

Gordon Institute of Business Science

University of Pretoria

Market timing on the JSE using the South African Volatility Index

Andre de Kock

Student number: 14449324

A research report submitted to the Gordon Institute of Business Science,
University of Pretoria, in partial fulfilment of the requirements for the degree of
Master of Business Administration

9 November 2015

ABSTRACT

Market timing, market volatility and implied volatility have been well documented for equity markets. Implied volatility indices forecast the volatility expectation of stock index returns over the short term. Market timing and market volatility are closely linked and are used to optimise net investment returns. The South African Volatility Index (SAVI) is an index designed to measure the markets expectation of the three month volatility on the JSE.

This study focus on the construction of an optimum market portfolio, taking into account the effects of market timing, market volatility and implied volatility as measured by the SAVI. The effect of transaction costs on a market timing strategy is evaluated. The annual returns of these portfolios are compared to those of a traditional buy and hold strategy for equities and bonds over the same period.

A market timing portfolio is identified that outperforms a buy and hold strategy over the long term. Annualised returns of 24.4% have been achieved. The introduction of transaction costs makes this strategy not cost effective, depending on the level of costs. An investment in equities outperformed an investment in bonds for the period under review.

Keywords: market timing; volatility; investment return; transaction cost; SAVI

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Andre de Kock

Date

CONTENTS

Abstract	ii
Declaration	iii
Contents	iv
List of Tables	viii
List of Figures	ix
List of Abbreviations	x
CHAPTER 1: INTRODUCTION	
1.1. Background	1
1.2. Research Title	2
1.3. Research Problem	2
1.4. Research Objectives	3
1.5. Research Purpose	4
CHAPTER 2: LITERATURE REVIEW	
2.1. Introduction	6
2.2. Market Timing	7
2.2.1. Definition	7
2.2.2. Strategies	8
2.3. Market Volatility and Implied Volatility	11
2.3.1. Market Volatility – Historic	11
2.3.2. Implied Market Volatility	14
2.4. Implied Volatility Indices	15
2.4.1. The VIX	16
2.4.1.1. Market Timing using The Vix	18

2.4.2. The SAVI Top 40	19
2.5. Bonds	21
2.6. Transaction Costs	23
CHAPTER 3: RESEARCH QUESTIONS	
3.1. Research Question 1	25
3.2. Research Question 2	25
3.3. Research Question 3	26
CHAPTER 4: RESEARCH METHODOLOGY	
4.1. Introduction	27
4.2. Research Design	28
4.3. Validity and Reliability	28
4.4. Population	29
4.5. Unit of Analysis	29
4.6. Sampling Method and Size	30
4.7. Research Instrument	31
4.8. Data Collection	31
4.9. Data Processing and Preparation	31
4.10. Data Analysis	32
4.10.1. Interrogation of Index Data	32
4.10.2. Investment return based on the JSE203 – Alsi TRI	33
And JSE – Albi Indices	
4.10.3. Daily moving averages of the SAVI Index	34
4.10.4. Construction of Market Timing Investment Portfolios	35
4.11. Research Limitations	36

CHAPTER 5: RESULTS

5.1.	Data Description	38
5.1.1.	JSE203 – Alsi TRI	39
5.1.2.	JSE – Albi TRI	40
5.1.3.	SAVI Top 40	41
5.1.4.	Data Coding in Excel	42
5.2.	Reliability and Validity of Data	43
5.3.	Equity Return versus Bond Return – Research Question 1	44
5.4.	SAVI Top 40 as Market Timing Tool – Research Question 2	45
5.4.1.	Lump sum investment – Delayed	45
5.4.2.	“Pure” style combined with “Market Timing” style	47
5.5.	Impact of Transaction Costs on Market Timing with the SAVI Top 40 – Research Question 3	47
5.6.	Conclusion	51

CHAPTER 6: DISCUSSION OF RESULTS

6.1.	Introduction	52
6.2.	Equities versus Bonds	52
6.3.	Research Question 1	53
6.4.	Market Timing	53
6.4.1.	Daily moving average Portfolios	54
6.4.1.1.	Delayed Investment	54
6.4.1.2.	“Market Timing” Investment Style	56
6.5.	Volatility and Implied Volatility	58
6.6.	The SAVI	59

6.7.	Research Question 2	59
6.8.	Transaction Costs	60
6.8.1.	Results	60
6.9.	Research Question 3	61
6.10.	Reliability and Validity of the Findings	61
6.11.	Conclusion of Findings	62
CHAPTER 7: CONCLUSION		
7.1.	Introduction	63
7.2.	Principal Findings	63
7.2.1.	Market Timing	64
7.2.2.	Market Volatility	65
7.2.3.	The SAVI	65
7.2.4.	Transaction Costs	65
7.3.	Implications for Investors	66
7.4.	Limitations of the Research	66
7.5.	Suggestions for Future Research	67
REFERENCES		68

LIST OF TABLES

Table 1:	Literature review summary and structure	6
Table 2:	Relationship between changes in volatility and stock returns	18
Table 3:	Threats to the validity and reliability of research findings	29
Table 4:	Excel coding explained	42
Table 5:	Reliability and validity of data	43
Table 6:	Cumulative returns for PBO1 and PEQ2	44
Table 7:	Cumulative returns for “moving average” portfolios using the SAVI Top 40 as market timing tool	46
Table 8:	Portfolio PMTMA3 – Impact of transaction costs	48
Table 9:	Portfolio PMTBO4 – Impact of transaction costs	49
Table 10:	Portfolio PMTEQ5 - Impact of transaction costs	50
Table 11:	Returns and ranking of the MA portfolios (PMTMA3) – Delayed return	55
Table 12:	Returns and ranking of the MA portfolios (PMTBO4) – Investment in Bonds followed by MT investment	57
Table 13:	Returns and ranking of the MA portfolios (PMTEQ5) – Investment in Equities followed by MT investment	58
Table 14:	Validity of research findings	62

LIST OF FIGURES

Figure 1:	JSE Top 40 – 3 month rolling realised volatility – mean reversion	13
Figure 2:	Implied volatility indices for 12 countries	15
Figure 3:	Closing levels of the S&P 500 Index and the VIX during the period Jan 1986 – Oct 2008	17
Figure 4:	FTSE/JSE Top 40 index level and its volatility	20
Figure 5:	The new SAVI, the old SAVI and the FTSE/JSE Top 40 index level	21
Figure 6:	Major asset classes returns on the JSE up to end 2014	22
Figure 7:	US equity market: Equity vs Bond returns	22
Figure 8:	Time series line chart per index	33
Figure 9:	Different daily moving averages of the SAVI Top 40 Index compared to the original index	34
Figure 10:	The JSE203 – Alsi TRI index for the period 28 February 2007 to 11 September 2015	39
Figure 11:	The JSE – Albi index for the period 28 February 2007 to 11 September 2015	40
Figure 12:	The SAVI Top 40 index for the period 28 February 2007 to 11 September 2015	41
Figure 13:	Cumulative monetary return and total percentage return for PBO1 and PEQ2	45
Figure 14:	Cumulative returns for “daily moving average” portfolios using the SAVI Top 40 as market timing tool	46
Figure 15:	Portfolio PMTMA3 – Impact of transaction costs on investment return	48
Figure 16:	Portfolio PMTBO4 – Impact of transaction costs on investment return	49
Figure 17:	Portfolio PMTEQ5 – Impact of transaction costs on investment return	50
Figure 18:	Flow of theory and methodology	64

LIST OF ABBREVIATIONS

CBOE:	Chicago Board Options Exchange
Excel coding:	See Table 4
FTSE/JSE Top 40:	Largest 40 companies ranked by full market value in the FTSE/JSE All-Share Index
JSE:	Johannesburg Stock Exchange
JSE203 – Alsi TRI:	Equity index linked to the FTSE/JSE, including dividends
JSE – Albi:	All bond index on the JSE
SAVI/SAVI Top 40:	South African Volatility Index
VIX:	CBOE Volatility Index

1. INTRODUCTION

1.1. Background

Is it possible to accurately predict when to invest in the stock and bond markets and by switching between these different asset classes to outperform these markets as a whole?

This has been the subject of several studies and research papers over recent years and various techniques, strategies, indices and methods have been developed and proposed by academics, economists as well as investors.

Market timing is a dynamic strategy that attempts to beat the passive buy-and-hold approach by predicting the future direction of the security or commodity markets (Zakamulin, 2014). In the security market, this involves the changing between differing asset classes or equity classes in expectation of future price movements (Ward and Terblanche, 2009).

Different market timing strategies and market timing rules have been proposed by researchers. Ferson (2012) have found that equity portfolios with more dynamic reactions to market **volatility** perform better in the long run. This was confirmed in earlier studies by Busse (1999), indicating the importance of volatility timing in generating higher risk-adjusted returns in mutual funds.

There are various measures of market volatility and recent developments have seen the introduction of numerous **volatility indices** in equity markets across the world. A formal volatility index, the VIX, was created by The Chicago Board Options Exchange (CBOE) in 1993 and was soon followed by similar indices in other markets. In South Africa, the **SAVI** was introduced in 2007 as an index to measure the markets expectation of the three month implied volatility on the JSE. In reviewing existing studies on these indices, López and Navarro (2012) have concluded that volatility indices outperform estimates of future realised volatility based on historical standard deviations, the lagged realised volatility, or the collection of GARCH volatility models.

With market timing forming the basis of this research paper, expected market volatility as measured by the SAVI will be used to evaluate investment returns by switching funds between the South African equity and bond markets.

1.2. Research Title

“Market timing on the JSE using the South African Volatility Index”

Conventional market timing has many definitions and has been researched extensively. The literature review will evaluate, discuss and analyse the historical research on market timing which will be used as starting point and base for this research paper.

Market timing is the strategy, policy or process of forecasting the future trend of a financial portfolio by shifting funds completely between risky and risk-free assets (equity and cash) where holdings in equity will be maximised in bull markets and investment in bonds will be increased in bear markets (see Ward and Terblanche, 2009; Droms, 1989; Zakamulin, 2013; Gao, Li, Cui, and Wang, 2012).

The JSE refers to the Johannesburg Stock Exchange Limited which was founded in 1887 predominantly as a vehicle to raise capital for the mining of gold in the then Transvaal Republic (Firer, Ross, Westerfield and Jordan, 2004). By 2002, the JSE had grown to the 22nd largest stock exchange in the world (Firer and Staunton, 2002). The JSE is still today one of the biggest, if not *the* biggest stock exchange in Africa and provides a platform where securities can be traded freely under a controlled structure.

The South African Volatility Index (SAVI) was launched in 2007 as a forward looking index to measure the markets anticipation of the three month volatility (Kenmoe and Tafou, 2014). The SAVI is based on the FTSE/JSE Top 40 index and is calculated as the weighted average prices of calls and puts over a series of strike prices, expiring in three months' time. It also incorporates a volatility skew which is in essence a crash protection volatility premium. The SAVI Top 40 index will be used as volatility indicator in this research paper.

1.3. Research Problem

An investment portfolio's performance can be attributed to three major components, factor level timing or investment policy, volatility or market timing and security selection (Ferson, 2012). Henriksson and Merton (1981) have developed specific tests that in order to identify and separate the gains of market timing skills from the gains of micro stock-selection skills.

Investment policy involves the allocation of the investment to an asset class, such as equities, fixed income, gold, cash, property, etc. For example, a financial advisor is

creating an investment plan for a graduate entering the job market for the first time and recommends a 100% equity exposure for the first 15 years. The key features of an investment policy are its long-term focus and the fact that it changes allocations occasionally and very modestly, when it does. Research done by Bikker, Broeders and De Dreu (2010) on pension fund investment policy has indicated that strategic asset allocation is typically set on a three- to five year horizon.

The second main factor in portfolio performance is market timing which is closely linked to market volatility. Any deviation from the original investment policy would be as a result of acting on market timing signals. The original investment policy proposed a 100% investment in stocks. After some time, market perception indicated that stocks are extremely over-valued and as a result you decide to be only 50% invested in equities. Che, Norli and Priestly (2012) have found that individual investors with timing ability skills outperform investors who have no timing ability.

The last major determinant of performance is security selection. How well do particular securities perform in terms of each other and in terms of their asset classes? At a certain point in time gold stocks might outperform for example banking stocks or high capitalisation value stocks might do better than small capitalisation value stocks. The resultant return would be attributed to security selection. The ability to identify securities within each asset class that will outperform others in the same asset class has been defined by Jagannathan and Korajczyk (2014) as security selection.

The objective of any investor or fund manager is to outperform the market over a certain period of time in order to create income as well as investment growth. This research paper will investigate the impact of market timing, the switching between asset classes and market volatility as anticipated by the SAVI, on investment returns.

Current academic literature and research related to the SAVI is limited due to the fact that the index was only launched in 2007. This study will expand on prior research related to the SAVI and will evaluate the impact of this index on investment decisions and the timing thereof.

1.4. Research Objectives

The fundamental question that this research paper aims to answer is, *“Can the SAVI be used as a market timing tool to optimise investment returns by switching between the equity and bond markets in times of market volatility?”*

To achieve this, the study is broken down into more specific objectives. The first objective is to understand the concept of market timing and its impact on investment decisions and outcomes. This forms the basis of the study and is achieved by doing a thorough literature review on market timing theory, market timing strategy and market timing performance.

The second objective is to understand market volatility with specific focus on implied market volatility as measured by the SAVI. In order to understand the SAVI, a thorough understanding of the theory and workings of other volatility indices are necessary, with specific focus on the VIX. The drivers of market volatility and implied volatility, including the methodology and mathematics behind its formulation, are investigated.

Market timing and implied market volatility as measured by the SAVI, is used in conjunction in order to achieve the final research objective: optimising of investor returns by switching between the equity and bond markets. Historical returns on the South African bond and equity markets are compared to returns that would have been generated as and when certain triggers indicated a switch between these two asset classes.

1.5. Research Purpose

Historical research on the SAVI is limited mainly due to the fact that the SAVI has been in existence for eight and a half years only, since its introduction in February/March 2007.

The knowledge gained from this research is expected to benefit the wider business community, especially fund managers, private investors and businesses that operate in the South African equity and bond markets. Market timing is key in the optimisation of investment returns and the SAVI can be an invaluable tool in predicting turning points in the market, thus signalling when and where to invest. An investment style incorporating the SAVI as market timing indicator can be derived.

Private investors are in most instances unaware of the impact that high transaction costs can have on their investments. Careful control and understanding of transaction costs can be an effective way for active investors to improve their performance. In this research paper, the evaluation of different levels of transaction costs and the ranking of the different portfolios versus some benchmarks will assist investors in their decision making.

The theoretical purpose of this research paper is twofold: It will create a framework for observing and understanding the SAVI as market timing indicator and secondly explains and predicts the relationship between variables. It is envisaged that this research paper will form the foundation of future research relating to the SAVI and build on the limited research available on this topic.

2. LITERATURE REVIEW

2.1. Introduction

The main objective of this section is to perform a detailed review of the theory on the subject where after the theory will be broken down into the key themes of the study. The first section explores the concept of market timing which forms the basis of this research. This is followed by a discussion on market volatility and implied market volatility as measured by volatility indices on international stock markets. The South African Volatility Index, the SAVI, is discussed in more detail as this index will be evaluated as a market timing indicator. This chapter is concluded by evaluating the key input criteria, the impacting factors as well as the potential theoretical and business contribution of the research.

A summary of the literature reviewed and the structure and flow of the theory identified is presented in Table 1.

Table 1: Literature review summary and structure

Section	Topic	Keywords	Page
2.2	Market Timing	Strategy; anticipation; bullish=equity & bearish =bonds; switch between risk & risk-free assets; forecast ability; transaction costs; buy & hold strategy	7
2.3.1	Market Volatility	Degree of change; uncertainty; clustering of periods; financial crises; interest rates; exchange rate; world markets interlinked	11
2.3.2	Implied Volatility	Estimation of future volatility; measure of risk; market “fear” gauges	14
2.4.1	The VIX	CBOE volatility index; index options; forward looking indicator; 30 days ahead; “investor fear gauge”; market turning points	16
2.4.1.1	Market timing and the Vix	Negative correlation Vix and stock returns; portfolio yield improvement; time the market	18
2.4.2	The SAVI	3 Month forward volatility; FTSE/JSE Top 40; model-free volatility index; limited research	19
2.5	Bonds	Lower return; linked to equity; hedge	21
2.6	Transaction Costs	Impact investment returns; affect trading strategies; benefit vs cost & risk	23

2.2. Market Timing

2.2.1. Definition

Market timing as a research topic has been studied by many researchers over the past century and for the purpose of this study, I will analyse the various definitions of market timing and this will form the basis of this research paper.

Che, Norli and Priestly (2012) have studied the market timing abilities of individual investors and their definition of market timing relates to the strategy followed by these investors. Individual investors will exclusively invest in bonds when the stock market is likely to perform worse than the bond market and shift to 100% equity when the equity market is likely to outperform the bond market. Fund managers, on the other hand who are constrained to invest in a specific asset class would have to follow a market timing strategy by moving between low and high beta stocks. The key theme here is the complete switching between bonds and equity based on expected market returns.

At the heart of research done by Zakamulin (2013) is the fact that market timing is the anticipation of the future direction of a financial market.

Davies (2013) has defined market timing as the strategy to hold common stocks in bull markets and cash equivalents in bear markets. This is closely linked to the definition proposed by Droms (1989) where he defines market timing as an attempt to outperform the stock market by holding equity during bull markets and to invest in cash during bear markets.

In evaluating “the market timing ability of UK mutual funds”, Cuthbertson, Nitzsche and O'Sullivan (2010) have proposed that market timing aims to increase or decrease the funds market beta in anticipation of an expected bull or bear market by strategic asset allocation, the use of derivatives or by re-arranging the fund's equity holdings.

Gao, Li, Cui, and Wang (2012) refers to market timing as the investment policy whereby investors intentionally shift the fund entirely between risky and risk-free assets after observing and forecasting market conditions. The importance of “market friction, such as management fees charged by fund managers”, has been highlighted in their study as this has an impact on the cost/benefit ratio.

Ward and Terblanche (2009) in their research on market timing have indicated the importance of forecast ability in the process of moving between asset classes to meet expectations about economic or segment related forecasts.

Hallerbach (2011) applied the Fundamental Law of Active Management (FLAM) to market timing and as a result defined market timing for the purpose of his research as the switching between net long and short positions in the market in the hope of outperforming the market.

An example of market timing as suggested by Dimson (2011), is the “act of buying stocks after large price falls (or when market dividend yields are high or price/earnings ratios are low) and selling stocks after significant market rises” in order to generate higher absolute returns.

Brennan and Xia (2010) in their research have suggested that market timing is merely the variance in the equity allocation with the equity premium. In other words, the selection or choice of stocks taken in consideration of the excess return required above the risk-free rate.

