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WITS BUSINESS SCHOOL

The Information Efficiency of the South African Corporate Bond Market in relation to Earnings Announcements

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Abstract

Corporate bonds issued by the four major commercial banks in South Africa, which account for 61% of the market, and their respective earning announcements in the period 1 January 2013 to 31 December 2014 were used to analyse the reaction of daily corporate bond prices to the earnings announcements of South African companies. The reaction of the daily corporate bond prices to earnings announcements was empirically analysed using cross sectional regressions. We concluded that on average the South African corporate bond market incorporates any new information from earnings announcements. We also investigated if the asymmetrical payoff structure of corporate bonds causes daily prices to be more sensitive to bad earnings announcements than good earnings announcements. Our investigation found that daily corporate bond prices are insensitive to both bad and good earnings announcements. Lastly, we analysed if the lack of infrastructure and liquidity in the corporate bond market hinders corporate bonds in incorporating information relative to the stock market, which has better infrastructure and liquidity. We observed that both corporate bonds and stocks on average incorporate new information from earnings announcements, irrespective of illiquidity and the absence of adequate infrastructure in the South African corporate bond market,

1. Introduction

The long term debt market is the least developed financial market segment in Africa. The growth in the African debt market is largely attributable to the government bond market. The corporate bond market has traditionally lagged the government bond market. Underdevelopment of the corporate bond market in most African countries is largely underlined by slow growth in the government debt market. Domestic debt is predominately of a short term nature. Domestic debt issues are infrequent and small in volume therefore resulting in an illiquid debt market and lack of reliable benchmarks.

The African debt market infrastructure (including clearing, settlement and systems) is basic or inadequate. Market microstructure problems such as small size, low liquidity, lack of long term maturities and limited investor base pose challenges to the debt market development and debt

strategy in Africa. Mitigating these challenges and problems require sound and stable macroeconomic policy, stable political environment, develop market infrastructure and introduce a reliable yield curve.

External debt dominates the African debt market as a result of dependence on concessional multilateral, bilateral funding and underdeveloped local markets (Andrianaivo and Yartey, 2010). African external debt has been historically unsustainable (Muhanji and Ojah, 2011). External debt sustainability refers to the ability of a country to meet the current and future external debt obligations of both private and public sectors without running into arrears, recourse to debt-rescheduling, and a need for balance-of-payments adjustment (Akyüz, 2007). Most African countries have repeatedly rescheduled their external debts which in turn has worsened their external debt problems. The vicious cycle of unsustainable external indebtedness in African countries is deeply rooted in infrastructural problems, such as a narrow export base, weak institutions and governance, poor domestic resource mobilization, and inadequate debt management capacity (Muhanji and Ojah, 2011). However, researchers (such as Claessens, 1990) provided evidence that external debt can aid economic growth and development when used productively and at sustainable thresholds. IMF recommend sustainable thresholds to be GDP ratio of 80%, debt to exports ratio of 60% and short term debt to reserves ratio of 80%. The World Bank corresponding recommendations given are 250%, 150% and 130% respectively. (Muhanji and Ojah, 2011).

The financial carnage of the Asian Crisis in the late 1990s may have been minimised if there was a well developed long term bond market (Johannsson, 2008). Therefore, bond markets are integral to the establishment of an efficient financial market as they lead to the generation of competitive interest rates that reflect true cost of funds at a wide range of maturities (Jeanneau and Tovar, 2008).True cost of funds reflected in bonds will encourage competitive pricing between the bond market and bank loans (Jeanneau and Tovar, 2008). A well functioning bond market in the financial markets allows for risk management in the financial markets though diversification therefore offering the economy stability against financial shocks (Jeanneau and Tovar, 2008). A competitive bond market allows for capital to be efficiently appropriated among investors within the financial markets (Johannsson, 2008). Currency and maturity mismatch issues are resolved through the issuing of long term bonds denominated in local currency. A

maturity mismatch arises when companies rely on short term debt (such as call deposits) to finance long term projects. Currency and maturity mismatches simultaneously occur when companies look to the international markets to raise foreign short term debt to finance locally denominated long term projects (Jeanneau and Tovar, 2008). Short term foreign debt is of a volatile nature as international investors may abruptly pull their funding from emerging markets on demand (Johannsson, 2008) and place it in safe havens such as US treasury bills if they suspect a looming financial shock. A non-existent bond market may also lead to debt issues being concentrated in the commercial banking sector (Jeanneau and Tovar, 2008). Over reliance on the commercial banking sector may result in a bank credit crunch if a financial crisis occurs. An economy hit with a bank credit crunch may face a recession. An active bond market allows companies to have alternative sources of funding therefore hedging the economy against the adverse effects of a bank credit crunch (Jeanneau and Tovar, 2008). The bond market facilitates the efficient pricing of credit risk by way of various continuous disclosure requirements imposed by regulators. It also enhances the transparency and disclosure of companies through the access provided by capital markets (ISOCO, 2011).

The ability of the bond market to realise the above mentioned benefits dependence on its information efficiency. Little has been written about the information efficiency of the African bond markets.

This paper examines the South African corporate bond market's response to the earnings announcements of South African companies. The results may be of interest to legislators, South African Reserve Bank and investors. It will also contribute to the much needed finance literature around information efficiency in the South African corporate bond market.

The paper is organized as follows: chapter two provides a brief overview of the South African bond market, chapter three discusses literature on the informational efficiency of financial markets, chapter four outlines the main hypothesis, data, and research design and lastly chapter five is the empirical analysis and interpretation of the results.

2. South African Bond Market

2.1 Bond Market background[1]

During the 1970s and 1980s, the bond market was mainly an over the counter (OTC) market comprising of government bonds and quasi government bonds. The government bonds were issued on an open end tap basis. The South African Reserve Bank operated as the principal underwriter. The bond market lacked basic infrastructure such as a regulated body, government benchmark bonds or yield curve. A brief timeline of bond market development in South Africa is as follows:

1980s - In 1981, Eskom was the first public entity to issue bonds, followed by the National treasury, Landbank, Telkom and Transnet. The E168 became the first benchmark bond.

1987- An inquiry into the bond market conducted by Jacobs and Stals was commissioned with the purpose of making recommendations to strengthen the efficiency of the bond market. The Jacobs and Stals' report made the following market defining recommendations: (1) the bond market was to be regulated by either the market or the South African Reserve Bank. The market chose self-regulation. In 1987, the Bond Market Association (BMA) was created to fulfill the function of self regulation in the bond market. The BMA consisted of bond issuers, intermediaries, banks, brokers and investors. (2) Consolidation of a number of small issues into benchmark bonds. (3) Creation of a yield curve. (4) Adoption of a well communicated and structured auction system.

1989 - The major clearing and bond settlement banks along with SARB created Universal Exchange Corporation Ltd (UNEXCor) in order to develop an electronic settlement system using a central securities depository (Sengupta et al, 2014).

1990 - The National Treasury consolidated a number of small issues to create R150 and R153.

[1]The historical account was largely based on Jones (2002), Guma (2007), Sengupta et al (2014), Hove (2008), Ojah and Pillay (2009), and BESA circular

1991 - The R150 replaced E168 bond as the benchmark bond

1992 - SA Breweries listed the first corporate bond on BMA

1994 - UNEXCor was appointed as the clearing house for the bond market. A secondary market in government bonds was created.

1995 - Gilt trading was moved from the JSE floor to BMA. BMA operated with an informal screen and telephone system with UNEXCor serving as the clearing house.

1996 - The BMA was granted an exchange license and started trading on 15 May 1996. BMA was renamed the Bond Exchange of South Africa. The exchange operated within the rules and directives set by Financial Services Board (FSB) (Oxford Business Group, 2008). South Africa decided to follow the widely accepted regular auctions practice as a method of selling primary issues of government securities.

1997 - BESA moves to t+ 3 rolling settlement. BESA became the first exchange in Africa to fully achieve compliance with G30 Recommendations for Clearing and Settlement. The first Collateralized Debt Obligation was listed (INCA BOND) in BESA.

1998 - South African Reserve Bank (SARB) was made responsible for conducting auctions of benchmark bonds on behalf of the National Treasury. The National Treasury appointed 12 Primary Dealers to make a market in seven government bonds**.** The open outcry-trading floor was closed due to a low turnover of 10%.

2000- Members began booking all trades on a new Bond Automated Trading System ("BATS"). BESA implemented the Total Return Index ('TRI") and the All Bond Index (ALBI). ALBI is comprised of 20 different bonds, which are selected based on their size and liquidity. The two sub-sections of the ALBI are the Government Bond Index ("GOVI") and the Other Bond Index ("OTHI"). The first CPI-linked bond issued by National Treasury listed.

2001- The corporate bond started to experience a pickup in growth. Four factors catalysed the growth in corporate bonds: (i) lower interest rates (ii) underleveraged corporates (iii) reduction in fiscal deficit resulting in low supply of new government debt; and (iv)implementation of

BASEL-II norms(Rand Merchant Bank, 2001)**.** BESA lists first mortgage-backed securitisation. The National Treasury introduced strip programme for: R150, R153, R157, R186 and R194. The National Treasury implemented 'Buy Back' programmes and switches.

2002 - BESA listed first receivable and credit swap synthetic securitisations and index-linked contract. BESA issued new listing disclosure requirements and rules.

2006 – BESA was demutualised and became a private company. 305 corporate bonds were issued by the end of 2006. During this period financial services were the biggest issuers of corporate bonds because non financial corporations issued only 22 of the total outstanding corporate bonds.

Until the day it was purchased by the JSE in 2009, BESA had never experienced any bond defaults and no claim had been made on the Guarantee Fund. BESA had also never closed its market during market disruptions

2008 - The JSE made a SENS announcement on Monday, 27 October 2008 about its firm intention to make an offer for all the BESA ordinary shares in issue.

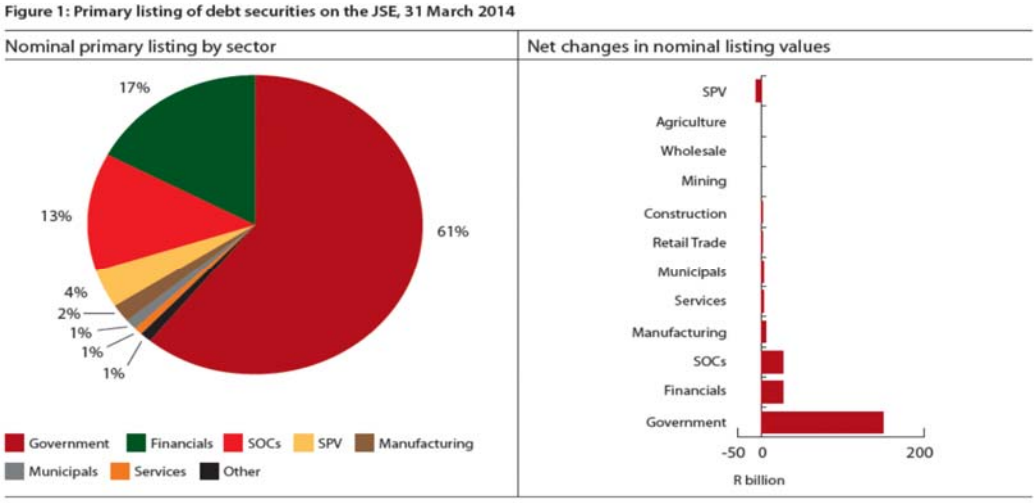
2009 - The competition tribunal approved the merger of BESA and JSE on the 3 June 2009. The JSE purchased all shares on issue for R125 each. BESA became a wholly owned subsidiary of the JSE on 22 June 2009. The value of the transaction was R240.6m. Post the merger the bond exchange was renamed the JSE Debt Market.

