Pension Funds and Development of Capital Markets in South Africa

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Abstract

This paper seeks to provide empirical evidence to establish the effect of pension fund assets on overall capital market development. It uses proxies for both stock and bond markets and uses the autoregressive distributive lag (ARDL) and the vector error correction model (VECM). The results show a positive relationship between pension savings and stock market development. No long-run relationship was established between pension savings and the bond market development. We find only unidirectional relationship between pension fund savings and stock market development. Evidence shows that policies in the stock market are conducive for the development of the bond market.

Keywords: pension funds, bond market, stock market, South Africa, capital market development, methodology

JEL Classification codes: G23, G20, G10, G11

1. Introduction

This paper examines one of the channels through which pension assets affect economic growth in South Africa. Several studies have established that there exist at least four channels through which pension assets increase economic growth: through savings, improved corporate governance, reduced labour market distortion and capital market development (Catalan, 2004; Catalan, Impavido, & Musalem, 2000; Davis & Hu, 2005, 2008; Hu, 2005; Kim, 2010; Meng & Pfau, 2010; Raisa, 2012; Rezk, Irace, & Ricca, 2009; Schmidt-hebbel, 1999; Walker & Lefort, 2002; Zandberg & Spierdijk, 2010). Investigating the strength of the relationship between pension funds and capital market development will help to determine the impact of this relationship on economic growth since literature has established the growth-inducing capability of capital markets in developing countries (Barr, 2006; Caporale, Howells & Soliman, 2004; Enisan & Olufisayo, 2009; Hassan, 2013; Hu, 2012; Moreno & Santos, 2008; Pradhan, Arvin, Bennet, Nair & Hall, 2016; Thumrongvit, Kim & Pyun, 2013; Yartey & Adjasi, 2007).

Studies on the impact of pension assets on capital market development in developing countries have mostly been focused on Asian and Latin American economies.

Pension funds over the last several decades have grown and made a substantial contribution to financial flows in the capital market. In South Africa there are 5150 retirement funds with an asset value of R3.67 trillion, derived from 15.9 million members and pensioners (FSB, 2014). The size of pension funds in the

South African market increased from R157 billion to R2.7 trillion between 1990 and 2012, and the pension assets ratio to GDP in 2016 is 57 per cent of GDP (OECD, 2016). Davis (2005) and OECD (2016) estimates show that emerging markets average ratios of 12 per cent of GDP depending on the maturity and size of the economy. In comparison to most developing countries the South African pension fund market has more similarities with pension assets in developed economies.

In the following section we review the role of pension funds in capital market development.

2. The role of pension fund assets in capital market development

Pension funds are also referred to as institutional capital, in this environment significant contributions from pension funds are accumulated in financial markets. This is coupled with a changing regulatory framework for institutional investors. Walker and Lefort (2002) outline that the size of these investors is unique and requires a specific set of new financial instruments for investing sizeable amounts of wealth. The process requires a parallel development of regulation to be developed for this institutional capital, this includes laws, regulations and financial instruments that are managed by pension regulatory authorities. The growth in pension funds stem from the increased number of pensioners, who are referred to as clients, now represented on the financial markets by such institutional investors. The scale of investments is usually large, with several pension fund managers appointed by pensioners to act on their behalf through pension funds. This relationship between pension funds and

pensioners is governed by rules for investment levels in various asset classes, reporting guidelines, accounting standards and general auditing standards usually overseen by a pension and investment regulatory authority. It is these systems that indirectly lead to a more developed capital market system as both risk management and transparency is promoted. In the literature pension funds have been recognised to play a contributory role in the development of capital markets (Davis, 2006; Hu, 2005; Walker & Lefort, 2002 Davis & Hu, 2004; Rezk et al., 2009). The importance of institutional investors and pension funds is heightened in the context of developing financial markets in a market-based economy.

A country's ability to make large gains from pension funds is dependent on financial market structure. Preconditions must be met for pension assets to have a substantial contribution to the development of capital markets. Meng and Pfau (2010) argue that an important precondition is the level of financial development: the higher the level of financial development, the more significant the impact of pension funds. The indicators for the levels of financial development vary depending upon market efficiency, the level of transparency and pension fund investment regulations, specific macroeconomic conditions and the existing legal and regulatory framework.

In order to trace the effect of pension fund investment on growth, the paper will provide the channels through which this is possible. The theoretical linkages are outlined in detail below.

Pension assets differ from household assets as they have a long-term outlook. They provide long-term supply of funds to capital markets, leading to financial development (Meng & Pfau, 2010; Davis, 2005). Raddatz and Schmukler (2008) outline the contribution of pensioners in the long term as their contribution of funds through the provision of a stable source of funding (their pension savings) that acts as a source of capital in financial markets. This differentiates pension funds from other institutional investors such as mutual or insurance funds. It lies in the behaviour of liabilities, for instance pension investments are usually released upon retirement, thus offering financial markets systems stability from longer investment time horizons which other retail investors do not provide. Kim (2010) points out that pension assets differ from insurance companies due the illiquid nature of liabilities, in contrast to more liquid insurance and mutual fund investors. Secondly, pension liabilities are usually invested in shares rather than bonds. According to the Towers Global Pension Asset Study (2014 and 2015), the average global asset allocation of the largest pension markets was distributed largely between equities and bonds with equities 52 per cent, bonds 28 per cent and in the following year equities dropped substantially to 44 per cent with bonds slightly higher at 29 per cent. According to the FSB (2014), current South African private pension funds asset allocation is largely skewed towards insurance policies (44 per cent), with equities (18 per cent), bonds (8 per cent) and foreign investments (15 per cent). Pension funds in South Africa are also recognised as critical drivers of the development of the stock or local securities market and improve liquidity and depth of local bond and equities market. Stock market development has a positive and significant correlation with growth (Levine & Zervos, 1998; Caporale, Howells & Soliman, 2005; Beck &

Levine, 2004). The development of the bond market, bond exchange and investments in the sector can be directly linked to the emergence and growth of pension funds (Faure, 2007). Investment levels, productivity and growth are significantly correlated with stock and bond markets.

