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Pension Fund and Capital Market Development in Nigeria: ARDL Bound Testing Approach

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Abstract

Economies require investments for sustainable growth and development and the capital market is one platform for the mobilization and allocation of savings critical to growth and development. The pension fund is a long-term retirement benefit for employee thus, the objective of the study is to examine the long-run connection between pension fund and capital market development in Nigeria using ARDL bound testing approach. The result discloses the existence of long-run co-integration between the variables and the system reverts to long-run equilibrium at the rate of 113%. The study also found the short-run causality running from pension fund assets to capital market at 10% significance level and causality running from inflation to capital market at 5% significance level but no short-run causality running from real interest rate to capital market. The study, therefore, recommended that the accumulated pension fund asset in Nigeria requires market discipline for investment in the capital market. The channelization of the pension fund investment and management plans as a policy response to the market can revamp to the bullish trend and positively influence the attitude of investors in the Nigerian capital market.

Keywords: Co-integration, Causality, Pension Fund, Capital Market Development

JEL Classification: C58, G20

Paper Classification: Research Paper

Introduction

The attention of policymakers in Nigeria is now on pension fund as a means of facilitating infrastructural development that will facilitate economic growth and development. In line with this, Ministry for Works, Power and Housing in Nigeria suggested that government should access the contributory pension for infrastructural development. The pension fund has grown to over N2 Trillion in 2016. Pension funds have been known to be one of the most important institutional investment in the world capital markets.

The colonial administration introduced the administration of pension in Nigeria by 1951 through the legislation of the Pension Ordinance (retroactively from January 1946). The Ordinance provided the opportunity of gratuity and pension payment during retirement for retirees of public establishments (Ahmad,2006). In 1961, a scheme known as the National Provident Fund (NPF) was introduced as the foremost retirement benefit structure that caters to pension issues in private organizations and it made provision for single lump sum retirement benefit for the employees in the private organisations in Nigeria. NPF was a structure where the workers and the organisation contribute, on a monthly basis, the amount of N4 respectively (Adegbite,2007). The National Social Insurance Trust Fund (NSITF) arrangement was introduced in 1993 to replace the outdated NPF structure in 1994.

The pension schemes had faced various shortcomings such as inadequate and untimely budgetary provision, increasing number of employers, poor implementation of the pension structure by the private sector, poor supervision and regulation and inadequate coverage of private sector employees by the scheme (Adegbite,2007; Olurotimi, 2009; Orifowomo, 2006; Yunusa 2009). Therefore in 2004, the pension structure was reformed, and a new Pension Act was introduced which was also amended in 2014. The accumulating assets (pension savings) coupled with its long-term nature as liabilities, provide investment opportunity in long-term financial assets with high returns in the capital markets (Davis, 1995; Meng & Pfau, 2010).

Economies require investments for sustainable growth and development. The capital market offers the avenue for mobilization and allocation of savings and investment critical to the sustainable growth and development of any economy (Alile 1984 & 1997; Anyanwu 1998; Equakun 2005; Osaze 2000). In 1969, Hicks posited that improvement in capital market activities which mitigated liquidity risk was a primary cause of the industrial revolution in England. The capital market mobilizes the savings of economic agents like pension funds and allocate such to long-term investment in the economy by providing avenue for firms and governments to sell stocks and bonds for self-sustained economic growth (Iyola, 2004; Nwaolisa, Kasie & Egbunike 2013).

The market is a major institution where long-term funds from the surplus sectors are mobilised, channeled to funding firms and government programmes that can propel economic growth and development (Chinwuba & Amos 2011; Nyong 1997; Osaze and Anao 1999; Ilaboya and Ibrahim 2004). The Nigerian stock market has continued to grow from the market capitalization of ₦5billion in 1981 comprising ₦3.1billion of government stock and ₦1.9billion equities which has increased to ₦5,248billion of government bond, ₦145billion of company's bond, ₦4.5billion of Exchange Trust Fund (ETF) which was introduced in 2011 and ₦11,477.7billion of equities with a total market capitalization of ₦16,875.1billion in December 2014 (CBN, 2014).

Despite the growth of the Nigerian capital market, the expected effect on long term projects like housing scheme, power, road and medical facilities are still underdeveloped. Nigeria still lacks basic infrastructural facilities such as good road networks, portable water, affordable housing scheme, proper education and facilities, adequate power supply and medical facilities (Tule, Okafor, Obioma, Okorie, Oduyemi, Muhammad & Olaoye 2015). The bond capitalisation of the Nigerian Stock Exchange market has a share of less than 1% of total market capitalisation in 2014 which was at its peak in 2011 at 13.05% of market capitalization (CBN 2014). This shows that the bond market is less active which translates to mean that there is low access to long term developmental funds in the market.