2.2.2. Strategies

An investment strategy would include decisions on various criteria, such as, the ultimate goal with the investment, tolerance for risk, capital and return expectations, investment horizon, choice of assets and cash flow requirements, to name a few. Market timing strategies are no different to this with its ultimate goal of timing or anticipating the market in order to optimise investment returns.

Shen (2002) used real time data in his research in order to identify market timing strategies that outperformed the traditional “buy and hold” strategy. When certain predetermined thresholds were crossed, it would prompt investing in stock markets. This was based on an analysis of spreads between the E/P ratio of the S&P 500 index and interest rates. Research findings indicated that switching strategies outperformed the market index by providing higher mean returns and lower variances which was particularly evident on the spread between the E/P ratio and the short term interest rate.

In his study on market timing, Zakamulin (2013) used the technical trading rules, the moving average rule and the time series or momentum rule to evaluate the performance of market timing strategies. His research suggested that the measured performance of these strategies contained significant data mining bias and ignores significant market frictions such as transaction costs. He concluded that the real life performance of these strategies were only marginally better over the long run than that of passive investing, for example the “buy and hold” strategy. Over the medium term, a

stock market timing strategy is likely to underperform versus a passive approach. Due to the fact that a market timing strategy is less risky, it generates a lower return and lower capital growth over a longer term investment period. Furthermore, his research indicated that due to the fact that a market timing strategy realised a better risk adjusted return in the past, it does not automatically mean that the same strategy will show a better risk adjusted return in the future.

Gao, Li, Cui, and Wang (2012) investigated market timing strategies with associated earnings and administration charges under a dynamic mean-variance structure. Their results indicated that an optimal strategy depends exclusively on the following of an “adaptive process which is dictated by the revised first and second order conditional moments of the surplus returns of the risky assets”. Thus, investors do not always invest all their capital in the stock market, but only do so in times with sufficiently good investment prospects, which relates to the condition of the market.

The Fundamental Law of Active Management (FLAM) as used by Grinold (1989) has been applied by Hallerbach (2011) in which the maximum attainable information ratio (IR) relative to skill and breadth is used to evaluate market timing strategies. He found that a success ratio of approximately 60% was required to match the Sharpe ratio of a “buy and hold” strategy. Increasing the breadth (number of bets taken over a period of one year and over separate strategies) can raise the performance of the timing strategies. The expected IR can also be improved by applying volatility-weighted bet sizes, both in cross-section and in time series.

Kacperczyk, Nieuwerburgh and Veldkamp (2014) have evaluated the performance of mutual fund managers in terms of their selection of stocks and market timing. Their literature review highlighted the fact that previous research indicated some evidence of picking skills (stock selection) and very little evidence of market timing skills amongst successful fund managers. The results of their research indicated that the state of the economy, whether in a recession or boom phase, has an influence on the preferred investment method used by these fund managers to outperform the market. Stock picking or stock selection is preferred in booms or bull markets whilst market timing strategies dominate in recessions or bear markets. This time-varying skill stems from anticipating changes in firm-specific or market fundamentals whilst conducting value-adding analysis and research on individual companies and firms during bear and bull markets. Their research has shown that fund managers who display this time-varying skill (stock picking and market timing) outperform the market by 70 – 90 basis points

per annum. This highlights the importance of market timing strategies in outperforming the market, especially in bear markets or in times of recession.

In their investigation into the reason why market timing enjoys a great popularity in the investment practice, Dichtl, Drobetz and Kryzanowski (2014) have pointed out that an effective market timing strategy requires a forecast accuracy that is beyond the scope of most active investors. In terms of its risk reduction properties, market timing were found to be superior to other methods, hence the attractiveness of market timing in a high volatility market environment as indicated by their Monte Carlo simulation tests. Their studies have concluded that investors with higher risk aversion coefficients as well as investors with shorter evaluation periods, typically one year and less, would benefit most from a market timing strategy.

Neuhierl and Schlusche (2011) examined the profitability of market timing rules taking into account the potential effects of data snooping. In ignoring the effects of data snooping, they have found that a basic set of simple market timing rules, based on a single indicator only, have outperformed a buy and hold strategy over the sample period from 1981 to 2007. The same superior performance were identified when the set of market timing rules were extended to include more complex strategies which were based on information obtained from several indexes and indicators. Dependencies across rules were ignored in the performance measurements. Due to the fact that data snooping is not considered to be a factor in this research, we have focussed on the research results of these authors excluding the effects of data snooping. Their research has highlighted the superiority of a market timing strategy versus a traditional buy and hold strategy in outperforming the market.

In revisiting the Fisher and Statman study on market timing, Pfau (2011) has applied PE10 decision rules and indicated that market timing has the potential to improve long term investment returns. When adjusted for risk, Pfau concluded that market timing strategies provide more favourable results compared to a 100 percent buy and hold strategy as well as a 50/50 fixed allocation strategy. A market timing strategy would also be more effective in a bear market where valuations and stock prices are diminishing.

2.3. Market Volatility and Implied Volatility

Historical volatility is also known as realised or statistical volatility and is in fact basically the opposite of implied volatility. The measuring and tracking of past market changes and their actual results differentiates historical volatility from other volatility measures. Implied volatility is all about probability and the estimation of future prices, rather than an indication of them. It does however help to consider the actions other investors are taking in relation to a stock or option, and implied volatility is directly correlated with market opinion, which in turn affects stock or option pricing.

Volatility measurement or volatility modelling can be segmented into two broad categories, historic volatility models and implied volatility models. Historical volatility applies past price information and appropriate estimation models to forecast future volatility. Implied volatility makes use of option pricing to determine or calculate future volatility (Song, 2014). Deciding on the best volatility measurement model to use, seems to be a matter of the model that best fits the purpose.

Samouilhan and Shannon (2008) reviewed 39 papers that investigated the merits of each of the two groupings. They found that there was an even split between the researchers in their choice between the two models in terms of superiority. With this in mind, this paper will discuss briefly the definition, background as well as previous research done on these subjects.

2.3.1. Market Volatility – Historic

Market timing and market volatility is closely linked and plays an important role in any investment strategy where the aim is to optimise returns over a period of time. This is emphasized by research done by Ferson (2012) where the total investment performance of an investment manager who engages in market timing is measured considering level and volatility timing as well as selectivity ability.

Market volatility refers to the degree at which share or stock values change on the stock market. When circumstances are calm, prices would move reasonably slowly, while prices would change at a quicker pace when news is freely available, insecurity is created and transacting increases (Taylor, 2011). Poon (2005) indicated that “volatility refers to the spread of all likely outcomes of an uncertain variable” which in asset markets relates to the spread of asset returns. This is usually measured as the sample

standard deviation. Risk and volatility are related, but should not be misinterpreted. Risk is linked with unwanted outcome, whereas volatility as an indicator for insecurity could be due to a positive outcome.

In his research regarding volatility in bullish and bearish markets, Masset (2011) have concluded some important “facts” that can be used to define volatility. This was later used by Song (2014) in his studies on volatility on the JSE sectorial indices. Masset indicated that volatility:

- i. Is not constant, but mean regressive.
- ii. Tends to cluster, so high volatility episodes are likely to be followed by further periods of high volatility.
- iii. Is severely impacted by economic shocks – the returns distribution has fat tails.
- iv. Is more distinct when returns are negative and less intense for positive returns.
- v. Is better described when measured at a high incidence when compared to lower selection periods.

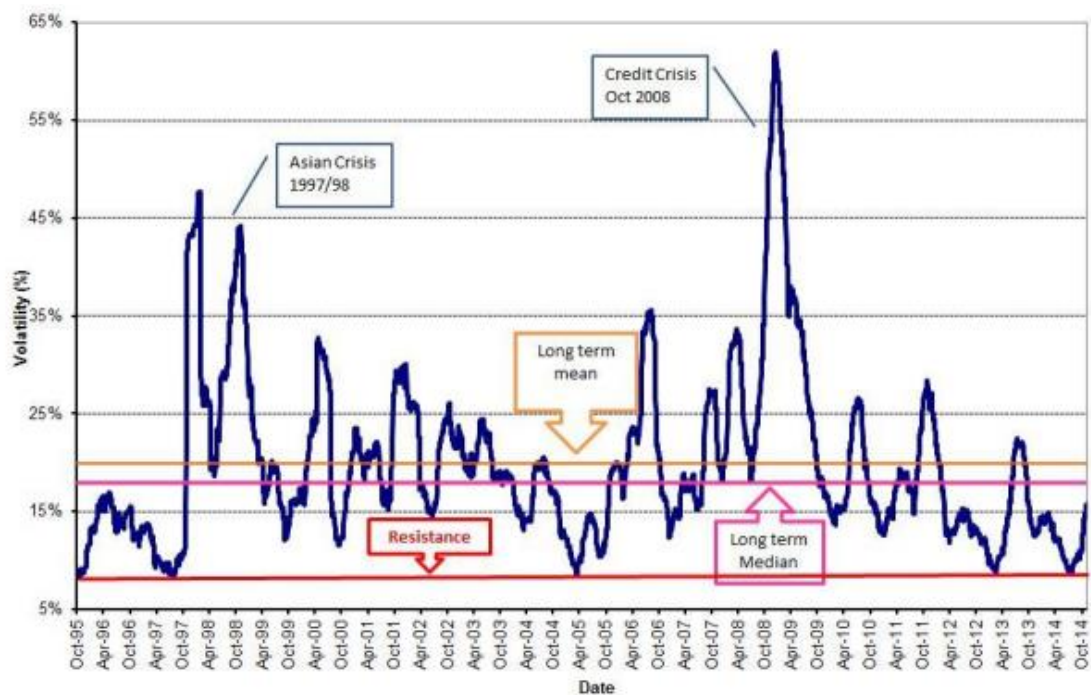
It is important to understand the origins, determinants and effects of stock market volatility in order to define market volatility. Chinzara (2011), in his research on stock market volatility in South Africa, found that macroeconomic insecurity meaningfully influences stock market volatility. Inflation, gold- and oil price volatility seem to have a lesser effect than fluctuations in short-term interest rates and exchange rate fluctuations. As expected, financial crises increase volatility in most macroeconomic variables with a resultant increase in stock market volatility.

Strong evidence exists that the connection among stock and foreign exchange markets is rule reliant and stock price volatility acts disproportionately to dealings in the foreign exchange market (Walid, Chaker, Masood and Fry, 2011). The South African Rand has come under extreme pressure from the UK and US currencies for the period under review with a subsequent rise in stock market volatility. Experimental results from earlier studies suggest that stock market volatility adversely affects consumption and investment growth with the main effect on robust consumption growth (Raunig and Scharler, 2011).

Sandoval and Franca (2012) in their research using the correlation matrices of 92 of the main world financial market indices, found that highly volatile markets are directly connected with strong parallels between them. This is echoed in the research done by

Kishor and Singh (2014) where the relationship between the stock returns volatility for the BRICS countries are evaluated against news generated from the US markets and the resultant impact on the US stocks. Their findings indicated that market volatility in the BRICS countries have been significantly affected by volatility in the US stock market over the period under review. South Africa forms part of BRICS, representing the worlds emerging markets which mean that the JSE is very susceptible to volatility in other international markets. See Figure 1 for the historic JSE Top 40 volatility for the period October 1995 to Oct 2014.

Figure 1: JSE Top 40 – 3 month rolling realised volatility – mean reversion (Kotzé, 2014)



2.3.2. Implied Market Volatility

Kenmoe and Tafou (2014) have defined implied volatility as “the option market’s estimate of future return volatility over the remaining life of the option”. Historical asset prices are used to predict the future volatility of the underlying asset and to explain the behaviour of stock market returns.

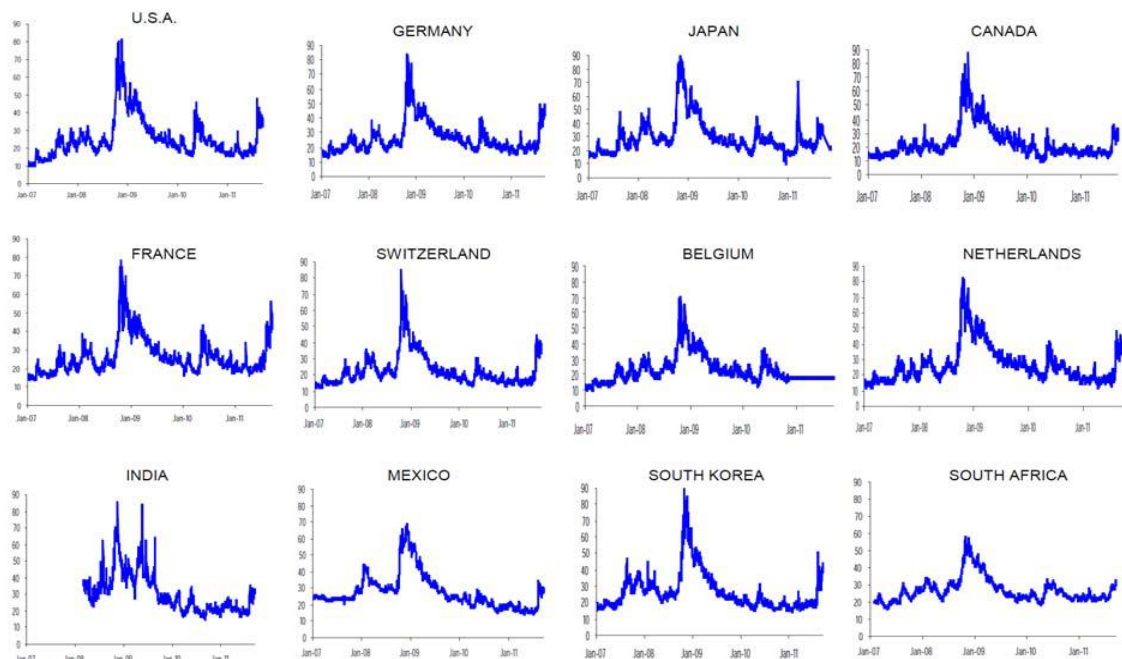
Implied volatility is in essence the estimation of the future fluctuations in a security or stock based on certain predictive factors. It is generally believed that implied volatility increases in a bear market, when investors expect that the stock price will decrease over time, and declines in a bull market, when investors expect that the price will rise over time. This stems from the belief that bear markets are more risky than bull markets. Grouard, Lévy and Lubochinsky (2003) referred in their research to implied volatility as expected volatility which is derived from option prices and used to predict future price changes. It is an approximate and subjective indicator of market risk.

López and Navarro (2012) defined implied volatility as “the standard deviation of the return of an asset, underlying an option in an option pricing model”, in essence, a forward-looking volatility estimate and a measure of risk. Their research focussed on the implied volatility indices in equity markets around the world. By characterising the methodology used and features of each of these indices, they have come to the conclusion that volatility indices overall outperform forecasts of future realised volatility based on historical standard deviations, lagged realised volatility as well as the GARCH family of provisional volatility models. They suggested that these implied volatility indices can be considered the fear gauges of investors of their particular stock markets.

2.4. Implied Volatility Indices

Equity markets around the world have experienced a significant increase in the number of implied volatility indices over the last two decades. The most important by continent are, the VIX for US; VDAX, VCAC and VSTOXX for Europe; VKOSPI and India VIX for Asia; S&P/ASX 200 VIX for Australia; and the new SAVI for South Africa (López and Navarro, 2013). Figure 2 shows implied volatility indices for 12 countries for the period January 2007 to January 2012. During this period there were three significant financial crises, the fall of 2008 in the US, the Greek sovereign debt crisis in May 2010 and in July 2011, the US debt debate and the intensifying UK debt crisis. The big spikes in risk are indicated by the majority of the implied volatility indices around the world (Bacchetta and Wincoop, 2013).

Figure 2: Implied volatility indices for 12 countries (Bacchetta and Wincoop, 2013)



Source: Datastream and local stock markets.

Siriopoulos and Fassas (2009) have reviewed 29 implied volatility indices around the world in their studies. López and Navarro (2012) have used information and research done on 21 volatility indices. Accurate information on the number of implied volatility indices currently in use around the world could not be obtained, but it is clear from this research that every major stock market in the world makes use of one or more market or asset specific implied volatility indices.

The main objective of these indices is to capture or forecast the volatility expectation of stock indices returns over the short term, usually 30 calendar days. Some of the applications of these indices as highlighted by López and Navarro (2013) include, forecasting of future realised volatility, assessing the underlying market risk of stock indices, identification of possible profitable opportunities in the stock market as well as the measurement of financial risk aversion. Their study focussed on the construction of a set of interest rate volatility indices for the Eurozone.

This research paper will focus on the South African Volatility Index (SAVI), but will start with a review of the first implied volatility index launched in 1993 by the Chicago Board Options Exchange (CBOE), the VIX.

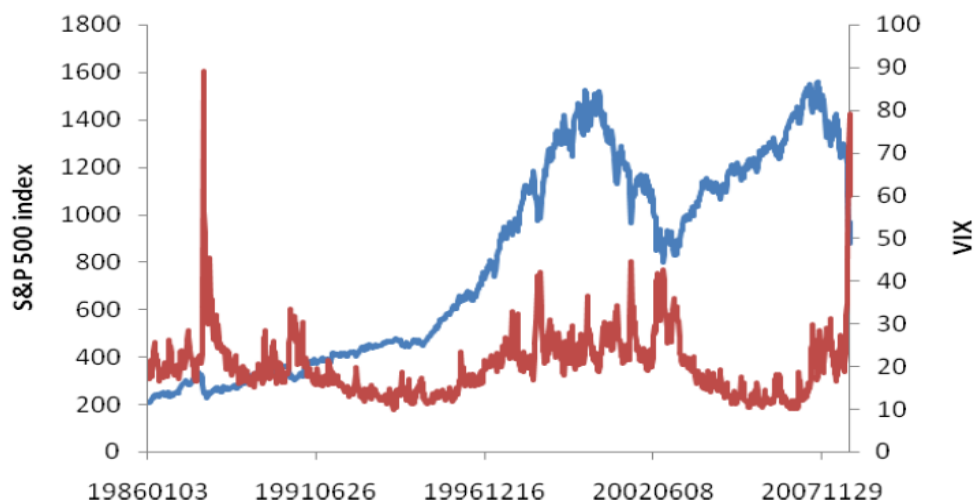
2.4.1. The VIX

The Chicago Board of Options Exchange (CBOE) created the Volatility Index, commonly known as the VIX, in 1993, to measure market expectations of the near-term volatility implied by stock index option prices. In September 2003, the CBOE created another market volatility index, called the VXO. The VXO denotes the implied volatility of a theoretical 30-calendar-day at-the-money S&P 100 index option, whereas the VIX centres on the values of a portfolio of 30-calendar-day S&P 500 calls and puts with weights being inversely proportional to the squared strike price. The VIX thus measures the anticipated market volatility by combining the information from option prices over the entire volatility skew, not just at-the-money strikes as in the VXO index. The VIX reflects a model-free estimator of the implied volatility, and therefore does not depend on any specific option pricing structure (Fernandes, Medeiros and Scharth, 2014). The VIX centres on index options rather than stock options and relies on the implied volatilities of both call and put options. This not only increases the volume of data that the index groups, but also mitigates any subsequent bias due to staleness in the detected index level and possible incorrect measurement in the riskless rate.