Raisa (2012) argues that no other investor is able to match the long-term nature and investment scale of pension assets. This requires pension funds to draw on and increase exposure in private and government bonds on the domestic markets, with variants such as inflation-linked or zero coupon bonds.

The size of pension assets enables them to hold greater proportions of equities and bonds than households (Davis, 2006). Empirical work by Hu (2005) found that as pension assets increase in size they encourage private bond finance in both the short and long run. Raddatz and Schmukler (2008) argue this is the reason why several scholars agree that pension funds increase the depth of markets due to increased demand for investment instruments. Impavido and Musalem (2000) explain that pension assets cause a rise in the demand for shares and bonds. The behaviour of pension funds as holders of these equities, bonds or cash changes the demand of the various market based instruments. Granville and Mallick (2002) argue that the growth, particularly in pension funds and life insurance products, determines whether or not the savings effect is positive. Secondly, an increase in pension fund investment promotes market liquidity and an increase in trading volumes. As the growth of pension funds occurs, it is coupled with a rebalancing of portfolios which now allocate assets

into new bonds and equities (and other instruments). Vittas (1999) terms this the attainment of a critical mass, referring to the increased scale of participation and ownership of pension assets on bond, equities, properties and other securities. This effect of depth from significant increases in assets accumulated across bond, equities, properties and alternative investments is supported across the literature (Impavido & Musalem, 2000 Vittas, 1999; Walker & Lefort, 2002; Kim, 2010; Meng & Pfau, 2010). Pension funds as institutional investors over time require diversification across portfolios, Chan-Lau (2004) refers to the optimal asset allocations which see diversification of a pension fund across different asset classes. Optimal portfolios are founded on the modern portfolio theory encouraging portfolio diversification which holds benefits such as protecting against inflation, hedging risk and protecting returns, allowing for investment into equities and bonds in either foreign or domestic capital markets.

It is however possible that pension asset growth may exceed the development of and growth of securities markets, as was the case in Eastern Europe and Latin America (Chan-Lau, 2004). Risk aversion and investment guidelines limiting investments in asset classes and low bond or equity issuance in developing markets result in few listed companies holding assets of the size required by pension investors, leading to significant concentration of assets invested in a few listed entities and government-related bonds. Chan-Lau (2004) lists several emerging markets with sizeable holdings in fixed income securities ranging between 40 to 90 per cent of holdings of pension fund portfolios. The high volume of pension funds enables them to achieve substantial exposure to a

variety of asset classes beyond bond and equity asset classes. The Public Investment Corporation (PIC) is South Africa's largest asset manager, representing almost half the total non-banking financial assets (49 per cent): this shows how pension funds in South Africa have broadened the depth of capital markets (Moleko & Ikhide, 2016). As at March 2015, PIC allocated 34 per cent of its portfolio to bonds, 48.68 per cent to equity, money markets and cash receiving a combined 10 per cent and the remaining asset classes allocated the remaining portion (PIC, 2015). Between 2007 and 2015 we have seen the allocation of equity remain steady at 48 per cent and local bonds at 35 per cent, while there has been a decline of cash and money market from 10.6 per cent to 4.46 per cent during the period. Offshore bonds and equities allocation have received between 5-6 per cent of PIC assets over the period. Both bond and equity market liquidity would appear to be positively influenced by such trades in both primary and secondary markets of trade turnover ratios (Kapingura & Ikhide, 2015).

Pension assets economies of scale enable them to also contribute indirectly to financial development. Pension assets behaviour enables them to contribute to lowering transaction costs and diversifying risk, and holds superior ability to process information (Davis & Steil, 2001; Raisa, 2012; Enache, Milos & Milos, 2015; Walker & Lefort, 2002). There are several reason for this: the first is that pension funds can be held responsible for enhanced competition on financial markets as they have a higher demand for shares and bonds on local markets. Diversification of portfolios is a necessary strategy for reducing risk, increasing the diversification of financial instruments in financial markets. The scale of

transactions for pension funds has spillover effects such as increased innovation that promotes efficiencies and lowers the direct cost of issuing financial instruments, reducing transaction costs. Additional spillover effects include the employment of experts and professional investment managers by pension fund managers, this tends to improve infrastructure and further develops information technology, as pension funds can simultaneously intensify the acquisition of systems and personnel to manage both risk and portfolios.

Government regulation may curtail the pension fund industry if restrictive regulations with excessive government influence guide investment decisions. These may limit optimal portfolio allocations, reducing returns as they are forced by regulations to invest in various asset classes to the detriment of portfolio performance. Government restrictions on investment are necessary to prevent any single investment receiving more than the maximum listed to limit concentration of risk in a single asset class, leading to reduced portfolio returns.