As a result of the foregoing discussion, the objective of the paper is to examine long run relationship of pension fund and capital market development to ascertain the significance of the relationship. Capital market provides the mechanism for the mobilisation and channelisation of surplus funds for firms and government to foster economic growth and development while pension fund is a long term retirement benefit for the employee, pension fund can be therefore be accessed to finance long term projects.

There has been many studies on the impact of capital market on economic development (Chinwuba & Amos 2011; Eze & Nwankwo 2013; Kolapo & Adaramola 2012; Magnusson & Wydick, 2002; Nwaolisa et al 2013; Owolabi & Ajayi 2013, among others) and the impact of pension fund and economic development (Gunu & Tsado 2012; Njuguna, 2010; Mesike & Ibiwoye 2012; Edogbanya, 2013). Studies on pension fund and capital market development include Akpan and Ukpong (2014), Nickel and Almenberg (2006); Ugwoke and Ogoegbunam (2013), Hu (2006); Meng and Pfau (2010) but the study in Nigeria is few. This may be due to the improper workings of the pension scheme before the 2004 Pension Reform.

So, the contribution of the study is that it takes into account the contributory pension fund period, study the association among pension fund and capital market development in Nigeria and fills the gap of few research studies from Nigeria on pension and capital market development.

The empirical model used quarterly data over the periods of 2006-2018, consisting of total pension fund assets and market capitalisation as proxy for pension fund and capital market development respectively. The study employed the Auto-Regressive Distributive Lag (ARDL) co-integration procedure to capture the long-run relationship and rate at which disequilibrium is corrected.

Review of Related Literature

This section contains the reviews of related concepts, the theoretical background and the discussions relevant empirical literature.

Conceptual Issues

The Contributory Pension Scheme (CPS) was established in 2004 to cover public and private sector employees in Nigeria. Minimum of 8% is contributed by the employee and a minimum 10% is contributed by the employer from the employee's monthly emolument. The employer may contribute to the staffs but the total contribution should not be more than or equal to 20% of the employee's monthly emolument. The scheme allows for voluntary contributions to the retirement savings account. In addition to the retirement contributions, there employer should also maintain a group life insurance policy of not less than three folds of the annual emolument of employee.

The Contributory Pension Scheme came into effect in Nigeria when the pension law was reformed in 2004 with the objectives as stated in PRA 2014 and PENCOM 2007 to include the establishment of identical rules, regulations and standards for management and payment of gratuity and pension for public and private sector workers; ensure that retiree receives his/her gratuity and pension regularly; enable employees the freedom to appoint their preferred licensed Pension Fund Administrator to manage their pension assets; support workers to save for their maintenance during retirement in order to reduce old-age poverty; and ensure strong regulatory and supervisory structure for the pension industry.

Every employee opens a Retirement Savings Account with an accredited Pension Fund Administrator of choice and notifies the employer of the chosen administrator which specifies a

Pension Fund Custodian for the employee. The employee's monthly contribution is remitted into the retirement savings account in 7 working days after the salary payment day. Upon receiving retirement savings, the pension fund custodian will notify pension fund administrator to credit retirement savings account of the employee.

Pension Fund Operator

Pension Fund Administrators (PFAs) and Pension Fund Custodians (PFCs) are the two (2) main pension fund operators as stipulated in PRA 2014. Additionally, to cater for the previous pension arrangement, the Nigeria Social Insurance Trust Fund (NSITF) and Closed Pension Fund Administrators continue to exist under the supervision of Pension Commission and subsequent employees shall join the new scheme PRA 2014.

Employees are provided Personal Identity Number (PIN) after opening their retirement savings account with a licensed pension fund administrator. Pension fund administrator will manage and invest the pension fund assets, keep related books of account on pension fund assets, provide regular information (investment, returns, account balances, statements and performance indicators) to PENCOM and beneficiaries, pay gratuity and pension to retired employees (Amoo 2008 in Gunu 2012).

Pension Fund Custodian

The pension fund custodian is a duly licensed private institution that is in-charge of the pension funds and assets on behalf of the beneficiary. Their function includes receiving of the total pension contributed and remitted by the employer, notifying the pension fund administrator of the remittance. Also, settle the transactions and perform other activities relating to the administration of pension fund investments on behalf of the pension fund administrator, provide data, information and statistical analysis of investments and returns to the PFA and PenCom.

Theoretical Background

Financial intermediation theory has shown and explained the financial market through the behavior of financial intermediaries and their roles to savers and investors. Various theoretical models have shown that financial intermediaries reduce information and transaction costs by reducing research costs on potential investors, exert corporate control, mobilise savings and manage risk (Allen & Santomero 1998; Levine 1997 & 2005).

