to prior analyses stronger

momentum is reported amongst large firms in the Australian market. Also it is concluded that buying ‘winners’ creates higher earnings than selling ‘losers’. Similar to the findings of Grinblatt and Moskowitz (2004) this study discovers seasonal influences which are consistent with ‘tax-loss selling’ and <sup>17</sup>. ‘window-dressing’. Another conclusion drawn from this research is that the momentum strategies exercised in the late 1990’s generate greater returns than those earlier in the decade.

Furthermore, in 2007, a paper was published by Drew *et al* also investigating the profitability of momentum trading and examining the power of predicting trading volume for stocks listed on the ASX. The sample chosen for the study consists of monthly data for the period June 1988 – May 2002 and follows the methodology of Lee and Swaminathan (2000). The results of this analysis also provide strong evidence of the presence of momentum, and conclude that momentum plays a significant part in providing evidence about stocks. Additionally, consistent with the findings of Lee and Swaminathan (2000), this study finds that past trading volume appears to also predict the scale and tenacity of price momentum.

### **3.2.5 International Evidence of Momentum**

Many academics and researchers have conducted studies across various countries and continents including developed and less-developed nations in order to gather more dispersed analyses across the globe.

Chan *et.al* (2000) identified momentum profits having conducted a study of the stock market indices of 23 countries; Asia-Pacific region (9), Europe (11), North America (2), South Africa (1).

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17. Theory suggests that institutions rebalance portfolio holdings to ‘window dress’ or influence performance-based remuneration, as cited in Ackert and Athanassakos (2000).

These countries range from developed to less developed markets across all continents including; Australia, Belgium, Switzerland, South Africa, UK, US, Indonesia and Malaysia

Weekly data is mainly obtained from PACAP database for equity market indices in the Asia-Pacific region with remainder gathered from Datastream. The time-frame is between January 1980 and June 1995. The results suggest that momentum profits are statistically and economically significant for short-term holding periods particularly 4-weeks.

It is reported that although momentum profits may be enhanced by exploiting the information on exchange rates the major source arises from price continuations in individual stock indices and that return continuation is much greater following a surge in the volume of trade. The authors provide evidence that the profitable returns are independent of any currency profits arising from exchange rate movements or fluctuations.

Similarly more recently [Liu \*et.al\* \(2010\)](#) examined the relationship between momentum earnings and conditions of various markets across numerous continents. The study shows the momentum effect exists in both up-market and down-market states. The sample includes 20,000 stocks from 10 various developed countries for the period January 1973 - December 2001. Monthly return data is sourced from Datastream International for non-US countries and also the CRSP. In order to gather the sample, the data is interestingly sourced and compared between Datastream and Yahoo Finance and those returns which aren't consistent are excluded from the data set. The final stocks are selected from the following ten countries; Australia, Canada, France, Germany, Hong Kong, Japan, Singapore, Switzerland, U.K., and U.S. The study focuses on the intermediate-term momentum effect, i.e. 6 month period. The study follows that of Jegadeesh and Titman and the results contradict the findings of [Cooper \*et.al\* 2004](#) that the strength of momentum profits are dependent on overall market conditions, suggesting that it doesn't support

behavioural predictions and the need for new explanations of momentum should perhaps be researched.

### **3.2.6 Momentum Strategies across various industries**

Positive momentum effects have also been found across various industries. Moskowitz and Grinblatt (1999) found that momentum profits are strongly related to specific industries where strategies of buying stocks from industries which were past 'winners' and selling stocks from industries which were past 'losers' leads to significant profits. This paper analysed the period of July 1963 – July 1995 and reveals that individual stock momentum is mainly attributed to industry momentum and stocks within an industry are inclined to be more highly correlated than securities across different industries.

In contrast to this study, Asness *et.al* (2000) finds that within-industry momentum, i.e. the firm's past returns less the industry average return, has an element of predictor power for a company's return additional to what is captured by momentum across an industry. This paper uses data sourced from NYSE, AMEX and NASDAQ for the period July 1963 – December 1998 and employs the Fama-French Model. The outcome declares that the two top performing industries are; Tobacco Products 1.63% and Candy and Soda 1.5%, whilst the poorest performing industries are Fabricated Products (0.65%) and Steel Works (0.72%).

According to Hou and Robinson (2006), firms in concentrated industries earn lower returns even after controlling for size, book-to-market and momentum and other various factors. The study reports that these economic effects are rather large. The findings show that those firms in the most competitive industries earn yearly returns almost 4% greater than those similar firms in more concentrated industries.

Additionally, in a study conducted and published one year later by Chan *et.al* 2007, using monthly US data for the period 1975-2004, it was found that higher return co-movement is more prominent for large-cap stocks belonging

to the same industry grouping compared with that for smaller-cap stocks of the same industry.

### **3.5 Chapter Summary and Conclusion**

This chapter has covered the principal issues and provides evidence of previous empirical research carried out on the momentum anomaly. Each study employed various time-frames, methodologies, and stock markets. There are similar results and findings however some papers found contrasting conclusions to prior research and not all theories are supported by other various academics.

Although there is a strong calibre of literature and empirical research on momentum investing, the most leading methodology appears to be the approach which was used by Jegadeesh and Titman (1993). Many research papers have continued to apply this methodology to their studies and have found various results across various stock markets and time periods.

