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Foreign versus domestic equity holdings and equity returns in South Africa

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Foreign versus domestic equity holdings and equity returns in South Africa

Vinesh Morar

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration.

Johannesburg, 2011

ABSTRACT

Foreign versus domestic investor returns performance was quantified and interpreted on the Johannesburg Stock Exchange (JSE) equities market from 2007 to 2009, utilising a real-time high frequency intraday transactional dataset sourced directly from the exchange. Foreign investors bought at higher and sold at lower than volume weighted average market prices relative to domestic investors, for the same stocks traded randomly on the same day. Foreign investors exhibited diminished returns attributed to information asymmetry effects. Across all trades, domestic investors demonstrated an edge over foreign investors when trading securities on the JSE.

DECLARATION

I, Vinesh Morar, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Vinesh Morar

Signed at ……

On the …….. day of …… 2011

DEDICATION

To the creator of the cosmos and all possibilities for the gift of life and the experiences within. This research paper is dedicated to my mother, Vasanti Morar, for providing the love, support and opportunities for me to reach for the stars. I am grateful to Dr Nisha Morar, Dr Nilesh Morar and Dr Sunjay Jagath for broadening my horizons with their inspiring personalities and admirable achievements.

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The study could not have been possible without the exceptional service of the Johannesburg Stock Exchange (JSE) as the data provider for the empirical analysis and mathematical modelling. Many thanks go to Melissa Oberholzer, the JSE Information Revenue Administrator for her professionalism, patience and commitment to supplying immense amounts of data timely and accurately. Finally, acknowledgments go to researchers internationally who pursue structured inquiries into financial market phenomena and produce thought provoking results.

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CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

The purpose of the research was to determine whether foreign investors outperformed domestic investors when trading securities on the Johannesburg Stock Exchange (JSE), using stock specific high frequency intraday transactional data for the period 1 January 2007 to 31 December 2009. The study provided a comparative analysis of foreign and domestic investor activity and price picking ability for individual stock trades. Investor types with superior trading capability bought and sold stocks at more profitable prices relative to the market, contributing to higher returns on a trade by trade basis.

1.2 Context of the study

Diversification is the pivotal tenet applied to portfolio selection, asset allocation and proportional capital rebalancing decisions. Modern portfolio theory, forged in 1952 by Nobel laureate Harry Markowitz in his seminal paper *Portfolio Selection*, significantly influenced portfolio construction and diversification paradigms (Markowitz 1952). In 1958, James Tobin expanded on Markowitz's work by adding a risk free asset to the theoretical optimal portfolio model, making it possible to leverage portfolios on the Efficient Frontier (Tobin 1958). Markowitz introduced the Efficient Frontier as a parabolic curve where expected returns are plotted against variance (standard deviation). The Efficient Frontier provides a theoretical view of optimally diversified portfolio construction; the result of intersecting sets of portfolios with minimum standard deviation and maximum returns. These founding hypotheses are the beacons steering investors towards exercising diversification as a primary risk management strategy to dampen turbulent market, sector and stock volatilities and contagion effects.

Traditionally, this entailed diversifying within the market using a cross section of sectors, asset classes and market capitalisation for a given risk appetite. However, to

further enhance diversification benefits, asset allocation can occur across international markets. International capital flows across country exchanges have expanded significantly as liberalisation increased over time (Tesar and Werner 1994, 1995). Detailed evidence on higher turnover and volume rates of foreign equity investments post liberalisation of Organisation for Economic Co-operation and Development (OECD) countries indicated that net capital flows remained positive and large. Following financial liberalisation, net United States (US) capital flows to 20 emerging markets escalated by 1.4% of market capitalisation (Kim and Singal 2000). The study established that some countries are more financially liberalised than others, and as a result, foreign investors build larger stakes in some countries than others.

The study of foreign investor trading performance in cross border stock exchanges originates from the advent of financial liberalisation of international markets. Financial liberalisation was expounded by Bekaert and Harvey (2000) as regulatory changes and structural breaks in equity capital flows to developing markets. Globalisation and financial liberalisation refer to progressive relaxation of regulatory constraints governing cross border capital flows, enabling domestic investors to include foreign financial market instruments in their portfolios (Beelders 2002). A direct causality of financial liberalisation is the participation of foreign investors in various country stock exchanges. Looking for endogenous break points by scrutinising capital flows and other variables, these structures were traced to financial regulatory liberalisation periods of emerging equity markets globally (Bekaert, Harvey and Lumsdaine 2002). The International Finance Corporation created the concept of emerging markets as an alternative to the conventional view of third world countries (Van Agtmael 1984; Park, Keith and Van Agtmael 1993). The term makes reference to developing market economies whose per capita income lies in the lower-middle range relative to world incomes at the per capita level.

Countries are deemed emerging based upon calibration of their reforms and developments in relation to other countries. As of 27 May 2010, Morgan Stanley Capital International (MSCI) Emerging Markets Index classified 21 countries as

emerging markets, including South Africa (MSCI 2010). The free float adjusted market capitalisation index is designed to measure equity market performance of emerging stock exchanges. China is also categorised as an emerging market even with an economy of significant magnitude. The emerging market definition includes a diverse profile of countries. It is based upon a country's progress towards international market liberalisation and reform programmes that enable their exchanges to sanction foreign investors and emerge into the global arena. International investors transacted in emerging market equities at exceptional rates, increasing threefold from 1989 to 1992 (Mullin 1993). Emerging market economies are accepted as being rapidly growing economies.

The JSE is characteristically an emerging market stock exchange and was established on 8 November 1887 by Benjamin Woollan (JSE 2005a). The correlation coefficient between the South African stock market and those of the US post March 1995 averaged 0.35 (Beelders 2002). The strong correlation was attributed to the US being the dominant capital market in the world. It is possible to construct low risk portfolios in emerging markets although returns are highly volatile (Bekaert and Harvey 2003). Undertakings to determine the financial liberalisation date for the JSE using structural breaks produced multiple results. Although the JSE's official liberalisation date is March 1995, structural breaks were observed during earlier periods (Makina and Negash 2005). The challenge of dating the JSE's liberalisation date was addressed by testing for significant time series structural inconsistencies of the total market index, as a measure of aggregate stock market performance from 1970 to 2002. Two structural breaks were observed; February 1990 and December 1992.

The JSE underwent considerable proliferation of foreign investment stock turnover post liberalisation. Foreign investor net equity purchases, quoted in South African Rand (ZAR), increased from ZAR0.2 billion to ZAR41 billion from 1994 to 1999 (Tswamuno, Pardee and Wunnava 2007). Foreign investor activity on the JSE has experienced sustained growth over time. In accordance with the increasing global trend of foreign investor trading on emerging market stock exchanges, prominent features of

their investment styles became apparent. Pervasive occurrences of investors holding minority proportions of their portfolios in foreign assets was formally identified and researched since 1970 (Levy and Sarnat 1970; Lessard 1973, 1976; Solnik 1974). The innate behavioural trait of an asset allocation bias tendency towards domestic assets has proven to be persistent across countries and time even though it is contrary to optimal portfolio diversification criteria (French and Poterba 1990, 1991; Tesar and Werner 1992, 1994, 1995; Cooper and Kaplanis 1994). Attempts by Lewis (1999) at explaining the phenomenon relate the home bias primarily to regularity and governance constraints of foreign exchanges, transaction costs, taxes and information asymmetries.

The home bias idiosyncrasy is a phenomenon whereby investors have the propensity to skew portfolio securities weightings towards equities from their own country where they have better information (Karolyi and Stulz 2003). In sequel to research on stock market liberalisation effects, home bias and information advantage, trajectories of interest enquired into contrasting foreign and domestic investor trading abilities and returns performance. Segments of research propose that domestic investors have enhanced performance in their own country stock markets due to home information advantage (Gehrig 1993; Brennan and Cao 1997; Kang and Stulz 1997). In the Korean stock market, domestic investors performed better, had access to private information and traded with information advantage over foreign investors (Choe, Kho and Stulz 2001). Domestic investors traded stocks more profitably in Indonesia and outperformed foreign investors who traded at higher prices (Dvořák 2005; Agudelo 2007). Similar results were reported from the Thailand Stock Exchange where foreign investors traded at less profitable prices than domestic investors (Taechapiroontong and Suecharoenkit 2008). These studies were consistent with domestic investors trading at better prices than foreign investors, inferring information advantage as evidenced by higher returns.

Divergent scenarios also transpired amongst researchers, sometimes within the same country stock exchange. In these instances, foreign investors displayed higher sophistication in their trading strategies and outperformed domestic investors. Foreign investors in Finland were the most sophisticated partakers from 1994 to 1996 (Grinblatt

and Keloharju 2000). They consistently traded at more beneficial prices than domestic investors on the Tokyo Stock Exchange from 1991 to 1999 (Bae, Ito and Yamada 2002). Foreign investors outperformed domestic investors in large stocks, reflecting greater trading sophistication in the Korea Stock Exchange (Kim 2002). In the Thailand stock market Chai-anant (2003) performed market timing tests from 1994 to 1998 and illustrated that foreign investors displayed distinct abilities to forecast market returns and generate wealth. Foreign investors demonstrated higher trading performance consistently before, during and after the Asian crisis, in Thailand's stock market (Kamesaka and Wang 2004). In the Indonesian stock market, foreign investors performed better than domestic investors in initiated orders i.e. orders that led to trades (Agarwal, Faircloth, Liu and Rhee 2007). Investigations between foreign and domestic investor trading prices were conducted by Kalev, Nguyen and Oh (2007) on the Helsinki Stock Exchange from 1999 to 2004. Findings revealed that foreign investors significantly outperformed local investors in Finland over the period.

Assessments of investor type performance measurements in emerging markets have produced mixed results. Domains of research encompassing empirical examinations of foreign versus domestic returns performance is closely interwoven with the research objectives on the JSE equities market. Following the JSE's official liberalisation date on March 1995, the study analysed the trading performance between foreign and domestic investor activity on the South African exchange. The price picking ability between different investor types was explored for stocks traded on the JSE from 1 January 2007 to 31 December 2009. The aim was to investigate whether foreign investors paid less when they purchased and received more when they sold, relative to domestic investors who bought and sold the same stocks on the same trading day.

The analysis endeavoured to examine and compare the profitability between foreign and domestic investors. Robust empirical evidence is provided on the magnitude of profits and losses, using a JSE dataset to measure performance. The raw data, sourced directly from the JSE TradElect™ information system, had investor class residential status

markers for every equity trade per trading day. Each stock was tracked by transactional buy and sell prices and trade volumes by investor type.

1.3 Problem statement

1.3.1 *Main problem*

The research problem was to deduce whether foreign investors outperformed domestic investors in the trading of equity holdings on the JSE in South Africa, using stock specific high frequency intraday transactional data for the period 1 January 2007 to 31 December 2009. The study conducted a comparative analysis of foreign and domestic investor returns performance on individual stocks traded. The investor class exhibiting superior trading proficiency buys at lower and sells at higher prices, contributing to higher returns on a trade by trade basis.

1.4 Significance of the study

The study fills a gap by identifying and extracting investor trading behaviours and trends in South Africa from JSE transactional level data. Outcomes and conclusions of the analyses offers guidance to an audience of academics, stock market institutional and individual traders, brokers, financial advisers and the investment community at large. Relevance of the research undertaking resides in sparse amounts of facts, figures and statistics available on investor type dynamics and profitability on the JSE. The research outcomes distinguish the investor class that paid less when they bought and received more when they sold.

Studies comparing foreign and domestic investor performance in emerging markets were conducted in Taiwan (Seasholes 2000), Japan (Hamao and Mei 2001; Bae et al. 2002), Korea (Choe et al. 2001; Kim 2002; Choe, Kho and Stulz 2005; Kang, Lee and Park 2008), Thailand (Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008), Indonesia (Dvořák 2005; Agarwal et al. 2007; Agudelo 2007) and China (Chan, Menkveld and Yang 2006). These studies produced varying results of foreign versus domestic investor performance and provided empirical coverage on 6 out of 21 countries comprising the MSCI Emerging Markets Index (MSCI 2010). Research conducted on the South African exchange contributes towards closing the gap on emerging markets yet to receive coverage. Further understanding of financial market dynamics of international emerging exchanges is gained with a growing knowledge base.

The research methodology employed the techniques adopted by corresponding studies in various emerging markets viz. Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agarwal et al. (2007) and Taechapiroontong and Suecharoenkit (2008). These studies formed the basis of particular analytical techniques applied to investigate buy and sell profitability between investor types relative to average market prices. Employment of the analytical methods in South Africa builds on the validity and credibility of the technique as a returns performance measurement tool and benchmark. The JSE study reinforced the integrity of the methodology using statistical assessments to test significance and accuracy of results prior to acceptance or rejection of the stated hypotheses.

In a broader context, the findings can be used to draw parallels against international markets for future research initiatives. Since equity trading is a zero sum game, gains made by foreign investors are the result of domestic investor losses and vice-versa. Each trader type can improve their trading strategies and performance capabilities by probing the investment styles of the net winners.

1.5 Delimitations of the study

- The research focuses on equities traded by foreign and domestic investors on the JSE from 1 January 2007 to 31 December 2009. Trader performance in derivatives, currencies, commodities, bonds, JSE alternative exchanges and other financial instruments fall outside the research scope.
- Foreign and domestic investor returns performance was assessed against the prevailing share price at exact time of trade on JSE TradElect™, exclusive of the applicable brokerage and transactional costs, duties and taxes. Trades calculated as marginally profitable could in reality be a net loss when mandatory trading costs and exchange rate fluctuations are accounted for.
- The study provides a comparative analysis of trader type performance for the same stocks traded. Data sampling filtered the population for stocks that were traded by both foreign and domestic investors on the same trading day. The remaining trades were excluded from sample calculations. The exclusions involved events where the same stock was traded by both investor types, but on different days.

1.6 Definition of terms

Domestic investor - A person or entity that has residential status in the Republic of South Africa, whose regular business is the buying and selling of securities (JSE 2005b).

Foreign investor - A person or entity who has residential status outside of the borders of the Republic of South Africa, whose regular business is the buying and selling of securities (JSE 2005b).

FTSE/JSE All Share Index (ALSI) - An index constructed to replicate the movement of the entire South African equities market.

Johannesburg Stock Exchange (JSE) - The company duly registered and incorporated with limited liability under the company laws of the Republic of South Africa, licensed to operate an exchange under the Stock Exchanges Control Act since 1947 (JSE 2005a).

JSE TradElect^{TM} - The JSE's real-time electronic trading and order processing system, operated under license from the London Stock Exchange (LSE). The information system also provides for the categorisation of listed companies into economic groups and industrial sectors (JSE 2005b).

Morgan Stanley Capital International (MSCI) - An established and prominent information source with decision making tools for investors such as asset managers, banks, hedge funds and pension funds (MSCI 2010).

Volume Weighted Average Price (VWAP) - A trading benchmark to determine the price level at which the majority of trades in a given security occurred. VWAP is derived by calculating the sum of the values traded for each transaction (price multiplied by the number of shares traded) and dividing the product by the total number of shares traded for the day (Berkowitz, Logue and Noser 1988).

1.7 Assumptions

The following assumptions were made during investigation and resolution of the problem statement:

- The transactional data used in the study was captured in real-time by the JSE TradElect™ information system. It is assumed that inherent accuracy exists in the data.
- It is imperative to note that foreign investors may invest in JSE equities for reasons other than profit generation on a trade by trade basis. Foreign investors could select South African stocks aimed at offsetting portfolio volatility in their home countries by investing in uncorrelated stocks. Hence, all foreign or domestic trades may not necessarily be profit driven. This study assumes that all equity investors on the JSE intended to buy at the lowest price and sell at the highest prices.
- Foreign investors may have performed a portion of their transactions through South African brokers. These transactions registered as domestic trades in calculations. Even though foreign investors were the recipients of the profits, the capability to generate those returns was attributed to domestic investors.
- It was assumed that foreign and domestic investors on the JSE equities market were long traders, aiming to profit from buying low and selling high. Short positions were not taken into account in returns calculations.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The review discusses prevailing literature on home bias, information advantage and trading performance of foreign versus domestic equity holdings. The chapter analyses equity trading performance i.e. buy and sell prices, by investor type in emerging markets. These studies aimed at ascertaining whether foreign or domestic investors are the more profitable traders for the same stock holdings. The literature review also addressed the research methodologies applied to other emerging markets, and the findings thereof.

Most research conducted on foreign and domestic investor performance in emerging markets focused on Asian markets viz. China, Indonesia, Japan, Korea, Taiwan, and Thailand. Complimentary emerging market works reviewed outside of Asia include the Finnish, Swedish and Helsinki stock exchanges.

2.2 Foreign and domestic investor returns performance in international markets

The advent of liberalisation of international financial markets spurred a growing trend of investors making cross border asset allocation decisions. Early works attempting to uncover these trends brought visibility to phenomena such as the home bias puzzle which is persistent across countries and time (Levy and Sarnat 1970; Lessard 1973, 1976; Solnik 1974; French and Poterba 1990, 1991; Tesar and Werner 1992, 1994, 1995; Cooper and Kaplanis 1994). There is evidence that distance matters. The weight of a US stock in American mutual funds is negatively related to the distance between the location of the fund and the investor (Coval and Moskowitz 1999, 2001). Foreign investors could be disadvantaged when trading globally by distance, differences in language, culture and time zones.

Flow of funds data was used by Karolyi and Stulz (2003) to present the evolution of the home bias for US investors from 1973 to 2001. The researchers analysed foreign stock holdings of US investors as a fraction of their total stock market wealth. The paper reported that holdings of foreign stocks were below 1% in 1973 and increased to 10% in 2001. Although this was a sharp rise over the period, it is dramatically less than the domestic holding proportion of the portfolios. The study indicated that the 10% weighting towards foreign assets remained relatively stable since 1994 even though the dollar value of foreign holdings more than doubled by 2001. Coupled with expanding foreign investor activity in emerging markets, the issue of which investor class trades more profitably with consistency is a topic gaining wide interest. Is it foreign or domestic investors that have superior trading abilities? Established research conducted across diverse markets empirically attests to outcomes of both scenarios i.e. foreign investors outperform domestic investors in some markets and vice-versa.

Foreign investors in Finland were the most sophisticated traders from 1994 to 1996 (Grinblatt and Keloharju 2000). Investor performance was measured by analysing whether the buy ratio of future winning stocks surpassed the buy ratio of future losing stocks. Investors ranking high with this measure indicated their ability to forecast top performing stocks. Foreign investors followed momentum strategies and exhibited an abnormally high proportion of positive buy ratio differences. Foreign investors are traditionally considered to have superior research capabilities with relatively extensive resources, giving them information and trading advantage. In Taiwan, Seasholes (2000) found that foreign investors bought ahead of good earnings announcements and sold ahead of bad earnings announcements. Domestic investors did the opposite. This is consistent with better information, greater sophistication and higher returns attributed to foreign investors.

In contrast, domestic investors displayed superior trading ability with individual stocks on the Korea Stock Exchange, using a dataset of all trades from 1996 to 1998 (Choe et al. 2001). The research methodology made use of Volume Weighted Average Prices (VWAP) to investigate whether various investor classes traded at different prices.

Foreign investors traded at less profitable prices; buying at higher and selling at lower prices than domestic investors. They also sold prior to large positive abnormal returns and bought before large negative abnormal returns. Foreign investors did not gain from large trades even when assessed 10 days following trade transaction dates. Supporting results emerged from the Tokyo Stock Exchange where Hamao and Mei (2001) found no evidence of superior foreign investor performance, information advantage or market timing abilities. The methodology used investor type data from 1974 to 1992 and non-parametric tests to evaluate investors' market timing conventions. In a more recent examination of the profitability of various investor types on the Tokyo Stock Exchange, foreign investors outperformed domestic institutional investors (Bae et al. 2002). Utilising weekly trading data from 1991 to 1999 and a structural vector autoregressive model, foreign investors traded consistently at better prices than domestic investors.

Following the approach of Grinblatt and Keloharju (2000), Dahlquist and Robertsson (2002) studied whether foreigner investors acted as informed investors when trading Swedish listed companies. The study analysed the behaviour and impact of foreign investors using data of firm characteristics, returns, foreign ownership and cross border transactions. Sparse evidence was found in support of foreign investors making more informed trades. On the Sweden Stock Exchange, foreigners were uninformed feedback traders from 1993 to 1998, increasing net holding in firms which have recently performed well.

Findings from the Korea Stock Exchange show that foreign investors performed better than domestic investors in large market capitalisation stocks (Kim 2002). In this case, foreign investors were more sophisticated. The VWAP of returns from 1996 to 2000 indicated that foreigners traded well only in large market capitalisation stocks where the information asymmetry problem was relatively small. Foreign investors underperformed local investors in smaller stocks where the information asymmetry problem was large. The efficiency of the Korean stock market was not addressed in this study. In the Thailand stock market, market timing tests were performed from 1994 to 1998 using variable autoregressive models which indicated that foreign investors had distinct

abilities to forecast market returns, resulting in high wealth generation (Chai-anant 2003). Foreign investors appeared to have access to private information due to their sophistication, extensive research resources and capabilities.

During the Asian crisis, Kamesaka and Wang (2004) used daily buy and sell flows from 1996 to 1999 to evaluate timely trading exposure of foreign investors in Thailand's stock market. Foreign investors were persistent in their trading as net buyers regardless of significant changes in market conditions. During the outbreak of the Asian crisis, foreigners did not withdraw from Thailand's equity market. Instead, they increased their aggregate net buying during the crisis; continuing to profit from local investors. In this regard, foreign investor short term speculative performance was surprisingly unwavering, almost giving the impression that they could predict the following day's stock price movement. Losses before, during and after the Asian crisis were more pronounced for domestic trading. Foreign investors demonstrated superior trading performance in Thailand's equity market using autoregressive analysis with 10 day lags.

A different result was obtained using a unique dataset of all trades on the Korea Stock Exchange from 1996 to 1998. Coupled with the VWAP method, Choe et al. (2005) studied whether domestic investors had an edge over foreign investors when trading Korean stocks. They investigated whether foreigners paid more for stocks when they bought and received less when they sold. Evidence indicated that foreign investors paid higher prices and obtained lower prices than domestic investors for medium and large capitalisation stocks. Dvořák (2005) also applied the VWAP methodology to the Jakarta Stock Exchange and found that domestic investors generated higher returns, implying they were more informed. Using transaction data from 1995 to 2001, results pointed to foreign investors systematically trading at worse prices than domestic investors.

Examining 76 listed companies in China's stock market from 2000 to 2001, Chan, Menkveld and Yang (2006) investigated whether foreign investors had an information advantage and higher trading performance than domestic investors. The study used a

bivariate autoregressive approach (extended for multiple markets) to model the dynamic relationship between trades and quotes. A key finding proved the hypothesis that domestic investors trade better and have more private information than foreign investors. However, this paper also cautions against drawing this conclusion. Foreign investors may have access to the same private information, but could be driven by strategic trading i.e. trading slower to reduce the market impact. Therefore, foreign investors are not necessarily less informed; they simply may choose to act on their information strategically.

Analogous with Dvořák (2005), Agarwal et al. 2007) analysed stocks on the Indonesian stock market from 1995 to 2003. Modeling the arrival of informed and uninformed traders solved the relationship between probability of informed trading (PIN) and the size of the bid-ask spread. Foreign investors performed better than domestic investors on initiated orders i.e. orders that resulted in trades. An identical PIN methodology was applied by Agudelo (2007) who analysed stocks on the Jakarta Stock Exchange from 2004 to 2006. In this case, domestic investors made more informed and profitable trades than foreign investors. Investigations of information asymmetries between foreign and domestic investors were conducted by Kalev et al. (2007) on the top 25 stocks listed on the Helsinki Stock Exchange for the period 1999 to 2004. This study recognised that the investor group with information advantage will always be the party with higher average returns given that access to information is a fundamental part of any successful trade.

Kalev et al. (2007) defined for every stock, the marked-to-market trading profits as a function of changes in share price and net inventory holdings. Subsequent to deriving profits per trade, intraday transactional data was employed in a spectral decomposition analysis to separate profits into short, medium and long term horizons. The results provided evidence that foreign investors significantly outperformed local investors. However, this performance was confined to Nokia, the largest stock on the Helsinki Stock Exchange. Excluding Nokia, domestic investors had information advantage and were more profitable than foreign investors.

Information asymmetry manifestations could be driven by more than foreign or domestic investor private information advantages. Perhaps the core issue requires a change in perspective. Foreign and domestic investors may interpret the same public information differently and as a result, they have divergent stances on domestic stocks. This was confirmed using data of Korean securities from 2000 to 2004 that strongly supported the hypothesis (Kang et al. 2008). The study was based on a sample of 2 702 firm-year observations making use of firm level *alpha* (α) estimates with domestic and world CAPM models of the form CAPM (α^D) and CAPM (α^W) respectively. The paper provided an alternative approach that was not based on information advantage. Instead, hypotheses were tested to assess whether the two investor groups interpreted the same information differently. Post Asian crisis, foreign investors traded stocks on the Thailand Stock Exchange at less profitable prices than domestic investors. Using transaction data from 1999 to 2004 and VWAP ratios, Taechapiroontong and Suecharoenkit (2008) reported that domestic investors outperformed foreign investors in terms of buy and sell prices.

The body of research covered in the literature review was further expanded by conducting a like study in South Africa, observing listed firms on the JSE from 2007 to 2009. The research methodology most widely used for trading performance analyses in emerging market research was VWAP calculations and ratios (Choe et al. 2001; Choe et al. 2005; Dvořák 2005; Agarwal et al. 2007; Taechapiroontong and Suecharoenkit 2008). The analytical techniques previously applied to investigate performance differences between foreign and domestic investors in emerging market economies such as Korea, Indonesia and Thailand, provided a tangible reference for comparing results recorded in South Africa, also an emerging market. In light of this, VWAP was the mechanism applied to equities trading performance comparisons on the JSE over the sample period.