Scholtens and Wensveen (2003) assert that optimality is the basis of the modern theory of finance (rational investors require optimal returns), arbitrage (asset of the same class are priced equally in each period without restrictions), and equilibrium (price adjustment).

A perfect market in a neoclassical model (Arrow-Debreu model) has the following assumptions:

- No individual can influence prices in the market.
- Borrowing and lending is done with the same conditions under equal circumstances.
- There is tax equality.
- There is no economies of scale.
- Homogeneous financial instruments which are divisible and tradable.
- There is no cost relating to information, transaction and insolvency.
- All market participants have full and immediate information (Scholtens & Wensveen 2003; Levine 1997).

The Arrow-Debreu assumptions are based on a perfect markets but it does not occur in practice. Intermediaries plays an important role in bringing savers and investors together by developing financial instruments that meet their needs.

Deviations from this model led to the financial intermediation theory which informs the need for financial intermediaries in order to bridge the imperfections. There has been a significant decline in transaction cost and information asymmetry and intermediation have increased and markets for financial futures and option have become intermediaries. It's becoming difficult to reconcile these changes with the traditional theory (Andrie, 2009 and Scholtens & Wensveen 2003)

Therefore, financial development happens when financial market consisting of financial intermediaries can develop financial instruments through innovation.Therefore, different views have been explained in the rationale behind financial intermediation.

Generally, risk management requires financial intermediaries to observe the risks and return profile of intermediation because risk and return are directly from financial institution's intermediation. The market consists of two groups; the first are the informed market participants who are knowledgeable and active participants in the management of the financial asset portfolio. The second is the uninformed market participants who take decisions based on the nature of their financial claims and market value.

Participation Costs Theory

The traditional frictionless theories assumed that investors are involved and fully participate in markets. This is because intermediaries add no value and there is no need for risk management. Empirical evidence has shown that full participation does not hold in practice (Allen & Santomero 1998). The theory of limited market participation was used in studies by (Merton,1987, Hirshleifer,1988, Cuny,1993; Allen & Gale, 1994; Allen & Santomero,1998) argued that participation cost is important in order to understand intermediation and its importance over the years.

The participation cost theory argued that diversification and the high trading costs are a result of the increase in the amount of equity held by intermediaries with the resultant decrease in equity owned by households. Mutual funds and pension fund administrators have low participation costs and thus invest efficiently for individuals whose costs of direct participation is high. Without friction, households should constantly review and alter their portfolios according to the available information. Therefore, the major role of intermediaries is to develop financial products/services with relatively stable return distributions.

Empirical Review

A contributory funded pension pillar and voluntary private scheme increases aggregate savings, boosts liquidity of the fledgling capital markets, and affects asset returns in the long run. This mitigates the effect of reduction in aggregate savings connected with population ageing when the population draws on their savings in retirement (Nickel & Almenberg, 2006).

Developed capital markets allow institutional investors access to long-term investment and this improves the quality and resilience of financial intermediation in an economy. It also addresses infrastructure deficits through the mobilization of local savings that follows infrastructure project long-term finance need against short-term bank loans.

Contributory pension funds affect the allocation of savings between the different higher share of the savings enter the capital markets and this leads to an increase in demand for securities

(Boersch-Supan & Winter, 2001). Hu (2006) and Davis and Hu (2008) assert that pension funds administrators engaged in feedback trading can potentially destabilize equity markets, whether such investment decisions are rational and consistent or not with economic fundamentals. Sias (1996) and Davis (2003) found that capital market with higher ratio of institutional investors' fund to market capitalization will experience high stock prices volatilities in quoted companies' share prices.

Catalan, Wilbert, Kenneh, Friedman & Paddison (2000), Catalan, Impavido & Musalem (2000), Walker & Lefort (2002), Impavido, Musalem & Tressel (2003) and Meng & Pfau (2010) in their studies, found that pension funds granger-cause capital market development, that is, pension assets have a positive impact on the stock market in terms of depth and liquidity.

In the same vein, Roldos (2004) and Genberg (2015), note that institutional investors (pension funds and insurance companies), as long-term investors can take on liquidity risk which can add to their return performance and also have a stabilizing effect on financial markets. Kim (2008) and Vittas (2000), examines the mechanism and preconditions that propels pension funds' contribution to the development of capital markets. The study confirms that favourable market apparatus for the management of pension funds may foster significant positive pension fund contribution to capital markets development once they (the fund) reach critical mass provided they operate in a conducive regulatory environment.