Since the detection of the anomaly, a vast amount of research has been carried out for many decades now and due to the wide range of contrasting results and different opinions on the area, the analyses and research into the area looks set to continue developing.



## **Chapter Four**

### **RESEARCH METHODOLOGY**

#### **4.1 Chapter Overview**

The purpose of this chapter is to outline the research data and methodology employed in the dissertation. This chapter begins by specifying the development of the key research objectives considered in order to conduct the study. Research objectives will be addressed, stemming from prior literature studies and aligned with hypotheses. The main focus of the research is to assess the presence of the momentum effect on the ASX, and also to determine its profitability for traders. In order to carry out this practical analysis, data is sourced from Thomson One Banker and quantitative-based methods are then applied to the study. The appropriate methodologies which were exercised are discussed in the chapter including their justifications. Furthermore, several limitations to conducting the research also exist and these are highlighted in the chapter.

#### **4.2 Research Objectives**

The primary aim of this study is to test for the presence and the profitability of momentum investment trading for stocks listed on the Australian Securities Exchange (ASX) within the chosen time-frame of 2002-2011. Two prime industries are used in order to analyse which sector the presence of the momentum effect is more prevalent in. The two industries are stocks listed from the banking sector (Financial Industry), and the mining sector (Natural Resources Industry).

The main research objectives of this study are:

- i. To test for the presence of the Momentum effect on the Australian Stock Market

- ii. To determine whether a Momentum approach can yield significant returns for traders
- iii. To identify what proportion of the effect may be attributed to other variables, such as; the January effect
- iv. To examine other fundamental factors that may be considered for momentum traders such as; the size of firms and their dividend policies
- v. To analyse the viability of the momentum investment strategy on this chosen stock exchange

However, a gap remains in the literature regarding two leading industries within the Australian stock market. Previous studies have been carried out on the existence of the momentum effect on similar industries such as Moskowitz and Grinblatt (1999) as discussed earlier. This suggests that examining industry-specific stocks within the Australian market may contribute to previous literature.

The research questions which will be posed for this analysis include;

- i. Are returns different for each sector over the same period of time?
- ii. Which industry generates superior profits for traders?
- iii. Is the momentum effect more predominant within a certain industry on the ASX?
- iv. Do factors attribute to the overall returns of the stocks during the time period analysed?
- v. Does the momentum effect provide slight predictability for stock movements?

These are all questions which the author will aim to answer within this study.

The methodology used to conduct the research will establish whether a momentum based strategy is present and hence whether such a strategy would generate significant excessive abnormal returns for momentum-traders.

### **4.3 Data Sample**

A Quantitative-based approach is chosen to analyse the data for this study.

This involves hard data, numbers, and figures. The purpose behind data

collection involves answering the research problem in a defined population or sampled data.

The data applied throughout this paper is sourced solely from *Thomson One Banker*. This sample consists of monthly data gathered based on past average stock returns for the chosen companies for the period January 2002 – December 2011. The rationale behind the chosen time-frame is firstly, choosing the more recent year is the optimal aim to gain the most accurate results in order to assess if the anomaly is present up to the most recent time period, and secondly analysing historical ten year data is also sufficient for this particular research.

There have been several valid studies conducted on the investigation of momentum-trading which utilised monthly data as opposed to more frequent available data, so a monthly sample is indeed adequate for this research paper. The total number of stocks used for the analysis consists of forty companies; twenty from each industry in order to obtain a balanced and fair outcome. The stocks chosen for this study are randomly selected companies from each of the sectors, not based on market capitalisation or size etc. By employing this method, this does not eliminate the possibility of the <sup>8</sup>. Size effect contributing to the analysis. (A list of each chosen company is provided in the appendices section).

#### **4.4 Research Methodology**

The methodology introduced by the foundational research of Jegadeesh and Titman (1993) is also mirrored in this study. There are various types of methods employed within this study following the gathering of historical monthly stock prices sourced from *Thomson One Banker*. The primary approach used is the traditional framework of the buy-and-hold abnormal returns. In a study conducted in 2007 by Barber *et al* it was declared that this is the more accurate method which reveals the real return that investors gain from their investment.

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7. Credit Suisse Yearbook 2011

8. Fundamental anomaly associated with small capitalisation stocks/Small-Firm Effect.

For this reason this is chosen instead of the Cumulative Abnormal Returns (CAR) approach.

To begin this method, precisely constructed portfolios are developed based on past stock returns. Both ranking and testing periods are considered for the analysis to test the existence and profitability of momentum strategies. The ranking period consists of  $r = 3, 6, 9$ , and 12 months, with successive holding periods  $h = 3, 6, 9$ , and 12 months also. This provides a total of 16  $r \times h$  momentum strategies to base this study upon.

Firstly, monthly returns are calculated using the equation below:

$$R_{jt} = \ln (P_{jt} / P_{jt-1}) \quad (1).$$

$R_{jt}$  : Return of stock  $j$  at time period  $t$

$P_{jt}$  : Price of stock  $j$  at end of time period  $t$

$P_{jt-1}$  : Price of stock  $j$  at end of time period  $t-1$ .