The specific methodology was validated and verified in broader financial market contexts prior to application. Is VWAP an effective and widely accepted tool for stock market trader and trading price performance evaluations? To scrutinise such queries, the

logic of the VWAP benchmark and a meaningful definition was reviewed. Justification for VWAP serving as a credible benchmark was originally furnished by Berkowitz et al. (1988). They proceeded to explicate VWAP as a volume weighted sum of average transaction prices on both sides of the trade, during the day of trade. Therefore, it is well suited for short term intraday trade price tracking as required for the JSE empirical analysis. Henceforth, a VWAP benchmark is the sum of every transaction price, weighted by trade volume. VWAP emphasises volume and price as the primary and secondary driver of the resultant.

Volume is widely analysed in financial markets and is indispensible to providing perspective on the behaviour of linked financial variables; fundamentally price and volatility (Tauchen and Pitts 1983; Easley and O'Hara 1987; Karpoff and Boyd 1987; Foster and Viswanathan 1990; Andersen 1996). As a result, investment banks and financial institutions the world over have adopted VWAP as an evaluation yardstick for trader performance, comparing the price per share paid and received by the trader, and the days' VWAP (Edelen, Kadlec and Gregory 2006). This study indicated that VWAP is often used as a trading benchmark by institutional investors such as pension and mutual funds, who habitually fragment large trades into multiple transactions. The objective of using VWAP trading targets as benchmarks is to ensure that traders execute orders in accordance with stock trading volumes at optimum price levels. Thus, it is conclusive that VWAP is an established and frequently used trading price performance benchmark in international financial markets.

Berkowitz et al. (1988) recognised that abnormally large trades in illiquid stocks receive heavier weighting in VWAP, forming a downward bias in market impact measurements. The downward bias in measuring market impact on VWAP was also conceded by Chan and Lakonishok (1995), who suggested using the previous day's VWAP as a benchmark to further reduce the effects of abnormal trades. The study used VWAP as a trading strategy to time buy and sell entries and exits, as opposed to using VWAP as a price performance benchmark for investor capability. Disadvantages include the residual VWAP memory constraints inherent in the formulation. As VWAP gains greater trading

memory with time; larger trading quantities are required to alter that memory (Slamka, Jank and Skiera 2009). Considering these short comings, the majority of studies employed VWAP when conducting investor type trading performance analyses. VWAP price ratio calculations are independent of assumptions and subjectivity making it preferable to theoretically based models of trader price performance benchmarks.

The literature covered in totality aided in defining a clear framework for the JSE research undertaking, in terms of concept and analytical methodologies. This laid the foundation for investor type performance comparisons in South Africa from 2007 to 2009. The VWAP set of measures provided the mechanism for objective acceptance or rejection of hypotheses statements that were formulated to solve the research problem. The statements contextualised empirical analysis findings on investor type returns performance on the JSE. The hypotheses appraised investor performance by exemplifying whether foreign or domestic investors were more profitable by trading stocks at better than market prices over the sample period.

2.3 Conclusion of Literature Review

A range of academic approaches were undertaken to evaluate the trading performance of foreign and domestic investors, providing comparative backdrops for JSE based analyses. Evaluating trader type performance in emerging markets focused on Asian markets viz. China, Indonesia, Korea, Thailand and Tokyo. Additional emerging market exchanges covered in the literature review include the Finnish, Swedish and Helsinki stock exchanges. Instances of inconsistent empirical results surfaced when different research groups studied investor performance in the same country and market viz. Japan (Hamao and Mei 2001; Bae et al. 2002), Korea (Choe et al. 2001; Kim 2002; Choe et al. 2005; Kang et al. 2008), Thailand (Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008) and Indonesia (Dvořák 2005; Agarwal et al. 2007; Agudelo 2007). Due to these results, it can be assumed that using different sample periods to conduct like analyses in the same country exchange frequently realises divergent outcomes.

In summary, the findings gained from previous studies surrounding the intriguing subject of investor type returns performance are inclined towards foreign investors outperforming domestic investors in emerging financial markets. Foreign investors generated profits consistently from their trading strategies, and as a result were deemed to have information advantage and superior market timing abilities (Grinblatt and Keloharju 2000; Seasholes 2000; Bae et al. 2002; Kim 2002; Chai-anant 2003; Kamesaka and Wang 2004; Agarwal et al. 2007; Kalev et al. 2007). The majority of research is coherent with better information and greater sophistication on the part of foreign investors. Generally, studies have proven that foreign investors acquired better quality information, higher returns and their trades reflected market information ahead of domestic investors.

The cases protracting domestic investor superior trading performance relative to foreign investors were equally compelling (Choe et al. 2001; Choe et al. 2005; Dvořák 2005; Agudelo 2007; Taechapiroontong and Suecharoenkit 2008). These researchers support

the hypothesis that domestic investors are more profitable in their markets due to familiarity and information advantage. Domestic investors are regarded as having information advantage because they know their country market, firm dynamics and operating environment more thoroughly. Studies in Tokyo, Sweden, China and Korea also produced neutral outcomes from investor type trading performance comparisons (Hamao and Mei 2001; Dahlquist and Robertsson 2002; Chan et al. 2006; Kang et al. 2008). Neutral outcomes were examples of no significant differences between foreign and domestic investor trading abilities and profits.

The JSE study extended the research covered in the literature review by hypothesising whether foreign or domestic investors traded at more profitable prices relative to the market and each other from 2007 to 2009. Findings reviewed in previous studies had varied and often opposing conclusions. The body of research covered in the literature review was further expanded by conducting analogous enquiries in South Africa, exercising the VWAP research methodology (Choe et al. 2001; Choe et al. 2005; Dvořák 2005; Agarwal et al. 2007; Taechapiroontong and Suecharoenkit 2008). The method was applied to investigate investor class performance differences in emerging market economies such as Korea, Indonesia and Thailand.

In South Africa, foreign and domestic investor trading activity was analysed and quantified to enhance visibility of the party with superior trading capability. The VWAP comparative framework was initially established by Berkowitz et al. (1988) for broader applications in financial markets. The robustness, depth of acceptability of this model and the importance of volume in understanding price and volatility levels was validated by Tauchen and Pitts (1983), Easley and O'Hara (1987), Karpoff and Boyd (1987), Foster and Viswanathan (1990), Andersen (1996) and Edelen et al. (2006). Therefore, the VWAP methodology has demonstrated soundness across financial market applications.

The literature review converged the essence of previous research into principles that guided hypotheses formulation into discrete acceptance and rejection criteria. Furthermore, insights were gained into the most appropriate mechanisms for resolution of the hypotheses. Presentation of the hypotheses to solve the problem statement adhered to established procedures for testing investor performance.

2.3.1 Hypothesis:

The impetus of the problem statement revolved around contrasting the returns performance of foreign and domestic investors on the JSE equities market from 2007 to 2009. Fulfilment of problem resolution was based upon realisation of results that enabled a tangible platform for price picking capability evaluations on a trade by trade basis, between investor types. The quantitative qualities of the data analysis methods exercised allowed for objective and unambiguous hypotheses formulation. Solving the problem was hypothesised as *null* (H_0) and *alternate* (H_1) statements, expressed as follows:

$$H_0: \mu_{FOREIGN} = \mu_{DOMESTIC}$$

$$H_1: \mu_{FOREIGN} \neq \mu_{DOMESTIC}$$

Whereby, $\mu_{FOREIGN}$ and $\mu_{DOMESTIC}$ are the calculated VWAP based returns performance ratios.

A neutral position was embodied by H_0 which made the supposition that foreign and domestic investors bought and sold the same stocks on the same trading day at the same prices. Thus, acceptance under the null implies equal and matched returns generation capability between foreign and domestic investors on the JSE. Rejection under the null points to the H_1 domain given that a significant disparity exists between investor type trading prices. To prove significance, the returns performance investor class deltas were

quantified and interpreted within *t*-statistic and *p* value parameters. In the event of H_1 acceptance, the extent of returns differences was calculated and the investor type with higher profitability was assessed. The returns performance hypothesis implies that the investors type with information advantage trades at more favourable prices than the market and their counterparts.

CHAPTER 3: RESEARCH METHODOLOGY

The chapter delineates the research methodology exercised to effect the analytical requirements of the study. In the context of this investigation, the literature surrounding quantitative research and the applications thereof are initially appraised. Thereafter, the research design and instrument are discussed, followed by annotations on the data collection process, sample analyses and interpretations of empirical outputs. The methodology concludes with detailed observations on validity and reliability of the study. To ensure methodological robustness and integrity, an objective view of the advantages and disadvantages of this method are addressed.

3.1 Research paradigm

Examining whether foreign investor trading behaviour exhibited superior returns characteristics relative to domestic investors on the JSE equities market necessitated the empirical basis to be quantitative in nature. The analyses encompassed mathematically based analytical assessments of raw transactional equities data directly from the JSE TradElect™ information system. Hence, the quantitative mode of analysis was more relevant to capturing the objectives of the study as opposed to qualitative research applications. Qualitative research assigns theoretical suppositions to the paradigm under interpretation, and is founded on the premise that social reality is dependent on the subjective experience of the people involved (Morgan and Smircich 1980). Whereas, quantitative analysis controls research inconsistencies by avoiding observer subjectivity, distortions and bias (Ting-Toomey 1984).

The more appropriate quantitative research systems indispensible to the JSE study encompassed analytical calculations, measurements of events and executing statistical analysis on numeric data populations (Smith 1988). By default, the data characteristics of the TradElect™ information system are numeric. The data format enabled measurement of the causal effects of investor type trading. Qualitative research is less driven by highly specific hypotheses and more concerned with emergent themes and idiographic descriptions, whereas quantitative analysis produces measures where

validity can be tested against cause and effect (Cassell and Symon 1994). This further validated quantitative over qualitative analysis for tracking trader performance, since the latter paradigm can depart from research objectives in response to changing environments. To maintain data analysis integrity, it was imperative that data interrogation outputs were not filtered by subjectivity. Therefore, determining whether foreign or domestic investors outperform their counterparts on the JSE equities market was aligned with the quantitative paradigm.

3.2 Research Design

The research design assimilated the form of mathematical models to evaluate and interpret the outcomes of investor stock trading behaviour on the JSE from 2007 to 2009. Analytical assessments provided representative facts about trading events for the study. Descriptive statistics were calculated to determine variances in mean trading price ratios by investor class. Accuracy of quantified results was enhanced by 95% confidence levels; a widely accepted statistical parameter (Cronbach 1951; Stevens 1996; Norusis 1999). The quantitative paradigm allowed for unbiased adjudication of JSE numeric data formats thereby enabling high reliability and analyses integrity. Adopting the quantitative paradigm proved advantageous for testing the hypotheses precisely with clearly defined variables for unbiased outcomes.

3.3 Population and sample

The data for the study was primarily collected from JSE databases and preceding studies conducted within international emerging markets.

3.3.1 Population

The nature of the data sourced from the JSE TradElect^{TM} system is classified as secondary data, and was received in numeric format. Secondary data concerns information that was gathered by individuals or organisations for reasons other than the study at hand (Lehmann 1989). The data type is derived from sources including but not

limited to databases, journals, publications and the internet. The JSE data inputs for research requirements were initially put into perspective against global exchanges as a barometer for gauging the relative magnitude of key local market statistics and dynamics, and to frame the context of results within and outside South Africa.

Statistical and market profiles and daily transactional information were primarily received from two data sources: The JSE and World Federation of Exchanges (WFE). The JSE attained WFE membership in 1963 and globally ranked 18 out of 52 WFE member exchanges weighted by market capitalisation during the sample period (JSE 2005a). The WFE serves as a central reference point for securities markets worldwide by promoting corporate governance standards and accepted principles of business conduct in member exchanges (WFE 2008). Other WFE member exchanges include London Stock Exchange (LSE), National Association of Securities Dealers Automated Quotations (NASDAQ), New York Stock Exchange (NYSE) and Tokyo Stock Exchange (TSE). As of December 2009, the WFE reported a total market capitalisation of all listed companies on member exchanges as US$46.5 trillion, including the JSE's market capitalisation of US$0.8 trillion (WFE 2008).

The population for the basis of the study encompassed JSE equities transactional data for every stock traded per trading day from 1 January 2007 to 31 December 2009. The data represented equity trades on the JSE Main Board, which is mutually exclusive from equity trades on the JSE Alternative Exchange (JSE AltX). The AltX provides smaller companies not yet able to list on the JSE Main Board with growth opportunities and access to capital (JSE 2005c). The market is still in infancy and was not included within the scope of study. Main Board transactional data captured by the JSE TradElect™ information system amounted to 3.6 million records for the period under study prior to sampling. The JSE market profile is elaborated on in Table 1 which tabulates key statistics per year over the sample period.

Table 1: JSE market profile from 2007 to 2009 (JSE, WFE*)

JSE PROFILE	As at Dec 2007	As at Dec 2008	As at Dec 2009	Mean
Market capitalisation (US$ million)	869 504	436 007	776 686	694 066
World rank; market capitalisation*	19	18	18	18
Market turnover (US$ million)	395 447	381 876	35 343	270 889
World rank; market turnover*	22	22	20	21
Listing statistics:				
New listings	62	23	10	32
Delistings	40	20	25	28
Foreign listings	37	46	47	43
Domestic listings	385	379	363	376
Companies listed	422	425	410	419
Securities listed	1 174	992	966	1 044
Daily averages:				
Number of trades per month	46 059	69 094	83 789	66 314
Daily volume (million)	283	333	332	316
Daily value (ZAR million)	11 876	12 986	11 179	12 014
Trading days per month	21	21	21	21

As at 31 December 2009, the JSE equities market logged an average of 83 789 trades per month from 419 listed firms. The number of listed firms changes every year due to new listings and delistings. The table also indicates that foreign and domestic investors competed over an average of 21 trading days per month, jointly generating daily turnovers of ZAR12 billion by value and 316 million shares by volume.

The JSE structures daily trading activity into events that occur at specific times as shown in Table 2. The official trading day spans from 08:30 to 18:00 on weekdays within the GMT +2:00 time zone, excluding South African public holidays. The equities trading system operates every business day of the week in standardised time slots.

Table 2: JSE official trading day activity schedule (JSE 2005b:36)

DURATION	TRADING STATUS
08h30 to 08h35	Market opening period
08h35 to 09h00	Opening auction call period
09h00 to 16h50	Automated trading period
16h50 to 17h00	Closing auction call period
17h00 to 18h00	Runoff period
18h00	System close
12h00 to 12h15	Intraday auction call period for selected equity securities.
Additional periods may occur under certain market conditions. These periods include: - Volatility auction period. - Market order extension period. - Price monitoring extension period.	
A maximum of two additional auction periods may occur after any auction call period, except for after a closing auction period when there may be up to a maximum of three. In this event, the closing auction period will be extended.	

The JSE TradElect^{TM} information system allows for orders to be placed on a twenty four hour basis. Orders logged before or after JSE trading hours are only executed at the next Open and are subject to overnight changes in international markets and economic and financial factors which may affect share prices (JSE 2005b). To manage this, risk averse investors have an option to place price level limits on orders initiated outside of JSE official trade times.

The information gathered to further support population and sample analyses provided a tangible perspective on the trading context, parameters and conditions confronting investors on the JSE equities market. The remaining trade data sourced directly from the JSE constituted sufficient depth to attain the research objectives of quantifying and contrasting returns characteristics by investor class on a trade by trade basis. This was made possible by capturing specific database field headings and identity markers as listed and defined in Appendix 2, Table 3. The high frequency trade data provided trade specific information including but not limited to: Share price per buy and sell side

transaction, volume traded, execution times in hours, minutes and seconds, and the investor residential status viz. foreign or domestic. The robust population base acquired from the JSE and WFE paved the way for a meaningful study.

3.3.2 Sample and sampling method

Input data for population and sample determination was sourced from the JSE and WFE to ensure authenticity. The population was further refined by way of sampling and filtering methods to extract information essential for direct assessments of foreign and domestic investors returns performance and their trade prices. It was anticipated that some stocks receive no foreign investor participation, whilst others attract high foreign trading interest. Furthermore, domestic investors traded virtually all stocks every day. Stocks traded by both foreign and domestic investors on the same trading day were of particular interest for final sample determination.

Commencing with 3.6 million records and averaging 83 789 trades per month on 419 listed firms, the process followed three principal filtering steps: Exclusion of specific trade type codes, identification of all stocks traded by foreign investors, detection of events where domestic investors traded the same stock on the same trading day as foreign investors. Sample crystallisation commenced with population refinement by means of filtering by data field trade type codes. Exclusion of the specific trade type codes described in Table 4 was imperative for sample distortion avoidance.

Table 4: JSE trade type codes and definitions excluded from population (JSE 2005b:37)

TradeTypeCode	DESCRIPTION	REFERENCE
OD	Delta Trade	A delta trade is a transaction where a member trades as a principal with another member, who also trades as a principal, in a single equity security. The transaction transfers the delta hedge from one member to the other in respect of a derivative transaction which has been reported to either the JSE derivatives trading system or the derivative trade recording system referred to in the directives.
OX	Exercise of Options	An exercise of options transaction may be used by a member to exercise an option or to settle a single stock future.
TX	Exercise of Traded Options	When the owner of a traded option exercises his or her right to buy or sell shares.
WX	Exercise of Warrants	When the owner of a warrant exercises his or her right to buy or sell shares.
GU	Give-up Trade	A give-up trade is a transaction where a member trades in a single equity security as a principal with another member, who trades either as an agent on behalf of a client or as a principal for that member's own account. The purpose of a give-up trade is to pass a trade that has been executed by the first member ("executing member") on the same day or the previous day to the second member ("receiving member") at the price of the original trade. The trade that is given up to the receiving member must have originally been executed by the executing member with the intention of giving it up to the receiving member.

Specific population data fields that were excluded for sampling is in accordance with JSE practices when disseminating official market statistics (JSE 2005b). Trade type codes omitted from the population included Delta Trades (OD), Exercise of Options (OX, TX), Exercise of Warrants (WX) and Give-up Trades (GU). These fields were excluded because they are not representative of pure equity trades. The first phase of sampling reduced the population to 2.3 million records.

Stocks with no foreign investor transactions over the sample period were discounted prior to data analysis. Observing the fact that foreign investor turnover relative to JSE total equities averaged 20% from 2007 to 2009, as plotted in Appendix 3, Figure 2, it was anticipated that this phase of sample determination would substantially reduce the number of records. Although, turnover is not necessarily indicative of number of trades. A total of 7 622 records represented foreign investor trades for the sample period. Due to their stock type preferences, all stocks traded by foreign investors were simultaneously traded by domestic investors on the same trading day. The third and final phase of sampling met empirical analysis prerequisites viz. evaluating trading returns performance by investor class, for the same stocks traded on the same day.

3.4 The research instrument

The research instrument transpired via direct communication with the JSE, more specifically the Products Information and Marketing department, detailing the research intent. Data specifications required for the research scope was agreed upon and processed directly from the JSE TradElect^{TM} information system. The JSE tracks all trade order data on the JSE TradElect^{TM} information system, which is then disseminated to third parties such as data resellers, financial and investment firms. Historical equities transactional data was captured in universal spreadsheet and database formats. The research instrument followed a logical process to promote fulfilment of specific population requirements aligned with the research objectives. The step by step process flow chart is mapped out in Appendix 4, Figure 3. Activity progressions through the process are iterative, thereby allowing for error detection and prompt resolution.

The advantage of the instrument approach resided in maintaining direct interface with the JSE. This enabled joint development, management and achievement of clear milestones towards successful data capture. The intraday per trade level of data required placed high demands on JSE resources in terms of time and effort. Therefore, it was more efficient to: Set distinct data specifications and scope upfront, receive initial

samples for approval, highlight deviations from specifications, receive updated sample, reach agreement upon specifications match, run query for full data capture. This ensured error identification and resolution timely in the process, prior to writing the queries for complete data retrieval from the JSE TradElect™ information system. The disadvantage of the iterative instrument was the excessive time required from all parties relevant to data compilation. However, this was outweighed by the invaluable benefits of ensuring population accuracy. The research instrument delivered an efficient and transparent framework for a representative population composition.

3.5 Procedure for data collection

The data collection procedure was pursued in conjunction with appointed JSE staff members. Key individuals were required with secure access to the JSE TradElect™ information systems for proprietary and confidentiality reasons. Structured queries were written internally by the JSE to harness the population from exchange databases. The procedure for data collection was guided by the framework laid out in Appendix 4, Figure 3. Regular communication with the JSE ensured alignment and achievement of requests and deliverables. Inherent in the research instrument was agreement upon data formats and storage media. This was a critical data collection procedure since propriety encrypted formats would prove undecipherable, rendering the data impractical. The format was interpretable by universal software applications used for analysis and dissection of numeric data.

3.6 Data analysis and interpretation

Effective sample determination facilitated application of robust data analysis techniques for fulfilment of empirical outcomes. The data analysis modus operandi exercised methods used extensively in existing published research referenced in the literature reviewed. The mathematical and statistical formulae adhered to previous studies with

like hypotheses domains and research contexts. In accordance with this, data analysis ensued VWAP measures adopted by researchers who conducted analogous studies in international emerging markets such as Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agarwal et al. (2007) and Taechapiroontong and Suecharoenkit (2008). The advantage of the analytical applications employed by these studies was non-reliance on theoretical models of expected returns.

VWAP was used to investigate foreign and domestic investor performance, trading ability and information advantage in Korea, Indonesia and Thailand. Akin to South Africa, these country exchanges are classified as emerging stock markets (MSCI 2010). The sturdiness of the VWAP benchmarks developed by Berkowitz et al. (1988) and the importance of volume in understanding price behaviour in financial markets was reported by Tauchen and Pitts (1983), Easley and O'Hara (1987), Karpoff and Boyd (1987), Foster and Viswanathan (1990), Andersen (1996) and Edelen et al. (2006). VWAP is advantageous for its simplicity and ease of comparability between price performance ratios.

Trade execution prices more beneficial than VWAP signifies that the security was traded at better than average market prices. A given trader using VWAP as a benchmark aims to meet or beat the VWAP price of the security traded (Berkowitz et al. 1988). VWAP is formulated by calculating the product of the volume traded at each price level and corresponding price, and dividing by the total volume. Price levels attracting greater volume per trade have higher impact on VWAP. The measurement was calculated for all stocks bought and sold by foreign and domestic investors on the JSE from 2007 to 2009. The volume weighted benchmark indicated whether foreign investors paid more when they bought and received less when they sold than domestic investors. The population under study contained sufficient depth to identify trades by investor type.

The VWAP is the average price for a stock trade, weighted by the volume traded at each price level. It is concerned with the total volume traded within a given time, such as a

single trading day or single trade. The purpose of the measure is to determine the ratio of value associated with all trading activity conducted during the sample period. This is achieved by comparing the value traded for a given time frame to the total volume transacted for the same period. The formula is flexible and can be applied to a wide range of stocks or a particular stock target. VWAP was initially calculated for all trades collectivity, segmented by investor type. Thereafter, VWAP for buy and sell side trades were computed separately.

Intraday stock trading activity is encapsulated by a discrete sequence of price and volume pairs of the order (P^t,V^t). The time series is valid for $t=\{0, 1, 2, 3,\ldots, T\}$, where $t=0$ is the time at market open, and $t=T$ is at market close, on a given trading day. The trading pair (P^t,V^t) means that a quantity of V^t stocks were bought or sold at share price P^t and recorded on JSE TradElect^{TM} at time t. A liquidity assumption prevails in the algorithm of the price-volume model; the price-volume sequence is observed as a singular pair per time period. The intraday trading sequence market VWAP symbolised by M is the average volume weighted price paid per share during the trading day, described as:

$$M = \{(P^0,V^0); (P^1,V^1); (P^2,V^2); \ldots; (P^T,V^T)\}, \forall\, t =\{0, 1, 2, 3, \ldots., T\} \quad (1)$$

Lower bounds were placed since share price P^t variability constants had positive integer expectancy. Share price levels in JSE equities transactional data had a lower bound of zero. Upper bounds were unwarranted given that securities prices hold no upper constraints on condition that a buyer and seller exists to match the trade.

$$P^t_{MIN,}\, P^t_{MAX} \geq 0 \quad (2)$$

The intraday market price variability range is satisfied by trading sequence *m* for all *t*:

$$m = \{(P^0{}_{MIN}, P^0{}_{MAX}); (P^1{}_{MIN}, P^1{}_{MAX}); (P^2{}_{MIN}, P^2{}_{MAX}); \ldots.;(P^T{}_{MIN}, P^T{}_{MAX})\} \quad (3)$$

Lower bounds were imposed on volume V^t to contain variability behaviour. Volume of stocks traded at share price levels in JSE equities are positive integer constants, requiring lower bounds of zero.

$$V^t{}_{MIN,}\, V^t{}_{MAX} \geq 0 \quad (4)$$

The intraday volume variability range for the market trading sequence *m* is represented by:

$$m = \{(V^0{}_{MIN}, V^0{}_{MAX}); (V^1{}_{MIN}, V^1{}_{MAX}); (V^2{}_{MIN}, V^2{}_{MAX}); \ldots.;(V^T{}_{MIN}, V^T{}_{MAX})\} \quad (5)$$

Calculated VWAP and trading price performance ratios incorporated the form of equations (1) to (5) for all JSE sample data pairs in market sequences *M* and *m*. To quantify VWAP, let $P_\sigma^{t\xi}$ denote the time varying share price and $V_\sigma^{t\xi}$ represent the number of shares for each stock σ, bought or sold at time *t,* for trade ξ. Then, the volume weighted average share price for all trades on the trading day is:

$$x_\sigma^{t\xi} = \frac{\sum_{t=T}^{t=0} P_\sigma^{t\xi} V_\sigma^{t\xi}}{\sum_{t=T}^{t=0} V_\sigma^{t\xi}} \quad , V \neq 0, \forall\, t = \{0, 1, 2, 3, \ldots., T\} \quad (6)$$

VWAP is further fragmented by investor type λ for buy and sell side transactions.

$$y_{\sigma\lambda}^{t\xi} = \frac{\sum_{t=T}^{t=0} P_{\sigma\lambda}^{t\xi} V_{\sigma\lambda}^{t\xi}}{\sum_{t=T}^{t=0} V_{\sigma\lambda}^{t\xi}} \quad , V \neq 0, \forall\, t = \{0, 1, 2, 3, \ldots., T\} \tag{7}$$

Trading performance by investor class is calibrated by the returns performance ratio δ. The ratio is computed and used as a measure of relative investor trading performance.

$$\delta = \frac{y_{\sigma}^{t\xi}}{x_{\sigma}^{t\xi}} \tag{8}$$

The performance ratio was calculated for returns made on each buy and sell transaction for foreign and domestic investor types. The basis of the research methodology was to quantify and compare buy and sell price ratios, enabling tangible foreign and domestic investor profitability evaluations. For investor type λ, the ranges of price performance ratio values are defined in Table 5.

