Can Pension Reforms Moderate Inflation Expectations and Spur Savings? Evidence from Nigeria

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Abstract: This paper tests the prior-savings theory which proposes that pension savings could moderate inflation, and spur long-tenured savings for fixed capital formation. An augmented Toda-Yamamoto long-run non-causality technique was used to analyze data from 1980 to 2018. The outcome reveals that pension saving has significant negative causal flow to gross fixed capital formation, while gross fixed capital formation does not drive inflation expectation. The outcome suggests that prior-savings theory does not hold in the Nigerian case, which may infer that government borrowing from pension fund has been for consumption expenditure. The results generalize many developing economies with similar financial structure. The paper recommends that borrowed pension savings be invested in infrastructures in line with prior-saving theory. Fiscal policy reforms that broaden and deepen the nexus are recommended.

1 Introduction

A common characteristic of low income inflation-oriented economies is the prevalence of weak long-tenured savings capacity; a condition that has caused major drawback to capital formation, fixed capital accumulation (FCA) and hence their financial architecture. In the neoclassical savings–development theory, saving and investment share horizontal plain, as properly structured saving corresponds to investment in fixed capital, which links growth. Growth of long-tenured savings in many developing countries is hindered by lack of momentous economic system that could mobilize it for increased investment, productivity, and minimize risk. Though, there is no consensus on the exact direction of inflation-economic growth nexus in the literature, ample evidence however, suggests debilitating role of inflation on financial sector performance, and hence underdevelopment [1], [2]. Inflation is also identified as a major influencer of government resort to deficit financing of its activities [3].

This study tests the prior-savings theory which argues that pension savings could spur long-tenured savings, promote fixed capital formation, and moderate inflation expectation. The regression results suggest that the theory does not hold in the Nigerian case. That is, pension assets were not channeled to capital formation, and hence did not support infrastructural development. The study contributes to the financial neoclassical literature which suggests that the saving-fixed capital formation gap could be improved given formidable pension system.

The Nigeria Personal Income Tax Act 1993 defines Pensions fund as a scheme designed to provide retirement benefits or deferred annuities for individuals or their dependents. In part therefore, the investment of the pension assets is essential for infrastructural development and realization of pension annuities. The 2004 Nigerian pension policy which recommends payments of a lump-sum of 25% of the pension contribution to retirees upon retirement may be inadvertently at variance with the philosophy of

pension savings as a capital formation mechanism. Compared to outstanding advancements and infrastructural transformation witnessed through pension reform initiatives in economies such as Chile, Singapore, and Malaysia, the Nigerian policy may have been slack, as lack of appropriate institutional reforms continually undermined Africa's development.

This study contests the neoclassical argument that, being a forced savings mechanism, pension system reforms can moderate inflation and provide the antidote for Nigeria's savings development. Pensions funds need to provide reward for the contributors irrespective of inflation dynamics, as the prior-savings theory reveals that pension economics somewhat has more potency for economic development through inflation management. The theory argues investment as a function of savings, and assumes that all long-tenured savings would find investment outlet, such that any investment not financed by prior-savings may be inflationary rather than promote real income or development [4]. This study tests these propositions in

Nigeria, as it contends that pension economics can in reality play more investment-stimulating role in a nation's economic activity than its direct statutory purpose, such as moderating consumption to tame inflation, stimulating physical and human capital formation and social infrastructural provisions, capable of addressing rising poverty level of the aged people and social protection for larger population.

Presented in Table 1 are Nigeria's savings ratio, inflation and gross fixed capital formation from 2008-2017 relative to peers in the World Bank categorized global lower middle-income (LMI) group. In any economy, savings interest rates are prices that should attract and reward depositors, and encourage long-tenured savings but this is achievable when inflation is tamed [5]. In Nigeria, while inflation has been rising over time except for 2013 and 2014, inflation statistics from the lower middle-income (LMI) peers have consistently shown a downward trend.