2013 - At the end of 2013 there were only eight remaining primary dealers from the 12 dealers appointed in the 1990s. The corporate bond market experienced its first default in its history when First Strut, a listed corporate bond defaulted.

2.2 Current Bond Market Overview[2]

2.2.1 Size

Figure 1: Primary listing of debt securities on the JSE, 31 March 2014



Source: Johannesburg Stock Exchange

The JSE debt market is the largest listed debt market on the African continent by market capitalization and liquidity. In the South African bond market, issuance is typically dominated by the government sector (Figure 1), which currently accounts for 61% (value R1.1 trillion) of the total listed debt on the JSE as at 31 march 2014, up from the prior year's 60%. This 1% increase is equivalent to R149.8 billion, which was the greatest increase in issuance recorded in the past year.

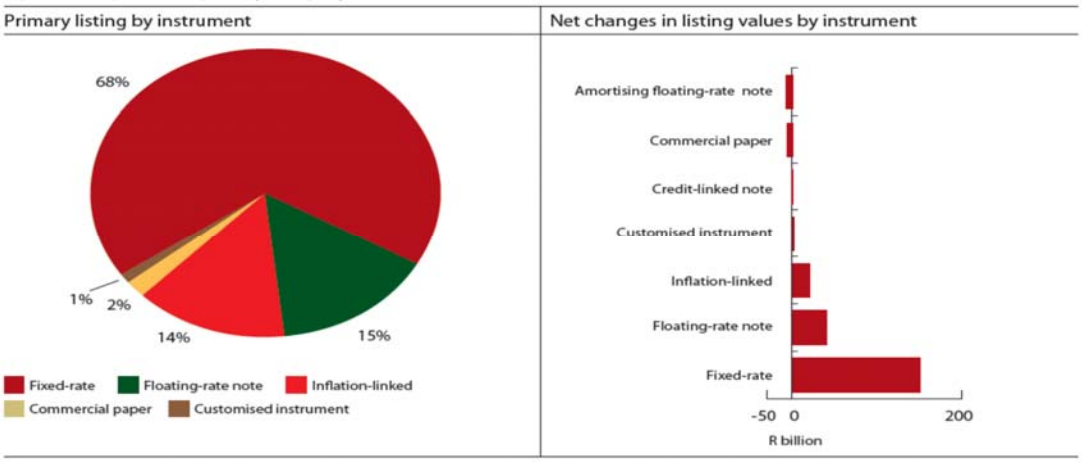
There has been an increase in government bond issuance since the 2009 global recession due to the government implementing a counter cyclical fiscal policy of increasing expenditure to boost a slow growth economy (National Treasury, 2014). The financial sector is the second largest contributor to the listed debt market with 17%, which equates to an increase in outstanding debt of R 27.2 billion in the current period. This is a significant achievement as one of the financial services functions is to attract funds from the households and corporates and loan these funds out to capital deficit investors(Ojah and Pillay, 2009).

[2]The current bond market overview is based on the JSE website and National Treasury debt management report 2013/2014.

State owned companies' outstanding listed debt amounted to 13% of total listed debt. State owned companies also added a sizeable amount of R 26 billion to their outstanding debt during the year as compared to the prior year. Both the financial sector and stated owned companies proportion of total listed debt remained the same year on year. Since SAB listed the first corporate bond in 1992 there has been more than 1500 corporate bonds issued on the JSE debt market.

2.2.2 Composition

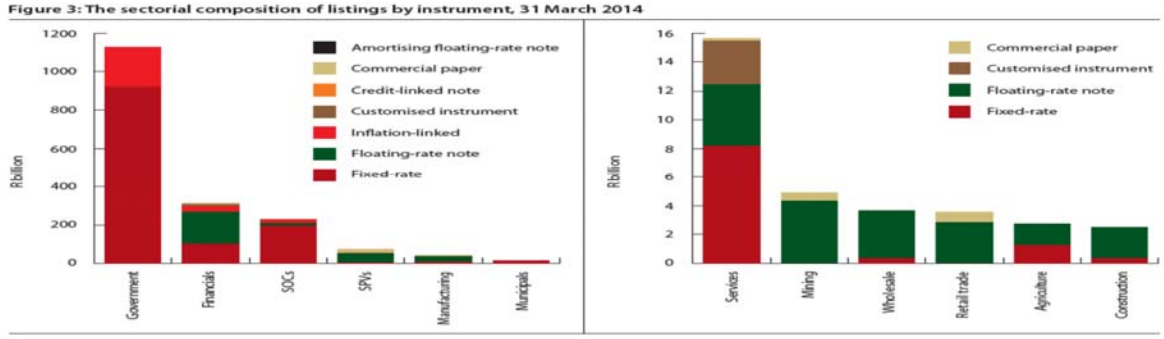
Figure 2: Composition of primary listings by instrument, 31 March 2014



Source: Johannesburg Stock Exchange

Fixed rate debt accounts for 68% of primary listings on the JSE (Figure 2). Issuers prefer to issue fixed rate debt as it allows them to lock in the interest rate at the time of issue therefore creating certainty around the cost of funds (National Treasury, 2014). The fixed rate debt was the bulk of the net increase in debt issuance during the period with an increase of R149.8 billion. Inflation linked listings and floating rate notes are the remaining larger contributors to the composition of primary listings with 14% and 15% respectively. Inflation linked issuance and floating rate notes also experienced growth during the year with an increase in issuance of R19.8 billion and R40.1 billion respectively.

Figure 3: The sectorial composition of listings by instrument, 31 March 2014

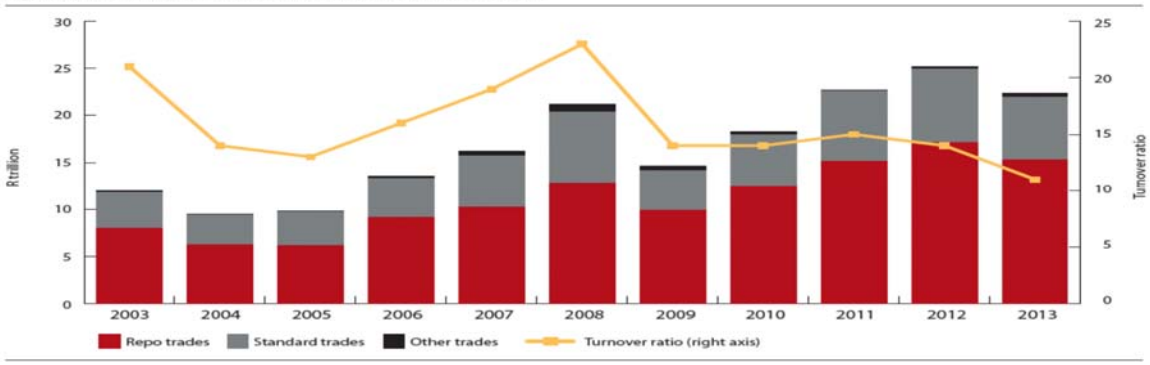


Source: Johannesburg Stock Exchange

In terms of sector composition (Figure 3), Government fixed rate debt make up a significant portion of total government debt with an 82% proportion. Financial sectors have a more cosmopolitan composition than the government sector with majority of debt being inflation linked and credit linked notes.

2.2.3 Secondary market

Figure 4: Turnover of the South African bond market, 2003 - 2013



Source: Johannesburg Stock Exchange

The secondary market is dominated by OTC trading. Due to the OTC market operating on a report basis, transactions are not concluded in real time. Transactions are reported after they have been concluded and settled. The main participants in the secondary markets are brokers, interdeal brokers, market makers and investors. The secondary market has expanded from R 11 trillion in 2000 to R21 trillion in 2011. The trading activity in the secondary market simmered down in 2013 from R25.1 trillion to R22.4 trillion. The slowdown in the secondary market is indicative of lower trading activity and liquidity due to US monetary policy shocks (such as reduction in quantitative easing by the US). The repo market was the main driver of trading volumes between

2011 and 2013, accounting for 67% in 2011, 68% in 2012 and 68% in 2013 of the total trade volumes. The bond turnover for the past decade is illustrated in Figure 4. The bond turnover ratio is defined as a measure of bond market liquidity and used to assess which bonds are the most liquid. The ratio is calculated as the extent of trading in the secondary market relative to the amount of outstanding bonds. The higher the turnover ratio, the higher the liquidity in the secondary bond market.

Government bonds account for 90% of the JSE's market liquidity. The R157 and R186 are the most traded bonds in the JSE listed debt market. They respectively generated turnover ratios of 69 times and 31 times. These bonds are highly liquid as they are used by the market as benchmarks. Market liquidity remains relatively low in the corporate bond market as compared to the government bond market due to the buy and hold approach by investors but issuance is steadily growing. The municipal bonds market is still in the infancy stage. Its development will add to the breadth and depth of the bond market. (Guma, 2007).

2.2.4 Foreign investment

Foreign participation in the South African Bond market is still at historic heights despite speculation that US Federal Reserve Bank may raise interest rates in 2014. The rise in foreign participation was ignited by the US Federal Reserve Bank QE programme, which resulted in the investor seeking high yield investments in emerging markets. Foreign investors have subscribed for 37.2% of government bonds in the first quarter of 2014, which is up from the approximate 12.8% in 2008. The South African bond market did experience a decline in bond purchases due t**o** uncertainty around the US monetary policy.

2.2.5 Maturity

African firms prefer to use short term debt funding to finance their investment activity. Long term debt ratio range for African countries is between 12%-17% whereas developed countries are in the range of 28% - 48%. (Gwatidzo and Ojah, 2009). Gwatidzo and Ojah (2009) offered plausible reasons for why African countries don't use asset as collateral to secure long term loans: Banks are not accepting assets as effective collateral, the correct market values of the assets can't be determined due to poor African secondary markets for these assets, problems with

the enforceability of the loan contracts, the most likely reason is that the African countries mainly use short term debt funding to finance activities.

3. Literature Review

3.1 Efficient Market Hypothesis

Market efficiency is the cornerstone of any well function capital market as it allows the capital market to fulfill its primary function of optimally allocating financial resources and diversifying financial risk. Fama (1970) defined an efficient market as a market in which security prices at any time "fully reflect" all available information. Fama (1970) describes security prices that fully reflect all available information as being market equilibrium prices. Market equilibrium prices are determined in terms of expected returns model theories. Therefore, all available information is fully utilized when ascertaining expected returns (Fama, 1970). The consequence of an efficient market is that investors in search of abnormal returns within capital markets will not consistently "beat" expected returns over long periods of time from using available information that has been disseminated to the capital markets.

The level of efficiency of a capital market depends on the ability of security prices to fully absorb three subsets of available information (Fama, 1970). Harry Roberts (1967) in his unpublished work was the first to make the distinction between weak form and strong form. Fama (1970) in his definitive review of the market efficiency classified the three subsets of information as (1) weak form, (2) semi-strong form and (3) strong form. Fama (1970) stated conditions sufficient for market efficiency but not necessary as they are not reflective of markets in practice as being: (1) no transaction costs in trading securities (such as taxes) (2) information is freely available to all investors and (3) all investors agree on the implications of current information on current security prices and future price distributions of securities.