Next, the buy-and-hold method is employed for all forty stocks arranging them into the sixteen different momentum strategies, i.e, 3x3, 3x6, 3x9, 3x12, 6x3..... 12x12. Many academics have followed this method in their studies such as Jegadeesh and Titman (1993), and Chordia and Shivakumar (2002).

The returns generated from this buy-and-hold method are then arranged into ten equally-weighted portfolios. In order to construct the <sup>9</sup>zero-cost momentum portfolios, the returns of the winners (best performing) are labelled P10 whilst the losers (worst performing) are labelled as P1. This is done for each of the strategies in the full-sample period and allows the stocks to be arranged clearly into winners and losers.

(L)	(W)
<b>P1, P2, P3, P4, P5, P6, P7, P8, P10.</b>	
(2).	

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<sup>9</sup>. Zero-cost strategy is employed for conciseness and ease of comparison.

Once these portfolios are arranged, the first results will present the overall returns for rank  $r$  and test period  $j$ . The returns from each sector will also indicate which industry generates greater profits. In order to determine the statistical evidence of these findings, a t-stat and P value is also tested to determine whether or not the difference is statistically different from zero.

The final step involves finding the difference between returns on the winner portfolios (W) and the loser portfolios (L) in order to determine those returns that will generate significant profits. If the momentum strategy works, and assuming the zero-cost strategy, then the study will find that past winner portfolios outperform past loser portfolios in the test period:

$$R_m = W - L \quad (3)$$

Similarly, a statistical test is also performed in order to establish if the difference is statistically different from zero.

In order to determine other factors which may explain momentum a test of seasonality is also carried out. This involves calculating the average returns of those stocks which were bought-and-held for each of the sixteen momentum strategies during the period of both January and July, i.e. analysing the presence of a January effect. Additionally, various statistical tests are carried out in order to determine the significance of firm-specific variables such as; firm-size and dividend policies. The aim of this is not to exclude any other contributable factors which may explain the presence of the momentum effect.

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10. July is the beginning of the Australian Financial Year.

#### **4.5 Limitations**

The method deployed to undertake this research contains a number of limitations. Firstly using monthly data is less accurate than daily or weekly data however a trade-off here exists as the use of monthly has proved more than adequate for such a study as various studies conducted have used this approach such as; Chan *et.al* (1996) and Grinblatt and Moskowitz (2004).

Also, another major limitation encountered involved sourcing the historical data for the companies listed between 2002 and 2011. The data available for many of the companies initially researched only dated back to 2004, so further investigation was required for several stocks listed. Only choosing the monthly stock prices for those companies with data available for the time period presented a number of obstacles as a researcher, however it is imperative for such an analysis otherwise the results may have been skewed and less accurate. Limiting the study in any way is not an option for this research paper.

Other variables may have been included in this study to assess which other factors may explain the profitability of momentum trading strategies such as; trading volume or analyst coverage which have been tested by other researchers such as: Hong *et.al* (2000) and Blume et al (1994) respectively.

There are other models also available which may be more detailed models however due to the scale and time restrictions of the research paper, less complex models were chosen for this analysis.

The final limitation includes the possibility of a larger sample frame being used, for example, more companies, more indices, a longer time period which is a possibility for future research and analysis.

#### **4.7 Chapter Summary**

This chapter presents the data sourced and methodology employed in order to conduct this research. The key objectives are outlined which form the basis of this study. There are five main areas of focus for the objectives along with a number of questions arising throughout the study. The data sourced is used for a quantitative-based research and the methodology undertaken emulates that of the widely-renowned framework introduced by Jegadeesh and Titman (1993) which has also been used globally by other researchers. Like any research, there are also limitations which exist and these have been discussed as the concluding element of this chapter.

## Chapter Five

### RESEARCH FINDINGS

#### 5.1 Chapter Overview

This aim of this chapter is to present findings of the primary research undertaken for this dissertation. It commences with an outline of the results of the total returns generated from a momentum-based trading strategy on the Australian Securities Exchange (ASX), and compares it to the market index, demonstrating variations of the two industries over the time-period. The results next presented are those from the buy-and-hold type trading strategy such as a rank and testing period. Finally, the last set of results presented are average returns of winners and losers in the rank periods, along with the average returns of a winner's minus loser's portfolio included in the momentum-based strategy. This chapter also documents evidence of the role of firm-specific factors included in the findings which were taken into account during the study.

#### 5.2 Market Return

Table 5.1 shown overleaf outlines the overall average monthly returns generated from momentum-style investment on Australian-listed stocks during the time-frame 2002-2011. This strategy involves buying-and-holding stocks for a short-to-medium time period of 3-12 months such as 3, 6, 9, and 12 months. The results show the mean annual returns of the companies, compared to the mean market index returns in order to determine if a momentum-based strategy will yield more significant earnings for traders. Table 5.1 also exhibits returns generated across the two industry sectors compared to the overall index market return. The results suggest that the the overall returns for a trader

**Table 5.1**

Year	Banking Returns	Mining Returns	Market Index
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	%	%	%
<b>2002</b>	4.52	3.86	-0.83
<b>2003</b>	14.64	4.42	-5.58
<b>2004</b>	282.68	28.7	10.08
<b>2005</b>	12.1	32.44	13.7
<b>2006</b>	14.17	20.31	12.87
<b>2007</b>	21.37	28.05	14.23
<b>2008</b>	-13.88	13.52	-5.47
<b>2009</b>	-17.97	-18.06	-22.63
<b>2010</b>	27.39	19.95	14.6
<b>2011</b>	4.52	12.03	0.16
<b>Mean</b>	<b>39.95</b>	<b>14.52</b>	<b>3.11</b>

employing a momentum-based strategy on banking stocks generates higher returns when compared to the market over the same time-period.

