The Impact of Exchange Traded Funds on the microstructure of their constituent shares: A South African case

[PHD Research Proposal]

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Abstract

An Exchange Traded Fund (ETF) is a financial asset, which allows investment into a basket of securities that is designed to track a pre-specified index or benchmark. Index-based products such as ETFs have grown exponentially in number and popularity since inception to encompass a large proportion of the overall market currently. Considering the size of the ETF market and its ever-expanding capacity and products, it is extremely important to understand its contribution to market quality, or conversely the ways in which it destroys market quality. The dangers of these products however are not often known, as they represent themselves as changes to the microstructure of the market, and are only exposed after empirical studies are performed. Elements such as price discovery, market liquidity, market volatility, systemic risk and informational efficiency are all important ones, which contribute to the overall quality of the market. The failure of any of these processes will result in greater market fragility, and is thus a case for regulatory concern. Much of the available research is based in US and European markets, and there is very little literature available in the South African context. Given the importance of market microstructure and its inherent regulatory and investment consequences, this study aims to fill a very large gap in the literature.

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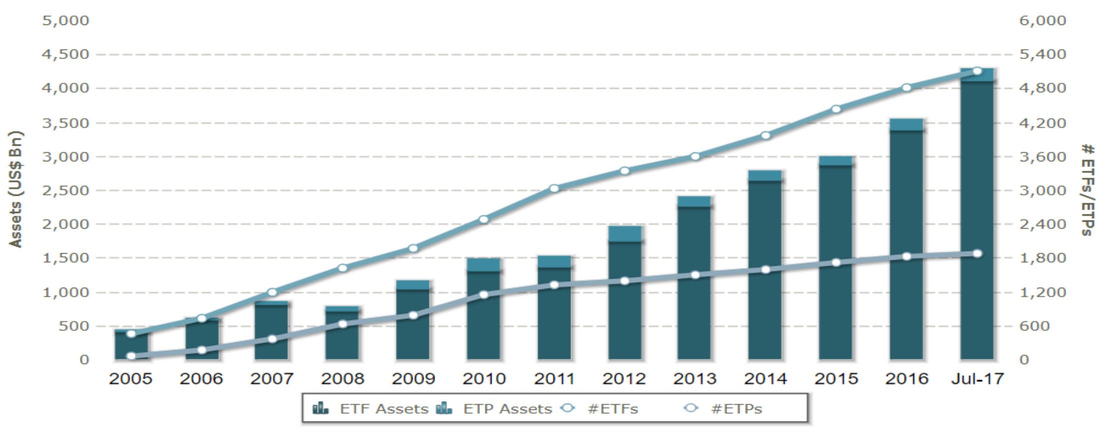
Introduction

An Exchange Traded Fund (ETF) is a financial asset, which allows investment into a basket of securities that is designed to track a pre-specified index or benchmark. ETFs form part of a broader classification of index funds, with the additional important feature of it being listed and traded on a stock exchange. These instruments were first introduced in the 1990s on the United States (US) and Canadian stock exchanges. Whilst initially, ETFs occupied only a small portion of the total index assets under management, in the period of 1995 to 2001 alone, the popularity of this product surged, with annual growth rates amounting to 132% (Gastineau, 2001). Deville (2008) found that at the time of his study, ETFs were the most actively traded asset in the US market. Since its introduction, the ETF market has grown exponentially, not only in market value, but also in the variety and number of products being offered. In 2015, the Wall Street Journal reported that ETFs had become so popular that more than 80% of the advisors surveyed, reporting using ETF products for their customers.

Guedj and Huang (2008) document that the first Exchange Traded Fund (ETF) dates back to Canada, where the Toronto Index Participation unit (TIPS) had launched it in 1990. This ETF contained a portfolio of shares tracking the Toronto Stock Exchange Top 60 index. The United States then introduced its first ETF in 1993 when the American Stock Exchange (AMEX) listed an ETF named Standard and Poor's Depository Receipt (SPDR) that tracked the S&P500. South Africa welcomed this financial innovation in November 2000, where the first ETF – the Satrix 40 (designed to replicate the Top 40 index) was listed on the JSE. Since its inception however, there have been major strides in the South African ETF market, with the current offerings across the board of commodity and equity offerings, which have both domestic and global alternatives, as well as global alternatives. Its popularity as an investment vehicle stems from its offering of diversification at minimal cost and effort, as well as its structures providing tax advantages for investors.

Statistics published by ETF research website, ETFGI, found that the total market capitalization of ETFs globally has grown from $416 billion in 2005, to $4,1 trillion in July 2017. The phenomenal growth of these ETFs is shown in figure 1 below, which also shows that the ETFs offered on a global scale have grown exponentially from approximately 500 in 2005, to 4800 currently.

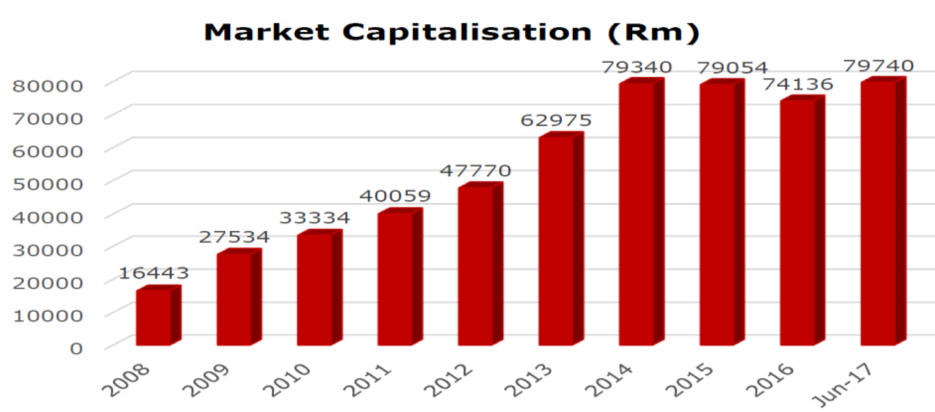
Figure 1: Growth of ETFs globally



(Source: ETFGI, 2017)

The current South African ETF market constitutes a small proportion of the overall global market, however it has also grown exponentially from 9 funds (total market capitalization of R12 billion) in December 2006, to 53 in June 2017 with a total market capitalization of R79 billion (ETFSA, 2017). Figure 2, below, shows the growth of the ETF market over the period of 2008 to mid-2017:

Figure 2: Market capitalization of ETF market from 2008 to June 2017



(Source: ETFSA, 2017)

The goal of an ETF is to provide investors with a well-diversified, index portfolio at a low cost – which is achieved by using economies of scale to buy large quantities of shares, at lower costs (Kostovetsky, 2003). The aim of an ETF is therefore exactly the same as its predecessor, index funds, however, it differs in some key characteristics. ETFs are constructed using a creation and redemption process, which decreases costs overall. The ETF shares that are created are traded on the secondary market (Johannesburg Stock Exchange), which means that ETFs provide the return and diversification benefits of traditional index funds, whilst allowing for the flexible trading characteristics of individual shares.