In Nigeria, Akpan and Ukpong (2014), Ogwumike (2008), Ogobuchi, Chukwuemeka, and Uche (2011) conclude that the pension fund is a source of capital formation for infrastructural development in Nigeria. Ahmad (2011), Edogbanya (2013), Gunu and Tsado (2012), Mesike and Ibiwoye (2012), and Nwanne (2015) conclude that pension fund has increased over the years and it has begun to contribute immensely to growth and development of the economy through the provision of long term capital.

In the contrary, Madukwe (2015) discovered that the contributory pension fund has no significant contribution to the growth of the Nigerian capital market. Tule et al (2015), suggest that the federal government of Nigeria should target pension funds through the issue of special-purpose infrastructure bonds purposely for infrastructural projects. Pension funds would provide the needed long-term financing to finance such projects. The adoption of the framework is expected to be beneficial to the Central Bank of Nigeria, pensioners and it will propel economic growth and development of the Nigerian economy.

Methodology

The study uses the econometric method of Auto-Regressive Distributive Lag (ARDL) approach to cointegration propounded by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001) in analyzing level relationship characteristics of time series. Impavido and Musalem (2000) and Mesike and Ibiwoye (2012) used these Error Correction Model (ECM) confirmed the existence of an equilibrium relationship between contractual savings and securities market development.

The ARDL known as the bounds testing methodology of Pesaran and Shin (1999) and Pesaran et al. (2001) has a number of features which give it some advantages over conventional cointegration testing. Some of the features are that ARDL can be used with a mixture of I(0) and I(1) data, it involves just a single-equation, making it simple to understand and interpret while variables can be given various lag-length as they enter the model (Giles 2013).

Data used was sourced and obtained mainly from the Central Bank of Nigeria statistical bulletin and the publications of the National Pension Commission. The sample covers the period from first quarter of 2007 to the second quarter of 2018.

Model Specification

The model used in this research work is specified following the studies of Kim (2008) and Raisa (2012). Kim (2008) specified a model to test the effect of the ratio of pension fund/GDP (k) on the development of stock markets (μ) after controlling the effects of other factors (z)

$$\mu_{i,t} = \beta(k)*k_{i,t} * z_{i,t} \quad 1$$

Where $\mu_{i,t}$ measures the depth or breadth of the stock markets and it is captured as the market capitalization/GDP ratio of country i in period t. $k_{i,t}$ measures the degree of development of the pension fund industry as the ratio of pension funds/GDP of i country in period t. β explains the response of the market capitalization/GDP ratio to the ratio of pension funds/GDP. The increasing function of k indicates positive spillover effects of pension funds on capital markets, shown with the response coefficient of β.

To ensure that the influence of other factors are properly controlled for, the elasticity of the degree of capital market development to the degree of pension fund β becomes bigger than 1. The econometric model of Kim (2008) is given as:

$$\mu_{i,t} = \mu_{i,t-1} + \beta k_{i,t} + \gamma_1 \pi_{i,t} + \gamma_2 i_{i,t} + \gamma_3 y_{i,t} + \gamma_4 o_{i,t} + f_i + \varepsilon_{i,t} \quad 2$$

The lagged dependent variable ($\mu_{i,t-1}$) represents the path dependence in the development of stock markets. The inflation rate ($\pi_{i,t}$) explains the effect on the development of the stock market. The real interest rate ($i_{i,t}$) explains the effect caused by the change in the yields of bonds as substitutes for stocks. Real GDP per capita ($y_{i,t}$) explains the effect of real sector productivity on stock market development. The ratio of population of over age 65 to age 15-64 ($o_{i,t}$) explains the effect of population aging on capital market development. f_i explains the unobserved fixed effects unique of country i and $\varepsilon_{i,t}$ is the error term.

In the same vein, Raisa (2012) developed the following regression model:

$$MK_{i,t} = \alpha MK_{i,t-1} + \beta\pi_{i,t} + \gamma_1 i_{i,t} + \gamma_2 g_{i,t} + \gamma_3 EF_{i,t} + \gamma_4 OAR_{i,t} + \gamma_5 PFA_{i,t} + \varepsilon_{i,t} \quad 3$$

Where $MK_{i,t-1}$ is the lagged dependent variable; $\pi_{i,t}$ is the inflation rate; $i_{i,t}$ is the long term interest rate; $g_{i,t}$ is the GDP per capital; $EF_{i,t}$ is Economic freedom; $OAR_{i,t}$ is Old age dependency ratio; $PFA_{i,t}$ is pension fund asset.