3.2 Brief historical Background

The study on efficient market hypothesis over the past several decades has largely concerned itself with whether prices "fully reflect" the three subsets of available information. The initial studies of efficient market hypothesis focused on the first subset, weak form, which is that all security prices fully reflect past information. The results of weak form have been vastly supported by the random walk model. The random walk model is based on two hypotheses; firstly current prices that fully reflect all available information imply that successive price changes are independent. This means previous knowledge of the sequence of price changes leading up to the time period, t is of no help in predicting the price change during the next period. Secondly, successive price changes are identically distributed. (Fama, 1970).

The initial work of random walk theory largely ignored for half a century was performed Bachelier (1900) as part of his doctoral thesis. Bachelier concluded that commodity prices exhibit random fluctuation. Bachelier's findings were later reaffirmed by several researchers (Kendall, 1953; Roberts 1959; Osborne, 1959). Kendall (1953) observed that "*in series of prices which are observed at fairly close intervals the random changes from one term to the next are so large as to swamp any systematic effect which may be present. The data behave almost like wandering series*." Roberts (1959) demonstrated that a randomly generated time series was similar to actual stock prices. Osborne (1959) documented in his findings that commodity prices in the US follow Brownian motion. Brownian motion is the random movement of a molecule caused by collisions with surrounding molecules. These findings imply that technical analysis is futile in trying to generate abnormal returns from past returns.

In the mid 1960s, autocorrelation started to creep into the validity of the random walk model. Fama (1965) discussed two main statistical tests of autocorrelation in the price data: (1) serial correlation model and (2) theory of runs. Serial correlation coefficient is a measure of the relationship between the value of the random variable in time period, t, and its value π periods earlier. Price changes will be independent of each other if the serial correlation co-efficient of the sample is close to its true value zero (Fama, 1965). The second major statistical test is the run tests. A run is a sequence of price changes of the same sign. A run ends when there is a change in sign in the sequence of price changes. Fama (1965) briefly discusses two of the shortcomings of

the serial correlation and run tests. The first short coming is that the tests are too simplistic for chartists to be able identify if the past returns can be used to generate excess returns. A more sophisticated test used by chartist is the Alexander Filter Trading Rules. The next shortcoming discussed by Fama (1965) is that the tests only identify dependence under special circumstances.

The early autocorrelation tests were concerned with the seasonality of stock returns. Seminal empirical studies found that daily, weekly and monthly returns can be predicted from past returns (Fama, 1965; Lo and Mackinlay, 1988; Fisher, 1966). Lo and Mackinlay (1988), also observed that autocorrelation in weekly returns was strongly exhibited by small stocks. Rozeff and Kinney (1976) were the first to observe unusually high returns in January, known as the January effect. Keim (1983) expanded on the findings of Rozeff and Kinney (1976). Keim (1983) observed that the January effect was the most prominent in small stocks from 1963 to 1979. Keim (1983) reported that a significant portion of the size effect can be attributed to the January month. Secondly that the January effect occurs mainly during the first week of trading.

The tax loss selling hypothesis attempts to explain the relationship between the small firms and the January effect (Roll, 1983; Reinganum, 1983). The hypothesis states that tax laws generally influence investors' portfolio decisions to sell securities that have experienced recent price declines so that the capital loss can be offset against taxable income. Small firm stocks are usually sold off for tax purposes as their stock prices are exposed to high volatility hence likely to incur capital losses from large price declines. It's important to note that the tax-loss hypothesis relies on the assumption that investors wait until the tax year-end to sell their "loser" stocks. The heavy selling of "loser" small stocks during the year end tax period depresses the prices of small firm stocks. After the tax year-end, the price pressure disappears and prices rise to equilibrium prices therefore small firm stocks display large returns at the beginning of the new tax year. A Monday effect was observed by French (1980), where Monday returns were significantly higher than the returns in other week days. Lakonishok and Smidt (1988) observed a monthly effect at the turn of the month. In the early 1990s Arial (1990) identified high returns around holidays. Another phenomenon in contradiction with the random walk model is long run mean reversal. Fama and French (1988a) found that 25- 40% of variations over the long run can be predicted in terms of negative serial correlation with past returns.

Semi strong form is security prices that fully reflect both past and current information available. There exists a burgeoning event study industry examining semi – strong form in capital markets. Event studies are tests used to measure how quickly security prices are able to fully reflect new public information.

The pioneering event studies were performed by Fama, Jensen and Roll (1969) on the reaction of the stock returns to stock split announcements and Ball and Brown (1968) on the reaction of stock markets to earnings announcements. The Fama, Jensen and Roll (1969) found that abnormal returns can't be obtained from purchasing split securities after the split is announced as it's a multiplication of number of shares held by the shareholders and not a source of new information. Increased returns may possibly be obtained, if investors using superior information or having the gift of analytical talents are able to predict which securities will experience increased dividends post the split announcement (Fama Jensen and Roll, 1969; Fama, 1970). Ball and Brown (1968) concluded that the adjustment of stocks to unexpected earnings news is consistent with market efficiency.

Strong form is security prices that fully reflect past, public and private information. Strong form studies attempt to identify that no individual or group of individuals in the market are able to generate abnormal profits from having monopolistic access to private information. (Fama, 1970).

Two early studies show that strong form is contradictory to market reality. Firstly, Niederhoffer and Osbourne (1966) found that specialists in the NYSE used monopolistic access to private information to generate abnormal profits. Scholes (1972) found that corporate insiders have monopolistic access to private information not reflected in security prices. One group of market participants, open mutual funds, has been studied with some depth. Jensen(1968)'s now classic research paper on open mutual funds attempted to answer the question of fund managers having monopolistic access to private information that allows them to earn abnormal profits. Jensen (1968) found that in the period 1945 to1964, mutual fund returns after expenses are below the market line of the Sharpe-Lintner model. When all published expenses of the funds are added back, the returns on mutual funds are scattered randomly about the market line. Jensen (1968) concluded based on these results that mutual-fund managers do not "beat" the market.

3.3 Empirical studies

Datta and Dhillion (1993)'s empirical study was unique in that it was the first to examine the bond market's response to unexpected earning announcements. Prior to their study, bond market information efficiency studies only focused on the bond market's response to dividends (Hanjinicolau and Kalay,1984; Jayaraman and Shastri, 1988) and stock repurchases (Vermelan, 1981) and Bartov, 1991). Datta and Dhillion (1993) tested a sample comprising only of 250 large earnings surprises by 135 different firms extracted from the Institutional Brokers Estimate system (IBES) during the period of October 1984 to August 1990. At that time IBES provided earnings forecasts done by 2500 analysts for 3400 stocks trading on the US and Canadian stock exchanges.

The relating clean corporate bond prices were extracted from the Data Resources Inc (DRI) and randomly cross checked for accuracy against Wall Street Journal. This raises a concern as there could be large pricing differences on the unchecked data, which may compromise the quality of the data used for the analysis. Manual adjustments for the accrued interest were made to the clean bond prices using Moody's bond journal. The sample excluded firms without traded debt in the US exchange market, firms with no dividend or earnings news and firms with dividend and earnings news within five days of each other to avoid any contamination effect from dividend news.

Standardized quarterly unexpected earnings (SUE) were used as a measure of unexpected earnings information hence avoidance of heteroscedascity that may be present in the sample. Datta and Dhillion (1993) included in their sample firms with an absolute value of SUE greater than or equal to one. This restricted the sample to large forecast errors in order to limit any noise. If a dividend announcement preceded the earnings, the window period was [+2 to + 30] days. When earnings preceded the dividend announcement, the window period was [– 29 to – 1] days. Datta and Dhillion (1993) used a cross sectional regression model to test for the information content of bond returns in relation on earning announcements:

$$\begin{aligned} SER_0 \quad = \quad & \alpha_0 + \alpha_1(SUE) + \alpha_2(SAR) + \alpha_3(MKTRET) \\ & + \alpha_4(SUE*DUMD) + \alpha_5(SUE*DUMR) + \varepsilon, \end{aligned}$$

SER is standardized announcement day excess returns for a non convertible bond. SUE is the standardized unexpected earnings being announced.*SAR* is the announcement day stock abnormal return. *MKTRET* is the announcement day return on a value weighted stock index from CRSP NYSE/AMEX file. Its controls for any market specific factors. DUMD is a dummy variable which takes a value of 1 if a dividend increase precedes an earnings announcement. *SUE*DUMD* it captures the effect of an earnings announcement on abnormal bond returns, which is preceded by dividend increase. *DUMR* is a dummy variable for bond rating, which takes a value of 1 if the bond is rated BB or below and 0 otherwise.*SUE*DUMR* captures the reaction of bond prices to unexpected earnings based on the investment grade of the bond. Datta and Dhillion (1993), regression attempts to capture the relationship between the standardized announcement day bond excess return (SER) and the standardized unexpected earnings measure (SUE).

Datta and Dhillion (1993) calculated the SUE coefficient as significantly positive at the 1% level therefore bond returns react to earnings announcements. Datta and Dhillion (1993) also documented the *SUE*DUMR* coefficient to be significantly positive therefore the result suggested that unexpected earning announcements had a greater impact on low investment graded bonds (such as junk bonds). The SAR coefficient was also found to be significantly positive at the 1% level. Datta and Dhillion (1993) inferred from this latter result that bonds and stock returns have a symmetric reaction to unexpected earnings announcements. This inference was later contradicted by the findings of Easton et al (2008) and Defond and Zhang (2009), which will be discussed later in the review.

Easton et al (2008)'s research provided the largest comprehensive data as compared to previous studies for both the short window test of [-10 to +10] days and long window test of a year. The long window period sample disproportionately contains large profitable firms. The results from the long window test may lack generalization and contain selection sample bias. (Easton et al, 2008). The corporate bond prices for the sample were extracted from Mergent Fixed Income Securities Database (FISD) over a 12 month period from 1 January 1994 through to 31 December 2004. Mergent FISD is a superior database as it has data over a longer period whereas as Trade Reporting and Compliance Engine (TRACE) has bond data for the period 2005 to 2006. TRACE is a mandatory reporting system initiated by the National Association of Security

Dealers that disseminates real-time transactions and price data for corporate bond trades. (Easton et al, 2008). Mergent FISD reports only on US insurance companies invested in exchange traded bonds. This limitation on the data may imply that their results on insurance companies can't be extended to other sectors if the market behavior of insurance companies is systematically different to other sectors. This may be a possibility due to the burdensome regulatory capital requirements around insurance companies (Easton et al, 2008). Easton et al (2008), provided mitigation against the sample selection bias. They explained that US insurance companies were about 30% to 40% of outstanding traded bonds therefore US insurance companies comprehensively represented the market behavior of the outstanding traded bond population. Another concern noted in the disproportionate sample was bond price bias. Easton et al (2008) motivated that the competitive pricing in the market mitigated any bias in the sample bond prices. The analyst forecast errors data was collected from IBES and apportioned into negative and positive earnings news. Easton et al (2008) tested the information content of quarterly (short window period) earnings and annual earnings (long window period) using the following regression model:

$$R_{ijt} = \alpha_0 + \alpha_1 \times \frac{EA_{it}}{MVF_{it-1}} + \varepsilon_{ijt}$$

(eq.1)

Rijt denotes the adjusted bond return from time *t-1* to *t* for the *jth* bond issued by firm *i*, *EAit* is an earnings metric of firm *i* from time *t-1* to *t; MVFit-1* denotes our proxy for firm *i*'s market value at time *t-1*. Easton et al (2008), uses to two different measures of the earnings metric: (1) seasonal differences in quarterly earnings and (2) analyst forecast errors. The earning metric is deflated by the firm's market value.

