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An empirical review of the complimentary nature of fundamental and technical analysis techniques based on JSE-listed stocks

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AN EMPIRICAL REVIEW OF THE COMPLIMEN
FUNDAMENTAL AND TECHNICAL ANALYSIS TI
JSE-LISTED STOCKS

BY

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A RESEARCH REPORT SUBMITTED TO THE FACULTY OF COMMEN
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ABSTRACT

This study contributes to the debate on whether fundamental analysis and technical analysis techniques can be used jointly in making investment decisions. Fundamental and technical analysis is frequently focused on analysis the valuation techniques independently of one another. In this study we construct a that integrates both fundamental and technical analysis (hybrid model) va determine whether the hybrid model can have a superior explanatory power to based on each value of the techniques in this study. This study is based on all shares that have been listed on the JSE main board between th Testing rejects the complimentary nature of fundamental and tec by showing that the technical analysis model has a superior to both the hybrid model and the fundamental analysis model. We also analyse the JSE-listed stocks do not exhibit momentum or contrarian effects with respect to perform and that the fundamental analysis variables that play a signific price movements of JSE-listed stocks are the value per share, cash flow earnings per share and dividends per share.

Keywords: Fundamental analysis, technical analysis, integration of funda technical analysis

DECLARATION

I, Vuyolwethu Mashiqa, declare that this research report is my own wor
in the references and acknowledgements. It is submitted
requirements for the degree of Master of Management in Finance and Invest
University of the Witwatersrand, Johannesburg. It has not b
degree or examination in this or any other university.

Vuyolwethu Mashiqa

Signed at &&&&&&&&&&&&&&&&&&

On the &&&&day of &&&&&&&2014

DEDICATION

This thesis is dedicated to my late mother, Nhotu Mutinwa Mashiq
who taught me in Vashiq
lessons in life. One of the lessons I could achieve whatever goals I so
matter what the challenge, if I believed in myself.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Numerous equity valuation techniques have been developed since the Equity[1] 1800s investors often have a preference for certain types of thes when selecting stocks include or remove from their investment po extensive amount of theoretical work has been conducted techniques, practitioners and academics remain divided on w captures stock prices movements. There is currently very limited amou to address this problem, especially in developing markets su

A further problem that remains answered is whether using a combina valuation technique can generate higher returns than using only one i

Answers to the above problems would not only settle the de amongst practitioners, but would also allow investors to be investment decisions and gain more insight into the drivers of asset p to address these challenges in the South African context.

The subsequent sections in this chapter are organised as background to the study to bring the reader up to speed with developments valuation techniques. Whether the gaps that have been identifie body of knowledge. Furthermore this study will address those g significance this expect to have.

1.2 Background to the study

There are mainly two equity valuation techniques used by equity, namely Fundamental Analysis and Technical Analysis. Both profitable investment opportunities approach them from entirely diffe perspective. The goal of a fundamental analyst is to determine whether a undervalued or overvalued relative to its true value. A technical analyst uses price and volumes of a future price trends of the security (see Levy, 1966

[1] Rutterford (2004) provides a history of developments in equity valuation

Jackson (2006) [illegible] technical analysis is an umbrella term for myriad of technical indicators. Technical chart patterns and technical the Dow Theory, Elliot Wave Theory, Kondratieff Wave Theory, provide the building blocks of technical indicators. Other technical indicators that have been introd recent times include Trend Following, Breath, Momentum, etc.[2] Sentiment I indicators have been developed with the purpose of giving a of tools to analyse the market and Pring (1991). No single indicator can ever be expected to signal its essential results a number of them together to build up a consensus .

Fundamental analysis is the main and shape of the value from their true fundamental prices. Short term market imbalances. The fund is determined by the fundamental analyst. The extent of internal factors that can influence the future. The external factors include wide dynamics that will affect all companies well as industry-specific factors that will affect all companies oper industry. The internal factors are specific concerns. On the basis of the temporary mispricing, a fundamental analyst would trade th profit when the stock price eventually converges towards the (Al-Abduljader-Mandaikhi, 2011)

An immense amount of literature has been written about the fu technical analysis valuation techniques, with particular refer adjusted returns.[3] However, level of market efficiency the valuation techniques can be consistently profitable. Stock prices reflect all av historical price and volume as analysts not be able to provide p price forecasts. A market whose prices reflect all publicly available should d both fundamental and technical analysis. The existing literature has p mixed results on whether stock markets are efficient or no popularity of technical analysis especially among asset ma

[2] Alexander (1961), Kaufman (2003) and Davis (2005) in depth discussion of these indicator
[3] See e.g. Brock et al (1992), Ready (2002), Lento and Gradojevic (2007)

Menkhoff (2010) points towards possible market reflecting i
in prices.

The existing literature often analyses the two valuation techniques
to consider whether the two techniques can be integrated that
can have superior explanatory power compared to these techniques a
considered without reference to one another

The possibility that fundamental analysis and technical analy
been noted by Lui and Mole (1998) based on Hong Kong foreign
exchange dealers. The survey shows that more than 85% of foreign exch
Hong Kong bought fundamental and technical analysis to forecast
movements. However, technical analysis was used for short term forecas
fundamental analysis was used for long term forecasts. Some of them used a
combination of fundamental and technical analysis for the same time horizon
Taylor & Allen (1992) and Oberlechner (2001) conclusions in
conduct in London and European trading centres respectively.

The Johannesburg Stock Exchange (JSE) has long attracted both local and global
investors. With over 800 listed securities, the JSE is currently t
largest stock exchange on the African market capitalization
ranks the 20th largest stock exchange among the members of the World Fe
Exchanges a market capitalization based.[4] This also shows the increased importa
of the JSE market therefore warrants a more thorough research int
drivers of the equities market.

1.3 Problem Statement

Three gaps in the existing body of knowledge have been ide
First, we are not aware of a study that proves which of the two valu
outperforms the other. This lack of conclusive literature implies that
no indication to which equity valuation technique can achieve superi
returns.

[4] Sources: www.jse.co.za and http://www.stockmarkets.com/exchanges/exchange/johannesb

Secondly, as highlighted by Bettman (2009), within each type of analysis ongoing debate regarding which explanatory variables to use in conduc an equity. An in-depth study is therefore required to examine th the JSE equities market.

Thirdly, the relationship between fundamental and technical two techniques is used simultaneously by investors is an area th covered by existing research and only a limited number of studies have considered relationship to be the subject. To the author's knowledge, studies conducte Bettman (2009) and Waworuntu & Suryanto (2010) on the US , respectively, have considered building models that integrates fundamental factors. There may be some justification for this p that reviews the complimentary nature of technical and fund reason is that there are disagreements amongst investors ab market. Some market participants to be invested in fundamentals to explain stock price, whereas others perceive psychological in more significant role (see Menkhoff, 2010). Reconciling thes challenge.

This lack of insight into the complimentary nature of technical and fundamen implies that there is little indication on what the performance integrates both techniques would be. However, should the both techniques have explanatory power of stock prices, a relati on each technique, independently, would suggest that the investor who strategy would be more profitable than each technique.

1.4 Purpose of the study

The primary purpose of this study is to determine whether fund analysis can be used in a complimentary manner. This making analysis will identify the fundamental and technical JSE analysis stock market. Furthermore, this study will also determine which valuatio superior explanatory power of fundamental and technical a

1.5 Objectives of the study

In summary, the objectives of this study are as follows:

(1) To identify the fundamental analysis factors that drive stock prices and measure their ability to explain prices.

(2) To identify the technical analysis factors that drive stock prices and measure their ability to explain prices.