Table 5: Interpretation of investor returns performance ratio values

δ Value	**All Trades**	**Buy Trades**	**Sell Trades**
δ=1	Trades at market prices.	Buy price = average volume weighted market price.	Sell price = average volume weighted market price.
δ>1	Trades at higher than market prices.	Buy price is higher than average volume weighted market price.	Sell price higher than average volume weighted market price.
δ<1	Trades at lower than market prices.	Buy price is lower than average volume weighted market price.	Sell price is lower than average volume weighted market price.

Foreign investors were at a trading performance disadvantage relative to domestic investors if they bought stock σ at a higher price than domestic investors on trading day t, ceteris paribus. Similarly, foreign investors were at an advantage relative to domestic investors if they sold stock σ at a higher price than domestic investors, on trading day t. The assessment over the sample period provided evidence of ratio differences between investor classes. Data analysis was dependent on VWAP as a measure to calibrate the ability of investor type λ to generate superior returns relative to their counterparts. In this regard, the ratio δ tracked the price differential of how much more or less foreign and domestic investors paid, when they bought and sold, relative to the market VWAP. The comparison was conducted for events where foreign and domestic investors traded the same stock on the same trading day.

Stocks not traded by both investor types on the same trading day were excluded from the study, consistent with the works of Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agarwal et al. (2007) and Taechapiroontong and Suecharoenkit (2008). The VWAP was computed for stocks transacted on the JSE by foreign and domestic investors from 2007 to 2009. VWAP enumerated the ratio of value associated with all trading activity conducted over the sample period; the price traded and the volume transacted. The hypotheses revolve around determination of whether the returns generated by investors significantly differed from each other. The research methodology had accuracy advantages over theoretical expectations driven models with price estimates. Calculating share price profitability differentials between investors was the empirical evidence essential for objective assessment of trader type capability on the JSE.

3.7 Limitations of the study

Prior to incorporating the research methodology, sampling and data analysis, it was important to take cognisance of systematic limitations.

3.7.1 Methodological limitations

The research methodology excluded South African currency effects resulting from fluctuations against major international currencies. Currency volatilities that may have motivated and influenced investor trading strategy decisions were not considered in the study. This is potentially a large driver because the JSE total equities market capitalisation is skewed towards currency based commodities driven listed firms. Foreign investor stock selection preferences could have been impacted by the currency and commodity nature of these businesses with primarily off shore clientele.

3.7.2 Sample limitations

The JSE TradElect™ information system initiated tracking capability of investor residential status during 2006. JSE data prior to 2006 exempted recording of investor residential status per trade order. Hence, the sample start date was limited by data availability to 1 January 2007, which restricted population size. Longer sample periods may provide more representative results. Although, the studies of Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agarwal et al. (2007) and Taechapiroontong and Suecharoenkit (2008) averaged three year sample periods, which was in accordance with the JSE study.

The JSE was not in a position to supply data with sufficient depth to discern foreign and domestic investors into individual and institutional investors. Studies such as Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agarwal et al. (2007) and Taechapiroontong and Suecharoenkit (2008) measured returns performance for foreign individual, foreign institutional, domestic individual and domestic institutional investor categories. Due to

data availability constraints, the JSE study broadly evaluated foreign versus domestic investor performance regardless of whether the investor type was individual or institutional.

The transactional records did not contain data field markers for trade events where foreign investors bought and sold equities through South African brokerage and investment companies. In the event of this relationship occurring, the trading ability would reflect under domestic investor performance.

3.7.3 Analytical limitations

There are explicit critiques of the VWAP benchmark in the literature. The bias in market impact pressures attributable to abnormally large trades in less liquid stocks and their resultant weighting on VWAP was recognised by Berkowitz et al. (1988). VWAP tends to underestimate market impact for instances where trades represent a significant portion of the day's total volume, particularly in illiquid stocks. In these cases, the market price is bias towards the price level receiving the highest volume trade. Therefore, VWAP can be ineffective as a benchmark for less liquid orders. For illiquid securities, the influence of trading VWAP price increases as trade size increases, relative to daily volume. Hypothetically, if a stock is bought by a single trader on a trading day, the buy execution prices will be equal to VWAP.

To compensate for these effects, Chan and Lakonishok (1995) used VWAP for the previous trading day as the benchmark. The effects of recognised limitations of the VWAP benchmark are dissipated in large market capitalisation liquid stocks on the JSE. High liquidity stocks mitigate the undue influence of abnormally large transactions on daily VWAP. Moreover, VWAP limitations are applicable to traders using the benchmark for market timing i.e. determine buy and sell entry and exit points respectively. The disadvantages are reduced from the perspective of using VWAP as a hindsight measure of whether an investor traded at market related prices.

3.8 Validity and reliability

The merit of research is subject to the researchers' proficiency to validate the credibility of the study. This is a necessary by-product of the observer presence and has intrinsic probable and possible impacts on the research data (Schwartz and Schwartz 1955). To restrain and control these distortions, validity and reliability of empirical discoveries are essential. The principles of external and internal validity and reliability were incorporated into the JSE study to ensure robustness and integrity of the research methodology and quantitative analysis methods adopted. A number of validity and reliability orientated studies link to the concepts of internal and external validity. The terms refer to requisites for the worth and credibility of an experiment (Campbell 1957; Campbell and Stanley 1963; Cook and Campbell 1979). These studies proceeded to rationalise that experiments with low internal invalidity implies that the results observed are not necessarily linked to the causal action of the experiment. Further, experiments that are not externally valid suggest that the outcomes cannot hold outside of the experimental setting.

Validity assesses whether research findings effectively represents reality, by evaluating the degree of the hypotheses representing or measuring the categories of human experience (Pelto and Pelto 1978; Hansen 1979). In the context of the study, the measurement of human experience was trader behaviour. Research is valid and true if it accurately represents what it was intended to explain (Hammersley 1987). This entailed realising results that accurately reflected the concept being measured i.e. foreign versus domestic investor returns performance on the JSE. Validity is concerned with a variable measuring what it is supposed to measure (Bollen 1989). The data variables in this case had clear identity markers defining trader residential status for every trade during the sample period. Hence, the variables subject to data analysis accurately represented the research objectives.

The research methodology largely focused on quantitative analysis methods as the most appropriate mechanism to measure investor trading performance. Research projects should use analytical tools to minimise deviations and enhance internal and external

validity of the study (Seliger and Shohamy 1989). This approach augmented objectivity of the research findings. Quantitative data can be used in two ways: As quantified goals or direct descriptors of performance (Dumas and Redish 1993). Quantified goals were not defined at study inception; hence, quantitative analysis was used as a direct measure of performance between investor classes. The research methodology maintained control and contained errors through adherence to a mapped process for the undertaking. In this regard, coverage spanned: Data request by direct interface with the JSE for authenticity purposes, data specifications, field definitions and receipt of information in unencrypted formats. This reinforced a high work ethic throughout the process.

Credibility in the study was further encapsulated by basing the enquiry and methodology on established and published frameworks such as Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agudelo (2007) and Taechapiroontong and Suecharoenkit (2008). An opportunity cost is attached to meeting internal and external validity conditions to the fullest. Whilst both types of criteria are important, they are often at odds, where increasing one can diminish the other (Campbell and Stanley 1963). The potential conflicts recognised by Guala (2002) refer to a trade-off between correct identification of the experiment's causal mechanism and whether the findings can be generalised to the real world. Therefore, the potential for friction exists between the requisites of validity types. Internal validity involves constructs that simplify and structure the research, often at the expense of external validity (Schram 2005). The JSE study sought balance in meeting validity and reliability principles and standards.

3.8.1 External validity

The classical composition of Cook and Campbell (1979) refers to external validity as instances where it can be inferred that the supposed causal relationships can be generalised across different persons, settings and times. Academic value is frequently linked to generalisability of the research conclusions. Research results have limited value if the findings are only relevant to unique and very specific contexts. External validity signifies the degree to which the results can be generalised when extended to

other settings (Anderson 1987). The enquiry questions if the findings of investor type performance on the JSE equities market can be generalised to other country stock exchanges. The external validity tested the degree to which the South African findings are applicable to contexts beyond the sample group investigated.

The study had low external validity because stock markets are dynamic and unique to their resident country. Thus, transference of JSE findings to other exchanges will yield divergent results. The lack of external validity was also observed in comparable literature reviewed. Variances and inconsistencies in results were prevalent even when the same methodologies were applied to the same country exchange, using different sample periods viz. Japan (Hamao and Mei 2001; Bae et al. 2002), Korea (Choe et al. 2001; Kim 2002; Choe et al. 2005; Kang et al. 2008), Thailand (Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008) and Indonesia (Dvořák 2005; Agarwal et al. 2007; Agudelo (2007). Consequently, meeting external validity and cross market generalisability for the JSE study is not possible, nor was it the objective. The research objectives were not inclined towards gaining predicative insights into investor behaviour, either in South Africa or internationally. Instead, the study observes a snap shot of past behavior based on actual trades and reports on the results for information purposes. Additionally, it is anticipated that conducting an identical study on the JSE with different sample periods, will reap dissimilar results.

3.8.2 Internal validity

To accomplish validity, the tested hypotheses must match the causal conditions of reality. Internal validity implies that a relationship between two variables is causal, and absence of the relationship infers absence of cause (Campbell and Stanley 1963; Cook and Campbell 1979). Are researchers actually observing what they should be measuring? This is the internal validity challenge and an important requirement for all research designs. Data analysis formats and database field definition specifications effectively converged what was observed and what was measured. The observed data was actual equity trade order transactions captured on JSE TradElect™ in real-time.

The data measurements were specific stock buy and sell prices for identification of trading patterns and calculation of returns performance for each trade. Therefore, the JSE study observed what had to be measured and the data selected for inspection represented the research objectives. Synchronising what was observed with what was measured enhanced internal validity of the study.

Internal validity was described by Yin (1994:33) as a causal relationship, where certain conditions leading to other conditions should be distinguished from unauthentic relationships. Therefore, internal validity compliance relies on making deductions from cause-effect relationships as opposed to applying a single technique. Extrapolations of causal relationships only gains internal validity when the researcher links specific observed variables with the changes being measured. Causal inferences exist if the cause leads to the effect, without the undue effect of other causes. Internal validity involves the approximate truth from inferences and causal relationships made in the study (Trochim 1999). The methodology applied to the research captured independent variables from JSE TradElect™, determined the dependent variables and interpreted the causal relationship outputs. The independent variables were based on facts and triangulated by three trade time data fields, as described in Appendix 2, to confirm the actual event: *StatisticDate*, *TradeDateTime* and *TradeReportDateTime*. This eliminated phantom trades that could distort findings, such as trades that were logged but resulted in cancelled or reversed trades. These actions, coupled with data specifications agreements with the JSE, ensured that independent variables were factual, represented reality and source directly from JSE real-time information systems. The observed JSE data was relevant and the correct agent for what had to be measured. Ensuring precise mathematical modelling inputs promoted output accuracy.

Discussions on internal validity should prescribe the actions used by the researcher to warrant correct cause and effect conclusions. Internal validity threats are research challenges and include history, maturation, observer effects, selection, regression, mortality and spurious conclusions (Campbell and Stanley 1963; Cook and Campbell 1979). These researchers proposed that unbiased conclusions can be reached through

accurate identification of measured causality associations. The JSE study explicitly defined causal relationships between dependent and independent variables. Independent variables were logged on JSE TradElect™ for every buy or sell side trade order. Independent variables included order date, stock code, price, volume and residential status. The data was analysed by way of VWAP returns performance ratio calculations i.e. the dependent variables. The dependent variables quantified causality relative to market and competing trader benchmarks. Internal validity of the JSE study was enhanced due to unambiguity in the nature of the causality relationship between independent and dependent variables. However, determining the causality of why investor types performed certain actions has multi-dimensional complexity and resides outside the scope of the study.

An observed relationship between two variables returns a causal process and the absence of the observed relationship suggests lack of a causal process (Curran and Wirth 2004). No trade logged (independent variable) against a trader, led to null trade statistics outputs (dependent variables), resulting in no causality. To further support validity arguments in the JSE study, threats to internal validity were sufficiently addressed. Accurate inferences were drawn on the relationship between independent (trade data) and dependent (trade performance) variables. High internal validity was attributable to an effective research design and data analysis process.

3.8.2.1 Threats to Internal Validity

a) Single group threat

Threats to internal validity refer to alternative causes, other than the research undertaking, which may be responsible for affecting the results. These threats prevent and obstruct the causal relationship observer from distinguishing the real causal effects of the research (Trochim 1999). This study classified internal validity threats into single and multiple group threats. Analysing investor type performance on the JSE was subject

to the single group threat. This occurs when the experiment involves a single group and no comparison group is used to verify causal relationships. Single group threats include history, maturation, testing, measurement, instrumentation, mortality and regression to mean threats. The comparison group available for interpretation of results resided in analogous works that conducted equivalent tests in different markets (Choe et al. 2001; Choe et al. 2005; Dvořák 2005; Agarwal et al. 2007; Taechapiroontong and Suecharoenkit 2008). However, findings are divergent based on the unique dynamics of country stock markets.

The single group threat exists in single data source scenarios. The JSE data analysis incorporated multiple checks and balances to distinguish internal validity threats. Foreign and domestic investor returns performance was computed relative to the market to detect abnormal deviations. Descriptive statistics and data range characteristics such as standard deviation, minimum and maximum values and standard errors with 95% confidence levels were implemented to promote accuracy. The JSE is the official disseminator and sole authorised provider of raw trade data for the South African exchange. Third parties are obligated to source data directly or indirectly from the JSE. Therefore, it was not possible to verify observed causality behaviours against additional data sets from alternative sources.

b) Selection Bias

An additional threat to internal validity included the data population being subject to a selection bias due to non-random selection (Girden 1996). The sample period for JSE source data was influenced by exogenic infrastructural factors; prohibiting random selection. JSE information system upgrades with tracking and reporting capability for investor residential status per trade was implemented during the 2006 trading year. Consequently, JSE equities trade data for the sample commenced 1 January 2007. This exposed the sample to non-random selection bias, thereby producing an internal validity weakness. These constraints rendered the population selection procedure as deliberate. This limitation was possibly contained by the high number of records (3.6 million) resulting from real time high frequency intraday trade data for every stock traded over

the sample period. Each independent and discrete record for buy and sell trades were random events, captured by JSE TradElect™ as and when they transpired. Therefore, the selection bias threat was minimised by the random constituents of the non-random selection. Mitigating against this factor increased the internal validity of the JSE study.

c) Measurement Error

Error is perceived as a pervasive threat to measurement. Validity is often discussed in connection with measurement error, which may be a systematic bias (Carmines and Zeller 1979: 14). To minimise the magnitude of error, it was necessary to interpret results relative to systematised concepts (Messick 1989). Expression of the causal hypotheses and JSE trader type performance results required supporting evidence. The evidence for validity assessment was high due to the characteristics of the study. The findings were based on facts, clearly defined hypotheses and quantitative analysis to eliminate interpretation ambiguities. Research conclusions were deduced within 95% confidence level parameters, limiting variability and misinterpretation from outlier distortions. The study also followed the measurement principles of established and comparable research in international emerging markets (Choe et al. 2001; Choe et al. 2005; Dvořák 2005; Agarwal et al. 2007; Taechapiroontong and Suecharoenkit 2008). Therefore, error avoidance was gained through proven and effective measurement techniques and guidelines. Potential measurement errors are also self-rectifying by nature of the VWAP analytical methods used to quantify and compare price performance ratios. The mechanics of weighted averages tend to smooth out errors and outlier effects over time, eventually neutralising the impact.

The data integrity of JSE measurement inputs contributed to high internal validity. The JSE is the exclusive authorised disseminator of the South African exchange trade data to third parties locally and internationally (JSE 2005d). Individuals or entities requiring past or present raw JSE trade data, either approaches the JSE directly or a third party vendor that sourced the data from the JSE. Due to the critical nature of the data with innumerable users and observers, it is highly unlikely that errors would go unnoticed,

and when noticed, go unrectified. The JSE complies with stringent international governance and data standards as prerequisites to WFE membership (JSE 2005a). This is in addition to South African regulatory compliance and governmental obligations that the JSE must meet in order to operate as the official country exchange. These factors jointly contributed towards restraining measurement error threats to internal validity.

3.8.3 Reliability

Validity is often discussed in connection reliability. From this perspective, validity involves systematic error and reliability involves random error. The latter being traditionally viewed as a reliability problem, occurs when repeated actions of the same measurement procedure yields varying results (Carmines and Zeller 1979: 14). Reliability refers to the extent to which the JSE study and data procedures can be replicated with the same results (Yin 1994:33). The measurement procedure on the South African exchange had 7 622 repetitions within the same study, based upon the total number of trades meeting the conditions of both investor types transacting the same stock on the same day.

The analyses initially calculated price performance ratios by investor type for all trades cumulatively. Ratios were subsequently evaluated for buy and sell side trades separately. This allowed for error inspection and identification of deviations. Buy and sell side results were matched against cumulative trade ratios for alignment purposes. Repeated applications of the measurement procedure on the same data sample will yield the same results since no assumptions and subjectivity was catered for during analysis. Therefore, the extent to which the measuring procedure yielded the same results on repeated trials was high with internal consistencies. The research methodology followed a logical process from concept inception to empirical findings.

CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

Results of the empirical analysis are presented herein and exhibited by way of tabular and graphical formats. At the outset, the JSE general market conditions are described to emphasise the climate under which investor classes competed during the sample period. The trading environment includes general JSE market statistics such as daily trade value, volume means and annual changes in numbers of securities listed, new listings and delisting. A perspective is gained on the extent and magnitude of foreign investor trading activities relative to the total JSE equities market from 2007 to 2009.

Presentation of results centres on foreign investor trading preferences founded on actual trades profiled by JSE stocks codes, economic groups, industrial sectors, market capitalisation and trade execution times. The remaining segment envelops the thrust of the study by rendering comparisons of returns performance by trader type based on VWAP calculations and the resultant ratios. The influence of the empirical findings on the conditions dictating acceptance or rejection of the null and alternate hypotheses is deliberated on, followed by an inclusive summary that crystallises a framework for interpretation of the results.

4.2 Demographic profile of sample

Due to the random nature of stock markets and trading behaviours, no preconceived ideas or expectation of specific outcomes arose prior to sample analysis. This stance was contributed to by several conflicting results observed in literature reviewed, albeit within same country exchanges. The JSE equities market conditions during the sample period were captured by plotting the FTSE/JSE ALSI as per Appendix 1, Figure 1. The index trend line was extracted using daily Open, High, Low and Close prices supplied

by the JSE. The chart provides a visual sense of market volatilities, depicted by recurrent peak and trough fluctuations over time.

The FTSE/JSE ALSI in Appendix 1, Figure 1 gained approximately 15% for the 2007 trading year, opening at 25 157 points and closing at 28 958 points. The first year of the sample period closed on an uptrend with bearish tendencies over the third and fourth quartiles. The price time series continued optimistically for the first half of 2008, exceeding 2007 highs. The uptrend was not sustained, reversing towards the end of the trading year to levels below the 2007 Open price. Prices declined approximately 27% during the year and closed at 21 509 points on 31 December 2008 from an Open of 29 290 points. The market gapped up at the 2009 Open to 22 304 points, gaining almost 20% by closing at 27 666. The final year of the sample period continued to lower its base from opening levels but recuperated with upside recovery for the remainder of 2009.

Referring to the sample demographic profile in Table 1 of Section 3.3, there were on average 419 companies listed on the JSE for the sample period, with several annual changes in the number of listings. On average, 32 new companies listed and 28 delisted per trading year from 2007 to 2009. Investors had 21 trading days per month at their disposal and participated in an average of 66 314 daily trades. At these activity levels, ZAR12 billion and 316 million shares were transacted per trading day. These demographics were representative of the magnitude of combined foreign and domestic investors trading and the general market dynamics that surrounding their trading decisions.

4.3 Results pertaining to the hypothesis

4.3.1 Market profile

Perspective on the scale of foreign investor trading activity relative to the market is gained from the chart presented in Appendix 3, Figure 2. The plot comprises the JSE equities market total monthly turnover by value versus foreign investor turnover for the sample period. Foreign investor turnover averaged 20% of total JSE equities market turnover from 2007 to 2009. The remaining 80% of trade turnover was attributed to by domestic investors.

4.3.2 Foreign investor stock preferences

Upon establishing that foreign investor trading was prevalent on the JSE over the sample period, their trading characteristics were analysed to profile investment behaviour and preferences. Observations made on foreign investor trades by JSE official stock code are presented in Appendix 5, Table 6. The list summarises the company name, market capitalisation classification and economic sectors of choice for foreign investor stock code preferences. The JSE stock code constituents of foreign investor portfolios weighted by trade value are shown in Appendix 6. The assessments in Figures 4 to 7 tracked foreign investor spend per stock code for each trading year, followed by the combined portfolio for the sample period. Foreign investor stock choices remained relative unchanged over the sample period.

The pie charts indicate that foreign investor buy and sell trades remained consistently skewed by value towards particular stocks: Anglo American Plc. (AGL) 26%, Standard Bank Group Ltd. (SBK) 15%, Firstrand Ltd. (FSR) 10%, Old Mutual Plc. (OML) 8% and Barloworld Ltd. (BAW) 7%. Alexander Forbes Ltd. (AFB) and Ellerine Holdings Ltd. (ELH) were not traded post 2007, whilst other stock picks were repeatedly traded year on year. In addition, Edgars Cons Stores Ltd. (ECO) delisted during 2007, hence the stock was not traded in, subsequent to the first year of the sample period.

Foreign investor trade value weighted by JSE official Economic Group classification codes are presented in Appendix 7, Figures 8 to 11. The figures depict the effect per trading year and cumulatively for the entire sample period. The foremost economic groups attracting foreign investor interest over the total sample period were: Financials (J080) 51%, Resources (J000) 26% and Cyclical Services (J050) 11%. The remaining turnover was directed towards General Industrials (J020), Non-Cyclical Consumer Goods (J040) and Non-Cyclical Services (J060). During the sample period, foreign investors did not trade equities from the Cyclical Consumer Goods (J030), Utilities (J070) and Information Technology (J090) economic groups.

The economic groups of listed firms are further categorised by the JSE into industrial sectors. Foreign investor activity was fragmented into JSE Industrial Sectors presented in Appendix 8, Figures 12 to 15. The charts were constructed for each trading year, followed by the net cumulative effect for the entire period under study. From Figure 15, the total trade value numbers analysed by industrial sector indicated distinct capital allocation towards Banks (J081) 30%, Mining (J004) 26%, Life Assurance (J084) 12% and General Retailers (J052) 11% for the total sample period. Portfolio weightings also indicated a coherent bias towards these industries for each year of study.

Foreign investor stock preferences were segmented by JSE market capitalisation as displayed in Appendix 9, Figures 16 to 19. This phase of data analysis categorised foreign investor stock picks by their market capitalisation characteristics. The cumulative chart in Figure 19 comprises the portfolio market capitalisation weighting over the total sample period. For the duration of study, foreign investors allocated 76% of trade value towards large capitalisation stocks. Capital allocations towards medium and small capitalisation stocks were 22% and 2% respectively. Similar proportional weightings were maintained year on year. Foreign investors positioned the greater part of their portfolios in large market capitalisation stocks.

4.3.3 Trade Execution Times

The final phase of identifying foreign investor stock preferences and trading behaviours incorporated mapping trade execution times for every trade, per stock from 2007 to 2009, referenced in Appendix 10, Figures 20 to 39. The cumulative chart in Figure 39 comprised trade times for all trades, across all stocks for the sample period. A high concentration of trade times occurred in the last hour of trading days i.e. between 16:00 and 17:00 across all trades and trading days. This distinct pattern was predominant throughout the sample period.

4.3.4 Returns performance by investor class

Results of investor type returns performance ratios based on VWAP calculations are reported in Appendix 11, Table 7. The ratios are equally weighted across all stocks and days traded by investors from 2007 to 2009. The table summarises the empirical findings and descriptive statistics for price performance measurements on the JSE. Returns performance ratios δ were initially quantified for all trades cumulatively and then computed for buy and sell side trades separately. Insights were gained into overall investor returns performance relative to the market; decomposed by the investor class that bought at lower prices and sold at higher prices.