Table 1: Nigeria's rank among peers in the lower middle-income (LMI) developing economies in savings, inflation and grossed fixed capital formation (GFCF): 2008-2017

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
NSgdp	31.99	24.89	24.32	24.00	31.89	18.10	21.06	15.82	15.84	18.3
LMI Sgdp	31.00	29.66	31.5	30.71	30.59	28.80	28.95	27.91	27.33	26.98
Ng Inflation	11.58	11.54	13.72	10.84	12.22	8.47	8.057	9.02	15.67	16.52
LMI Inf. (%)	11.49	4.58	5.99	7.33	5.17	5.72	5.27	4.00	3.52	3.85
NgGfcf(%)	8.32	12.08	16.55	15.53	14.16	14.17	15.08	14.83	14.70	n.a
LMI Gfcf (%)	27.31	27.1	26.99	27.03	26.98	25.94	25.58	25.06	25.17	25.54

Source: *World Bank Indicators (WDI): data.worldbank.org. LMI indicates lower middle income group of which Nigeria is classified [6];* **LMI Sgdp** *is average savings to GDP. NSgdp is Nigerian savings per GDP;* **NgGfcf** *is Nigeria's gross fixed capital formation; n.a. indicates not available.*

In capital–scarce economies, mandatory contributory pensions system may increase 'capital accumulation for economic development' by creating demand for long-term financial instruments for both corporate investments and social economic infrastructures beyond the public pillar model [7]. Pension reforms for savings development may target increased percentage of contributions that could increase long-tenured savings habit, increased number of working years, increased national coverage, abolish lump-sum payments, and dynamic adjustments of investment instruments of contributors for higher returns on savings. In Nigeria, pension reforms may not have been far reaching. The 2014 Pension reform raised the employee's contribution of total emolument from 7.5% to 8.0%, while the employer contributes 10 % [8]. The Pension Act broadens the saving coverage of social safety net, as it stipulates that organizations with three employees and above are to be part of the privatized pension scheme, an endeavor that may have locked-in the informal sector.

While varieties of pension plans have evolved across countries, the concern for the aged peoples' poverty, global susceptibility of the aged to retirement adversity, and a non-frictional nexus of pension fund and infrastructure development further necessitates reforms towards an enduring privatized pension model particularly for developing economies [9]. Therefore, how well does the privatized pension system fit the savings architecture for the cycles of development in infrastructure-deficit developing economies? This study conjectures that there is pension reform gap in its linkage to inflation and infrastructural development. The study therefore tests the prior-savings theory by hypothesizing that, first, there is no significant relationship between pension savings and inflation dynamics in Nigeria; and secondly, that there is no significant relationship between pension savings and gross savings in Nigeria. The rest of the paper is structured as follows: following this introduction, section two is literature review, section three treats theoretical framework and methodology, sector four presents and discusses the results, while section five is the conclusion and recommendations.

2. Literature Review

2.1 Theoretical review:
The relationship of pension savings and inflation moderation may be analysed through the household consumption and investment theories. Huge evidence of it is contained in the Keynesian general theory revolution, the rational expectation or the 'forward-looking' thesis of Milton Friedman, Robert Lucas, and Modigliani and Brumberg [10]'s life cycle hypothesis and the relative utility consumption function. Others are the relative-permanent income synthesis [11], precautionary savings and the time inconsistency models of consumer behavior. What may be more intuitive, given current realities of uncertainty in nations' economies, is that savings decision should reflect the individual's consumption smoothing preferences over the life-time. Similarly of current reality is the rational expectation of economic agents that may react to policies different from the expectations of policy makers, such that policy produces unintended results.

The random-walk model reveals that contrary to the permanent income hypothesis (PIH), the future might be imperfect in line with the real-world uncertainties [10]. This thought reflects what operates in many developing economies, as uncertainties such as unforeseen policy reversals, adverse events, and inflation may affect savings and frustrate investment behavior. In the case of investment theory aimed at increased aggregate capital stock leading to long-term output growth, standard neoclassical investment models emphasize savings as a spur for profit maximizing firm, including the Keynesian investment function, Tobin's marginal q, and the user cost of capital function.

The importance of savings and investment nexus to real income growth continuously reflects in the finance-growth debate [12]. The trajectory of financial development and growth is effectively summed in [13] and [14], such that the claims of lagging role of finance by [15], and its leading role by endogenous development theorists [16] is put to rest in [13], particularly for developing economies. Therefore, the prior-saving theory

claims that savings is the fundamental determinant of any investment; and that, given appropriate monetary and fiscal policies, all savings should find their investment outlets [4] otherwise investment that lacks prior-savings may generate inflationary growth.

Inflation in developing economies can be viewed from the orthodox monetary and the structuralist approaches [17]. In the Classical–Keynesian inflation synthesis, the orthodox inflation theory in the quantity theory of money suggests that inflation is a function of excess money supply; then Keynes's excess aggregate demand (inflationary gap) theory at full employment level or potential output [17]. Other thoughts on inflation theories traceable to consumer behaviour are Friedman's adaptive (backward looking) expectation theory, which was sooner modified rational (forward looking) behavior theory, sticky-price framework, which claimed that expectations are not fully adaptive but employs more latent information [18]. However, in developing economies, the structuralist view seems more plausible, since these economies hardly achieve full employment. Admixtures of structural imbalances in output deficiencies, deficit financing, infrastructural gaps, and exposure to globalization of economies could explain inflation outcomes.