Positive returns in the banking stocks were generated each year with the exception of 2008 and 2009 which produced negative consecutive earnings.

In 2004, in particular the returns generated are significantly larger than the index average. Only in 2005 and 2008 did the market yield greater returns than the average banking industry.

Similarly, the results generated under this momentum strategy generated higher results for mining stocks vis-a-vis the market average. Mining stocks are depicted to generate profitable returns each year except in 2009 where both the mining stocks and the market index yielded negative returns, with the index faring worst at a total of -22.63% in contrast to -18.06% for the mining stocks.

In comparing both sectors it is quite evident that the banking sector results are higher than the mining sector ones. The table above table exhibits these results with a complementing line-chart also included in the appendices section displaying the comparison of both sectors. In five years out of the selected ten-year period, the mining stocks actually outperform the banking peers, however in total terms it is the banking sector which earns significant returns overall. As previously mentioned, 2004 saw very high results for the banking stocks, which led this sector to yield positive returns for momentum traders between the years 2002 and 2011.

These findings suggest that traders which follow a momentum-based strategy when buying and holding stocks yield a more economically significant return than that of the overall market. The results also propose a sector effect, i.e. banking sector is more profitable for an investor in this specific time-frame.

### 5.3 Returns of Stock Momentum Trading

Table 5.2 illustrates the overall returns of momentum-based trading using the short-to-medium term strategy. The same time periods are chosen, 3, 6, 9 and 12 months and in this case a ranking  $r$  and holding  $h$  period is tested. It presents the returns generated for each momentum strategy for each ranking period  $r$  along with the average returns of the portfolio  $r \times h$ , this approach is parallel to the pivotal methods of Jegadeesh and Titman (1993). Statistical measures are also documented with the t-stats and P-values of each strategy employed. The total sample consists of 40 stocks with 20 in each sector; banking and mining.

**Table 5.2 Returns of a Momentum-Based Strategy**

<b><i>n=40</i></b>					
<i>Rank Period (J)</i>			<i>Test Period (K)</i>		
<b><i>R</i></b>	<b><i>Portfolio</i></b>	<b><i>Returns %</i></b>	<b><i>Strategy</i></b>	<b><i>Portfolio</i></b>	<b><i>Returns %</i></b>
<b>3</b>	<b>Total n=40</b>	<b>12.73</b>	<b>3x3</b>	<b>Total n=40</b>	<b>28.36</b>
	<b>Banking (B) n=20</b>	<b>19.98</b>		<b>Banking (B) n=20</b>	<b>53.26</b>
	<b>Mining(M) n=20</b>	<b>5.48</b>		<b>Mining(M) n=20</b>	<b>3.46</b>
				<b>Total t-stat</b>	<b>1.309</b>
				<b>P Value</b>	<b>0.191</b>
			<b>3x6</b>	<b>Total n=40</b>	<b>6.93</b>
				<b>Banking (B) n=20</b>	<b>11.19</b>
				<b>Mining(M) n=20</b>	<b>2.67</b>
				<b>Total t-stat</b>	<b>1.97</b>
				<b>P Value</b>	<b>0.05</b>
			<b>3x9</b>	<b>Total n=40</b>	<b>8.54</b>
				<b>Banking (B) n=20</b>	<b>7.57</b>
				<b>Mining(M) n=20</b>	<b>9.51</b>

				Total t-stat	3.27
				P Value	0.00
			<b>3x12</b>	Total n=40	7.11
				Banking (B) n=20	7.92
				Mining(M) n=20	6.29
				Total t-stat	2.76
				P Value	0.006
<b>6</b>	Total n=40	20.97	<b>6x3</b>	Total n=40	29.04
	Banking (B) n=20	29.49		Banking (B) n=20	47.10
	Mining(M) n=20	12.45		Mining(M) n=20	10.98
				Total t-stat	1.43
				P Value	0.152
			<b>6x6</b>	Total n=40	30.74
				Banking (B) n=20	51.63
				Mining(M) n=20	9.84
				Total t-stat	1.42
				P Value	0.155
			<b>6x9</b>	Total n=40	7.59
				Banking (B) n=20	8.45
				Mining(M) n=20	6.73
				Total t-stat	2.69
				P Value	0.007
			<b>6x12</b>	Total n=40	6.51
				Banking (B) n=20	10.78
				Mining(M) n=20	22.24
				Total t-stat	3.19
				P Value	0.002
<b>9</b>	Total n=40	23.805	<b>9x3</b>	Total n=40	14.17
	Banking (B) n=20	30.13		Banking (B) n=20	9.35
	Mining(M) n=20	17.48		Mining(M) n=20	18.99
				Total t-stat	4.12
				P Value	0.00
			<b>9x6</b>	Total n=40	32.08
				Banking (B) n=20	50.03
				Mining(M) n=20	14.12