(3) To determine which valuation technique has a superior explanato stock prices between fundamental and technical analysis

(4) To determine whether a model that integrates both fundam analysis factors can explain prices better than the use of the technique in isolation

1.6 Significance of study

This study aims to contribute to the understanding of the valuation tec the context of the investment decision-making process. These results are expected t beneficial financial market participants, especially those in the investment r area.

In addition, this study will also shed some light on the valuation JSE-listed stocks, both fundamental and technical analysis. The equity valuation framework developed by Ohlson (1995), which states that st book values per share and earnings per share, lays the foun constructed in this study. The study goes well beyond Ohlson (199 framework by incorporating the following additional-to variables market ratio, cash flow per share and dummy variables that return performances.

Although this study is exclusively on the equities market, finding can be applied to other asset classes.

1.7 Outline of study

The remainder of this paper is organised as follows: Chapter 2 reviews the relevant literature on the Efficient Market Hypothesis, JSE Market

the fundamental analysis valuation technique, the technical analysis valuation technique and how the two valuation techniques can be integrated into

Chapter 3 presents the methodology adopted including the framework in which the explanatory power of a model that integrates both fundamental analysis and technical analysis factors can be measured relative to models based on only one without reference to the other.

Chapter 4 presents the empirical results analysis of the research. Chapter 5 concludes the report

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter begins by examining the existing literature on t
A brief background of the Efficient Market Hypothesis is reviewed
literature focuses on the JSE. The JSE of efficiency of the JSE is considered
to be relevant in this study because the success of the JSE
study depends on whether the JSE is efficient or not.

The subsequent sections review the existing literature on
analysis, technical and the integration of these techniques.

2.2 Efficient Market Hypothesis

Fama (1970) defined an efficient market as a market where a
available information. However this definition is very
tested. Jensen (1978) provided a more practical definition as follows

> A market is efficient with respect to it is impossible to m
> economic profits by trading on the basis of information s

Jensen defined three forms of Weak-form, Semi-strong form and
Strong-form. The differences revolved around the definition of t
by the information set.

A market will be weak-form efficient prices reflect all the information
historical prices of time. This implies that a weak-form efficient market
market participants cannot earn profits by examining the past
the market.

A semi-strong form efficient market is one where prices are all
information at time. This implies that market participants cannot
profits by trading on available information such as financial stateme
Since past price history forms a part of public, this is a se
strong form efficient market is also weak efficient.

In a strong-form efficient market, market incorporate all available infor
public and private. This implies that any trading strategies
would not yield any risk-adjusted profits.

A number of research has found equity developed econom
be efficient, semi-strong form efficient. Malkiel (2003) studied the eff
the US stock market on the index constituents of the Standard
index and found the semi-strong form efficient. Malkiel (2003) concedes that
anomalous behaviour in stock prices may exist, but it is a
opportunity that enables investors to adjust the extraordinary ri
consistent with conclusions on earlier studies that found t
trading opportunities (see e.g. Olsen, 1999).

Malkiel (2005) analysed the performance of professional inves
US and abroad and that investment managers do not outperform the
benchmark. This result makes it difficult for active fund managers
excessive investment management fee involved in active fu
passive fund management also provided evidence that market
appear to reflect all available information.

Given the lack of outperformance by professional investment managers in M
study, French (2008) examined the cost of investing costs to
invest in the US stock market relative to the cost invested
passively. He found investors 0.67% of the aggregate value of the
year in search of superior active fund management. This finding implies t
the investing community does not fully subscribe to the not
even in a developed market such as the US.

2.2.1 Market efficiency outside the US

Jammine and Hawkins (1974) conducted the first study of
JSE. The study tested whether stock prices followed a random walk
change in price over the period from 1966 to 1973. Jammine and Hawkins (19
concluded that stock prices did not follow a random walk proce
JSE was not weak form efficient.

Hadassin (1976) used the serial correlations and runs test to test the efficiency of stocks trading on the JSE. He established there was a definite correlation and future share prices but that the exact relationship between the maximum and minimum. This result also suggests that the JSE was not efficient.

Gilbertson and Roux (1977) found evidence of deviations from stock prices. However, they noted that such deviations are consistent with an efficient market. They also found that South African unit trust managers performed the market in the period from 1973 to 1976, thus questioning the value added by management over passive fund management. However, Strebel (1977) challenged findings from Gilbertson and Roux (1977) on the basis that more than half of the JSE stock volumes so low that analysis of their performance is meaningless. Strebel (1977) also stated that many of the previous studies that analysed the efficiency of the JSE of minor use as they did not separate out the low volume.

Instead of using the serial correlations test and the runs test used to test the efficiency of the JSE, Klerck (1986) conducted analysis to determine whether there was any systematic relationship activity and share prices. He concludes that share prices on reasonable accuracy. However, forecasting accuracy of Klerck (1986) can be challenged as only data used in the inputs into the model also have forecasted.

Philpott and Firer (1994) found that share price anomalies of a magnitude direct transaction costs of switching from one share to another anomalies were found to be persistent. Philpott and Firer (1994) also added Strebel (1977) concerns about the low volume effect by splitting into high and low volume shares. Share price anomalies were high and low volume stocks.

Oldfield and Page (1997) investigated the skilling of sevenstock South African unit trust managers over the period from 198 performance measure. No evidence of superior performance

consistent with an Gilbert (1977) conclusion about the performance by fund managers. These results are consistent with an efficient mar

Some months have been proven to have higher returns than other months, especia January (Rozeff and Kinney (1976)). Rozeff and Kinney also reflect the JSE and evidence of the January effect over the period from 1986 was inconsistent with an earlier finding by Bradford (1990). In a study conducted by Auret and Cline (2011), no evidence of the January effect was found in JSE.

The efficiency of the JSE compared to other African countries has also been et al. (2002) tested the hypothesis that the stock market index follows a rando South Africa, Egypt, Kenya, Morocco, Botswana, and Mauritiu hypothesis is rejected for all the markets except for South Africa. The findings of this st are also consistent with a weak-form efficient market.

In a recent study, Mbululu and Chipeta (2012) effects on the JSE sectors over the period from 1995 to 2011. Not a day detected f of the nine sectors considered, the basic materials sector was fou Monday effect. The conclusion from this study is that the J respect to the other eight sectors considered weak-form basic inefficient.

The debate on the whether the JSE as a whole is efficient or not literature has produced a result. The primary reference conclusions appea to be a result of different methodologies and periods of investigation. Earlier studies appear to consistently conclude that the JSE was inefficient, while more of the recent studies are finding the JSE results efficient to an increase market efficiency of the JSE in recent times which can be a speed of information dissemination to investors and reduction of time. However, the fact that some of the recent studies have foun that trading strategies that aim to exploit such market ineff and Technical Analysis techniques can be profitable when ap

2.3 Fundamental Analysis

Lev and Thiagarajan (1993) define a fundamental analysis as the value of corporate securities by a careful examination of earnings, risk, growth and competitive position. The primary sources of information examined by a fundamental analyst are the annual company financial announcements, interviews with the management of the company and so forth.

The goal of fundamental analysis is to produce a fair value (or a fair value) security that can be compared to the market price in order to determine the security is under or over. The fundamental analyst believes that the the security is the correct price and that any deviations between the intrinsic the market value represent profitable buying (or selling) opportunities a when the intrinsic value of the security is above (below) the market value of th

However, if the stock markets are efficient, fundamental ana yield any adjusted profits. This is because the information analysed b fundamental analysts is publicly available and has already incorporate prices.

Graham and Dodd s 1934 seminal work on US stocks laid development of fundamental analysis (see Chaney et al, 1993). Since 1993 a myriad of st have been conducted to determine which fundamental variables have an influence o prices. Chaney et al (1993) studied the effect of earnings yield, market compa ratio and cash yield on Japanese stock prices over the period et al (1993) found a significant relationship between the return the four fundamental variables. The book-to-market ratio is found to be most variable, statistically and economically. Firms with high-book ratios significan outperformed firms with low-book ratios. Fama and French (199 same book-to-market effect when studying US stocks.

