

Full Length Research Paper

Interest rate, capital market and pensions management: Lessons from Nigeria

Patrick Omoruyi Eke^{1*} and Akinwunmi Kunle Onafalujo²

¹Department of Banking and Finance, Lagos State University, Ojo, Lagos State, Nigeria.

²Department of Insurance, Lagos State University, Ojo, Lagos State, Nigeria.

Received 15 April 2015; Accepted 20 June, 2015

This paper examines empirically the causal relationship between interest rate, capital market, and pension assets in Nigeria from 1981-2013. While literature provides preponderant evidence of transmission from pension asset to capital market growth, little evidence is available of the reverse and the interaction with interest rate. The 2014 Pension Act widens the scope of pension fund investments into real estate and infrastructure markets, which hitherto are interest rate sensitive. Nigeria's high short-term interest rate regime attracts long-term funds and can make the capital market volatile, which might pose systemic risks to pension assets. Using ordinary least square (OLS) regression technique in a recursive system, the study reveals that pension asset is directly sensitive to stock market Index, while the index is inversely sensitive to short term interest rate, implying that the high short term interest rate regime might be inimical to building 'wholesome' pension assets of the capital market. The study suggests that monetary and fiscal authorities should manage short-term interest rate to optimal lower rate to attract pension assets to the capital market, making the capital market to operate at lower volatility conducive for bi-directional growth.

Key words: Capital market, interest rate, pensions, recursive system.

INTRODUCTION

Nigerian Pension Reforms toward privatized mandatory defined contributory (DC) scheme started in 2004, but subsequently reviewed in 2014 to accommodate obvious managerial and macroeconomic challenges. Nigeria and many economies' pension reform are noted by Palacios (2003), Otinche (2012) to have been tailored to the Chilean model. In this construct, it is

presumed that the level of financial development of Chile and Nigeria could have been close. Vittas (2003) proposed that a precondition for effective pension management is linked to capital market development. He re-emphasised this linkage as the most important feasibility precondition, which is for financial authorities to maintain sound financial system, so that pension fund

*Corresponding author. E-mail: ekeopatrick@gmail.com. Tel: +2348179715587.

JEL Code: G12 E43 J32 C21

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](http://creativecommons.org/licenses/by/4.0/)

managers can optimize their investment strategies. Feldstein (1982) observes that generally the ability of share prices to reasonably reflect value of pension obligations is the important link of personal private pensions to national savings, what recently Stowell (2013) regards as the “best barometer of value”.

Unarguable, the capital and real sector markets now absorb high percent of pension funds towards meeting old-age retirement obligations in diverse economies since the World Bank (1994) intervention. The World Bank (1994) argues that the pay-as-you-go system was financially unsustainable towards its objectives, hence the mandatory fully funded DC scheme, preferably private run as main pillar, citing other economic development benefits (Singh, 1998). Carmichael and Pomerleano (2002) opine the increasing aging population worldwide coupled with its attendant explosion of public pension liabilities necessitated “rethinking” of the public-private funding mix.

Controversies associated with the fortunes of the defined benefit (DB) scheme and the DC scheme are well documented (Munnell et al., 2011; World Bank, 2008; Singh, 1998; Bodie et al., 1988); however the transfer of responsibility and risk for managing pension funds to the employee exposes the scheme to greater risks of little savings, investment risk of financial market fluctuation, financial costs, inflation erosion of investments and retirement incomes, agency risk, and longevity risk of retirement (Munnell et al., 2011: 2). Bodie et al. (1988) reveal that the DB scheme creates implicit securities that are welfare enhancing not currently available in the capital market. Also, while many DB scheme might assure the employee of real benefit risk post retirement, most DC schemes lack guaranteed inflation adjusted sum. Kidwell et al. (2008) otherwise argue that the DB scheme is not of the employer’s delight since it places the investment risk squarely on them. Bodie et al. (1988) again argue that the DC scheme helps the employee determine the present value of pension benefits, which may be difficult under the DB scheme; rather it “imposes severe informational requirement” on the employee. Arguing from the public sector perspective, Munnell et al. (2011:7) contend that adopting the hybrid system requires recognizing the need to balance the risks to employee and the risk to the tax payer, suggesting that the issues that should decide employing the either DC scheme or the DB scheme are such critical factors of risks, costs and the human resource goals.

The World Bank (2000) notes that given effective management, there are broader impacts of pension savings scheme for higher economic growth. On the other hand, its poor management not only reduces future pensions but can result in misallocation of resources, particularly in poor and capital scarce developing countries.

Robust economic infrastructures of interest rate and the

capital market are germane to pension fund management strategies without which excessive risk need not be taken (Feldstein and Morck, 1982; Wang, 2004). Mayo (2004) stresses the role of pension plan as to build-up income earning assets for workers so that they will have riskless funds at retirement. Correspondingly, the capital market is an integral part of the financial system that mobilizes long term capital efficiently by attracting resources preferably the long-term savers in a cost-efficient manner, and converting funds of short-term investors into long-term capital. Be this as it may, critical financial reforms that should precede development in the pensions industry need to be emphasized to strengthen the bidirectional relationship between the capital market and pensions funds.

The market is assumed competitive, information efficient, and commands securities priced under given homogenous expectation. The market therefore affords pension funds with diversified savings instruments, mechanism and other economic utilities for its huge resources to actualize efficient pricing and valuation of its assets. Merton and Bodie (1995) opine that these and other functions of the financial system may be improved by pension reform. In this regard the fund’s superior contribution to depth, breadth and width of the capital market is particularly impressive (Carmichael and Pomerleano, 2002). Blommestein (1998) reveals that for the financial market that absorbs vast amount of savings from pension funds means that financial policy makers need to be acquitted with investment and trading strategies of pension funds and activities of other allied institutions associated with managing retirement income. Wang (2004) argues that though both the capital market development and pension fund system are closely connected, the argument as to which comes first is hard to establish. The paper however reasons that an accelerated financial openings, financial legislation and regulation are germane for a pension system to progress far.