2.2 Empirical and methodological review

The linkage of savings development to financial sector reform is often argued to be of double edge [19]. Financial sector reform could provide more savings options and higher returns, and hence inspires more savings habit. On the other hand, a developed financial system may constrain the need to save if household borrowing capacities are relaxed, and when the insurance industry provide better substitutes that could reduce the necessity for precautionary savings [20].

Retirement systems' reforms should be intensified in developing countries to stem four key risks that commit the aged to poverty, namely individual risk; retirement system risk; country-wide risk; and non-diversifiable (global) risk [21]. Mitchell [21] opines that market

institutions and regulatory structures might protect the pension fund risks. Aside from longevity related risks, other risks which the pension system, as insurance, might mitigate are capital market uncertainty, inflation risks, earnings uncertainty, job tenure uncertainty, labour market interruption, and social insurance uncertainty [22]. These risks, particularly inflation, can be mitigated when pension fund recursively pass through infrastructural finance. However, the Nigeria financial system is noted as weak, maladapted, and disproportionately disadvantaged against the long-end and the real sector requirements [12]. The World Bank reveals that in many developing economies critical infrastructural investment fund often lay bare, thus, requiring urgent need of financial reform [22].

Chybalski [7] employed spearman correlation and cluster analysis in a static and dynamic study to evaluate the adequacy of pensions from its multi-dimensional efficiency perspective across 28 European economies from 2007 to 2011. The study finds that using both static and dynamic indicators, the Norwegian and Icelandic pension systems seem most efficiently run among the 28 countries studied. However, the role of pensions in the connection between inflation management and capital formation was outstanding. In a comparative study on the threshold effects of inflation on financial development between the Economic Community of West African States (ECOWAS) and Southern Africa Development Community (SADC) from 1980 to 2011, [1] employed panel smooth transition regression (PSTR). The outcome reveals the existence of robust single threshold of inflation in both regions. It indicates 17.9% and 14.5% of inflation for ECOWAS and SADC respectively. However, the role of pensions in inflation-capital formation nexus was not considered.

Ozturk and Karagoz [2] adopted ARDL bound test for co-integration to examine the relationship between inflation and financial development in Turkey. The outcome reveals negative effects of inflation on financial development and economic growth. In Nigeria [23] used granger causality technique for short-

run relationship; and impulse response and variance decomposition tests for long-run estimation to examine the influence of pension reforms on capital formation from 1981 to 2013. The results reveal that pension fund does not granger-cause gross capital formation. Also, gross capital formation forecast error was absorbed by savings and gross domestic output, with insignificant impact from pension assets. This outcome is however not consistent with economic development theory. Pension fund, as an inflation management instrument was not considered in the study. Karam, Muir, Pereira and Tuladhar [24] adopted a stochastic general equilibrium model to evaluate the macroeconomic effects of three public pension reforms (increased retirement age, reduction in benefit, and increase in contribution rate) in a global study. The outcome reveals that pension reforms have positive impact on growth in both the short-run and long-run periods. Pension fund impact on inflation was however not tested, and the study sample also excludes Nigeria.

3. Theoretical Framework and Methodology

3.1 Theoretical framework

In the neoclassical growth model, investment capacity is closely associated with saving potency and increased stock of capital [10]. Solow [25] and Kaldol [26] extend this argument fundamentally to capital accumulation as aid to technical progress and proportionate growth rate of output. Thus, this study adopts three functional relations: the savings function; the investment function; and the technical progress function. The framework is as follows:

Savings function: $S_t = \psi P_t + \tau(Y_t - P_t)$, *where*

$1 > \psi > \tau \geq 0$

(1)

Equation (1) indicates that the savings (S_t) consists of savings (ψ) out of profit (P_t), and savings (τ) out of wages ($Y_t - P_t$) in period, t. In capital scarce developing economies, the capacity to save (Sc) is far less than the social requirements of savings (Sr), more attributable to higher level of disguised unemployment [27]. Thus, $Sc < Sr$ (2)

Equation (2) transmits to low investment capacity, such that with low Sc, the level of investment is largely brought about by rate of profits as follows:

Investment   function:

$$K_t = \psi' Y_{t-1} + \tau' \left(\frac{P_t - 1}{K_t - 1} \right) Y_{t-1} \quad , \quad where$$

$\psi', \tau' > 0$ (3)

and that $I_t = K_{t+1} - K_t$

(4)

K_t is capital stock in time t, ψ' is coefficient of output and τ' is coefficient of rate of profit on capital. From equation (2), with limited I_t, then warranted growth rate (G_w) would be less than its national growth potentials (G_n):

$G_w < G_n$ (5)

Technical progress is thus limited to the level of change in income:

Technical   Progress   function

$$\frac{Y_{t+1} - Y_t}{Y_t} = \psi'' + \tau'' \frac{I_t}{K_t} \quad , \quad where$$

$\psi'' > 0, and\, 1 > \tau'' > 0$ (6)

Equation (6) states that the growth rate in income (and labour productivity) increases proportionately to the rate of net investment plus technical progress, moderated by the level of economy's social savings. τ'' represents capital per head; ψ'' is coefficient of technical progress.

3.2 Methodology
3.2.1 Data

This study sourced annual data from 1980 to 2017 from the database of the National Bureau of Statistics (NBS), the Central Bank of Nigeria, and the Pension Commission of Nigeria. Inflation rate (*Inf*) connote annual price changes that constitute risks in the macroeconomy and affects the well-being of citizens; although it could also encourage industrial production [28]. Gross fixed capital formation (*Gfcf*) is the proxy for infrastructure. It represents the non-consumptive current available resources deployed to increase the nations' stock of capital goods for production of the economy's consumable outputs in the future [27]. Pension

savings (*Psn*) is central to the World Bank's objective of poverty reduction and shared prosperity; an integral part of the economy's social protection system against old age poverty. The pension contributory determinant has been discussed at the introduction section. Interest rate (*irt*) has supply and demand determinants in the literature. Effectively, it constitutes input cost in the demand for capital. Gross national saving (*Gsvn*) is key growth variable for the economy's capital accumulation and capital formation.

3.2.2 Techniques of Estimation
Granger –VAR specification

The behaviour of macroeconomic variables is a key determinant of national development. The variables' impacts are assumed to relate in dynamics form, and therefore necessitates the application of technique of VAR structure [29] comprising pensions saving, gross national savings, gross fixed capital formation, inflation rates and interest rates. In the strict sense of VAR innovation, all variables are treated endogenously which imply that in a general reduced form, each equation has the same set of regressors. In simple implicit form, the foregoing is presented in equation (7) as a generalized VAR structure:

$$V_t = f(V_{t-i}) \tag{7}$$

The log-form and dynamic multivariate Granger-VAR system for inflation rate (*inf*), gross fixed capital formation (*gfcf*), gross national savings (*gsvn*), pensions savings (*psv*), and interest rates (*int*) are stated explicitly in equations (8) to (12):

$$\Delta L\mathrm{inf}_t = \alpha_1 + \sum_{j=1}^{P}\beta_{1j}\Delta L\mathrm{inf}_{t-j} + \sum_{j=1}^{P}\beta_2\Delta Lgfcf_{t-j} + ... + \sum_{j=1}^{P}\beta_4\Delta Lpsv_{t-j} + \sum_{j=1}^{P}\beta_5\Delta L\mathrm{int}_{t-j} + \varepsilon_{1t}, \tag{8}$$

$$\Delta Lgfcf_t = \alpha_2 + \sum_{j=1}^{P}\beta_{1j}\Delta L\mathrm{inf}_{t-j} + \sum_{j=1}^{P}\beta_{2j}\Delta Lgfcf_{t-j} + ... + \sum_{j=1}^{P}\beta_{3j}\Delta Lgsvn_{t-j} + \sum_{j=1}^{P}\beta_{5j}\Delta L\mathrm{int}_{t-j} + \varepsilon_{2t}, \tag{9}$$

$$\Delta Lsvn_t = \alpha_3 + \sum_{j=1}^{P}\beta_{1j}\Delta L\mathrm{inf}_{t-j} + \sum_{j=1}^{P}\beta_{2j}\Delta Lgfcf_{t-j} + ... + \sum_{j=1}^{P}\beta_{4j}\Delta Lsvn_{t-j} + \sum_{j=1}^{P}\beta_{5j}\Delta L\mathrm{int}_{t-j} + \varepsilon_{3t}, \tag{10}$$