Easton et al (2008) found that both seasonal differences in earnings and analyst forecast errors over short and long window produced similar results. They estimated the coefficient on negative earnings changes as being significantly larger than the coefficient on positive earnings changes. They observed that the coefficient on unexpected earnings news reported by firms with speculative-grade bonds was significantly larger than the coefficient on unexpected earnings news reported by firms with investment grade bonds. Easton et al (2008) concluded from their

observations that bonds are more sensitive to bad unexpected earnings news and more so in speculative bonds. They justified their results using the non linear bond payoff structure hypothesis. (Easton et al, 2008). The non linearity of bond payoff results in limited upside in bond returns as bondholders will not be able to partake in any increase in the firm's future cash flows as their claim on the firm's future cash flows is fixed. The downside is greater than the upside but the loss is also limited to the initial investment. (Easton et al, 2008; Defond and Zhang, 2009). The asymmetric reaction of the bonds to unexpected earnings news is in direct contradiction with the findings of Datta and Dhillion (1993), who found that bonds have a symmetric reaction to unexpected earnings news.

Easton et al (2008) also tested for increases in bond trading post the earnings announcements. They observed that trading peaked two days after the announcement date. Easton et al (2008) noted in their findings that the bonds included in the sample may have a liquidity discount. The liquidity discount may have confounded the short window results. They tried to mitigate the liquidity discount by testing a long window period because in the long run the discount will disappear due to healthy competition between dealers. In the latter part of their research Easton et al (2008) further noted sample selection concerns and mitigations such as measurement errors and double counting. Easton et al (2008) used the bond trade size data from Mergent FISD to calculate the bond trade volumes. Easton et al (2008) highlighted measurement errors in their calculated trading volumes: (1) transaction costs are included in the trade size therefore the trade volumes have positive bias (2) trades between insurances companies are reported as two separate trades in Mergent FISD and not as one trade. Easton et al (2008) deleted one trade to avoid double counting in the traded volumes.

Hotchkiss and Ronen (2002) were the first to test the informational efficiency of corporate bonds returns at both a daily and intraday level using actively traded high yield bonds over a short horizon. Previously intraday behavior of bond returns was only tested in government bonds using economic news (Fleming and Remolona, 1997; Nyborg and Sundaresan, 1996; Balduzzi, Elton and Green, 2001). Fifty five active high yielding bonds were extracted from the Fixed Income Pricing System (FIPS) over a 9 month period of 3 January 1995 and 1 October 1995. FIPS captures bond prices, volumes, and transactions for limited number of high yield bonds based on liquidity.

Hotchkiss and Ronen (2002) selected to test 34 of the 55 FIPS bonds using two cross sectional regression model at the daily and intraday level in order to see if an earnings announcement reaction is reflected in stocks or bond returns:

$$RB_{[-1,t]} = \alpha_0 + \alpha_1 * FE + \alpha_2 * RM_{[-1,t]} + \varepsilon$$
$$RS_{[-1,t]} = \alpha_0 + \alpha_1 * FE + \alpha_2 * RM_{[-1,t]} + \varepsilon, \quad \textbf{(eq.2)}$$

The log of forecast errors is used as a proxy for unexpected earnings news. Hotchkiss and Ronen (2002) calculated the bond returns using the midpoint price. Stock returns were calculated using the last transaction price. They noted that the differences in the calculation of bonds returns and stocks returns might bias the results to stocks adjusting to earnings news quicker than bonds.

The regressions were carried out using two set of window periods period, first window period is [0 to 7] days for daily data and [0 to +14] days for intra daily data respectively. Second window period is [-1 to + 4] days for daily data and [-1 to + 13] for intra data respectively. In the first window period, the daily bond returns were significantly positively related to forecast earnings errors at +1. The coefficient remains significantly positive as the window period is increased, but the magnitude of the coefficient drops at +7. Similarly, daily stock returns were also significantly positive as the first window period was increased. In the second window period, daily returns were only significant positively to earnings forecast errors in the interval [-1 to 0], thereafter daily returns were insignificantly related to forecast earning errors. Daily stock returns were only significantly positive until the end of the announcement date, [0 to +1].

The intra returns were significantly positive from the hour post the earning announcements in the interval [-1 to + 1] until interval [-1 to + 14] in the first window period. Earnings news was fully absorbed into intra daily bond returns by the fourth hour. Intra daily stock returns were significantly positive for through both window periods. Earning news was incorporated into intra daily stock returns by the seventh hour. Stock returns took slightly longer than bond returns to absorb the earning news, but most of the information is absorbed in the stock returns in the first hour.

Hotchkiss and Ronen (2002) concluded in their findings that any new firm specific information was quickly impounded into both daily and intra daily bonds returns. They also concluded that bond returns are just as information efficient as stock returns hence stock returns don't lead bond returns. The latter conclusion contradicts the findings of Kwan (1996) who argued that the individual stocks lead bonds in incorporating firm specific information, based on the explanatory power of lagged stock returns on current bond yields. In other words, stocks reflect information about the firm's assets more quickly thus a predictive power for future bond returns. Low frequency data may result in researchers concluding extreme information inefficiencies in the bond market. Hotchkiss and Ronen (2002) using active trades may have had the advantage of minimizing false conclusions arising from low frequency data. The 55 high yield bonds extracted from FIPS may not have been reflective of the market behavior of the larger bond population in the US therefore the results from the sample may lack generality.

4. Main hypothesis

The main hypothesis is based on the asymmetrical bond payoff structure discussed by Easton et al (2008). Bonds have a limited upside as the bondholders will not be able to participate in an increase in the firm's future cash flows because they have a fixed claim on the firm's future cash flows. The downside is relatively greater than the upside but the loss is limited to the initial investment of the bondholders.

Unexpected earnings news is a new source of information about the firm's future cash flows. Good unexpected earnings news is an indication of future growth in the firm's future cash flows, whereas bad unexpected earnings news may be signaling to market that the firm is undergoing future cash flow problems. Based on the asymmetrical nature of the bond payoff, bondholders will react more sensitively to bad unexpected earnings news than good unexpected earning news due to risk of losing their entire investment. This implies that the relationship between unexpected good earnings news and bond returns will be weak irrespective of how large the good unexpected earnings news due to the bondholders' fixed claim on cash flows. Bad unexpected earning news will lead to adjustment of bondholders' expectation of future coupons payments. A strong positive relationship between bond returns and bad unexpected earnings news is therefore predicted.

Stocks are also representative of a claim to firm's future cash flows therefore the stock market will also react to unexpected earnings news (Ball and Brown, 1968). This gives rise to the question of whether stocks lead corporate bond in incorporating unexpected earnings news in prices due to illiquidity and lack of infrastructure in the corporate bond market. Corporate bonds are less liquid than stock markets due to the buy and hold investment approach of market participants and low price volatility (Easton et al, 2008), therefore price formation process in corporate bonds may be hindered. The lack of adequate infrastructure in the corporate bond market infringes on the transparency of the market. The lack of transparency may disrupt the informational efficiency of the corporate bond market.

The benefit of transparency in the corporate market is that there will be less adverse investment selections, encourage uniformed investors to enter the market therefore increased improvement in the price formation process (Hotchkiss and Ronen, 2002). The impact of illiquidity and infrastructure on information efficiency in the corporate bond market will be tested by examining if both bonds and stock respond to unexpected earnings news over the window period. If stocks do lead bonds in adjusting to unexpected earnings news this implies that bond market regulators need to make a concerted effort to deepen market liquidity and implement adequate infrastructure to improve transparency.

4.1 Research design

4.1.1 Sample

The secondary market bonds issued by the four major commercial banks were imported from Bloomberg for the period between 1 January 2013 and 31 December 2014. The four major banks by market value are Standard Bank Group Ltd, First Rand Ltd, Barclays Africa Group Ltd (formerly known as ABSA Group Ltd) and Nedbank Group Ltd. The initial sample extracted was 912 traded corporate bonds on the JSE Debt Market. The bond specific information such bond issue size, bond capital outstanding, coupon rate, floating rate or fixed rate, issue date, maturity date, issuer name, currency, other bond characteristics were obtained from Thomson Reuters (see appendix A1).

We eliminate any bonds for which the earnings announcements preceded or succeeded a significant event. Bonds with a maturity of less than one year as at 31 December 2014 are excluded from the sample. Bonds with a maturity of less than one year tend to behave like money market instruments (JSE) and also have small price changes (Ederington et al, 2012). Foreign currency bonds, bonds with variable rates, callable bonds, convertible bonds or any other special features are also eliminated from the sample. Special features are excluded as they affect the value of the bond. Zero coupon bonds are also eliminated from the sample as they tend to behave like stocks (Bessembinder et al, 2009). After elimination of bonds with special features, zero coupon bonds and a maturity of less than a year the sample reduced to 42 traded bonds.

Corporate bonds tend to trade infrequently due to the buy and hold investment approach of market participants. The infrequently traded bonds may be become more active during the earnings announcement period due to earnings surprises (Hotchkiss and Ronen, 2002), therefore, all non convertible, fixed rate, locally denominated bonds (i.e. conventional or vanilla bonds) issued by the four major commercial banks both liquid and illiquid are included in the testing sample. A concern of sample selection bias in our sample may be raised as we only selected corporate bonds from the four major commercial banks. This may suggest that the generality of the results is reduced. The sample selection bias may be mitigated because South African commercial banks are the largest issuers of corporate bonds in South African market. There are currently over 1500 bonds listed on the JSE Debt Market (JSE). Commercial banks currently have in issue approximately 912 listed corporate bonds as at 31 December 2014, which is approximately 61% of outstanding corporate bonds in the JSE Debt Market (See author calculation in appendix, A1). Commercial bank issued corporate bonds are therefore a good representative of the market behavior in the South African corporate bond market.

4.1.2 Earnings announcement

Earnings announcement or news is when the directors of a listed company release the firm's actual performance results for a period of time (quarterly, semi annually and year end results) to the financial markets as per the exchange disclosure rules. Unexpected earnings news or forecast errors is the difference between market expectations made public (e.g. analysts) before the

announcement date and actual earnings. This is the component of the earnings news that is digested by the market and reflected into asset prices.

The earnings announcement dates for each commercial bank in South Africa were traced to the Stock Exchange News Service (SENS) announcements posted on their respective commercial bank websites. Sixteen earnings announcements were identified in the analysis period (see appendix, A2 and A3). The SENS is a JSE news service that provides the user with access to company announcements such as mergers take-over, rights offers, capital issues and cautionary, which have a direct impact on the markets.

The four major South African commercial banks traditionally release earnings SENS announcements for semiannual and full year end earnings. Therefore, semi-annual and full year end reported earnings will be extracted from Bloomberg. Unexpected earning news will be parted into good unexpected earnings news and bad unexpected earnings news. Negative forecast errors will be used as a proxy of bad unexpected earnings news. Positive forecast errors will be a proxy of good unexpected earnings news. Median analyst forecast earnings will be used as a proxy for market expected returns as they are reflective of all currently available information in the market. Analyst forecast earnings will be obtained from Bloomberg. Forecast errors will be computed as follows:

$$\textbf{Forecast error (FE)} = \frac{\textbf{Actual Earnings (AE)} - \textbf{Analyst Forecast (AF)}}{\textbf{Analyst Forecast (AF)}} \qquad \textbf{(eq. 3)}$$

4.1.3 Calculation of daily bond and stock returns

The daily last prices were extracted for the period between 1 January 2013 and 31 December 2014.The dirty price for bonds is defined as the clean price plus accrued interest since the last coupon payment. Most researchers typically use the dirty price as it's the price received or paid by the bond traders (Ederington et al, 2012). The use of clean prices can be disadvantageous because returns based on the clean price don't reflect the full return as they exclude interest accrued but in short window tests this disadvantage is insignificant (Ederington et al, 2012). Non trading day(s) are assumed to take the price of the trading day prior to the non trading day(s). The corporate bond daily returns can be computed in two ways.