As a result of the nature of the data used in this study (quarterly time series) and the non-availability of some variables in the Kim (2008) and Raisa (2012) studies, the model in the studies of Kim (2008) and Raisa (2012) is modified and the following is the structural form of the regression model used for this study;

$$mcap_t = C + \beta penf_t + \gamma\pi_t + \delta i_t + \varepsilon_i \quad 4$$

Where mcap is the market capitalization; C is the constant; penf is the pension fund asset; π is the inflation rate; i is the real interest rate and ε_i is the error term.

The econometric form of the Auto-Regressive Distributive Lag (ARDL) model to capture the short and the long run associationship and equilibrium between the variables is:

$$\Delta mcap_t = C + \alpha_i \Delta mcap_{t-i} + \beta_i \Delta penf_{t-i} + \gamma_i \Delta\pi_{t-i} + \delta_i \Delta i_{t-i} + \theta_1 mcap_{-1} + \theta_2 penf_{-1} + \theta_3 \pi_{-1} + \theta_4 i_{-1} + \varepsilon_i \quad 5$$

Where $\Delta mcap_{t-i}$ is the first differenced market capitalisation at the appropriate lag; $\Delta penf_{t-i}$ is the first differenced pension fund asset at the appropriate lag; $\Delta\pi_{t-i}$ is the first differenced inflation rate at the appropriate lag; Δi_{t-i} is the first differenced interest rate at the appropriate lag while α_i,

β_i, γ_i, and δ_i are the parameters of market capitalization, pension fund asset, inflation and interest rate respectively at various lag length. The lag length is selected using the Akaike and Schwatz lag selection criterion.

Also, $mcap_{-1}$, $penf_{-1}$, π_{-1}, and i_{-1} are the one-period lag of market capitalization, pension fund asset, inflation and interest rate respectively while θ_1, θ_2, θ_3, and θ_4 are the parameters used to estimate the long run relationship between the variables.

The Error Correction Mechanism (ECM) model is:

$$\Delta mcap_t = C + \alpha_i \Delta mcap_{t-i} + \beta_i \Delta penf_{t-i} + \gamma_i \Delta \pi_{t-i} + \delta_i \Delta i_{t-i} + \sigma ect_{-1} + \varepsilon_i \quad \ldots\ldots\ldots\ldots \quad 6$$

Where ect_{-1} is the one period lag error correction term which measures the speed of adjustment from short-run disequilibrium back to the long run equilibrium with the parameter σ. The variable (ect) is the residuals derived from the structural form of the regression model (equation 4).

The apriori expectations for the parameters are:

$\theta_1=\theta_2=\theta_3=\theta_4=0>$ pesaran et al (2001) upper and lower bound critical value.

α_i, β_i, γ_i, and δ_i should be significant at 5% level respectively.

$\sigma < 0$ and significant at 5% level.

Methods of Data Analysis

In this study, the Augmented Dickey-Fuller (ADF) unit root test was used to establish the variable's order of integration, followed by estimating the Auto-Regressive Distributive Lag (ARDL) model to determine if the variables have long-run or equilibrium relationship. The Error Correction Model (ECM) is then estimated to determine the short-run disequilibrium adjustment and the Wald test is used to test for the short run relationship. The residual diagnostic test is done for the ARDL and ECM models using the serial correlation LM test and the Cusum stability test to ascertain the appropriateness and adequacy of the model for policy consideration and implementation.

Data Analysis and Discussion Findings

This section presents the findings from the ARDL and ECM models as discussed under methodology section. It starts with the unit root test and then the determination of the leg length for the models follow by the ARDL and ECM estimation. The result is expected to show the long-run and short relationship between the variables and the speed of adjustment from disequilibrium to long-run equilibrium position.

Unit Root Test

Table 1: Augmented Dickey-Fuller (ADF) test statistics

Variables	ADF	1%	5%	10%	P-Value
LMCAP at level	-1.960096	-3.621023	-2.943427	-2.610263	0.3024
LMCAP at 1st difference	-5.636756	-3.626784	-2.945842	-2.611531	0.0000*
LPENF at level	-1.357592	-3.626784	-2.945842	-2.611531	0.5919
LPENF at 1st difference	-8.948563	-3.632900	-2.948404	-2.612874	0.0000*
INF at level	-1.822850	-3.621023	-2.943427	-2.610263	0.3640
INF at 1st difference	-4.845037	-3.626784	-2.945842	-2.611531	0.0004*
INT at level	-1.033984	-3.621023	-2.943427	-2.610263	0.7309
INT at 1st difference	-5.253649	-3.626784	-2.945842	2.611531	0.0001*

*significant at 1%
Source: Authors computation, 2019

The unit root test (stationary test) result conducted on the data used for this study employing the Augmented Dickey-Fuller (ADF) approach is presented in Table 1. The result shows that LMCAP, LPENF, INF and INT are all not stationary at level I(0) while all of them are stationary at first difference I(1). The pre-conditions for using the Auto-Regressive Distributive Lag (ARDL) regression methodology are that none of the data should be I(2) but there can be a mixture of I(0) and I(1) data. Since none of the data are I(2) it is, therefore, appropriate to use the ARDL approach to test for co-integration among the variables.