Carmichael and Pomerleano (2002) contend that the capital market has often relied on pooled and contractual savings from non-bank institutions such as the pensions, that has become the largest source of capital formation in many economies and also source of direct investments in public and corporate securities-debt and equities. However, the attitude to risk of pension fund often influences both their degree of involvement in financial development and the project they finance (Franzen, 2010; Campbell; Viceira, 2002). Campbell and Viceira (2002) argue theoretically that although in practice risk management of pension funds differ based on their conceptualization of risks, pension fund being long term investors judge risk of long term investment more critically than short term investment. Scheuenstuhl (2012) expresses worry following the recent global capital market crises, heightening the fear that pension plans may not

Table 1. Nigeria's portfolio of pension assets and as ratio of GDP and market capitalization 2007-2011.

S/n	Asset class	2011 Amt. (₦'B)	%	2010 Amt. (₦'B)	%	2009 Amt. (₦'B)	%	2008 Amt. (₦'B)	%	2007 Amt (₦'B)	%
1	Local Ordinary Share	319.82	13.09	358.03	17.64	220.71	14.43	222.77	20.27	243.44	29.86
2	Foreign Ordinary Share	32.64	1.39	24.10	1.19	2.80	0.81	-	-	-	-
3	FGN Securities	1,362.93	55.79	829.20	40.85	498.48	32.61	350.82	31.92	279.74	34.32
4	State government Securities	109.81	4.5	69.60	3.43	33.71	2.20	-	-	-	-
5	Corporate Debt Securities	74.89	3.07	50.73	2.50	31.71	2.04	15.12	1.38	0.24	0.03
6	Local Money market Securities	312.35	12.79	489.25	24.10	542.22	35.45	349.69	31.82	186.01	22.82
7	Foreign Money market Securities	0.64	0.03	7.36	0.36	17.72	1.16	-	-	-	-
8	Open/Close end fund	11.45	0.47	8.61	0.42	5.74	0.38	9.03	0.82	4.46	0.55
9	Real Estate Properties	186.05	7.62	170.52	8.42	142.96	9.35	125.13	11.39	79.08	9.70
10	Unquoted Securities	9.26	0.38	8.18	0.40	6.18	0.40	6.86	0.62	4.43	0.54
11	Cash & Other Assets	22.99	0.94	14.19	0.70	27.53	1.80	19.57	1.78	17.79	2.18
	Total Pension Assets	2,442.84	100	2,029.77	100	1,529.63	100	1,098.99	100	815.19	100
	% of GDP	6.0	-	5.8	-	6.0	-	5.0	-	4.0	-
	% of Market Capitalization	25.25	-	20.46	-	21.75	-	11.49	-	6.18	-

Sources: Pension assets: Pencom's Annual Reports; GDP: National Bureau of Statistics; Market capitalization: Central Bank of Nigeria Statistical bulletin, accessed on January 15, 2015. GDP and market capitalization ratios by are authors' calculation.

be able to cope with future financial market challenges. Brown and Matysiak (2000) however note that pension fund's investment policies often adopt risk-averse posture in their long term investment plan.

A review of the facts (Table 1) testifies to the risk-averse posture of Nigerian Pension investments as treasury and money market instruments of pension assets constitute 57% in 2007, 64% in 2008, 77% in 2009, 68% in 2010, and 73% in 2011 respectively. However, the steady growth of private pension assets relative to GDP and stock market capitalization from 2007 to 2011 reveals its increasing depth in the Nigerian financial structure and future role in financial stability. While asset to GDP grew from 4 to 6%, asset to market

capitalization grew from 6.18 to 25.25% between 2007 and 2011.

Stylized facts

Table 2 provides inter-country comparison of contributions of pension fund to their economies. The first column assesses pension assets to the size of each country's economy. The Netherlands, South Africa, United States and Chile are top economies whose pension funds seem to perform relatively better in descending order. In terms of share of stock market capitalization (column 4), the order of relative performance is Netherlands, United States, Chile and South Africa in descending order. In column 4, the average

growth rate (2002-2007) of pension assets is pronounced for Nigeria, Chile and Hong Kong more than the rest economies.

Evidence above portends that although substantial progress may be achieved in asset growth and fund pool in non-OECD countries (see Nigeria, Hong Kong) and asset to GDP (see South Africa), they remain smaller in size than the OECD countries (OECD, 2013). 27 four (2013) notes that pension funds are institutional investors internationally, but in Africa the small size of the stock market makes it difficult for pension funds to play a "constructive role" unlike developed financial market.

This paper therefore seeks to explore the following for the Nigerian economy: why should

Table 2. Pension assets and capital market size for selected OECD and Non-OECD countries, 2012.

S/n	Countries	Pension asset % of GDP	Pension asset % of Market capitalization	Pension asset % growth rate 2007-2012
1	Nigeria*	7.7	25.25	129
2.	South Africa*	82	41.20	-
3.	Chile	60	51.7	45.6
4.	Netherland	160.2	184.2	11.4
5	Brazil*	14	27.6	-
6.	Hong Kong*	34.3	9.4	40.1
7	United States	74.5	90.3	10.4

Sources: Pension assets: OECD Global Pension Statistics, www.oecd.org/finance/pensionmarketinfocus, Pencom's Annual Reports; Market Capitalization: World Development Indicator, www.worldbank.org/indicator; * represents Non-OECD countries; ratios are authors' calculation; accessed June 10, 2015.

the fortune of privatized pension system be tied to the capital market development? Why is interest rate management strategic to pension asset growth? Why would there be a recursive link from interest rate to long term funds market, thereon to pension assets growth? The hypotheses proposed are that: the treasury (interest) rate does not impact the capital market; and also that the capital market does not impact pension asset development in Nigeria. Following this introduction, the rest of the sections of the paper are structured as follows: literatures review; theoretical framework and methodology; regression results; discussions; recommendations and conclusion.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Theoretical review: The bidirectional link between pension fund and the financial market has been explored in the literature. Vittas (1999a) argues that a private pension fund management may require sound and prudent financial institutions; it however does not require existence of well developed securities market *ex-ante*. Carmichael and Pomerleano (2002) argue that pension institutions are impactful by acting as channels of savings and resource allocation, and as source of depth and liquidity in the capital market, adding that it has being a source of social benefit by way of providing security in old age. While individual investors might be unable to purchase ownership rights in large-scale assets (real estates and foreign assets) and hedge risks with derivative products, pooled pensions resources are able to offer each participant in the fund a better-diversified portfolio and more efficient use of risk management tools that would otherwise be possible (Carmichael and Pomerleano, 2002: 107-8).