It is also argued that pension funds receive significant commissions and fees and are thus able to hire skilled professionals who not only manage pension funds, but reduce and diversify risk. Increased specialisation occurs as a spinoff, usually leading to diversified financial instruments and improved systems for valuing and gathering information on current and future investments for best returns (Impavido & Musalem, 2000 Raisa, 2012; Walker & Lefort, 2002; Thom, 2014). Professionals provide innovation in the development of new instruments such as CDOs, zero coupon bonds, asset backed securities, futures, CPI indexed bonds,

mortgage-backed securities and derivate instruments. The allocation of funds directly affects trading patterns, and the ability to allocate these assets is what affects capital market development.

Table 1 shows the distribution of assets between the years 1981-2013. The last three decades have seen considerable changes in the asset portfolios of privately managed pension funds. According to data from the Financial Services Board Pension Funds Registrar, the biggest allocation of pension assets now sits with insurance policies, almost doubling at the advent of democracy in 1995 at 24.6 per cent, 46 per cent in 2008, to 40.7 per cent in 2015.. Unit trusts, now also referred to as collective investment schemes, received a quarter of allocation from their higher levels of 25 per cent in the mid 1980s to 6 per cent in 2008 and 7.2 per cent in 2015.

Table 1 below shows the investment asset allocation of South African pension funds reported annually by the Financial Services Board, trends are shown from 1981-2011. The information provided below reflects the available data sourced from the FSB Annual reports, after 1994 reports incorporate investment patterns of self administered funds. Privately administered funds contributed R1.1 trillion, at 47% in 2011 of total R2.4 trillion aggregate asset value of South African pension funds. Post democracy we see the pension funds allocated almost half of pension assets onto equities, likely due to financial market liberalization but as markets stabilized the market allocation has stabilized to 20% (2008) and the total allocation to listed and unlisted equities, and other domestic equity index linked instruments totalling 18.1 per cent in 2013. The

most significant decline in asset allocation is the reduction of assets to bills and bonds issued by the government through state-owned enterprises, provincial administration or local authorities. The reasons for the decline is largely due to legislative changes, with the regulatory framework no longer enforcing exposure (through minimum requirements) to government, municipal or state-owned enterprise bonds. The effect has been a reduction from 22.4 per cent in 1981 to 7.2 per cent in 2008, down to 7.8 per cent in 2013 of total bills and bonds. The allocation of state-owned enterprises and government administration was accounted for separately and it is now probably included in total bills and bonds. This declined from being almost a quarter of pension asset allocation in the early 1980s at 25 per cent to the 7.8 per cent combined in the total bills and bonds. The effect of its inclusion in an already declining total bills and bonds allocation shows the contribution is now insignificant. Other assets. which include derivative instruments and unit trusts up until 1982, remains small at less than 2 per cent in the last three decades. It is arguable whether increased assets have increased the number of assets in the case of South Africa. Instead it would appear that overall the allocation has done quite the opposite. These trends are quite surprising and further investigation of the composition of insurance policies is required.

Table 1: Investment by Asset Class of SA Pension Funds

	1981	1987	1991	1995	1999	2002	2005	2008	2011	2015
1. Immovable properties	5.8	5.9	4.8	4.3	3.6	1.1	0.6	1.1	0.7	1.2
2. Bills and Bonds	22.4	17.9	9.4	12.6	12.0	10.5	8.6	7.2	7.5	8.5
3. Bills and Bonds issued by government or provincial administration	9.1	3.6	0.5							
4. Bills and Bonds issued by local authorities and administration boards	8.2	7.0	3.6							
5. Bills and Bonds issued by Rand Water Board or Electricity Supply Commission	7.9	0.3	2.6							
6. Bills and Bonds issued by Land and Agricultural Bank and SARB	4.5	0.7	0.5							
7. Loans	6.3	1.4	0.5	0.3	0.6	0.8	0.1	0.1	-	-
8. Debentures	8.7	6.6	10.2	0.7	0.2	0.6	0.1	1.1	1.1	?
9. Deposits and savings accounts	15.6	19.5	24.4							
10. Equities/Shares in companies				47.7	34.3	29.3	23.3	20	18.8	17.6
11. Collective Investment Schemes/Unit Trusts		24.4	33.3	1.5	5.8	6.2	5.5	6.6	7.9	7.2
12. Insurance Policies				24.6	28.2	35.0	47.6	46	45.9	40.7
13. Deposits and Krugerrands	-			7.5	7.0	6.7	4.3	6.3	5.1	4.3
14. Foreign Investments				-	-		7.8	9.9	11.8	18.8
15. Other Assets	17.0	12.7	10.2	0.8	8.3	9.8	2.1	1.7	1.2	0.11

Source (Financial Services Board, 1981-2015) [3]

[3] FSB's annual reports outline the investment pattern for pension funds for each period. Until 1994 the reports reflected only the self-administered, state-controlled and foreign funds. The annual reports show that from 1994 to date investment patterns remain isolated to self-administered funds. The question arises what constitutes insurance policies: are they also allocated to bonds and shares/equities? Without clarity on this the table can be misinterpreted. The definition is not clear in the annual reports.

Pension funds trigger innovation in financial systems. New instruments, the modernisation of infrastructure and improved regulations occur as a consequence of the development of pension funds (Davis, 2006). Pension funds contribute to the loan and securities market, improving competitiveness as they compete with the banking sector. It is argued that efficiency and a reduction of transaction costs and market volatility occurs as lending rates, and spreads are lowered, reducing firm and household costs for accessing capital (Davis, 2005). Pension fund assets reduce dividend yields and increase price-to-book ratios, indicating a decline in the cost of capital (Walker & Lefort, 2002). This is also enhanced when concurrently increased corporate governance and liquidity is experienced.