For all trades from 2007 to 2009, foreign investors generated mean returns performance ratios of 1.00425 and domestic investors realised 0.99968 for the same stocks traded on the same trading days. The ratio difference of 0.00456 was in favour of domestic investors. Significance was confirmed by the two tailed difference between paired means *t*-statistic of 20.64. The *p* value tended towards zero at 0.05 alpha levels. For the same stocks traded on the same day; domestic investors traded significantly below average volume weighted market prices and foreign investors traded significantly above market prices across all trades. There was sufficient empirical evidence to support rejection of H_0 due to significant differences in returns performance between investor classes. Foreign and domestic investors do not trade at equal prices as expressed under

the null. The returns ratio differential confirmed H_1 acceptance. Foreign and domestic investors traded the same stocks on the same trading day are substantially different prices.

Subsequently, returns performance ratios were assessed separately for buy and sell side transactions. Foreign investors generated mean buy side ratios of 1.00991 whilst domestic investors achieved 0.99895. The *t*-statistic for the two tailed paired mean difference is 34.43 with an approximately zero *p* value at 0.05 alpha levels. Foreign investors paid significantly more than domestic investors for the same stocks traded randomly on the same day. Domestic investors consistently bought stocks below market prices, demonstrating superior buy price picking abilities relative to foreign investors. Foreign investors had a mean returns performance ratio for sell side trades of 0.99331 compared to domestic investor results of 1.00073. The *t*-statistic is -31.61 and the *p* value approaches zero at 0.05 alpha levels. Foreign investors experienced diminished returns from sell transactions by selling frequently below average market prices. By comparison, domestic investors sold the same stocks at higher than volume weighted average market prices.

The results presented established that H_0 is rejected in favour of H_1. This was attributable to domestic investors buying and selling at more profitable prices relative to foreign investors on the JSE equities market. The performance disparity was consistent for all trades.

4.4 Summary of the results

The presented findings summarised the sample demographics into general market conditions and extracted foreign investor trading preferences according to various criteria. Additionally, comparisons of investor type returns performance were rendered for the same stocks traded from 2007 to 2009. The FTSE/JSE ALSI chart captured the uptrend and downtrend swings and general market volatilities for the sample period. Foreign investor trading activity averaged 20% of JSE equities market value for the period. They consistently traded specific stocks annually with stable portfolio weightings in Anglo American Plc., Standard Bank Group Ltd., Firstrand Ltd., Old Mutual Plc. and Barloworld Ltd. securities. Foreign investors uniformly allocated capital primarily towards the Financials, Resources and Cyclical Services categories of JSE Economic Groups. Their stock selection preferences were contained within the Banking, Mining and Life Assurance classifications of JSE Industrial Sectors. Foreign investor portfolios were weighted towards these industries for each year of study.

Segmenting foreign investor stock trades by JSE market capitalisation revealed a distinct bias towards large capitalisation stocks. Trade execution times across all stocks and trades indicated that the highest concentration of trades occurred during the closing hour of trading days. This behavioural pattern was relevant to buy and sell trades, regardless of the stock traded. Investor type returns performance ratio outputs were described for stocks traded by foreign and domestic investors from 2007 to 2009. Interpretation of results established that H_0 was rejected due to significant differences in foreign and domestic investor trade prices. Domestic investors generated higher returns than foreign investors when trading the same stocks. Following H_1 affirmation for all trades, returns performance was compared for buy and sell side transactions independently. For buy trades, foreign investors paid higher than average market prices relative to domestic investors. Similarly, foreign investors received lower than average market prices when they sold. Domestic investors sold the same stocks at more favourable prices. In summary, the outcomes presented indicated that domestic investors generated superior returns; buying and selling the same stocks at more profitable prices than foreign investors on the JSE equities market.

CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Introduction

The discussion on empirical outputs and related observations will be extended to harness the meaning and inferences in context of analogous studies from literature reviewed. Sample demographics and JSE equities market statistics are compared to international emerging economy exchanges. Foreign investor trading preferences along several measures are paralleled against behaviours reported from these markets. Examining trading performance, the price hypotheses for foreign and domestic investors implies that the investor class with information advantage trades at better prices than their counterparts. The focus of the chapter encompasses interpretation of returns performance ratios and the implications of these measures in relation to previous studies. This is linked to considerations, based on statistical analysis, surrounding rejection of H_0 and acceptance of H_1.

5.2 Demographic profile of sample

The FTSE/JSE ALSI index plotted in Appendix 1, Figure 1 exhibits the equities market environment for the sample period. The uptrend and downtrend fluctuations provide a broader perspective on foreign and domestic investor trading capability in varying market conditions. This is advantageous over single sided scenarios that assess trader performance in either uptrend or downtrend markets exclusively. From the literature reviewed, previous studies on international markets did not specify market trends and conditions over their sample periods. With the exception of Kamesaka and Wang (2004), who focused particularly on a pre and post Asian crisis sample period to test investor trading performance and behaviour in Thailand's stock market.

Analysing country exchanges at different time periods provided a means of comparing investor performance in the course of varying market conditions, as was done in Japan

(Hamao and Mei 2001; Bae et al. 2002), Korea (Choe et al. 2001; Kim 2002; Choe et al. 2005; Kang et al. 2008), Thailand (Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008) and Indonesia (Dvořák 2005; Agarwal et al. 2007; Agudelo 2007). Conflicting results of foreign and domestic trader performance and profitability reported from these country exchanges becomes plausible when taking timeframe differences into account. It is evident that foreign and domestic trader ability is influenced by market conditions. The JSE population was not subject to bull and bear biases on trader performance, attributed to both climates prevailing over the data sample period.

Foreign and domestic investors traded the stocks of 419 listed firms on the JSE from 2007 to 2009 as presented in Table 1 section 3.3. This fell within the range of research conducted in international emerging markets. The emerging market with the highest number of listed firms was Korea Stock Exchange with 785 listed companies (Choe et al. 2001). Lower ranges were found in Stockholm Stock Exchange which had 322 listed companies (Dahlquist and Robertsson 2002). The Jakarta Stock Exchange had 343 listed companies when Dvorák (2005) studied trader type profitability. Higher numbers of listed firms promotes sample size and provides a wider spectrum for investor trading performance comparisons. The number of listed companies on the JSE is an uncontrollable factor in sample determination.

5.3 Discussion pertaining to Hypothesis

5.3.1 Market profile

The scale of foreign investor trading against the backdrop of the total JSE equities market turnover by value is represented in Appendix 3, Figure 2. Foreign investor trade transactional value averaged 20% of total JSE turnover in equities. The total market turnover included all trades across an average of 419 firms listed on the JSE from 2007 to 2009. Domestic investors contributed towards the residual 80% of market turnover

value. The trading turnover proportion of investor class participation was consistent throughout the sample period.

Corresponding studies in emerging markets tracked foreign investor turnover with similar outcomes: 18% in Korea Stock Exchange (Choe et al. 2001), 20% in Stockholm Stock Exchange (Dahlquist and Robertsson 2002) and approximately 25% in Jakarta Stock Exchange (Dvorák 2005). Whilst foreign investor JSE equities trade turnover proportions emulated the emerging exchanges of Korea, Sweden and Indonesia; variances existed in terms of trade value, volume and number of trades. The underlying feature is vested in the fact that domestic investors were the most active traders on the JSE. In this regard, domestic investors provided the critical mass of volume and liquidity on the JSE equities market for the sample period.

5.3.2 Foreign investor stock preferences

Stock selection decisions made by foreign investors on the JSE were considerably skewed towards large market capitalisation stocks. Controlling the data for firm size revealed an average year on year asset allocation bias towards large capitalisation stocks of 76% of trade value (Appendix 9, Figures 16 to 19). Foreign investors had a distinct preference for large market capitalisation securities on the JSE. These stock types are favoured for their high liquidity and low information asymmetry characteristics. The disposition of foreign investors towards large established firms on the JSE reinforced previous findings in emerging markets.

In Korea, Kim (2002) proved that large capitalisation stocks have smaller information asymmetry problems than small capitalisation stocks. Small stocks on the Korea Stock Exchange were subject to higher degrees of information asymmetry and market liquidity constraints, whilst large stocks had wider analyst coverage, including foreign analysts. The study concluded that the information asymmetry effect outweighed the effect of investor sophistication. Foreign investors prefer large firms with high liquidity

and global coverage. They are influenced by the need to minimise the impacts of information advantage that domestic investors may be privy to.

For this reason, Grinblatt and Keloharju (2000) focused the sample on the 16 largest Finnish stocks on the Helsinki Stock Exchange. The largest stocks had the highest liquidity and sufficient information for foreign investors. In effect, the study controlled the sample for market liquidity and information asymmetry for uninhibited monitoring of foreign investor sophistication and performance. Similarly, Seasholes (2000) narrowed the data sample of Taiwan Stock Exchange stocks to the top 14 largest market capitalisation companies. The intention was to ensure adequate information availability to foreign investors.

These studies attempted to remove barriers to foreign investor trading performance through sample selection. Centring the data sample on large firms evens the playing field, enabling a more precise reflection of foreign versus domestic investor returns performance. In Sweden, foreign investors were drawn to firms with international profiles and more transparent information (Dahlquist and Robertsson 2002). The study on foreign holdings of Swedish stocks found bias towards large and financially solid listed companies with adequate access to information.

Large capitalisation firms have the most liquid stocks on the JSE. Traders accept firm size as a good proxy for liquidity (Agarwal et al. 2007). In Thailand, 61% of foreign investor transactional value was traded in the largest stocks; further testimony of bias towards holding large market capitalisation securities (Taechapiroontong and Suecharoenkit 2008). Foreign investor capital allocated to JSE equities was considerably inclined towards large stocks for the period under study. Trading strategies incorporated by foreign investors on the JSE suggested an awareness that possible information asymmetries may exist on the South African exchange. Their trading behaviour endeavoured to supress information disadvantage effects.

The securities primarily traded by foreign investors typified the characteristics of liquidity, stability and foreign analyst coverage. Foreign investor trading strategies hedged against potential information disadvantage risks of the JSE equities market. The findings allude to the existence of information asymmetry between foreign and domestic investors in South Africa. The results are consistent with preceding literature; foreign investors converge their stock selection criteria towards large market capitalisation stocks with high liquidity, international profiles and reduced information asymmetry effects.

5.3.3 Trade Execution Times

Controlling the data for foreign investor intraday trade execution times revealed the conspicuous patterns viewed in Appendix 10, Figures 20 to 39. Transaction time stamps were logged in real-time on the JSE TradElect™ information system at the exact time of trade. The scatter plots for every stock traded illustrates a prominent density of transactions between 16:00 and 17:00 i.e. the closing hour on a given trading day. This trade time pattern was contrary to Korea Stock Exchange where foreign investors traded uniformly throughout the day (Choe et al. 2001). No specific foreign trade time trends were identifiable in Korean stock trades. In contrast, foreign investors trading the Thailand Stock Exchange concentrated 43% of their trade activity during the morning period (Taechapiroontong and Suecharoenkit 2008). Foreign investors adopted varying trade execution time patterns in different country exchanges.

It is indistinguishable whether the JSE GMT +2:00 time zone was a factor in foreign investors performing a majority of their transactions in the market closing hour. The trade characteristics infer that foreign investors were seldom intraday market timers. Their short term trading strategy circumvented intraday trading investment styles. Foreign investors placed greater emphasis on the JSE stock Close price as opposed to Open, High and Low prices. Filtering out intraday prices from foreign investor entry and exit decisions conceivably assisted them in reducing intraday volatility noise. Foreign investor trade time patterns on the JSE were not replicated in other emerging exchange studies reviewed.

5.3.4 Returns performance by investor class

The empirical findings for foreign and domestic investor returns performance on the JSE is presented in Appendix 11, Table 7. Ratios quantified from VWAP measures are equally weighted across all stocks and days from 2007 to 2009. At the outset, returns performance ratios were computed for total trades cumulatively and then for buy and sell side trades discretely. Trading performance was analysed for events where foreign and domestic investors traded the same stock on the same day. For all trades over the sample period, foreign and domestic investors produced mean ratios of 1.00425 and 0.99968 respectively. The foreign investor mean returns ratio is greater than one (the market) and significantly greater than domestic investors. Domestic investors outperformed foreign investors by 46 basis points relative to the market across all trades. The two tailed difference between paired means *t*-statistic is 20.64, with a *p* value tending to zero at 0.05 alpha levels. Domestic investors traded significantly below volume weighted market prices and foreign investors traded significantly above market prices for the same stocks traded on the same day, implying information advantage (Choe et al. 2001; Kalev et al. 2007).

The findings rejected H_0 given that foreign and domestic investors did not trade equities at equal prices on the JSE. Foreign investors traded at higher than market prices returning lower profits than domestic investors. This was contrary to the Korean exchange where foreign investors outperformed domestic investors by 40 basis points relative to the market for all trades (Kim 2002). The Korean study suggested that foreign investors were more sophisticated than domestic investors after controlling for information asymmetry and market liquidity by sampling large market capitalisation stocks. Domestic investors were at a distinct information advantage across all trades in South Africa. The significant returns differential between investor types supported acceptance of H_1. Foreign and domestic investors traded the same stocks on the same trading day at substantially different prices.

Following H_1 validation, the divergence of returns were further scrutinised to obtain greater accuracy and further clarity on foreign investor performance. This was enhanced

by conducting VWAP calculations distinctly for buy and sell side trades. Separation of events is necessary in view of the fact that low ratios are favourable to buy trades but detrimental to sell side positions. Ideally a long trader aims to buy below and sell above market prices. Returns performance differences between investor classes became more apparent when trades were assessed separately for buy and sell transactions. The outcomes further reinforced H_0 rejection in support of H_1 acceptance. Mean buy side ratios for foreign and domestic investors were 1.00991 and 0.99895 respectively. The two tailed *t*-statistic of 34.43 and approximately zero *p* value at 0.05 alpha levels proved significance. Foreign investors paid on average 110 basis points more than domestic investors for the same stocks bought on the same day. Domestic investors consistently bought these stocks at lower than market prices. The mean sell side ratio values for foreign and domestic investors are 0.99331 and 1.00073 respectively. The returns ratio *t*-statistic is -31.61 and the *p* value approaches zero at 0.05 alpha levels. Foreign investors experienced diminished returns from sell transactions by exiting positions at lower than market prices. By comparison, domestic investors sold the same stocks on the same day at 75 basis points higher, relative to market prices. The results demonstrated that domestic investors had information advantage and traded with superior buy and sell prices relative to foreign investors and the market.

The JSE findings were analogous with more recent studies in Korea where domestic investors on the exchange were at an advantage over foreign investors by 21 basis points for buy trades and 16 for sell trades (Choe et al. 2005). Similar results extended to Indonesia where foreign investors paid 14 basis points more than domestic investors when they bought and received 24 basis points less when they sold (Dvořák 2005). Using a different sample period in Indonesia, foreign investors paid on average, 9 basis points more and sold stocks 14 basis points less than domestic investors (Agarwal et al. 2007). The investor group with information advantage is the one with higher average profits; the one who knows more gains more (Kalev et al. 2007). Thailand stock market supported the information advantage hypothesis where domestic investors bought at lowest prices and sold at highest prices (Taechapiroontong and Suecharoenkit 2008). Foreign investors paid 20 basis points higher than domestic investors for buy trades. They gained less by selling 10 basis points lower than domestic investors.

Domestic investors generating superior profitability in their own country exchanges is inverse to the mainstream results from literature reviewed. The JSE findings diverged from studies proving foreign investor acquisition of better quality information, higher returns and the ability to reflect market information faster than domestic investors. The majority of studies reviewed deduced that foreign investors generated higher profits from their trading strategies and had information advantage, sophistication and superior market timing abilities compared to domestic investors (Grinblatt and Keloharju 2000; Seasholes 2000; Bae et al. 2002; Kim 2002; Chai-anant 2003; Kamesaka and Wang 2004; Agarwal et al. 2007; Kalev et al. 2007). These studies are coherent with better information, greater sophistication and the capability to generate higher returns on the part of foreign investors.

The JSE findings aligned with research advocating domestic investor superiority and higher profitability than foreign investors. Like results were found in international emerging exchanges such as Korea (Choe et al. 2001; Kim 2002; Choe et al. 2005; Kang et al. 2008), Thailand (Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008) and Indonesia (Dvořák 2005; Agarwal et al. 2007, Agudelo 2007). Domestic investors made more profitable trades than foreign investors on the JSE.

5.4 Conclusion

The study brought awareness to key foreign and domestic investor dynamics on the JSE equities market. Investor type returns performance was tracked amidst bull and bear market conditions. The FTSE/JSE ALSI movements captured investor performance during uptrend and downtrend oscillations from 2007 to 2009. The magnitude of foreign investor turnover during this period averaged 20% of the total JSE equities market by value. Corresponding proportions were observed in Korea, Stockholm and Jakarta stock exchanges (Choe et al. 2001; Dahlquist and Robertsson 2002; Dvorák 2005). The similarities arose despite considerable market capitalisation and turnover variances between the country exchanges. Domestic investors were more active market participants than foreign investors on the JSE equities market.

Foreign investor stock choices by total trade value were consistent year on year, with minor adjustments. Cumulatively, 76% of foreign investor total trade value was directed towards large market capitalisation stocks. Foreign investor stock preference tendencies were characteristic across international emerging markets. Foreign investors are attracted to large market capitalisation stocks with established profiles, transparent information, wide international analyst coverage and high liquidity (Kim 2002; Dahlquist and Robertsson 2002; Agarwal et al. 2007). Securities preferences traded by foreign investors on the JSE attempted to limit information asymmetry.

Conspicuous patterns emerged from foreign investor trade execution times across all stocks, days and trades. A large proportion of trades occurred within the closing hour of trading day. The trade time behaviour on the JSE differed from other country exchanges. Studies on international emerging exchanges indicated that foreign investor trade time trends varied in all countries. Hence, foreign investors did not have particular trade execution time routines that the JSE findings could be compared against. The JSE trade time stamps indicated that foreign investors did not schedule trades according to intraday price movements. Their trading decisions were based on market closing prices between trading days, and not intraday price differences.

The returns performance ratio comparisons and differences between investor types were quantified and assessed. The results indicated that domestic investors generated superior returns when trading JSE equities. They bought and sold the same stocks at more favourable prices than foreign investors. For all trades, foreign and domestic ratio values were 1.00425 and 0.99968 respectively. The results proved significance for H_0 rejection. Acceptance of H_1 was further validated by calculating returns performance ratios for buy and sell transactions discretely. Foreign investors and domestic investors had buy side ratios of 1.00991 and 0.99895 respectively. This indicates that foreign investors paid higher than market prices relative to domestic investors. For sell side trades, foreign investors measured 0.99331 and domestic investors 1.00073. Foreign investors were at a profitability disadvantage by selling stocks at lower than average market prices. Domestic investors sold those securities at higher than average market prices, on the equivalent trading day. The relatively high *t*-statistic values imply serial correlation in the time series data points. This attribute was anticipated given that measures were calculated relative to market prices, where both investor types combine as market co-creators.

The findings provided evidence that domestic investors had information advantage and outperformed foreign investors across all trades on the JSE. Using the VWAP method of measurement, domestic investors paid less than foreign investors on buy trades and received more on sell trades. This is coherent with like studies in international emerging markets where domestic investors paid less than foreign investors when they purchased and received more when they sold. Cases of domestic investors demonstrating superior trading performance relative to foreign investors occurred in Korea, Indonesia and Thailand stock exchanges (Choe et al. 2001; Choe et al. 2005; Dvořák 2005; Agudelo 2007; Taechapiroontong and Suecharoenkit 2008). These reports support the hypothesis that domestic investors are more profitable in their own country exchanges due to familiarity and information advantage. Domestic investors generated superior profitability on the JSE equities market, complementing the findings of these studies.

In additional to information asymmetry effects that diminished foreign investor returns, trade execution times may have compounded the trading disadvantage. Domestic investors traded uniformly throughout the day. They bought and sold by seizing opportunities as and when share prices fluctuated above or below average market prices. Domestic investors exhibited superior timing abilities and sensitivity towards average market price levels and acted accordingly. This is a further characteristic of trading with information advantage. Foreign investors tactically differed from domestic trade execution time attributes. Their entry and exit positions occurred predominantly around closing prices, regardless of whether the closing price was higher or lower than average market prices for day. These factors conceivably contributed towards foreign investor buy and sell prices persisting respectively higher and lower than market levels.

In summary, foreign investors were outperformed by domestic investors on the JSE and generated lower returns for the period under study. Domestic investor performance and consistency in beating average market prices imply familiarity, information advantage and timing as a contributor to superior gains. The results presented rejected H_0 by statistically significant differentials. Accepting H_1 was based on domestic investors buying and selling at more profitable prices, relative to foreign investors for the same stocks. The performance disparity between investors was uniform for all trades.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The chapter crystallises the research outcomes and structures the discussion to harness notable implications and conclusions. The key results are deduced in the context of South Africa and related to literature covering previous studies on emerging markets internationally. Recommendations based on findings are made to stakeholders, followed by suggestions for further research initiatives that will broaden the body of knowledge on investor type dynamics on the JSE and international emerging markets.

6.2 Conclusions of the study

The research scope encompassed determination of foreign versus domestic equity returns performance on the JSE, South Africa. Empirical analyses utilised real-time high frequency intraday trade transactional data captured by the JSE TradElect™ information system. The study yielded a number of conclusions and provided evidence on the range, preferences and performance of foreign and domestic investor types. The problem statement was resolved by structuring the empirical formulation and analyses along acceptance and rejection criteria for either of two logical statements; foreign and domestic investors trade the same stocks on the same day at the same price (H_0) or foreign and domestic investors trade the same stocks on the same day at different prices (H_1). The extent to which investor types outperformed their counterparts was quantified, gauged and statistically validated. Outperformance was characterised by the investor type that demonstrated the ability to generate higher returns from profitable trades.

The volatile fluctuations of the FTSE/JSE ALSI provided a backdrop encapsulating bull and bear oscillations during investor type returns performance dynamic valuations. Controlling for firm characteristics, foreign investor stock selection by trade value was

bias towards large market capitalisation stocks. This stylised tendency is consistent with foreign investor preferences for large financially solid and liquid stocks with contained information asymmetry effects. Foreign investors were drawn to firms with international profiles and more transparent information, indicating an awareness of probable domestic investor information advantages on the JSE.

Extending the analysis of foreign investor preferences, peculiarities were detected in trade execution time stamp formations. A critical mass of transactional time density transpired within the closing hour of trading days. The configuration appears to be unique to the JSE equities market. It is plausible that trade time foci around market close was a product of trading strategy as opposed to geographic time zone parameters. Entry and exit point decisions insinuates that foreign investors were not day traders and intraday market timers. They priced stocks using current and previous closing price comparison criteria. In contrast, domestic investors priced and engaged in transactions based upon optimal intraday price movements.

Domestic investors consistently demonstrated market beating price picking ability, generating higher returns performance relative to foreign investors in the JSE equities market from 2007 to 2009. The outcome is congruent with domestic investor information advantage. They paid less when they bought and received more when they sold the same stocks as foreign investors on random days. The JSE findings diverged from literature reporting that foreign investors acquired better quality information, higher returns and their trades reflected market information faster than domestic investors. The majority of literature reviewed was coherent with foreign investors having greater sophistication and access to better information.

In South Africa, foreign investors were at an information disadvantage despite trading predominantly in large capitalisation stocks with limited information asymmetry effects. The research undertaking presented findings that substantiated rejection of H_0 in support

of H_1 validity. Returns performance differentials between foreign and domestic investor types on the JSE equities market were statistically and economically significant.

6.3 Recommendations

Foreign investors can consider taking intraday price levels into consideration for short term trades, as opposed to closing prices. Domestic investor profitability was enhanced by trading sensitivities towards market prices throughout the trading day. This will enable foreign investors to trade at prices more aligned to short term market price levels. The cost of information asymmetry was an additional contributor to foreign investor outperformance. For the sample period, foreign investors allocated 76%, 22% and 2% of portfolio value towards large, medium and small market capitalisation stocks respectively. Foreign investors can deliberate on allocating a larger proportion of trade value towards large market capitalisation listed firms that are well established, liquid and receive high international analyst coverage. Alternatively, foreign investors have an option to trade through South African stock brokers which could minimise information disadvantage impacts. Foreign investors may not be aware of the extent of price differences they were susceptible to relative to domestic investors, even though they traded fundamentally large capitalisation stocks where information asymmetry is considered to be reduced.

The study appends an additional report to the collection of 6 emerging market countries currently covered by existing studies calculating investor type performance differences. These studies include Taiwan (Seasholes 2000), Japan (Hamao and Mei 2001; Bae et al. 2002), Korea (Choe et al. 2001; Kim 2002; Choe et al. 2005; Kang et al. 2008), Thailand (Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008), China (Chan et al. 2006) and Indonesia (Dvořák 2005; Agarwal et al. 2007; Agudelo 2007). It is recommended that additional studies be conducted in the remaining 21 MSCI Emerging Markets Index countries (MSCI 2010). Further studies will provide valuable insights and generalities over a wider base of emerging

exchanges, enabling greater understanding of general investor type subtleties in these markets.

The VWAP research methodology employed as a measure of returns performance was in-line with studies that adopted the technique in emerging markets internationally viz. Choe et al. (2001), Choe et al. (2005), Dvořák (2005), Agarwal et al. (2007) and Taechapiroontong and Suecharoenkit (2008). It is proposed that this method be used as a price performance benchmark measure for reasons of accuracy and reliability of results. The methodology was not reliant upon theoretical models, subjective inputs or assumptions for results determination. Analysis was based on direct computation of factual events. Further applications of VWAP methodologies to investigate investor buy and sell profitability in emerging market studies will reinforce the validity and credibility of the technique as a returns performance measurement tool and benchmark.