Since an ETF trades on two markets, it has two prices. The first price, the net asset value (NAV), is the net value of the fund's holdings divided by the number of shares, computed at the end of each trading day. The second price, the market price per share, depends on the supply and demand on the stock exchange. If buying or selling pressure is high, these two prices may deviate from each other (Deville, 2008). This also means that the TER for ETFs are lower than conventional index funds, since there are no transaction costs to incur, and the only costs incurred by an investor is the brokerage cost from purchasing the ETF, and the bid-ask spread. Furthermore, capital gains tax is negligible, making them more tax-efficient alternatives to index funds (Kostovetsky, 2003).

Whilst the advantages of ETFs are well advertised, the disadvantages of these products and their possible damaging effects on the market is not fully known. Recent years have seen a growing amount of literature dedicated to evaluating the effect of ETF formation on the microstructure of the market. These studies look at the effects of ETF formation and trading on the underlying assets which make up the index that is being replicated in order to evaluate possible systemic dangers posed by ETFs, given their immense popularity, and adoption by both institutional and retail investors.

Since ETFs are derivative securities, their presence should not affect the microstructure characteristics of the assets that make up the ETF. However, a theory derived by Subrahmanyam (1991) advocates that since ETFs are so popular due to their simplicity and ready diversification, many investors have migrated from trading individual shares, to simply trading ETFs. As a result, there may be a migration of liquidity as well, from the underlying assets to the ETFs, with ETFs said to "cannabalise" the liquidity of the constituent stocks. This will therefore represent itself in the underlying assets having wider bid-ask spreads, and thus greater adverse selection costs (Charupat and Miu, 2013). Other studies focusing on different elements of market structure focus on price formation and informational efficiency of the underlying assets (Yu, 2005), volatility of the underlying asset (Ben-David et al, 2014) and effects on firm value and systematic risk of the constituent securities (Bae et al, 2012). Studies of this type are imperative as their results provide important implications for individual investor's portfolio construction, as well as for corporations. Overall, the study of these various elements is still in its infancy globally, and to the author's knowledge there has been very little evidence produced in the South African context.

Problem Statement

Since the introduction of first official Stock Market in the 1600s, the quantity, nature and diversity of the products offered on the stock exchange have increased vastly beyond just stocks and bonds. The current financial environment grants exposure to a number of diverse products that provide key advantages to investors and financial managers. The dangers of these products however are not often known, as they represent themselves as changes to the microstructure of the market, and are only exposed after empirical studies are performed. Elements such as price discovery, market liquidity, market volatility, systemic risk and informational efficiency are all important ones, which contribute to the overall quality of the market. The failure of any of these processes will result in greater market fragility, and is thus a case for regulatory concern.

Index-based products such as ETFs have grown exponentially in number and popularity since inception to encompass a large proportion of the overall market currently. Considering the size of the ETF market and its ever-expanding capacity and products, it is extremely important to understand its contribution to market quality, or conversely the ways in which it destroys market quality. Wurgler (2010) purports that the introduction of index-based products like ETFs have generated new phenomena on the stock market that were previously not observed, with the possibility that in effect, ETFs are not only reducing their ability to deliver on their advertised benefits, but are also negatively affecting market function. Battacharya and O'Hara (2016) echo this sentiment, and they find that markets could become more fragile if the information reflected in ETF markets does not perfectly mirror the information reflected in the underlying assets.

The effect of ETF formation on the assets that underlie it are therefore an extremely important contribution to the field of knowledge. If ETF formation significantly affects factors like volatility, price formation, firm value and liquidity of the underlying securities, this would imply that the market price of shares, and their result returns are distorted, which then leads to discrepancies in many other areas, since the investment decisions of both investors and financial managers are guided by the share price (Yu ,2005).

The inherent dangers of ETFs on market quality have attracted increasing interest, especially since the Flash Crashes of May 2010 and August 2015, with the United States Securities Exchange Commission (SEC) currently preparing an intensive review of the asset class amid fears that ETFs may be increasing volatility in financial markets (Authers and Newlands, 2016). The subject has also garnered academic interest, with a growing body of international evidence being produced, some in favour of ETFs increasing market quality, whilst others show that this asset destroys aspects of market quality.

Hasbrouck (2003) is one such study that found positive effects of ETF formation, as he found that the ETF improved the price discovery process for the underlying stocks. Boehmer and Boehmer (2003) found that the introduction of ETFs increased the liquidity and market quality of the constituent assets, whilst Glosten, Nallareddy and Zou's (2015) analysis discovered that ETFs increased the informational efficiency of the underlying assets.

In contrast, Ramaswamy (2011) found that ETFs increase the systemic risk present, whilst Hamm (2014) found that the introduction of ETFs decreases the liquidity of its constituent assets. Studies such as Vijh (1994), Barberis, Shleifer and Wurgler (2005) and Da and Shive (2016) have all found that the introduction of ETFs have caused the correlations of their underlying assets to increase, and this increase is due to non-fundamental factors. A recent study by Israeli, Lee and Sridharan (2015) also finds that ETFs increase synchronicity, which means that the prices of shares are less dependent on their individual information, and more dependent on movements in the ETF. Another study by Ben-David, Franzoni and Moussawi (2014) found that the conception of ETFs result in increased volatility in their underlying assets.

Studies of this type on the South African market are still in its infancy. A study by Charteris (2013), evaluating the pricing efficiency of four domestic and three foreign ETFs found that all were price inefficient. Matarutse and Sibanda (2014) evaluated whether the introduction of the Satrix Top 40 ETF affected the volatility of the underlying shares, and their results overall proved that volatility increased after introduction of the ETF. McCullough (2017) also used the Satrix Top 40 ETF as a subject, and aimed to evaluate whether ETFs contribute to the price discovery process between future and spot markets. Her findings reveal that ETFs improve the price discovery process overall. To the authors' knowledge, the afore-mentioned three articles are the only ones available in the South African context on the subject. Given the importance of market microstructure and its inherent regulatory and investment consequences, this study aims to fill a very large gap in the literature.

Research Objectives and Questions

This thesis will take the form of a PHD by Publication, and as such, there are three distinct research questions, each of which form one publication. These will be thoroughly discussed in the following pages, with each section detailing the background, literature review, and methodology of that particular paper.

The central research objective of this thesis, which serves as an encompassing goal intended to unify these papers together under a central theme is as follows:

What is the impact of the introduction and trading of Exchange Traded Funds on the microstructure components of the South African Financial Market?

The following research questions are therefore posed:

1. Does the inception of ETFs affect the liquidity of the underlying securities positively or negatively?

   Title of the paper: *The impact of ETF inception on the liquidity of the underlying assets in South Africa*

   Research objective: To evaluate the liquidity impact of the introduction of the Satrix Top40 and RMB Midcap ETFs, on the shares that underlie these indices.

2. What effect do ETFs have on the informational efficiency of their underlying assets?

   Title of the paper: *Measuring the contribution of ETFs in South Africa towards informational efficiency*

   Research objectives: To evaluate the effect that ETF activity has on ability of shares to accurately incorporate fundamental information timeously. The data used will be the trading data and accounting information of the Satrix Top40 and RMB Midcap ETFs.