Impavido and Musalem (2000) argue that a benefit of increased pension savings is enhanced competition, efficiency and modernisation of the securities market. This occurs as fund managers increase their participation in the bond and stock markets, which is followed by competitive bidding on bond and stock issues. Stock exchanges are at times restructured and technology is introduced to manage increased trading volumes. As pension funds and their scale increase on the market we see settlement systems and professional specialisation. Capital markets make gains from improved governance as a result of increased pension funds activism; this is heightened as at times they represent minority interests (Raisa, 2012), putting a focus on companies being more transparent, improving company disclosures and boosting the execution of good governance.

Some of the benefits of institutional investors include a reduction of transaction costs and market volatility, coupled with greater transparency and market efficiency (Davis, 1995). A reduction of transaction costs is explained by the effect of pooling large assets in deals, some of which invest in indivisible assets, an example being properties. Davis (2005) argues that due to their scale, pension fund investments are concentrated in assets whose returns are weakly related. As fund managers seek to improve diversification whilst compensating for risk, these asset portfolios also invest in specific assets which show long-term yields. The impact on capital markets is on both the volume and prices of specific instruments. The efficiencies gained are price reduction in asset classes such as corporate bonds, equities and other securitised debt instruments, with a simultaneous decrease in prices of the asset classes as the supply gains from economies of scale are realised in the securities market.

3. Empirical background, evidence of linkages between pension fund assets and capital market development

The empirical literature on the contribution of pension fund assets on overall capital markets has been focused largely on developed countries and developing economies in Eastern Europe and Latin America. The strength of the relationship between pension fund assets and capital markets development differs between countries and the level of financial development is pointed out as the likely cause (Enache, et al., 2015).

One of the earliest studies showing a strong correlation between pension fund assets and financial market development used a financial market index. These indicators examined total factor productivity and output linkages and capital stock accumulation levels in Chile (Holzmann, 1996). The results showed that pension funds resulted in deeper and more liquid financial markets. Schmidt-Hebbel (1999) pointed out that very little empirical analysis had investigated the linkages between pension system funding and economic growth through capital market development. This is one of the reasons for more empirical analysis.

In looking at the impact of pension funds on Asian financial markets, Hu (2012) used the panel error correction model for 10 Asian countries over the period 2002-2008. The results showed a positive relationship between pension fund assets and the development of financial and capital markets. The study used variables including the banking sector, bonds and the stock market. In another study the linkages between pension assets and economic growth using datasets of 59 countries split between OECD and non-OECD, contrasting results were found (Zandberg & Spierdijk, 2010). This indicates that pension funds may lead to financial development through specifically capital market development, but the relationship need not automatically translate to a positive growth impact. Hu (2005) investigated pension reform, growth and financial development in empirical work combining developed (21 OECD) and developing countries (38 EMEs) using Granger causality. He establishes several advantages pension funds hold for capital market development, such as information provision, incentive challenges, risk management, the clearing and settlement of payments, share subdivision and assembling, and the transfer of resources in different times and

spaces by smoothing consumption through asset accumulation. He found that relationship between pension assets and growth was negative in the short run, but positive in the long run. Contrasting results by Zandberg and Spierdijk (2010) using OLS estimation found no relation between funding of pensions and economic growth. The paper argued that once capital market returns and demographic developments were controlled for, the causality disappeared.

The fact that capital market development may not always lead to growth does not reduce the positive impact that institutional investors exhibit on the levels of financial development. Using vector error correction model and Granger causality, Sibanda and Holden (2014) found no linkage between institutional investors and gross capital formation. The results however showed that there was co-integration between institutional investors and financial development in South Africa. The proxies used in this study could be further developed to include both stock and bond markets, which was lacking in their study. It is clear in empirical literature that pension fund growth is strongly associated with capital market development (Meng & Pfau, 2010; Kim, 2010; Raisa, 2012; Walker & Lefort, 2002; Poirson, 2007). Walker and Lefort investigated the hypothesis of pension fund reform and its impact on capital market development in mostly emerging market economies. The results show that pension funds reduce the cost of capital, lower prices of securities, increase trading volumes and reduce volatility. However others argue that volatility is not necessarily reduced (Kim, 2010). The same pattern exists in 15 European Union countries using the OLS and EGLS estimation technique between 1994-2011. The results show that growth of pension funds exhibit positive spillovers on stock market

development. The contribution made by Kim (2010) and Meng and Pfau (2010) is the measurement on capital markets including both stock and bond markets in empirical testing. Kim's (2010) examination of 37 was mainly developed countries using VAR and GMM estimates showed that the growth of pension funds does stimulate the economy. A different LSDV technique was used by Meng and Pfau (2010) for a longer time period, from 1980-2008, with a combination of developed and emerging countries. This research highlighted that indeed pension funds do impact capital market development but only in countries with high levels of financial development, showing the variation of intensity across countries and outlining necessary fundamental requirements. Factors such as macro and economic conditions, market efficiency, transparency and the regulatory framework of financial markets were the differentiating factors.

Thom (2014) investigated the impact of pension funds on particularly stock markets within South Africa. The results overall show a positive linkage between pension funds and stock market development between 1985-2013 using Johannsen Cointegration and VECM to examine the linkages. Trading volumes also showed a positive relationship with increasing levels of pension fund assets. The contrary was experienced with stock market volatility, with increased investment from pension funds reducing volatility.