6.4 Suggestions for further research

The study concludes that domestic investors had information advantage on the JSE and surpassed their foreign counterparts by buying at lower prices and selling at higher prices. It would be of interest to gain perspective on whether South African domestic investors capitalise on this advantage by displaying home bias tendencies in their investment portfolios. This will require analysing and categorising South African investor portfolio constituents into domestic and foreign instruments, weighted by value. Abnormal skewing towards domestic instruments may infer that domestic investors are cognisant of their information advantage on the JSE and capitalise on their edge by trading primarily domestic markets.

The literature reviewed entailed studies that produced disparate results when the same study was conducted in the same country exchange using different sample periods. This occurred in emerging markets such as Japan (Hamao and Mei 2001; Bae et al. 2002), Korea (Choe et al. 2001; Kim 2002; Choe et al. 2005; Kang et al. 2008), Thailand

(Chai-anant 2003; Kamesaka and Wang 2004; Taechapiroontong and Suecharoenkit 2008) and Indonesia (Dvořák 2005; Agarwal et al. 2007; Agudelo 2007). Similarly, it is suggested that investor type analyses be conducted on the JSE over different sample periods to assess divergences in results over time. Repeated studies on the JSE equities market with varying sample periods will provide a more comprehensive view of investor type performance differences. This will also provide a means to assess consistency in foreign investor trade turnover, stock preferences and trade execution times. Foreign investor stock choices and trade price patterns were consistent year on year with negligible adjustments. It remains to be seen whether these trading decisions will remain intact in future.

Further studies can provide additional insights into the nature of domestic investor information advantage. The information advantage may originate from linguistic, cultural and geographic familiarities that facilitate more profitable trades. A number of questions remain to be answered viz. What form of information advantage do domestic investors have? Is it private information or does it reflect better access and ability to process and analyse public information? Does the JSE equities market have information asymmetry? If so, are the effects more severe in medium and small market capitalisation stocks relative to large listed firms? Investigating these business problems will provide further understanding on the transparency of information on the South African exchange.

The fact that foreign investors on the JSE traded primarily around market close implied that they were not day traders and intraday market timers. Future studies will provide more clarity on the investment and trading styles used by foreign investors. This includes assessments of durations that foreign investors remain in positions. Calculation of holding periods requires the researcher to match trades to specific and unique investors. This will assist in understanding their trading strategies and logic behind price entry and exit points. The paper tested short term trading abilities and returns calculations based upon random buy and sell trades by foreign investors on random days. Studying duration of foreign holding positions will provide perspective on their trading strategies.

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APPENDIX 1

FTSE/JSE ALSI trend from 2006 to 2010

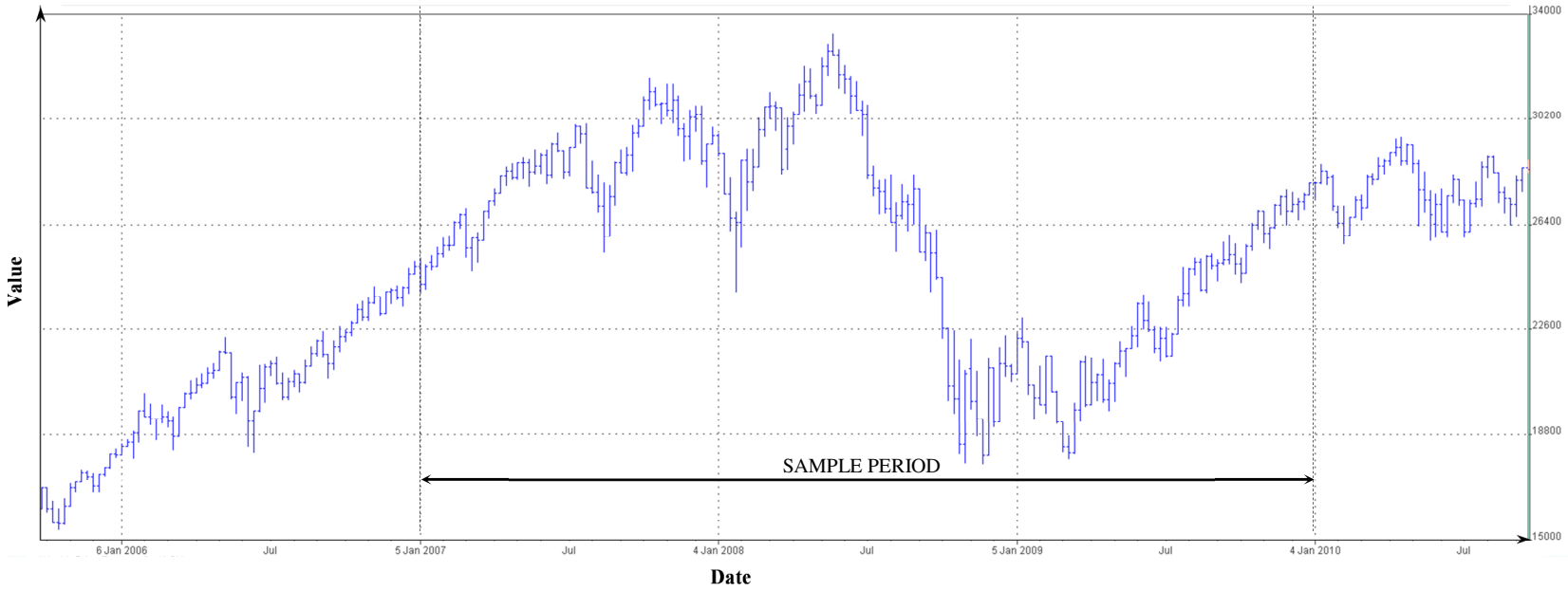


Figure 1: The FTSE/JSE ALSI trend from 2006 to 2010 illustrating equities market conditions over the sample period (JSE)

APPENDIX 2

JSE raw data field definitions and identity markers

Table 3: JSE TradElect^{TM} information system database population field definitions (JSE 2005b:36)

DATA FIELD	DEFINITION
StatisticDate	The date on which a trade was executed, either automatically, via the trading system, or by telephone.
	The format of this field is CCYYMMDD.
	Length: 8
	Format: Numeric
	ISO Standard: ISO 8601
TradableInstrumentAlphaCode	Together with the Country of Register, the code used to uniquely identify a tradable instrument. This is the International Security Identification Number (ISIN). If an ISIN Code has not been assigned by a national numbering authority, the Exchange will place the SEDOL Code in positions 5-11 within the Tradable Instrument Code and space fill the other positions.
	Length: 12
	Format: Alphanumeric
	ISO Standard: ISO 6166
ISIN	Non London Tradable Instrument Code. This is the International Security Identification Number (ISIN) of the Non London traded security. If an ISIN Code has not been assigned by a national numbering authority, the Exchange will place the SEDOL Code in positions 5-11 within the Tradable Instrument Code and space fill the other positions.
	Length: 14
	Format: Alphanumeric
	ISO Standard: ISO 6166
TradeDateTime	This is the time at which a trade was executed, either automatically within the trading system, or by telephone.
	This field is of the format HHMMSS.
	Length: 6
	Format: Numeric
	ISO Standard: ISO 8601

Table 3: (continued)

DATA FIELD	DEFINITION
TradeReportDateTime	This is the time at which a trade was reported either automatically within the trading system, or by telephone. This field is of the format HHMMSS.
	Length: 6
	Format: Numeric
	ISO Standard: ISO 8601
TradePrice	The price at which a trade was executed.
	Length: 18
	Format: Numeric
	Precision: 8
	ISO Standard: N/A
TradeSize	The quantity of tradable instrument which was bought or sold.
	Length: 13
	Format: Signed Numeric
	ISO Standard: N/A
	Note: Corrections to trade volumes will be made by the Exchange. The trade size entered by the participant must be greater than zero.
BroadcastUpdateAction	Identifies the action to be taken by customers on receipt of a message.
	Length: 1
	Format: Alphanumeric
	ISO Standard: N/A
	The field can have the following values: 'A'=The information contained in the message is new and should be added. 'C'=The information contained in the message is changing previously advised information. 'D'=The information contained in the message is deleting previously advised information. 'F'=The information contained in the message is part of a full data download.
CurrencyCode	This field contains the currency in which prices for a tradable instrument must be expressed.
	Length: 3
	Format: Alphanumeric
	ISO Standard: ISO 4217 plus GBX and USX.
	A list of all codes is contained in ISO 4217 - Codes for the presentation of currencies and funds, except that, for SEAQ compatibility, GBX and USX have been retained.

Table 3: (continued)

DATA FIELD	DEFINITION
ResidentialStatusCode	Identifies the residential status of the trader.
	Length: 7
	Format: Alphanumeric
	ISO Standard: N/A
	The field can have the following values: 'Foreign' 'Local'
TradeTypeCode	This indicates the type of trade which has occurred.
	Length: 2
	Format: Alphanumeric
	ISO Standard: N/A
	The field can have the following values:
	AT, OD, OP, UT, LT, NX, TX, AS.
DealingCapacityBuy	Buy/Sell Indicator. Identifies whether the participant wishes to buy or sell a quantity of a tradable instrument/currency.
	Length: 1
	Format: Alphanumeric
	ISO Standard: N/A
	The field can have the following values: 'B'=Buy 'S'=Sell
DealingCapacitySell	Buy/Sell Indicator. Identifies whether the participant wishes to buy or sell a quantity of a tradable instrument/currency.
	Length: 1
	Format: Alphanumeric
	ISO Standard: N/A
	The field can have the following values: 'B'=Buy 'S'=Sell
MarketSegmentCode	This code identifies a division of the market within a market segment.
	Length: 4
	Format: Alphanumeric
	ISO Standard: ISO 3166, where appropriate.

APPENDIX 3

JSE equities market turnover from 2007 to 2009

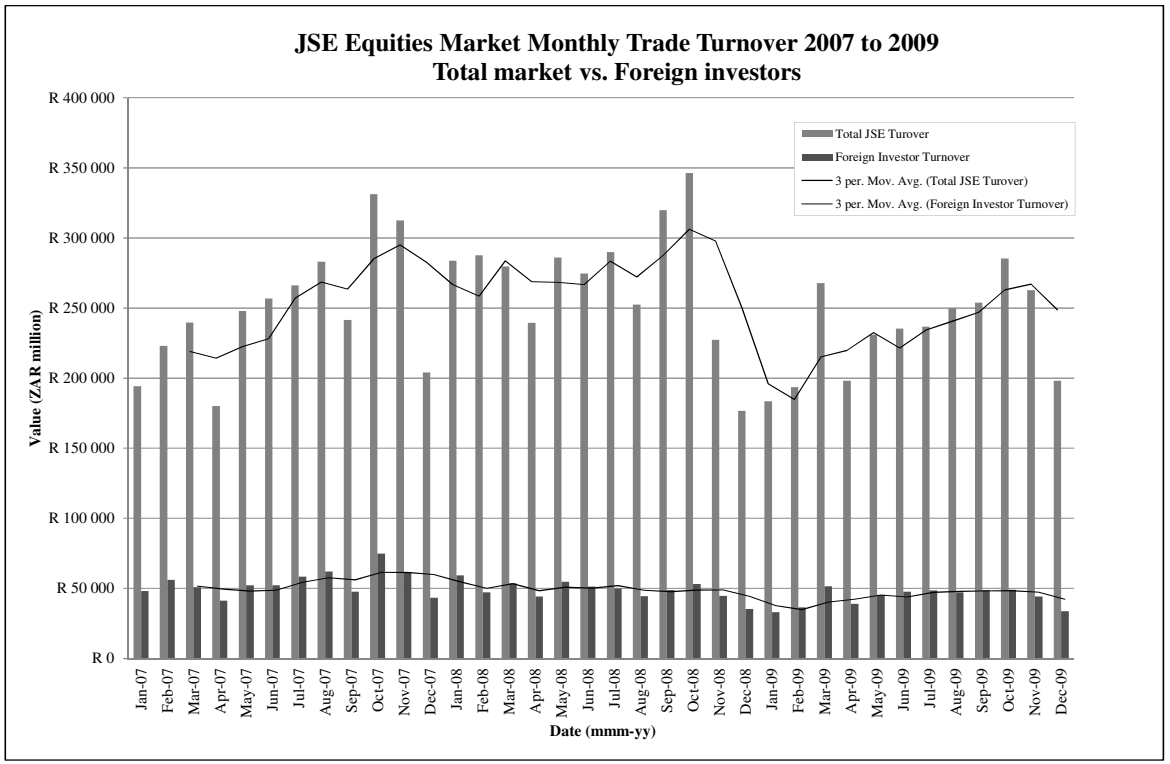


Figure 2: Comparison of foreign investor activity levels relative to the JSE total equities market turnover by value (JSE)

APPENDIX 4

Research instrument process flow diagram

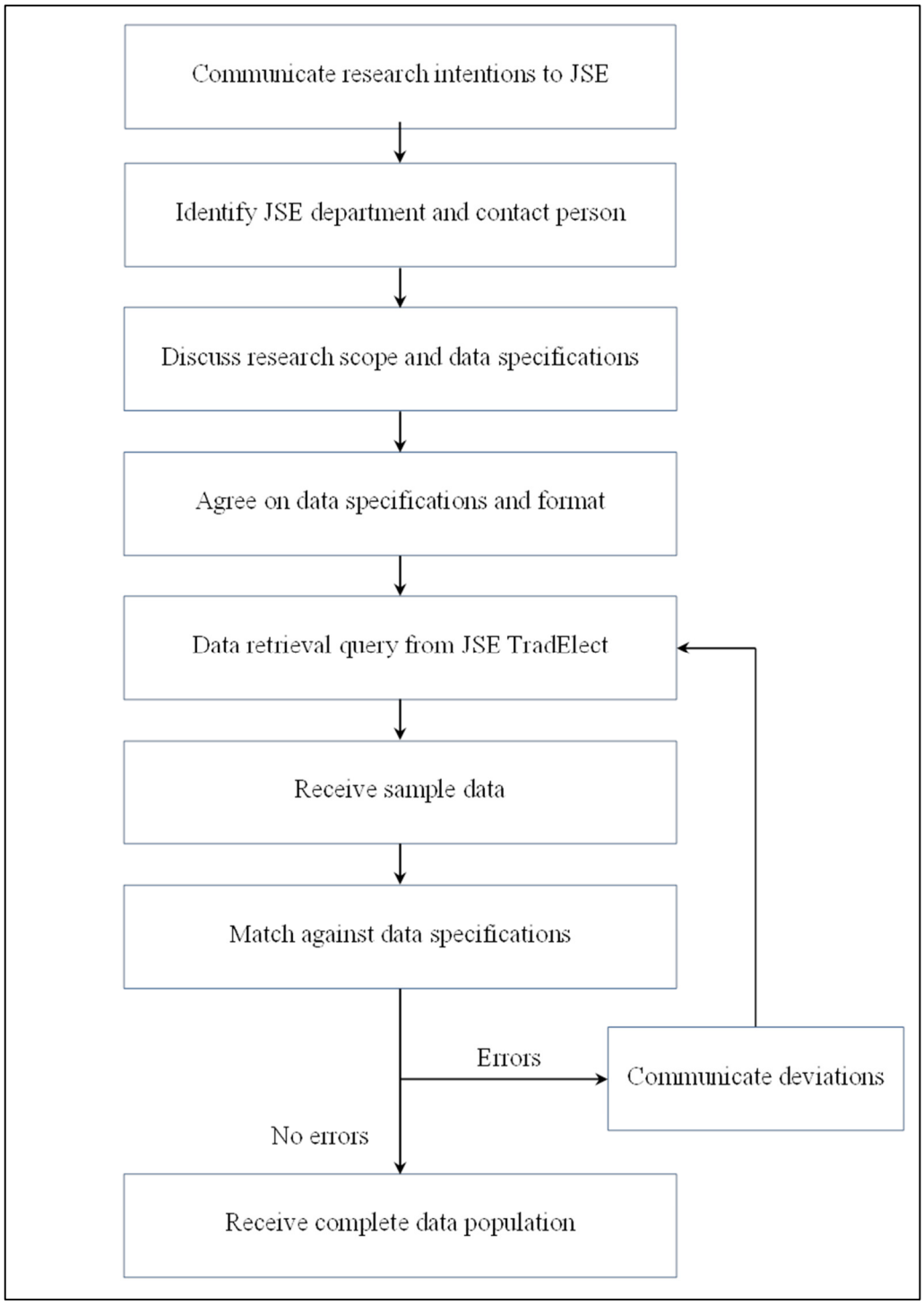


Figure 3: Flow diagram of the research instrument process

APPENDIX 5

Foreign investor preferences by JSE listed company

Table 6: List of foreign investor stocks, economic groups and industry sectors (JSE)

JSE Long Name	Stock Code	ISIN	Market Capitalisation	JSE Economic Group	Index Code	JSE Industrial Sector	Index Code	JSE Sub Sector
African Oxygen Ltd.	AFX	ZAE000067120	Medium Cap	Basic Industries	J010	Chemicals	J011	Specialty Chemicals
Alexander Forbes Ltd.	AFB	ZAE000018230	Medium Cap	Financials	J080	Speciality and Other Finance	J087	Insurance Brokers
Anglo American Plc.	AGL	GB0004901517	Large Cap	Resources	J000	Mining	J004	General Mining
Barloworld Ltd.	BAW	ZAE000026639	Medium Cap	General Industrials	J020	Diversified Industrials	J024	Diversified Industrials
Edgars Cons Stores Ltd.	ECO	ZAE000068649	Large Cap	Cyclical Services	J050	General Retailers	J052	Apparel Retailers
Ellerine Holdings Ltd.	ELH	ZAE000022752	Large Cap	Cyclical Services	J050	General Retailers	J053	Home Improvement Retailers
Firstrand Ltd.	FSR	ZAE000066304	Large Cap	Financials	J080	Banks	J081	Banks
Investec Ltd.	INL	ZAE000040531	Medium Cap	Financials	J080	Investment Companies	J085	Investment Services
Metropolitan Holdings Ltd.	MET	ZAE000050456	Medium Cap	Financials	J080	Insurance	J083	Life Insurance
Mutual and Federal Insurance.	MAF	ZAE000010823	Large Cap	Financials	J080	Insurance	J083	Property and Casualty Insurance
Nedbank Group Ltd.	NED	ZAE000004875	Large Cap	Financials	J080	Banks	J081	Banks
Oceana Group Ltd.	OCE	ZAE000025284	Small Cap	Non-Cyclical Consumer Goods	J040	Food Producers and Processors	J043	Farming and Fishing
Old Mutual Plc.	OML	GB0007389926	Large Cap	Financials	J080	Life Assurance	J084	Life Insurance
Sanlam Ltd.	SLM	ZAE000070660	Large Cap	Financials	J080	Life Assurance	J084	Life Insurance
Santam Ltd.	SNT	ZAE000006854	Medium Cap	Financials	J080	Insurance Non Life	J083	Property and Casualty Insurance
Shoprite Holdings Ltd.	SHP	ZAE000012084	Large Cap	Non-Cyclical Services	J060	Food and Drug Retailers	J063	Food Retailers and Wholesalers
Standard Bank Group Ltd.	SBK	ZAE000057378	Large Cap	Financials	J080	Banks	J081	Banks
Truworths International.	TRU	ZAE000028296	Medium Cap	Cyclical Services	J050	General Retailers	J052	Apparel Retailers
Vukile Property Fund Ltd.	VKE	ZAE000056370	Small Cap	Financials	J080	Real Estate Holding and Development	J086	Real Estate Holding and Development

APPENDIX 6

Foreign investor portfolios by JSE Stock Code value per year and cumulative

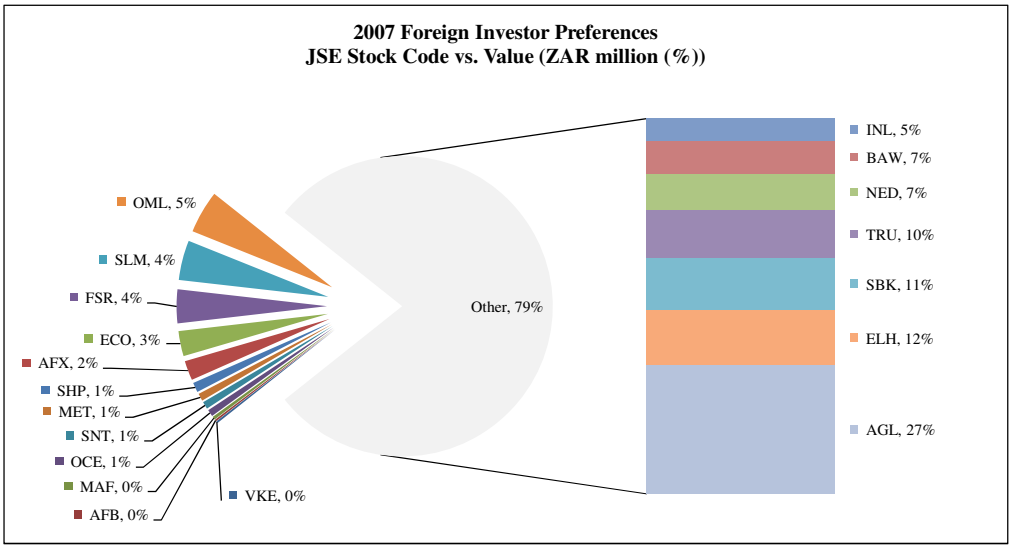


Figure 4: Foreign investor portfolio constituents for 2007 trading year (JSE)

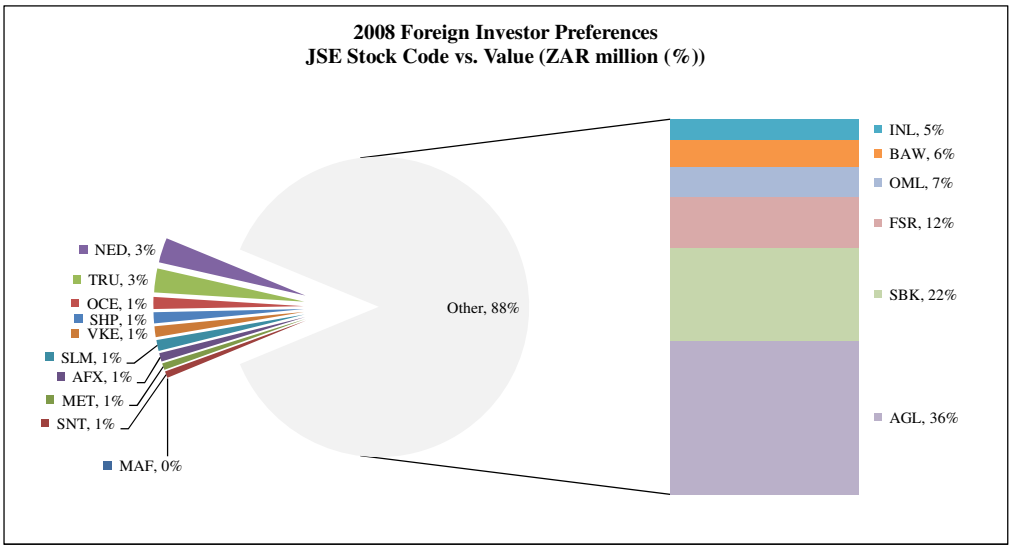


Figure 5: Foreign investor portfolio constituents for 2008 trading year (JSE)

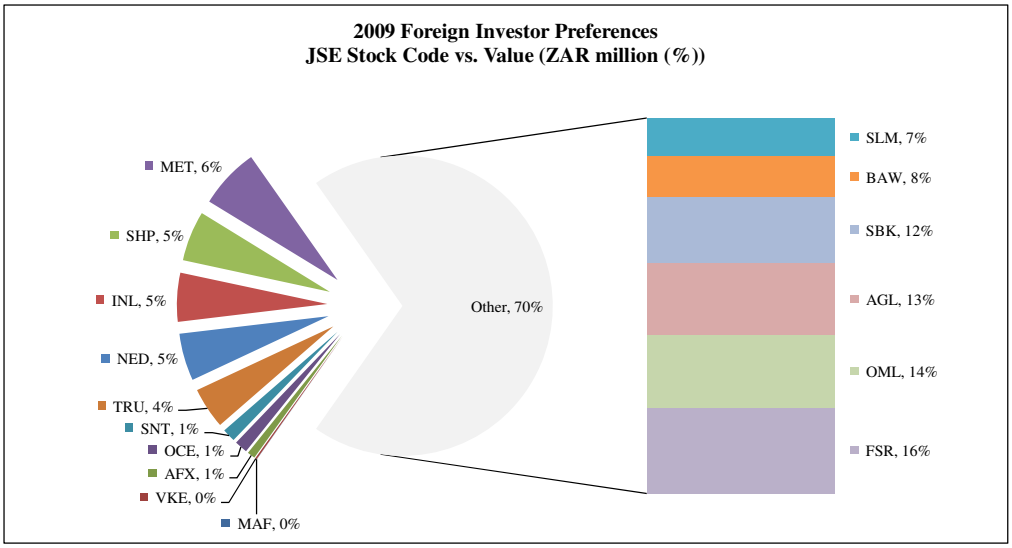


Figure 6: Foreign investor portfolio constituents for 2009 trading year (JSE)