The VIX soon became known as the “investor fear gauge” and served as an indicator of the investor climate or the “market temperature” (Whaley, 2000). Dash and Moran (2005), believe that it is an indicator of an investor’s appetite for risk. “During times of uncertainty it is one of the most closely watched global indicators” (Fairburn Capital, 2009). In essence, the VIX is a measure of what investors are willing to pay to hedge their equity portfolios using S&P 500 index options. A rise in the VIX is seen as an indicator that investors are becoming increasingly worried about downside instability in the stock market. It is a forward-looking indicator and measures the volatility investors expect to see in the near future. History has shown that “the VIX can provide useful information about investor sentiment and can act as an indicator of possible market turning points” (Thorp, 2010). This is echoed in research done by Fernandes et al., 2014 which indicated that high VIX levels typically mirror negativity, causing equity prices to trade lower while low VIX levels would reflect complacency among market members, setting up the market for disappointment and increasing the probability of a market correction.

Previous research has indicated that the actual advantage of any index is to compare its present level to some historical levels and standards. Figure 3 looks at the history of the VIX and indicates week-ending levels of the S&P 500 and the VIX from the beginning of January 1986 till October 31, 2008. The VIX reached a record high in October 1987, the time of the 1987 stock market crash – see decline in S&P 500 Index. This trend continuous for the balance of the period under review, a spike in the VIX is followed by a decline in the S&P 500 Index and *vice versa* (Whaley, 2008).

Figure 3: Closing levels of the S&P 500 index and the VIX during the period Jan 1986 – Oct 2008 (Whaley, 2008)



2.4.1.1. Market timing using The VIX

In order to understand the relationship between market timing and a volatility index like the VIX, one has to first determine the link between stock returns and the implied volatility index. López and Navarro (2012) in their research have documented and summarised the findings of previous researchers on this topic. The conclusion reached by the majority of researchers indicates a negative, often irregular or synchronous relationship between the changes in volatility indices and the fundamental stock returns. See Table 2.

Table 2: Relationship between changes in volatility indices and stock returns

Market	Vol Index	Findings	Researcher
US	VXO	Asymmetric, negative correlation	Whaley (2000); Giot (2005b)
US	VXN; VIX	Asymmetric, negative correlation	Simon (2003); Whaley (2009)
UK	VFTSE	Negative and asymmetric relationship	Siriopoulos and Fassas (2008)
German	VDAX-NEW	Strong negative, contemporaneous relationship, no asymmetry	Gonzalez and Novales (2009)
Swiss	VSMI	Strong negative, contemporaneous relationship, no asymmetry	Gonzalez and Novales (2009)
Spain	VIBEX-NEW	Strong negative, contemporaneous relationship, no asymmetry	Gonzalez and Novales (2009)
Greek	GRIV	Inverse and asymmetric correlation	Siriopoulos and Fassas (2012)
Korea	KOSPI200	Asymmetric, negative relationship	Ting (2007)
India	IndiaVix	Asymmetric, negative relationship	Kumar (2012)
Australia	AVIX	Asymmetric, negative relationship	Frijns et al (2010)

Copeland and Copeland (1999) indicated that “changes in the VIX are statistically significant principal indicators of daily market earnings”. On days that follow rises in the VIX, large-capitalisation stocks outperform portfolios of small-capitalisation stocks and value-based portfolios outperform growth-based portfolios. The opposite occur on days following a decrease in the VIX. This implies that market timing may be a practical approach to improve investment performance. This was confirmed by research done by

Boscaljon, Filbeck and Zhao (2011), which showed that for holdings of 30 days or more, investors may be able to achieve significant returns by rebalancing their portfolio between value and growth stocks based on fluctuations in the VIX index.

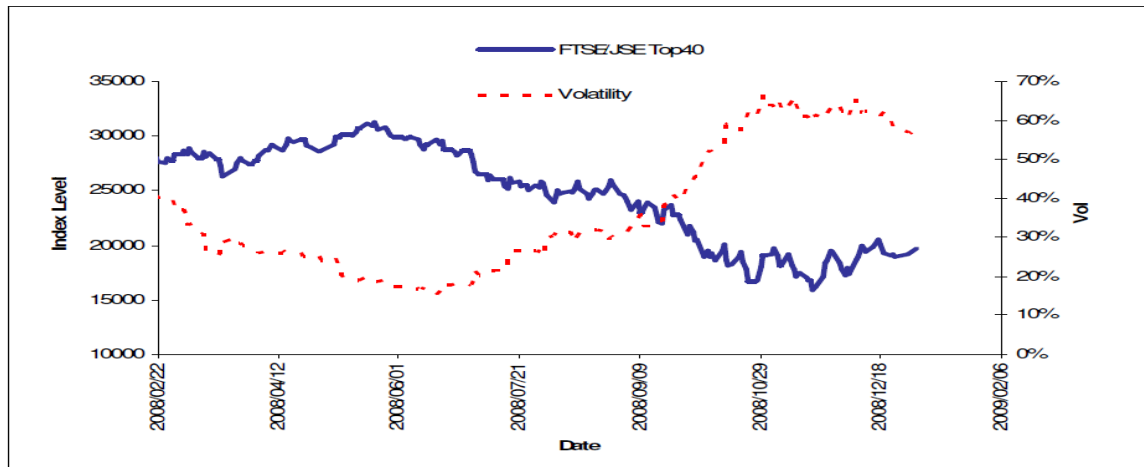
Kostakis, Panigirtzoglou and Skiadopoulos (2011) in their research, developed a forward-looking method that uses data from market option prices in order to address the issue around static asset allocation. They constructed portfolios containing risky and risk-free assets and calculated their out-of-sample performance. Their findings indicated that the use of risk-adjusted implied distributions times the market and resulted in better returns compared to the situation where past return distributions were used to estimate the optimum approach. The results were valid under a number of assessment metrics and utility functions even when transaction costs were included.

It is clear from previous research that investment stock returns, market timing and implied volatility indices, like the VIX, are closely linked and that the VIX can be used as an indicator to time the market and to optimise investment returns.

2.4.2. The SAVI Top 40

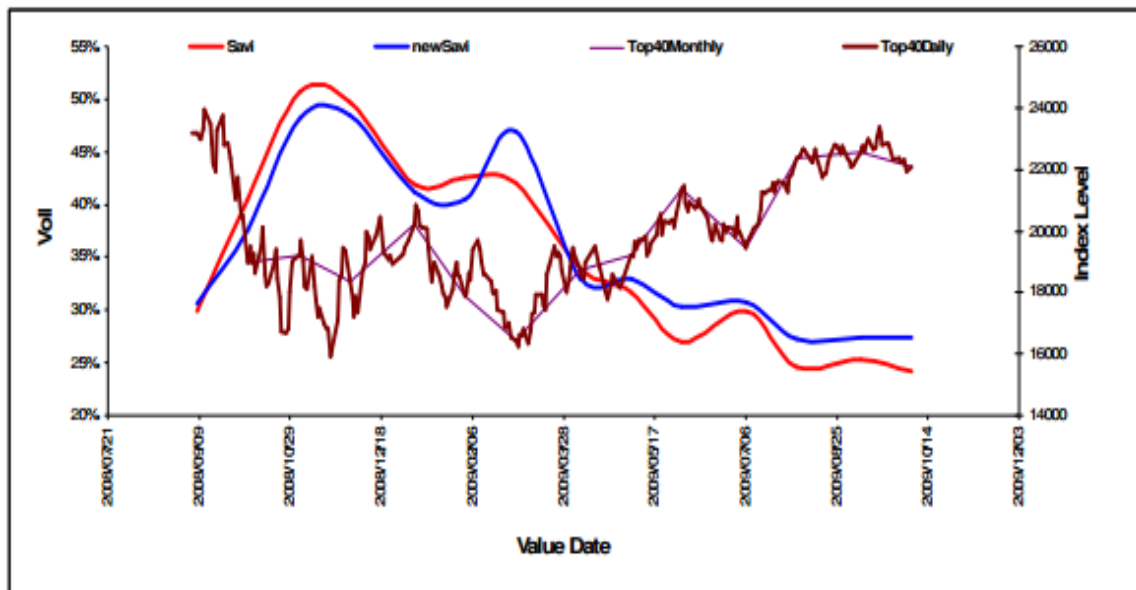
Launched in 2007 by the South African Futures Exchange (SAFEX), the SAVI is an “index designed to measure the market’s anticipation of the three month volatility” (Kenmoe and Tafou, 2014). The FTSE/JSE Top 40 index level is used as its basis and it is calculated using the at-the-money volatilities. As with the VIX, a negative connection exists between the fundamental index level and its volatility and the SAVI, like the VIX, can be seen as a “fear” gauge for the South African market – see Figure 4.

Figure 4: FTSE/JSE Top 40 index level and its volatility. When the Als40 falls the volatility rises (Kotze, Joseph and Oosthuizen, 2009).



In 2009, the new SAVI was launched which reflected a different way of measuring the anticipated 3-month volatility. Also based on the FTSE/JSE Top 40 Index, the new SAVI is not only calculated using the at-the-money volatilities but also using the volatility skew. The volatility skew is the market's expectation of a crash, and therefore the new SAVI is a more effective investor or market "fear" gauge, since it includes a market crash guard volatility premium. The new SAVI is calculated as the weighted average prices of calls and puts over a extensive range of strike prices that terminates in three months' time (Kenmoe and Tafou, 2014). Figure 5 indicates the new SAVI in blue with the old SAVI in red. The new SAVI are marginally different to the old SAVI due to the influence of the skew with the new SAVI.

Figure 5: The new SAVI, the old SAVI and the FTSE/JSE Top40 index level (Kotze, Joseph and Oosthuizen, 2009).



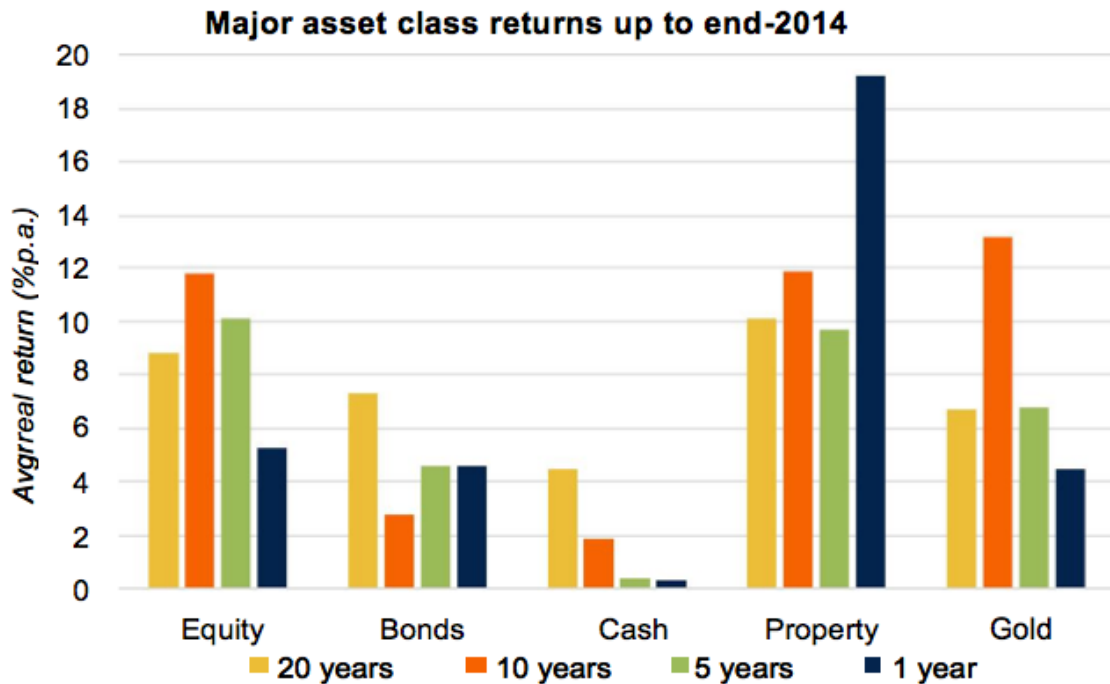
Kotze, Joseph and Oosthuizen (2009) have indicated that the new SAVI is a model-free volatility index that fully incorporates all the dimensions of volatility.

2.5. Bonds

It is widely accepted in the investment community that equities would normally outperform bonds over a period of time, all other things being equal. This would normally depend on the market volatility which will influence the investors' judgement of market risk which in turn affects their invest style and asset allocation.

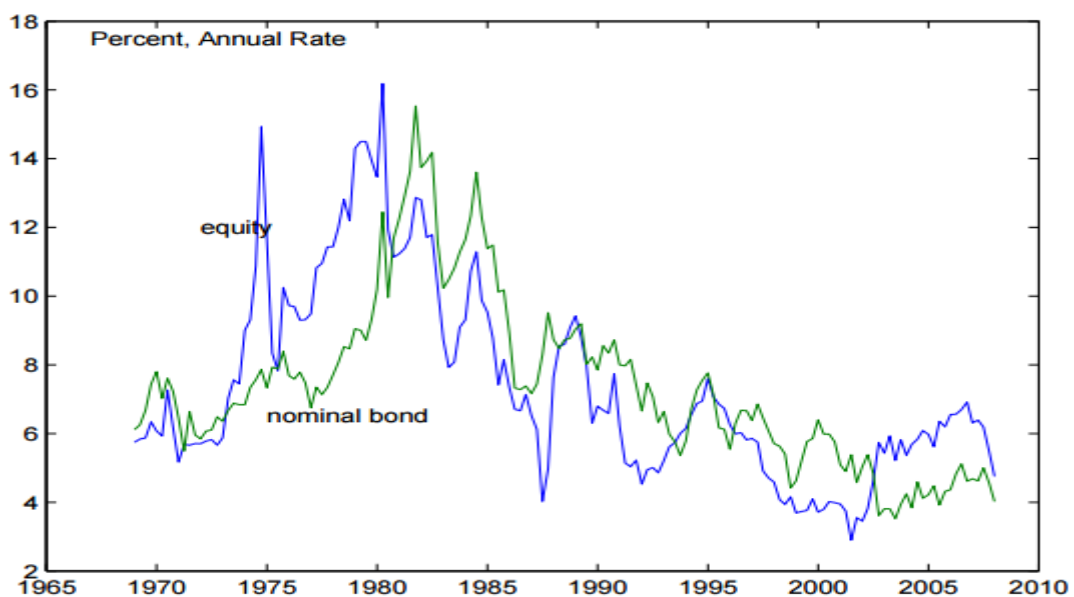
As can be seen from Figure 6 ("Long term real investment returns", 2015), equity was the top performing asset class over the past five years, but it was outperformed by listed property over the past 20, 10 and one-year periods. Equities also outperformed bonds in all four measuring periods.

Figure 6: Major asset classes returns on the JSE up to end 2014 (“Long term real investment returns”, 2015)



Bekaert and Engstrom (2010) on the other hand researched the yield on a long-term nominal bond and compared the results to the equity return (including dividends) for the total US equity market from 1969 to 2009. It can be seen from Figure 7 that US equity and bond returns are closely linked.

Figure 7: US equity market: Equity vs Bond returns (Bekaert and Engstrom, 2010)



Ang and Ulrich (2012) in an evaluation of their research model indicated that the average 10-year anticipated return on equity is 10.9% whilst the real bond return for the same period is 6.5%, a difference of 4.4%. Coeurdacier and Gourinchas (2011) in their research indicated that relative bond yields (whether nominal or real) are closely associated with actual exchange rate variations. It is therefore a sound investment strategy for investors to use bond holdings as a hedge against exchange rate threats.

The research shows that equity and bond returns are closely linked. Their returns are dependent on a number of factors which include the market wherein the investment operates, the investment time period, as well as any exchange rate fluctuations, to name a few. This research paper will evaluate the bond and equity returns on the JSE since the inception of the SAVI in 2007.

2.6. Transaction Costs

Transaction cost is incurred in the buying or selling of securities and is one of the key variables in calculating net investment returns. The magnitude and frequency of transactions determine the total amount of transaction costs over a period of time and the impact on investment returns. Higher transaction costs and more frequent trading will result in lower investment returns, all other variables being equal. Many research studies exclude transaction costs or brokerage fees from their investment calculations which might nullify any significant economic findings. Strugnell, Gilbert and Kruger (2011) have acknowledged this in their research on beta, size and value effects on the JSE and indicated that some trading strategies might be ineffective if transaction costs are taken into account.

Gârleanu and Pedersen (2013) in their research suggested that the ideal investment strategy depends on securities' recent anticipated returns, the progression of expected returns in the future, their risks and relationships, and their transaction costs. They've acknowledged the importance of transaction costs and the fact that any active investor should continuously weigh the anticipated benefit of transacting against its costs and risks.

Extensive research have been done by Woodside-Oriakhi, Lucas and Beasley (2013) on the rebalancing of a financial portfolio, taking transaction costs into consideration when the quantity of assets held is altered. They have identified transaction costs as either fixed (so paid regardless of the volume traded, provided a trade took place)

and/or variable (linked to the amount traded). The significance of the investment skyline is highlighted in order to demonstrate the nature of the efficient boundary that results when rebalancing such a portfolio. They've developed a model that integrates the relationship between optimum portfolio allocation, transaction costs and investment horizon.

It is evident from previous research that transaction costs should not be ignored in the analyses or modelling of an investment strategy that involves the regular trading of assets. l'Ons and Ward (2011) have used a total fee per trade of 0.5% in their research on the use of PEG ratios to predict share performance on the JSE. Transactions costs or brokerage fees of 0.0%, 0.25%, 0.5%, 0.75% and 1.0% per trade will be used in this research paper.

3. RESEARCH QUESTIONS

In line with the literature review, the main objective of this research is to answer the following question: *“Can the SAVI be used as a market timing tool to optimise investment returns by switching between the equity and bond markets in times of market volatility?”*

In order to achieve this, the central research question is broken down into more specific research questions that will form the basis of, and lead up to, answering the central research question. The research questions are specific to the JSE and refer to the daily closing prices of indices on the JSE. Index price periodicity, linked to market volatility and market timing will be investigated and not stock or industry pricing.

The central research question and the methodology followed to answer this will by default constitute an investment style. A superior investment style will result in returns that are higher than the market average while returns below market average will constitute a poor investment style.

3.1. Research Question 1

Based on the JSE203 – Alsi TRI and JSE – Albi indices, question one compares the returns from a buy and hold strategy in the stock market to the same strategy for the bond market for the period under review. It is normally expected that an investment in equities would outperform an investment in bonds in a typical bull market.

RQ1: Can the investment return from an investment portfolio in bonds outperform the returns from a buy and hold strategy in the equity market over the period under review?