In many economies the pension reform has opened up

the savings-investment space from the overburdened unfunded public pension scheme with a funded mandatory contributory scheme. Carmichael and Pomerleano (2002) state that the growth effects are "notoriously" difficult to measure, citing 'dramatic' growth (national savings and GDP) evidences from simulation studies in Australia (Bateman and Piggot, 1998); Mexico (Ayara, 1996); and Switzerland (James, 1997); and more recently evidence from The Actuary (2012) puts the value of top global pension funds at \$12trn.

Pension funds access to capital market creates impact on increasing demand for securities evidenced in turnover growth, improved liquidity, and should help to lower the cost of capital and interest rate to firms, potentially stimulating capital formation. Allen and Gale (1994) and Davis (1998) assert that overall the growth in pension fund tends to shift financial market towards a "capital market oriented" stage of financial development, and can be of future benefit to industries whose knowledge level is uncertain such as biotechnology, IT, energy. Carmichael and Pomerleano (2002) again argue in favour of the 'market-based' economic role of pension funds, as correlation exists between the inherent long-term focus of pension fund investment and the long-term development of the capital market, which otherwise is not adequately supported by the short term focus of a bank based system. Vittas (1996) cites diverse role of pension funds to include innovations in corporate governance and privatization in the United States; and their global reforms of stockbroking commissions.

Carmichael and Pomerleano (2002) rationalize that since pension funds invest directly into debt and equity instruments, they provide alternative financial intermediation for savers in the financial system. A characteristics of the pension fund as non-bank financial intermediary is that they use employees' savings to purchase real and financial securities, such that employees indirectly hold the securities. The indirect

effect on interest rate would be formidable if the pressure on banks for capital formation is reduced. This presents a resultant increase in the competitiveness and efficiency in interest rate regime in the economy (Matthews and Thompson, 2008: 29), as less reliance on bank financing can promote the resilience of the financial system against external shocks (Carmichael and Pomerleano, 2002). For developing economies like Nigeria whose financial market is "grossly imperfect" and interest rate regime is 'maladapted' (Ojo, 2010:168-9), the lower the cost of fund, the greater the security that individuals feel about the future, and they will be more willing to undertake normal business risk in the present and advance the future course of entre-preneurship.

The capital market needs higher level of information competitiveness for asset managers to optimize opportunities, given that the private contributory pension system involves a 'fiduciary promise' to contributors. Of the vital measure of economic utility of markets, informational efficiency is more apt to the financial market, that is, financial prices must fully reflect underlying value (Ross et al., 2009). Shleifer (2000) argues out three conditions that lead to market efficiency, they are: rationality behavior of investors; independent deviation from rationality; and professional arbitraging.

Megginson et al. (2007)'s findings reveal that countries that rely mainly on compulsory private financed pension tends to have larger capital market and are most efficient (e.g. United States, United Kingdom; Netherlands; and Switzerland), compared to others, such as continental European countries that rely on state run unfunded pension system, who are characterized by relatively smaller market. Davis (1998) analyzes the impact of pension reforms on the financial sector development and argues that generally the type of pension reform instituted has stronger influence on the effects of capital markets development and stronger stability support, warning that a non-competitive regulatory system that restricts portfolio investments is likely to affect adversely the beneficial effect of the funds on capital market.

While there are preponderant evidence of link from pension funds to capital market growth (Enache et al., 2015; Mailos, 2012; Meng and Pfau, 2010), little evidence is available of the reverse and its interaction with interest rate in the literature, which is the contest of this study. Catalan et al. (2000) find a bidirectional positive correlation between contractual savings (pensions and insurance) assets as a ratio of GDP and both market capitalization and value traded in 26 OECD countries. The theoretical link of the capital market to pension funds development can be established through the capital asset pricing model (CAPM). The model relates an asset expected return to its associated systematic risks, under given assumptions about investors and markets (Megginson et al., 2007). Further, the factor models appear more general, having explanatory power than the

CAPM, particularly with respect to how macroeconomic systematic risks affects expected returns in the stock market (Sollis, 2012: 114). Financial markets, depending on their level of efficiency, are expected to offer pension fund managers positive Net present Value (NPV) investment opportunities (Megginson et al., 2007). Franzen (2010) argues that the greatest characteristics of pension funds are the commitment to liabilities and the long term investment horizon, stating the correlation in institutional investment practice that exposure to equity should increase with length of investment horizon.

Further link of the secondary capital market to pension funds development, as savings and investment platform include opportunity to realize or liquidate holdings when pension liabilities crystallize. Such market can offer lower information and trading cost, diversified asset class and efficient clearing and settlement system. Pension managers might however face liquidity risk of disposal, depending on the level of depth, width and breadth of the securities market- a problem in many African capital markets (27four, 2013). Increased market interest rate might pose fundamental risk to pensions' investments in the capital market such that their values fall disproportionately. Matthew and Thompson (2008: 136) note however, that a factor that has led to the growth of pensions assets in the capital or securities market is probably the "wealth effect present with the growth in wealth-favouring securities", in which the pensions and life insurance funds are long term beneficiaries.