3. What effect does the introduction of ETFs have on the correlations of the underlying constituents of the Satrix Top40 and RMB Midcap ETFs?
   Title of the paper: *Does ETF trading increase the correlations of its constituent securities? A South African Perspective*
   Research objectives: To examine whether the inception of ETFs create a phenomenon whereby the underlying assets movements are correlated more with each other, and less with fundamental information.

<u>Paper 1: The impact of ETF inception on the liquidity of the underlying assets in South Africa</u>

Liquidity in the financial market, refers to the ability to transact and adjust portfolios and risk profiles without significantly affecting the prices of the underlying assets. The concept of market liquidity encompasses many other facets, which are detailed by Kyle (1985) as follows:

- The market should be "tight", which means that there should be a very small difference between the bid and ask spreads. This would be an indication that there are many competing offers to purchase/sell the share, which is what narrows the bid-ask spread. A liquid market, should have infinite "tightness".
- "market depth" – refers to the existence of many orders, both above and below the price at which an asset is trading. A liquid market should not be infinitely deep.
- "resiliency", which is the speed with which prices recover from a random shock. A liquid market should consist of prices which are resilient enough to trend towards their underlying intrinsic value.

The presence of liquidity is integral to financial markets, to ensure that market efficiency is maintained, transaction costs are low and bid-ask spreads are narrow (Crockett, 2008). There are many theories which aim to dictate how market liquidity should be affected upon inception of basket securities, such as ETFs. This evidence is subdivided into two different streams. The first body of evidence is termed "adverse selection hypothesis", which postulates that the introduction of ETFs would result in decreased liquidity in the component stocks. This argument is favoured by studies like Subramanyam (1991) as well as Gorton and Penacchi (1993). The second body of evidence, termed “arbitrage hypothesis”, develops its argument based on the assumption of imperfect markets (contrary to the adverse selection hypotheses, which assumed perfect markets), and studies like Fremault (1991) indicate that liquidity of these stocks should increase after ETF conception.

Subramanyam (1991) attempts to model the effect of index formation on the underlying assets liquidity, by analysing the interaction of traders who would choose to execute their trading strategy, either in the ETF or in the underlying stocks. His analysis begins firstly identifying two types of investors: informed traders, who choose to trade securities based on informed analyses, and liquidity traders, who trade for reasons other than their future payoffs, such as their desire for cash, or tax planning. Liquidity traders are then further subdivided into discretionary and non-discretionary traders. Whilst discretionary traders can choose to either trade on the ETF or on individual shares, and makes the decision based on the associated costs, non-discretionary traders are constrained by other circumstances to either trade in the ETF, or in the individual assets.

Subrahmanyam (1991) finds that ETF markets represent the lowest cost market for discretionary liquidity traders, since the asset-specific component of adverse selection gets diversified away in the basket of securities. Furthermore, the adverse selection component of individual securities will also increase after introduction of the ETF due to decreased liquidity trading in these individual assets. This increase is likely to be higher for securities with smaller weights in the ETF, than for those which hold a greater proportion of the ETF. As a result, one should find that the liquidity in individual assets varies in conjunction with the adverse selection – the higher the adverse selection present, the lower the liquidity in that security.

A similar conclusion is reached by Gorton and Penacchi (1993), who argue that introduction of the ETF will result in a migration of investors away from the underlying securities, to the ETF, due to easier trading and lower transaction costs. This will therefore result in greater adverse selection risk in the underlying securities market, which will mean that prices become very responsive to the quantities traded, ie. Markets become less deep. This in turn reduces the liquidity of the underlying securities.

Fremault (1991) asserts that the introduction of securities like the ETF assists in making markets more complete, thereby enhancing the investment and arbitrage opportunities available to investors. This increase in arbitrage activity due to the creation and redemption process of ETFs, will in turn result in increased price efficiency, increased liquidity, a decrease in adverse selection risk and thus also a decrease in overall volatility.

A similar result is obtained from Merton's (1987) "Investors Recognition Theory", in which he suggests that the introduction of an ETF attracts more investors as this instrument allows them to trade easily, at a low cost and with minimal expertise. This therefore leads to an increase in interest not only in the index which is being replicated by the ETF, but in its individual constituents, especially those with the lowest weighting in the index which tend to be traded less than the larger assets. Due to this added level of investor participation, liquidity of the overall market should increase, and the volatility of the market should decrease as well, an effect which would be largest for the smallest companies in the index.

Literature Review

The literature on the issue starts first with analyses of other derivative securities such as options and futures, which were traded long before ETFs were derived. Jegadeesh and Subrahmanyam (1993) used an event study to evaluate whether the introduction of index futures affected the liquidity of the underlying assets. They utilised information for 6 months before and after the introduction of the S&P500 futures contract, and found weak evidence of increased liquidity. Clarke and Shastri (2001) found evidence of increased liquidity when comparing closed ended funds to their underlying shares.

Hegde and McDermott (2004) was the first study to look particularly at the effect of ETF introduction on the liquidity of the underlying shares. They used transactional market volume and price data to conduct an event study on the Nasdaq 100 (QQQ) ETF and the Dow Jones Industrial Average 30 ETF (DIAMONDS). They used an event window of 50 days prior, and 50 days post, the introduction, as well as two different methodologies to provide a conclusion. Hegde and McDermott's (2004) univariate analysis made use of trading activity and liquidity cost measures to evaluate the liquidity of the underlying assets, whilst the multivariate analysis made use of a Seemingly Unrelated Regression (SUR) to model the changes in relative spread and depth of the funds. Overall, strong evidence was found in favour of the liquidity of the component stocks of the Diamond ETF increasing in liquidity subsequent to its introduction, whilst similar results were found for the QQQ ETF, albeit weak evidence. Their study also looked at the effect of ETF introduction on derivative (such as index futures) trading. It was found that after the introduction of the ETFs, there was an increase in trading of the futures, which indicates arbitrage activity.

Van Ness, Van Ness and Warr (2004) also evaluated the DIAMONDS ETF, however their study made use of a 30 day event period, and they derived a matching sample of similar companies to control for any other factors that might also affect liquidity. Van Ness et al (2004) utilize Feasible Generalised Least Squares (FGLS) of estimation and find that relative to the matched sample, the introduction of the DIAMONDS ETF causes a decrease in liquidity of the underlying assets, which indicates that there is a shift of investors (uninformed) away from the index components, and towards the ETF.

Richie and Madura (2007) also evaluated the Nasdaq 100 to evaluate the liquidity hypotheses, but their study involved an additional dimension of attempting to analyse whether the liquidity effect is asymmetric, and dependent on the weighting of the component asset in the index. The method used was similar to the multivariate analysis used by Hegde and McDermott (2004). Their results proved that overall, the liquidity of the QQQ constituent stocks increased subsequent to the introduction of the ETF, but that the effect was seen to be more significant for lower-weighted stocks in the ETF.

De Winne, Gresse and Platten (2009) conduct similar tests on the CAC 40 ETF in order to evaluate the liquidity effect when the ETF market involves selected market makers. Their study is unique as the CAC 40 ETF is traded in a market which requires Liquidity Providers (LPs) to provide immediacy services. Their study concludes that the market for underlying stocks becomes more liquid after ETF introduction, however, the stock market also becomes less deep for the stocks with large weights in the index, due to migration of some investors from the large stocks to the index.