3.2. Research Question 2

In question two, various daily moving averages of the SAVI is used as market timing indicators to switch between the equity and bond portfolios. The returns of these portfolios are compared at the different daily moving averages. Question two intends to answer the central research question.

RQ2: Can the SAVI be used as a market timing tool to optimise investment returns by switching between the equity and bond markets in times of market volatility and the absence of transaction costs?

3.3. Research Question 3

Question three evaluates the impact of transaction costs on the investment styles considered in question two. Different levels of transaction costs have been applied in the construction of the portfolios.

RQ3: Can the SAVI be used as a market timing tool to optimise investment returns by switching between the equity and bond markets in times of market volatility and with the inclusion of transaction costs?

4. RESEARCH METHODOLOGY

4.1. Introduction

The research methodology that was followed will be discussed in detail and substantiated by appropriate academic literature on each subject. It will start with an in-depth explanation of the research design, followed by discussions and theoretical validation of the unit of analysis, the population, the sample size, sampling method and research instrument used. Specific attention is given to the data collection process and the process of data analysis as this is pivotal in answering the research questions. The chapter is concluded by discussing the associated research limitations encountered and identified during the research process.

In their research, Saunders and Lewis (2012) have identified and defined two different approaches to conduct research: deduction and induction. Deduction involves the assessment of a theoretical proposal by using a research approach specially designed for the purpose of its testing. Induction on the other hand, refers to a research methodology which involves the development of theory as a consequence of data previously collected.

The literature review suggested that there is a relationship between market timing, market volatility, implied market volatility as calculated by the various volatility indices, as well as investment returns. The aim of this research was to study and explore the relationship between these variables and therefore a deductive approach was deemed to be best suited. Saunders and Lewis (2012) have identified the following stages in a deductive research approach:

- i. Start with general theory and define the research questions;
- ii. Specify the way and method in which the questions may be answered;
- iii. Find answers to the questions in point i;
- iv. Analyse the results – does it support the theory or need to be modified?;
- v. Confirm the initial general theory or modify it in the light of the findings.

Gray (2013) has indicated that research studies can be categorised according to their particular purpose into four areas: exploratory, descriptive, explanatory and interpretive. Explanatory research sets out to explain and account for the descriptive information obtained through the identification of causal relationships between key variables. An explanatory research approach was used in order to explain the relationships between the aforementioned key variables.

4.2. Research Design

The research was quantitative in nature and utilised a longitudinal design approach which was best suited to track the changes in volatility and market indices over the research period (Bloomberg, Cooper and Schindler, 2008). Longitudinal studies are used for casual studies where the events occur over a period of time. The study entailed the collection and analysis of data for the period 2007 to 2015 and started at the inception of the SAVI on the JSE in February/March 2007.

Creswell (2013) have identified the following qualities that can be linked to quantitative data and research methods:

- i. Most of the times start with the testing of a theory
- ii. The relationship between variables are projected in terms of questions or hypothesis
- iii. Validity and reliability are key
- iv. Involves statistical analysis
- v. Use of predetermined instruments to collect data

4.3. Validity and Reliability

The credibility of any research findings will rest upon the validity and the reliability of the data, the data collection methods and the analysis and procedures used to answer the research questions (Saunders and Lewis, 2012). The principal factors which threaten the validity and reliability of the research findings and conclusions are listed in Table 3. The research has been carried out in such a way to eliminate all of these factors.

Table 3: Threats to the validity and reliability of research findings (Saunders et al., 2012)

Validity	Reliability
Subject selection – biases resulting in research subjects being unrepresentative of the population	Subject error – measurement taking place at different times may produce different results
History – events occurring during the research, affecting the findings	Subject bias – research subjects giving unreliable information – lying
Testing – effects that the data collection process might have on the findings	Observer error – same questions asked differently by different researchers
Mortality – loss of subjects during the process, especially longitudinal research	Observer bias – same data interpreted differently by different researchers – biasing the findings and conclusions
Ambiguity about causal direction – confusion over the direction flow of cause and effect	

4.4. Population

According to Saunders et al., (2012), the population should be readily available and is the complete set of group members. The targeted population of this study were the following indices listed on the JSE for the period under review:

- i. JSE203 – Alsi TRI
- ii. JSE – Albi
- iii. SAVI Top 40

The historic data for these indices can be obtained from various databases and websites, but for the purpose of this study only one database was used, INET BFA who specialises in financial data feeds and analysis tools for the African continent.

4.5. Unit of Analysis

The unit of analysis was the cumulative portfolio returns produced under the different criteria in the testing phase. The relative size of the differences between the portfolios was compared and analysed.

4.6. Sampling Method and Size

The researchers' judgement was used based on certain premises and reasons in selecting the sample members which ultimately comprised the population. This non-probability sampling technique is an example of typical case purposive sampling where the sample is typical of the population and considered to be illustrative and representative (Saunders et al., 2013).

The specific attributes of each of the samples that were selected are listed below. This also formed part of the criteria that were used to select the different samples specific to the JSE:

JSE203 – Alsi TRI

An index designed to replicate the movement of the equity market containing the primary securities listed on the JSE, measured by market capitalisation. Important to note that any cash dispersals, such as dividends are reinvested back into the index.

JSE – Albi

This refers to the All Bond Index on the JSE that are comprised of “vanilla” bonds across the full range of maturities in the South African bond market and measuring the daily movement in the bond market. The Albi index contains the top 20 vanilla bonds ranked by liquidity and market capitalisation.

SAVI Top 40 / SAVI

An index designed to forecast equity market risk or implied volatility in the local South African equity market – acting as a gauge of general market sentiment.

4.7. Research Instrument

A research instrument or tool was developed using Microsoft Excel spread sheets which was populated and analysed via a number of data management techniques in Excel. Anderson, Sweeney and Williams (2014) have discussed in detail the use of Excel in research applications and this methodology was applied in this research paper through the application of various Excel formulas, graphs and other Excel tools. The use of Excel as a research instrument will be discussed in more detail during the data collection, data processing and data analysis phase.

4.8. Data Collection

This study only used secondary quantitative data which has been defined by Saunders et al., (2013) as “data used for a research project that were originally collected for some other purpose”.

Information and data relating to the various indices that formed part of the research, was obtained from the INET BFA website and database. This database gives historic daily closing prices or values for these indices at the end of each day. The index values for the period under review were downloaded into the research tool, Excel.

4.9. Data Processing and Preparation

The following points briefly describe the general approach and methodologies used to process and prepare the data for analysis purposes.

- i. The selected indices were downloaded from the INET BFA database.
- ii. The indices were sorted in date order with the starting date 28 February 2007 and the ending date 11 September 2015.
- iii. The daily return percentage for the JSE203 – Alsi TRI and JSE – Albi indices were calculated.
- iv. The daily return percentage was applied to a lump sum investment at the start of the period and compared to the cumulative returns at the end of the period. In other words, the return over the research period of a portfolio made up of only equities was compared to a portfolio made up of only bonds.
- v. The SAVI index was used as the base and different daily moving averages was calculated for the period under review.

- vi. A market timing indicator was developed based on the daily moving averages to prompt a switch in investment between the two different asset classes or portfolios. In essence, a new investment portfolio was created consisting of 100% equity or 100% bonds at a time
- vii. Different percentages of transaction costs were included in the formula for calculating the investment return of the newly created portfolio over the research period.
- viii. The returns of the newly created portfolios were compared to the original portfolios consisting of only equities or only bonds.

Data processing and data preparation was done in Excel.

4.10. Data Analysis

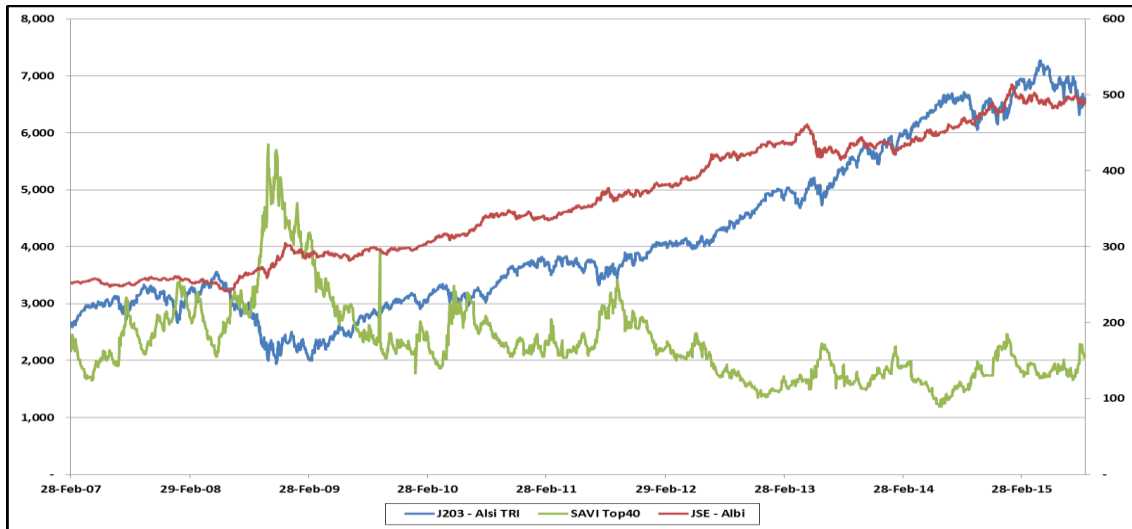
The data analysis was broken down into four distinct phases. Some of these phases have already been identified in the discussion on data processing and data preparation already. Phase one involved the interrogation of the index data to identify possible anomalies. Phase two involved the calculation of the return over the research period, based on a lump sum investment using the JSE203 – Alsi TRI (equity) and JSE – Albi (bond) indices. In Phase three, the SAVI index was used as the base and different daily moving averages of the index was calculated and applied as a market timing indicator to switch between the two indices. In Phase four, new investment portfolios were constructed based on the theory developed in Phase three. Transaction costs were included in the calculation of the investment return of the new portfolios.

4.10.1. Interrogation of Index data

A time series analysis was used to interrogate the index data with the aim to identify possible anomalies that might distort the data analysis and possibly the outcome of the research. The time series for each index for the period under review were plotted via line charts. Chatfield (2013) has identified the objectives of a time series analysis as description, explanation, prediction and control. The time series in this case was classified as continuous and descriptive as observations were made continuously through time. See Figure 8 for the time series line chart for each index.

Any irregularities in the data will be highlighted by a sudden spike or trough in the line graphs after which the trend will return to normal. Such a spike have been identified on the SAVI Top 40 line graph, to be specific, on the 5th of October 2009 when the index soared from a closing of 2 401 points the previous day, to a closing of 3 970 on the 5th, to close again on 2 342 on the 6th of October. The index point for the 5th has been ignored and assumed to be the same value as that of the 4th of October 2009.

Figure 8: Time series line chart per Index



4.10.2. Investment return based on the JSE203 – Alsi TRI and JSE – Albi Indices

The daily change in these indices were calculated and expressed as a percentage change versus the previous day. A lump sum of R100 000.00 was assumed to be invested in each of these indices at the start of the period (Day 1) and the total investment amount including growth was calculated at the end of the period and compared to each other. Investment return was expressed as a total Rand value return, a total percentage return over the period as well as an annualised percentage return. Two portfolios were created, one consisting completely of equity stocks and one consisting of bonds only.

Portfolio 1 (PBO1)

PBO1 was based on a lump sum investment of R100 000 on Day 1 in a pure bond portfolio with the return linked to the JSE – Albi over the period.

Portfolio 2 (PEQ2)

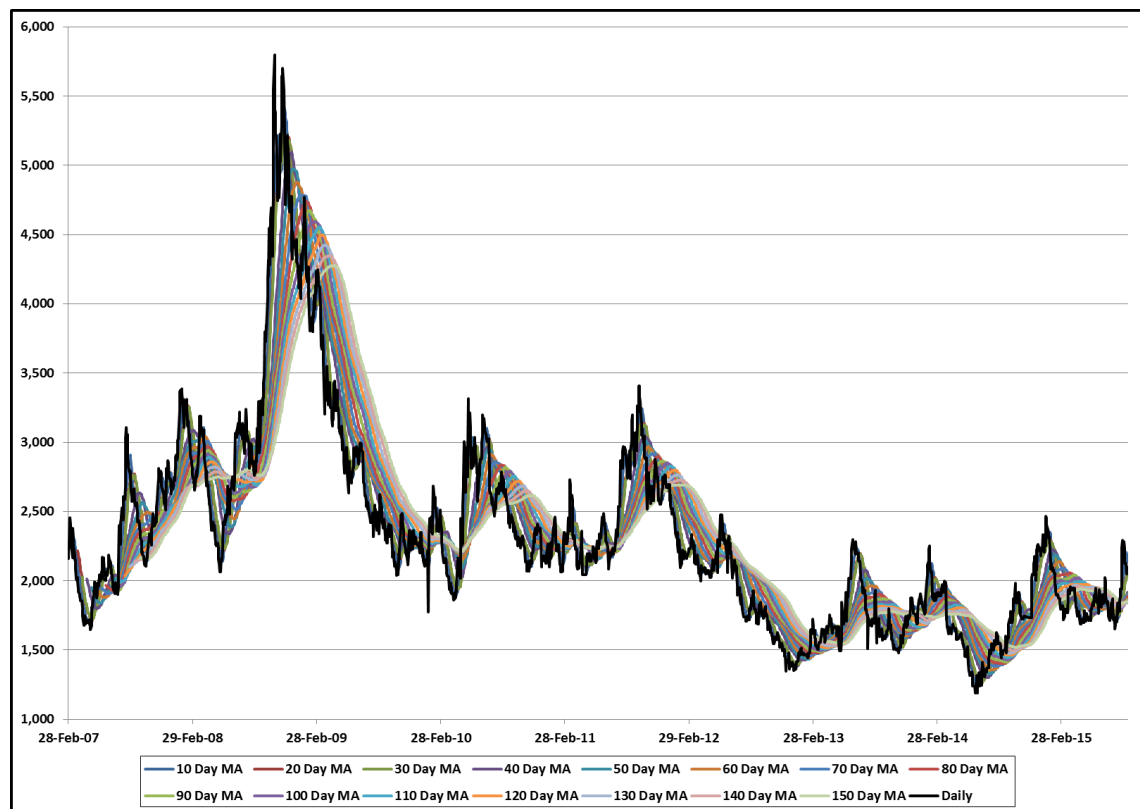
PEQ2 was based on a lump sum investment of R100 000 on Day 1 in a pure equity portfolio with the return linked to the JSE203 – Alsi TRI over the period.

4.10.3. Daily moving averages of the SAVI Index

The daily moving average (MA) of the SAVI Index was calculated for the period under review as applied by Babikir, Gupta, Mwabutwa and Owusu-Sekyere (2012) in their research on the relevance of structured breaks to stock return volatility in South Africa. Fifteen different daily moving averages were calculated, starting with a 10 day moving average (10 Day MA) and ending with a 150 day moving average (150 Day MA) with ten day intervals between each.

A model was developed in Excel which indicated when the different daily moving average lines would intercept the original SAVI index line. This can also be achieved by plotting the time series data on a line graph. See graphical representation in Figure 9.

Figure 9: Different daily moving averages of the SAVI Top 40 Index compared to the original Index (in black)



Any interception of the original SAVI index line would indicate that an investment switch should be made between equity and bonds or *vice versa*.

4.10.4. Construction of market timing investment portfolios

Three market timing portfolios were created each with their own set of criteria. Different daily moving averages of the SAVI were applied as well as varying transaction costs. Each portfolio demonstrated the following characteristics:

Portfolio 3 (PMTMA3)

In the construction of PMTMA3, different daily moving averages were applied as well as variable transaction costs. A lump sum investment of R100 000 was applied on the last day of the first daily moving average calculation for each set. Using the SAVI as market timing indicator, the investment was swapped between a pure equity portfolio and a pure bond portfolio, with the application of the different sets of transaction costs. Again, the return was linked to the JSE203 – Alsi TRI for a pure equity return and the JSE – Albi for a pure bond return.

Portfolio 4 (PMTBO4)

In the construction of PMTBO4, different daily moving averages were applied as well as variable transaction costs. A lump sum investment of R100 000 was applied on Day 1 in a pure bond portfolio where after the SAVI as market timing indicator was used to alternate between a pure equity portfolio and a pure bond portfolio, with the application of the different sets of transaction costs. The switch to this investment style applied on the last day of the first daily moving average calculation for each set. The return was linked to the JSE203 – Alsi TRI for a pure equity return and the JSE – Albi for a pure bond return.

Portfolio 5 (PMTEQ5)

In the construction of PMEQ5, different daily moving averages were applied as well as variable transaction costs. A lump sum investment of R100 000 was applied on Day 1

in a pure equity portfolio where after the SAVI as market timing indicator was applied to alternate between a pure equity portfolio and a pure bond portfolio, with the application of the different sets of transaction costs. The switch to this investment style applied on the last day of the first daily moving average calculation for each set. The return was linked to the JSE203 – Alsi TRI for a pure equity return and the JSE – Albi for a pure bond return.

4.11. Research Limitations

Although care has been taken during the research design procedure to minimise and exclude possible research restrictions, some limitations and concerns were recognised.

The SAVI was introduced in 2007 with the result that the time series data available covered a period of 2 227 work days, a total of 3 118 actual days or approximately 8.5 years (from 28 February 2007 to 11 September 2015). It is acknowledged that a longer time period in this instance can be considered to be more appropriate for the analysis of stock market trends.

As indicated by Figure 8, the period under review reflected mainly bullish market conditions where the share prices were generally in a growth phase as indicated by the JSE203 – Alsi TRI index line. A bear market existed for a relative short period during the credit crises around October 2008. A time series which includes a number of bear and bull phases are considered to be appropriate for the study of share prices or share indices and this links into the first research limitation.

The ALSI is used comprehensively by researchers because of the convenience of it being freely available. A limitation of the ALSI is that it is skewed towards mining and resource companies (Bhana, 2010) and the use of the JSE203 – Alsi TRI is a possible limitation in the methodology used.

Initial transaction costs when entering the equity or bond markets for the first time have been ignored as part of this study. It is assumed that these costs would be equal for all of the portfolios. It is acknowledged however that the inclusion of these costs at the onset of the initial lump sum investment for a pure equity or bond portfolio should be considered.

Microsoft Excel has been extensively used as the research and statistic tool and the impact of possible processing errors are acknowledged. User operating skills,

consistent application of formulas and assumptions and an above average knowledge of Excel is accepted as key in ensuring error free analysis and results. Care has been taken to make sure the data and results are error free.

5. RESULTS

This chapter reviews the results and present the data analysis in the order of the research questions and is made up of six parts.

It starts with a description of the data obtained, in essence defining the JSE indices that were used. The coding used in Excel to indicate the key variables are presented in tabular form.

In the second part, a brief interpretation on the reliability and validity of the data is conducted followed by a discussion of the results.

The third part of this chapter compares the investment returns of a pure investment in equities to the returns for a pure investment in bonds. The time series returns are graphically presented with line graphs for the period under review. This section answers research question one.