Gordon and Shapiro (1956) emphasized the importance of dividends in a firm s market value when multiplied by the Dividend Discount Model. Recent studies have a confirmed the relation between dividends and market prices (Gunasekarang and Power, 2006) extended Gordon (1956) and Shapiro

Dividend Discount Model by expressing the price as a weighted average of current earnings minus current dividends, and the dividends are subtra because a dollar of dividends displaces a dollar of market value. Ohlson (1995) derived based on the clean surplus requirements, which change in book v equal earnings minus dividends. Ohlson (1995) also states that book valu estimators of market values in that the expected (1997) will e applied the framework developed by Ohlson (1995) on US st to 1993. Collins (1997) confirmed Ohlson (1995) that stock price are dependent on book value earnings.

Based on the literature above, a fundamental analysis is extended by the valuation framework developed by Ohlson (1995). Thi that are included in our fundamental analysis value per share, earnings per share, dividend per share, book-market and cash flow per share

2.4 Technical Analysis

Levy (1966) defines technical analysis as the recording of (including both price movement and the volume of transactio equities, and deducing the future from this historical analysis. Technical analysis was popularized by Dow, the editor of the Wall Street Journal 1890s. Dow Theory laid the foundation for much analysis techniques currently practitioners. Neely and Weller (2011) summ the three principles that guide the chart analysts. The first pri market action (prices and volume) discounts everything. This implies that mark prices incorporate all the relevant information. The second principle prices move in trends. The third principle is that it repeats itself with respect movements.

Brock (1992) highlighted that technical analysis is the original for analysis as it came into widespread use. The period of extensive disclosed financial statements which fundamental analysis to develop

However technical analysis has not been widely accepted a
securities as much as fundamental analysis, in the scope. The views
academic against technical analysis are well (1958, p. 132)

Obviously I am biased against the chartist. This is not only
professional one as well. Technical Ama to the academic wor
pick on it. Our bullying tactics are prompted by two conside
false; and it s easy to pick on. And while it may seem a bi
target, just remember it is your money we are trying to save

Several studies have been conducted to the technical analysis
significant value to an investor studies have produced mixed
results thus far. Jensen and Bennington (1970) Fama and Blume (1966) the
profitability of various technical trading rules relative to a b
found that the technical rules could not outperform a buy and

Brock et al. (1992) tested the profitability of the Moving Average and
Breakout rules using data from the period from 1897 to 1986 stocks Dow
Jones Industrial Average (1992) concluded that the trading rules have th
to forecast future stock prices. However, Ready (2002) found that th
Brock et al. (1992) performed poorly after 1986. The results from the study cond
Lento and Grandojevic (2007) also (1992) validating Brock over the
period from 1995 to 2004. A plausible explanation of these contradictory findings i
trading opportunities could have been arbitraged away by the

The extensive amount of studies that have been conducted on
emergence of two investment strategies that have been called passed p
contrarian and momentum investment strategies. The effective
strategies influenced whether the market reacts or reacts to information.
Jegadeesh and Titman (1993) stock prices under reacts to
information, then profitable trading strategies that select sto
will exist.

2.4.1 Momentum investment strategies

Jegadeesh and Titman (1993) investigate the profitability of trading strategies stocks based on their past returns. They conclude that trading strategies that buy past winners and sell previous three to month period are significant abnormal returns over a holding period months. Rouwenhorst (1998) also evidence of the momentum effect investigating European countries between 1989 and 1995. Liu et al (1999) found the momentum effect to be present in UK stocks. Testing the momentum trading strategies are profitable.

To provide further insight on the existence of the momentum Moskowitz (1999) found that once the industry momentum is controlled, the mo stocks become less significant. Hong et al (2000) finds that the profitability of strategies will be higher in the new market capitalization stocks and also among stocks that have low analyst coverage.

2.4.2 Contrarian investment strategies

In contrast to the studies that support the momentum effect Bohdt and Thaler (1985) found that a portfolio of past revisors over three to five year p outperformed prior winners over three to five year. This study was conducted using data from 1926 to 1982 on US stocks.

Page and Way (1992) tested the profitability of contrarian s same methodologies employed by De Bondt and Thaler (1985). Page and Way (1993) results show that a portfolio of prior losers significantly out three year holding period over the period from 1974 to 1989.

This study uses technical analysis based on corporate/ricalged formulate technical analysis based on the past return prices and dummy variables based on the past return perfo study. The presence of dummy variables in the model will help dete momentum or contrarian effect is present on the JSE.

2.5 Integration of Fundamental and Technical Analysis

Bettman et al (2009) were the first to explore the complementary nature of fund and technical analysis. They constructed a model that integrates b

techniques. The model developed by Bettman (2009) is based on the framew was established by Ohlson (1995).

Bettman (2009) constructed in 3 models, study with only fundamen analysis factors, one with only technical and the integrated fundamental and technical factors. The fundamental analysis factors included Bettman (2009) fundamental analysis book value per share, per share. The technical analysis factors include the lagged price and two momentum dummy variables, one reflecting extremely positive the other reflected extremely negative returns

Bettman (2009) concluded that the model that both fundamental and technical factors had a superior stock pattern shown by the marked higher adjusted R^2 values and lower Amatori values as compared to models that examine fundamental and technical analysis in isolation

The testing done by Bettman (2009) was based on US listed stocks over th 1983 to 2002. A similar study conducted by Waworuntu an Indonesian market confirmed the complementary technical of analysis techniques

This study to apply the models developed by Bettman (2009) to JSE stocks and also extend the model to include book-market, dividend per share an cash flow per share

2.6 Chapter Summary

This chapter has presented the relevant literature and evidenc equities market, how the fundamental and technical analysi performed in practice. Empirical studies on how the two existing valuation techniques are also considered.

The literature reveals that although the efficiency of the JS market practitioners, recent studies indicate that there has efficiency.

Ohlson (1959) valuation model provided a rigorous framework whi
in this study to include other relevant variables beyond the earnings
variables considered by Ohlson (1995). Empirical studies
earnings and book value variables, significant relationship
cash flows, market ratio, historical share price performance
prices. The models developed in this paper takes account additiona

The following chapter presents the data sources and the
selection process used to select the sample that underpins this study.

Chapter 3: METHODOLOGY

3.1 Introduction

Numerous valuation models have been developed in recent lite
determining the market values of developed markets (see Ohlso
Bettman, 2009). However, only a few studies have been exten
markets as South Africa. This study seeks to extend the mo
(1995) and Bettman et al (2009) to determine whether fu
explanatory variables are relevant in explaining market price

In this chapter we develop valuation models in a linear regression
with several explanatory variables and investigates the impa
of fundamental explanatory variables, namely book value,
share, dividend per share, book to market ratio and cash fl
movements as in Ohlson (1995)

The second model seeks to examine how well technical expl
market prices. The technical variables include the histor
variable and momentum/contrarian dummy variables that de
return performance.

The third model integrates both the fundamental and technic
single model with the sole purpose of determining whether the hybr
superior explanatory power of stock prices.

3.2 Data and Data Sources

3.2.1 Data sources

The data required for this study consists of three month
the fiscal year end), earnings per share, book value, cash flow figures,
dividends, historical return performances for individual stocks
outstanding for all the firms under consideration.

The sample period covers the 2002 fiscal year to the 2012 f
year data set). This study includes all the stocks that have b

in the periods between the 2002 and 2012 fiscal years, bot
delisted shares.

The list of firms that have been listed on the JSE s main boa
between 2002 and 2012 was generously provided by the
department. The other data for each firm was obtained from
Servei (henceforth, Bloomberg) database and from publicly av
of the firms.