Lag Selection

The next step after the test of stationary is to determine the lag length that is appropriate to be used for the model. Lag five (5) is selected by the Akaike and the Schwarz lag selection criteria. The value of the Akaike and Schwarz from lag 2 to lag 5 is shown in Table 2.

Table 2: Lag Length Values

Lag Length	Akaike Value	Schwarz Value
2	-0.60	-0.02
3	-0.63	0.13
4	-0.46	0.49
5	-1.73	-0.58

Source: Author's computation, 2019

Table 3, indicates that the Akaike value of -1.73 is the smallest in lag 5 and the corresponding Schwarz value at the same lag length is -0.58 which is also the smallest. Therefore, lag 5 is used for the ARDL and ECM regression models.

ARDL Regression and Co-Integration Test

The Auto-Regressive Distributive Lag (ARDL) is estimated to determine the long-run association between pension fund and capital market development including inflation and interest rates as the control variables using the lag length of 5 as determined by the lag length criterion.

Table 3: ARDL Regression Result

Dependent Variable: D(LMCAP) Method: Least Squares Date: 12/30/18 Time: 18:40 Sample (adjusted): 2008Q3 2018Q2 Included observations: 32 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	6.605668	6.150703	1.073970	0.3185
D(LMCAP(-1))	0.380289	0.450962	0.843284	0.4269
D(LMCAP(-2))	0.237849	0.355047	0.669908	0.5244
D(LMCAP(-3))	0.435444	0.293188	1.485204	0.1811
D(LMCAP(-4))	0.622393	0.291802	2.132932	0.0704
D(LMCAP(-5))	0.135525	0.301896	0.448912	0.6671
D(LPENF(-1))	1.806895	2.041070	0.885268	0.4054
D(LPENF(-2))	5.458721	1.717478	3.178335	0.0155
D(LPENF(-3))	3.827940	1.135405	3.371431	0.0119
D(LPENF(-4))	-0.505782	1.003711	-0.503912	0.6298
D(LPENF(-5))	-1.551134	0.979293	-1.583933	0.1572
D(INF(-1))	0.099636	0.069791	1.427643	0.1964
D(INF(-2))	0.045256	0.056359	0.802997	0.4484
D(INF(-3))	0.024097	0.037629	0.640396	0.5423
D(INF(-4))	0.074979	0.032589	2.300710	0.0549
D(INF(-5))	0.017374	0.024518	0.708643	0.5015
D(INT(-1))	-0.012499	0.056941	-0.219515	0.8325
D(INT(-2))	0.043202	0.036152	1.195007	0.2710
D(INT(-3))	-0.012262	0.041195	-0.297656	0.7746
D(INT(-4))	-0.006152	0.047334	-0.129959	0.9003
D(INT(-5))	-0.090417	0.037802	-2.391836	0.0480
LMCAP(-1)	-1.031899	0.488966	-2.110369	0.0727
LPENF(-1)	0.332709	0.242039	1.374608	0.2116
INF(-1)	-0.071613	0.085090	-0.841617	0.4278
INT(-1)	0.036149	0.027548	1.312205	0.2308
R-squared Adjusted R-squared S.E. of regression Sum squared resid Log likelihood F-statistic Prob(F-statistic)	0.921463 0.652194 0.099909 0.069873 52.62289 3.422094 0.049562	Mean dependent var S.D. dependent var Akaike info criterion Schwarz criterion Hannan-Quinn criter. Durbin-Watson stat		-0.003740 0.169410 -1.726431 -0.581325 -1.346861 1.791588

Source: Author's Computation, 2019

Table 3 is the ARDL regression result consisting of 5 lag 1st differenced estimates of the variables; log of pension fund assets (LPENF), log of market capitalization (LMCAP), inflation (INF) and real interest rate (INT), where the estimates of LMCAP (-1), LPENF (-1), INF (-1) and INT (-1) are one-period lag estimates of the variables at level which are used to estimate the long-

run relationship between the variables of the model. The Wald test coefficient diagnostics is used to test the coefficients of LMCAP (-1), LPENF (-1), INF (-1) and INT (-1) jointly to ascertain if there is long-run association between pension fund assets, market capitalization, inflation rate and real interest rate in Nigeria.