				<i>t</i> -stat	1.58
				<i>P</i> Value	0.115
			<b>9x9</b>	Total n=40	31.73
				Banking (B) n=20	48.05
				Mining(M) n=20	15.40
				Total <i>t</i> -stat	1.47
				<i>P</i> Value	0.141
			<b>9x12</b>	Total n=40	17.24
				Banking (B) n=20	13.07
				Mining(M) n=20	21.42
				Total <i>t</i> -stat	3.84
				<i>P</i> Value	0.00
12	Total n=40	36.69	<b>12x3</b>	Total n=40	37.40
	Banking (B) n=20	50.69		Banking (B) n=20	54.04
	Mining(M) n=20	22.69		Mining(M) n=20	20.76
				Total <i>t</i> -stat	1.72
				<i>P</i> Value	0.085
			<b>12x6</b>	Total n=40	35.33
				Banking (B) n=20	49.08
				Mining(M) n=20	21.59
				Total <i>t</i> -stat	1.79
				<i>P</i> Value	0.074
			<b>12x9</b>	Total n=40	33.56
				Banking (B) n=20	46.64
				Mining(M) n=20	20.49
				Total <i>t</i> -stat	1.66
				<i>P</i> Value	0.098
			<b>12x12</b>	Total n=40	40.41
				Banking (B) n=20	53.00
				Mining(M) n=20	27.83
				Total <i>t</i> -stat	1.86
				<i>P</i> Value	0.064

In the rank period, positive returns are suggested to be generated, with the 12 month ranking period generating the most profitable returns of 36.69% for the returns overall and also for each sector.

Once again the banking returns are shown to exceed the returns of the mining stocks in each ranking period.

In terms of the test period, the results suggest that of the 16 strategies, each one is profitable. From initial analysis of results it is clear that the most profitable strategy exercised overall for the forty stocks, is the 12-month ranking period, 12-month holding period (12x12) and this is consistent with the findings of the ranking period above, while in contrast the least profitable strategy overall is the 6-month ranking period, 12-month holding period (6x12). The most profitable strategy for the banking stocks is; the (12x3) strategy yielding profits of 54.04% and for the mining stocks it is also the (12x12) strategy yielding highest profits of 27.83%.

This buy-and-hold method basically shows that buying stocks one year ago, and holding them for a year, yields abnormal returns for a momentum trader. Additionally, it is interesting to note from the results depicted in the table above that there are some strategies where the mining sector outperforms the banking sector; (3x9), (6x12), (9x3) and (9x12).

Also, in terms of the significance levels, there are quite a number of strategies which display statistically significant P values at the 95% confidence level which are; (3x6), (3x9), (3x12), (6x9), (6x12), (9x3), (9x12), (12x3), (12x6), (12x9), (12x12). Moreover, this confirms that each of the strategies listed previously whereby the mining stocks outperform the banking stocks are all statistically significant.

Overall the results demonstrate the profitability of a momentum-style strategy in total and for each specific industry sector across 16 strategies and ten-year time frame.

#### 5.4 Portfolio Momentum Returns

Table 5.3 shown below illustrates the monthly momentum returns of the ten equally-weighted portfolios formed, ranging from the winner portfolio P10 to the loser portfolio P1 for the Australian stock market for the time-period 2002-2011. This table indicates the average returns of winners and losers in the rank  $r$  periods and also the average returns of the winners minus loser's portfolio (W-L) for the  $r \times h$  strategies.

**Table 5.3 Winners & Losers Portfolio**

<b>n=40</b>					
<i>Rank Period (J)</i>			<i>Test Period (K)</i>		
<b>R</b>	<b>Portfolio</b>	<b>Returns %</b>	<b>Strategy</b>	<b>Portfolio</b>	<b>Returns %</b>
<b>3</b>	<i>Winner (W)</i>	<i>144.09</i>	<b>3x3</b>	W	310.166
	<i>Loser (L)</i>	<i>-37.05</i>		L	-40.860
				W-L	269.306
				<i>t-stat</i>	<i>1.620</i>
				<i>P Value</i>	<i>0.247</i>
			<b>3x6</b>	W	99.744
				L	-46.660
				W-L	53.084
				<i>t-stat</i>	<i>0.820</i>
				<i>P Value</i>	<i>0.499</i>
			<b>3x9</b>	W	86.080
				L	-27.630
				W-L	58.450
				<i>t-stat</i>	<i>1.138</i>
				<i>P Value</i>	<i>0.373</i>
			<b>3x12</b>	W	79.811
				L	-30.970
				W-L	48.841
				<i>t-stat</i>	<i>0.987</i>
				<i>P Value</i>	<i>0.428</i>