Simple returns:

$$BR = \frac{BP_{(t)} - BP_{(t-1)}}{BP_{(t-1)}} \quad \textbf{(eq. 4)}$$

BR – Daily corporate bond return

BP $_{(t)}$– Prior day's corporate bond price

BP $_{(t-1)}$–Today's corporate bond price

Log returns or continuously compounding returns:

$$\textbf{Ln (BR)} = \textbf{ln (BP}_t\textbf{)} - \textbf{ln (BP}_{t-1}\textbf{)} \quad \textbf{(eq. 5)}$$

Ln (BR)– Log of daily corporate bond return

Ln (BP$_t$) –Log of prior's day corporate bond price

Ln (BP$_{t-1}$) –Log of today's corporate bond price

We will employ log returns in our analysis as academic literature generally uses log returns as it has three attractive properties. Firstly, log returns can be interpreted as continuously compounded returns thus returns across different assets can be compared. Secondly, continuously compounding returns are time additive. Thirdly bonds are characterized with heteroscedasticity (Ederington et al, 2012) therefore logs have the effect of rescaling the data to pull in extreme observation. The last daily stock prices for the four commercial banks were retrieved from Bloomberg for the same analysis period. The stock log returns are computed as follows:

$$\textbf{Ln (SR)} = \textbf{ln (SP}_t\textbf{)} - \textbf{ln (SP}_{t-1}\textbf{)} \quad \textbf{(eq. 6)}$$

Ln (SR)– Log of daily stock return

Ln (SP$_t$)– Log of prior's day stock price

Ln (SP$_{t-1}$) –Log of today's stock price

4.1.4 Abnormal returns

Abnormal or unexpected return is defined as the difference between actual return less the return expected by the market. The daily abnormal return for each bond or stock in the sample will be calculated separately. The abnormal bond return can be measured using three different models: (1) mean adjusted model, (2) matching portfolio or (3) factor models (Bessembinder et al, 2009). The mean adjusted model which accounts for term structure changes is the most frequently used model for calculating abnormal returns. The abnormal return in terms of the mean adjusted model is the actual bond return less the return on the matching Treasury bond with similar time to maturity and coupons. The second measurement uses a matching portfolio as a proxy of expected returns. The matching portfolio may be a bond index on the exchange or a benchmark portfolio can be developed to better match bonds based on default risk and time to maturity risk. The benchmark portfolio is weighted either using equal weighted or value weighted returns (Bessembinder et al, 2009). The third model is the five factor model developed by Fama and French(1993), which is an extension of the three factor model used to measure stock returns. The five factor model includes the treasury yield curve slope and default premium. In our study the matching portfolio model will be used to measure the abnormal bond returns.

The All Bond Index (ALBI) will be used as a proxy of market expected return in the corporate bond market. The ALBI is generally used by South African fund managers as a benchmark to assess the performance of bond portfolios. The ALBI is a vanilla bond index comprising of 20 government and non government bonds ranked by both liquidity and market capitalisation. Non government bonds comprise of municipalities, state entities and corporate bonds. The contribution of each bond to the index's total return is weighted according to the par value in issue (JSE).The daily abnormal bond return will be the difference between the actual daily corporate bond return less the daily return on the ALBI. The financial sector index (FINI) will be used to as a proxy for the expected market return on commercial bank stocks. The daily abnormal stock return is the difference between the actual return less the daily return on the FINI.

Event studies use both standardized and unstandardised abnormal returns. Standardised abnormal returns are abnormal returns standardised by their estimated return volatility. The estimated

return volatility is measured by the standard deviation of the abnormal return (Ederington et al, 2012). Past researchers have compared the power tests of standardized and unstandardised returns. Kothari and Warner (2006) found that a test using standardized abnormal returns is in principle superior under certain conditions, especially in short-horizon event studies, but it typically makes little difference outside of these conditions in comparison to unstandardised abnormal returns. Information efficient studies have mainly used unstandardised returns (Hotchkiss and Ronen, 2002; Easton et al, 2008; Defond and Zhang, 2009). Similarly in our study unstandardised returns will be used to test for information efficiency in South African Corporate Bonds. The unstandardised abnormal return for both bonds and stocks is calculated as follows:

Abnormal bond return (ABR) = Log bond Returns (BR) – All Bond Index Return (ALBI) (eq. 7)

Abnormal stock return (ASR) = Log stock Returns (SR) – Financial services Index (FINI) (eq. 8)

4.1. 5 Firm average returns

Once we have calculated the abnormal bond return for each bond (or stock) within the sample we used the abnormal bond (stock) returns to determine the firm average abnormal bond (stock)return for each short window period. There are three methods of calculating the firm average abnormal bond return. The same method will be applied to the abnormal stock returns First method, each abnormal bond (stock) return is treated as a separate observation known as the bond level approach (Narayanan and Shastri,1988). The problem with the bond level approach is the sample will be biased toward large firms as they tend to have multiple bonds. Secondly, it violates the assumption that returns are independent as the returns on different bonds of the same firm are correlated. This results in the standard deviation of the sample lowering and biasing the t-statistic upwards (Bessembinder et al, 2009).

The second method is the representative bond approach. A representative bond for each firm from the sample is selected. The representative bond (stock) may not clearly capture the value change in the firm's listed debt and may possibly also bias the results. For example, certain events may have a significant impact on bonds with the long time to maturity hence the representative bond(stock) may overstate the firm return's reaction to unexpected earnings news

(Bessembinder et al, 2009). The third method and the more preferred approach for our analysis is the firm level approach. The firm level return is all the abnormal bond (stock)returns in each short window period are weighted using the outstanding bond capital of the relating issuing firm, therefore resulting in a firm level return within each short window period (Bessembinder et al, 2009). The firm level approach is the preferred method for two reasons. Firstly, it's not exposed to firm cross correlation. Secondly, it's a good representative of the firm value changes arising from a corporate event.

4.1.6 Window period

Window period is the period of time around the event occurrence. A long window may raise the power of the test for two reasons (1) the number of event days for which the returns are calculable raises the power test but at a decreasing rate 2) the larger number of trades before and after earning announcement day (t) averages out some of the noise in individual bond trade prices but the downside of a longer window period is that the test power may be reduced since returns over longer windows include more non-event noise that can't be averaged out (Ederington et al, 2012). The window period of four days [0, +4] has been used in the analysis in order to capture the strength of the power test and avoid any non event noise. 0 is the earnings announcement date (t). In the analysis we increased the window period from [0, +1] until the [0, +4] to see if the impact of earning news is fully incorporated at 0or it takes longer to incorporate the unexpected earnings news. The firm level returns over the four day short window period were converted into an average daily short window return in order to test the strength of the coefficient as we increased the window period (Easton et al, 2008).

4.1.7 Cross sectional regression

Cross sectional regression has been used in past research to determine the relationship between bond returns and earnings announcements (Hotchkiss and Ronen, 2002; Easton et al, 2008; Defond and Zhang, 2009). A cross sectional regression will also be used in our analysis in order to capture the reaction of South African daily corporate bond returns in relation to unexpected earnings announcements of South African companies over a short window period:

Abnormal Bond Returns (ABR) $= \propto + \boldsymbol{a} * \boldsymbol{ForecastError(FE)} + \boldsymbol{b} * \boldsymbol{MarketReturns(MR)} + \boldsymbol{c} * \boldsymbol{DDUM} + \boldsymbol{e}$**(eq. 9)**

ABR is the cumulative abnormal bond returns for the four day short window periods over the analysis period. Market returns (MR) represented by the index return of FTSE/JSE Top 40is included in the regression to account for any market specific movements over the short window period. The FTSE/JSE Top 40 Index consists of the largest 40 companies ranked by full market value (JSE). The index was designed to represent the performance of South African companies. The index also provides investors with a comprehensive and complementary set of indices, which measures the performance of the major capital and industry segments of the South African market (JSE). DDUM is the dividend dummy variable. An interim and final dividend is announced on each earnings SENS announcement by the commercial banks. The interim and final dividend is increased at each earning SENS announcements. A dividend announcement is also a source of new information that will impact bond prices as it's a signal to the bondholder that either the firm future cash flows will be sufficient to service their debt or outflow of cash to finance the dividend may impinge on their right to debt repayments (Ederington et al, 2012).

The dummy variable is included in the cross section regression in order to capture the effect of the dividend increase on each earnings announcement in order not to contaminate the results. The dummy variable will take on the value of 1 if there is a dividend increase on earnings announcement day otherwise a value of 0. The stock returns will also be regressed over the same short window period in order to analyse if stock returns lead bond returns incorporating unexpected earnings announcements:

Abnormal Stock Returns (ASR) $= \propto + \boldsymbol{a} * \boldsymbol{ForecastError(FE)} + \boldsymbol{b} * \boldsymbol{MarketReturns(MR)} + \boldsymbol{e}$**(eq. 10)**

ASR is the cumulative abnormal stock return for the four day short window period over the analysis period. The remaining variables are the same inputs as used in the bond cross sectional regression.

4.1.8 Descriptive statistics

4.1.8.1 Descriptive statistic on issuer characteristics

Table 1 Bond issuers Characteristics as at 31 December 2014	
Firm fundamentals	
Median market value	198,004,040,030
Median tier 1 Capital ratio	12.80%
Median total risk based capital ratio	15.05%
Median efficiency ratio	55.46%
Median total Loans	694,489,500,000
Median total deposits	727,574,000,000
Median total Assets	984,981,000,000

Table one provides the issuer characteristics. Public borrowers are large, more profitable, have a higher credit rating, less likely to experience financial difficulties, have projects with low liquidation values, and have a longer operating history, than firms that rely on private debt (Ojah and Pillay, 2009). The South African commercial banks are in line with this characteristics as they are fairly large at median market capitalisation of approximately R198 billion, well established and profitable though they are less efficient than other countries (Andrianaivo and Yartey, 2010) with a median cost efficiency of 55.46% (total cost to total income).

The median book value is approximately R 85 million, which is 1.80 times the median market capitalisation meaning South African commercial banks are creating wealth for shareholders (market capitalization to book value). The South African commercial banks are well capitalized in order to absorb financial shocks. The median Tier 1 capital ratio is 12.80%; this is above the minimum regulatory requirement of 6% of Risk Weighted Assets (RWA).The median total risk based capital is 15.05%, which is above the minimum regulatory requirement of 8% of RWA. The capital adequacy measure is consistent with the findings of Andrianaivo and Yartey, (2010) who found an average of 16% of RWA.