$$\Delta Lpsv_t = \alpha_4 + \sum_{j=1}^{P}\beta_{1j}\Delta L\mathrm{inf}_{t-j} + \sum_{j=1}^{P}\beta_{2j}\Delta Lgfcf_{t-j} + ... + \sum_{j=1}^{P}\beta_{4j}\Delta Lpsv_{t-j} + \sum_{j=1}^{P}\beta_{5j}\Delta L\mathrm{int}_{t-j} + \varepsilon_{4t}, \tag{11}$$

$$\Delta L\mathrm{int}_t = \alpha_5 + \sum_{j=1}^{P}\beta_{1j}\Delta L\mathrm{inf}_{t-j} + \sum_{j=1}^{P}\beta_{2j}\Delta Lgfcf_{t-j} + ... + \sum_{j=1}^{P}\beta_{4j}\Delta Lpsv_{t-j} + \sum_{j=1}^{P}\beta_{5j}\Delta L\mathrm{int}_{t-j} + \varepsilon_{5t}, \tag{12}$$

Augmented Toda-Yamamoto non-causality approach

Toda and Yamamoto [30] advanced the VAR literature by establishing an augmented granger non-causality theorem for time series dataset with non-uniform level of stationarity. Engle and Granger [31] reveal the inherent flaws in the use of non-stationary and co-integrated variables' coefficients with the standard granger-causality test. Summarized specification of the

Toda and Yamamoto framework for *Yt* and *Xt* series is stated below:

$$Yt = a + \sum_{i=1}^{p+d}\varphi_i Y_{t-i} + \sum_{j=1}^{q+d}\lambda_j X_{t-j} + u_{Yt} \tag{13}$$

$$X_t = a + \sum_{i=1}^{p+d}\xi_i X_{t-1} + \sum_{j=1}^{q+d}\vartheta_j Y_{t-1} + u_{Xt} \tag{14}$$

Where *d* stands for the system's maximum order of integration of the variables, *p* and *q* are

optimal lag of *Yt* and *Xt*. *u* is assumed the white noised random error.

3.2.3 Model specification

The simple implicit form of the conceptual linkage of the construct variables- inflation rate (*inf*), gross fixed capital formation (*gfcf*), gross savings (*gsvn*), pension savings (*psv*) and interest rate (*int*) is presented in log form as follows:

$$Linf_t = f(Lgfcf_t, Lgsvn_t, Lpsv_t, Lint_t) \quad \text{where } t = 1,...,T \quad (15)$$

The signs above are the expected *a priori* expectations of the coefficients. T indicates the period in years. The explicit form of the model is presented as follows:

$$L\inf_t = \alpha_t + \beta_1 Lgfcf_t + \beta_2 Lgsvn_t + \beta_3 LPsn_t + \beta_4 L\operatorname{int}_t + \varepsilon_t \tag{16}$$

4. Estimation Results and Discussion

4.1: Pre-estimation tests: This section presents the unit root, optimal lag length, and diagnostic tests.

4.1.1: Unit root analysis

Presented in table **4.1** below is the unit root test statistics. Using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) criteria, inflation rate (*inf*) is a level variable, devoid of unit root, but the rest of the variables weren't free of trending issues overtime. Consequently, while three variables (gross fixed capital formation (*gfcf*), gross national saving (*gsvn*) and interest rate (*Lirt*)) are stationary at first difference, pension savings (*Psn*) however, became stationary at second difference under the ADF but it is stationary at first difference under PP. The non-uniform stationary properties of the variables suggest the use of Toda-Yamamoto methodology for long-run co-integration and regression study [30]. The Phillips-Perron (PP) test became necessary to accommodate structural break influence that may exist in the data series.

Table 4.1: Unit root tests

Methods	Augmented Dickey-Fuller (ADF) Test			Phillips-Perron (PP) Test		
Variables	[1]Test stat	Prob. value	Stationary@	[1]Test stat	Prob. value	Stationary@
Linf	-3.9894	0.0181**	I(0)	-3.8918	0.0225**	I(0)
Lgfcf	-5.9881	0.0001***	I(1)	-6.6138	0.0000***	I(1)
Lgsvn	-5.8035	0.0002***	I(1)	-5.8053	0.0002***	I(1)
Lpsv	-4.8828	0.0037***	I(2)	-3.6888	0.0394**	I(1)
Lirt	-6.1358	0.0001***	I(1)	-7.7755	0.0000***	I(1)

Source: The authors. *,**,*** denotes 0.1, 0.05, and 0.01 levels of significance respectively. [1]Test is for constant and trend models.