6	Winner (W)	221.32	6x3	W	300.550
	Loser (L)	-49.14		L	-42.450
				W-L	258.100
				<i>t-stat</i>	1.594
				<i>P Value</i>	0.252
			6x6	W	323.007
				L	-57.060
				W-L	265.947
				<i>t-stat</i>	1.498
				<i>P Value</i>	0.273
			6x9	W	95.270
				L	-53.330
				W-L	41.940
				<i>t-stat</i>	0.643
				<i>P Value</i>	0.586
			6x12	W	164.130
				L	-42.430
				W-L	121.700
				<i>t-stat</i>	1.288
				<i>P Value</i>	0.327
9	Winner (W)	241.27	9x3	W	137.760
	Loser (L)	-54.15		L	-44.810
				W-L	92.950
				<i>t-stat</i>	1.128
				<i>P Value</i>	0.376
			9x6	W	323.790
				L	-54.390
				W-L	269.400
				<i>t-stat</i>	1.521
				<i>P Value</i>	0.268
			9x9	W	331.900
				L	-58.730
				W-L	273.170
				<i>t-stat</i>	1.498
				<i>P Value</i>	0.273
			9x12	W	170.280
				L	-57.980

				W-L	112.300
				<i>t-stat</i>	1.093
				<i>P Value</i>	0.389
12	Winner (W)	358.48	12x3	W	370.320
	Loser (L)	-57.84		L	-58.910
				W-L	311.410
				<i>t-stat</i>	1.545
				<i>P Value</i>	0.262
			12x6	W	352.770
				L	-52.610
				W-L	300.160
				<i>t-stat</i>	1.572
				<i>P Value</i>	0.256
			12x9	W	327.000
				L	-57.020
				W-L	269.980
				<i>t-stat</i>	1.504
				<i>P Value</i>	0.271
			12x12	W	382.520
				L	-62.350
				W-L	320.170
				<i>t-stat</i>	1.535
				<i>P Value</i>	0.265

In the rank period, the most profitable ranking period depicted is the 12-month ranking period, with average winner returns of an abnormal 358.48% whilst the least profitable strategy is the 3-month one at -57.84%. This is also consistent to the previous results of overall momentum returns.

In the test period, the results suggest that the momentum returns are positive for all of the sixteen strategies. The most profitable strategy, not surprisingly comes from the 12-month ranking, 12-month holding periods (12x12), which has been the consistent findings of each result thus far in the study. The strategy yielding the least profitable earnings is the 6-month ranking, 9-month holding period (6x9). Of each of these winners minus loser's strategies, none of them appear to be significant at the 95% confidence level.



## 5.5 Firm-Specific Factors

Shown below are Tables 5.4 and 5.5 which indicate the <sup>18</sup>market capitalisation of each company which were selected at random ranging from small to much larger corporations in each industry and does not eliminate the size effect anomaly. The smallest stock is just AUS\$2million, whilst the largest is over AUS\$110,000.

**Table 5.4 Market Capitalisation - Banking Stocks**

<i>Banking Companies</i>	<b>Mkt. Cap per Million AUS\$</b>
BENTLEY CAPITAL LIMITED	11
PRIME FINANCIAL GROUP LIMITED	19
FIRSTFOLIO LIMITED	57
HOMELOANS LIMITED	67
EQUITY TRUSTEES LIMITED	109
MORTGAGE CHOICE LIMITED	176
MYSTATE LIMITED	237
WIDE BAY AUSTRALIA LTD	300
CARLTON INVESTMENTS LIMITED	449
BKI INVESTMENT COMPANY LIMITED	512
SFG AUSTRALIA	1,113
BANK OF QUEENSLAND	1,841
BENDIGO AND ADELAIDE BANK LIMITED	3,192
ORION EQUITIES LIMITED	3,221
ASX LIMITED	5,333
PUBLIC HOLDINGS (AUSTRALIA) LIMITED	10,500
NATIONAL AUS.BANK	55,591
AUSTRALIA AND NEW ZEALAND BANKING GROUP LTD.	57,139
WESTPAC BANKING CORPORATION	66,995
COMMONWEALTH BANK OF AUSTRALIA.	81,517

**Table 5.5 Market Capitalisation - Mining Stocks**

<i>Mining Companies</i>	<b>Mkt. Cap per Million AUS \$</b>
AXG MINING LIMITED	2
MOLY MINES LIMITED	54
ARAFURA RESOURCES	65
MOLOPO ENERGY LIMITED	111
PANORAMIC RESOURCES LIMITED	130
GREENLAND MINERALS AND ENERGY LIMITED	160
RANGE RESOURCES LIMITED	163
ROC OIL COMPANY LIMITED	208
RESOLUTE MINING LIMITED	796
ONESTEEL LIMITED (ARRIUM LIMITED)	940
PERSEUS MINING LIMITED	1,094
PANAUST LIMITED	1,901
SIMS METAL MANAGEMENT LIMITED	2,610
OZ MINERALS LIMITED	3,154
ILUKA RESOURCES LIMITED	6,490
ALCOA INC.	9,492
FORTESCUE METALS GP.	13,296
NEWCREST MINING LIMITED	22,669
RIO TINTO	26,276
BHP BILLITON	110,546

The two predominant companies in the banking sector are Commonwealth Bank of Australia and Westpac Banking Corporation, and in the mining sector, it is two most renowned stocks which are BHP Billiton and Rio Tinto. In terms of the winning stocks, Fortescue Metals was the most recurring profitable company and is the fourth largest stock of the mining sector, whilst

Sims Metals is the most frequent of the losing stocks and is in fact the eighth-largest, of the twenty chosen from this industry.