Hamm (2014) uses data on 8420 US firms between 2002 and 2008 to evaluate what impact the inception of ETFs has on the liquidity of the underlying stocks. Her results show a decrease in liquidity after inception, a result that is in conjunction with that of Van Ness et al (2004). Similar studies by Ben-David et al (2014) and Madhavan and Sobczyk (2014) found, in contrast, that the ETF market is more liquid than the underlying.

Cong and Xu (2016) hypothesise that the market for ETFs becomes the preferred one when compared to the market for the underlying assets since not only is information incorporated easily into the market, but it is incorporated with minimal impact whereas depending on the level of liquidity in the underlying asset, the price impact might be more significant. As a result of this, the ETF market's ability to absorb new information means that they are less adversely affected by speculators, and thus investors prefer the basket security to the underlying assets. Whilst their model is purely theoretical, it indicates overall that the liquidity of the underlying should decrease after introduction of the ETF due to a migration of traders.

Research Methodology

Studies of liquidity have a variety of different measurement alternatives which can be used, which corresponds to the definition of liquidity provided earlier, viz. the proxy assists in capturing tightness, depth and resilience of the market. Earlier studies of the subject such as Demsetz (1968) and Stoll (1978) simply measured the tightness and thus liquidity of the market by using bid-ask spreads, however Lee, Mucklow and Ready (1993) find that this is an insufficient measure to evaluate liquidity of the market, and depth should also be included in liquidity analyses. Subsequent studies, therefore, made use of both spread and depth in measuring market liquidity.

The method of analysis used in this paper will be derived from the studies of Hegde and McDermott (2004) as well as Richie and Madura (2009). Both papers made use of a multivariate analysis to evaluate both spreads and depth of the ETF market and its underlying securities.

In order to incorporate for varying liquidity effects, various proxies will be used to capture both spread and depth. These proxies, as well as the method of calculating these variables is listed below:

- Quoted spread is equal to the ask price less the bid price (expressed in Rands). This spread is simply the difference between the price an investor is willing to sell the security, and the price an investor is willing to pay to purchase it. The quoted spread represents an immediacy cost, since this is what is paid when investors want to trade immediately. The bid-ask spread is said to capture both explicit transaction costs, such as taxes and order processing costs, as well as implicit costs such as execution cost. This is the most commonly used measure of liquidity, and is used in Van Ness et al (2004), Hegde and McDermott (2004), De Winne et al (2009), Richie and Madura (2009) and Calamia et al (2013).

- Percentage spread = $\frac{Ask_t - Bid_t}{(Ask_t + Bid_t)/2}$

  The percentage spread allows for the fact that a given spread will be less expensive for higher prices, and is easier to compare across markets (Sarr and Lybek, 2002). This measure is used in Van Ness et al (2004).

- Quoted depth is equal to the equally weighted average of the sum of volume at the bid and ask prices.

- Turnover rate =$\frac{Volume}{S \times P}$, where Volume is the rand volume traded, S refers to the outstanding stock of the ETF, and P is the average price of the ETF during the day.

- Amihud's (2002) illiquidity measure= $\sqrt{\frac{\frac{1}{N}\sum_1^N \sum |R_t|}{Volume_t}}$, where the numerator is the absolute value of the daily return for each stock and ETF, $Volume_t$ represents the daily ETF turnover. The conventional form of this measure does not include the square root in the formula, and captures the daily price response associated with one Rand of trading volume, however it was found by Hasbrouk (2005) that when using daily data, the square root of this measure is more appropriate for use. A high value for this measure indicates that the stock price has moved a lot, on low volume, which indicates illiquidity.

Therefore, in total, five liquidity measures are used. Whilst quoted spread and percentage spread aim to capture trading costs, and thus the tightness of the market, quoted depth and turnover ratio capture depth and breathe of the market. Amihud's (2002) Illiquidity measure measures price impact, which is the ability of a share to trade with minimal price impact.

The aim of the paper is to evaluate the impact of the ETF introduction on the liquidity measures described above, therefore it is necessary to specify both "pre" and "post" periods. Whilst Hegde and McDermott (2004) utilize a 50 day period before and after introduction, Van Ness et al (2009) uses a 30 day period and Richie and Madura (2007) and De Winne et al (2009) both utilize a three month period. Whilst there is no particular reasoning provided for the varying event periods, this study will make use of a 50 day trading period, to account for uniformity in both the pre-and post-event periods, as well as a longer time period of evaluation.

The focus of the study is only on domestic, purely equity ETFs, and there are currently 30 ETFs trading on the JSE which meet this criteria. The sample will therefore consist of the following ETFs and their respective underlying assets:

ETF	**Inception date**	**ETF**	**Inception Date**
Satrix 40	27 November 2000	Stanlib SWIX 40	18 October 2010
Satrix FINI	8 February 2002	Stanlib Top 40	18 October 2010
Satrix INDI	8 February 2002	Coreshares PropTrax Ten	30 May 2011
Satrix RESI	10 April 2006	Satrix Rafi 40	August 2011
Satrix SWIX	10 April 2006	Coreshares Green	1 December 2011
Satrix DIVI	29 August 2007	NewFunds Equity Momentum	26 January 2012
NewFunds Givi Top50	23 June 2008	NewFunds SWIX	26 January 2012

Coreshares PropTrax	25 September 2009	Ashburton Midcap	15 August 2012
Ashburton Top40	16 October 2008	Stanlib Property	13 February 2013
NewFunds NewSA	1 December 2008	Coreshares DivTrax	14 April 2014
NewFunds Shariah Top40	6 April 2009	Coreshares LowVolTrax	14 April 2014
NewFunds S&P Givi Financials	15 June 2009	Coreshares Top 50	13 May 2015
NewFunds S&P Givi Industrial	15 June 2009	Ashburton Enhanced Value	4 July 2016
NewFunds S&P Givi Resources	15 June 2009	Ashburton Enhanced Beta	4 July 2016
Coreshares Top 40 EW	25 March 2010	Satrix Property	24 February 2017

Data will be collected for the assets underlying the ETF for the 50 day period pre- and post-inception date. This will first be run through diagnostic tests to check for presence of undesirable effects such as heteroscedasticity or autocorrelation. Thereafter it will be used in a Seemingly Unrelated Regression (SUR) as follows:

$$\%\Delta Spread = \beta_{d0} + \beta_{s1}\%\Delta Volume + \beta_{s2}\%\Delta Price + \beta_{s3}\%\Delta StdDev + \varepsilon_s$$

$$\%\Delta Depth = \beta_{d0} + \beta_{d1}\%\Delta Volume + \beta_{d2}\%\Delta Price + \beta_{d3}\%\Delta StdDev + \varepsilon_d$$

Where:

$\%\Delta Spread$ and $\%\Delta Depth$ are calculated for each of the component stocks as the natural log of the ratio of each of the afore-mentioned liquidity measures over the 50 trading days in the post-introduction period to the mean of the pre-introduction period

$\%\Delta Volume$ is captured by the daily standardized trading volume

$\%\Delta Price$ is the daily closing share price

$\%\Delta StdDev$ is the standard deviation of daily closing returns

The intercept terms of the afore-mentioned equations therefore capture any changes in spread or depth during the focus period after controlling for volume, price and the standard deviation. The reason these three variables are included as controls, is due to the studies of Benston an Hagerman (1974) and Stoll (1978), who found that a large fraction of the difference in spreads is due to these three factors. By including them in the equation, it therefore eliminates their effects on the liquidity measures. The system of equations will be estimated using GMM with a robust error covariance matrix. The results of the SUR will be analysed using t-tests.