The fourth part answers the central research question and evaluates the effectiveness of the SAVI Top 40 as a market timing tool. Research question two will be answered in this part.

Part five evaluates the impact of transaction costs on the portfolios created in question two and compares the outcome of each investment style inclusive of transaction costs.

In part six, a brief summary is given of the results which act as base for the findings and theoretical discussion in chapter six.

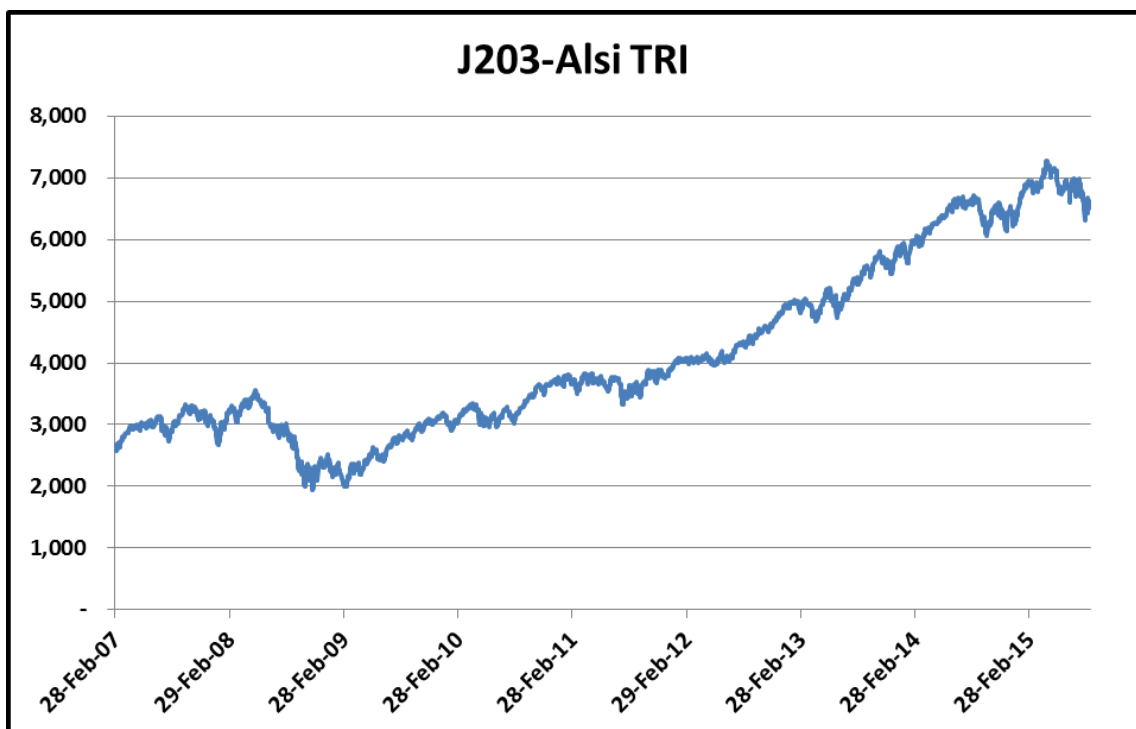
5.1. Data Description

The data sample consisted of the daily market indicators for the JSE203 – Alsi TRI (equity), the JSE – Albi (bond) and the SAVI Top 40 (implied volatility) indices and was downloaded from the INET BFA database. The data was reviewed for the period between 28 February 2007 and 11 September 2015.

5.1.1. JSE203 – Alsi TRI

The JSE203 – Alsi TRI is also commonly known as the all share index and is one of five indices that make up the headline indices on the Johannesburg Stock Exchange (JSE). This index represents approximately 99% of the full market capitalisation of all eligible equities listed on the main board of the JSE. The total number of companies included in the index has recently been estimated at between 160 and 165. The index is reviewed quarterly in March, June, September and December of each year. It is important to note that any cash distributions, such as dividends, are reinvested into the index and this is indicated by the “TRI” acronym. It can be seen from Figure 10 that the index has been increasing steadily from 2 670 points on the 28th of February 2007 to 6 520 points on the 11th of September 2015, the period under review. The total period can be classified as a bull market with the exception of the bearish market conditions that existed in the period before and after 28 February 2009 when the index reached a low of 1 945 points on the 20th of November 2008. This coincided with the credit crises in the United States.

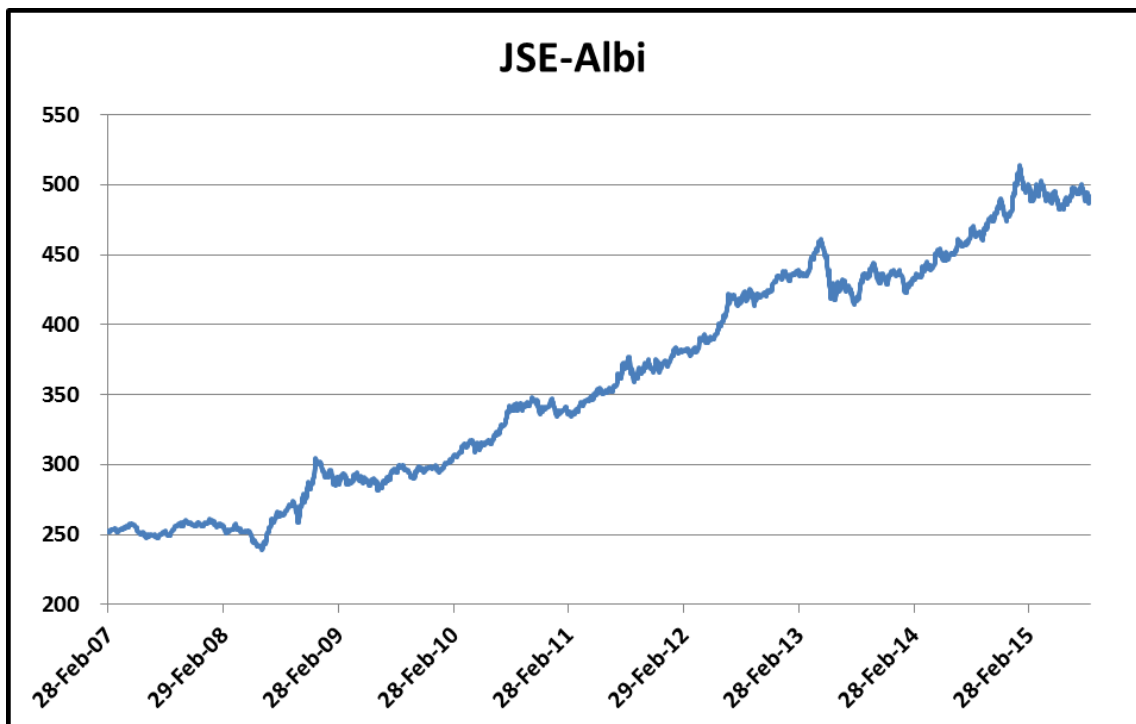
Figure 10: The JSE203 – Alsi TRI Index for the period 28 February 2007 to 11 September 2015



5.1.2. JSE – Albi

The Albi index is a compounded index comprising of the top 20 vanilla bonds categorised dually by liquidity and market capitalisation. The index includes bonds from across the full series of maturities in the bond market and serves as a valuable measure of the daily movement in the bond market. It can be seen from Figure 11 that the index has been increasing steadily from 253 points on the 28th of February 2007 to 492 points on the 11th of September 2015, the period under review. The bond index reached a low of 239 points on 1 July 2008 which coincides with the first three quarters of 2008 where the prime overdraft rate was the highest for the period under review.

Figure 11: The JSE – Albi Index for the period 28 February 2007 to 11 September 2015

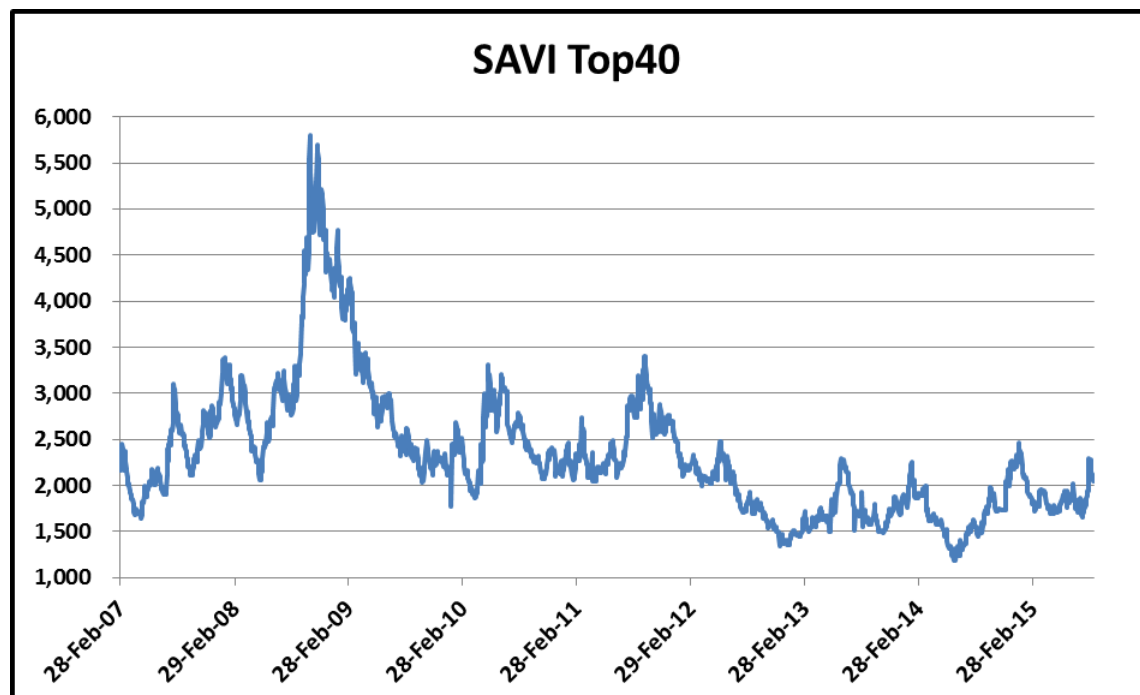


5.1.3. SAVI Top 40

The South African Volatility Index (SAVI) Top 40 is a forecast of equity market risk in South Africa and modelled on the VIX, a common measure for the volatility of the S&P 500. It is not a tradable product, but a transparent indicator of market sentiment. The SAVI Top 40 enables investors to gauge fear and market sentiment relating to the local equity market. In essence, the SAVI constructs a forward-looking index that provides a daily forecast of market volatility in three months' time. It is calculated using implied volatilities obtained daily from particular Top 40 options.

As can be seen from Figure 12, the SAVI has been relatively steady over the period under review with the only big spike during the credit crises in the US which occurred during the last quarter of 2008. As a consequence, the SAVI reached a high of 5 797 index points on 27 October 2008, highlighting the volatile market conditions. At the start of the period under review, 28 February 2007, the SAVI measured 2 160 index points and ended on 2 099 points on the 11th of September 2015.

Figure 12: The SAVI Top 40 Index for the period 28 February 2007 to 11 September 2015



5.1.4. Data coding in Excel

Specific coding has been developed in Excel to distinguish between the different variables and data sets that have been used. Table 4 below gives a summary of the coding used as well as an explanation of its meaning.

Table 4: Excel coding explained

Code	Explanation	Unit of measure
PBO1	100% Bond portfolio as per JSE - Albi	Rands (ZAR) & %
PBQ2	100% Equity portfolio as per JSE203 – Alsi TRI	Rands (ZAR) & %
PMTMA3	Market timing portfolio including transaction costs using the SAVI as indicator to switch between a 100% equity and 100% bond portfolio	Rands (ZAR) & %
PMTBO4	Same as PMTMA3 but with an initial investment in bonds only until the last day of the first moving average application	Rands (ZAR) & %
PMTEQ5	Same as PMTMA3 but with an initial investment in bonds only until the last day of the first moving average application	Rands (ZAR) & %
MA10 – MA150	Different daily moving averages applied to the SAVI index, starting with a 10 day moving average (MA10) and ending with a 150 day moving average (MA150)	Work days
PMTMA3 (%) PMTBO4 (%) PMTEQ5 (%)	Same as above portfolios with the % in brackets indicating the level of transaction costs that was applied	Rands (ZAR) & %
B	Indicates that the investment should be in bonds	Indicator only
E	Indicates that the investment should be in equity	Indicator only
Sw	Indicates that the investment should switch from equity to bonds or vice versa	Indicator only
St	Indicates that the investment should remain where it is, stay	Indicator only

5.2. Reliability and Validity of Data

An evaluation of the data has been done as listed in section 4.3 and Table 3 and the results are set out in Table 5 below. The evaluation interrogates the three indices concerned, the JSE203 – Alsi TRI, the JSE – Albi and the SAVI Top 40.

Table 5: Reliability and validity of the data

VALIDITY of DATA	
Threat	Evaluation
Subject selection	Data population are official indices of the JSE representing the equity, bond and implied volatility markets. Available on the INET BFA database and widely used by investors and businesses
History	Time series data is used and the aim of the indices is to track and display the impact of events during this period
Testing	Data collection process is sound with little or no possibility of errors. Possible data error found in SAVI Top 40 and excluded from dataset – see section 4.10.1
Mortality	Consistency in the official setup and calculation of these indices ensure that the impact of subject losses are minimal
Ambiguity – causal direction	Clear explanation and indication on direction flow of cause and effect
RELIABILITY of DATA	
Threat	Evaluation
Subject error	Limitation acknowledged with time period of data available from SAVI Top 40 – see section 4.11. Impact regarded as low
Subject bias	See subject selection
Observer error	Possibility acknowledged of processing errors in Excel. High impact
Observer bias	Specific, industry verified data sets with limited or no opportunity for observer bias in this research application

5.3. Equity return versus Bond return – Research Question 1

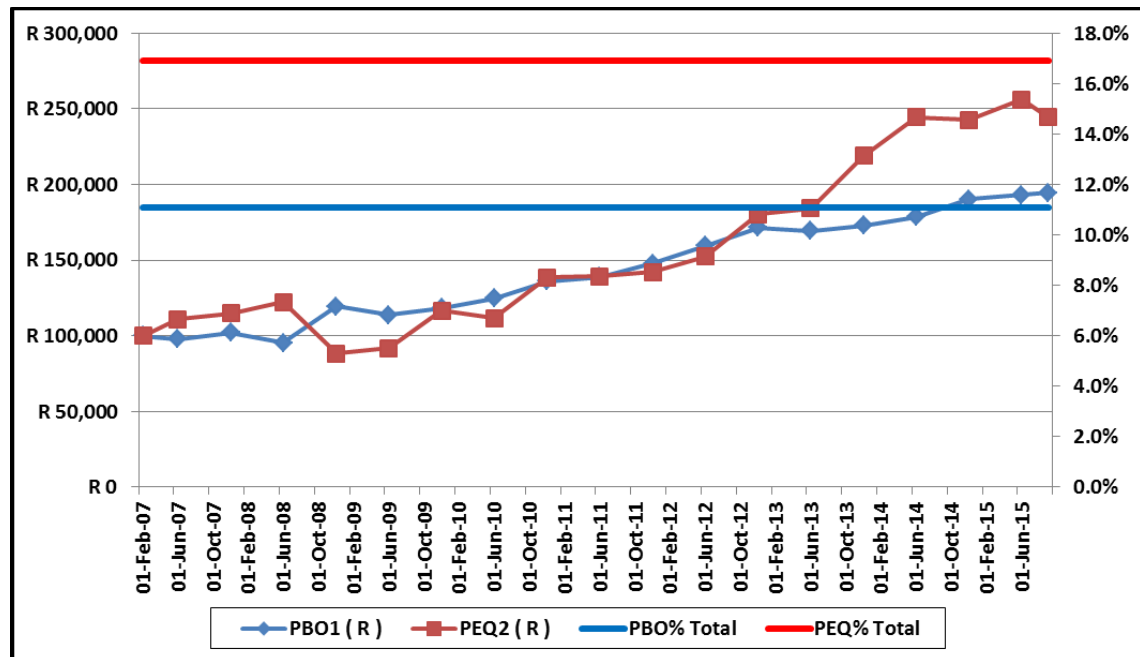
The investment returns of a pure investment in equities are compared to the returns for a pure investment in bonds. The time series returns are graphically presented with line graphs for the period under review. This section answers research question one.

The investment returns of Portfolios PBO1 and PEQ2 are compared with an initial investment of R100 000.00 on Day 1 (28 February 2007) with an ending date of 11 September 2015. The daily returns are based on the JSE indices for bonds (JSE Albi) and equities (JSE203 – Alsi TRI) for the period under review. The cumulative returns as well as the total percentage return of each investment over the time period is presented in Table 6 and Figure 13. The cumulative monetary returns are measured on the last day of every year and then again halfway through each year. The percentage returns as presented are annualised for the total period under review.

Table 6: Cumulative returns for PBO1 and PEQ2

PBO1 vs PEQ2	PBO1 (R)	PEQ2 (R)	PBO% Total	PEQ% Total
28-Feb-07	R 100,000	R 100,000	11.1%	16.9%
29-Jun-07	R 97,895	R 110,935	11.1%	16.9%
31-Dec-07	R 102,098	R 114,867	11.1%	16.9%
30-Jun-08	R 95,278	R 122,192	11.1%	16.9%
31-Dec-08	R 119,428	R 88,178	11.1%	16.9%
30-Jun-09	R 113,622	R 91,787	11.1%	16.9%
31-Dec-09	R 118,247	R 116,512	11.1%	16.9%
30-Jun-10	R 124,882	R 111,781	11.1%	16.9%
31-Dec-10	R 135,936	R 138,630	11.1%	16.9%
30-Jun-11	R 139,013	R 139,326	11.1%	16.9%
30-Dec-11	R 147,898	R 142,189	11.1%	16.9%
29-Jun-12	R 159,260	R 152,204	11.1%	16.9%
31-Dec-12	R 171,588	R 180,127	11.1%	16.9%
28-Jun-13	R 169,227	R 184,185	11.1%	16.9%
31-Dec-13	R 172,680	R 218,736	11.1%	16.9%
30-Jun-14	R 178,502	R 244,483	11.1%	16.9%
31-Dec-14	R 190,204	R 242,529	11.1%	16.9%
30-Jun-15	R 193,153	R 256,187	11.1%	16.9%
11-Sep-15	R 194,461	R 244,186	11.1%	16.9%

Figure 13: Cumulative monetary return and total percentage return for PBO1 and PEQ2



5.4. SAVI Top 40 as market timing tool – Research Question 2

An evaluation of the SAVI Top 40 as a market timing tool has been conducted and the results are presented in Table 7 and Figure 14. Transaction costs are ignored in this section and the overriding objective is to answer the central research question, research question two.