The loanable fund theory contends that *ceteris paribus* interest rate is determined by the interaction of savers and investors, such that investment varies inversely with the rate of interest, while savings is directly related with interest rate. Portfolio theory further contends that in the real world, financial investments are subject to systematic risk, such that there is a limit to diversification (Megginston et al., 2007). While identifying interest rate as potential pensions risk Scheuenstuhl (2012) again reviews that a prudently managed pension fund requires being consistently forward looking in managing all risk factors that drive the outcome of the pension assets and liabilities in a turbulent capital market. It suffices that 'immunizing' future capital market risks behavior for an economically realistic outcome is better managed with derivative instruments and contracts, a market yet to fully debut in Nigeria's security industry.

METHODOLOGICAL AND EMPIRICAL REVIEW

Blommestein (2000) applies the non-parametric method to study pension reform and financial market among OECD countries, following the growing concern for the need to shift from the pay-as-you-go system to the pre-funded pension system from 1990-1996. The study discovered that the average annual growth in pension assets was 10.9%, with total pension asset rising from 29% of GDP in 1987 to 38% or \$7trillion in 1996. By 1998 the financial assets of

the OECD pension funds was about \$10 trillion, from \$3.7 trillion in 1990. The study also found that countries with high pension fund schemes tend to have highly developed securities market. Becceea (2010) compared the four pillar pension system in Mauritius against the three pillar superannuation system in Australia. The study did a random survey among three hundred (300) working adults in Mauritius on the attitude and perspective of Mauritians towards shift from pension system to a superannuation system. The findings indicate that the superannuation scheme would impact the Mauritius economy, as in Australia.

Scheuenstuhl (2012), within the concept of liability driving investing (LDI), examines how to derive a prudent investment and risk management strategy for pension fund given prevailing turbulent capital market and regulatory risk of pension accounting. The study argues that one outcome of financial market crises is that the usual correlation between assets breaks down such that all asset classes show negative behavior- equity crashes, credit spread widening, interest rate dropping, and many assets becoming illiquid. Onafalujo and Eke (2010) examine the pension risks of the DC scheme of 2004 in Nigeria and the implications of investing the funds in the capital market using simulation and trend analysis. The study establishes that the weakness in the traditional DC scheme concerning non-guaranteed pensions can be further aggravated by inherent capital market risks such as appropriate interest rate for actuarially determined annuities; minimum guaranteed returns on investment; and a DC scheme based on the risk appetite of the workers.

Blake (2003) examines the accumulation and distributional phases of the U.K pension system, and argued that whether a system is of the DC scheme or the DB scheme, appropriate financial instruments and investment strategy are more critical than both the financial market structure and the nature of the financial institutions in driving successful private sector pensions. The study discovered that in many markets including the U.K, pension fund managers underperformed the market. Similarly, Meng and Pfau (2010) examine the role of pension fund in capital markets development among OECD using least square dummy variable (LSDVC) estimation in a panel data study. All-together the study found that the impact of pension fund on capital market differs significantly depending on the depth of financial development. Countries with well developed financial market (i.e. well managed investment strategies in the stock and bond markets) enjoy significant growth in their pension funds than those with thin financial development.

Borsch-Supan et al. (2004) use panel data to examine how population aging and pension reform impact savings behavior in continental Europe, comprising France, Germany and Italy. These countries are noted for large and ailing pay-as-you-go public pension system; relative thin capital market and relatively low capital performance. The study found a positive link from the aging population syndrome to savings growth by young generation, passing-through to the capital market, with beneficial side effect on productivity and aggregate growth. Wang (2004) did a non-parametric study on China's pension reform and capital market development and found a correlation between a funded pension system's boost of the capital market and existence of appropriate financial infrastructure and effective financial regulations.

Enache et al. (2015) use the single equation error correction model (ECM) to investigate the impact of pension funds on capital market in a sampled ten (10) Central and Eastern European Countries from 2001 to 2010. The finding provides further evidence of short term impact and lower magnitude long term impact on market capitalization.

The World Bank reviewed the success of government policy and regulations on all pension schemes, given that governments often influence their investment policies. It notes that private managers

under the mandatory scheme often face intrusive regulation. Similarly, the bank notes that many developing countries' local capital markets are rather dominated by public bonds; hence the markets remain underdeveloped with features of illiquidity and non-existence of vibrant bond and stock markets which constitute impediments to private pension managers. Non-existence of strict rule of law, property right and basic financial and economic infrastructures can also limit the investment powers of pension managers (Beim and Calomiris, 2001).

An important caveat noticed by the World Bank is the poor corporate governance culture common among the stock markets where lack of accountability and transparency are the hallmark of the corporate boards. The World Bank studied the impact of governance on private managed and public managed schemes in Canada, the U.S., Sweden and Japan, and observed that the private managed schemes are likely to produce reasonable returns in countries with medium or high governance rating. This study agrees with the recent World Bank's study where it struck a balance between good governance and private pension management, and thus advised that poorly governed countries should probably avoid funding and managing pension system.

Review of Pension Reform 2014:

The Pension Reform (2014) aims at deepening the private pension and the social security system in the country. Though not completely privatized by continuous innovation in the contributory system, the government's implicit pension liability is being reduced. The 2014 Act has increased the coverage of the DC scheme to compulsorily include organizations with three employees and above, towards encouraging the informal sector participation, which can boost involuntary savings. The minimum rate of pension contribution is now increased to 18% (8% employee plus 10% employer) of total monthly emoluments.

The social security innovations include the reduction in the waiting time for accessing benefits in the event of loss of employment to four (4) months from hitherto 6 month. Employers are now mandated to open a Temporary Retirement Savings Account (TRSA) on behalf of employees who failed to do such upon assumption of office after three (3) months. Henceforth, punishment awaits defaulting employers who fail to deduct or remit contributions due to employees within seven (7) days of salary payment. Individuals aged fifty (50) years and above who voluntarily retire, resign or disengaged from employment now have access to 25% of his/her retirement savings account (RSA), if he/she is unable to secure another job within a period of 4 month (Pension Act, 2014). In the previous system, only involuntary disengaged individuals could have access to 24% after remaining jobless for six (6) months. These are basically parametric reforms which do involve interest rate functions which should have been an indirect function of minimum guaranteed return.