The F-statistics value of the Wald test for the joint coefficients of LMCAP (-1), LPENF (-1), INF (-1) and INT (-1) is 4.909611. In the ARDL bound testing approach to cointegration, the F-statistics value calculated is compared to Asymptotic critical value bounds for the F-statistic as provided by Pesaran et al (2001). The critical values under unrestricted intercept and no trend where k = 3 (number of variables minus 1) as applied to the ARDL model of this study under 5% level are 3.23 for lower bound and 4.35 for upper bound under the hypothesis of no co-integration.

Therefore, since the F-statistics value is greater than the critical upper and the lower bounds values, the null hypothesis of no co-integration is rejected and concludes that the variables move together in the long run, in other words, there is long-run association (co-integration) between the variables PENF, MCAP, INF and INT.

Model Diagnostic Checking

A diagnostic check is appropriate in order to establish whether the model can be accepted for policy consideration and implementation or not. The serial correlation LM test and the stability test under the Cusum test are conducted to know if the model is robust.

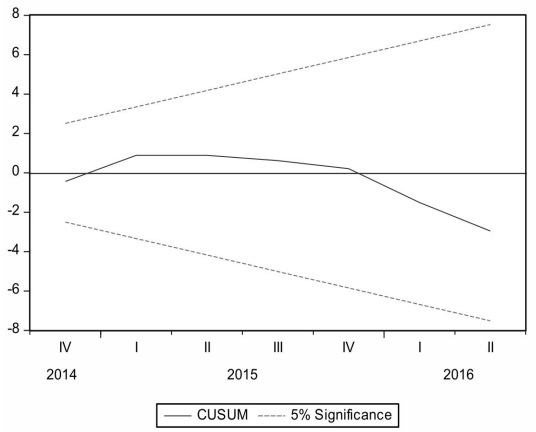
Table 4: The Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.197100	Prob. F(2,5)
Obs*R-squared	2.338509	Prob. Chi-Square(2)

Source: Author's Computation, 2019

The Breusch-Godfrey serial correlation test result as shown in Table 4 indicates P-values 0.8272 and 0.3106 for the F-statistics and the Observed R2 respectively, which are more than 5% level of significance. Thus, under the hypothesis of no serial correlation, the result shows that the hypothesis should be accepted, meaning there is no serial correlation in the residual of the ARDL model.

Figure 1: Stability Test



Source: Author's computation, 2019

The stability tested by the CUSUM test of the recursive estimate method of stability diagnostic and the result is shown as Figure 1. It revealed that the model is stable at 5% significance level because the blue line is between the two red lines sloping upward and downward sloping. Therefore, the ARDL model residual is stable. Thus, the ARDL model residual has no serial correlation and it is stable, both results are desirable.

ECM and Short Run Causality

The Error Correction Model (ECM) is used to determine the short-run disequilibrium adjustment to long-run equilibrium among the variables of the ARDL since the variables are found to be co-integrated and the ARDL model residual is stable and not serially correlated.

The Error Correction Term (ECM) is the residuals derived from the Ordinary Least Square (OLS) estimate of the variables at level.

Table 5: Error Correction Model

Dependent Variable: D(LMCAP) Method: Least Squares Date: 12/30/18 Time: 22:58		Sample (adjusted): 2008Q3 2018Q2 Included observations: 32 after adjustments		
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.162136	0.093229	-1.739116	0.1126
D(LMCAP(-1))	0.685973	0.277859	2.468777	0.0332
D(LMCAP(-2))	0.331324	0.219962	1.506278	0.1629
D(LMCAP(-3))	0.564512	0.216803	2.603797	0.0263
D(LMCAP(-4))	0.842493	0.234062	3.599448	0.0049
D(LMCAP(-5))	0.501475	0.240401	2.085993	0.0636
D(LPENF(-1))	-1.604763	1.575601	-1.018509	0.3324
D(LPENF(-2))	2.690991	1.278641	2.104570	0.0616
D(LPENF(-3))	4.049631	1.266567	3.197328	0.0095
D(LPENF(-4))	-0.728526	1.070192	-0.680743	0.5115
D(LPENF(-5))	-1.675969	0.831491	-2.015618	0.0715
D(INF(-1))	0.101078	0.023747	4.256490	0.0017
D(INF(-2))	0.035713	0.021707	1.645218	0.1309
D(INF(-3))	0.010007	0.016879	0.592853	0.5664
D(INF(-4))	0.060982	0.018036	3.381083	0.0070
D(INF(-5))	0.021798	0.019041	1.144826	0.2789
D(INT(-1))	-0.098727	0.051100	-1.932049	0.0822
D(INT(-2))	0.017609	0.037528	0.469225	0.6490
D(INT(-3))	-0.039221	0.045218	-0.867373	0.4061
D(INT(-4))	0.050028	0.042116	1.187863	0.2623
D(INT(-5))	-0.096655	0.039014	-2.477429	0.0327
ECT(-1)	-1.138528	0.351914	-3.235249	0.0089
R-squared Adjusted R-squared S.E. of regression Sum squared resid Log likelihood F-statistic Prob(F-statistic)	0.853973 0.547317 0.113982 0.129919 42.69930 2.784787 0.048798	Mean dependent var S.D. dependent var Akaike info criterion Schwarz criterion Hannan-Quinn criter. Durbin-Watson stat		-0.003740 0.169410 -1.293707 -0.286013 -0.959685 1.540842