The findings are outlined and displayed in the next section as there were outliers present so this is discussed further. This attempts to determine whether or not the size of a firm plays a role in how profitable the returns can be for momentum trading. To add to this the statistical evidence shows a t-stat value of 1.751 with a corresponding P value of 0.081 which means that these two variables are not statistically significant at the 95% confidence level, suggesting that firm size and momentum are not linked. (Output included in Appendices section).

Another factor which may be considered for a trader employing a momentum style is in relation to a company paying a <sup>19</sup>dividend to its shareholders.

The table 5.6 shown overleaf outlines each of the company's <sup>20</sup>dividend yield's rates as of the end of 2011. Dividend policies capture much attention in the world of finance and whether they exist in a company or not can impact very much on financial traders. For firm-holders, there is a big decision to be made once the company begins to earn profits and it ultimately involves the shareholders. (Al-Malkawi *et al* 2010).

The term <sup>21</sup>'dividend policy' refers to "the practice that management follows in making dividend pay-out decisions or, in other words, the size and pattern of cash distributions over time to shareholders".

In this study, there are 12 firms in total which are non-dividend paying. Of this sub-sample, 9 are from the mining industry, and only 3 are from the banking industry this is outlined in Table 5.6 also shows the average dividend yield rate for the forty companies which is 0.468.

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19. A payment made to holders of a firm's common stock and/or preferred stock. (Encyclopaedia of Finance ,2006)

20. Dividends per share of common stock divided by market price per share (Encyclopaedia of Finance ,2006)

21. 'Dividend Policy: It's Impact on Firm Value', Lease et al (2000).

**Table 5.6 Dividend Yield Rate**

<b><u>Company</u></b>	<b><u>Industr y</u></b>	<b><u>Div. Yield (%) as of 2011</u></b>
ALCOA INC.	Mining	0.12
ARAFURA RESOURCES	Mining	0
ASX LIMITED	Banking	1.86
AUSTRALIA AND NEW ZEALAND BANKING GRO	Banking	1.32
AXG MINING LIMITED	Mining	0.06
BANK OF QUEENSLAND	Banking	0.52
BENDIGO AND ADELAIDE BANK LIMITED	Banking	0.6
BENTLEY CAPITAL LIMITED	Banking	0.02
BHP BILLITON	Mining	1.04
BKI INVESTMENT COMPANY LIMITED	Banking	0.06
CARLTON INVESTMENTS LIMITED	Banking	0.8
COMMONWEALTH BANK OF AUSTRALIA.	Banking	3.25
EQUITY TRUSTEES LIMITED	Banking	0.9
FIRSTFOLIO LIMITED	Banking	0
FORTESCUE METALS GP.	Mining	0.08
GREENLAND MINERALS AND ENERGY LIMITED	Mining	0
HOMELOANS LIMITED	Banking	0.06
ILUKA RESOURCES LIMITED	Mining	0.75
MOLOPO ENERGY LIMITED	Mining	0
MOLY MINES LIMITED	Mining	0
MORTGAGE CHOICE LIMITED	Banking	0.13
MYSTATE LIMITED	Banking	0.35
NATIONAL AUS.BANK	Banking	1.78
NEWCREST MINING LIMITED	Mining	0.32
ONESTEEL LIMITED	Mining	0.07
ORION EQUITIES LIMITED	Banking	0
OZ MINERALS LIMITED	Mining	0.6
PANAUST LIMITED	Mining	0
PANORAMIC RESOURCES LIMITED	Mining	0.04
PERSEUS MINING LIMITED	Mining	0
PRIME FINANCIAL GROUP LIMITED	Banking	0.02
PUBLIC HOLDINGS (AUSTRALIA) LIMITED	Banking	0
RANGE RESOURCES LIMITED	Mining	0
RESOLUTE MINING LIMITED	Mining	0
RIO TINTO	Mining	1.34
ROC OIL COMPANY LIMITED	Mining	0
SFG AUSTRALIA	Banking	0.03
SIMS METAL MANAGEMENT LIMITED	Mining	0.45
WESTPAC BANKING CORPORATION	Banking	1.62

WIDE BAY AUSTRALIA LTD	Banking	0.53
<b>Dividend Yield Average</b>		<b>0.468</b>

In the Appendices section, a chart illustrates each company's dividend yield rate along comparing these to the overall mean rate.

## 5.6 Robustness Checks

When conducting this study there were major outliers present whereby returns were abnormally superior to others, so for the purpose of this section two separate columns are created outlining which companies were the 'winners' and which were the 'losers' for each of the sixteen strategies over the ten-year period. One includes the results with the obvious outliers present, as Orion 2004 occurs for each strategy, and the other table excludes this in order to gain a better insight into the other performers in the chosen sample-set.