The second method of analysis used by Hegde and McDermott (2004) and later extended by Richie and Madura (2007) is motivated by Subrahmanyam's (1991) argument that liquidity traders would migrate to the ETF market as it serves as the lower cost market. This method therefore allows for a comparison of the market liquidity in the ETF against the market liquidity of a market-cap weighted portfolio of the constituent securities over the post-introduction period. Richie and Madura's (2007) pooled model, which allowed for an additional component of asset weighting is shown below:

$$ln(Spread) = \alpha_0 + \alpha_1 \, ln(Price) + \alpha_2 \, ln(Volume) + \alpha_1 \, ln(Volatility) + \alpha_4 Dummy + \alpha_5 Weight + \alpha_6 (Dummy \times Weight) + \varepsilon$$

(Equation 1)

Where: Spread is the time-weighted quoted spread

Price is the natural logarithm of the daily closing share price

Volume is the natural logarithm of the daily standardized trading volume

Volatility is calculated using Parkinson's (1980) extreme value method, ie.

$volatility^2 = \frac{[\ln(High) - \ln(Low)]^2}{4\ln(2)}$ where high and low are the daily high and low prices

Dummy is a dummy variable which takes the value of 1 for the period post-introduction, and 0 otherwise

Weight is the proportion of the ETF represented by security *i* at time *t*.

Equation 1 will be estimated using the panel data approach and not a pooled regression. The sign and statistical significance of the estimates (tested by making use of t- and f-tests) will provide an indication of the nature of the relationship between each of these variables and the bid-ask spread, and resultantly their effect on liquidity overall.

Paper 2: Measuring the contribution of ETFs in South Africa towards informational efficiency

The two primary aims of a financial market are to distribute risk, as well as effectively convey information to investors. The degree, to which an asset reflects new information, and the time taken to reflect it, refers to informational efficiency of the asset, a construct which is highly dependent on the overall structure of the market (Huang and Wang, 1997). Since the introduction of new securities alters market structure and thus overall information efficiency, it is necessary to evaluate what impact the introduction of ETFs have had on this aspect.

In a perfectly efficient market described by Fama (1965), all investors have full (symmetric) access to all the information present on a security, and this information is fully reflected in the price of the asset. In reality however, the investors in financial markets often have asymmetric information, which means that the market price of securities often convey important information to investors. When derivative instruments such as ETFs are introduced into the market, they have two opposing effects. The first effect is to increase the informational efficiency[2] of the market, since the prices of these new assets conveys important information to investors. Cong and Xu (2016) derive a model where they define three different types of informational efficiency: "Overall efficiency", which refers to how well prices reflect the intrinsic value of an asset, "systematic efficiency", which refers to how prices of assets reflect market-related (systematic) information, and "asset-specific efficiency" which captures how well firms reflect firm-specific information. They posit that overall; introduction of a basket security decreases asset-specific efficiency, increases systematic efficiency and increases the level of overall efficiency, an impact that is found to be greater for illiquid assets.

The second, opposing effect is that it decreases informational efficiency since the expanded trade opportunities and products may generate an additional element of price movements that are not due to fundamental information, thus making prices less informationally efficient (Huang and Wang, 1997). Israeli, Lee and Sridharan (2015) hypothesize that the inclusion of a share into an ETF should theoretically decrease its informational efficiency through two different avenues. Firstly, as the ETF grows in size, a proportionately higher amount of the available shares of a company get "locked up" by the fund sponsor which means there are less shares available to be traded by informed traders who wish to purchase or sell the share based on firm-specific information.

Secondly, the ETF market provides a lower cost and easier market for uninformed traders, thus making them migrate away from the market for the underlying securities. Over time, this "cannabalises" the liquidity of the underlying stocks, and creates a disincentive for informed traders to utilize resources in order to obtain firm-specific information. The result is thus a decrease in the extent to which individual shares are able to adjust to new information. This also

[2] "Informational efficiency" and "pricing efficiency" refer to the same concept, and will be used interchangeably in this study

creates the possibility that the ETF market is capable of transmitting shocks that are attributed to non-fundamental factors (such as market sentiment), which will thus result in a disconnect between fundamentals and stock prices. Since the market price of an asset is used to guide a variety of different financial and investment decisions in companies, the disconnection from fundamentals creates important ramifications, which need to be considered.

Literature Review

Yu (2005) analyses a sample of Sector SPDR ETFs to evaluate what effect the introduction of an ETF has on the informational efficiency of prices, using tick data over a 58 day period (1 July 2002 – 20 September 2002). She uses the multi-asset variance decomposition methodology to measure the "efficient" prices of an asset, after which the deviation between the market price and the efficient prices is calculated and analyzed. Her results found that the deviations between market and efficient price of the component securities were significantly smaller after the introduction of the ETF, which suggests that information efficiency is improved with the formation of ETFs. Yu (2005) also found that changes in the ETF prices informs changes in the individual stock returns, with an almost equivalent weighting to changes in the stocks own fundamental information. Yu's (2005) overall conclusion states that, technically, even though ETFs are derivative securities, which falls into the category of redundant assets[3], they facilitate both production and dissemination of information, which leads to increased efficiency in markets overall.

Glosten, Nallareddy and Zou (2015) test quarterly cross-sectional US ETF data using the Fama-Macbeth (1973) method of two-pass regression, over the period of 2004 – 2013, to test whether an increase in ETF trading leads to increased pricing efficiency in the constituent shares. They find overall that ETFs incorporate contemporaneous accounting information into asset prices, but not

[3] Derivatives are considered to be redundant assets from a hedging perspective, since their payoff can be easily replicated by taking associated positions on their underlying assets.

lagged or forecasted information, and only for the smaller stocks in the index. They attribute this observation to the possibility that information does not reflect timeously for smaller firms due to aspects such as illiquidity and short sale constraints, therefore the easily traded and liquid ETFs allow this information to be incorporated into these securities.

Israeli et al (2015) use their study to test two hypotheses, viz. as the proportion of ETF ownership of a particular company becomes larger, the transaction costs associated with the component securities will increase, and that this increase will cause a decrease in the informational efficiency of the assets. They utilize panel data on US stock data over the period of 2000 to 2014, and find that as ETF ownership increases, the pricing efficiency of the underlying assets decreases, along with the number of analysts researching the firm.