4.1.8.2 Descriptive statistics on bond and stock characteristics

Table 2 Summary of bond and stock characteristics			
Bonds		**Stocks**	
Total outstanding capital	33,652,759,832	Mean abnormal returns	(0.000773)
Median bond issue	434,800,000	Median abnormal returns	0.007743
Mean abnormal returns	(0.000826)	Standard deviation abnormal returns	0.029329
Median abnormal returns	(0.002049)	Skewness abnormal returns	(1.233800)
Standard deviation abnormal returns	0.003259	Ex. kurtosis abnormal returns	0.875280
Skewness abnormal returns	0.931920		
Ex. kurtosis abnormal returns	(0.335770)		
Median issue date	3/28/2012		
Median maturity date	4/24/2019		
Median maturity term	7.08		

Table two briefly provides the characteristics of bonds and stocks. The total outstanding bond issue of the sample is approximately R 33.7 billion with the median outstanding bond issue in the sample being approximately R434.8m. The sample has a median issue date and maturity date of 28 March 2012 and 24 April 2019 hence corporate bonds in South Africa generally have a median bond term of seven years. This is in line with Gwatizo and Ojah (2009)'s observation of the African debt market having short term maturities. The mean and median of abnormal bond returns is -0.00082614 or -0.0020494 respectively. The mean and median of abnormal stock returns is -0.00077278 and 0.0077434 respectively.

The standard deviation of abnormal returns is 0.0032588 and 0.029329 for bonds and stocks respectively. This means stocks have more volatility than bonds around earnings announcement day .It is expected that stocks will be more volatile than bonds because bonds are ranked higher than stocks in the liquidation process. Bonds are ranked higher due to debt covenants being stipulated in agreements and collateral pledged to protect bondholders. The high volatility in stock returns is consistent with the high median stock returns i.e. higher volatility (risk) comes with higher reward. Normally distributed returns must have a skewness of zero and kurtosis of 3 (excess kurtosis must be zero).

Skewness is defined as a measure of the asymmetry of a probability distribution about the mean. In statistical terms a skewness of zero means the data is symmetrical about the mean of the distribution. Positive skewness means that the distribution has a long tail to the right hence distribution lies more to the left of the mean. Positive skewness in financial returns is interpreted

by investors as asset returns being more susceptible to large positive shocks than large negative shocks. Negative skewness means a long left tail hence the distribution lies mainly to the right of the mean. Investors interpret negative skewness as asset prices being more susceptible to large negative shocks than large positive shocks.

The abnormal bond returns in the sample have a negative skewness of -0.33577 meaning the South African corporate bond market is more likely to experience large negative shocks than large positive shocks. In recent years, the South African bond market has been adversely affected by increasing interest rate shocks, rising inflation shocks and global shocks amid slow growth. In particular, 2013 was characterized by bouts of volatility when the US Federal Bank in May unexpectedly indicated that it intended to reduce quantitative easing (QE). This resulted in a massive global sell off of risky assets in emerging markets. In December 2013, the US Fed confirmed a reduction in QE of $10 billion. This led to the weakening of the rand due to the emerging market currencies sell offs. To combat the inflation impact from the weaker rand, the South African Reserve Bank increased interest rate by 50 basis points since 2008 (Management debt report, 2014).

Kurtosis looks at the peak level of the probability distribution about the mean. Normally distributed returns have a kurtosis of three meaning the probability distribution will have a mesokurtic peak. If the probability distribution has negative excess kurtosis, the peak will be lower and broader than a normal distribution and tails are shorter and thinner. A low and broad peaked probability distribution is said to be platykurtic. If the probability distribution has positive excess kurtosis, the peak will be higher and sharper than the peak of a normal distribution and tail is longer and fatter. A high and sharp peaked probability distribution is known as a leptokurtic distribution. The bond abnormal returns in the sample have positive excess kurtosis of 0.93192 and therefore will have a leptokurtic distribution.

The stock abnormal return has a negative skewness of -1.2338 meaning financial stocks in South Africa are more likely to be exposed to large downside than upside. The commercial banks' performances are linked to the current poor economic outlook in South Africa of slow growth, political infighting, sovereign downgrades, widening current deficit, volatile portfolio inflows, rising inflation and interest rate hikes. These economic factors put a squeeze on the commercial

bank margins: increased impairment provisioning, reduced loan growth due to higher borrowing rates incurred by consumers, and reduced trading activity in secondary market. The negative skewness in the stock abnormal returns is also consistent with the findings of other researchers (Alagidede, 2011; Jefferis and Smith, 2005) in the South African stock market. The abnormal stock returns have a positive excess kurtosis of 0.87528 hence abnormal stock returns have a leptokurtic distribution. The leptokurtic distribution in the abnormal stock returns is consistent with empirical stylized facts on stock returns (Fama, 1965, Jefferis and Smith, 2005).The stock returns descriptive statistics therefore reject the assumption that stock returns are independent and normally distributed.

5. Bond and stock markets reaction to earnings news

Table 3
Effect of earnings news on daily corporate bond returns and stock returns

Daily return interval	Intercept	Earnings forecast		JSE Top 40 Index
Bonds			P- Values	
[0,1]	-0.000151	-0.006340	(0.0694) *	0.056548
[0,2]	-0.001209	-0.050720	(0.0694) *	0.226192
[0.3]	-0.000454	-0.019020	(0.0694) *	0.056548
[0,4]	-0.000605	-0.025360	(0.0694) *	0.056548
Stocks				
[0,1]	-0.002386	0.067334	(0.04010) **	0.263523
[0,2]	-0.004771	0.134667	(0.04010) **	0.263523
[0.3]	-0.007157	0.202001	(0.04010) **	0.263523
[0,4]	-0.009543	0.269335	(0.04010) **	0.263523

***, **, * indicates significance at 1%, 5% and 10% levels respectively

We firstly examine the corporate bond market's reaction to earnings surprises (Table 3) before partitioning between good and bad unexpected earnings surprises. The earnings forecast error coefficient is -0.00633996 on the day one return [0, +1], which is significantly positively related to bond returns at p≤ 10%. The earnings forecast error remains significantly positive as the window period is increase to [0, +4].Similarly, stock returns have an earnings forecast error coefficient of 0.0673336, which is significantly positive at p ≤ 5%. The stock returns earnings forecast error coefficient remains significantly positive as the window period is increased to [0, +4]. The regression results in Table 3 indicate that both bonds and stock returns on average

respond to unexpected earnings news. This means that the lack of liquidity and infrastructure has not on average hindered the information efficiency of bonds from a daily return perspective or in other words there is some limited liquidity and transparency in the corporate bond market that allows bonds on average to be information efficient. An analysis at the intraday level similar to Hotchkiss and Ronen, (2002) would need to be conducted to measure the exact speed of adjustments in bond and stock prices to conclusively determine the impact of illiquidity and lack of infrastructure on the information efficiency of corporate bonds.

Table 4

Effect of good earnings news on daily bond and stock returns					Effect of bad earnings news on daily bond and stock returns				
	Daily return interval	Intercept	Earnings forecast	JSE Top 40 Index		Daily return interval	Intercept	Earnings forecast	JSE Top 40 Index
Bonds			P- Values		**Bonds**			P- Values	
	[0,1]	-0.000322	-0.003562 (0.6148)	0.077311		[0,1]	-0.000744	-0.022201 (0.1320)	-0.024316
	[0,2]	-0.000643	-0.007124 (0.6148)	0.077311		[0,2]	-0.001487	-0.044401 (0.1320)	-0.024316
	[0,3]	-0.000965	-0.010686 (0.6148)	0.077311		[0,3]	-0.002231	-0.066602 (0.1320)	-0.024316
	[0,4]	-0.001287	-0.014248 (0.6148)	0.077311		[0,4]	-0.002975	-0.088803 (0.1320)	-0.024316
Stocks					**Stocks**				
	[0,1]	-0.002875	0.041518 (0.3341)	0.886796		[0,1]	0.007682	0.306984 (0.0459) **	0.630765
	[0,2]	-0.005750	0.083036 (0.3341)	0.886796		[0,2]	0.015364	0.613967 (0.0459) **	0.630765
	[0,3]	-0.008625	0.124554 (0.3341)	0.886796		[0,3]	0.023046	0.920951 (0.0459) **	0.630765
	[0,4]	-0.011500	0.166073 (0.3341)	0.886796		[0,4]	0.030728	1.227930 (0.0459) **	0.630765

***, **, * indicates significance at 1%, 5% and 10% levels respectively

We then partition the earnings forecast errors into good and bad unexpected earnings news in Table 4. The good news' earnings forecast error coefficient is -0.00356208, which is insignificantly related to corporate bond returns. The coefficient remains insignificant as we increase the window period to [0, +4]. This observation is in line with the main hypothesis as we expected a weak relationship between good unexpected earnings news and corporate bond returns due to the fact that bondholders do not share in the firm's increased future cash flows as they have a fixed claim on the firm's future cash flows. The bad news' earnings forecast error co efficient is -0.0222007, which is insignificantly related to corporate bond returns.

The result is not in line with the main hypothesis as we expected corporate bond returns to be significantly related to bad unexpected earnings news due to the risk of bondholder possibly losing their initial investment. The main investors in the South African corporate bond market are institutional investors (such as pension funds and insurance companies) and banks. Institutional investors are required by legislation to hold a certain percentage of fixed income and

also require fixed income in order to match their long term liabilities. Banks are required by the South African Reserve Bank to keep a minimum of fixed income in order to meet liquidity and capital requirements. These requirements have created a buy and hold to maturity strategy in the South African bond market hence the market's irresponsiveness to bad unexpected earnings news. The small sized and infrequent issuances and lack of a secondary corporate bond market further incentivises investors to hold onto corporate bonds until maturity (IOSCO, 2011).

A buy and hold to maturity strategy depresses liquidity in the corporate bond market, which in turn may lead to disruptions in the bond price formation process. Price formation disruptions may lead to information inefficiencies in the corporate bond market. Regulators may need to look at means of increasing the investor base to include retail investors; larger and more frequent issuances and implementing sophisticated secondary corporate bond market infrastructure in order to encourage liquidity in the corporate bond market thus further improve information efficiency. The reaction to good and bad unexpected earnings news indicates there is no asymmetric reaction to good and bad unexpected earnings news in South African corporate bonds as we had predicted but instead it's symmetric.

Similarly, we also partitioned between good and bad unexpected earning news for stock returns. We found that the good earning news' earning forecast coefficient of 0.0415181 was insignificantly related to stock returns at the day one returns [0, +1]. The co efficient remained insignificant as we increased the window to [0, +4].The bad news' earnings forecast errors coefficient of 0.306984 was found to be significantly positively related to stock returns at $p \leq 5\%$ for the day one return [0, +1]. The coefficient increased and remained significant at the $p \leq 5\%$ when the window period was increased to [0, +4].

The response of stock returns to good and bad unexpected earnings news indicates that South African stock have an asymmetric reaction to good and bad earnings news. It's generally expected that a negative shock is likely to cause more volatility in stock returns than a positive shock of the same magnitude. Asymmetry in stock returns is generally attributed to leverage effects. Leverage effect is when a fall in the value of a firm's stock causes the debt-to-equity ratio to rise. This leads stockholders, who bear the residual risk of the firm, to perceive their future cash flow stream as being relatively more risky (Alagidede, 2011). The irresponsiveness

of the stockholders to good earnings news may also indicate that good unexpected earnings news has been incorporated into the returns prior to earnings announcement date.