3.2.2 Data selection

In maintaining consistency with existing literature such as B
and Suryanto (2010), the data as self-compacted with book valu
per share equal to or less than 0 more, excluded that excess
of 90 days from the fiscal year-end to disclose annual financial informati
are also excluded.

However, in contrast to Bettman et al (2009) and Waworuntu and
with missing observations and firms that have been delisted
not removed from the study. Instead, where there were missing observa
zero was assigned to the data point. The inclusion of firms with missing observatio
ensures that the sample size for the study is as large as po
also ensures that there is no selection bias in the study towa
the JSE and that the data sample is comprehensive.

3.3 Research Design

The following linear regression model is used to evaluate the
fundamental accounting variables.

$$= + \quad + \quad + \quad + \quad + \quad / \quad + \qquad (1)$$

Where:

$P_{t+0.25}$ = stock price three months after year-end

$BVPS_t$ = book value per share at the end of fiscal year

EPS_t = earnings per share during year t

$CFPS_{it}$ = cash flow per share at time it

DPS_{it} = dividend per share at time t

B/M_{it} = book to market ratio of firm i at time t

μ_t = error term

± = intercept term

The next model is the technical analysis model. This model is technical analysis variables used by technical analysts. The model is similar to that of Bettman (2009) and Waworuntu & Suryanto (2010), model leads a function of lagged prices and return performance. The technical analysis model is designed as follows:

. = + . + + + (2)

Where:

$P_{t\ 0.25}$ = lagged price of the firm i prior to time t

$D_{t\ up}$ = dummy variable equal to 1 if the firm i in the 6 month return period commencing 1 year before the $i_{t+0.25}$ is extremely positive and placed in the highest performance decile, equal to 0 otherwise

$D_{t\ down}$ = dummy variable equal to 1 if the firm i in the 6 month return period commencing 1 year before the $i_{t+0.25}$ is extremely negative and placed in the lowest performance decile, equal to 0 otherwise

μ_t = error term

¸ = intercept term

The third model is the hybrid model that combines both the fundamental and technical analysis variables. This model is an integrated model (1) and model. The model is presented as follows:

. = + + + + + / + . +
+ + (3)

The coefficient of determination (adjusted R^2) is the goodness statistic employed this study to measure the ability of the model in explaining s movement. The student is used to determine the value of each of t explanatory variables in the models.

3.4 Specification of the explanatory variables

The International Accounting Standard (IFAS) Framework states that the objective of financial statements is to provide information about the fina changes in financial position of an enterprise that is useful making economic decisions. Within the financial statements there are components that a financial analyst could explore in order to arr the financial prospects of a particular firm. The financial analyst is thus determine which accounting variables are relevant in the equity. In thi study, five fundamental accounting variables are identified that are most value explaining market prices based on empirical, dividends per share, cash per share, book value per share, earnings share and book market ratio. The follow section states how each of the variables specified in the model study and also highlights how these variables have been tested in the existing literature.

3.4.1 Dividends per share variable

The importance of dividends as one of the explanatory variables is the information content of dividends hypothesis introduced by Modigliani and Lintner (1961). The hypothesis states that managers us dividend announcements to signal their belief, as both of the pro possess privileged information. The hypothesis further supported by Graham (1934) who stated that investors scrutinize companies divid management s thinking about the durability of the value of the cash flow

The results of a study conducted by BJSE listed companies p support for the information content of dividends. The study was condu data from the period 1970 to 1988.

Given the strong support for the information content of dividends, we therefore expect that:

> H_1: The firm s dividend per share positively and signific
> share price.

The dividend per share is calculated as the sum of the interi
dividend by the outstanding number of shares in a given year. Any other forms of divide
cash dividends are not considered in this study.

3.4.2 Cash flow per share variable

The inclusion of the cash flow per share variable is supported by previous studies t
found that cash flows are correlated with stock prices, (see
Kwon 2009 and 1993). We thus posit that:

> H_2: The firm s cash flow per share positively and signifi
> share price.

The cash flow per share is calculated as the cash flow
operating cash flow divided by the outstanding number of shares in a given year. For companies that do not state
flows from operations explicitly in the financial statements,
estimated as the sum of depreciation and amortization.

3.4.3 Earnings per share variable

In maintaining consistency with previous studies, core earnings
(1997), core earnings are used in this study. Core earnings
represent earnings that are generated
principal business activities and excludes gains or losses from nonrecurr

The primary reason for using core earnings which take of the ac
nonrecurring items is to account the existing
items from the existing suggests that
nonrecurring activities can adversely affect the value relevan
Elliot & Hanna 1996 and Elliot and Hanna (1996) examined th
Elliot and Hanna (1995) examined the
content of earnings in the presence of large nonrecurring c
gs. They
demonstrate that the investment community places less weig
that earnings response coefficients generally decrease in
nonrecurring items. Elliott and Hanna (1996) also noted an increasing fr

items are being reported across time. Taking into account a
items should be excluded from the analysis in order to the
information content derived from the earnings variable.

As this study pools together both profitable and loss making
in order to estimate the information content of earnings, thi
the estimated earnings response coefficient. A study conduct
firms reporting negative earnings have lower earnings respo
firms. Hayn (1995) also states that the reporting of negative
very frequent.

With regards to the earnings per share variable, we are i
following hypothesis:

> H_3: The firm s earnings per share positively and signific
> share price.

The earnings per share variable is calculated as the core earnings o
the income statement divided by the total number of shares o

3.4.4 Book value per share variable

A vast amount of literature has determined the relative value releva
between book values and earnings (Beaver 1996 and
Collins 1997). The studies appear to unanimously conclude th
important in explaining market prices than earnings are negative
nonrecurring items, we expect that:

> H_4: The firm s book value per share positively and signif
> share price.

The book value per share variable is defined as the value of
minus liabilities) as the financial year end balance sheet fi
shares outstanding in year t.

3.4.5 Book-to-market variable

The question of whether the book-to-market ratio can be a value relevan
explaining market prices that has attracted a lot of academ

researchers (see Rabinovitch 1985, Chan 1992, Fama & French 1992 and 1980). A study conducted by Fama and French (1992) based firms with higher-market ratios have higher returns than firms w market ratios. Based on the framework developed by Fama and Fre Sinclaire (2006) applied the framework to the South African were consistent with Fama and French (1992). We therefore expect that:

> H_6: The firm-to-market ratio positively and significantly in share price.

The book-to-market ratio is defined as the ratio of book value of the balance sheet figures at the financial year end divided by the market val (market capitalisation of the firm).

3.4.6 Momentum/contrarian dummy variables

Following Bettman (2009) methodology, the shares are according to past re performance in the six month period preceding exactly one before the measurement of $P_{it+0.25}$ and then assigned to performance deciles. performing shares (in the) are allocated D_{up} (D_{down}) dummy equal to 1. Shares in the remaining deciles are assigned a value equal to 0.

When the momentum effect (D_{up} (D_{down}) present, expected to be sign positive (negative) when performance is measured over the s the contrarian effect is present, then expected to be significan (positive) in the technical analysis model used by Jegadeesh an Titman (1993), Bettman (2009) and by Wawortunto (2010) Suryan

Given the vast amount of literature that supports the exi contrarian effects on various markets[5] including the JSE, we expect that:

> H_6: Either firms that outperformed (underperformed) in the past continue to outperform (underperform) in future in the presence of the momentum firms that outperformed (underperformed) in the past now underperform (outperform) in future in the presence of the contrarian e

[5] See Jegadeesh and Titman (1993), Rouwenhorst (1998), Liu et al (1999), and Way (1992) etc.