The daily moving average (MA) of the SAVI Index was calculated for the period under review as applied by Babikir, Gupta, Mwabutwa and Owusu-Sekyere (2012) in their research on the relevance of structured breaks to stock return volatility in South Africa. Fifteen different daily moving averages were calculated, starting with a 10 day moving average and ending with a 150 day moving average with ten day intervals between each. A model was developed in Excel which indicated when the different daily moving average lines would intercept the original SAVI index line.

5.4.1. Lump Sum Investment - Delayed

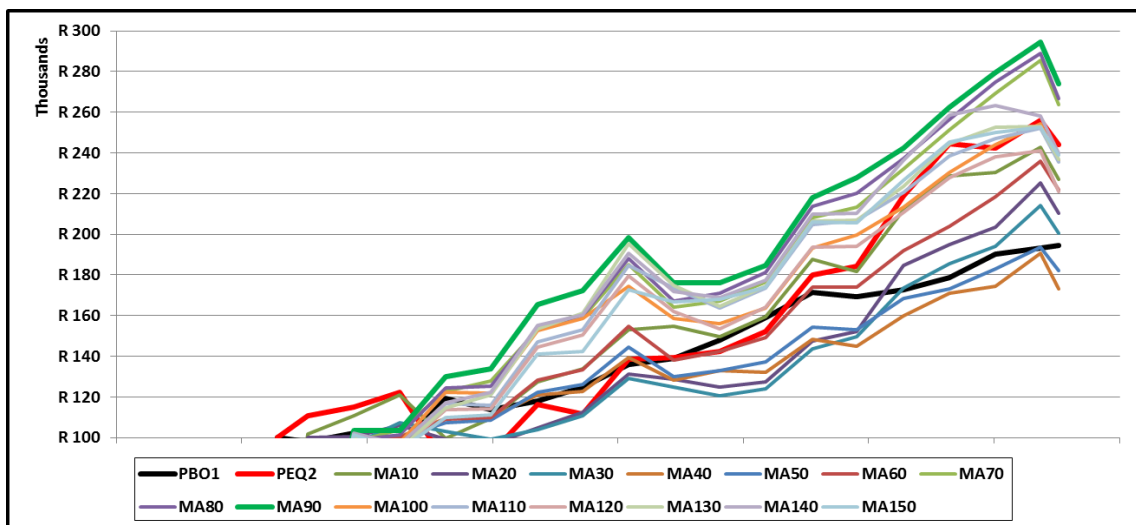
A lump sum investment of R100 000 was applied on the last day of the first daily moving average calculation for each set. Using the SAVI as market timing indicator, the investment was swopped between a pure equity portfolio and a pure bond portfolio. Again, the return was linked to the JSE203 – Alsi TRI for a pure equity return and the

JSE – Albi for a pure bond return. The investment returns for the different SAVI “moving average” portfolios (MA10 – MA150) were compared to the original portfolios, PBO1 and PEQ2.

Table 7: Cumulative returns for “moving average” portfolios using the SAVI Top 40 as market timing tool (zero transaction costs and return in Rand, thousands)

R'000	PBO1	PEQ2	MA10	MA20	MA30	MA40	MA50	MA60	MA70	MA80	MA90	MA100	MA110	MA120	MA130	MA140	MA150
28-Feb-07	R 100	R 100	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
29-Jun-07	R 98	R 111	R 102	R 100	R 97	R 96	R 96	R 97	R 98	R 98	R 0	R 0	R 0	R 0	R 0	R 0	R 0
31-Dec-07	R 102	R 115	R 111	R 100	R 97	R 96	R 97	R 96	R 98	R 99	R 104	R 99	R 101	R 100	R 100	R 102	R 102
30-Jun-08	R 95	R 122	R 121	R 106	R 107	R 100	R 100	R 100	R 104	R 101	R 104	R 97	R 94	R 94	R 95	R 97	R 94
31-Dec-08	R 119	R 88	R 100	R 99	R 103	R 109	R 108	R 109	R 123	R 124	R 130	R 122	R 117	R 114	R 115	R 117	R 110
30-Jun-09	R 114	R 92	R 109	R 97	R 99	R 110	R 109	R 110	R 128	R 125	R 134	R 122	R 116	R 114	R 121	R 122	R 111
31-Dec-09	R 118	R 117	R 127	R 105	R 104	R 121	R 123	R 128	R 153	R 154	R 166	R 153	R 147	R 145	R 153	R 155	R 141
30-Jun-10	R 125	R 112	R 134	R 112	R 111	R 123	R 126	R 134	R 159	R 160	R 172	R 159	R 153	R 150	R 161	R 160	R 142
31-Dec-10	R 136	R 139	R 153	R 131	R 129	R 139	R 144	R 155	R 185	R 188	R 198	R 175	R 185	R 179	R 195	R 191	R 173
30-Jun-11	R 139	R 139	R 155	R 129	R 125	R 128	R 130	R 138	R 164	R 167	R 176	R 159	R 173	R 162	R 175	R 172	R 167
30-Dec-11	R 148	R 142	R 150	R 125	R 121	R 133	R 133	R 142	R 167	R 171	R 176	R 156	R 164	R 153	R 165	R 169	R 168
29-Jun-12	R 159	R 152	R 160	R 127	R 124	R 132	R 137	R 149	R 176	R 181	R 185	R 164	R 174	R 164	R 175	R 178	R 174
31-Dec-12	R 172	R 180	R 188	R 148	R 144	R 148	R 154	R 174	R 208	R 214	R 218	R 193	R 205	R 194	R 207	R 210	R 206
28-Jun-13	R 169	R 184	R 182	R 152	R 150	R 145	R 153	R 174	R 213	R 220	R 228	R 200	R 207	R 194	R 207	R 210	R 206
31-Dec-13	R 173	R 219	R 212	R 185	R 173	R 160	R 168	R 192	R 232	R 237	R 243	R 213	R 221	R 211	R 224	R 237	R 227
30-Jun-14	R 179	R 244	R 229	R 195	R 186	R 171	R 173	R 204	R 251	R 256	R 262	R 231	R 239	R 228	R 245	R 259	R 245
31-Dec-14	R 190	R 243	R 231	R 204	R 194	R 174	R 183	R 219	R 269	R 275	R 279	R 244	R 247	R 238	R 253	R 263	R 250
30-Jun-15	R 193	R 256	R 243	R 225	R 214	R 191	R 194	R 236	R 285	R 289	R 294	R 254	R 252	R 241	R 253	R 258	R 253
11-Sep-15	R 194	R 244	R 227	R 210	R 200	R 173	R 182	R 222	R 264	R 267	R 274	R 236	R 236	R 221	R 237	R 240	R 239

Figure 14: Cumulative returns for “daily moving average” portfolios using the SAVI Top 40 as market timing tool



5.4.2. “Pure” Style combined with “Market Timing” Style

A lump sum investment of R100 000 was applied at the start of the period under review (28 February 2007) in either a pure equity or a pure bond portfolio. Daily moving average calculations of the SAVI Top 40 was used to develop a “market timing” investment strategy. Using the SAVI as market timing indicator, the investment was swapped between a pure equity portfolio and a pure bond portfolio in the absence of transaction costs. Again, the return was linked to the JSE203 – Alsi TRI for a pure equity return and the JSE – Albi for a pure bond return. The results are presented in Table 9 in terms of the return percentage for each portfolio for the period under review.

5.5. Impact of transaction costs on market timing with the SAVI Top 40 – Research Question 3

The impact of different levels of transaction costs are analysed on the portfolios created for research question two. Transaction costs of 0.25%, 0.50%, 0.75% and 1.0% have been applied whenever an investment switch or trade is made, that is, from a pure equity portfolio to a pure bond portfolio and *vice versa*. The use of the SAVI Top 40 as market timing tool, inclusive of transaction costs, are evaluated to determine the level of transaction costs at which this investment style would not yield superior results to the PBO1 and PEQ2 (pure bond and pure equity portfolios).

Different daily moving averages of the SAVI Top 40 are also applied with the inclusion of the different levels of transaction costs. It is acknowledged that transaction costs do apply in the investment world. It is an expense that is incurred when securities are bought or sold and consists of various commissions and other fees. It is used in the calculation of net returns. It diminishes returns over the long run and is a key determinant in this study.

The same methodology that was used in section 5.3 to section 5.4 is applied to present the impact of transaction costs on the different portfolios. See Tables and Figures below.

Table 8: Portfolio PMTMA3 – Impact of transaction costs

PMTMA3 - Market Timing Portfolio - Lump sum on 1st MA					
Portfolio 3	PMTMA3 (0.0%)	PMTMA3 (0.25%)	PMTMA3 (0.5%)	PMTMA3 (0.75%)	PMTMA3 (1.0%)
PBO1	11.1%	11.1%	11.1%	11.1%	11.1%
PEQ2	16.9%	16.9%	16.9%	16.9%	16.9%
MA10	14.9%	(0.4%)	(7.0%)	(9.7%)	(10.9%)
MA20	13.0%	2.7%	(3.4%)	(6.9%)	(9.0%)
MA30	11.9%	2.4%	(3.3%)	(6.7%)	(8.8%)
MA40	8.7%	1.6%	(3.1%)	(6.1%)	(8.1%)
MA50	9.8%	3.3%	(1.3%)	(4.5%)	(6.8%)
MA60	14.7%	8.3%	3.4%	(0.3%)	(3.1%)
MA70	19.8%	12.9%	7.4%	3.2%	(0.2%)
MA80	20.3%	13.5%	8.1%	3.8%	0.5%
MA90	21.2%	14.5%	9.1%	4.8%	1.3%
MA100	16.7%	10.9%	6.3%	2.6%	(0.4%)
MA110	16.7%	11.2%	6.7%	3.1%	0.2%
MA120	15.0%	9.5%	5.0%	1.5%	(1.3%)
MA130	17.0%	11.2%	6.5%	2.8%	(0.3%)
MA140	17.5%	11.3%	6.4%	2.5%	(0.6%)
MA150	17.4%	11.5%	6.7%	2.9%	(0.2%)

Figure 15: Portfolio PMTMA3 – Impact of transaction costs on investment return

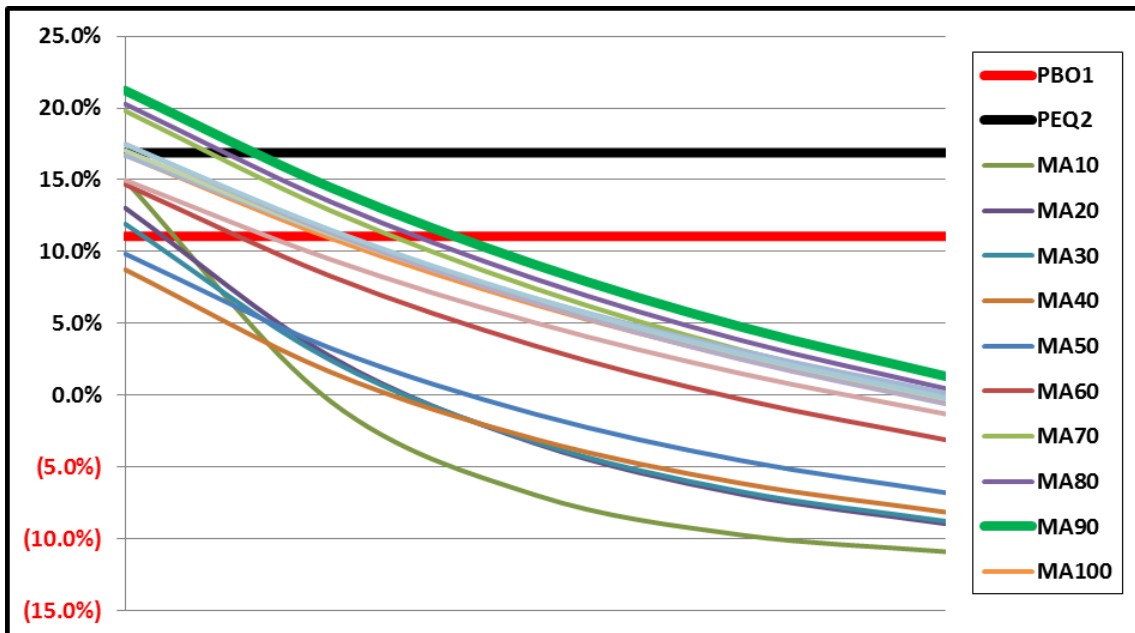


Table 9: Portfolio PMTBO4 – Impact of transaction costs

PMTBO4 - Market Timing Portfolio - Day 1 Bonds then MT from 1st MA					
Portfolio 4	PMTBO4 (0.0%)	PMTBO4 (0.25%)	PMTBO4 (0.5%)	PMTBO4 (0.75%)	PMTBO4 (1.0%)
PBO1	11.1%	11.1%	11.1%	11.1%	11.1%
PEQ2	16.9%	16.9%	16.9%	16.9%	16.9%
MA10	15.0%	(0.4%)	(6.9%)	(9.7%)	(10.9%)
MA20	12.8%	2.6%	(3.4%)	(6.8%)	(8.9%)
MA30	11.8%	2.4%	(3.2%)	(6.6%)	(8.7%)
MA40	8.7%	1.7%	(3.0%)	(6.0%)	(8.0%)
MA50	10.0%	3.4%	(1.1%)	(4.3%)	(6.6%)
MA60	14.7%	8.4%	3.6%	(0.1%)	(2.9%)
MA70	19.1%	12.4%	7.1%	3.0%	(0.2%)
MA80	19.4%	12.9%	7.7%	3.6%	0.4%
MA90	19.9%	13.6%	8.4%	4.4%	1.1%
MA100	15.6%	10.2%	5.8%	2.3%	(0.5%)
MA110	15.4%	10.3%	6.1%	2.7%	(0.1%)
MA120	13.9%	8.7%	4.6%	1.3%	(1.4%)
MA130	16.0%	10.5%	6.1%	2.6%	(0.3%)
MA140	16.0%	10.3%	5.8%	2.2%	(0.7%)
MA150	16.3%	10.8%	6.3%	2.7%	(0.1%)

Figure 16: Portfolio PMTBO4 – Impact of transaction costs on investment return

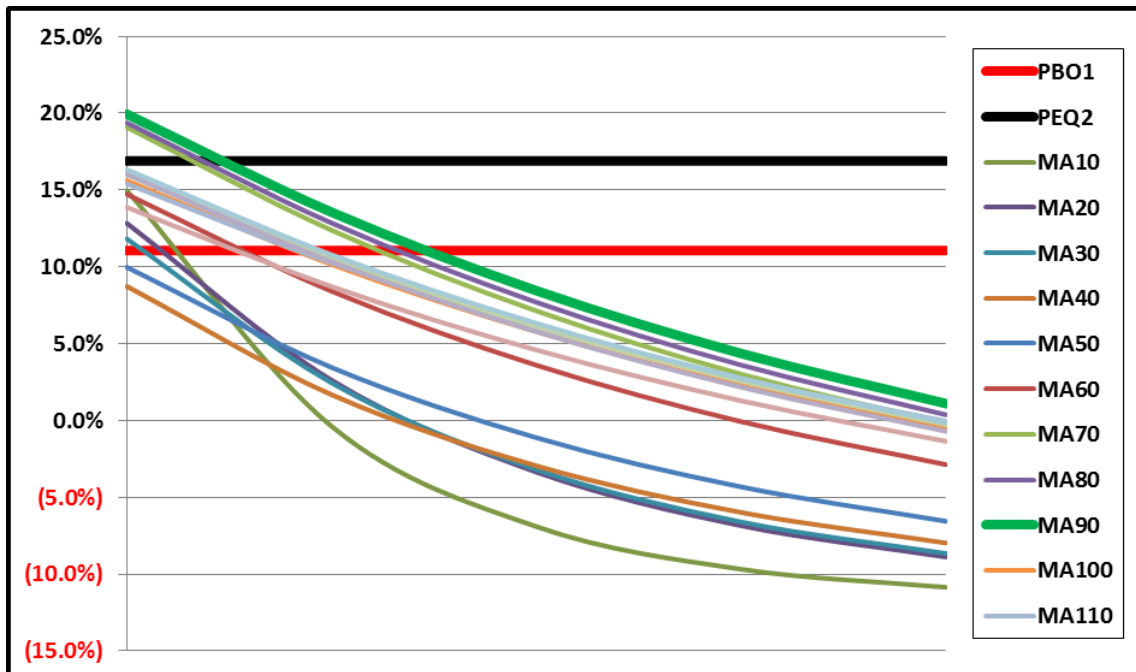
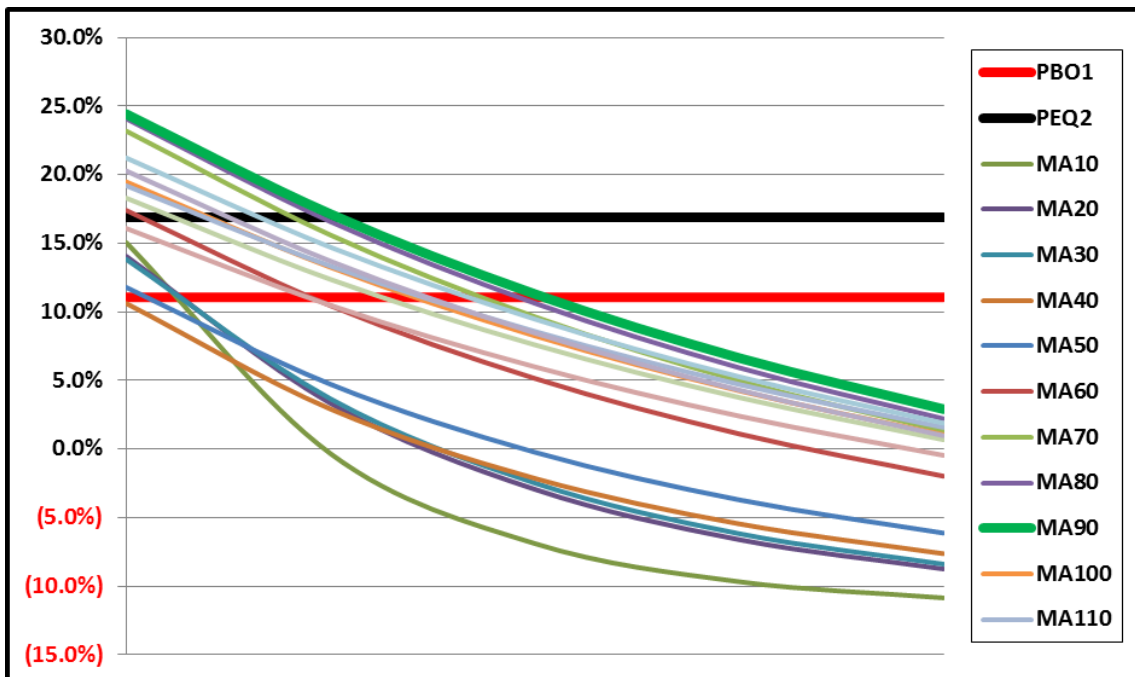


Table 10: Portfolio PMTEQ5 – Impact of transaction costs

PMTEQ5 - Market Timing Portfolio - Day 1 Equity then MT from 1st MA					
Portfolio 5	PMTEQ5 (0.0%)	PMTEQ5 (0.25%)	PMTEQ5 (0.5%)	PMTEQ5 (0.75%)	PMTEQ5 (1.0%)
PBO1	11.1%	11.1%	11.1%	11.1%	11.1%
PEQ2	16.9%	16.9%	16.9%	16.9%	16.9%
MA10	15.1%	(0.3%)	(6.9%)	(9.7%)	(10.9%)
MA20	14.1%	3.3%	(2.9%)	(6.6%)	(8.7%)
MA30	13.8%	3.7%	(2.5%)	(6.2%)	(8.4%)
MA40	10.6%	2.9%	(2.1%)	(5.5%)	(7.6%)
MA50	11.8%	4.7%	(0.2%)	(3.7%)	(6.1%)
MA60	17.4%	10.4%	5.1%	1.1%	(2.0%)
MA70	23.2%	15.6%	9.6%	5.0%	1.3%
MA80	24.1%	16.6%	10.6%	5.9%	2.2%
MA90	24.4%	17.1%	11.3%	6.6%	2.9%
MA100	19.5%	13.2%	8.3%	4.2%	1.0%
MA110	19.2%	13.3%	8.6%	4.7%	1.6%
MA120	16.1%	10.5%	6.0%	2.4%	(0.5%)
MA130	18.3%	12.4%	7.6%	3.8%	0.7%
MA140	20.3%	13.7%	8.5%	4.3%	1.0%
MA150	21.2%	14.7%	9.5%	5.3%	1.9%

Figure 17: Portfolio PMTEQ5 – Impact of transaction costs on investment return



As can be seen from Tables 8 to 10 and Figures 15 to 17, the impact of transaction costs is quite significant, especially at levels between 0.5% and 1.0%.