Methodology

The literature surrounding the topic suggests that there are a variety of different methods which can be used to test information efficiency. Whilst Yu (2005) utilized tick data to model the effect of ETF introduction, the possibility is that informational efficiency effects increase over time after introduction, so her method is considered unfeasible. Israeli et al (2015) and Glosten et al (2015) both use measures of ETF ownership to model informational efficiency, however, Israeli et al (2015) includes variables such as analyst coverage, which is information that is not easily available in the South African environment. Furthermore, Israeli et al (2015) aim to identify the long-term implications of ETF trading, whilst Glosten et al (2015) study whether the presence of ETFs allow current quarter earnings information to be incorporated faster into current quarter share returns. Therefore, the method of Glosten et al (2015) is followed, as the aim of this study is not to imply ETFs allow one to predict future fundamental information, but rather how timeously information is incorporated into stock prices.

Since this study makes use of accounting data, the lowest frequency that can be applied is of a quarterly basis. Quarterly ETF and accounting information will therefore be obtained for the sample of 30 ETFs mentioned previously. The starting date for each ETF will therefore be based on the first full quarter of information, which will vary for each of the ETFs depending on the date of inception.

The variables used in the study are as follows:

- Return (R_{it}) is the natural log of the return for stock *I* during quarter *t*
- ETF ownership (ETF_t) = $\frac{total\ number\ of\ shares\ owned\ by\ ETF}{Total\ shares\ outstanding\ in\ each\ underlying\ asset}$
- $Earnings_{i,t} = \frac{X_{it} - X_{it-4}}{P_{it-1}}$

  Where: X_{it} measures the Earnings per share excluding extraordinary items for firm *I* in quarter *t,* and P_{it-1} is the price per share for firm *I* at the end of quarter *t-1*.

  The Earnings variable is seasonally adjusted by deflating earnings by the beginning of quarter price (X_{it-4}).
- Size ($S_{i,t}$) is the natural log of the market value of equity at the beginning of each quarter.
- $MTB_{i,t-1}$ is the market to book ratio.
- $Loss_{i,t}$ is a dummy variable which assumes the value of 1 is quarterly earnings for firm *I* is negative, and 0 otherwise.
- $STD_{i,\ t-1}$ is the standard deviation of earnings during the 20 quarters preceding quarter *t*.

Whilst the dominant relationship being evaluated exists between R_{it}, ETF_t and $Earnings_{i,t}$, the remaining variables of Size, MTB, Loss and STD are all necessary control variables to be included, since they affect either stock returns, or earnings.

Glosten et al (2015) utilized Fama and Macbeth's (1973) method of two-pass regression to conduct their analysis, however this study uses the superior method of panel data instead. The following regression will therefore be estimated:

$$
\begin{aligned}
R_{i,t} = {} & \gamma_{0,t} + \gamma_{1,t}Earnings_{i,t} + \gamma_{2,t}\Delta ETF_{i,t} + \gamma_{3,t}\left(Earnings_{i,t} \times \Delta ETF_{i,t}\right) + \gamma_{4,t}Earnings_{i,t-1} \\
& + \gamma_{5,t}\left(Earnings_{i,t-1} \times \Delta ETF_{i,t}\right) + \gamma_{6,t}Earnings_{i,t+1} \\
& + \gamma_{7,t}\left(Earnings_{i,t+1} \times \Delta ETF_{i,t}\right) + \gamma_{8,t}SIZE_{i,t-1} + \gamma_{9,t}MTB_{i,t-1} + \gamma_{10,t}STD_{i,t-1} \\
& + \gamma_{11,t}Loss_{i,t} + \gamma_{12,t}\left(Earnings_{i,t} \times Loss_{i,t}\right) + \gamma_{13,t}ETF_{i,t-1} + \varepsilon_{it}
\end{aligned}
$$

(Equation 2)

The preceding regression allows for ETF trading to impact both past ($Earnings_{i,t-1}$) and future ($Earnings_{i,t+1}$) information, and also allows for the capturing of the interactions between change in ETF ownership and these variables. In addition, the level of ETF ownership ($ETF_{i,t-1}$) is also included as a control variable to account for possible volatility effects.

The coefficient $\gamma_{3,t}$ captures the effect of ETF trading on informational efficiency. A positive coefficient for $\gamma_{3,t}$ would indicate that pricing efficiency is improved, whilst a negative coefficient would indicate that informational efficiency decreases. Standard t-tests will be used for hypothesis testing.

<u>Paper 3: Does ETF trading increase the correlations of its constituent securities? A South African Perspective</u>

The CAPM model developed by Sharpe (1964) purported that risk comes in two forms, viz. a systematic component that is formed by an assets response to market-specific movements, as well as an unsystematic portion, attributed to firm-specific information. Whilst there is nothing that can be done about systematic risk, the unsystematic portion of risk inherent in assets can be easily diversified away, simply by investing in many different assets, which have low correlations with one another. This basic idea is the one that dominates the composition of any investment portfolio, and is the key to generating an efficient portfolio that effectively balances the tradeoff between risk and return.

The concept of diversification is, theoretically, a very simple one. It is less risky to spread your bets across five different horses, rather than betting on just one horse. The same logic applies to stocks, but in order for the process to work, it is based on the key concept of correlation. In order to generate an investment portfolio that is well diversified, it is necessary to find assets that are uncorrelated with one another, so if the returns of one asset decreases, the negative effects are mitigated by the positive performance of the other assets.

The increase in basket trading, however, has resulted in the simultaneous buying and selling of the stocks which trade in a particular index, regardless of the industry or fundamentals of the share. This means that the returns on these shares move together on any given day, which increases correlations between shares and thus has a destructive effect on diversification (Sullivan and Xiong, 2012). For example, the Top 40 index in South Africa is composed of the top 40 market capitalization firms in South Africa, which come from many different industry sectors. Since there are, many ETFs based on this index, this implies that buying and selling of these shares for the creation and redemption process, as well as for arbitrage purposes, occurs often. These 40 stocks therefore become more correlated to one another, simply because the buying pressure pushes the prices of all these stocks upward simultaneously, or vice versa. This phenomenon was termed the "asset-class effect" by Basak and Pavlova (2013).

Wurgler (2010) advised that the increase of index investing such as ETFs distorts the risk-return tradeoff for assets, and thus may lead to a variety of other disruptions in other areas such as portfolio allocation and corporate investment decisions. Indices thus no longer serve as mere conveyers of information, as they are capable of generating new stock market phenomena that have not been observed or in existence previously. Barberis et al (2005) also indicates that the popularity of basket products may result in prices delinking from movement based on their fundamentals, and thus once assets are included into an index, it starts to correlate more with the other components in the index, and less with the rest of the market. The prices of stocks will therefore no longer be simply a function of their fundamentals, which has damaging effects on market efficiency, as well as the concept of diversification.

The irony is therefore, that, ETFs were created with the purpose of promoting ready diversification, whilst in reality their presence might actually be reducing the effectiveness of the diversification process. This has thus led to regulators being extremely concerned about the impact of ETFs on market fragility, which is why this study holds such large significance for South Africa.

Literature Review

Early studies around the issue of correlations were either conducted on indices or other basket securities such as index funds. Vijh (1994) analysed the correlation of securities after inclusion into the S&P 500 index, and found that the covariance between the stocks and market returns increased after inclusion. A similar study by Greenwood and Sosner (2007) evaluated an event where 30 stocks were replaced on the Nikkei 225 index, and found that there was a significant increase in correlations in the 30 assets after inclusion into the index. Greenwood (2008) also found that shares which were weighted more heavily in the Nikkei 225 index exhibited higher levels of correlation.