3.4.7 Lagged/Historical price variable

The dependent variable ($P_{t+0.25}$) is defined as the price three months after end. This ensures that the market has had sufficient time to dissect an and that the new information has been fully incorporated int ahead as therefore circumvented, and where the data used in the s available but not yet known by investors. This approach is consistent with th used by Collins (1997).

With regards to the lagged price variable, we are interested in the following hypothesis:

> H_7: The firm s lagged price positively and significantly price movements.

The lagged price variable is defined as the firm s lagged price to 6 months prior to $P_{t+0.25}$. This approach is consistent with previous studies such as Waworuntu & Suryanto (2010).

3.5 Panel Data Approach

In order to determine the most appropriate form of each m whether we should use a model with a pooled-switching cross and/or period effects. Whilst employing a pooled data approach is relative to the panel data approach, this approach does no sectional relationships as might be the data sample and also ignore of time when estimating the models (Baltagi, 2005).

Furthermore, employing a panel data approach instead of a further advantages to the estimation process (2008). Firstly, by Bo range of issues can be addressed and tackled with panel da pure time series or pure cross-sectional data approach. Secondly, by com sectional and time series data, one can increase the number of degrees of freed thus the power of the test. One can therefore test the dynam of variables at the same time. Employing the panel data ap problems associated with multicollinearity, which may arise if time series individually.

For each model, we conduct the redundant fixed effects t
ascertain the most appropriate form of each model. We use t
to determine whether cross-sectional and/or period effects are suppor
sample instead of simply using a pooled data sample.

The redundant fixed effects test is conducted by imposing restrictions
determine whether these restrictions are supported by the data. Three of restrictions
are imposed. Cross-section effects are restricted to zero; Period fixe
to zero and finally, both cross-section fixed effects and period fixed effec
zero. For each restriction, Fed, Chi-Square test statistics and values
are calculated.

Provided that cross-sectional and/or period effects are supported by
Hausman to determine whether fixed effects or random effects

Brooks (2008) sheds some light on the difference between r
random effects. For simplicity, consider a model with only cross-sectional fixed effects (
no period effects) versus a model with only cross-sectional random effects. Brooks (20
clarifies the difference as follows: both models will allow the
firm, however, the difference with the random effects model
cross-sectional firm is assumed to arise from a common intercept (which is the
cross-sectional firms and over time) plus a random term whic
deviation of each firm s intercept from the common intercept
the common intercept and a zero mean, are independent
observation error terms, have constant variance and are inc
variables. A fixed effects model on the other hand, captures
introducing dummy variable for each firm s intercept.

3.6 Data Characteristics

In order to apply concerns about the possibility of the price variab
containing a unit root, we employ the testing procedure of Sh
(2003) Pesaran, and Shi, or IPS, which extends the renowned Dickey-Fuller stationarity test
accommodate panel data. The data use the IPS testing procedure was

empirical studies that have found the procedure to be superior to a whole
techniques in modeling relationships (Hoang and McNown, 2006).

The IPS Procedure accommodates panel data by averaging the
statistics across-sectional units.

The IPS begins by first testing the null hypothesis of unit
cross-sectional units based on the following data generating pro

$$Dy_{it} = a_i + b_i y_{i,t-1} + \sum_{j=1}^{p_i} r_{ij} Dy_{i,t-j} + e_{it}, \quad t = 1, 2, \&. T \qquad (4)$$

The null hypothesis of unit roots is then defined as:

$H_0: \sigma_i^2 = 0$ for all i

The alternative hypothesis is defined as:

$H_A: \sigma_i^2 < 0$ for $I = 1, \&, N_1$; $\sigma_i = 0$ for $i = N_1 + 1, \&, N$

The alternative hypothesis assumes that the fraction of indiv
is non-zero, $\lim_{N \to \infty} (N_1/N) = \delta$, $0 < \delta < 1$. In other words, the alternative hypo
some cross-sectional units to have unit roots, but not all.

After estimating model (4) for each of the N cross-sectional units, an average o
statistics from equation (4) is computed as follows:

$$= -\sum \qquad (5)$$

Im, Pesaran, and Shin (2003) show that when the average statistic is standardise
follows a standard normal distribution as T and N approach
Limit Theorem.

3.7 Chapter Summary

The purpose of this chapter is to present the work with which the joint
relevance of both fundamental and technical variables can b
that consider the two types of variables in isolation.

The chapter will begin with a brief introduction of the chapter. In the next section, the research design for the study is discussed. This section presented the regression models for the fundamental analysis, technical an

In the third section, the definition and measurement of each variable was provided as well as their a summary of the existing literature to justify the inclusion in this study. Section four discusses the data sources used, sample and the criteria used to select the data. The panel approach used to analyse the data is discussed in section four.

Chapter PRESENTATION AND ANALYSIS OF RESULTS

4.1 Introduction

Initially we first present descriptive statistics and the correlation coefficients calculated from the data sample. We then show that the independent price variable in the methodology developed by Pedsaya (2003) and is suitable for linear regression model.

We then present the estimation results for the fundamental, technical analysis model and the hybrid combined fundamental analysis analysis explanatory variables. We conclude the chapter by comparing the statistics of the fitted models to determine which explanatory of stock prices-for the JSE.

4.2 Descriptive Statistics and Correlation Coefficients

The final-sectional sample comprises of 2,547,204 observations that the data sample used in this study is extensive and the stock prices of the stocks included in the study range from 2004 to 2012 over the period from 2002 to 2012.

Table 4.1 also shows that stocks used in this study are also consistent with the data selection criteria for the study.

Table 4.1 Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
$P_{t+0.25}$	34.485	8.9500	2480.0	0.0057	92.565	11.987	237.50
$P_{t-0.25}$	32.843	8.5000	2299.0	0.0048	87.473	11.700	227.48
$BVPS_t$	14.270	5.2435	940.96	0.0002	35.463	14.058	294.64
$CFPS_t$	3.3242	0.8614	381.26	-30.567	10.654	18.692	604.65
EPS_t	2.4030	0.7273	270.30	-22.450	7.7498	19.092	576.90
DPS_t	0.9745	0.2100	57.200	0.0000	2.7689	10.810	166.64
B/M_t	0.9014	0.6260	34.602	0.0003	1.4968	13.365	251.02

The notation used in the above table is as follows: $P_{t+0.25}$ refers to the price of the stock three months after the fiscal year end. $P_{t-0.25}$ refers to the price of the stock three months before the fiscal year end. $BVPS_t$ refers to the book value of the fiscal year end. $CFPS_t$ refers to the cash flow per share at fiscal year end. EPS_t refers to the earnings per share at fiscal year end. DPS_t refers to the sum of th

interim and final dividends declared during the book value divide
market price at-end fiscal year

A relatively high correlation coefficient (0.82946) between EPS
4.2 below, which could indicate near multicollinearity. However,
from the literature review for the inclusion of both these var
variable bias, none of the variables were dropped from the m
given that the presence of near multicollinearity does not a
the ordinary least squares (OLS) estimators (i.e. unbiased, consistent, ef
presence of multicollinearity significantly affect the model as long as the r
adequate.

Table 4.2 Correlation Matrix

	R_{t+3}	R_{t-3}	$BVPS_t$	$CFPS_t$	EPS_t	DPS_t	B/M_t
R_{t+3}	1.0000						
R_{t-3}	0.9841	1.0000					
	(0.00*0						
BVP_t	0.8180	0.8364	1.0000				
	(0.000	(0.000					
CFP_t	0.7484	0.7511	0.7394	1.0000			
	(0.000	(0.000	(0.000				
EPS_t	0.7492	0.7466	0.7697	0.8294	1.0000		
	(0.000	(0.000	(0.000	(0.000			
DPS_t	0.5477	0.5397	0.4571	0.5343	0.5451	1.0000	
	(0.000	(0.000	(0.000	(0.000	(0.000		
B/M_t	-0.1089	-0.1080	-0.0351	-0.0819	-0.0860	-0.0986	1.0000
	(0.000	(0.000	(0.068	(0.000	(0.000	(0.000	

* Values in brackets below the correlation coefficients represent p

** = insignificant at the 5% significance level

Table 4.2 above presents the correlation coefficients calculated from
analysis. The notation used is as follows: $R_{t+0.25}$ refers to the stock price three months
year and $R_{t-0.25}$ refers to the stock price three months before the fiscal

the book value per share at fiscal year end t. CFPS refers to the earnings per-share at fiscal year end t. DPS refers to the sum of the inter final dividends declared during fiscal year t. BM refers to the book value divided by the at fiscal year end t.