This paper investigates further the influence of pension funds on the overall financial market system by including bond market impact in the empirical analysis. The allocation of privately administered funds is across various asset classes mainly bonds, insurance policies, shares and foreign investments. Meng

and Pfau (2010) included both stock and bond market proxies as a measure for capital market development and 32 countries were clustered according to the level of financial development. Using LSDVC estimation the regression results show that countries with low levels of financial development exhibited no linkages between pension fund assets and capital market development, while countries with high levels of financial development showed strong linkages between pension fund assets. South Africa was included in the sample countries and was classified as a highly financially developed country with the sample period 1994-2008. The paper uses panel data methodology that makes it difficult to isolate heterogeneity in the results. In this paper we shift away from aggregate results and use a data set that is more comprehensive to identify the impact of pension assets on a wider array of proxies in South African capital markets. Inclusion of a proxy that measures capital market development that is not focused on only the stock markets will enable us to understand the transmission effect of pension assets on capital markets.

4. Data and variables

4.1 Data

The dependent variable is a proxy for capital market development which measures the separate impact of stock and bond markets, due to the structure of the financial system in South Africa. Literature uses stock market capitalisation as a percentage of GDP and the less commonly used bond market capitalisation as a percentage of GDP. Meng and Pfau (2010) exclude public bonds, stating that government fiscal stance influences public bond issuance. Government bonds are argued to have a significant impact on the secondary market development since

these are traded in the secondary market and respond to market returns (Faure, 2007). Therefore private and public bond market capitalisation effects are measured using total assets of direct investments in debt instruments for private bond market and for public debt. Stock market capitalisation as a percentage of GDP is measured from 1975-2012.

The data used comprises annual data taken from the World Development Indicators (WDI) between 1965-2013. The data for stock market capitalisation is available from 1975-2015 from the World Bank WDI. Total pension fund asset data for the period 1965-2013 is derived from the Financial Services Board's Annual Reports, issued annually by the South African Registrar of Pension Funds. The asset level of portfolio investments in debt securities is derived from the IMF Datasets from 1965-2013.

Investments in debt securities is defined as cross-border transactions and positions involving debt securities. These investments allow residents in one economy to have a degree of influence or management on financial instruments in another economy. This is a dependent variable used as a proxy for private and public sector bond market capitalisation.

Stock market capitalisation is defined as the market value of shares as a percentage of GDP. This is a dependent variable used as a proxy for stock market capitalisation. The natural logarithm is used with a higher level of financial sector development associated with the enhanced capability of financial intermediaries to mobilise savings to capital for investments. We expect higher

levels of financial development as measured by private sector domestic credit to increase the impact on market capitalisation.

Inflation rate is measured by the change in consumer price index (CPI) and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. CPI is also a measure to estimate macroeconomic stability and is an indicator for monetary policy. The natural logarithm is used and we expect inflation to have a negative effect on capital market development.

Private sector credit is defined as all domestic credit provided by the financial sector which is a common indicator measuring the levels of financial sector development. The natural logarithm is used with a higher level of financial sector development associated with the enhanced capability of financial intermediaries to mobilise savings to capital for investments. We expect higher levels of financial development as measured by private sector domestic credit to increase the impact on market capitalisation.

Interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator: the natural logarithm could not be used due to the period of negative real interest rates in the economy. The effect of interest rates on particularly the bond market must be controlled for as the change of yields has an impact on the demand for stocks and bonds. We expect that a rise in yields is likely to decrease the demand for stocks, and the expected sign is negative.

Pension fund assets are all privately administered funds, underwritten funds, Government Employee Pension Fund, Transnet funds, Telkom Pension fund, Post Office Retirement Fund and foreign funds. We expect an increase in pension fund assets to have a positive effect on the growth of capital markets, thus a move in a positive direction with capital market development.

The variables selected in this study follow those used by several studies that measure the impact of pension assets on capital market development, especially those measuring the determinants in South Africa for capital markets, both bonds and share markets: bond market capitalisation (Adelegan & Radzewic-Bak, 2009; Thumrongvit et al., 2013; Rocholl & Niggemann, 2010); stock market capitalisation (Rocholl & Niggemann, 2010; Catalan et al., 2000; Kuluratne, 2002; Thom, 2014; Zhou, Zhao, Belinga, & Gahe, 2015); private sector credits (Kuluratne, 2002; Thom, 2014; Zhou et al., 2015), and macroeconomic indicators, interest rates and inflation (Kuluratne, 2002; Pradhan et al., 2016; Raisa, 2012; Thom, 2014 Zhou et al., 2015).

The analysis sought to include the levels of financial liberalisation, in order to measure the ability to trade and invest on stock and bond markets with minimum regulatory limitations. The proxy used in several studies is foreign direct investment outlining the level of the market's openness to international trade. It is expected to have a positive effect on the level of capital market development. The results were however unable to show significant cointegration in models including this variable.

4.2 Model specification

The Autoregressive Distributed Lag (ARDL) bounds testing econometric approach was used to determine the cointegration of the variables in this study. ARDL allows for analysis regardless of the levels of the stationarity, provided that none of the variables are I(2). Pesaran (2001) states that ARDL offers a new approach in testing relationships where regressors' stationarity levels are a combination of purely I(0) or I(1). The results of the stationarity tests in this study show that most of our variables are I(1), with only one variable I(0) at 10 per cent. Chowdhury (2012) states that ARDL is useful for small sized samples, as the model is better than other approaches due to its ability to robustly model against autocorrelation and simultaneous equation bias. This cannot be argued to be relevant in this instance where our time series exceeds 40 years. Perhaps the most advantageous reason for this estimation technique is the ability to take an adequate number of lags. Pesaran (2001) makes use of Schwarz Bayesian Criterion and the Akaike Information Criterion for appropriate lag selection per variable. Ozturk and Acaravci (2010) state that the ARDL procedure enables a model to have a variety of optimal lags which is not possible with other cointegration procedures. The dependent and independent variables are permitted to have different lags for different variables. This benefit is described as enabling the past values to impact the present value (Ajilore & Ikhide, 2013). Lastly, ARDL estimation is able to produce t-statistics that are valid and unbiased in the long run, differentiating it from the other more commonly used co-integration estimation techniques (Odhiambo, 2010).