Boyer (2011) evaluated the BARRA Value and Growth indices and found that shares which recently migrated from the growth index to the value index, become more correlated to the new index, and less correlated to the index it leaves. The same effect was found for stocks that migrated from value to growth. Boyer (2011) found that this result was only found in data post-1992, which indicates that the effect is stronger in more recent data. Whilst the issue of correlation has been examined many times before, the application of these approaches to the realm of ETFs is relatively new, with the author only being able to find four articles to date that study the issue directly.

Sullivan and Xiong (2012) utilize daily data on all the stocks listed on the NYSE, Amex and Nasdaq exchanges during the period of 1979 – 2010 to evaluate the effect of index trading on correlations and systematic risk. Since the simultaneous trading of index components will result in moving both the prices and volumes of assets in the same direction, Sullivan and Xiong (2012) utilize their data to measure the dispersion in trading volume changes, as well as pairwise correlations. Their results show that whilst the former period of 1979 – 1996 indicated an overall decrease in correlations, the latter period of 1997 – 2010 indicated a persistent increase in correlations, regardless of the status of the market[4].

Leippold, Su and Ziegler (2016) develop a theoretical and empirical model to investigate the relationship between trading activity on the ETF and index futures markets, and correlations of their underlying securities. Their theoretical model predicts that, since ETFs are derivatives, their value is very closely linked to that of the underlying security. When demand shocks therefore affect the index, this also causes the ETF to move away from its NAV. The resultant underpricing thus causes arbitrageurs to take positions in these securities, thus causing simultaneous trading in both markets, and increased correlations.

Leippold et al (2016) use daily data on the three largest ETFs that track the S&P500 index, during the period of 1993 – 2012, to test the relationship between index trading and correlations. They utilize multiple pooled regressions to conduct their analysis, and their overall results confirmed their hypothesis that demand shocks affect the correlations of assets over time. The authors note

[4] The latter period consisted of two market crises, viz the tech bubble in 2000 and the subprime crisis in 2007, and since correlations are known to increase during market stability, the authors made a note of evaluating correlations both inside and outside of these periods.

that there is a possibility that the correlations could simply reflect the information transmission from the underlying securities to the ETF, so they conduct further analyses on the correlations, in order to determine if they are also associated with price reversals. Their results find that higher correlations are accompanied by large stock reversals as well, which indicates that a substantial portion of the correlation is excessive, and transmitted via non-fundamental shocks. Whilst price reversals indicate that the effects decay over time, studies like Petajisto (2013) find that arbitrage opportunities present themselves very often, which means that the effect of increasing correlations is not ever reduced or eliminated. This could therefore contribute to the fragility of the financial system, and will have a negative impact on the diversification possibilities for investors.

Da and Shive (2016) make use of ETF specific data over the period of July 2006 to June 2012. Their total sample consists of 699 US equity ETFs and the 4700 stocks that underlie these ETFs. Their panel data analysis showed that a 1% increase in ETF turnover results in an increase in the correlation between its constituent stocks by 1.2%. When investigated further, this result was found to be attributed more to the ownership and turnover of the ETF, than the actual creation and redemption activity of the ETFs.

Da and Shive (2016) also found that a 1% increase in ETF ownership of an asset is associated with a 0.03 increase in the stock's beta. The overall results found that the effect of ETF activities on stock correlation is found to be stronger for smaller stocks, and during turbulent periods when mispricings are common. Similar to Leippold et al (2016), the authors also test for signs of excess comovement, by examining the distribution of the autocorrelations in the model. Da and Shive (2016) also find evidence of price reversals, although their evidence suggests it happens relatively quickly.

Staer and Sottile (2016) posit that the amount of a stock traded indirectly through an ETF, affects its correlation with other basket securities through the arbitrage channel. Whilst theoretically, the possibility of arbitrage would imply that the price of an ETF will not deviate significantly from its NAV, in some cases (as noted in paper 1), the liquidity of the ETF is sometimes higher than that of the underlying securities, thus leading to persistant mispricing. The authors therefore develop a measure to capture arbitrage-induced trading, called "Equivalent volume", which measures the relative liquidity of the individual asset, against the liquidity of the same stock as part of the ETF structure.

Staer and Sottile (2016) utilize high-frequency data over the period of 2002-2011 to evaluate their hypothesis that the higher the level of equivalent volume (ie. The more frequently a stock is traded), the higher the correlation among assets in the basket security. They apply the methods of Dynamic Conditional Correlations (DCC) and Pearson correlations to calculate the correlation coefficients, and panel data to run the regressions necessary, and find confirmation of their hypothesis that equivalent volume is directly related to correlations. More specifically, they find that a 1% increase in equivalent volume leads to a 0.02% increase in correlation, using the DCC method, and a 0.26% increase using the Pearson correlation method.

The results from the studies surveyed all find evidence that the introduction of ETFs increases the correlation of their underlying securities. Since there is currently no South African evidence available, this study aims to fill that gap in the literature.

Methodology

The empirical evidence surrounding the issue of correlation suggests that many different methods of analysis can be utilized, each with its own advantages and disadvantages. Whilst Sullivan and Xiong (2012) simply makes use of pairwise- and cross-correlation calculations to conduct their analysis, Leippold et al (2016) use pooled regressions, and Da and Shive (2016) as well as Staer and Sottile (2016) make use of the superior panel data method. They key decision in this case however, is how the measure of correlation is measured. The predominant method used in the empirical research is that of Pearson correlation coefficients, whilst Staer and Sottile (2016) utilize both Pearson coefficients and the DCC method of estimation.

Whilst the Pearson Correlation coefficient is widely used to calculate correlations in literature, it has been found to be distorted for fat-tailed returns – a phenomenon that is commonly witnessed in financial data. Furthermore, this value assumes that correlations stay constant, or static, over time, an assumption that is clearly unrealistic given changing market conditions. The DCC method, however, overcomes these weaknesses, and is a superior model for correlation estimation (Isogai, 2016). This paper therefore seeks to emulate the Staer and Sottile (2016) study, by using the DCC method to estimate correlations.

The key difference between the Da and Shive (2016) approach, and the Staer and Sottile (2016) approach, is that Da and Shive evaluated the relationship between ETF-related activity and correlation, much like the studies preceding it, whilst Staer and Sottile (2016) was the first study of its kind to look at the relationship between arbitrage-induced trading, and correlation. Whilst the objective of Staer and Sottile's (2016) paper is an extremely important and innovative one, their study was conducted after already establishing that there was a significant relationship between ETFs and correlation – something that has not been proven or disproven in South Africa yet. As such, whilst the Staer and Sottile (2016) method of calculating correlations is used, the variables and regression analysis utilized in Da and Shive (2016) is replicated.