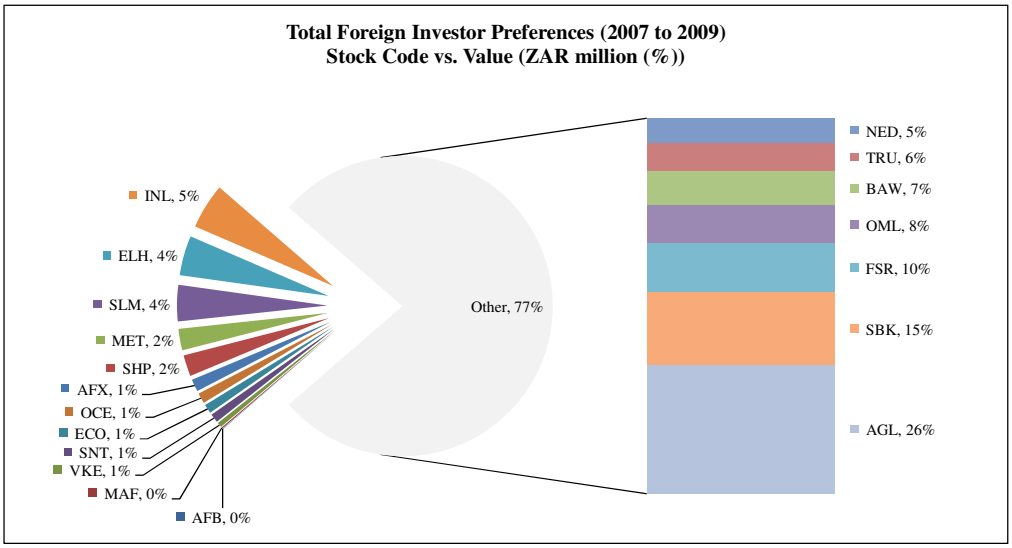


Figure 7: Foreign investor portfolio constituents cumulative from 2007 to 2009 (JSE)

APPENDIX 7

Foreign investor portfolios by JSE Economic Groups per year and cumulative

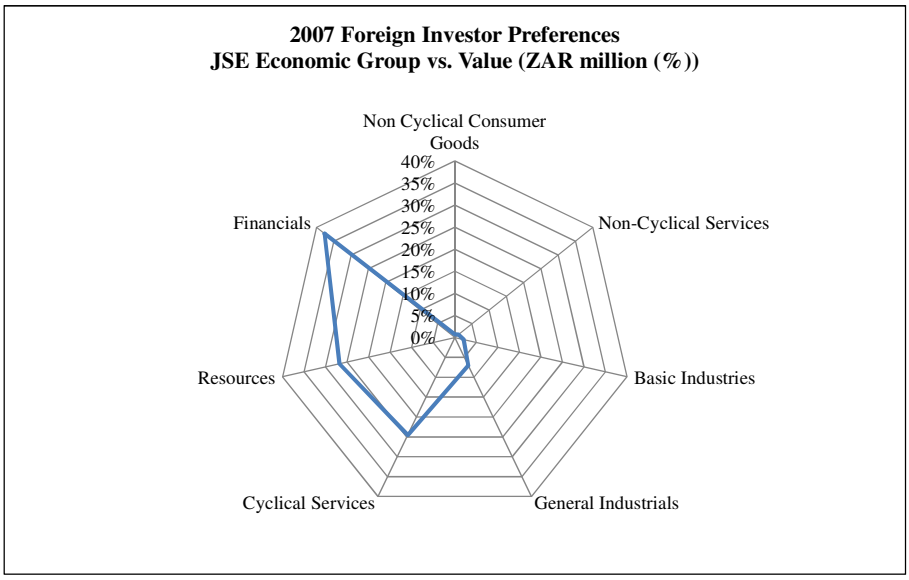


Figure 8: Foreign investor porfolios weighted by JSE Economic Group for 2007 (JSE)

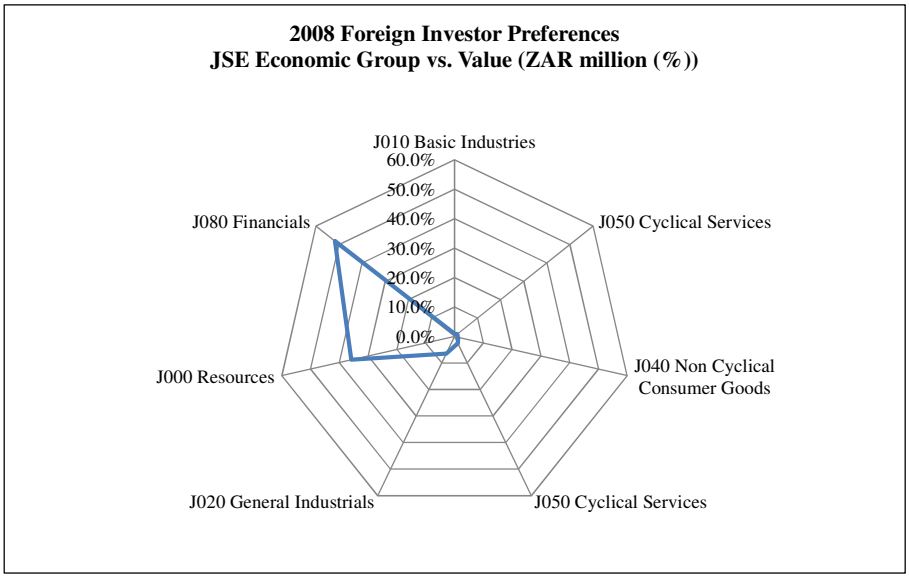


Figure 9: Foreign investor porfolios weighted by JSE Economic Group for 2008 (JSE)

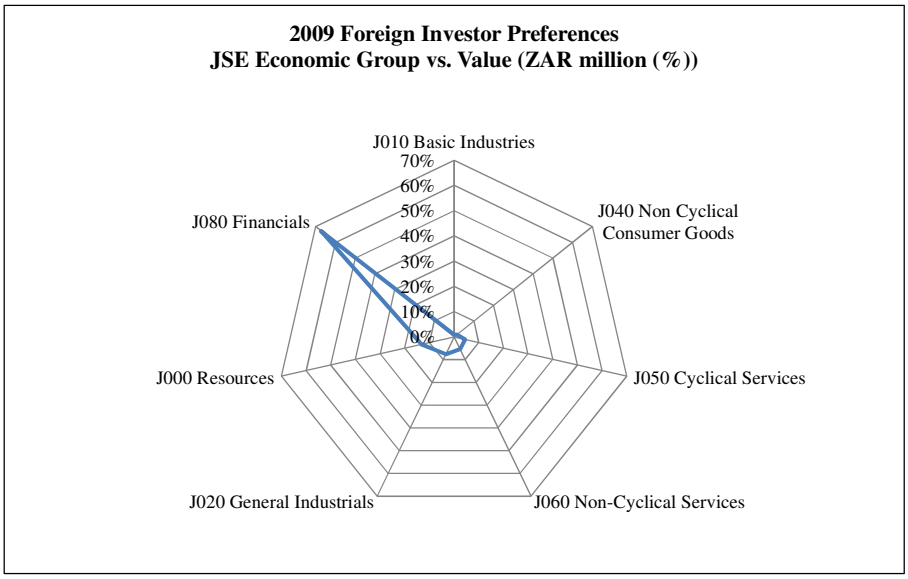


Figure 10: Foreign investor porfolios weighted by JSE Economic Group for 2009 (JSE)

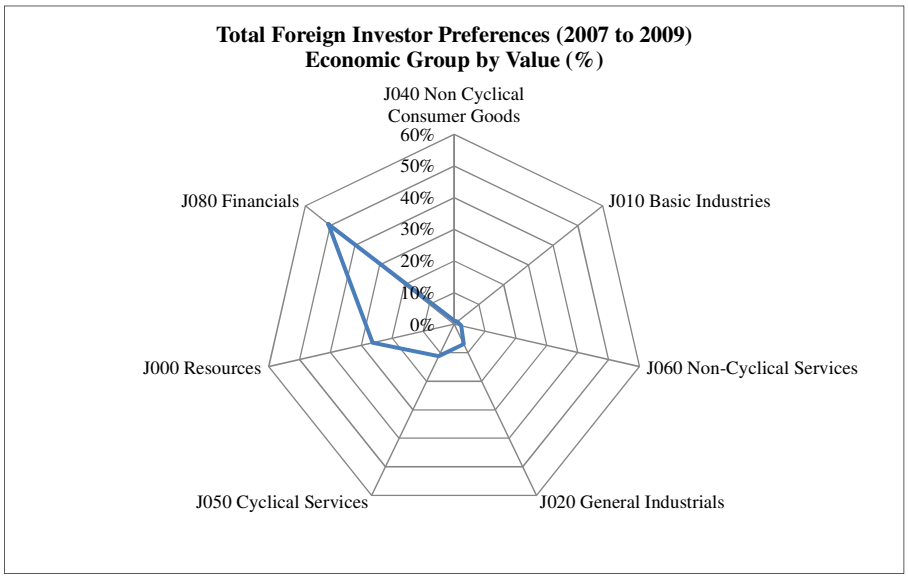


Figure 11: Foreign investor porfolios weighted by JSE Economic Group cumulative from 2007 to 2009 (JSE)

APPENDIX 8

Foreign investor portfolios by JSE Industrial Sectors per year and cumulative

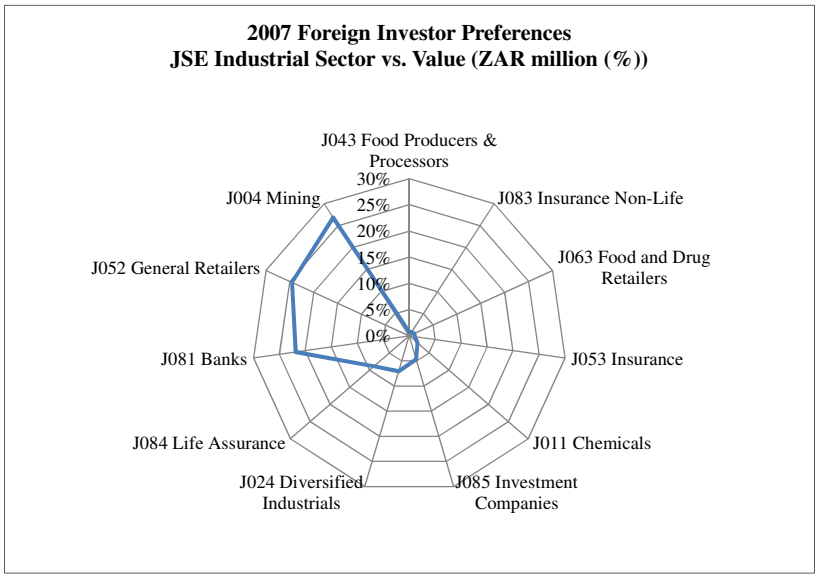


Figure 12: Foreign investor porfolios weighted by JSE Industrial Sectors for 2007 (JSE)

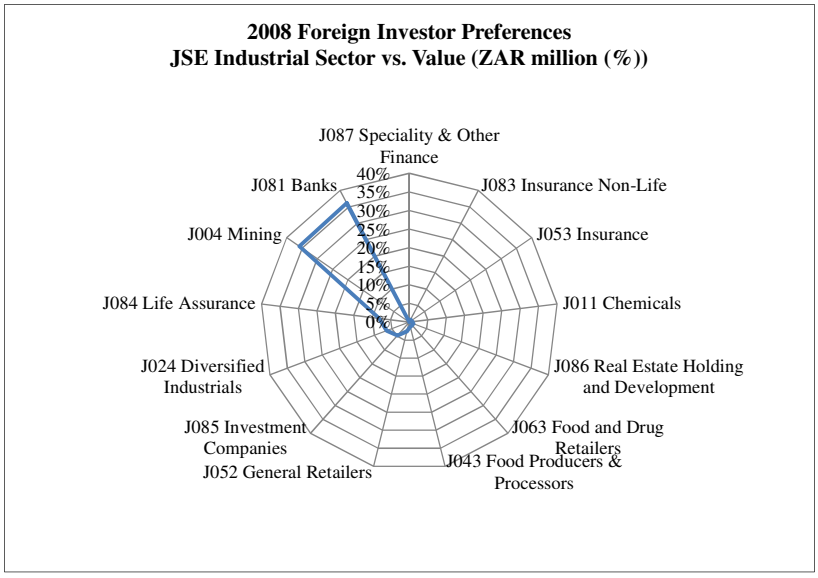


Figure 13: Foreign investor porfolios weighted by JSE Industrial Sectors for 2008 (JSE)

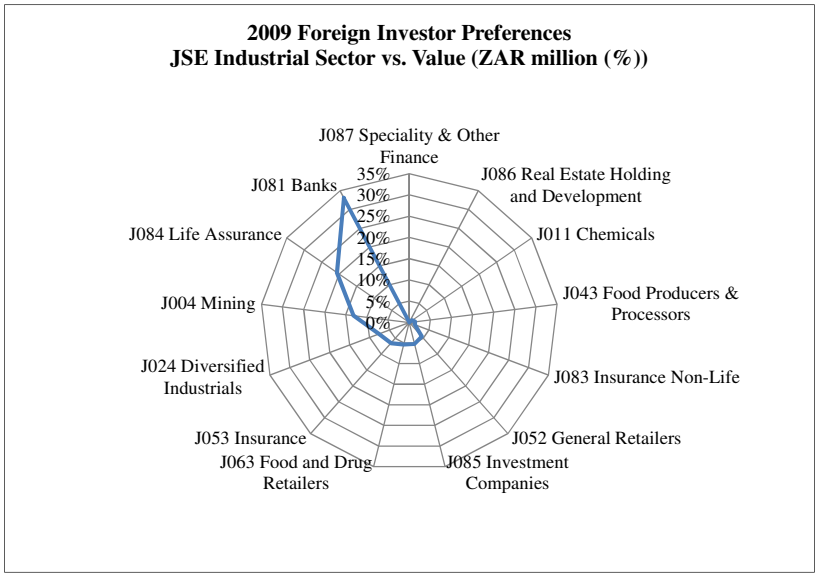


Figure 14: Foreign investor porfolios weighted by JSE Industrial Sectors for 2009 (JSE)

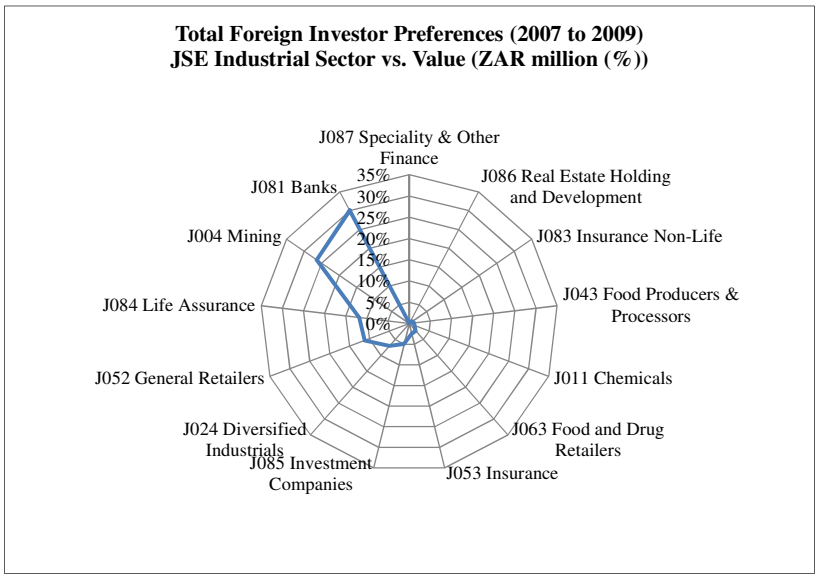


Figure 15: Foreign investor porfolios weighted by JSE Industrial Sectors cumulative from 2007 to 2009 (JSE)

APPENDIX 9

Foreign investor portfolios by JSE Market Capitalisation per year and cumulative

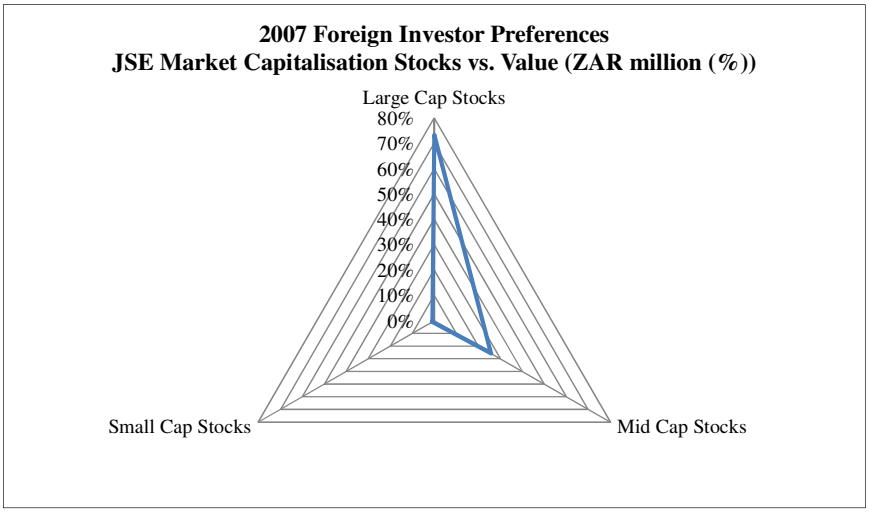


Figure 16: Foreign investor porfolios weighted by JSE market capitalisation for 2007 (JSE)

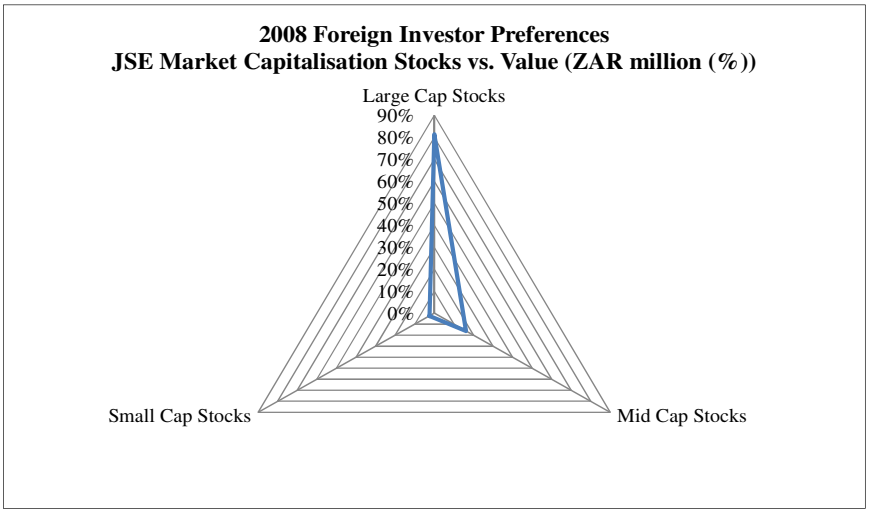


Figure 17: Foreign investor porfolios weighted by JSE market capitalisation for 2008 (JSE)

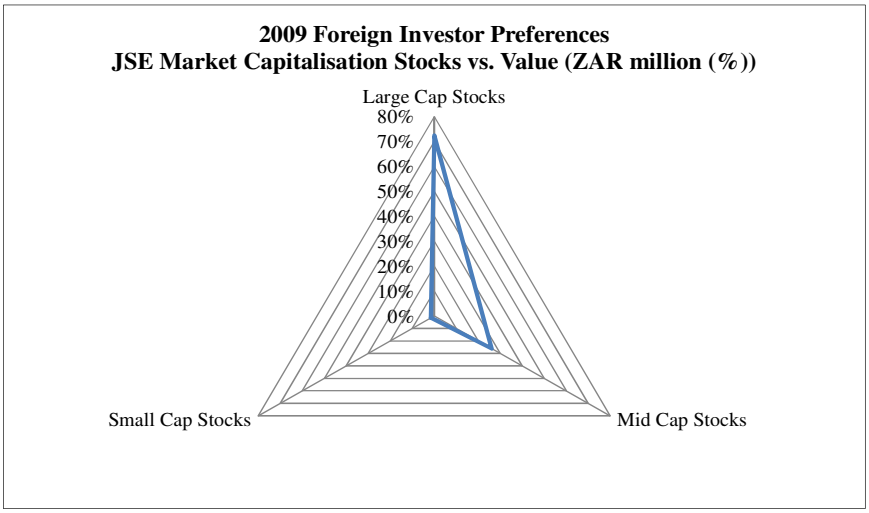


Figure 18: Foreign investor porfolios weighted by JSE market capitalisation for 2009 (JSE)

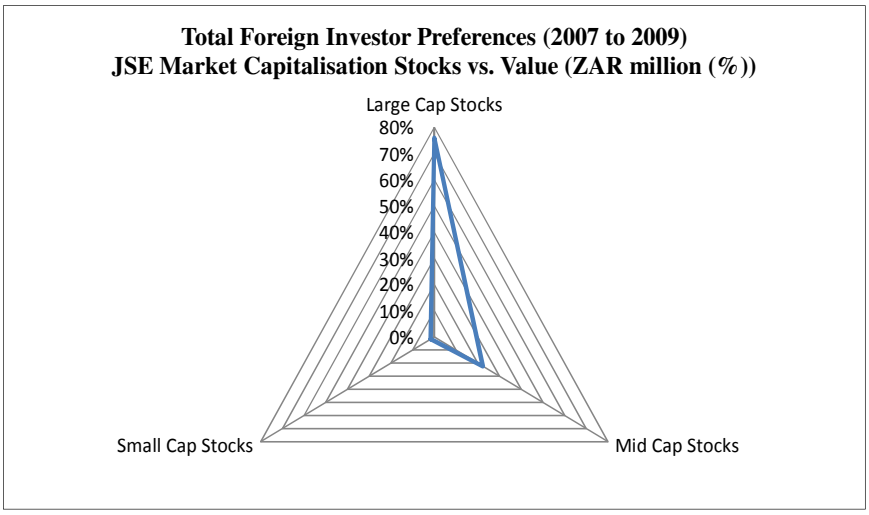


Figure 19: Foreign investor porfolios weighted by JSE market capitalisation cumulative from 2007 to 2009 (JSE)

APPENDIX 10

Foreign investor JSE trade execution times across all stocks and trades from 2007 to 2009

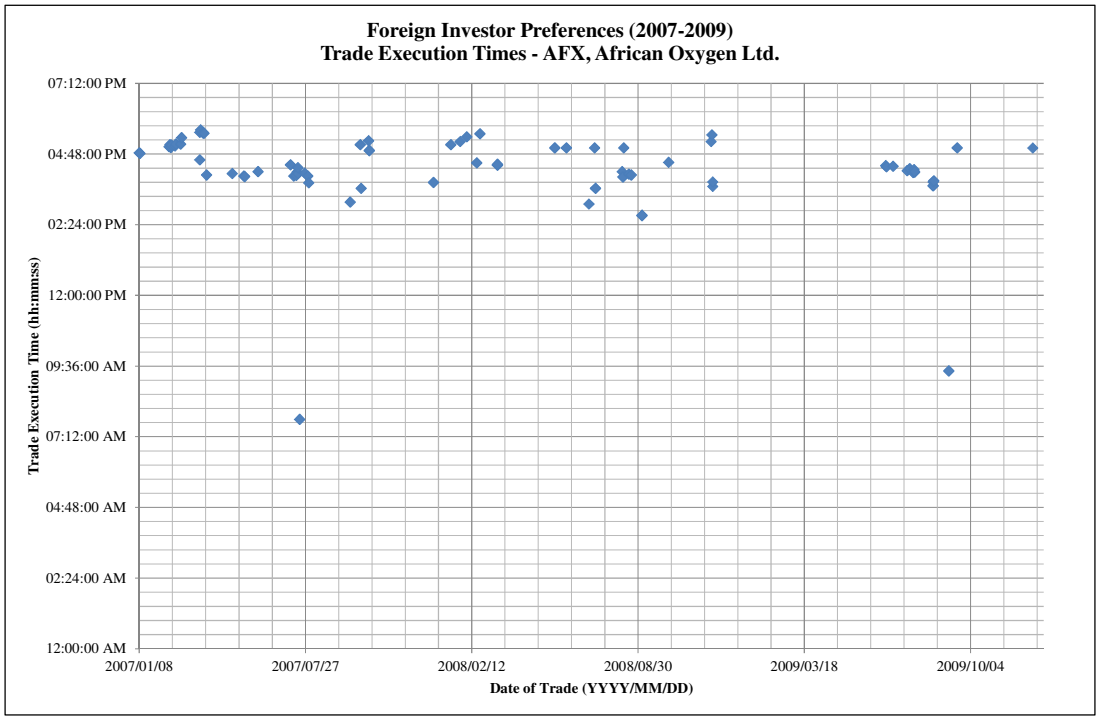


Figure 20: Density of foreign investor trade execution times, African Oxygen Ltd. (JSE)