4.1.2 Optimal Lag Structure

The model's optimal lag length for the study is suggested as one (1), since the entire five (5) criteria settled for it. It is presented in table **4.2** below:

Table 4.2: Lag Structure

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-160.5691	NA	0.0626	11.4185	11.6543	11.3924
1	9.0863	269.1088*	3.00e-06*	1.4424*	2.8567*	1.8853*
2	28.9508	24.6593	5.06e-06	1.7965	4.3896	2.6086

Source: The authors. Where LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.

4.1.3 Diagnostic statistics

Table 4.3: LM Serial correlation test

Lag	Observations	LM Stat.	*D.f*	*Probability*
1	32	34.0767	25	0.1063

Source: The authors

Table 4.4: VAR residual heteroscedasticity test

Observations	χ^2 Stat.	*D.f*	*Probability*
32	310.7097	300	0.3230

Source: The authors

Table 4.5: Short-run (Dynamic) causality results

Dependent variable	Exp. variables' optimal lag	Short-run resid's coef.	Prob.	Implication of result
Linf	1	-1.1827**	0.0408	Equation converges to equilibrium
Lgfcf	1	-0.2393*	0.0922	Equation converges to equilibrium
Lpsv	1	-0.6421	0.1509	Equation converges to equilibrium.
Lgsvn	1	-0. 6451	0.1872	Equation converges to equilibrium.
Lirt	1	-1.7816***	0.0043	Equation converges to equilibrium

Source: The authors; *, ** & *** denote 0.1, 0.05, 0.01 levels of significance.

4.1.3.1 Test for Serial correlation

The model serial correlation test of the residual produces LM statistics of 34.0767, presented in table 4.3 below. In line with the null hypothesis of no serial correlation, using the p-value, the study fails to reject the hypothesis that the model is free of serial correlation at the required P-Lag of 1.

4.1.3.2 Model residual heteroscedasticity test

Presented in table 4.4 below is the residual heteroscedasticity test result, including cross terms. From the p-value of 0.3230, the result suggests non rejection of the null hypothesis, which indicates that the residuals of the cross sections are homoscedastic.

4.2 Short-run (dynamic) effects

The short and long-term results are presented in tables 4.5 and 4.6 below. In the short-run, all equation models produce the standard negative coefficients which suggest stability and convergence towards equilibrium within one year. Similarly, it indicates that the explanatory variables co-integrate with the dependent variable in the long-term equilibrium process. The exceptional adjustment rate value of above 100 percent speed recorded in inflation rate (Linf) and lending interest rate (Lirt) is justified in extant works of [28], [32] and [33]. In [32] the speed of adjustment process to equilibrium on the demand for money in Fiji from 1970-2002 was -1.114 (-111.4 per cent). In a study on saving and investment relationship in Nigeria, [33] find that the speed of adjustment to equilibrium was -1.107 (-110.7 per cent). Eke [28] recently finds that corporate bond issue equation has -1.009 speed of adjustment towards long-term equilibrium in thirteen (13) African economies.

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4.3 Long-run causality result

The Toda Yamamoto (TY) Granger non-causality long-run result is presented in line with the model optimal lag-length of one (1) in table **4.6** below. The regression result contradicts the correlation results above, as it reveals significant negative relationship between pension savings *(Psv)* and gross fixed capital formation *(Ggcf)*, the proxy for infrastructure, which implies that pension savings is not being utilized to grow the nation's fixed capital formation. The gross fixed capital formation (*Gfcf*) however shares negative relationship with inflation rate, albeit insignificantly, just as pension savings and inflation rate are bi-directionally and negatively related. The outcome may suggest that, should substantial amount of the over ₦8.0 trillion (about $22 billion) pension asset as at December 2017 be investment in infrastructure, pension savings would have had the potency to moderate long-term inflation downwards. International evidence from Chile's pension reform and liberalization show substantial growth, investment and saving improvement [34]. In extroverted developing economies like Nigeria, inflation could exacerbate economic challenges and risk. The theory of financial repression depicts that inflation, particularly the unexpected, could significantly curtail financial intermediation, by aggravating financial sector instability [35], [19].

Moreover, against the *a priori,* pension savings *(Psv)* negatively and significantly affect gross saving *(Gsvn)* while gross savings positively and significantly drive pension savings. These results reveal that barring the empirical technique employed, the pension's mechanism being more of forced-savings device could encourage more long-tenured savings development relative to the voluntary short-tenured savings instruments in Nigeria, if supported with effective reforms.