The same sample of ETFs which were used for the previous two papers will be utilized here, with just one notable change. The sector-based ETFs will be removed from the sample, since for these funds it will be difficult to differentiate between fundamental-based correlation, and correlation caused by ETF formation. Daily values will be used, as high-frequency data was also tested by

Staer and Sottile (2016), and the same result was produced. Daily data on the following 19 ETFs will therefore be used:

Satrix 40	Stanlib SWIX 40	Stanlib Top 40	Satrix Rafi 40
Satrix SWIX	Coreshares Green	NewFunds Equity Momentum	NewFunds Givi Top50
NewFunds SWIX	Ashburton Midcap	Ashburton Top40	NewFunds NewSA
Coreshares DivTrax	Coreshares LowVolTrax	Coreshares Top 50	NewFunds Shariah Top40
Ashburton Enhanced Value	Ashburton Enhanced Beta	Coreshares Top 40 EW	

The method of Dynamic Conditional Correlation (DCC) was introduced by Engle (2002) as a variation of the Multivariate GARCH model, and uses a two-step approach to separate the covariance matrix into the individual univariate conditional variances, and the dynamic conditional correlation series (Katze, n.d). The first step involves conditioning the ETF and individual asset returns on the market return (proxied by the JSE ALSI):

$$R_{s,t} = \alpha_s + \beta_{M,s} R_M + \varepsilon_{s,t}$$

(Equation 3)

$$R_{ETF,t} = \alpha_{ETF} + \beta_{ETF,M} R_M + \varepsilon_{ETF,t}$$

(Equation 4)

Where:

$R_{s,t}$ refers to the logged return for the individual asset, at time *t*

$R_{ETF,t}$ measures the logged return of the ETF, at time t (after excluding the return for the individual asset being tested (stock *s*))

R_M is the logged return on the JSE ALSI

$\varepsilon_t \sim N(0, H_t)$, with the conditional variance (H_t) equal to:

$$H_t = D_t R_t D_t$$

(Equation 5)

Where D_t is representative of the k x k matrix of the time-varying standard deviations from the univariate GARCH, with $\sqrt{h_{it}}$ on the i^{th} diagonal, and R_t modelled as the time varying correlation matrix:

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1}$$

(Equation 6)

Where:

$$Q_t = (1 - \alpha - \beta)\bar{Q} + \alpha(\bar{\varepsilon}_{t-1}\varepsilon'_{t-1}) + \beta Q_{t-1}$$

(Equation 7)

And Q_t^* is a diagonal matrix which consists of the square root of the diagonal elements of Q_t, and $\bar{\varepsilon}_t$ is an m x 1 vector of the standardized residuals $D_t^{-1/2}\varepsilon_t$.

The second step of the process therefore involves calculating the dynamic correlation as follows:

$$\rho_{s,ETF,t} = \frac{q_{s,ETF,t}}{\sqrt{q_{s,ETF,t \times q_{s,ETF,t}}}}$$

(Equation 8)

The results of this approach is therefore to obtain a dynamic correlation coefficient for each stock *I*, which represents the correlation between the returns of that stock, and the return of the remaining components of the ETF.

The resultant correlations will thereafter be used in panel data regressions, against measures of ETF activity as well as certain control variables necessary, reminiscent of Da and Shive (2016). There are three measures of ETF activity utilized, viz:

- *ETF Holdings* = $\frac{market\ capitalisation\ of\ the\ ETF}{total\ market\ capitalisation\ of\ all\ stocks\ held\ in\ the\ underlying\ portfolio}$,

  and this measures the proportion of the underlying portfolio that is held by the ETF
- *ETF activity* $= \frac{standard\ deviation\ of\ the\ daily\ number\ of\ shares\ outstanding\ in\ the\ ETF}{average\ shares\ outstanding\ during\ the\ month}$,

  which is meant to capture the creation and redemption activity of the ETF, which could by its nature could lead to increased correlations
- *ETF turnover* $= \frac{daily\ number\ of\ shares\ traded}{number\ of\ shares\ outstanding\ per\ day}$

  This measure captures the arbitrage activity in the ETF

The control variables used in the study are as follows:

- ER = Expense ratio = the annual expense ratio of the fund, measured in Rands
- TNA = the total net assets of the fund in Rands
- No = Log (N Holdings) = the log of the number of shares held in the ETF

The following two panel regressions will therefore be estimated:

Panel Regression A:

$$Correlation_t = \beta_1 + \beta_2 Holdings_t + \beta_3 Activity_t + \beta_4 Turnover_t + \beta_5 (Holdings_t \times Activity_t) + \beta_6 (Holdings_t \times Turnover_t) + v_t$$

(Equation 9)

Where: $(Holdings_t \times Activity_t)$ and $(Holdings_t \times Turnover_t)$ are meant to capture the interaction of Activity and Turnover with Holdings, since it is expected that if the ETF's holding represents a bigger share of the underlying assets, this would result in increased creation and redemption activity, as well as increased arbitrage activity.

Panel Regression B:

$$Correlation_t = \beta_1 + \beta_2 Holdings_t + \beta_3 Activity_t + \beta_4 Turnover_t + \beta_5 ER + \beta_6 TNA_t + \beta_7 No_t + \omega_t$$

(Equation 10)

Whilst Panel regression A is used to study the interaction between the variables, panel regression B is used to account for the effect of the control variables on the original variables. When conducting Panel Data regressions, a Hausman Test is usually applied in order to evaluate whether there are Fixed or Random effects present in the data. However, Da and Shive (2016) only accommodate for a fixed effect in their data, and conduct the analyses with fixed fund and time effects to evaluate the differences in results. Since the Fixed Effects model is preferable when there is a possibility of omitted variable bias[5], this study will therefore follow a similar route and only employ fixed effects. As with the other papers, hypothesis testing will allow for the evaluation of the relationships between the variables.

Dissertation Outline

Chapter One: Introduction

1.1. Background to study

1.2. Research Problems and Objectives

1.3. Scope and method of study

[5] Omitted variable bias occurs when there may be variables not included in the study, that could exhibit a correlation with the variables in the model

1.4. Outline of dissertation

Chapter Two: The impact of ETF inception on the liquidity of the underlying assets in South Africa

2.1. Introduction

2.2. Literature Review

2.3. Methodology and Data

2.4. Data Analysis and Findings

2.5. Conclusion

Chapter Three: Measuring the contribution of ETFs in South Africa towards informational efficiency

3.1. Introduction

3.2. Literature Review

3.3. Methodology and Data

3.4. Data Analysis and Findings

3.5. Conclusion

Chapter Four: Does ETF trading increase the correlations of its constituent securities? A South African Perspective

4.1. Introduction

4.2. Literature Review

4.3. Methodology and Data

4.4. Data Analysis and Findings

4.5. Conclusion

Chapter Five: Conclusion

5.1. Summary

5.2. Limitations to the study

5.3. Suggestions for future research

5.4. Conclusion

Conclusion

In the current financial environment, ETFs serve as an extremely important and popular mechanism for individual investors and corporations to invest and speculate in. However, as with Securitization in the early 2000s, the systemic properties of ETFs are relatively unknown and research of its microstructure implications is still in its infancy. Since the results of these studies might provide valuable information to both regulators, as well as individual investors, a study of this sort in South Africa is necessary. This dissertation will therefore aim to fill a substantial gap in the literature on the subject.

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