4.3 Diagnostic Test

Table 4.3 presents the results of the unit root test for the price variable usi IPS methodology. The null hypothesis is that the price varia stationary and contrarious to, the alternative hypothesis is that series is stationary. Given a value of the test (0.0247) is less than 0 reject the null hypothesis of a unit root at the 5% of significa alternative hypo. We therefore conclude that the price variabl

Table 4.3 Panel Unit Root Test, Pesaran (IPS) Shin

Method	Statis	Prob
Im, Pesaran and Shin	-1.964	0.024

4.4 Fundamental Analysis Model

The primary focus of this paper is to determine whether fundamental and technical analysis factors can have a high prices compared to models that consider each of the factors. Prior to conducting this analysis, we examine how well each model can explain stock prices in explaining.

In order to determine whether time/period fixed effects are su the data instead of simply employing a pooled sample, a re conducted.

4.4.1 Redundant Fixed Effects Test

Table 4.4 below presents the results of the redundant fixed effec analysis model.

Table 4.4 Redundant fixed effects test for the fundamental analysis model

Effects Test	Statistic	d.f.	Prob

Cross-section F	7.84182	(465,22	0.000
Cross-section Chi-square	2626.396	465	0.000
Period F	9.35374	(10,222	0.000
Period Chi-square	111.4084	10	0.000
Cross-section/Period F	7.76200	(475,22	0.000
Cross-section/Period Chi-square	2645.010	475	0.000

The values for all three restrictions for both Chi-square and Chi-square equal to zero to decimal places. This implies that restrictions of the cross-section and period effects are not supported by the data. This then implies that a cross-section model in effects and period fixed are more appropriate than a pooled sample.

Given that the appropriate model is an intercept that varies over time and a varying for each firm in the data sample, we also determine phenomenon can best be captured by a model with random effects.

4.4.2 Hausman Test

One of the requirements of a valid random effects framework component of the model should be independent of the explanatory (Brooks, 2008). This independence assumption is tested using Hausman's test.

The null hypothesis of the test is that the uncorrelated effects that explanatory variables and thus the random effects model is the fundamental analysis model. Chi-square distribution with 5 degrees The results of the Hausman test are presented below.

Table 4.5 Hausman's test for the fundamental analysis model

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	95.781306	5	0.000

The value of Hausman's test is equal to zero to four decimal model with random effects is rejected and that fixed effects a

The redundant fixed effects tests and Hausman test conducted for the f analysis model have shown that the appropriate fundamental analysis is one where the intercept varies for each firm in the data over time and stal utilising a pooled walk, a model with fixed effect than random effects should be preferred.

4.4.3 Estimation results for the fundamental analysis model

A model that satisfies the above-mentioned criterion is estimated. The below model is estimated with both sectional fixed effects and period fixed e

Table 4.6 Estimation results for the fundamental analysis model

= + + + + + / + ¼ + + (1)

Variable	Coefficie	Std. Error	t-Statisti	Prob.
Intercept	13.99673	1.312273	10.6660	0.000
BVPS	0.818468	0.075271	10.8735	0.000
CFPS	1.460429	0.137543	10.6180	0.000
EPS	1.376841	0.182309	7.55222	0.000
DPS	1.539106	0.365862	4.20679	0.000
B/M	-0.878452	0.817134	-1.07504	0.282
Adjusted squar	0.876674	Mean depend		34.482
S.E. of reg	32.48381	S.D. depend		92.499
Sum square	2350982.	Akaike info c		9.9589
Log likelih	-13008.46	Schwarz cri		11.007
F-statistic	41.10438	Hann-Quinn c		10.338
Prob(F-statist	0.000000	Durbin-Watson		1.6223

The notation used in this table refers to the stock price of firm i th after the fiscal year. BVPS refers to the book value per share of firm at fiscal yea cash flow per share at fiscal year. CFPS refers to the earnings per share at fiscal refers to the sum of the interim and final dividends declared duri book value divided by the market price at fiscal year. B/M refers to the sectional effects but does not vary in time. Intercept that is consta sectionally a remainder disturbance term.

The estimation results show that price is indeed highly dependent on th
share and earnings per share. This is in line (1995) Ohlson's Clean surplus
relation. Explanations that have been put forward for the positi
stock prices and book value per share and earnings per sha
share represents the liquidation value of the company, and earnings per share s
a proxy for the current value (see e.g. Bettman, 2009). These results are
consistent with Collins (1997) who found the value of book values
earnings per share to be increasing over time. These estimated results are supp
hypothesis 3 and hypothesis 4, as the earnings per share and the book
variables are significant and positively related to market prices.

The results in Table 4.6 also consistent with Gordon and Shapiro (19
the early pioneers of equity valuation with the finding of this p
had also found a significant relationship between dividends and mar
relationship that laid the revolutionary Dividend Discount Model. This
finding therefore, supports hypothesis 1 with regards to the importance of di
share in explaining stock price movements.

However, the results in Table 4.6 at odds with Chan (1993) regarding the
importance of book-market ratios in equity valuations. This study
market ratio to be an insignificant explanation of market, implying that we reje
hypothesis 5. This result is at odds with Auret and Sinclaire (2006
market ratio effect to be significant in the JSE Chan at the peri
(1993) had also found book-market ratios to be the most significant va
and economically in the Japanese market. The results in this paper
Fama and French (1992) finding. Fama and French (1992) found a positi
between book-market ratios and stocks.

The results in Table 4.6 consistent with hypothesis 2, which tested that the c
flow per share positively and significantly influence stock price movements
result is consistent with Cheng et al (1997) and Kwon (200
Korean stock markets, respectively.

Table 4.6 Also presents the goodness of fit statistics on the fundamental analy modeling only statistically significant. The joint-validity of the null hypothesis that all the coefficients of the explanatory variables ($\alpha_1^2 = \alpha_2^2 = \alpha_3^2 = \alpha_4^2 = \alpha_5^2 = \alpha_6^2 = 0$) is equal to zero to six decimal places. The adjusted R^2 of the model is 8 percent.

4.5 Technical Analysis Model

In a similar approach to the above section on the fundame perform the redundant fixed effects test to determine whethe should be completely stated should vary with time cross-sections in the data sample. Lastly, we will perform Hausman s test to random effects would be suitable.

4.5.1 Redundant Fixed Effects Test

Table 4.7 below shows that the restriction of the cross-section effects is well supported by the data. The null hypothesis which states that equal to zero is not to the Chi-square test and by the Fimplies th the intercept of the model will not be to vary with the firm data sample.

Since the cross-section effects are insignificant, it also suggests that a combination o cross-section and period effects will also be insignificant.

Table 4.7 Redundant fixed effects test for the technical analysis

Effects Test	Statist	d.f.	Prob
Cross-section F	0.4596	(466,23	1.00
Cross-section Chi-square	246.718	466	1.00
Period F	11.0163	(10,235	0.00
Period Chi-square	129.576	10	0.00
Cross-section/Period F	0.6849	(476,23	1.00
Cross-section/Period Chi-square	367.506	476	0.99

However, the period effects are highly significant to Four de
test and the Chi-Square Test. means that the intercept of the techni
will only be allowed to vary over time and will remain fixed
data sample.