The framework that will be used for estimating the contribution of pension assets to both bond and stock market development will include the control variables *Private Sector Domestic Credit, Inflation, Real Interest Rates* and *Pension Assets.* Different combinations of explanatory variables are used, as shown in the different estimations.

The dependent variables Debt Investments securities is used in Model I, while Model II uses the dependent variable stock market capitalisation. These two models are estimated to measure the overall impact of pension fund assets on capital market development. Variables are in logarithms (LN) except for real interest rates that have negative variables, this is factored in the interpretation of the results. Our model specification is formulated as follows:

$$Ln(BOND)_t = \alpha_0 + \beta_1(PSC)_t + \beta_2 Ln\,(INFL)_t + \beta_3 Ln\,(INT)_t + \beta_4 Ln\,(PFA)_t + \varepsilon_t \quad (1)$$

$$Ln(STK)_t = \alpha_0 + \beta_1(PSC)_t + \beta_2 Ln\,(INFL)_t + \beta_3 Ln\,(INT)_t + \beta_4 Ln\,(PFA)_t + \varepsilon_t \quad (2)$$

where *LnPENSION* represents the log of total pension assets which is used to measure pension savings, *LnINFL* represents the log of inflation which is used to proxy monetary policy, *LnPSC* represents the log of private sector credit, which is a proxy for the level of financial development and structure, *INT* represents the level of interest rates that is used to measure macroeconomic stability, subscript

t represents the time index and ε_t represents the residuals. We estimate the dependent variable *LnBOND* which represents the level of investment on the bond market in the first model. In the second model we run *LnSTK* represents the stock market capitalisation as a percentage of GDP. Both *LnBOND* and *LnSTK* act as proxies for capital market development.

The second step in this paper is once we have established the effects of pension funds on our dependent variables, we augment the study by using VECM and variance decomposition. VECM allows us to measure the robustness of our findings, and also allows us to measure feedback effects between the variables. The variance decomposition extends the study by showing the effects of shocks for the variables in the model and further supplements the ARDL results. It outlines the contributions from each variable in the presence of a shock.

5. Results and empirical analysis

5.1 Unit root test

The Augmented Dickey Fuller and the Phillips Peron were employed to determine the order of integration of the variables. It must be noted that with the ARDL the variables can be I(0) or I(1), however they cannot be I(2). The stationarity test was to help eliminate any variables that do not satisfy this condition. The variables are all I(1). We can reject the null hypothesis that there is a unit root at levels, at first difference the variables are I(1). Given the fact that the majority of variables are I(1) we are able to proceed with the cointegration method.

Table 2: Time series unit root test

	LEVELS				FIRST DIFFERENCE			
	ADF	ADF	PP	PP	ADF	ADF	PP	PP
Tstatistic	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept
Ln PSC	-0.5391	-2.3357	-0.4819	-2.3357	-5.7634*	-5.6802*	-5.9028*	-5.8099*
Ln INFL	-1.0463	-4.1947**	-1.8914	-4.1156*	-9.9926*	-9.9852*	-10.8131*	-11.7556*
Ln INT	-3.3248**	-3.5455**	-3.3402**	-3.5267***	-7.7142*	-7.6145*	-8.6501*	-9.5178*
Ln PFA	-3.2234**	-0.3429	-2.9756**	-0.3429	-4.05473*	-5.0309*	-4.0964*	-4.9900*

The asterisks *denotes the level of significance, therefore showing the rejection of the null hypothesis at 10%***, 5%** and 1%*

The variables are stationary at I(1) and I(0), we see that LnINT is I(0) and that LnPSC is I(1). LnINFL and LnPFA are a combination of I(0) and I(1). This result tells us that the variables will allow the estimation to exhibit valid results. We can reject the null hypothesis of a unit root in the series and we can investigate the existence of a cointegration relationship. When using the ARDL procedure the variables can be a combination of I(0) and I(1), however variables that are I(2) cannot be included in the estimation. None of our variables are integrated at second difference, we can thus continue in our estimation.

5.2 Cointegration test

The bound testing procedure is used to determine whether there is a long-run relationship between capital market development and pension assets and other independent variables. According to the F statistic the null hypothesis of no cointegration can be rejected at the 1 per cent significance level for both models. The computed F statistic of each model is shown below, they must lie above the upper critical bound at the 5 per cent level in each model if there is a long-run relationship between the independent variables and capital market development in stock or public and private bond markets. The F statistic 4.629>4.37 and 5.156>4.37 both lie above the upper critical bound and show that there is evidence of a long-run relationship in both models.

Table 3: ARDL Bounds Test for cointegration

Computed F Statistic	Model 1	Model 2
	4.6292	5.1566
Critical bounds (10%)	LCB 2.2	UCB 3.09
Critical bound (5%)	LCB 2.56	UCB 3.49
Critical bound (2.5%)	LCB 2.88	UCB 3.87
Critical bound (1%)	LCB 3.29	UCB 4.37

Both models exhibit no sign of conflicting residual diagnostic assumptions, there exists no serial correlation or heteroscedasticity in measuring the relationship between LnBond, LnSTK and their respective arguments. The models are both stable using the CUSUM and CUSUM squares test and normal distribution is confirmed, thus fulfilling all residual diagnostic criteria. All tests confirm the appropriateness of the models.