Source: Author's computation, 2019

Table 5 shows the estimates of the Error Correction Model (ECM) with the residual of the OLS estimates of the variables at level being the Error Correction Term (ECT) which measures the speed of adjustment from short-run disequilibrium to long-run equilibrium. The ECT lag 1estimate is correctly signed negatively and statistically significant at 5% which is the expected outcome of the result. This indicates that the speed of adjustment from short-run disequilibrium towards long-run equilibrium is 113%. In other words, the system (pension fund assets, market capitalization, inflation and real interest) is getting adjusted towards long-run equilibrium at the speed of 113%.

To measure the short run association or causality from pension fund assets, inflation and real interest rate to market capitalization, the Wald test is conducted under the hypothesis of no short run associationship.

Table 6: Wald Test for Short run relationship

Variables	F-statistics	Probability
Pension fund assets	2.883776	0.0724**
Inflation rate	4.338507	0.0232*
Real interest rate	-0.46	0.3089

**significant at 10%, *significant at 5%

Source: Authors computation, 2019

The Wald test result which measures the short-run relationship or causality is presented in Table 6 showing the F-statistics value and the corresponding probability (P-value). The P-value of the F-statistics obtained for pension fund asset is not statistically significant at a 5% level but significant at 10% level. This result indicates that there is no short-run causality running from pension fund assets (lag 1 to lag 5 jointly) to market capitalization in Nigeria at 5% significance level but at 10% significance level.

In the same vein, the P-value of the F-statistics obtained for the inflation rate is statistically significant at 5% level. This means that there is short-run causality running from inflation rate (lag 1 to lag 5 jointly) to market capitalization in Nigeria.

Also, the P-value of the F-statistics obtained for the real interest rate is not statistically significant at 5% and 10% level. This result shows that there is no short-run causality running from real interest rate (lag 1 to lag 5 jointly) to market capitalization in Nigeria at 5% and 10% significance level.

Thus, there is no short-run causality running from pension fund to capital market development in Nigeria, there is no short run causality running from real interest rate to capital market development in Nigeria, but there is short-run causality running from inflation to capital market development in Nigeria.

Summary, Conclusion and Recommendations

This study investigates pension fund and capital market development in Nigeria using the ARDL bound testing approach to establish co-integration and short-run causality. The empirical review shows a diverse results from different countries and Nigeria inclusive. The paper used the market capitalization as proxy for capital market development and total pension fund assets as proxy for pension funds. Real interest rate and inflation are used to control for the influence of changes of yields offered by bonds and changes in the demand for stocks as result to inflation expectations respectively. All variables are quarterly data covering the periods of 2007 1st quarter to 2018 2nd quarter.

Findings reveal that there is long-run co-integration between the variables and the system (consisting of pension fund, market capitalization, inflation and real interest rate) reverts to long run equilibrium at the speed of 113%. Also, it is found that there is short-run causality running from pension fund assets to capital market at 10% significance level and causality running from inflation to capital market at 5% significance level but there is no short-run causality running from real interest rate to capital market. The findings conform to previous literatures such as Hu (2012); Impavido et al (2003) Kim (2008); Meng and Pfau (2010); Raisa (2012); Vittas (1998).

In conclusion, results indicate that there is long-run association between pension fund assets and capital market and that there is short-run causality running from pension fund to capital market development in Nigeria which confirms the findings from previous literatures. It also found that the speed of adjustment from short-run disequilibrium towards long-run equilibrium is 113% which indicates that there is a high rate of adjustment when reverting to long run equilibrium.

As a result of the findings in this paper, the following recommendations were proffered for policy consideration; the accumulated pension fund asset in Nigeria needs to be secured by market discipline for management and investment of the pension fund assets. Strengthening the pension fund investment and management plans can be an efficient policy response to a lack of risk-taking attitude by investors in the Nigerian capital market which can revamp the market to the bullish trend as experienced before the financial meltdown. The Nigerian capital market should liaise with development finance institutions (DFIs) to access an array of methods to facilitate domestic bond issuances and access to long-term finance for firms and infrastructure projects that is consistent with pension fund investment objective.

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