4.5.2 Hausman Test

The results of Hausman's test are Table 4.8. The null hypothesis tha
appropriate model is one with random effects-value of the
test (0.8177) exceeds the 5% significance level by far.

Table 4.8 Hausman's test for the technical analys

Test Summa	Chi-Sq. Statis	Chi-Sq. d.	Prob
Period rand	0.931922	3	0.817

The results of Hausman s test suggest that an appropriate t
should contain random effects rather than fixed effects.

The redundant fixed effects test suggested that an appropriat
one with only period effects (i.e. intercept will vary over tim
cross-sectional Taking into consideration the results of the re
test and Hausman s test, the appropriate technical analysis
random effects. The estimation results of this model are pres

4.5.3 Estimation results for the technical analysis model

Table 4.9 presents the estimation results for the technical analys

Table 4.9 Estimation results of the technical analysis model

. = + . + + + + (2)

Variable	Coeffic	Std. Error	t-Statis	Prob
Intercept	0.5284	1.189146	0.4443	0.65
P .	1.0384	0.003205	324.01	0.00
D_{UP}	-1.172	0.985321	-1.1902	0.23
D_{DOWN}	-0.334	0.990253	-0.3373	0.73

Adjusted R-squared	0.9738	Mean depend	8.846
S.E. of regressio	15.744	S.D. depend	97.41
F-statistic	35264	Sum square	7027
Prob(F-statistic)	0.0000	Durbin-Watson	2.105

The notation used in the above table is as follows: $P_{it+0.25}$ refers to the stock price of firm months after the fiscal year-end $P_{it+0.25}$ refers to the stock price of firm i three m fiscal-year D_{up} is a dummy variable equal to 1 if the holding period month period commencing 1 year before this measurement is extremely positive and p in the highest performance decile, D_{down} is a dummy variable equal to 0 otherwise. holding period return of firm i in the 6 month period commencing 1 year before the measurem $P_{it+0.25}$ is extremely negative and placed in the lowest performance de term that varies over time but is constant across the random each cross-sectional firm s intercept from the global intercept term. g_{it} is the individual observa error term.

Testing results Table 4.9 show that lagged price is the most significa prices in the model. This result supports hypothesis regards to the importance lagged price in explaining future price movements. The significance of the lagged variable in accordance with studies conducted by Lo and Mack (2009) and Waworuntu and Suryanto (2010). The implication of this result is tha able to produce reasonably accurate forecasts of future sto prices. This result, thus, contradicts the random walk hypothesis which states price changes independent of each other (Dupernex, 2007).

Notably, both dummy variables representing extreme return significant. This result suggests that the extreme return performa the prior 6 month holding period continues to show a persistence in re performance into the next 6 months. We therefore reject the significant result for investors JSE equities market. This is because inves were winners in prior periods or sell losers from previous periods cannot exp outperform the market with those strategies. The insignificance of the dum means that there is also no evidence of a contrarian, we've important to note that this result alone does not mean that th

The lack of momentum/contrarian effect found in this study is in contrast with a num
of studies that have been conducted on momentum and contrarian
markets including the JSE.

Jegadeesh and Titman (1993), Rouwenhorst (1998) found the
momentum effect to be present in the US, European and UK s

Some the previous studies on the contrarian effect contrasts incl
Bondt and Thaler (1985) who found that a portfolio of the past
year period outperformed the prior winners over the ensuing
US stock Assubsetqu study by Pavgay (1992) using the same me
concluded that the effect existed on the JSE equities market o
1974 to 1984.

One possible explanation for the lack of momentum/contrarian effects
opposed to earlier studies can be partly attributed to a study conducted by
Mabhunu (2004). Mabhunu (2004) found the efficiency of the
the period from 1999 to 2003, particularly with regards to
contributing factors to the improved efficiency introductions of the SE
Exchange News Service) and STRATE (Share Transactions T
JSE.

The technical analysis model has a adjusted R squared of 97.39 percent, which
that the model fits the data fairly well.

4.6 Integration of the fundamental and technical analysis m (Hybrid model)

In this section we present results for the model that integrates both
and fundamental analysis factors. In order to establish the a
employ, we use the redundant fixed effects test and Hausman s
the preceding sections.

4.6.1 Redundant Fixed Effects Test

The results of the hybrid model are shown in Table 4.1 below.

Table 4.70 Redundant fixed effects test for the Hybrid model

Effects Test	Statist	d.f.	Prob
Cross-section F	0.3154	(446,21)	1.00
Cross-section Chi-square	165.639	446	1.00
Period F	11.1888	(10,216)	0.00
Period Chi-square	132.552	10	0.00
Cross-Section/Period F	0.5591	(456,21)	1.00
Cross-Section/Period Chi-square	292.868	456	1.00

The cross-sectional effects are highly insignificant under both th test. The combination of cross-sectional period effects is significant. The r suggest that the appropriate form of the hybrid model is one

4.6.2 Hausman Test

Hausman s test helps us determine whether we should use r in the model. The results of Hausman s test for the hybrid mo below.

Table 4.81 Hausman's test for the hybrid model

Test Sumr	Chi-Sq. Stati	Chi-Sq. d	Prob.
Period rar	16.317575	8	0.0381

The results of Hausman s test in Table 4.81 show that the period random effec significant at the 5% significance level. This implies that th model is one with only period fixed effects. This model is est

4.6.3 Estimation results for the hybrid model

The estimation results for the hybrid model are shown in Table 4.81 below.

Table 4.2 Estimation results for the hybrid model

$$= + + + + + / + + + + \quad (3)$$

Variable	Coeffic	Std. Error	t-Statis	Prob
Intercept	0.3312	0.419674	0.7893	0.430
$BVPS_t$	-0.1020	0.017583	-5.8039	0.000
$CFPS_t$	-0.0117	0.056012	-0.2093	0.834
EPS_t	0.4918	0.080049	6.1444	0.000
DPS_t	0.5815	0.138604	4.1959	0.000
B/M_t	0.0509	0.215184	0.2366	0.813
$P_{it+0.25}$	1.0355	0.007152	144.79	0.000
D_{UP}	-1.3057	1.036009	-1.2604	0.207
D_{DOWN}	0.1036	1.087076	0.0953	0.924
Adjusted squared	0.9710	Mean depend		34.91
S.E. of regress	15.905	S.D. depend		93.45
Sum squared re	659765	Akaike info		8.378
Log likelihood	-10986.	Schwarz cri		8.420
F-statistic	4891.8	Hannan-Quinn c		8.393
Prob(F-statistic)	0.0000	Durbin-Watson		2.309

The notation used in this table refers to the stock price of firm i th
after the fiscal year-end. $BVPS_t$ refers to the book value per share at fiscal yea
cash flow per share at fiscal year-end. EPS_t refers to the earnings per share at fiscal
refers to the sum of the interim and final dividends declared during
book value divided by the market price at fiscal year-end. $P_{it+0.25}$ refers to the stock price of
three months before the fiscal year-end. D_{UP} is a dummy variable equal to 1 if the h
return of firm i in the 6 month period commencing 1 year before
extremely positive and placed in the highest performance decile, D_{DOWN} is a
dummy variable equal to 1 if the holding period return of firm i in the
year before the measurement of $P_{it+0.25}$ is extremely negative and placed in the low
decile, equal to 0 otherwise that variables are constant cross-sectionally and
measures the random deviation of each cross-section intercept from the glo
term v_{it} is the individual observation error term.

In the presence of technical analysis, cash flow per now become an insignificant explanator of prices. This refinding, from M technical analysis factors were not included. The presence therefore diminishes the importance of cash flow per share as an explanator of st

In accordance with finding, the book-market ratio still rema insignificant.