On the management of pension funds, there is provision for the utilization of pension funds for national development by encouraging the investment in the real sector and infrastructure, particularly in addressing the mortgage crises. But nothing is added to buttress the need to grow the capital market or manage the interest rate risk in reducing pension risk.

Theoretical framework and methodology

The framework is developed from Borsch-Supan et al. (2004)'s study of capital market effects of population aging and pension reform, with spillover effect on productivity and growth in continental Europe- France, Germany and Italy, using overlapping generation

(OLG) model. Closely too, the work follows Enache et al. (2015)'s single equation ECM model adopted to estimate the short and long run impact of pension funds on market capitalization in a sample of 10 Central and Eastern European countries.

The capital asset pricing model (CAPM) framework indicates that the expected return, $E(R_i)$, on a given asset is a product of the risk free rate, R_f , and the outcome of the asset beta's sensitivity, β_i , to the expected risk premium on the market portfolio, $E(R_m) - R_f$:

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f] \quad (1)$$

This structure recalls that beta captures largely the asset's sensitivity with the capital market's systematic risks. The systematic nature of interest rate in the economy is attested as potential risks of capital assets. To estimate the recursive link from interest rate via the capital market development to pension funds development, this study thus adopts ordinary least square (OLS) technique which can yield consistent parameters without any "information loss" (Pindyck and Rubinfeld, 1998: 348), given that the OLS assumptions are met. A recursive system of equation allows the endogenous variables in the model to be determined sequentially, with the assumption that each equation's disturbances term is independently determined in a white noise process.

Model specification and data

The ordinary least square (OLS) regression technique is adopted to test the elasticity impact of treasury bill (short term) interest rate, Stock market index, with GDP acting as control variable on pensions asset growth as presented in the hypothesis stated in the introduction section. The implicit forms of the models, including the *a-priori* logics are here presented:

$$\text{Stock Market: } Sndx_t = f(Tbrt_t, Gdp_t) \quad (2)$$

$$\text{Pension asset: } Pnast_t = f(Skndx_t, Gdp_t) \quad (3)$$

Where: Skndx is stock market index, an indicator for stock market performance; Pnast represents average annual pension assets; Tbrt is short term interest rate; while Gdp is gross domestic product. The explicit function of the models in double log form is stated as follows:

$$Sndx_t = \alpha_0 + \xi_1 Tbrt_t + \xi_2 Tbrt_{t-1} + \xi_3 LGdp_t + \mu_i \quad (4)$$

$$lPnast_t = \beta_0 + \beta_1 Skndx_t + \beta_2 LGdp_{t-1} + \beta_3 lPnast_{t-1} + \varepsilon_j \quad (5)$$

Where the respective stochastic error terms assume the standard conditions as follows:

$$E(\mu_i), E(\varepsilon_j) = 0; \text{Var}(\mu_i), \text{Var}(\varepsilon_j) = \delta^2; \text{cov}(\mu_i, \varepsilon_j) = 0 \quad (6)$$

The *a priori* expectations are: Tbrt, Tbrt-1 < 0; LGdp, Skndx, Skndx-1, lPnast, lPnast-1, LGdp > 0; while α_0, β_0 are the constant terms;

μ_i, ε_j are stochastic errors for equations 4 and 5 respectively.

Data for 33 years (1981-2013) were sourced from the Nigeria's National Bureau of Statistics (NBS), the Central Bank of Nigeria (CBN)'s statistical bulletin and National Pension Commission (Pencom)'s annual reports. The stock market index (Sndx) has been more equity driven market until 2005 when bond market effectively took off. The Treasury bill rate (Tbrt) is the Central Bank's instrument to manage short term liquidity in Nigeria. A high Tbrt attracts investible funds from the capital market, and vice versa. The data for the privatized pension asset which commenced in 2004 were extracted from Pencom's annual report 2007-2013. Non-availability of data on pension assets during the publicly sponsored DB scheme era was a limitation to the study. Available data on annual Pension contributions obtained from the CBN's statistical bulletin was scaled by average annual Treasury bill rate. Mitchell (2000) reveals that most pension plans seem to rely on government investments for pension development. Evidence from stylized facts (Table 1) reveals that government securities constitute 34% in 2007, 32% in 2008, 35% in 2009, 44% in 2010 and 60% in 2011. Eview 7 was the package employed.

As was expected for most financial time series data, the variables were non-stationary in their respective level but stationary in their first difference (integrated of order one (1)) (Gujarati and Porter, 2009: 760) (Table 3). By implication, following Maddala and Kim (1998), Dritsakis and Adamopoulos (2004) these transformed variables can be cointegrated as well following one or more Linear combinations.

Granger causality test was applied in the contexts of 'rationale expectations'; for weak, strong, or super exogeneities; and assumes that every variable has a "precedence" (Maddala and Kim, 1998; Gujarati and Porter, 2009). Intuitively, when the past and present value of Y_t provides useful information to predict X_{t+1} at time t , then it is said that Y_t granger causes X_t . The results from the standard pairwise granger causality test (Table 4) reveal that Pnast and Skndx are bidirectional causal, that GDP granger-causes Sndx, while other relations were found independent.

RESULTS AND DISCUSSION

The diagnostic test for equation 1 (Table 5a) reveals that the multiple coefficient of determination (R^2) is 98% evidencing good fit; it suggests that the explanatory variables reasonably determine the fortunes of the explained variable. The adjusted coefficient of determination (adj. R^2) is also 98%. The reliability of these tests is confirmed by the significance of the joint influence test (F. test) at 5% of all the explanatory variables. It implies that *ceteris paribus* the joint coefficient of explanatory variables determined the outcome of the dependent variable.

The Durbin-Watson (DW) statistics of 1.67 fall within the "do not reject" zone indicating we fail to reject the null hypothesis that there is no first order serial correlation in the model. Similarly, the LM statistics result of the Breusch-Godfrey serial correlation LM test (Table 5b) is less than the χ^2 critical value, reaffirming that the model is free of serial correlation.

The coefficients of the explanatory variables reveal that

Table 3. Unit root test.