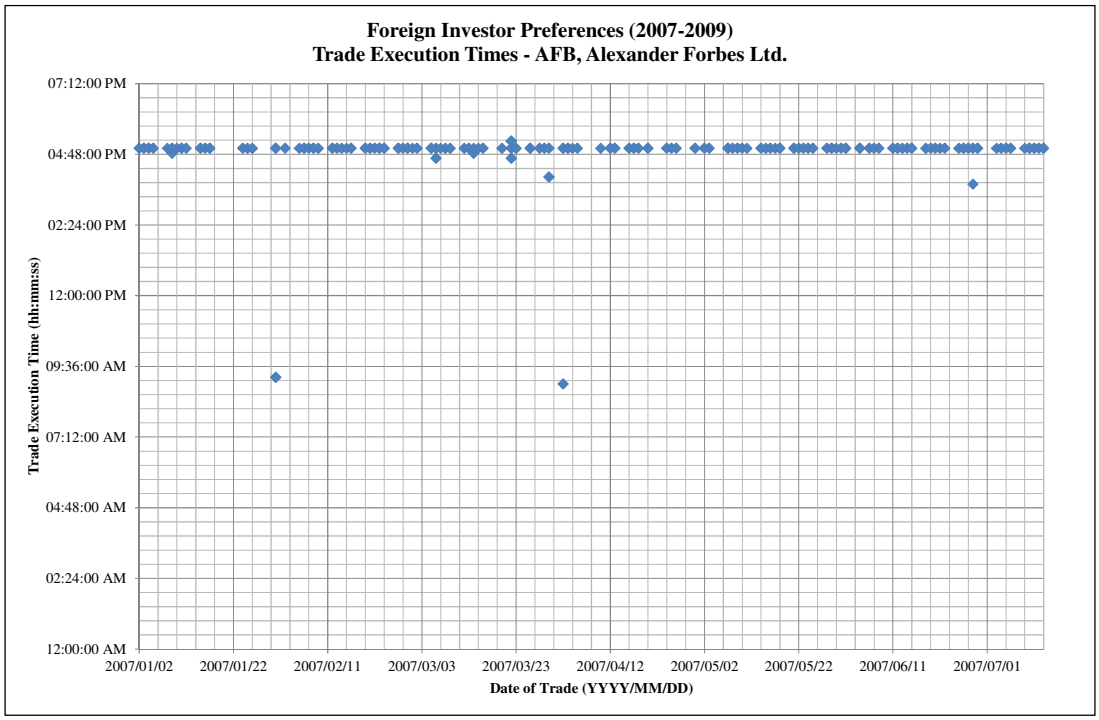


Figure 21: Density of foreign investor trade execution times, Alexander Forbes Ltd. (JSE)

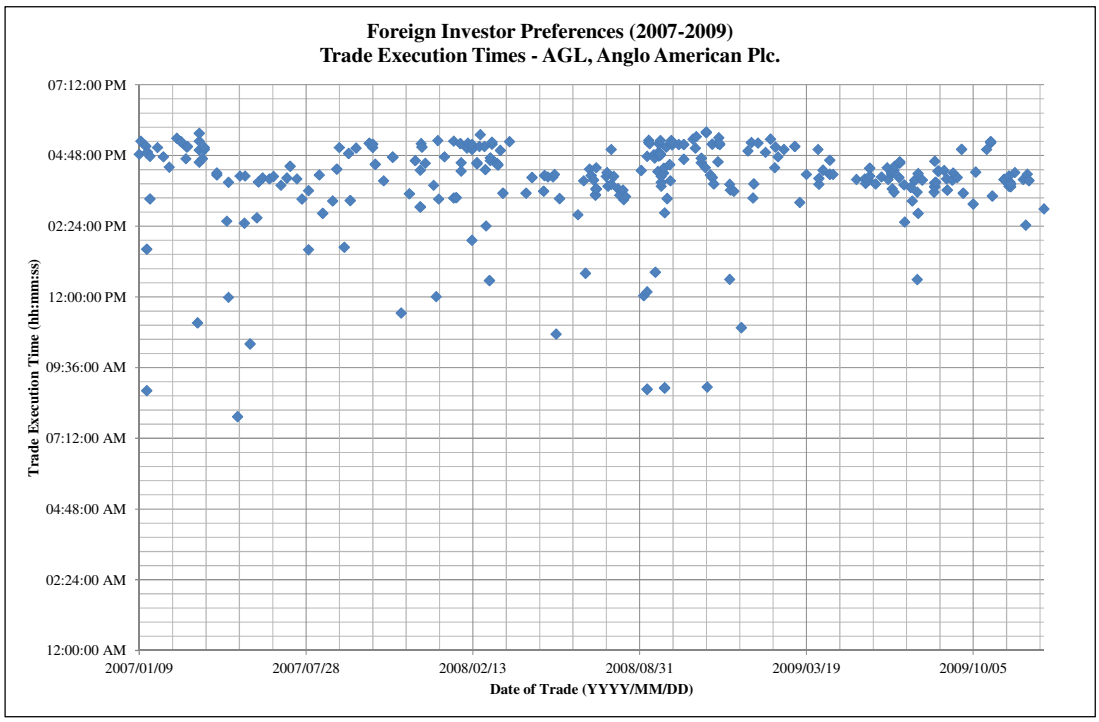


Figure 22: Density of foreign investor trade execution times, Anglo American Plc. (JSE)

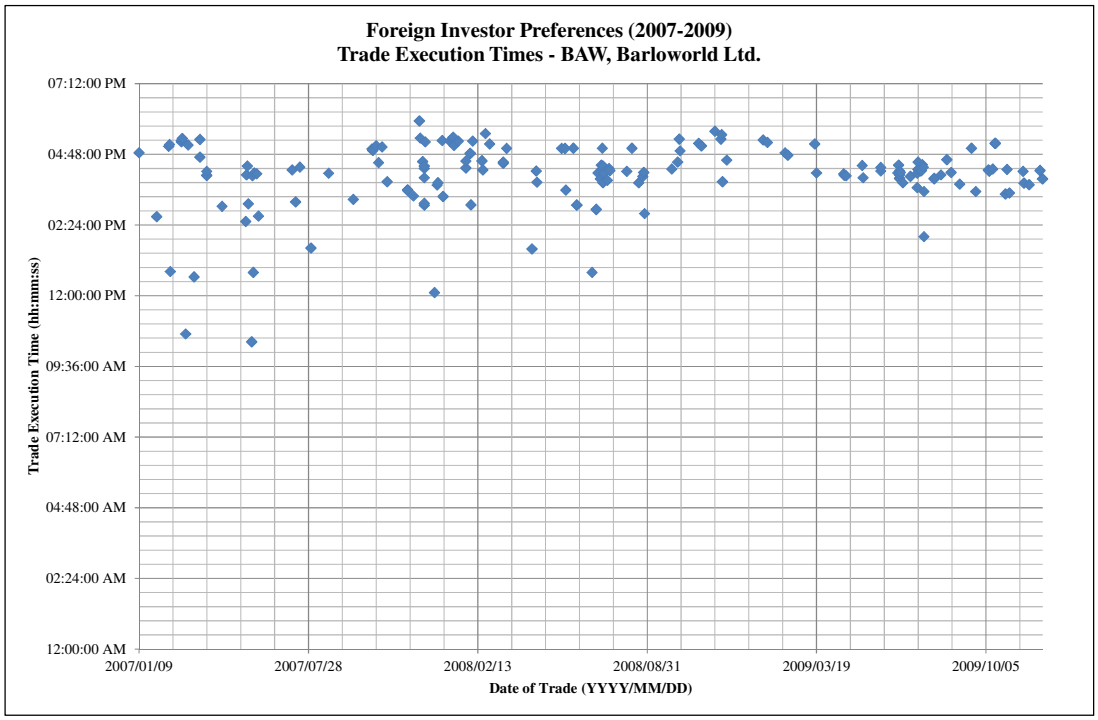


Figure 23: Density of foreign investor trade execution times, Barloworld Ltd. (JSE)

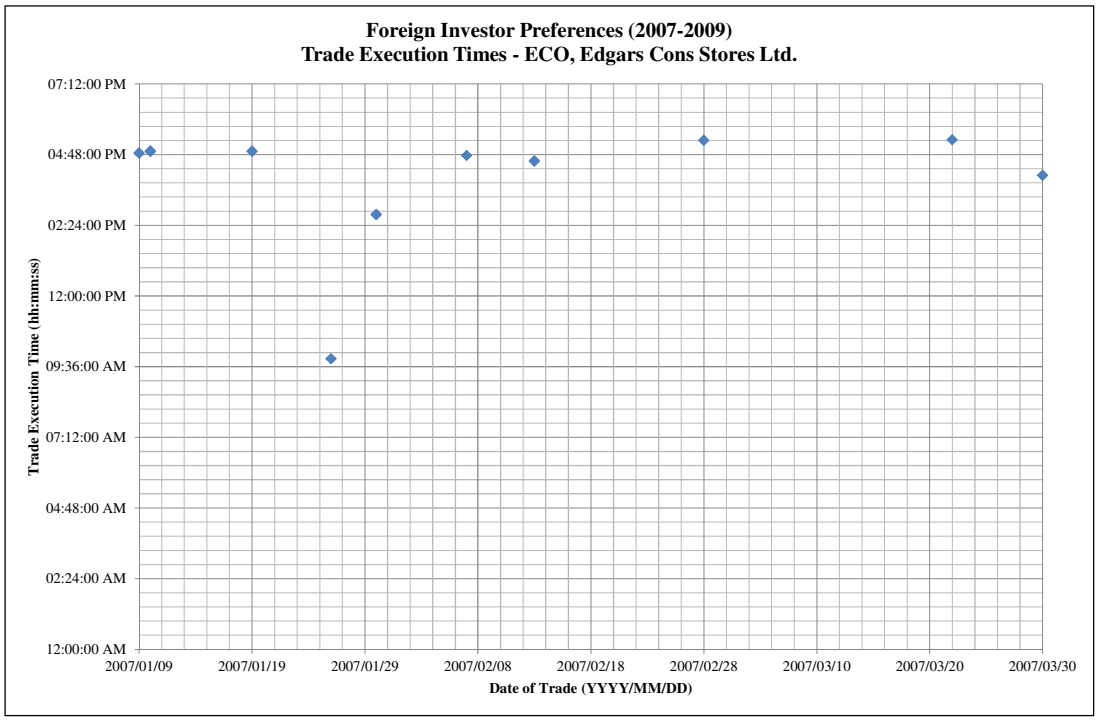


Figure 24: Density of foreign investor trade execution times, Edgars Cons Stores Ltd. (JSE)

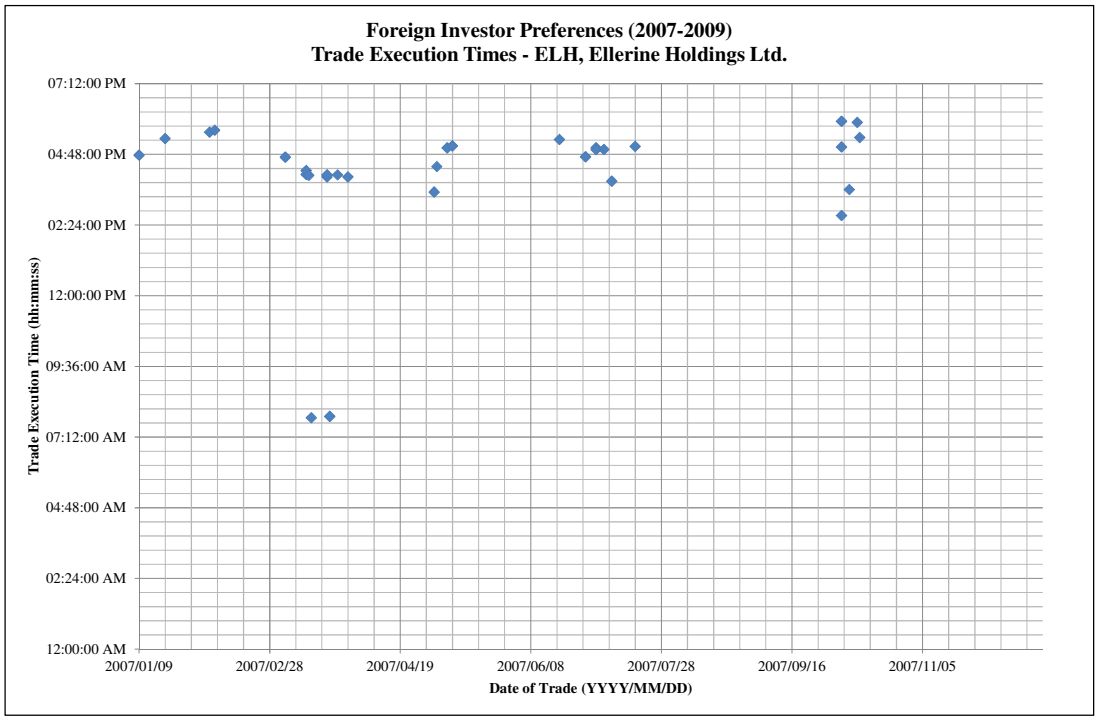


Figure 25: Density of foreign investor trade execution times, Ellerine Holdings Ltd. (JSE)

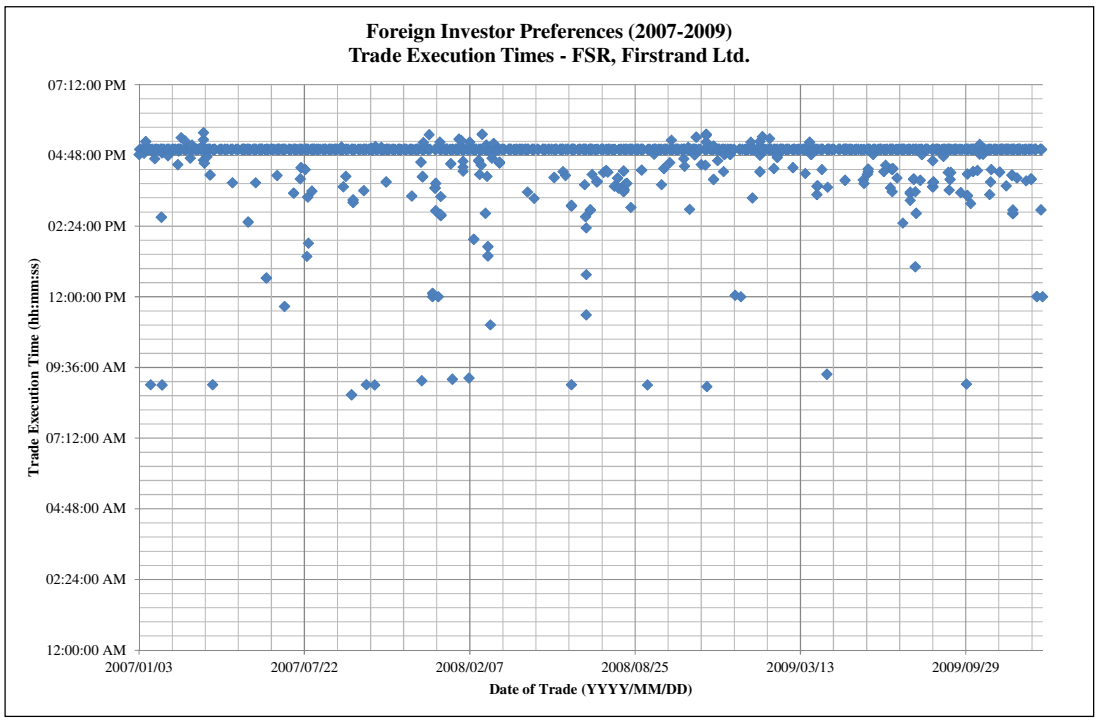


Figure 26: Density of foreign investor trade execution times, Firstrand Ltd. (JSE)

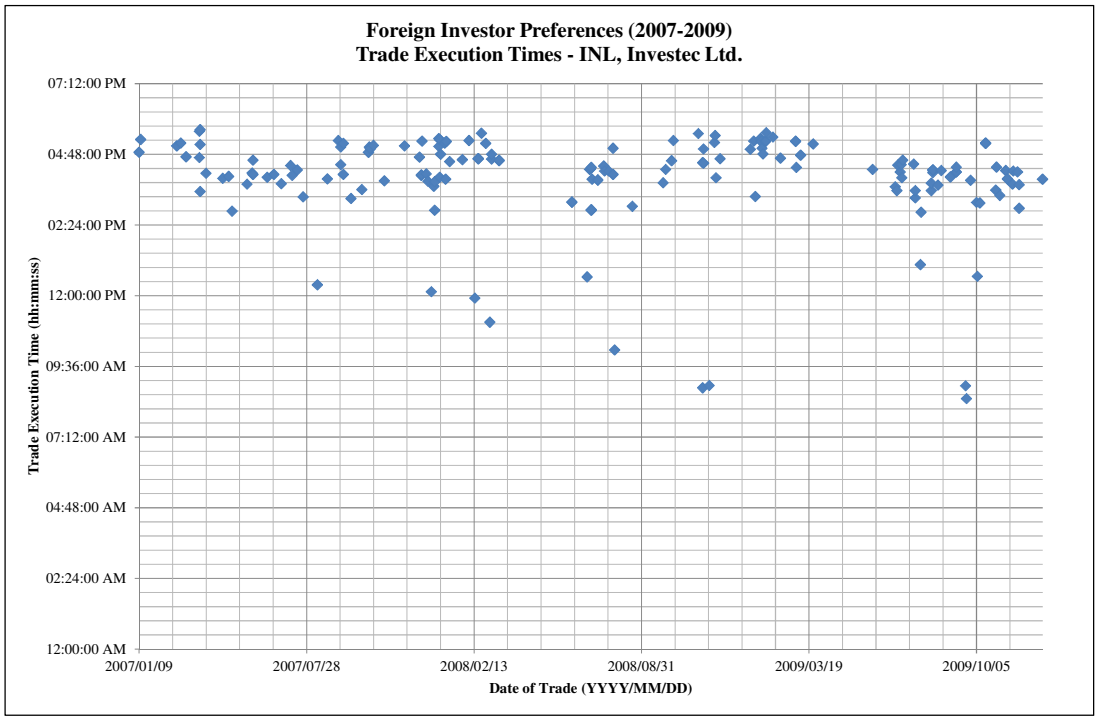


Figure 27: Density of foreign investor trade execution times, Investec Ltd. (JSE)

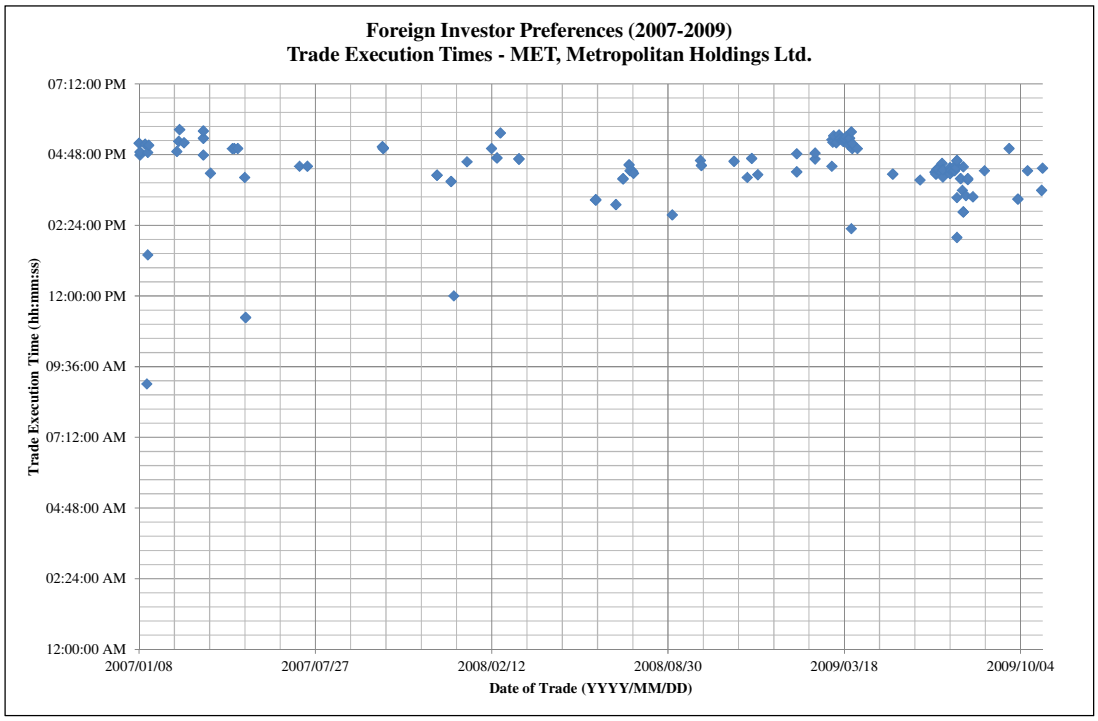


Figure 28: Density of foreign investor trade execution times, Metropolitan Holdings Ltd. (JSE)

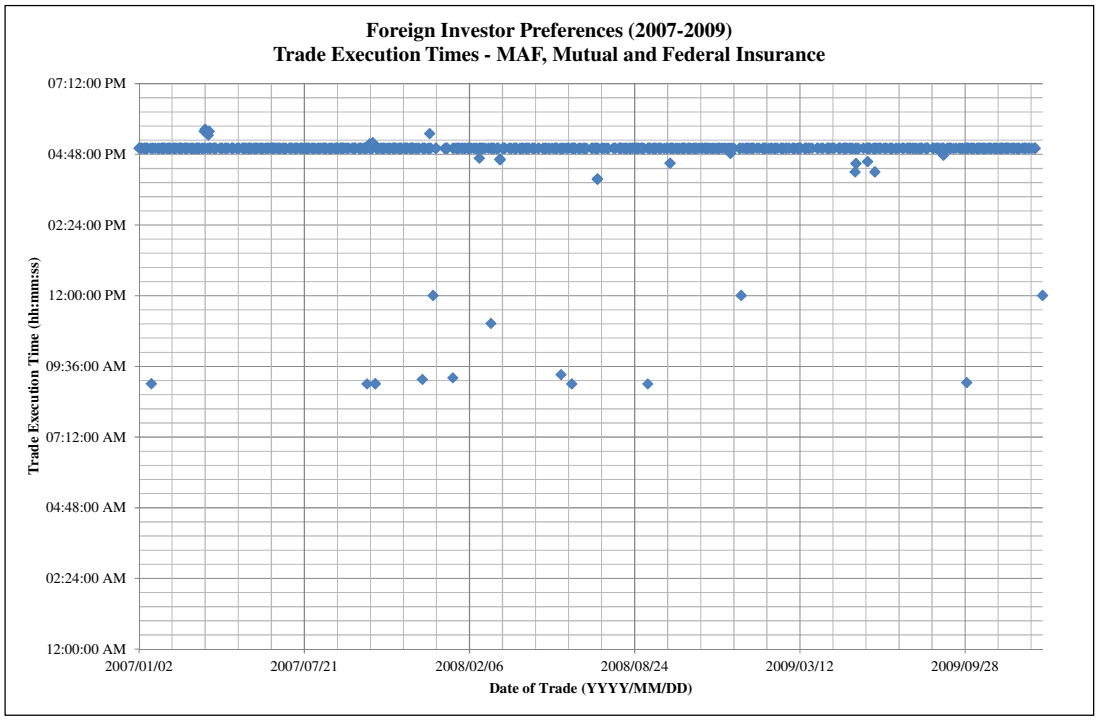


Figure 29 : Density of foreign investor trade execution times, Mutual and Federal Insurance (JSE)

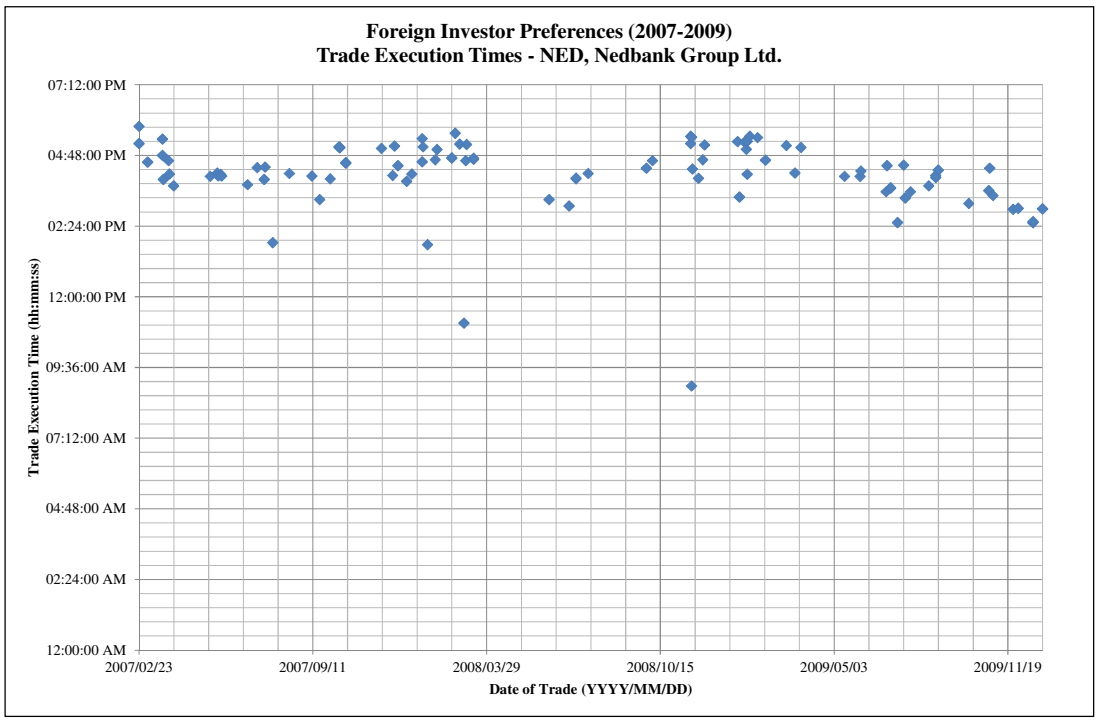


Figure 30: Density of foreign investor trade execution times, Nedbank Group Ltd. (JSE)