5.6. Conclusion

A discussion and interpretation of the research data, methodology used as well as the provisional results have been presented in tabular and graphical format in this chapter. Below is a brief summary of the main themes and outcomes.

The JSE203 – Alsi TRI, JSE – Albi and SAVI Top 40 are official indices of the JSE and the reliability and validity of the data pertaining to these indices have been verified and accepted as suitable for this research. It should be noted that no statistical testing was applied to the data and that all processing and analysis of the data was done in Excel. This might be a limitation of this research and can be an area for future research.

The independent equity and bond portfolios that were created clearly indicated that the equity portfolio outperformed the bond portfolio for the period under review. This was in line with historical results where the returns between pure equity and bond investments were compared. Research question one was answered by this analysis.

The suitability of the SAVI Top 40 as a market timing tool have been evaluated with the application of different daily moving averages of the SAVI. In response to research question two, it has been concluded that the SAVI can be used as a market timing tool to optimise investment returns.

With the introduction of transaction costs in section 5.5 and as per research question three, the research has indicated that above average returns can still be achieved at lower levels of transaction costs. The use of the SAVI as market timing indicator, inclusive of transaction costs is suggested.

An in depth discussion of the results in terms of the research theory and research questions will follow in chapter six.

6. DISCUSSION OF RESULTS

6.1. Introduction

This chapter discusses the results obtained from the data analysis in accordance with the relevant literature and the research questions. The findings are explained in terms of the theory base used in the literature review and in terms of general investment and portfolio theory.

This chapter is designed to follow on the theme of Chapter five by (1) evaluating the return from a pure bond portfolio to the return from a pure equity investment, employing a buy and hold strategy, (2) assessing the effectiveness of the SAVI Top 40 index as a market timing tool by applying different daily moving averages of the SAVI, (3) investigating the effect of transaction costs on the returns of the different portfolios that were constructed. The chapter is concluded with a summary of the research findings which will form the basis for the research conclusion in Chapter seven.

6.2. Equities versus Bonds

As evident from Chapter five (see Table 6 and Figure 13), an initial investment of R100 000 on the 28th of February 2007 in a portfolio comprising of bonds only (PBO1), grows to R194 460 by 11 September 2015. This equates to a total net return of R94 461 over the period or an annualised return of 11.1%. The same investment in a pure equity portfolio (PEQ2) yields a net return of R144 186 or 16.9%.

This indicates that for the period under review, a buy and hold strategy in equities will outperform the same investment in a pure bond portfolio by 5.8% on an annualised return basis. These findings seems to be in line with the research noted in Section 2.5 where it was indicated by the article, “Long term real investment returns” (2015), that equities on the JSE outperformed bonds over the past 20 years. This is of particular importance for the 10 year period ending at the end of 2014, which in essence coincides with the time series investigated by this research paper.

Another important observation is the fact that the trending of the time series lines for the two portfolios is closely linked over the period. The overall returns generated by the portfolios are in fact closely related over time. This concurs with studies done by Bekaert et al. (2010) which indicated the close linkage of equity and bond returns for the US market.

Ang et al. (2012) developed a research model which indicated a 4.4% difference in returns between equity and stocks over a ten year period. This is closely associated with the return of the equity portfolio in this research, which outperformed the bond portfolio by 5.8% over a period of 8.5 years. This would be the typical case in a bull market (Droms, 1989) where stocks would outperform equities in the long run. As per Figure 8, the period under consideration constituted a typical bull market.

Transaction costs associated with the construction of these portfolios have been disregarded due to the assumption that these costs would be very similar. It will be a once-off cost due to the fact that a buy and hold strategy is employed over the investment period.

Investors can definitely benefit by applying this buy and hold strategy in the equity market based on this findings.

6.3. Research Question 1

It can be concluded from the above that research question one has been answered and that the returns from an investment portfolio in bonds do not outperform the returns from a buy and hold strategy in the equity market for the period under review.

It can further be concluded that the period under review exhibited a bullish market as indicated by the index time series lines in Figure 8.

6.4. Market Timing

Fifteen different daily moving averages of the SAVI Top 40 was calculated in order to transform the SAVI from a pure implied volatility index to a market timing “tool” as suggested by Babikir et al. (2012). It started with a 10 day moving average, with ten day intervals in between and ending with a 150 day moving average, in essence creating fifteen different investment portfolios.

6.4.1. Daily Moving Average Portfolios

Two sets of “daily moving average” portfolios was created with the main differentiator being the timing of the initial investment as well as the initial investment strategy that was applied. The results and findings relating to these portfolios are discussed in the sections that follow.

6.4.1.1. Delayed Investment

A lump sum of R100 000 was invested in each of the fifteen “moving average” (MA) portfolios that was constructed. It is important to note that the investment was done on the last day of the first moving average calculation period for each portfolio set, so for example the R100 000 investment in the 10 day “moving average” portfolio (MA10) was done on the 13th of March 2007, 10 work days after the start of the research period, which was on the 28th of February 2007.

The original SAVI index acted as a market timing indicator, signalling when an investment swop should be implemented (between a pure equity and a pure bond portfolio). The results of the different portfolio returns are presented in Table 7 and Figure 14 in section 5.4.1. The performance of each portfolio (PMTMA3) was ranked in terms of the annualised investment return over the investment period for each portfolio (that is from the date of the initial investment till the end date, 11 September 2015). It should be noted that the investment period for each MA portfolio was different and that the total number of days for each portfolio was used in the calculation of the annualised returns. Transaction costs have been excluded in the calculation of the net returns for each portfolio. Table 11 below shows the returns and ranking of the portfolios.

Table 11: Returns and ranking of the MA portfolios (PMTMA3) – Delayed Investment

PMTMA3	Ann Return	Cum Ret	WDays in Eq	Rank (%Ret)
MA90	21.2%	R 273,866	55.5%	1
MA80	20.3%	R 266,942	54.8%	2
MA70	19.8%	R 263,746	54.6%	3
MA140	17.5%	R 239,985	57.4%	4
MA150	17.4%	R 238,972	56.9%	5
MA130	17.0%	R 237,001	56.7%	6
PEQ2	16.9%	R 244,186	100.0%	7
MA100	16.7%	R 236,420	55.6%	8
MA110	16.7%	R 235,627	55.7%	9
MA120	15.0%	R 220,987	55.9%	10
MA10	14.9%	R 227,000	55.0%	11
MA60	14.7%	R 221,907	54.8%	12
MA20	13.0%	R 210,316	54.7%	13
MA30	11.9%	R 200,406	54.3%	14
PBO1	11.1%	R 194,461	0.0%	15
MA50	9.8%	R 182,157	54.0%	16
MA40	8.7%	R 173,307	53.7%	17

It can be seen from the returns that PEQ2 and PBO1 are ranked number seven and fifteen respectively out of a total of seventeen investment portfolios. Portfolio MA90 with a 21.2% annual return and a net return of R173 866 over the period is ranked as the number one performing fund. Portfolio MA40 has been ranked as the worst performing fund with an annualised return of 8.7% or R73 307 over the period. It can also be concluded that six out of the fifteen MA portfolios outperformed the pure equity portfolio (PEQ2) whilst thirteen of the MA's outperformed the pure bond portfolio (PBO1).

The theory applied in terms of asset allocation for the above portfolios corresponds to the research done by Gao et al. (2012) where market timing refers to the investment policy whereby investors intentionally shift the fund entirely between risky and risk-free assets after observing and forecasting market conditions, in the absence of transaction costs. It is concluded that effective market timing skills were applied that yielded returns better than that of a traditional buy and hold strategy – see MA130, MA150, MA140, MA70, MA80, MA90.

The results tie in with the strategy suggested by Che et al. (2012) where individual investors will invest in bonds when the stock market is volatile and in equity when the equity market is likely to outperform the bond market. The period under review is typical of a bull market and it can be seen that all MA portfolios spend between 53% to 58% days in the equity market.

6.4.1.2. “Market timing” Investment Style

A lump sum of R100 000 was invested at the start of the period under review (28 February 2007) in either a pure equity or a pure bond portfolio – the same as for PBO1 and PEQ2. The daily moving average calculations of the SAVI Top 40 that was used in 6.3.1 was again applied as market timing indicator, to swop between a pure equity portfolio and a pure bond portfolio, in the absence of transaction costs. The main difference between the portfolios created in 6.3.1 and these, are the fact that the initial investment was now done on Day 1, and it was kept in a pure bond or pure equity portfolio until the last day of the first moving average calculation, after which a “market timing” strategy was followed using the SAVI to alternate between equity and bonds. As an example, for PMTBO4, using a daily moving average for the SAVI of ten days (MA10), the investment of R100 000 would have been done on the 28th of February in a pure bond portfolio and then changed after ten work days to a “market timing” portfolio, from the 13th of March 2007. The same methodology applied for the creation of PMTEQ5, except that the initial investment would be in a pure equity portfolio on the 28th of February 2007. Two portfolio sets were created consisting of fifteen moving average (MA) portfolios each. See Tables 12 and 13 below.

Table 12: Returns and ranking of the MA portfolios (PMTBO4) – Investment in Bonds followed by MT Investment

PMTBO4	Ann Return	Cum Ret	WDays in Eq	Rank (%Ret)
MA90	19.9%	R 270,234	53.3%	1
MA80	19.4%	R 265,380	52.9%	2
MA70	19.1%	R 262,905	52.9%	3
PEQ2	16.9%	R 244,186	100.0%	4
MA150	16.3%	R 239,437	53.1%	5
MA140	16.0%	R 236,867	53.8%	6
MA130	16.0%	R 236,533	53.3%	7
MA100	15.6%	R 233,285	53.1%	8
MA110	15.4%	R 231,502	52.9%	9
MA10	15.0%	R 227,774	54.8%	10
MA60	14.7%	R 225,721	53.3%	11
MA120	13.9%	R 218,467	52.9%	12
MA20	12.8%	R 209,601	54.2%	13
MA30	11.8%	R 200,960	53.6%	14
PBO1	11.1%	R 194,461	0.0%	15
MA50	10.0%	R 185,150	52.8%	16
MA40	8.7%	R 174,517	52.7%	17

It can be seen from the results in Table 12 that PEQ2 is now ranked the fourth best portfolio (previously ranked seventh) and PBO1 is still ranked fifteenth. MA90 remains the top performer and MA40 the worst. The ranking sequence from the best to the worst performer has basically remained the same (See Table 11), but the average annualised return of the best portfolio has decreased with a few percentage points. This downward trend can be seen in the majority of the portfolios in the top half of the table, whilst there is a slight improvement in the worst performing portfolios.

Three “market timing” portfolios, using the SAVI as indicator, MA90, MA80 and MA70 have still outperformed the pure equity portfolio compared to six in the previous scenario. The effect of the initial lower returns in the bond market are highlighted and this emphasise the market timing strategies proposed by Davies (2013) and Droms (1989), where equity holdings is preferred in bull markets and cash or bonds in bear markets in order to optimise investment returns.

The “switching” strategies employed in these portfolios, concurs with the findings of Shen (2002), which states that a “switching” strategy outperforms the market index by providing higher mean returns.

Table 13: Returns and ranking of the MA portfolios (PMTEQ5) – Investment in Equities followed by MT Investment

PMTEQ5	Ann Return	Cum Ret	WDays in Eq	Rank (%Ret)
MA90	24.4%	R 308,435	59.7%	1
MA80	24.1%	R 305,564	58.6%	2
MA70	23.2%	R 297,931	57.8%	3
MA150	21.2%	R 281,170	64.1%	4
MA140	20.3%	R 273,079	64.1%	5
MA100	19.5%	R 266,262	60.3%	6
MA110	19.2%	R 263,898	60.9%	7
MA130	18.3%	R 256,212	62.9%	8
MA60	17.4%	R 248,544	57.6%	9
PEQ2	16.9%	R 244,186	100.0%	10
MA120	16.1%	R 237,316	61.6%	11
MA10	15.1%	R 228,515	55.5%	12
MA20	14.1%	R 220,038	55.6%	13
MA30	13.8%	R 218,086	55.7%	14
MA50	11.8%	R 200,655	56.3%	15
PBO1	11.1%	R 194,461	0.0%	16
MA40	10.6%	R 190,632	55.5%	17

It follows from the results in Table 13 that the highest annualised returns are achieved by the historically top performing portfolios, by increasing the duration of their investment in equities. The annualised return of MA90 have increased from a previous high of 21.2% to 24.4% as a result of an initial investment in equities for 90 days, followed by the SAVI “market timing” investment style.

This corresponds to findings of Neuhierl et al. (2011) that a simple market timing rule can outperform a buy and hold strategy over a period of time. It can be concluded that the use of the SAVI as market timing indicator as well as the increase in the number of days of pure equity investment, resulted in an increase in the mean annualised return from the sample portfolios tested.

6.5. Volatility and Implied Volatility

The link between market volatility, market timing and the optimising of investment returns as indicated by Ferson (2012) have been highlighted by the research results achieved. In the study of the SAVI Top 40 index as well as the moving average lines

constructed, it can be seen from Figure 8 that the period under review had a distinct volatile period around October 2008, which coincided with the US debt crises. This corresponds to the findings of Walid et al. (2011) and Chinzara (2011) about the influence of macroeconomic factors on stock market volatility. Specific to the South African context is the fact that market volatility in the BRICS countries are significantly impacted by volatility in the US stock market (Kishor et al., 2014).

The methodology used in the application of the different daily moving averages of the SAVI Top 40 index suggests by default that it is used as a market timing indicator and a fear gauge of the stock market. This echoes the sentiments of Lopez et al. (2012) and highlights the inherent risk measurement properties of the models that were applied.

6.6. The SAVI

Research incorporating the SAVI as a subject matter is limited in the South African context and the findings of this research paper will assist in highlighting the SAVI as a market timing and volatility indicator. Investors, fund managers and academics can use these research findings to obtain a better understanding of the SAVI as a subject for future research. It can also assist in the improvement of investment returns, the establishment of new investment styles as well as the development of new investment models. Work done by Kenmoe et al. (2014) should be used in conjunction with this research paper.

The VIX has been researched extensively and many of the findings relating to the VIX can be linked to the SAVI. The negative relationship between changes in the volatility indices and stock returns, as highlighted by Lopez et al. (2012) is not that obvious in the South African context as represented by the SAVI Top 40, JSE203 – Alsi TRI and JSE – Albi index lines in Figure 8. The fact that the period under review was relatively short (8.5 years) could have influenced the findings.

6.7. Research Question 2

Research question two incorporates all aspects of the theory and literature reviewed and forms the base of this study. Question two is the central and most important question and represents ultimate goal of this study, the improvement of investment

returns by using the SAVI as market timing tool to forecast market volatility and to indicate asset allocation.

There are some key words that have been used in the formulation of research question two and the goal of this section was to evaluate each of these words in terms of the theory and results obtained. Validation and justification of these words in terms of the research findings is vital in answering the research question. The key words are as follows: the SAVI; market timing; market volatility; tool; optimise; returns

It can be concluded from the findings in sections 6.4 to 6.6 that the SAVI can be used as a market timing tool to optimise investment returns in times of market volatility.

6.8. Transaction Costs

The importance of transaction costs in the buying or selling of securities is a definite determining factor in the calculation of net investment returns. The magnitude and frequency of transactions over the time period will determine the total amount of transaction costs and ultimately the impact on investment returns.

Transactions costs have been included as part of the methodology used to investigate research question three. The effectiveness of the investment strategy proposed by research question two will be put to the test in a realistic and real life situation where transaction costs cannot be ignored. This coincides with the proposition by Strugnell et al. (2011) that some trading strategies might become ineffective if transaction costs are taken into account.

The cost/benefit relationship between transacting and the associated costs should be considered as proposed by Garleanu et al. (2013). The intention of research question three is to do exactly this.

6.8.1. Results

The impact of different levels of transaction costs were calculated and analysed for the portfolios created in research question two. Transaction costs of 0.25%, 0.50%, 0.75% and 1.0% have been applied whenever an investment switch or trade was made. The chosen range coincides with the transaction fees used by l'Ons et al. (2011) as applied

in the prediction of share performance on the JSE. The same methodology that was used in the construction and evaluation of the portfolios in research question two, were applied in research question three.

As can be seen from Tables 8 to 10 and Figures 15 to 17, the impact of transaction costs is quite significant, especially at levels between 0.5% and 1.0% with the result that most, if not all of the portfolios constructed are yielding returns below that of a pure buy and hold equity portfolio. At transaction costs of 0.5%, only PMTEQ5 at a ninety day moving average (MA90), have annualised returns better than PBO1 – 11.3% versus 11.1%. It is concluded that careful consideration should be given to the impact of transaction costs on investment returns, especially at levels higher than 0.25% of the amount invested.

6.9. Research Question 3

It is concluded that the SAVI can still be used as an effective tool to optimise investment returns should transaction costs be included, but at low levels of transaction costs only. The number of transactions should be limited to decrease the impact on net returns. The effect of a fixed and variable fee structure on the investment skyline should be investigated as this might influence the type of investment style preferred.

6.10. Reliability and Validity of Findings

It is important that the reliability and validity of the research findings are evaluated in terms of the structure proposed by Saunders et al. (2012). See Table 14.