Variables	ADF: First difference (Intercept and Trend)	Remark: Order of integration
Sndx	-5.068360	$I(1)$
LPnask	-5.032492	$I(1)$
Tbrt	-6.524136	$I(1)$
LGdp	-5.197816	$I(1)$

Source: Authors' Estimation using E-view 7.0; MacKinnon (1996) one-sided p-value. Note: the variables were significant at 1 percent level, with critical value being -4.296729.

Table 4. Granger causality test.

Pairwise Granger Causality Tests			
Date: 11/16/14 Time: 23:42			
Sample: 1981 2013			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
LPNAST does not Granger Cause SNDX	32	6.32392	0.0177
SNDX does not Granger Cause LPNAST		4.44009	0.0439
LGDP does not Granger Cause SNDX	32	6.73919	0.0147
SNDX does not Granger Cause LGDP		0.79699	0.3793

the regression signs conform to *a priori* postulations. *Ceteris paribus* a one percent increase in treasury bill rate (Tbrt) generated approximately two (2) unit point decline in stock market (index) value. Similarly, a one percent increase in GDP induces thirty-four (3) unit point increase in stock (index) value.

The diagnostic test for model 2 (Table 6a) reveals that the multiple coefficient of determination is 95%, while the adjusted rate is 94%; this suggests that the model satisfies the good fit criterion. The equation's standard error is 0.858. The F. statistics of 114.3 which is significant at one percent, attests that the joint influence of the explanatory variable determines the outcome of the pension assets in Nigeria. The outcome of the Breusch-Godfrey serial correlation LM test (Table 6b) suggests that we accept the null hypothesis that the model is free of serial correlation as the test statistics is less than the χ^2 critical value.

The parameters of the explanatory variables also reveal that the regression signs conform with the *a priori* expectation. *Ceteris paribus* a one unit increase in stock (index) value, a one percent increase in one period lagged GDP, and one period lagged Pnast generates 14.5, 6.3, and 90.0% increase in pension assets respectively.

The result of bidirectional causal relations between the stock performance (index) value and pension assets runs

counter to the recursive system's *a priori* (that thereverse order might not hold), which suggests that both variables predict themselves in the Nigerian case. Furthermore, though the result agrees with the world-wide phenomenon (Vittas, 1999b; Catalan et al., 2000) of 'strong correlation' between the two (pension fund and stock market performance); it however varies inversely with Vittas (1999a). For Nigeria, this result implies that the more privatized the pension system the greater in width, breadth and depth of the stock market, and an immediate reverse order is a possibility. The unidirectional causal relation from the control variable-GDP to stock market value agrees with the model and implies that the economy reasonably determines the fortunes of its principal components.

The negative outcome of the relationship between Tbrt and Stock market index underscores how the management of the treasury, through the open market operations (OMO) can impact the growth of the long term funds market. When short term interest rate is higher relative to returns from a small and volatile capital market, rational investors tend to turn to the money market, there by slowing down the growth of the capital market.

The GDP is a control variable in all dynamic economy and impacts all economic activities. Its positive relationship with the stock market index suggests how closely

Table 5a. Summary of OLS results (model 1).

Variables- Regressed: Sndx	Coef.	Std. Error	T. Stat.	Prob. Value
Constant	7.925	4.791	1.655	0.11
Tbrt	-0.017	0.01	-1.251	0.22
Tbrt(-1)	-0.012	0.01	-0.937	0.35
IGdp	0.343	0.302	1.13	0.26

Diagnostics: $R^2=0.983$; $Adj.R^2=0.981$; S.E.= 0.287; F-Stat.= 383.45; Prob.(F-Stat.)= 0.0000; D.W.=1.67; Observations 31. Source: Authors' estimation using E-view 7.0.

Table 5b. Test for serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.548198	Prob. F(1,25)	0.4660
Obs*R-squared	0.665179	Prob. Chi-Square(1)	0.4147

Table 6a. Summary of OLS Results (model 2).

Variables- Regressed: IPnast	Coef.	Std. Error	T. Stat.	Prob. Value
Constant	0.03	4.791	0.027	0.97
Sndx	0.145	0.388	0.372	0.71
IGdp(-1)	0.0631	0.481	0.131	0.89
IPnast(-1)	0.901	0.121	7.545	0.00

Diagnostics: $R^2=0.95$; $Adj.R^2=0.94$; S.E.= 0.858; F-Stat.= 114.3; Prob.(F-Stat.)= 0.0000; D.W.=2.005; Observations 31. Source: Authors' estimation using E-view 7.0.

Table 6b. Test for serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.092616	Prob. F(1,25)	0.7634
Obs*R-squared	0.114420	Prob. Chi-Square(1)	0.7352

related the two variable (GDP and Stock market performance), hence their fortunes are correlated. Practically, the GDP absorbs the pains and gains of all macroeconomic incomes, expenditures and outputs, including their risks.

In the second model, in line with anecdotal evidence the stock market performance positively impacts the pension assets by 14.5% which suggests that the impact of the post 2004 privatized pension reform is gradually being felt in the market. Similarly, the GDP positively drives the pension asset. When the economy experiences higher income and growth, depending on the *Gini* index status, it may directly results in higher pension contribution, leading to higher investments, and hence higher returns on asset balances. The one-period lagged

pension asset produces a higher impact on current pension assets, which indicates that the investment of current pension asset is being influenced by returns from prior pension investment class.

Conclusion

This study has examined the development in the Nigerian pension industry relative to stock market and interest rate in line with the argument in Vittas (1999a). Relying on theoretical framework in Borsch-Supan et al. (2004) and Enache et al. (2015) recursive model was employed, albeit for data challenge, to trace the link between the management of interest rate and the stock market and

then pension asset development. GDP was effective as a control variable in the model, impacting both the stock market and pension assets in the two respective models. The granger causality test revealed that pension asset development and stock market performance were bi-directionally causal while GDP granger causes stock market performance.