5.3 Error correction representation

The Wald test shows that pension assets (*LnPFA*) do not cause or influence the bond market in the short run. When investigating the causality in both models the Wald test does not show causality between *LnPFA* and capital market development. The probability for the test statistic in both models is 0.55 (*LnSTK*) and 0.54(*LnBOND*), it is not statistically significant. The results in Table 4 show the short-run relationship, which reveals that *LnPFA* is not significant at t statistic -0.57 with corresponding probability levels of 0.56 for LnBOND and t statistic 1.08 and probability of 0.28 for *LnSTK*. Although the *LnPSC* shows a significant relationship in both estimations, the same result is seen in the short

run for *INT* when *LnSTK* is the dependent variable. We see that in the short run *LnPSC* and *INT* are significant and correctly signed. This means that in the short run *INT*, *LnPSC* are in part responsible for changes in capital market development, but *LnPFA* do not cause changes in capital market development. The short-run results are shown in Table 4.

Table 4: Short-run cointegrating form

Variable	Regressors	Coefficients	(t-stat)
BOND (1,0,0,2,0)	ΔLNPSC	1.812432**	2.483843
	ΔLNINFL	-0.507926	-1.614738
	ΔINT	-0.066920*	-3.836329
	ΔINT(-1)	0.026192**	1.719082
	ΔLNPFA	-0.152640	-0.575270
	ECM(-1)	-0.399213*	-4.683035
STOCK MARKET (1,1,0,0,0)	ΔLNPSC	1.300569*	3.025994
	ΔLNINFL	0.079560	0.497064
	ΔINT	-0.015750	-1.610056
	ΔLNPFA	0.175254	1.081959
	ECM(-1)	-0.908911*	-5.675011

Note: *denotes the level of significance, showing the rejection of the null hypothesis at 10%***, 5%** and 1%* level of significance. The null hypothesis is that the independent variables cause BOND and STOCK MARKET in the short run.

Having shown in the F-bounds estimation that there exists a long-run relationship between the variables, we are also able to see the level of disequilibrium in the cointegration relationship from the error correction term. They are significant and correctly signed at the 1% level, supporting

cointegration between capital market development and all the independent variables.

Having established that there is cointegration we can estimate the vector error correction model (VECM). To determine if there is long causality from the dependent variable to all its variables and their lags, variables must be co-integrated as a necessary condition. Using VECM/Block Exogeneity estimation we are able to test the robustness of our findings and also show the direction of causality. In the instance of *LnSTK* we find that there is pension-led market capitalisation. The error correction term is significant and in the right direction at -0.94%, with a corresponding t statistic of -2.57. There is a uni-directional causality as none of the other variables exhibit significant cointegration equations. In contrast, for *LnBOND* there is no evidence of pension-led market capitalisation. The causality relationship between capital market development indicators in both stock and bond markets is summarised in Table 5.

Table 5: Causality results based on VECM

Dependent variable	Lag	Pension led market capitalisation		Market capitalisation led pension growth	
		T stat (Standard error)	ECT	T stat (Standard error)	ECT
STOCK	1	[-2.57621]* (0.36543)	-0.941415	[1.16768] (0.12570)	0.146778
BOND	2	[-1.12414] (0.10769)	-0.121062	[1.66475] (0.01993)	0.033184

Note: The t-statistic is reported in parenthesis[ ]. The asterisks indicate the significance of the variable.

We are able to conclude that there is pension-led market capitalisation using stock market development (market capitalisation as a share of GDP) as a proxy for capital market development.

5.4 Variance decompositions

The VECM that is shown in Section 5.3 shows us the results for testing causality, however the relative strength of the cointegration is done by applying shocks to the estimation. In extending the VECM we apply the decomposition error variance to outline contributions from each variable, in the presence of a shock to all the variables. When the variables were decomposed Figure 1 below shows us the estimations for all the variables. There are five variables in our system, and the functions show the behaviour of each variable to the shocks in the system. We show the movement of each sequence, from either a shock from other variables or its own shock. The results for variance decomposition for stock market development show that regarding the capital market of South Africa, market capitalisation has a high impact at 80.51 per cent, followed by interest rates responsible for a variation of 7.25 per cent. The highest influence on capital markets is itself, followed by interest rates. We can see that the variable of interest pension assets is influenced by 67 per cent variation in itself, that an 11 per cent variation can be caused by a shock to both interest rates and private sector credits, and that inflation affects 8 per cent of the variation of pension assets.

Table 6: Variance decomposition for analysed indices for both bond and capital markets

Market Capitalisation/ Bond Investments	MARKET_CAP	PSC	INFLATION	INTEREST	PENSION_ASSETS
Stock	80.51%	6.23%	2.12%	7.25%	3.89%
Bond	84.56%	2.45%	2.61%	8.51%	2.45%
Domestic Credit to Private Sector					
Stock	12.40%	59.74%	6.08%	4.77%	17.01%
Bond	9.88%	31.49%	39.12%	2.24%	17.27%
Inflation					
Stock	1.27%	37.97%	53.64%	4.38%	2.74%
Bond	10.67%	11.49%	72.55%	0.69%	4.59%
Interest Rate					
Stock	7.75%	22.34%	42.70%	26.36%	0.86%
Bond	21.25%	4.73%	52.59%	19.33%	2.10%
Pension Assets					
Stock	1.40%	11.79%	8.48%	11.02%	67.31%
Bond	12.92%	19.84%	16.40%	5.63%	45.21%

Note: The percentages are computed over a time horizon of 35 lags.