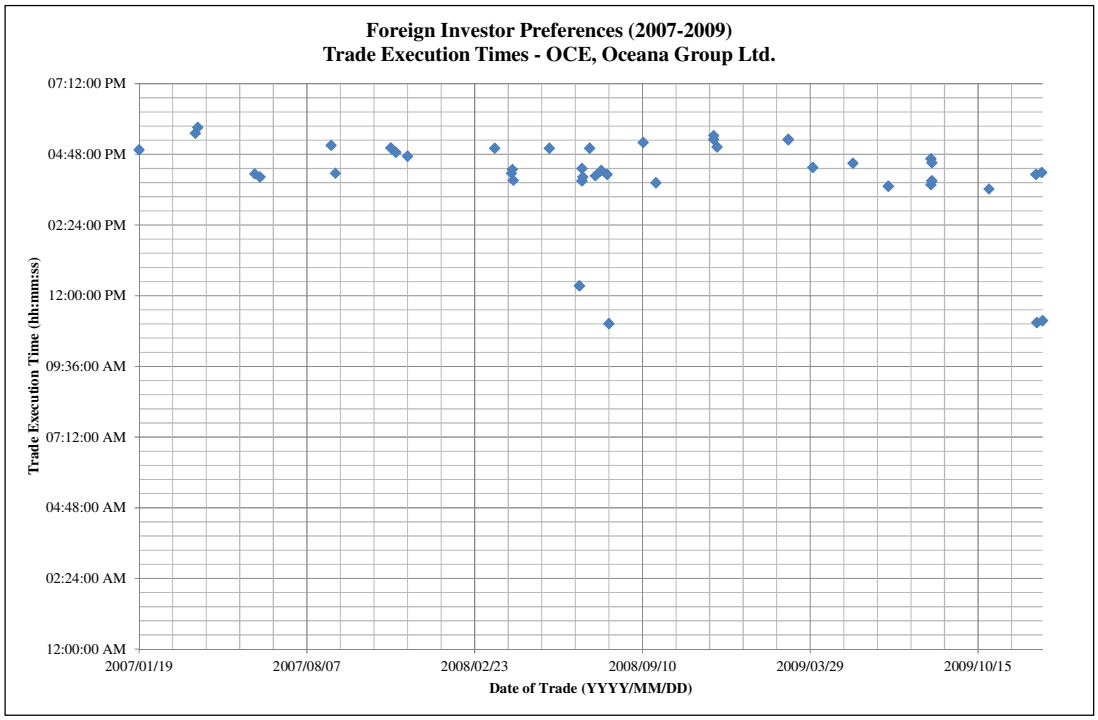


Figure 31: Density of foreign investor trade execution times, Oceana Group Ltd. (JSE)

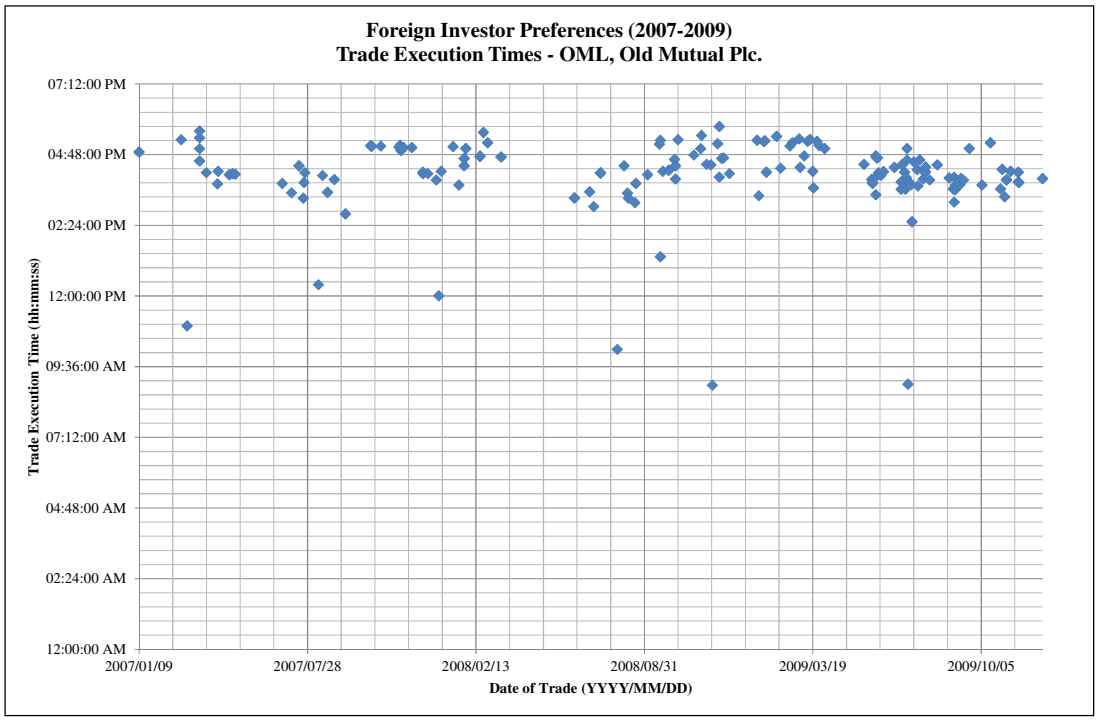


Figure 32: Density of foreign investor trade execution times, Old Mutual Plc. (JSE)

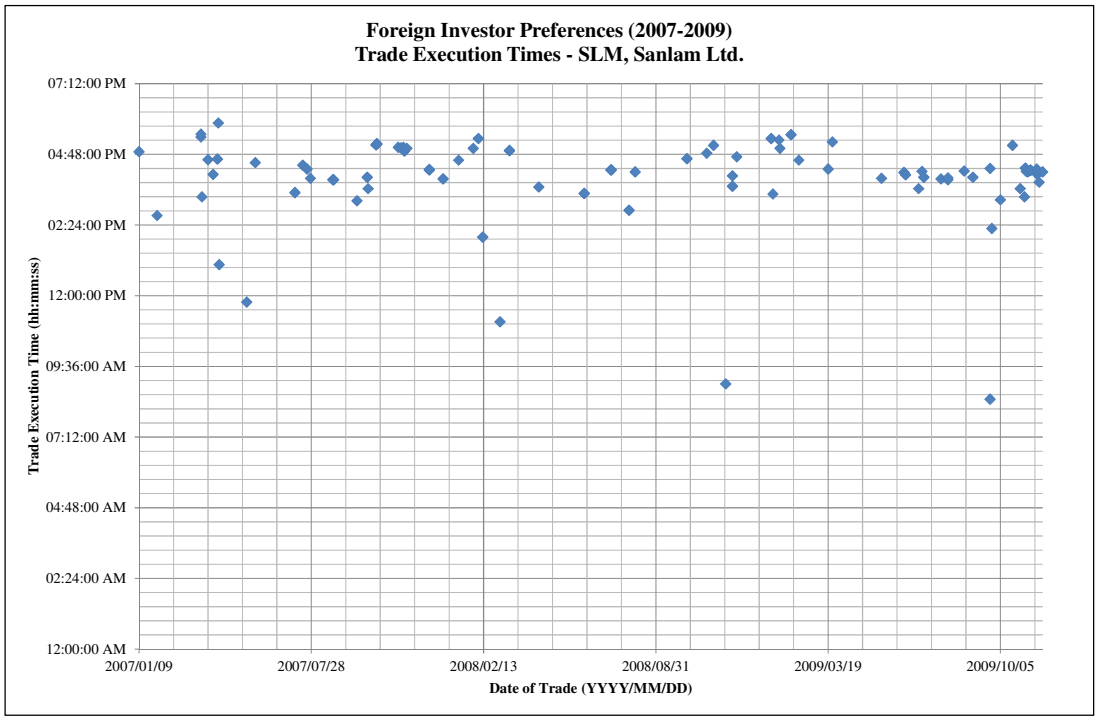


Figure 33: Density of foreign investor trade execution times, Sanlam Ltd. (JSE)

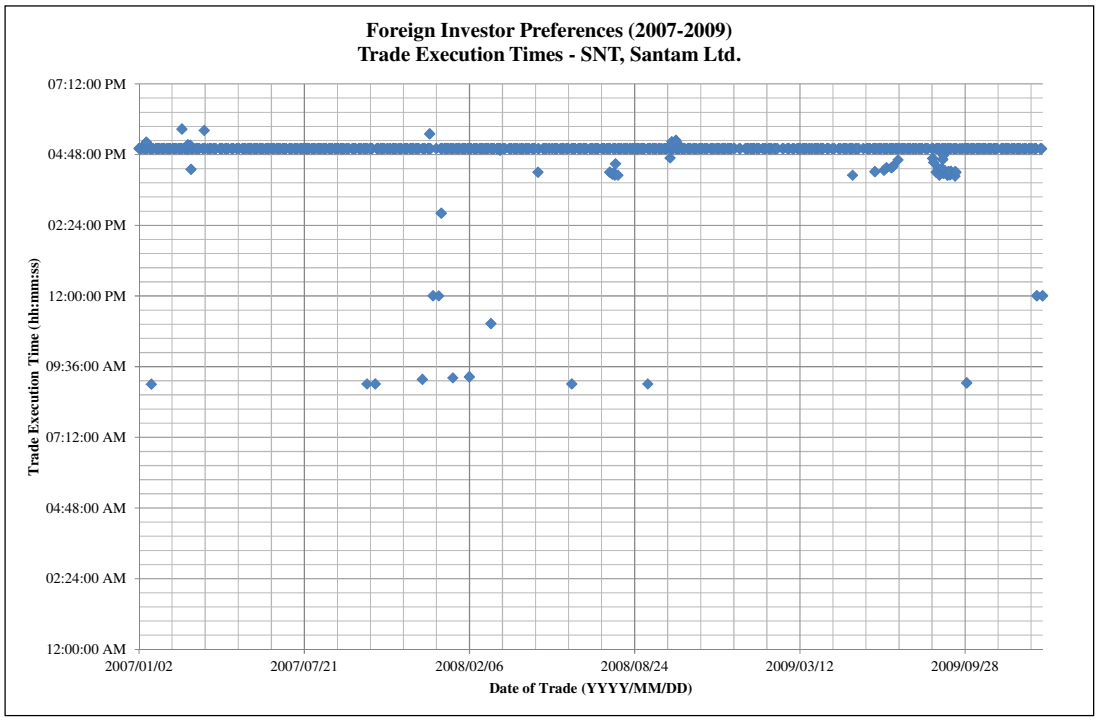


Figure 34: Density of foreign investor trade execution times, Santam Ltd. (JSE)

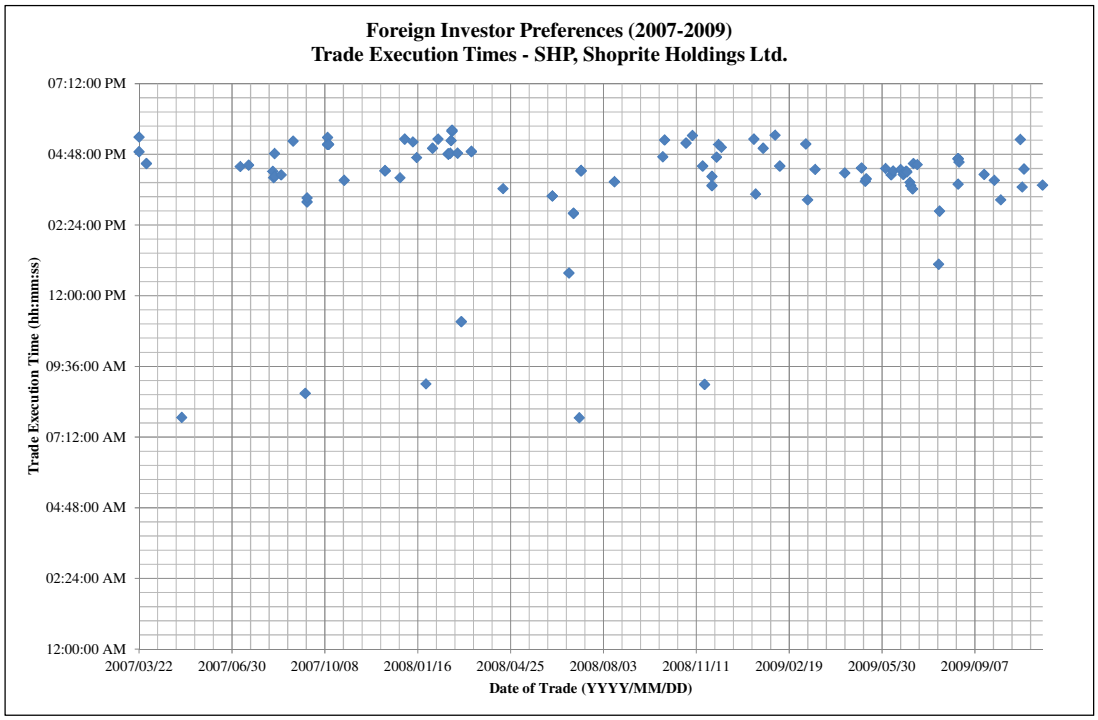


Figure 35: Density of foreign investor trade execution times, Shoprite Holdings Ltd. (JSE)

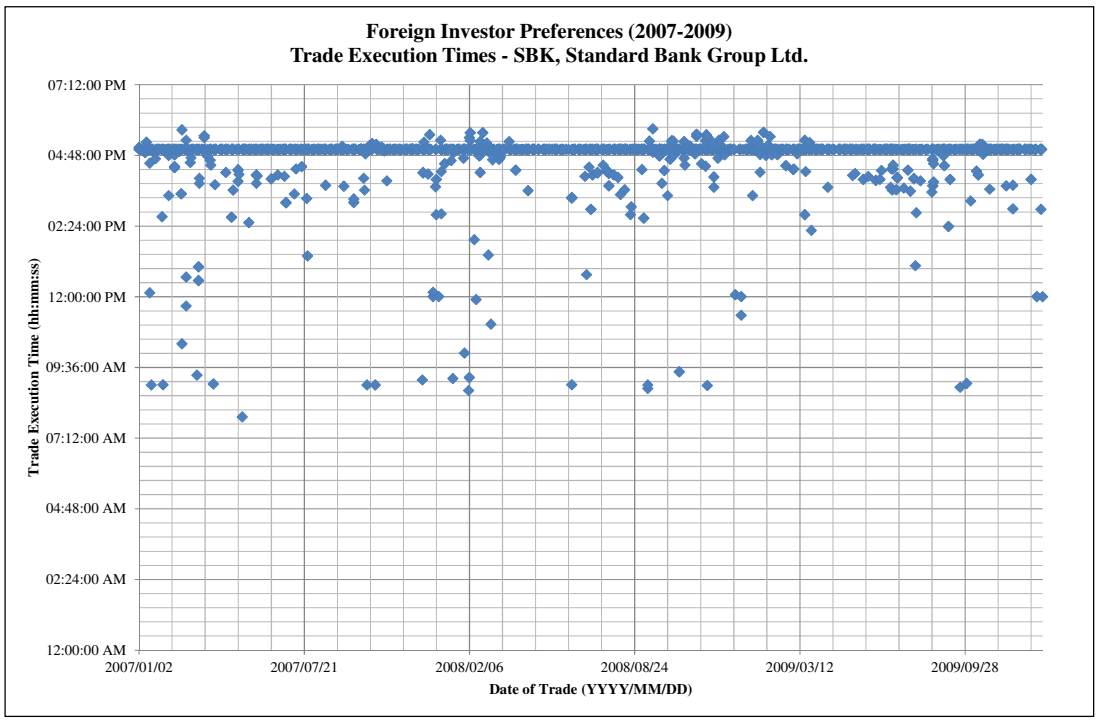


Figure 36: Density of foreign investor trade execution times, Standard Bank Group Ltd. (JSE)

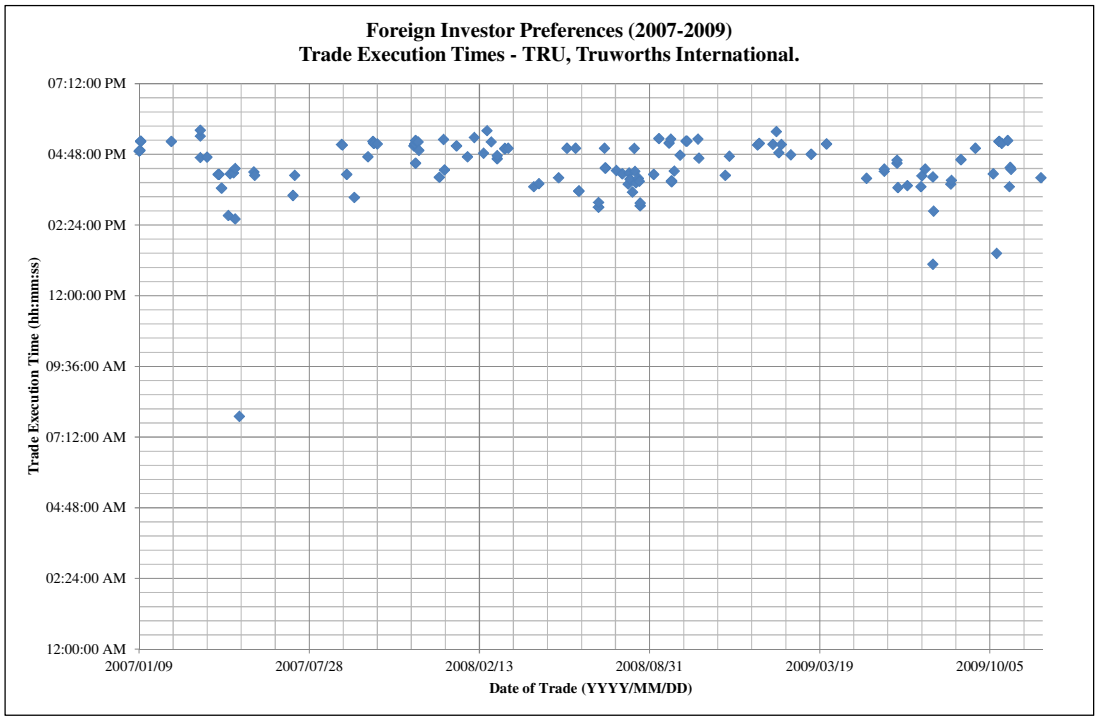


Figure 37: Density of foreign investor trade execution times, Truworths International (JSE)

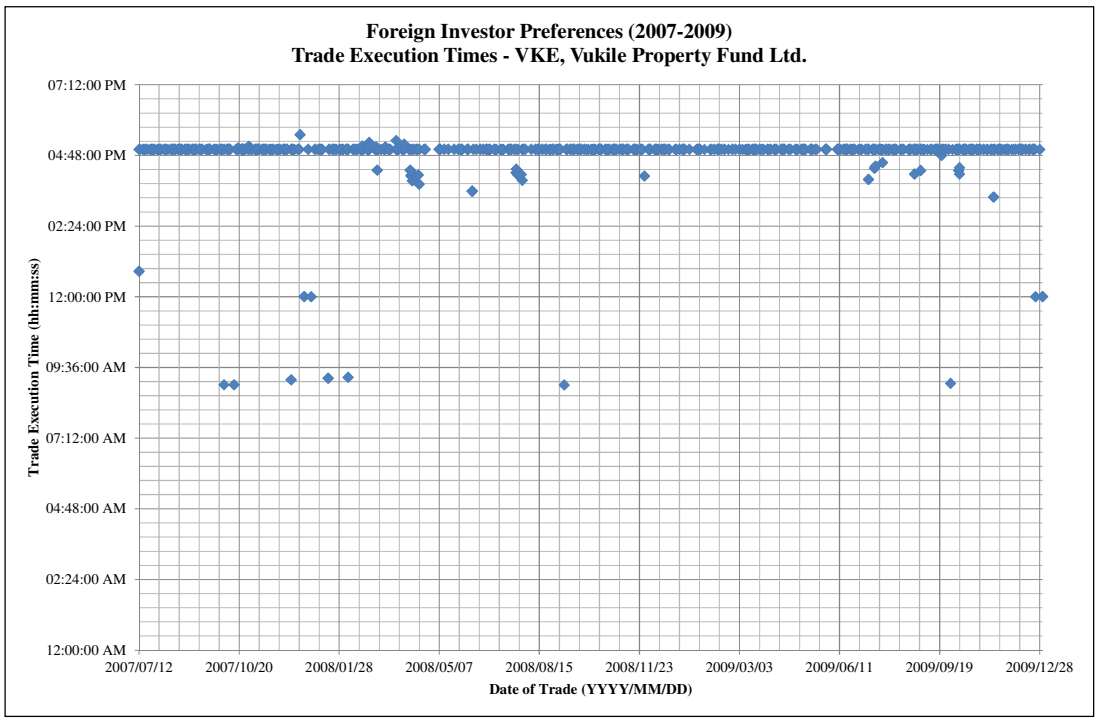


Figure 38: Density of foreign investor trade execution times, Vukile Property Fund Ltd. (JSE)

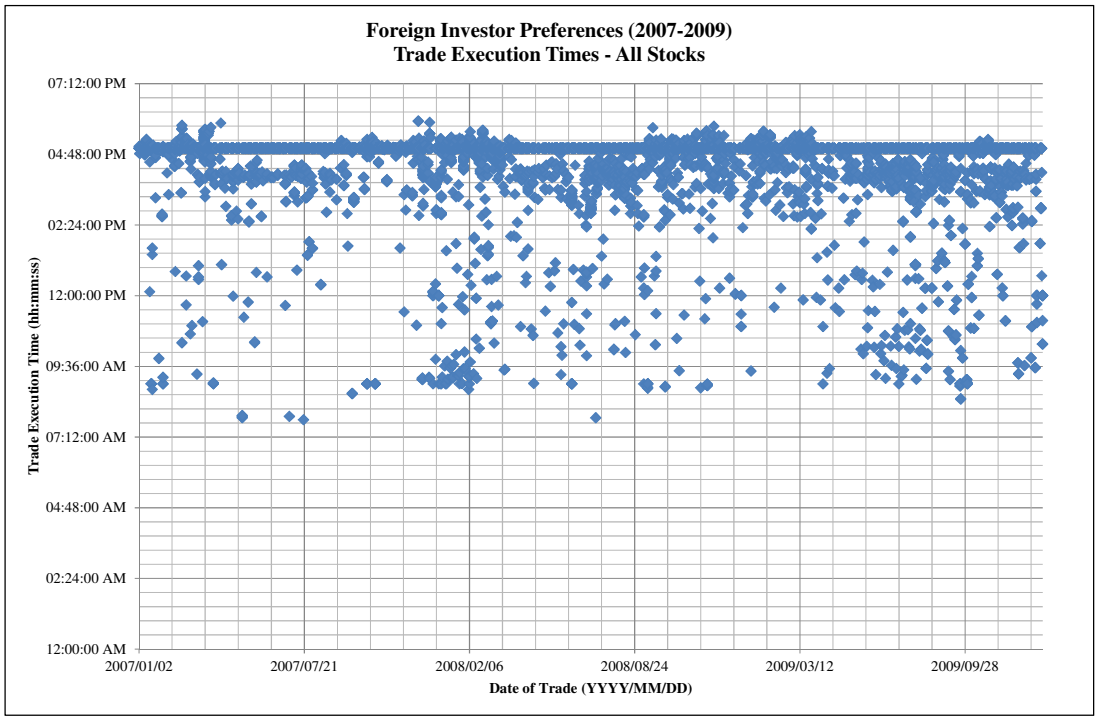


Figure 39: Density of foreign investor trade execution times for all trades (JSE)

APPENDIX 11

Foreign versus domestic investor returns performance on the JSE Equities market (2007 to 2009)

TABLE 7: Returns performance VWAP ratios by trader type, equally weighted across all stocks and days

$x_{\sigma}^{t\xi} = \sum_{t=T}^{t=0} P_{\sigma}^{t\xi} V_{\sigma}^{t\xi} / \sum_{t=T}^{t=0} V_{\sigma}^{t\xi}$, $y_{\sigma\lambda}^{t\xi} = \sum_{t=T}^{t=0} P_{\sigma\lambda}^{t\xi} V_{\sigma\lambda}^{t\xi} / \sum_{t=T}^{t=0} V_{\sigma\lambda}^{t\xi}$, H_0: $E(y_{\sigma\lambda}^{t\xi}/x_{\sigma}^{t\xi}) = E(\delta) = 1$, $\forall\ t = \{0, 1, 2, 3, \ldots, T\}$ under the null.

Returns Performance Ratio Averages (δ)	All Trades		Buy Side Trades		Sell Side Trades	
	Domestic Investors	Foreign Investors	Domestic Investors	Foreign Investors	Domestic Investors	Foreign Investors
Range	0.03857	0.05414	0.06133	0.07331	0.03976	0.05889
Minimum	0.98059	0.97679	0.96826	0.97332	0.98076	0.96329
Maximum	1.01917	1.03094	1.02959	1.04663	1.02052	1.02218
Count (n)	7622	7622	7622	7622	7622	7622
Standard Error	0.00013	0.00018	0.00020	0.00024	0.00013	0.00019
Standard Deviation (σ)	0.01118	0.01564	0.01770	0.02132	0.01142	0.01700
Sample Variance Var(δ)=σ^2	0.00013	0.00024	0.00031	0.00045	0.00013	0.00029
Kurtosis	-1.20489	-1.19004	-1.19000	-1.21822	-1.18992	-1.19556
Skewness	0.02634	-0.03916	-0.01820	0.01582	0.00196	-0.02830
Confidence Level (95.0%)	0.00025	0.00035	0.00040	0.00048	0.00026	0.00038
Median	0.99949	1.00433	0.99890	1.00953	1.00064	0.99335
Mean annual trade value (ZAR million)	5 212 636	1 145 596	3 013 084	586 840	2 199 552	558 756
Mean (δ)	0.99968	1.00425	0.99895	1.00991	1.00073	0.99331
Delta Mean (δ)		-0.00456		-0.01096		0.00742
(t-statistic, α=0.05: H_0=1)		20.64		34.43		-31.61
Pearson Correlation		-0.00822		-0.00627		-0
Hypothesized Mean Difference		0		0		0
df (n-1)		7621		7621		7621
P(T<=t) two-tail		3.80E-92		1.51E-241		3.26E-206
t Critical two-tail		1.96		1.96		1.96