5.1 Limitation of data

Low frequency bonds included in our data may lead to the conclusion of extreme informational inefficiency. Corporate bonds are less liquid than stocks therefore there is a concern that the prices in our sample may not be at intrinsic value. False conclusions may be drawn about the information efficiency of the corporate bonds due to infrequently traded bonds becoming liquid during the earnings announcement period. Liquidity discounts may be present in bond prices from investor quickly selling off their infrequently traded bonds in response to bad unexpected earning news. To the extent there is a positive relationship between the magnitude of the bad news and the size of the liquidity discount, we will observe positive relation between bond returns and bad unexpected earnings news that is not directly attributable to a revision in bondholders' expectations about future payoffs (Easton et al, 2008).

5.2 Robust checks

4.2. Robustness Checks

We performed robustness checks in Gretl to ensure model adequacy. The Ljung-Box statistic on the OLS model in A5 (appendix) finds that there is no evidence of autocorrelation in the time series. A model is said to have an ARCH effect if the variance of errors changes over time rather than systematically with one of the explanatory variable. The ARCH (7) test in table A4 (appendix) indicates that there is no evidence of conditional heteroscedasticity in the model. These robust checks imply that the model is adequate.

5.3 Conclusion

Using a 42 corporate bond sample selected from the four major commercial banks in South Africa, we analysed the information efficiency of the corporate bond market in South Africa in relation to earnings announcements of South Africa companies. We also examined if the lack of infrastructure and illiquidity in the corporate bond market slows down its information efficiency relative to the stock market. We found that on average both corporate bonds and stocks incorporate any new information in earnings announcements over a four day window period. We also observed that corporate bonds are insensitive to both good and bad unexpected earnings news. This insensitivity affirms a buy and hold strategy in the South African corporate bond market, which is currently undermining liquidity in the market. Regulators would do well to encourage retail investor participation; larger and more frequent issuances and implement sophisticated secondary market infrastructure in order to encourage liquidity in the corporate bond market therefore further improve information efficiency. We saw that stock returns have an asymmetric reaction to good and bad unexpected earnings news, which is consistent with the behavior of other African stock returns.

Appendix

A1								
Issuer	**Maturity date**	**Outstanding capital**	**Issue size**	**Rate**	**Country**	**Currency**	**Issue date**	**Type**
STANDARD BANK								
SBAEI 11.4200				Fixed	South	South African		
07-Jul-16 MTN	07-Jul-2016	750,000,000	750,000,000	Coupon	Africa	Rand	07-Jul-2009	Bond
SBAEI 8.2500				Fixed	South	South African		
15-Sep-17 MTN	15-Sep-2017	213,000,000	326,000,000	Coupon	Africa	Rand	09-Oct-2007	Bond
SBAEI 8.2500				Fixed	South	South African		
15-Sep-17	15-Sep-2017	5,000,000	5,000,000	Coupon	Africa	Rand	02-Jul-2012	Bond
SBAEI 9.3500				Fixed	South	South African		
24-Feb-19	24-Feb-2019	100,000,000	100,000,000	Coupon	Africa	Rand	24-Feb-2012	Bond
SBAEI 9.6500				Fixed	South	South African		
26-Mar-19	26-Mar-2019	500,000,000	500,000,000	Coupon	Africa	Rand	26-Mar-2012	Bond
SBAEI 8.8700				Fixed	South	South African		
24-May-19	24-May-2019	2,714,000,000	2,714,000,000	Coupon	Africa	Rand	24-May-2012	Bond
SBAEI 7.2500				Fixed	South	South African		
15-Jan-20	15-Jan-2020	5,302,000	5,302,000	Coupon	Africa	Rand	29-May-2012	Bond
SBAEI 8.6000				Fixed	South	South African		
16-Nov-21	16-Nov-2021	500,000,000	500,000,000	Coupon	Africa	Rand	16-Nov-2006	Bond
SBAEI 10.1800				Fixed	South	South African		
23-Jun-21 MTN	23-Jun-2021	2,100,000,000	2,100,000,000	Coupon	Africa	Rand	23-Jun-2011	Bond
SBAEI 6.7500				Fixed	South	South African		
31-Mar-21	31-Mar-2021	58,700,000	58,700,000	Coupon	Africa	Rand	26-Apr-2012	Bond
SBAEI 6.7500				Fixed	South	South African		
31-Mar-21	31-Mar-2021	391,600,000	391,600,000	Coupon	Africa	Rand	07-May-2012	Bond
SBAEI 9.6600				Fixed	South	South African		
01-Dec-22 '12	01-Dec-2022	1,780,000,000	1,780,000,000	Coupon	Africa	Rand	01-Dec-2011	Bond
SBAEI 8.2000				Fixed	South	South African		
25-May-26	25-May-2026	750,000,000	750,000,000	Coupon	Africa	Rand	25-May-2006	Bond
SBAEI 10.0500				Fixed	South	South African		
15-May-26								
MTN	15-May-2026	1,894,000,000	1,894,000,000	Coupon	Africa	Rand	15-May-2012	Bond
SBAEI 8.1200				Fixed	South	South African		
18-Apr-28	18-Apr-2028	200,000,000	200,000,000	Coupon	Africa	Rand	15-Nov-2006	Bond

A1 (continued)								
NEDBANK								
NEDJN / NEDJ 10.5500 15-Sep-15	15-Sep-2015	2,000,000,000	2,000,000,000	Fixed Coupon	South Africa	South African Rand	09-Sep-2009	Bond
NEDJN / NEDJ 9.6800 19-Apr-15 MTN	19-Apr-2015	478,000,000	478,000,000	Fixed Coupon	South Africa	South African Rand	19-Apr-2010	Bond
NEDJN / NEDJ 11.3900 09-Sep-19 MTN	09-Sep-2019	1,273,000,000	1,273,000,000	Fixed Coupon	South Africa	South African Rand	24-Nov-2009	Bond
NEDJN / NEDJ 10.5400 17-Sep-20 '15 MTN	17-Sep-2020	1,000,000,000	1,000,000,000	Fixed Coupon	South Africa	South African Rand	17-Sep-2007	Bond
FIRSTRAND								
FSRJHB / FSRJ 8.0000 15-Sep-16 MTN	15-Sep-2016	924,000,000	924,000,000	Fixed Coupon	South Africa	South African Rand	04-Apr-2012	Bond
FSRJHB / FSRJ 8.5000 15-Sep-17 MTN	15-Sep-2017	1,086,500,000	1,086,500,000	Fixed Coupon	South Africa	South African Rand	04-Apr-2012	Bond
FSRJ 7.4700 20-Jun-17	20-Jun-2017	18,000,000	18,000,000	Fixed Coupon	South Africa	South African Rand	01-Jun-2012	Bond
FSRJ 7.4100 20-Jun-17	20-Jun-2017	12,000,000	12,000,000	Fixed Coupon	South Africa	South African Rand	01-Jun-2012	Bond
FSRJHB / FSRJ 5.0750 20-Sep-17	20-Sep-2017	10,000,000	10,000,000	Fixed Coupon	South Africa	South African Rand	21-Sep-2012	Bond
FSRJ 10.5000 14-Apr-18 MTN	14-Apr-2018	1,581,000,000	1,581,000,000	Fixed Coupon	South Africa	South African Rand	14-Apr-2010	Bond
FSRJHB / FSRJ 9.0000 15-Nov-19 MTN	15-Nov-2019	1,766,000,000	1,766,000,000	Fixed Coupon	South Africa	South African Rand	04-Apr-2012	Bond
FSRJHB / FSRJ 10.7500 10-Dec-24	10-Dec-2024	943,000,000	943,000,000	Fixed Coupon	South Africa	South African Rand	10-Dec-2009	Bond
FSRJHB / FSRJ 9.5000 21-Feb-31 MTN	21-Feb-2031	5,000,000,000	5,000,000,000	Fixed Coupon	South Africa	South African Rand	21-Feb-2011	Bond
FSRJHB / FSRJ 2.0000 26-Jan-42 MTN	26-Jan-2042	100,000,000	100,000,000	Fixed Coupon	South Africa	South African Rand	26-Jan-2012	Bond
FSRJHB / FSRJ 8.0000 14-Apr-45 MTN	14-Apr-2045	175,000,000	175,000,000	Fixed Coupon	South Africa	South African Rand	14-Apr-2010	Bond

A1 (continued)								
BARCLAYS AFRICA								
ABSP 8.9500 23-Feb-16 MTN	23-Feb-2016	7,599,305	9,199,305	Fixed Coupon	South Africa	South African Rand	01-Mar-2012	Bond
ABSP 9.1300 23-Mar-16 MTN	23-Mar-2016	35,131,534	35,231,534	Fixed Coupon	South Africa	South African Rand	30-Mar-2012	Bond
ABSP 8.9500 12-Apr-16 MTN	12-Apr-2016	1,016,096	1,016,096	Fixed Coupon	South Africa	South African Rand	19-Apr-2012	Bond
ABSP 8.7200 18-May-16 MTN	18-May-2016	11,602,939	11,602,939	Fixed Coupon	South Africa	South African Rand	25-May-2012	Bond
ABSP 8.5000 01-Jun-16 MTN	01-Jun-2016	17,215,700	17,235,700	Fixed Coupon	South Africa	South African Rand	08-Jun-2012	Bond
ABSP 8.5890 14-Jun-16 MTN	14-Jun-2016	4,630,690	4,630,690	Fixed Coupon	South Africa	South African Rand	21-Jun-2012	Bond
ABSP 7.6000 20-Jul-16 MTN	20-Jul-2016	301,253	5,768,253	Fixed Coupon	South Africa	South African Rand	27-Jul-2012	Bond
ABSP 7.6300 23-Aug-16 MTN	23-Aug-2016	7,160,315	7,160,315	Fixed Coupon	South Africa	South African Rand	30-Aug-2012	Bond
ABSP 9.8000 20-Jun-19	20-Jun-2019	200,000,000	200,000,000	Fixed Coupon	South Africa	South African Rand	12-Apr-2012	Bond
ABSP 8.2000 01-Jun-20	01-Jun-2020	1,152,000,000	1,152,000,000	Fixed Coupon	South Africa	South African Rand	18-Jun-2007	Bond
ABSP 8.2950 21-Nov-23 '18 MTN	21-Nov-2023	1,188,000,000	1,188,000,000	Fixed Coupon	South Africa	South African Rand	21-Nov-2012	Bond
ABSP 8.8000 11-Sep-26 MTN	11-Sep-2026	2,700,000,000	2,700,000,000	Fixed Coupon	South Africa	South African Rand	11-Sep-2007	Bond

A1 continued Financial Sector %	
Total corporate bonds	1500
Major Commercial banks	912
Percentage	**61%**