Areas that can be examined by future research include long run (cointegration) study of the relationship; and with increasing pension asset portfolio investments in foreign markets: the impact of exchange rate risks and foreign interest rate volatility on pension assets.

RECOMMENDATIONS

First, the relatively high Treasury bill rate (in second digit) is inimical to attract sizeable investments into the capital market. This study wishes that being in a relatively low risk market, treasury rates should be below five percent (5%), given that government equally pursues fiscal tightening, which prior studies indicate as bane of Nigeria's high inflation (Oduola and Akinlo, 2001; Chimobi, 2010). The long-term capital market would attract higher amount of capital commensurate with the long -term maturity risk when short-term interest rate is low as theory and practice postulate. The yield curve theory notes that yield (interest rate) varies with maturity, such that the yield offered by long term securities (bond) is sufficient for the investors expected positive real return (Megginson, et al., 2007). Then, the capital market will operate at lower volatility conducive for bi-directional growth.

Secondly, the GDP may rationally induce capital market growth by spurring investors' confidence. Both the regulators of the capital market and the relevant government agencies responsible for the development of the small, medium, and large scale enterprises (SMLEs) need to fashion out appropriate policy models that would attract sizeable number of small companies for quotation, as in the advancing markets in Singapore, India and China having large SMEs listing and large enterprises, such as the unlisted telecommunication firms.

Thirdly, the stock market's impact on pension asset development would be accelerated if there is improvement in efficient market system and market regulators are seen to be diligent. Capital market imperfections must be addressed to attract more pension investments, since the pension system is liability investment driven. Innovative products attractive to pension funds such as longevity bond that are less subject to volatilities should be the investment hallmark of government and corporations in the stock market.

Fourthly, the GDP as proxy for the macro-economy requires that efficient macroeconomic management is necessary to control inflation and boost employment of

resources, engineer growth and generates income which should grow pension contributions, income and investments. Efficient macroeconomic management can also help manage corporate risks, generate labour employment and ensure progressive labour relations. This study suggests that Treasury rate should be effectively managed to optimal lower (competitive) rate regime to attract pension funds to the capital market and hence build efficient financial architecture with pension assets.

Conflict of Interests

The authors have not declared any conflict of interests

REFERENCES

- 27four (2013). "An insight into African Pension Funds and Financial Market", Investment Managers, 54 Bath Avenue Rosebank, 2196 Johannesburg, pp1-8, accessed June 10, 2015 <http://www.27four.com/wp-content/uploads/2013/12/An-Insight-into-African-Pension-Funds-and-Financial-Markets.pdf>
- Allen F, Gale D (1994). "A welfare comparison of the German and US financial systems" LSE Financial Markets Group Discussion Paper No. 191
- Ayara U (1996). "The savings Impact of the Mexican Pensions Reform", World Bank Discussion Paper, Washington, D.C., World Bank.
- Bateman H, Piggot J (1998), "Mandatory Retirement Saving in Australia", *Ann. Public Cooperative Econ.* 69(4):547-69.
- Becceea, N. B. (2010). Service in Public Sector: The Pension System in Mauritius and Superannuation, International Research Symposium in Service Management, pp.1-15.
- Beim DO, Calomiris CW (2001). *Emerging Financial Market*, McGraw-Hill Irwin, pp.150-188; 334-338.
- Blake D (2003). "Financial System Requirement for successful Pension Reform", Paper Presented at Policy Options for Pension Reform in Asia: Challenges in Design and Implementation, a joint conference of the Asian Development Bank and the Pacific Pension on Institute, Manila, Philippines, pp.1-40.
- Blommestein JH (1998). "Financial Market Implications of Pension Reforms", *The ISE Review*, 2(7-8):79-89.
- Blommestein H (2000). Ageing, Pension Reform, and Financial Market Implications in the OECD Area, Center for Research on Pensions and Welfare Policies (CERP), W.P. 9/01, pp.1-24.
- Bodie Z, Marcus JA, Merton CR (1988). "Defined Benefit versus Defined Contribution Pension Plans: What are the Real Trade-offs?" In *Pensions in the U.S. Economy*, Zvi B, Shoven, J. B. and Wise, D. A. Eds., National Bureau of Economic Research <http://www.nber.org> pp.139-162.
- Borsch-Supan AH, Koke FJ, Winter J (2004). Pension reform savings behavior and Capital Market Performance, National Bureau of Economic Research (NBER), Cambridge, Massachusetts pp.1-37
- Brown GR, Matysiak GA (2000). *Real Estate Investment: A Capital Market Approach* FT, Prentice Hall, pp.200-201.
- Catalan M, Impavido G, Musalem AR(2000). "Contractual Savings or Stock Market Development: Which Lead?", *J. Appl. Soc. Stud.* 120(3):445-487.
- Campbell YL, Viceira LM (2002). Strategic asset allocation: Portfolio choice for long -term investors, Oxford, Clarendon.
- Carmichael J, Pomerleano M (2002). *The Development and Regulation of Non-Bank Financial Institutions*, The International Bank for Reconstruction and Development/World Bank, Washington D.C.
- Chimobi OP (2010). "Inflation and economic growth in Nigeria", *J. Sustain. Dev.* 3:129-166.
- Davis EP (1998). "Linkage between pension reform and financial sector