In Table 6 we see the variance decomposition presented for bond market development compared to stock market development. The results for variance decomposition for bond market development show that investments in the bond market have a higher impact of 84.56 per cent on itself, followed by interest rates at 8.51 per cent. Pension assets, on the other hand, have a lower 45.21 per cent variation on itself, it seems that a shock in pension assets has a far lower impact in bond markets, with a much higher variation of 19.84 per cent caused by private sector credit shock, closely followed by a 16.40 per cent inflation level shock. What this means is that a shock in private sector credit and inflation has a greater influence in the variation in pension assets, in the context of bond markets. In contrast stock markets pension assets see a greater effect from a shock of interest and private sector credit.

5.5 Long-run estimation

The variable of interest produces mixed results: in the case of the stock market as a dependent variable we find it has positive results, whereas in the context of stock markets a 1 per cent increase *LnPFA* results in a 0.22 per cent effect on stock market development. This is confirmed as expected by Yartey and Adjasi (2007) when pension savings are identified as an important determinant in stock market development. These results are similar to Thom (2014), Impavido, Musalem and Tressel (2003), Raisa (2012), and Catalan et al. (2000) using a different methodology. In the case of the bond market as a dependent variable we find it has insignificant results. One of the reasons for the insignificant effect on *BOND* is that equities have historically received the bulk of institutional investment and have been heavily relied on for sources of finance on financial

markets in South Africa (Faure, 2007). Although this has changed in recent years with the development of the bond market, combined with financial markets ratings of the SA bond market, the increased participation in the bonds market by institutional investors (both foreign and domestic) has not yet shown significant positive results due to lagged effects. The results show that the best channel for pension assets to affect capital market development is through the influence of stock markets.

The ARDL cointegration results are confirmed by the VECM estimation results, which reveal that in the long run *STK* has a positive relationship with all the independent variables. The speed of adjustment shown by the error correction term is significant. All the variables, including pension fund assets, cause stock market development. In the case of *BOND* as the dependent variable, the results show that the variables do not jointly cause bond market development. *INFL* shows a positive long-run relationship with BOND and stock market development.

In the long-run ARDL estimation we find that interest rates are both significant and have a negative effect on overall capital market development. A 1 per cent increase in interest rates results in a 1.73 per cent and 22.69 per cent decline in *STK* and *BOND* respectively. It is confirmed, however, that the higher cost of financing as measured by higher interest rates tends to negatively affect the liquidity in both these markets (Yartey & Adjasi, 2007; Enisan &Olufisay, 2009; Kapingura & Ikhide, 2015).

Inflation has a negative relationship with *BOND* which confirms that high inflation has a negative effect on capital market development. In the study done by Kapingura and Ikhide (2016), bond liquidity is shown to be negatively affected by inflation and the stock market index. Inflation rates are outlined as a significant determinant in bond market development.

Table 6: Summary of results for long-run ARDL coefficients

Regressors	BOND (1,0,0,2,0)	STOCK MARKET (1,1,0,0,0)
C	-7.906527	1.038484
	(-1.239481)	(0.823926)
	[0.2248]	[0.4161]
LnPSC	5.124414**	0.205866
	(2.357999)	(0.486086)
	[0.0251]	[0.6302]
LnINFL	-0.849726***	0.086491
	(-1.740646)	(0.714947)
	[0.0920]	[0.4798]
INT	-0.226229*	-0.017309*
	(-4.888761)	(-2.108152)
	[0.0000]	[0.0429]
LnPFA	-0.434551	0.222964*
	(-1.239481)	(2.987930)
	[0.2248]	[0.0054]

The parentheses show t statistics (….) and P values […] respectively

The positive impact of *PSC* is as expected, it is outlined as a precondition in the development of the stock market (Yartey & Adjasi, 2007; Zhou et al., 2015). The increased ability of the South African financial system to mobilise capital and allocate it towards private sector credit enhances its operations. Furthermore, a more developed banking sector offers greater support for capital market development. Infrastructure such as interbank markets offer support services that positively affect the rate of development. Our results show that a 1 per cent increase in *PSC* increases bond market development by 5.12 per cent, and the relationship is positive in stock markets although it is not significant.

South Africa is classified as a developing economy however the financial sector exhibits traits similar to those in developed economies with regard to scale, sophistication and levels of development. The positive impact of financial intermediation is also confirmed in some studies, with the mobilisation of savings by the financial sector showing indirect positive effects on per capita GDP (Kuluratne, 2002).

6. Conclusion

In this paper the impact of pension fund savings on bond and stock market development is investigated using South African time series data. Stock and bond market development proxies measure the impact using ARDL and VECM estimation techniques for robustness. It can be concluded that pension funds have indeed positively affected the growth of stock market development, but this cannot be confirmed in the case of bond market development from our

estimations. It can be confirmed that a higher level of financial sector development causes a higher impact of pension funds on overall capital market development.

Secondly the Block Exogeneity tests within the VECM framework show a unidirectional relationship between pension funds and only stock market development. Despite the high degree of financial development and capital stock in South Africa, the ability to mobilise these savings for investments in the bond market that translate to increased bond market capital market developments is insignificant. This shows that pension funds' ability to allocate assets that contribute significantly to the local bond markets development requires further analysis: as it currently stands, their impact is limited.

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