The presence of fundamental analysis variables does not app level of significance of the technical analysis variables. The lagge significant whilst the momentum/contrarian effects dummy va

The hybrid model is significant and the explanatory variables explain t stock well as shown by the statistically valued of 97.10 percen 4.12)

4.7 Comparison of the models

The previous sections of this chapter have solely focused on the ability of explaining stock prices in isolation. We now examine whet complementary with technical analysis. We achieve this by statistics of the individual in particular the adjusted R-squared statistic.

The technical analysis model has a figure of 97.39 percent fundamental analysis model-squared of 89.85 percent (Table 4.13). This important result indicates that technical analysis is better suited in explaining st than fundamental analysis when constructing JSE adjusted R squared value for technical analysis in line with findings from similar stud Bettman (2009) and Waworuntu and Suryanto (2010) in the U markets, respectively.

Table 4.13 below further shows that the hybrid model has a higher explan the fundamental analysis model as shown by the adjusted R-squared value hi (i.e. 97.10 percent vs. 89.85 percent). This result suggests that by integr analysis factors into a fundamental analysis model, one c explanatory power of a security valuation model.

However, the adjusted R of the technical analysis model is hig
hybrid model. This result implies that by integrating fundam
technical analysis models not necessarily produce a superior
analysis model is therefore superior The technical mo
fundamental analysis factors does not enhance the explanat
only serve to reduce it. This finding is at odds with previous Bettman (2009)
and Waworuntu and Suryanto (2010), who found the hybrid
explanatory power than both the fundamental analysis and te

Table 4.3 Comparison of the models

. = + + + + + / + ¼ + + (1)

P . = ± + ² P . + ² D + ² D + µ + v (2)

. = + + + + + / + . + +
+ + (3)

Variable	Fundamental Ana (1)	Technical Anal (2)	Hybrid Mo (3)
Intercep	13.99673	0.528445***	0.331260*
BVPS	0.818468		-0.102050
CFPS	1.460429		-0.011726*
EPS	1.376841		0.491855
DPS	1.539106		0.581583
B/M	-0.878452***		0.050921*
$P_{t-0.25}$		1.038498	1.035580
D_{UP}		-1.172772**	-1.305792*
D_{DOWN}		-0.334109**	0.103616*
Adjusted R-squa	0.876674	0.973874	0.971035
S.E. of reg	32.48381	15.74416	15.90527
F-statisti	41.10438	35264.60	4891.839
Prob(F-statist	0.000000	0.000000	0.000000

*** = Insignificant coefficient

The notation used in this Table refers as follows: $P_{t+0.25}$ is the stock price of firm i three months after the fiscal year end. $BVPS_t$ refers to the book value per-share of firm i at fiscal year end t. $CFPS_t$ refers to the cash flow per share and EPS_t refers to the earnings per-share at fiscal year end t. DPS_t refers to the sum of the interim and final dividends declared during fiscal year end t. B/M_t refers to the book value divided by the market price of firm i at fiscal year end t. $P_{t+0.25}$ refers to the stock price of firm i three months after the fiscal year end. $Dum_{i,t+0.25}$ is a dummy variable equal to 1 if the holding period return of firm i in the 6 month period commencing 1 year before the measurement of $P_{t+0.25}$ is extremely positive and placed in the highest performing decile, Dum_{Growth} is a dummy variable equal to 1 if the holding period return of firm i in the year before the measurement of $P_{t+0.25}$ is extremely negative and placed in the lowest performing decile, equal to 0 otherwise.

4.8 Chapter Summary

A number of notable results have been demonstrated throughout the analysis. A brief overview of the main findings are summarised below.

One, we demonstrated the fundamental analysis variables that play a role in explaining stock price movements on the JSE. The following: book value per share, cash flow per share, earnings per share and dividends.

Two, we found no evidence of a momentum/contrarian effect. That is, stocks that outperform (underperform) in one period do not continue to outperform (underperform) in subsequent periods.

Three, we found the technical analysis model to possess a higher explanatory power than its fundamental analysis counterpart. This result indicates that technical analysis is better suited to explaining the volatility in JSE listed stocks.

Finally, we found the technical analysis model to be superior to the fundamental analysis model in explaining stock prices. This dismisses the idea that technical analysis could be complementary in nature when considering

Chapter 5: CONCLUSION

5.1 Introduction

Extant literature on equity valuation techniques has not sufficie
of equity valuation techniques that are essential to a succes
of the most important questions in equity valuation that h
whether fundamental analysis and technical analysis are con
different way, this question equity analyst that uses a com
fundamental analysis and technical analysis can achieve hu
analysts that uses only one of the valuation techniques.

Furthermore, each of the valuation techniques has its own g
theoretical foundations or otherwise. Each group of propo
valuation technique is more superior to the other. However, ve
has been conducted to evaluate these assertions, more espe
context.

This paper makes a contribution by key questions. Listed
stocks, for the benefit of market participants. Over and above thi
also consolidates work that has been done on drivers of stoc
the value relevance of several fundamental analysis and technical
variables.

This chapter is organised as follows: Section 5.2 discusses
5.3 concludes the study.

5.2 Discussion

The results indicate that technical analysis and fundamenta
complimentary in nature when considering JSE-listed stocks. The
hybrid model having a lower explanatory power than the te
measured by the adjusted R^2. The technical analysis model a
explanatory power than the fundamental analysis model. This
technical analysis techniques are best suited in-explaining
stocks. The superiority of the technical analysis model relative

model is consistent with Bettman et al (2009) and Waworu
However the lack of evidence in support of the complementar
techniques is in direct contrast to Bettman et al (2009) and Waworuntu and Suryantu
who found the valuation techniques to be complimentary in
markets, respectively.

We also found no evidence of a momentum or contrarian effect on t
stocks that had extreme performances in a previous periods did no
a persistence in extreme returns. An plausible explanation for
finding as suggested by Mabhunu (2004) is that the JSE has
periods that had trading opportunities from market inefficiencies
away. This finding is at odds with Pagel and Ways (1992) who found that the
contrarian effect existed on the JSE over the period from 19
results also contrasts several studies conducted on internatio
either the momentum or contrarian effects (see Jegadeesh an
(1998), Liu et al. (1999) and De Bondt and Thaler (1985)).

With regards to fundamental stock prices, we find book value per share
dividends per share, cash flow per share and lagged prices t
prices. The significance of book values per share and earni
Ohlson (1995) s clean surplus framework, as well as Collins
Waworuntu and Suryantu (2010). Significance of the divid
consistent with the renowned Dividend Discount Model framework
of the cash flow per share is supported by Chan et al (1993)
stock market. The significant ability of the lagged price variable t
consistent with Lo and MacKinlay (1988).

However, we also note that the book-to-market ratio does not play a sign
in explaining price movements of JSE-listed stocks. The presence of integrat
and fundamental analysis variables does not alter this finding
study conducted by Auret and Sinclaire (2006) who found the
significantly related to JSE stock prices.

5.3 Conclusion

The primary goal of this study was to examine whether funda
techniques are complimentary or substitutes. Whilst the two valuatio
techniques can explain share price movements fairly well i
however, show that when considering JSE-listed stocks, the two techniques
complimentary and that technical analysis plays the JSE biggest role in

The empirical results show that technical analysis has a higher ex
fundamental analysis model in isolation and as well as the
valuation technique

The prominence of the technical analysis model thus cha
hypothesis with regards to JSE-listed stocks. Notwithstanding the above
technical analysts should not rely on momentum or contrarian
search for risk-adjusted returns as no evidence of these effects was

Furthermore, in South Africa, the best predictors of stock p
this study to be the book value, earnings, dividends and the

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