Table 14: Validity of the research findings

VALIDITY of RESEARCH FINDINGS	
Threat	Evaluation
Subject selection	Relevant and widely used data and theory have been applied on a subject that is of importance to investors, fund managers and businesses around the world
History	Time series data is used and the aim of the indices is to track and display the impact of events during this period
Testing	Data collection process is sound; Possibility of processing errors in Excel is noted
Mortality	Consistency in the official setup and calculation of these indices ensure that the impact of subject losses are minimal
Ambiguity – causal direction	Clear explanation and indication on direction flow of cause and effect
RELIABILITY of RESEARCH FINDINGS	
Threat	Evaluation
Subject error	Limitation acknowledged with time period of data available from SAVI Top 40 – see section 4.11; Impact regarded as low
Subject bias	See subject selection
Observer error	Possibility acknowledged of processing errors in Excel; High impact
Observer bias	Specific, industry verified data sets; Theoretically recognised interpretation methodology used; Limited or no opportunity for observer bias in this research application

6.11. Conclusion of Findings

Overall, the findings presented in chapter six answered the research questions and supports and build on the findings of previous research on market timing, market volatility, implied volatility and the SAVI.

The findings allowed for the development of an investment model or investment style that can be applied in the equity market to optimise investment returns, subject to certain conditions and criteria as discussed.

7. CONCLUSION

7.1. Introduction

The objective of this research was to determine whether the SAVI can be used as a market timing tool and predictor of market volatility in order to optimise investment returns.

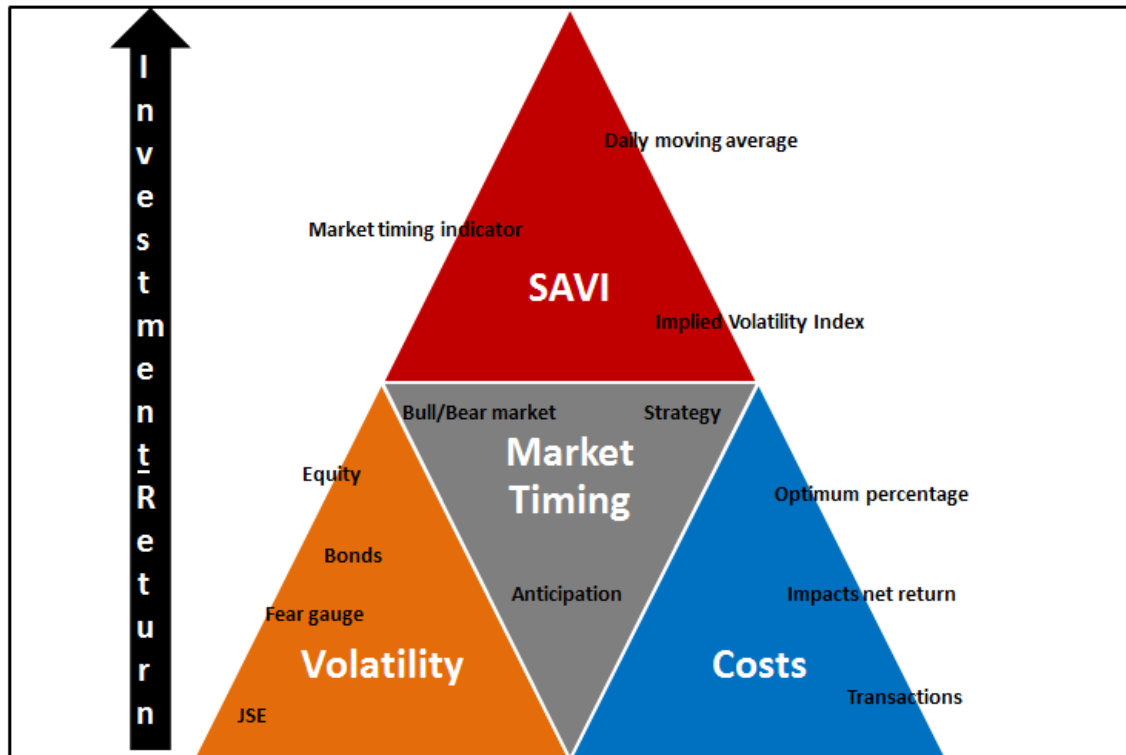
The primary objective of this research was to evaluate different investment models or portfolios, by making use of different daily moving averages of the SAVI. The aim was to forecast future market volatility in order to predict when to switch between equity and bonds. These portfolios or investment styles can be useful to investors, fund managers and businesses that want to increase investor returns.

This chapter will include a brief summary of the major findings, general recommendations and highlight possible areas that warrant further research. The significance of this study in both theoretical and practical terms will be outlined.

7.2. Principal Findings

The findings will be presented in terms of the model below which follows the logical flow of the theory and methodology used in the research. This includes the areas of market timing, market volatility, the SAVI, the impact of transaction costs and culminates in impact on investment returns over the investment period. See Figure 18 for a visual presentation of the discussion flow

Figure 18: Flow of theory and methodology



7.2.1. Market Timing

The research has indicated that the SAVI can be used effectively as a market timing indicator. This entails the switching between different asset classes, in this case between equities and bonds which relates to strategic asset allocation as proposed by Cuthbertson et al. (2010).

By implication, the SAVI can thus be used to anticipate the future direction of the market as this is closely linked with market timing (Zakamulin, 2013).

A traditional buy and hold strategy of either equities or bonds have proven to perform worse than some of the research portfolios that were constructed. The period under review extended over 8.5 years and it can be concluded that a market timing strategy as suggested by this research can outperform this traditional strategy. This agrees with the findings of Shen (2002). It should be noted that this research indicated that the addition of transaction costs can adversely affect the net investment returns and supports the findings by Zakamulin (2013) on the real life performance of a market timing strategy including transaction costs.

Kacperczyk et al. (2014) indicated that market timing strategies dominate in recessions or bear markets. The period of this research covers predominantly bullish market conditions and it is acknowledged that the performance of this market timing strategy should be measured over a period that includes a number of bullish and bearish markets.

7.2.2. Market Volatility

The SAVI index is an indicator of expected market volatility and is closely linked to market timing as indicated by Ferson (2012). Different hybrids of the SAVI have been derived by applying different daily moving averages to the original SAVI Index. The application of these models has proven to be successful in timing the market as indicated in section 7.2.1.

The SAVI and the models derived in this research does indicate expected market volatility as proposed Sandoval et al. (2012) and the correlation between the main financial indices in the world market is confirmed.

7.2.3. The SAVI

Limited research is available on the SAVI, especially concerning its ability to optimise investor returns. Samouilhan et al. (2008) indicated that the SAVI over predicts one day ahead domestic volatility which was part of the scope of this research.

The fact that the SAVI is a recognised volatility index on the JSE indicates the legitimacy of its data and the application of the SAVI in research studies.

7.2.4. Transaction Costs

The research findings have highlighted the importance of transaction costs in the buying or selling of securities. It is a definite determining factor in the calculation of net investment returns.

The inclusion of transaction costs in the construction of the research portfolios has adversely affected the annualised net investment return percentage. It can be concluded that high levels of transaction costs as well as frequent trading will eradicate

the market timing abilities of the SAVI. This confirms studies done by Strugnelli et al. (2011) indicating that some trading strategies might become ineffective if transaction costs are taken into account.

7.3. Implications for Investors

Based on the results and findings of the research, the following recommendations are made for consideration by investors, fund managers and businesses in order to optimise their investment returns:

- i. A buy and hold strategy of equities will outperform the same strategy for bonds over a prolonged period.
- ii. Market timing is an important factor to consider in the maximising of net investment returns.
- iii. The SAVI index and the derivatives developed in this research can be used to optimise investment returns.
- iv. The impact of transaction costs should be considered in any investment strategy or investment style. The level and frequency of transaction costs are important.

7.4. Limitations of the Research

The main limitations and concerns that were recognised are summarised below.

The data analysis on the SAVI covered a period of 8.5 years which is considered relatively short in studies on the market returns. It is acknowledged that a longer time period in this instance should be considered to be more appropriate for the analysis of stock market trends. A time series which includes a number of bear and bull phases are considered to be appropriate for the study of share prices or share indices and this links into the first research limitation.

Initial transaction costs when entering the equity or bond markets for the first time have been ignored as part of this study. It is assumed that these costs would be equal for all of the portfolios. It is acknowledged however that the inclusion of these costs at the onset of the initial lump sum investment for a pure equity or bond portfolio should be considered.

Microsoft Excel has been extensively used as the research and statistic tool and the impact of possible processing errors are acknowledged. User operating skills, consistent application of formulas and assumptions and an above average knowledge of Excel is accepted as key in ensuring error free analysis and results.

The use of inferential statistics should be applied in order to determine the relationships between the different dependent and independent variables used in this research.

7.5. Suggestions for Future Research

The limitations of the research and the results obtained indicate the need for further research on the subject with specific reference to the SAVI. The possible research areas are listed below.

Future research studies incorporating the SAVI should include data that span over a longer time period in order to verify existing research and to increase the confidence levels of research on the SAVI.

Statistically determine the relationship between the SAVI and other variables used in this research.

Incorporation of the SAVI into other investment styles or investment strategies and the evaluation of its ability to optimise investment returns.

REFERENCES

- Anderson, D., Sweeney, D., & Williams, T. (2014). *Modern business statistics with Microsoft Excel*. Cengage Learning.
- Ang, A., & Ulrich, M. (2012). Nominal bonds, real bonds, and equity.
- Babikir, A., Gupta, R., Mwabutwa, C., & Owusu-Sekyere, E. (2012). Structural breaks and GARCH models of stock return volatility: The case of South Africa. *Economic Modelling*, 29(6), 2435-2443.
- Bacchetta, P., & Van Wincoop, E. (2013). Sudden spikes in global risk. *Journal of international Economics*, 89(2), 511-521.
- Bekaert, G., & Engstrom, E. (2010). Inflation and the stock market: Understanding the “Fed Model”. *Journal of Monetary Economics*, 57(3), 278-294.
- Bhana, N. (2010). The stock market reaction to criticism of corporate governance practices of companies listed on the JSE. *Investment Analysts Journal*, 39(72), 1-12.
- Bikker, J. A., Broeders, D. W. G. A., & De Dreu, J. (2010). Stock market performance and pension fund investment policy: rebalancing, free float, or market timing. *International Journal of Central Banking*, 6(2), 53-79.
- Bloomberg, B., Cooper, D., & Schindler, P. (2008). Business Research Methods.
- Boscaljon, B., Filbeck, G., & Zhao, X. (2011). Market timing using the VIX for style rotation. *Financial Services Review*, 20(1), 35.
- Brennan, M. J., & Xia, Y. (2010). *Persistence, predictability, and portfolio planning* (pp. 289-318). Springer US.
- Busse, J. A. (1999). Volatility timing in mutual funds: Evidence from daily returns. *Review of Financial Studies*, 12(5), 1009-1041.
- Chatfield, C. (2013). *The analysis of time series: an introduction*. CRC press.

- Che, L., Norli, O., & Priestly, R. (2012). *Market Timing by Individual Investors*. working paper, Norwegian Business School.
- Chinzara, Z. (2011). Macroeconomic uncertainty and conditional stock market volatility in South Africa*. *South African Journal of Economics*, 79(1), 27-49.
- Coeurdacier, N., & Gourinchas, P. O. (2011). *When bonds matter: home bias in goods and assets* (No. w17560). National Bureau of Economic Research.
- Copeland, M. M., & Copeland, T. E. (1999). Market timing: Style and size rotation using the VIX. *Financial Analysts Journal*, 55(2), 73-81.
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Cuthbertson, K., Nitzsche, D., & O'Sullivan, N. (2010). The market timing ability of UK mutual funds. *Journal of Business Finance & Accounting*, 37(1-2), 270-289.
- Dash, S., & Moran, M. T. (2005). VIX as a companion for hedge fund portfolios. *The Journal of Alternative Investments*, 8(3), 75-80.
- Davies, J. E. (2013). Predicting the Bull Run: scientific evidence for turning points of markets.
- Dichtl, H., Drobetz, W., & Kryzanowski, L. (2014). *Timing the stock market*. Working paper, Concordia University.
- Dimson, E. (2011). *Equity Premia Around the World* (Doctoral dissertation, London Business School).
- Droms, W. G. (1989). Market timing as an investment policy. *Financial Analysts Journal*, 45(1), 73-77.
- Fairburn Capital. (2009). *Gauging Investor Fear*. September 2009.
- Fernandes, M., Medeiros, M. C., & Scharth, M. (2014). Modeling and predicting the

- CBOE market volatility index. *Journal of Banking & Finance*, 40, 1-10.
- Ferson, W. E. (2012). Performance measurement with market and volatility timing and selectivity. *Available at SSRN 2022142*.
- Firer, C., Ross, S. A., Westerfield, R. W., & Jordan, B. D. (2004). Fundamental of corporate finance South African Edition.
- Firer, C., & Staunton, M. (2002). 102 Years of South African financial market history. *Investment Analysts Journal*, 31(56), 57-65.
- Gao, J., Li, D., Cui, X., & Wang, S. (2012). Market Timing Strategy in Dynamic Portfolio Selection: A Mean-Variance Formulation. *Available at SSRN 2015580*.
- Gârleanu, N., & Pedersen, L. H. (2013). Dynamic trading with predictable returns and transaction costs. *The Journal of Finance*, 68(6), 2309-2340.
- Gray, D. E. (2013). *Doing research in the real world*. Sage.
- Grinold, R. C. (1989). The fundamental law of active management. *The Journal of Portfolio Management*, 15(3), 30-37.
- Grouard, M. H., Lévy, S., & Lubochinsky, C. (2003). Stock market volatility: from empirical data to their interpretation. *Financial Stability Review, Banque de France*, (2), 61-79.
- Hallerbach, W. G. (2011). On the expected performance of market timing strategies. *The Journal of Portfolio Management*, 40(4), 42-51.
- Henriksson, R. D., & Merton, R. C. (1981). On market timing and investment performance. II. Statistical procedures for evaluating forecasting skills. *Journal of business*, 513-533.
- Jagannathan, R., & Korajczyk, R. A. (2014). Market Timing. *Available at DOI: 10.13140/2.1.3635.0406*.

- Kacperczyk, M., Nieuwerburgh, S. V., & Veldkamp, L. (2014). Time-Varying Fund Manager Skill. *The Journal of Finance*, 69(4), 1455-1484.
- Kenmoe S, R. N., & Tafou, C. D. (2014). The Implied Volatility Analysis: The South African Experience. *arXiv preprint arXiv:1403.5965*.
- Kishor, N., & Singh, R. P. (2014). Stock Return Volatility Effect: Study of BRICS. *Transnational Corporations Review*, 6(4), 406-418.
- Kostakis, A., Panigirtzoglou, N., & Skiadopoulos, G. (2011). Market timing with option-implied distributions: A forward-looking approach. *Management Science*, 57(7), 1231-1249.
- Kotzé, A. (2014). *South African Financial Market Volatility*. Retrieved from http://www.researchgate.net/profile/Antonie_Kotze/publication/268075536_South_African_Financial_Market_Volatility/links/5460cc950cf2c1a63bff7094.pdf
- Kotzé, A., Joseph, A., & Oosthuizen, R. (2009). The new South-African Volatility Index: New SAVI. *Available at SSRN 2198359*.
- I'Ons, T., & Ward, M. (2012). The use of price-to-earnings-to-growth (PEG) ratios to predict share performance on the JSE. *South African Journal of Business Management*, 43(2), 1-10.
- López, R., & Navarro, E. (2012). Implied volatility indices in the equity market: A review. *African Journal of Business Management*, 6(50), 11909-11915.
- López, R., & Navarro, E. (2013). Interest rate and stock return volatility indices for the Eurozone. Investors' gauges of fear during the recent financial crisis. *Applied Financial Economics*, 23(18), 1419-1432.
- Luus, C. (2015, November). Long term real investment returns. *SA Financial Markets Journal*. Retrieved from <http://financialmarketsjournal.co.za/long-term-real-investment-returns/>
- Masset, P. (2011). Volatility stylized facts. *Available at SSRN 1804070*.

- Neuhierl, A., & Schlusche, B. (2011). Data snooping and market-timing rule performance. *Journal of Financial Econometrics*, 9(3), 550-587.
- Pfau, W. D. (2011). Revisiting the Fisher and Statman Study on Market Timing. *Available at SSRN 1876225*.
- Poon, S. H. (2005). *A practical guide to forecasting financial market volatility*. John Wiley & Sons.
- Raunig, B., & Scharler, J. (2011). *Stock Market Volatility, Consumption and Investment; An Evaluation of the Uncertainty Hypothesis Using Post-War US Data* (No. 168).
- Samouilhan, N. L., & Shannon, G. (2008). Forecasting volatility on the JSE. *Investment Analysts Journal*, 37(67), 19-28.
- Sandoval, L., & Franca, I. D. P. (2012). Correlation of financial markets in times of crisis. *Physica A: Statistical Mechanics and its Applications*, 391(1), 187-208.
- Saunders, M., & Lewis, P. (2012). *Doing research in business and management: An essential guide to planning your project*. Financial Times Prentice Hall.
- Shen, P. (2002). Market-timing strategies that worked. *Available at SSRN 445920*.
- Siriopoulos, C., & Fassas, A. (2009). Implied volatility indices—a review. *Available at SSRN 1421202*.
- Song, M. (2014). *Modelling and forecasting volatility of JSE sectoral indices: A model confidence set exercise* (Doctoral dissertation).
- Strugnell, D., Gilbert, E., & Kruger, R. (2011). Beta, size and value effects on the JSE, 1994–2007. *Investment Analysts Journal*, 40(74), 1-17.
- Taylor, S. J. (2011). *Asset price dynamics, volatility, and prediction*. Princeton university press.

- Thorp, W. A. (2010). CBOE's Volatility Index (VIX). *AAII Journal*, July 2010.
- Walid, C., Chaker, A., Masood, O., & Fry, J. (2011). Stock market volatility and exchange rates in emerging countries: A Markov-state switching approach. *Emerging Markets Review*, 12(3), 272-292.
- Ward, M., & Terblanche, R. C. (2009). Market timing on the JSE using exchange rate fluctuations. *Investment Analysts Journal*, 38(70), 1-10.
- Whaley, R. E. (2000). The investor fear gauge. *The Journal of Portfolio Management*, 26(3), 12-17.
- Woodside-Oriakhi, M., Lucas, C., & Beasley, J. E. (2013). Portfolio rebalancing with an investment horizon and transaction costs. *Omega*, 41(2), 406-420.
- Zakamulin, V. (2014). Dynamic Asset Allocation Strategies Based on Unexpected Volatility. *Journal of Alternative Investments*, 16(4).
- Zakamulin, V. (2013). The Real-Life Performance of Market Timing with Moving Average and Time-Series Momentum Rules. *Journal of Asset Management*, 05/2013, 15(4).