**Table 5.7**

Including Outliers		Excluding Outliers		
Strategy	W	L	W	L
J3	orion (2004)	sims metal (2003)	orion (2005)	sims metal (2003)
J6	orion (2004)	fortrescue (2003)	fortrescue (2005)	fortrescue (2003)
J9	orion (2004)	alcoa (2011)	molopo (2008)	alcoa (2011)
J12	orion (2004)	bentley (2004)	molopo (2008)	bentley (2004)
K3	orion (2004)	sims metal (2003)	panoramic (2007)	sims metal (2003)
K6	orion (2004)	fortrescue (2009)	fortrescue (2005)	fortrescue (2009)
K9	orion (2004)	alcoa (2002)	alcoa (2010)	alcoa (2002)
K12	orion (2004)	alcoa (2002)	alcoa (2005)	alcoa (2002)
L3	orion (2004)	sims metal (2003)	molopo (2007)	sims metal (2003)
L6	orion (2004)	fortrescue (2009)	fortrescue (2005)	fortrescue (2009)
L9	orion (2004)	public holdings (2009)	fortrescue (2004)	public holdings (2009)
L12	orion (2004)	alcoa (2002)	alcoa (2005)	alcoa (2002)
M3	orion (2004)	arafura (2008)	fortrescue (2005)	arafura (2008)
M6	orion (2004)	sims metal (2003)	molopo (2007)	sims metal (2003)
M9	orion (2004)	sims metal (2003)	panoramic (2007)	sims metal (2003)
M12	orion (2004)	public holdings (2009)	alcoa (2005)	public holdings (2009)

These tables present the findings of those companies which performed better than others for the various strategies by indicating which stocks generate significant returns for a trader and which yield negative earnings. The years are also included in brackets to outline which was the better performing year (W) in the study and which years were underperforming (L). The items shaded

in yellow are all the banking companies, and green are the mining stocks. It is evident from looking at the right-hand side of the table, that there are far more mining companies which were either winning or losing for each strategy throughout the ten-year time-frame in contrast to the banking sector.

The company which generated the most significant returns throughout each of the sixteen strategies and within the ten year time-period is Fortrescue Metals, whilst Sims Metal documents the most negative returns. Also it appears that the year 2005 showed the most recurrent 'winning stocks', whereas the year 2003 displayed the most frequent 'losing' returns.

## **5.7 Chapter Summary**

This chapter has presented the results in a series of tables and these are illustrated in a number of graphs also. The first set of results show that the average returns for a momentum-based trader generates larger returns than the overall market index for the same testing period, and this is the case for both the banking and mining sectors stocks.

Returns are depicted in the banking sector outperforms the mining sector, and these findings indicate that momentum trading tends to yield more significant returns than that of the overall market tested.

The ranking and holding periods which were tested demonstrate that a 12-month ranking period is most profitable of all whilst this is also the case for the test period, whereby the (12x12) strategy yields the greatest profits for a momentum trader with (6x12) month period generating the least profitable returns.

The Winner-Loser portfolios document results of a similar nature to the previous findings indicating that the 12x12 strategy is the most profitable but none of these appear to be statistically significant.

This study also captures other firm-specific variables such as firm-size and dividend-paying elements. These are reflected upon as possible factors contributing to the momentum effect however this study finds no evidence of either of these variables playing a major role in the momentum effect.

The findings presented in this section will be further analysed and discussed in the following chapter.

## **Chapter Six**

### **DISCUSSION**

#### **6.1 Chapter Overview**

This chapter is the final stage of the dissertation and evaluates the findings, conclusions and recommendations established from the research. It begins by reviewing the key objectives which have framed the entire study. The next section then summarises the central themes and issues from the prior literature chapters by incorporating the empirical evidence from this study and discussing how these results can be compared and contrasted to previous analyses, hypotheses and overall findings. The next section presents the limitations and challenges posed surrounding the research. Following this, some practical implications are suggested for future research before finally concluding the dissertation by inclusively summarising the study in the context of specific gaps in this area of research.

#### **6.2 Objectives of the study**

This study primarily investigates the existence of the renowned fundamental anomaly known as the momentum effect on the Australian stock market. There are several main objectives implemented in this research which stems from the prior literature and empirical studies surrounding the highly topical momentum anomaly in the world of finance.

The principal aim is to examine the presence of the momentum effect on the ASX. Many academics have focused on testing the existence of momentum for traders and investors in order to effectively ‘beat the market’. These tests have been carried out globally across numerous stock markets with the objective still enduring to be explored for numerous financiers and behavioural analysts. This study has ultimately found the presence of momentum on the Australian stock market for the selected time-frame of 2002-2011, i.e. the winners keep on winning, and the losers keep on losing. The next objective for this study is based on assessing the profitability of the momentum effect on this chosen stock exchange. Traders wish to evaluate the

momentum-style trading so as to yield significant profits from their investments. This study assessed forty stocks over a period of ten years and suggests that the most profitable momentum strategy reaping the greatest returns is the 12 month ranking period, and the (12x12) month testing period. The objective of this test is to examine which of the sixteen strategies would prove most profitable overall and the results indicate that a momentum trader employing a buy-and-hold method would generate greater returns when buying stocks, and holding them for a year. Of each of the strategies, this is the longest testing period, and proved persistent for both the ranking and testing period. This study suggests that those traders investing in stocks and selling them a short period of time later is less profitable than holding on to the shares perhaps on an annual basis.

As there have been many contributions over the years as to what may cause the momentum effect with various possibilities suggested such as; the January effect, the Size effect, trading volumes, analyst coverage and so on, this study aimed to identify what proportion of the momentum effect is explained by the widely-recognised January effect. As the findings presented in the previous chapter indicate that there are

### **6.3 Summary of the Literature**

### **6.4 Limitations**

### **6.5 Practical implications**

### **6.6 Recommendations for Future Research**

### **7.7 Chapter Summary and Conclusion**

The study investigated