Some other results in the model reveal crucial influences. Inflation rate (*inf*) expectation positively drives interest rate (*int*), while the observed reverse or negative relationship from $int \rightarrow inf$ is not significant. It may affirm the weakness of interest rate policy as the antidote to inflation prevalence in Nigeria, and therefore, the dominance of inflation in the $int \leftrightarrow inf$ nexus in many developing economies. Gross fixed capital formation (*gfcf*) negatively and significantly drives interest rate. It may imply that necessary financing mechanism of pension can produce indirect effect on price of capital, to manage high cost-push inflation through investments in gross fixed capital formation. Moreover, both pension savings and gross savings negatively and significantly drive interest rate, which suggests that as noted in last paragraph, improved active savings behaviour could potently manage the economy's cost of capital downward, rather than direct interest rate fixation, a policy pill of Milton Friedman [36].

Thus, in response to the two hypotheses tested, first this study fails to reject the hypothesis that pensions fund does not significantly relate with inflation expectation in Nigeria; and secondly, the study fails to rejects the proposition that pensions fund does not significantly drive gross savings in Nigeria. While pension savings does not drive gross national savings, it does not act as antidote to inflation.

Table 4.6: Long-run causality results: Augmented Toda-Yamamoto technique

Null Hypotheses	Coefficient	Lag order(P)	Causality flow /Co-integration	Modified Wald test (P. value)	
				F. Stat.	X² Stat.
Lpsv does not cause Lgfcf	-2.9340	1	Lpsv→Lgfcf	2.4085(0.145)	4.817(0.089)**
Lgfcf does not cause Lpsv	-0.0094	1	Lgfcf→ Lpsv	2.8928(0.12)	5.785(0.05)**
Lgfcf does not cause Linf	-0.0236	1	No causality/	1.0916(0.37)	2.1833(0.33)
Linf does not cause Lgfcf	-0.0972	1	co-integration	1.4733(0.27)	2.9467(0.22)
Lpsv does not cause Linf	-2.2388	1	No causality/	1.0497(0.38)	2.099(0.35)
Linf does not cause Lpsv	-0.0461	1	co-integration	1.3883(0.31)	2.776(0.25)
Lpsv does not cause Lgsvn	-0.4412	1	Lpsv→Lgsvn	3.6936(0.067)*	7.3873(0.02)**
Lgsvn does not cause Lpsv	0.3985	1	Lgsvn→Lpsv	7.0588(0.02)**	14.117(0.00) ***
Lgsvn does not cause Linf	0.6348	1	No causality/	1.5051(0.27)	3.0102 (0.22)
Linf does not cause Lgsvn	0.0843	1	co-integration	1.7340(0.23)	3.4681(0.17)
Lirt does not cause Linf	-1.037	1		1.7192(0.23)	3.4384 (0.17)
Linf does not cause Lirt	0.0127	1	Linf→lirt	7.1443(0.01)***	14.288(0.00)***
Lgsvn does not cause Lgfcf	-0.7988	1		1.4072(0.29)	2.8144(0.44)
Lgfcf does not cause Lgsvn	-0.0711	1	Lgfcf→Lgsvn	2.5493(0.13)	5.098(0.07)*
Lirt does not cause Lgfcf	0.5458	1		1.502(0.27)	3.001(0.22)
Lgfcf does not cause Lirt	-0.0269	1	Lgfcf→Lirt	6.8504(0.01)***	13.701(0.00) ***
Lirt does not cause Lpsv	-0.1976	1		1.5252(0.28)	3.051(0.21)
Lpsv does not cause Lirt	-0.1787	1	Lpsv→Lirt	6.748(0.016)**	13.497(0.00) ***
Lgsvn does not cause Lirt	-0.2119	1	Lgsvn→Lirt	6.7245(0.016)**	13.449(0.00) ***
Lirt does not cause Lgsvn	-0.1410	1		1.4042(0.29)	2.8044(0.24)

Source: The authors; * ,** and *** indicate 0.1, 0.05 and 0.01 levels of significance; → denotes one-way causality/co-integration. Probability values are in parenthesis

Table 4.7: Long-run causality results: Modified Wald Test

Variables at lag order P=1: Linf, Lgfcf, Lpsv, Lgsvn, Lirt	F. Stat.	χ^2 Stat.	P.value (F. Stat.)	P.value (χ^2 Stat.)	Outcome: joint influence flow
Dependent variable: Lpsv	3.6109	18.055	0.0620*	0.0029***	Yes
Dependent variable: Lgsvn	1.9429	9.7146	0.1823	0.0837*	Yes
Dependent variable: Lirt	2.9010	14.5051	0.0785*	0.0127**	Yes

Source: The authors; * ,**and *** stand for 0.1, 0.05 and 0.01 significance level.