A2 Sample					
Earnings announcement dates	Firm	Bond abnormal returns - [0,1] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-0.11%	5.45%	-0.09%	1
08/14/2014	Std Bank	0.04%	-7.26%	0.11%	1
08/05/2014	Nedbank	-0.02%	7.30%	0.21%	1
07/30/2014	BAGL	-0.01%	-0.50%	-0.51%	1
03/06/2014	Std Bank	-0.07%	5.00%	-0.20%	1
03/04/2014	Firstrand	-0.12%	5.59%	0.09%	1
02/24/2014	Nedbank	-0.06%	13.67%	-0.11%	1
02/11/2014	BAGL	-0.03%	4.32%	0.69%	1
09/10/2013	Firstrand	-0.08%	-0.78%	0.49%	1
08/15/2013	Std Bank	-0.07%	1.54%	0.10%	1
08/06/2013	Nedbank	0.11%	0.40%	0.49%	1
07/30/2013	BAGL	0.15%	-8.89%	0.66%	1
03/07/2013	Std Bank	-0.05%	11.36%	0.28%	1
03/05/2013	Firstrand	-0.07%	1.54%	0.71%	1
02/25/2013	Nedbank	0.11%	3.77%	0.28%	1
02/12/2013	BAGL	-0.05%	-2.04%	-0.22%	1
Earnings announcement dates	Firm	Bond abnormal returns - [0,2] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-0.90%	5.45%	-0.19%	1
08/14/2014	Std Bank	0.31%	-7.26%	0.22%	1
08/05/2014	Nedbank	-0.16%	7.30%	0.41%	1
07/30/2014	BAGL	-0.06%	-0.50%	-1.02%	1
03/06/2014	Std Bank	-0.53%	5.00%	-0.40%	1
03/04/2014	Firstrand	-0.95%	5.59%	0.18%	1
02/24/2014	Nedbank	-0.50%	13.67%	-0.21%	1
02/11/2014	BAGL	-0.28%	4.32%	1.38%	1
09/10/2013	Firstrand	-0.66%	-0.78%	0.97%	1
08/15/2013	Std Bank	-0.55%	1.54%	0.19%	1
08/06/2013	Nedbank	0.90%	0.40%	0.98%	1
07/30/2013	BAGL	1.19%	-8.89%	1.31%	1
03/07/2013	Std Bank	-0.41%	11.36%	0.55%	1
03/05/2013	Firstrand	-0.52%	1.54%	1.43%	1
02/25/2013	Nedbank	0.88%	3.77%	0.57%	1
02/12/2013	BAGL	-0.41%	-2.04%	-0.44%	1
Earnings announcement dates	Firm	Bond abnormal returns - [0,3] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-0.34%	5.45%	-0.28%	1
08/14/2014	Std Bank	0.12%	-7.26%	0.32%	1
08/05/2014	Nedbank	-0.06%	7.30%	0.62%	1
07/30/2014	BAGL	-0.02%	-0.50%	-1.52%	1
03/06/2014	Std Bank	-0.20%	5.00%	-0.61%	1
03/04/2014	Firstrand	-0.36%	5.59%	0.28%	1
02/24/2014	Nedbank	-0.19%	13.67%	-0.32%	1
02/11/2014	BAGL	-0.10%	4.32%	2.07%	1
09/10/2013	Firstrand	-0.25%	-0.78%	1.46%	1
08/15/2013	Std Bank	-0.21%	1.54%	0.29%	1
08/06/2013	Nedbank	0.34%	0.40%	1.47%	1
07/30/2013	BAGL	0.45%	-8.89%	1.97%	1
03/07/2013	Std Bank	-0.15%	11.36%	0.83%	1
03/05/2013	Firstrand	-0.20%	1.54%	2.14%	1
02/25/2013	Nedbank	0.33%	3.77%	0.85%	1
02/12/2013	BAGL	-0.15%	-2.04%	-0.66%	1
Earnings announcement dates	Firm	Bond abnormal returns - [0,4] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-0.45%	5.45%	-0.37%	1
08/14/2014	Std Bank	0.15%	-7.26%	0.43%	1
08/05/2014	Nedbank	-0.08%	7.30%	0.82%	1
07/30/2014	BAGL	-0.03%	-0.50%	-2.03%	1
03/06/2014	Std Bank	-0.26%	5.00%	-0.81%	1
03/04/2014	Firstrand	-0.47%	5.59%	0.37%	1
02/24/2014	Nedbank	-0.25%	13.67%	-0.42%	1
02/11/2014	BAGL	-0.14%	4.32%	2.76%	1
09/10/2013	Firstrand	-0.33%	-0.78%	1.95%	1
08/15/2013	Std Bank	-0.28%	1.54%	0.39%	1
08/06/2013	Nedbank	0.45%	0.40%	1.96%	1
07/30/2013	BAGL	0.60%	-8.89%	2.62%	1
03/07/2013	Std Bank	-0.21%	11.36%	1.11%	1
03/05/2013	Firstrand	-0.26%	1.54%	2.85%	1
02/25/2013	Nedbank	0.44%	3.77%	1.14%	1
02/12/2013	BAGL	-0.20%	-2.04%	-0.88%	1

A3 Sample					
Earnings announcement dates	Firm	Stock abnormal returns - [0,1] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-1.12%	5.45%	-0.09%	1
08/14/2014	Std Bank	-1.03%	-7.26%	0.11%	1
08/05/2014	Nedbank	0.33%	7.30%	0.21%	1
07/30/2014	BAGL	-0.03%	-0.50%	-0.51%	1
03/06/2014	Std Bank	0.21%	5.00%	-0.20%	1
03/04/2014	Firstrand	0.12%	5.59%	0.09%	1
02/24/2014	Nedbank	0.21%	13.67%	-0.11%	1
02/11/2014	BAGL	0.68%	4.32%	0.69%	1
09/10/2013	Firstrand	0.94%	-0.78%	0.49%	1
08/15/2013	Std Bank	-0.13%	1.54%	0.10%	1
08/06/2013	Nedbank	0.20%	0.40%	0.49%	1
07/30/2013	BAGL	-1.87%	-8.89%	0.66%	1
03/07/2013	Std Bank	0.33%	11.36%	0.28%	1
03/05/2013	Firstrand	-0.01%	1.54%	0.71%	1
02/25/2013	Nedbank	0.68%	3.77%	0.28%	1
02/12/2013	BAGL	0.19%	-2.04%	-0.22%	1
Earnings announcement dates	Firm	Stock abnormal returns - [0,2] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-2.25%	5.45%	-0.19%	1
08/14/2014	Std Bank	-2.07%	-7.26%	0.22%	1
08/05/2014	Nedbank	0.65%	7.30%	0.41%	1
07/30/2014	BAGL	-0.06%	-0.50%	-1.02%	1
03/06/2014	Std Bank	0.42%	5.00%	-0.40%	1
03/04/2014	Firstrand	0.25%	5.59%	0.18%	1
02/24/2014	Nedbank	0.42%	13.67%	-0.21%	1
02/11/2014	BAGL	1.36%	4.32%	1.38%	1
09/10/2013	Firstrand	1.88%	-0.78%	0.97%	1
08/15/2013	Std Bank	-0.27%	1.54%	0.19%	1
08/06/2013	Nedbank	0.40%	0.40%	0.98%	1
07/30/2013	BAGL	-3.75%	-8.89%	1.31%	1
03/07/2013	Std Bank	0.67%	11.36%	0.55%	1
03/05/2013	Firstrand	-0.03%	1.54%	1.43%	1
02/25/2013	Nedbank	1.36%	3.77%	0.57%	1
02/12/2013	BAGL	0.38%	-2.04%	-0.44%	1
Earnings announcement dates	Firm	Stock abnormal returns - [0,3] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-3.37%	5.45%	-0.28%	1
08/14/2014	Std Bank	-3.10%	-7.26%	0.32%	1
08/05/2014	Nedbank	0.98%	7.30%	0.62%	1
07/30/2014	BAGL	-0.09%	-0.50%	-1.52%	1
03/06/2014	Std Bank	0.63%	5.00%	-0.61%	1
03/04/2014	Firstrand	0.37%	5.59%	0.28%	1
02/24/2014	Nedbank	0.63%	13.67%	-0.32%	1
02/11/2014	BAGL	2.04%	4.32%	2.07%	1
09/10/2013	Firstrand	2.83%	-0.78%	1.46%	1
08/15/2013	Std Bank	-0.40%	1.54%	0.29%	1
08/06/2013	Nedbank	0.60%	0.40%	1.47%	1
07/30/2013	BAGL	-5.62%	-8.89%	1.97%	1
03/07/2013	Std Bank	1.00%	11.36%	0.83%	1
03/05/2013	Firstrand	-0.04%	1.54%	2.14%	1
02/25/2013	Nedbank	2.04%	3.77%	0.85%	1
02/12/2013	BAGL	0.56%	-2.04%	-0.66%	1
Earnings announcement dates	Firm	Stock abnormal returns - [0,4] interval	Forecast errors	JSE Top 40 index return	Dummy
09/09/2014	Firstrand	-4.49%	5.45%	-0.37%	1
08/14/2014	Std Bank	-4.13%	-7.26%	0.43%	1
08/05/2014	Nedbank	1.31%	7.30%	0.82%	1
07/30/2014	BAGL	-0.11%	-0.50%	-2.03%	1
03/06/2014	Std Bank	0.85%	5.00%	-0.81%	1
03/04/2014	Firstrand	0.50%	5.59%	0.37%	1
02/24/2014	Nedbank	0.85%	13.67%	-0.42%	1
02/11/2014	BAGL	2.72%	4.32%	2.76%	1
09/10/2013	Firstrand	3.77%	-0.78%	1.95%	1
08/15/2013	Std Bank	-0.53%	1.54%	0.39%	1
08/06/2013	Nedbank	0.80%	0.40%	1.96%	1
07/30/2013	BAGL	-7.50%	-8.89%	2.62%	1
03/07/2013	Std Bank	1.33%	11.36%	1.11%	1
03/05/2013	Firstrand	-0.06%	1.54%	2.85%	1
02/25/2013	Nedbank	2.72%	3.77%	1.14%	1
02/12/2013	BAGL	0.75%	-2.04%	-0.88%	1

A4

```
Test for ARCH of order 7

            coefficient    std. error    t-ratio    p-value
  ------------------------------------------------------------
  alpha(0)    1.46190e-05   8.95637e-06    1.632     0.3499
  alpha(1)   -0.427750      0.488827      -0.8751    0.5424
  alpha(2)   -0.0968451     0.728768      -0.1329    0.9159
  alpha(3)   -0.896877      0.674204      -1.330     0.4104
  alpha(4)   -0.0306538     0.743945      -0.04120   0.9738
  alpha(5)    1.02065       0.656481       1.555     0.3639
  alpha(6)    1.54294       1.01689        1.517     0.3710
  alpha(7)   -1.45477       1.19472       -1.218     0.4377

  Null hypothesis: no ARCH effect is present
  Test statistic: LM = 8.17118
  with p-value = P(Chi-square(7) > 8.17118) = 0.317742
```

A5

```
Breusch-Godfrey test for autocorrelation up to order 8
OLS, using observations 2014:09-2013:02 (T = 16)
Dependent variable: uhat

                   coefficient   std. error    t-ratio   p-value
  ---------------------------------------------------------------
  const             -0.00189120   0.000808654   -2.339    0.0665  *
  Forecast_errors   -0.00105085   0.00830533    -0.1265   0.9042
  Market_return     -0.0661994    0.0381220     -1.737    0.1430
  uhat_1            -0.782671     0.363112      -2.155    0.0837  *
  uhat_2            -0.915016     0.414366      -2.208    0.0783  *
  uhat_3            -1.09674      0.374792      -2.926    0.0328  **
  uhat_4            -0.889992     0.469016      -1.898    0.1162
  uhat_5            -1.53895      0.548858      -2.804    0.0378  **
  uhat_6            -1.87903      0.585551      -3.209    0.0238  **
  uhat_7            -1.74204      0.739599      -2.355    0.0651  *
  uhat_8            -0.309036     0.738808      -0.4183   0.6931

  Unadjusted R-squared = 0.901751

Test statistic: LMF = 5.736356,
with p-value = P(F(8,5) > 5.73636) = 0.0352

Alternative statistic: TR^2 = 14.428008,
with p-value = P(Chi-square(8) > 14.428) = 0.0713

Ljung-Box Q' = 11.866,
with p-value = P(Chi-square(8) > 11.866) = 0.157
```

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