- development", Working Paper PI-9909, the Pensions Institute, Birkbeck College, London.
- Dritsakis N, Adamopoulos A (2004). "Financial development and economic growth in Greece, an empirical investigation with Granger causality analysis", *Int. Econ. J.* 18:547-559.
- Enache C, Milos RC, Milos MC (2015), *Pension Reform and Capital Market Development in Central and Eastern European Countries*, Economic Research-Ekonomska Istrazivanja, Taylor Francis Group 21(1):75-84.
- Feldstein M, Morck R (1982). "Pension Funds Decision, Interest Rate Assumption and Share Prices", National Bureau of Economic Research Working Paper Series No (938):1-44.
- Franzen D (2010). "Managing Investment Risks in Defined benefit Pension Funds", OECD Working Papers on Insurance and Private Pensions, No. 38, OECD Publishing. doi:10.1787/5kmnr3sr2f3-en
- Gujarati DN, Porter DC (2009). *Basic Econometrics*, 5th Edition, McGrawHill, pp652-658.
- James E (1997). "Pension Reform: Is there an Efficient-Equity Trade-Off?", Paper prepared for the conference on inequality-reducing growth in Latin America's Market Economies, World Bank, Washington, D. C., January.
- Kidwell DS, Blackwell DW, Whidbee DA, Peterson RL (2008). *Financial Institutions, Markets and Money*, John Wiley & Sons, Inc. pp.565-566.
- Maddala GS, Kim I (1998). *Unit Roots, Co-integration and Structural Change*, Cambridge University Press, pp.47-258
- Matthews K, Thompson J (2008), *The Economics of Banking*, 2nd Edition, John Wiley & Sons, Ltd: 29, 136.
- Mayo BH (2004). *Financial Institutions, Investments, and management: An Introduction*, Thomson, Southwestern, pp.39-40.
- Megginson WL, Smart SB, Gitman LJ (2007). *Corporate Finance*, Second Edition, South-Western, Cengage Learning, pp.226, 420-449
- Meng C, Pfau WD (2010). "The Role of Pension Funds in Capital Market Development", GRIPS Policy Research Centre, Discussion Paper, pp.1-20.
- Merton R, Bodie Z (1995). "A Framework for Analysing the Financial System", in Crane et al., Eds, *The Global Financial System: A Functional Perspective*, Boston, MA, Harvard Business School Press.
- Milos R L (2012), "Spillover Effects of Pension Funds on Capital Market. The EU Countries Case", *Annals of the "Constantin Brancusi"*, University of Targu Jiu, Economy Series Issue 4, pp 164-170.
- Mitchell OS (2000). "Building an Environment for Pension Reform in Developing Countries" in *Foundations of Pension Finance*, Bodie, Z. and Davis, P. E., Eds. London: Edward Elgar pp.480-503.
- Munnell HA, Aubry J, Hurwitz J, Quinby L (2011). "A role for defined contribution plans in the public sector", Centre for Retirement Research at Boston College, Hovey House 140 Commonwealth Avenue, Chestnut Hill, MA 02467-3808.
- Odusola AF, Akinlo AE (2001). "Output, Inflation, and Exchange Rate in Developing Countries: An Application to Nigeria", *Dev. Econ.* 39:499-522.
- OECD (2013). *Pension market in focus*, Global Pension Statistics, www.oecd.org/daf/pensions/pensionmarket, accessed June 10, 2015
- Ojo AT (2010). *The Nigerian Maladapted Financial System: Reforming Tasks and Development Dilemma in Nigeria*, Chartered Institute of Banker Press, Nigeria, pp 154-174, 456-471
- Onafalujo AK, Eke PO (2014). "Rethinking social insurance as panacea for parlous corruption in Nigeria", *Australian Journal of Commerce Study SCIE Journals*, www.scie.org.au, pp.21- 32.
- Otinche SI (2012). *Pension Administration in Nigeria: Issues in Theory and Practice*, Marvelous Printers, Lapai, Nigeria, pp.263-297
- Palacios R (2003). "Privatizing national social security schemes: The international experience with privatizing pension systems", International Social Security Association Meeting of Directors of Social Security Organizations in English-speaking Africa Banjul, The Gambia, 7-9 October
- Pension Reform (2014). Federal Republic of Nigeria, Official Gazette, Act 4, Vol. 101, Pp A27-A91
- Pindyck RS, Rubinfeld DL (1998). *Econometric Models and Economic Forecasts*, Fourth Edition, Irwin McGraw-Hill, pp.346-349
- Ross SA, Westerfield RW, Jaffe JF, Jordan BD (2009). *Corporate Finance: Core Principles and Applications*, second edition, McGraw-Hill Irwin International edition: pp.173-198.
- Scheuenstuhl G (2012). "Liability Driven Investment Strategies-for prudent pension investing in turbulent capital markets", *Asset Management*, www.risklab.com/Dokumente accessed on October 30, 2014.
- Shleifer A (2000). *Inefficient Market: An introduction to Behavioral Finance*, Oxford University Press, Oxford, United Kingdom
- Singh A (1998). "Pension Fund, the Stock Market, Capital formation and Economic Growth: A Critical Complementary on the World Bank's Proposals", *ISE Research*, 2(7-8):50-78.
- Sollis R (2012). "Empirical Finance for Finance and Banking", John Wiley and Sons Ltd, pp.113-137
- Stowell DP (2013). *Investment Banks, Hedge Funds, and Private Equity*, Second Edition, Elsevier, p.87.
- The Actuary (2012). "The Assets of World's largest pension funds hit \$12 trn", *The Magazine of the actuarial profession*, www.theactuary.com/news/2012/09, accessed June 15, 2015
- Vittas D (2003). "The Role of Occupational Pension Funds in Mauritius", The World Bank, Financial Sector Development.
- Vittas D (1999a). "Pension Reform and Financial Markets", *Development Discussion Papers: Central America Project series*, Harvard Institute for International Development, Harvard University, pp.1-21.
- Vittas D (1999b). "Market Development: "Feasibility" and "Impact" Preconditions", *Development Research Group, World Bank*
- Vittas D (1996). "Pension Funds and Capital Markets", *Public Policy for Private Sector Note 71*, Washington, D.C.: World Bank, February.
- Wang X (2004). *China's Pension Reform and Capital Market Development*, *China & World Economy*, Vol. 12, No. 3, Pp 3-16
- World Bank (2008). "The World Bank Pension Conceptual Framework", *World Bank Pension Reform Primer*, www.worldbank.org/pensions accessed on 22/11/ 2014
- World Bank (2000). "Portfolio Limits: Pension investment restrictions compromise fund performance", *World Bank pension reform primer series*. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/2000> accessed on November 22, 2014.
- World Bank (1994). "Averting the old age crisis; policies to protect the old and promote growth", The World Bank, Washington DC.