4.4 Long-run Causality: Joint Statistics

The Wald test result for the long-run causality is presented in table 4.8 below. It reports that pension savings (Psv), gross savings (Gsvn) and interest rate (Lirt) equations are significant, while inflation rate (inf) and gross fixed capital formation (gfcf) are insignificant. The result suggests that the long-term development of the Psv, Gsvn, and Lirt depends on the respective model's explanatory variables.

4.5 Discussion

The implications of the result are matters of interest to economic planners in developing economies at same level of financial development with Nigeria. The result that no significant positive flow exists from pension savings *(Psv)* to gross fixed capital formation

(Ggcf) may imply that the prior-savings theory does not hold for the economy. Firstly, the result suggests that the huge pension asset in excess of $22 billion as at December, 2017 may not have been optimally utilized to provide national infrastructure, which suggests that the economy may be over relying on excessive external debt finance for infrastructure development. The neo-structuralist school argues against inappropriate and uncoordinated public borrowings, as nations' excessive debt to GDP ratio have become worrisome to multilateral financial institutions [35]. Secondly, the result suggests that the huge pension fund may be financing consumption expenditure, that is, government borrowings from the fund end in recurrent expenditures. The harmful implications on the macroeconomy of deploying scarce capital funds

for recurrent expenditure are well discussed in the literature [17] .

 The adverse linkage of pension savings (*Psv*) to gross fixed capital formation (*Ggcf*) may not be economically justified in a capital scarce economy like Nigeria. The underdeveloped state of physical infrastructure in Nigeria adds substantially to the incidence of cumulative, double-digit inflation in the economy, which erodes real wage, and currently accentuating high poverty growth rate [23]. Huge infrastructure gap remains a major hindrance for both foreign and indigenous direct investments in the economy, such that the doing business competitiveness ranking in Nigeria relative to global standard remains abysmal [37], as evidenced in the stylized facts earlier presented.

Secondly, by *a priori* the observed negative relationship between gross fixed capital formation and inflation indicates the potential of improvement in infrastructure provision to mitigate the prevalence of high inflation rate in the economy. Lack of critical economic infrastructure in the energy, roads and rail transport sectors generate high operating cost in the manufacturing industry, which has limited their production capacity.

Thirdly, the negative flow of relationship from pension savings to gross saving strongly reveal the imperative for a redirection and reorientation of savings from short- to long-tenured savings instruments, with potential benefits for the economic and financial system development. The traditional neoclassical growth doctrine reveals that differences in capital accumulation among different economies are sources of differences in their per capita income [25], [26], [38].

5 Conclusion and Recommendations

The study adopts deductive research thought to conclude that the prior-savings theory does not hold in Nigeria. The empirical test that pension savings could grow investment in fixed capital formation to manage inflation expectation and spur long-tenured savings reveals that pension savings negatively drives fixed capital formation, while no causality was found between gross fixed capital formation and inflation expectation. Thus, in the Nigerian case, with the adoption of an augmented TY technique, the prior-savings theory is not upheld. This conclusion may apply to other developing economies that haven't been deploying pension fund assiduously towards developing their financial system. The study therefore recommends as follows: first, the negative impact from pension savings to gross fixed capital formation require changes in investment policy and an innovative approach to the packaging and launching of infrastructure-oriented investment products that can attract pension fund investments. In order to attract structured funds such as pensions and insurance into infrastructure development, there is a compelling need to up-scale Nigeria's institutions governance structure, policy constituency, legal infrastructures to protect creditors and ensure credit discipline.

Secondly, the finding that gross fixed capital formation *(Gfcf)* could reduce inflation expectation in the long-term informs the need to mobilize and pursue policies such as the private-public partnership and foreign direct investments, and liberalized private capital flow for improved investments scale in Nigeria's physical infrastructures.

Finally, pension savings is found to negatively reduce overall short-tenured saving, and hence against long-tenured savings. Governments are advised to use fiscal incentive in strengthening this outcome for long-term savings development culture that would direct investments from short-term end to the long-term end of the yield curve, and hence control tendency of long-term inflation.

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Patrick O. Eke established the research thought, produced the original draft and conducted the empirical analysis. Lawrence U. Okoye reviewed, edited and produced the final manuscript. Alexander E. Omankhalen supervised and produced camera-ready version of the manuscript in line with journal specifications.