ISLAMIC UNIVERSITY JOURNAL OF SOCIAL SCIENCES VOL 5, NO 4

ISSN: 2709-2429(Print), 2709-2437(Online)-Published 31st July 2026

Re-examining the Feldstein-Horioka Hypothesis: Savings-Investment Dynamics in Nigeria: Evidence from ARDL and NARDL Approach

by

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Abstract

This study investigates the dynamic relationship between domestic savings and investment in Nigeria: testing the validity of the Feldstein-Horioka (F-H) hypothesis from 1980 to 2023. The study employs Autoregressive Distributed Lag (ARDL) and Nonlinear ARDL (NARDL) models to examine the long-run and short-run interactions between savings and investment. Additionally, the Toda-Yamamoto (T-Y) causality test is applied to determine the direction of causality between the variables. The ARDL results show a strong and positive long-run relationship between savings and investment, consistent with the F-H hypothesis, indicating low capital mobility. Specifically, a 1% increase in savings leads to a 1.229% rise in investment, while a 1% rise in investment increases savings by 0.728%, both statistically significant. The NARDL model reveals asymmetric effects: positive savings shocks significantly increase investment, while negative shocks have insignificant effects. In the short run, savings strongly influence investment, and vice versa, with significant error correction terms indicating convergence toward equilibrium. The Toda-Yamamoto test confirms bidirectional causality between savings and investment, reinforcing the notion of limited capital mobility in Nigeria. The findings suggest that Nigeria's financial markets are not fully integrated with global capital markets. Policymakers should focus on reducing structural barriers and strengthening the financial system to enhance capital mobility and attract foreign investments. This study's novelty lies in its application of both linear and nonlinear models to capture the asymmetric dynamics of savings and investment. It also provides empirical support for the F-H hypothesis in the Nigerian context, using robust causality tests and recent data.

Keywords: Savings, Investment, Capital Mobility, Feldstein-Horioka Hypothesis, Nigeria

JEL Code: E22, F21, C32

1. Introduction

The Feldstein-Horioka (F-H) hypothesis has been a cornerstone of global macroeconomic debates concerning capital mobility and domestic financial integration. Originally formulated by Feldstein and Horioka in 1980, the hypothesis posits that in closed economies, there exists a strong correlation between domestic savings and investment, whereas in open economies where capital is mobile this correlation tends to be weaker.

In their seminal study titled "Domestic Saving and International Capital Flows", Feldstein and Horioka (1980) analyzed data from 16 OECD countries between 1960 and 1970. The study revealed a surprisingly high correlation between national savings and domestic investment, even among industrialized nations presumed to have open capital markets. This finding suggested that, during that period, international capital mobility was limited, and domestic investment was largely financed through internal savings rather than foreign capital. Given the timeframe prior to the globalization of financial markets and the liberalization of capital accounts these results were understandable, as international capital flows were still heavily restricted.

The resulting Feldstein-Horioka Hypothesis (FHP) emphasizes that in economies with low capital mobility, domestic savings tend to be invested locally, making investment levels heavily dependent on national saving rates. Conversely, in economies with high capital mobility, foreign capital inflows can compensate for low domestic savings, and excess savings may be channeled abroad, weakening the savings–investment correlation (Rye & Robertson, 2003; Nadabo, et al. (2024a). Thus, the hypothesis has served as a litmus test for the degree of capital mobility and financial openness in an economy.

In the context of Nigeria, the F-H hypothesis takes on special relevance as the country continues its pursuit of financial liberalization and greater integration into the global financial system (Nasiru & Haruna, 2013). Over the years, Nigeria has implemented several reforms such as interest rate deregulation, exchange rate unification, and partial capital account openness aimed at improving capital mobility and attracting foreign investment (Nadabo, 2023). However, empirical evidence suggests that the country still exhibits features of low capital mobility (Akadiri, et al. 2022; Mustapha, et. al., 2023; Nadabo, et al. 2024b; Hammayo, et. al., 2024; Hammayo, et. al., 2025; Abdullahi, & Nadabo, 2025).

Despite these policy efforts, structural impediments such as macroeconomic volatility, institutional weaknesses, and an overdependence on oil revenues have constrained Nigeria's ability to fully integrate into global capital markets (Nadabo & Abdullahi, 2024). These challenges call into question the effectiveness of Nigeria's domestic financial liberalization strategies in mobilizing international capital and reducing the reliance on domestic savings to finance investment.

This study, therefore, seeks to re-examine the Feldstein–Horioka hypothesis for Nigeria using both linear (ARDL) and non-linear (NARDL) models in the Nigerian context, where domestic savings and investment have shown structural inconsistencies despite increased financial globalization.

The rest of the paper is organized as follows. Section 2 presents a brief review of the relevant literature on the saving–investment nexus. Section 3 presents data and methodology. Section 4 reports the empirical results and analysis. Finally, section 5 concludes the paper.

2. Literature Review

Numerous studies have sought to address the Feldstein–Horioka (F-H) puzzle by evaluating its validity through theoretical, empirical, or combined approaches across various countries, particularly employing time series data. For instance, Mishra et al. (2010) utilized the Johansen cointegration technique and a Vector Autoregressive (VAR) framework to analyze data from 1950-2009 in India, finding a stable long-run relationship with directional Granger causality.

In the case of Pakistan, Shahbaz et al. (2010) applied the ARDL bounds testing approach and an Error Correction Model (ECM) using data from 1976–2006. Their findings indicated a long-run relationship among savings, investment, and other macroeconomic variables, suggesting limited capital mobility. Supporting this, Seth (2011) used the Engle Granger method and ECM on Indian data from 1980–2008, revealing cointegration between savings and investment, particularly within the corporate sector, which implies reliance on internal financing and low capital mobility. In contrast, Adebola and Dahalan (2012) investigated Tunisia (1970–2009) using ARDL and Granger causality methods. Their results showed a long-run relationship when investment was the dependent variable and found bidirectional causality, affirming the F-H hypothesis.

Nasiru and Haruna (2013) studied Nigeria over the period 1980–2011 using the ARDL framework and ECM, finding a long-run relationship consistent with the F-H hypothesis, suggesting weak international capital mobility. Similar conclusions were drawn by Gómez et al. (2015), who employed time series analysis for Colombia (1925–2011). Their results confirmed cointegration between savings and investment, implying that increased domestic saving constrained capital inflows. Likewise, Tursoy and Faisal (2017) used the ARDL bounds testing approach and the Bayer–Hanck combined cointegration test for North Cyprus (1983–2012), confirming cointegration and validating the F-H hypothesis, thus indicating low capital mobility. In Türkiye, Caglar and Yavuz (2018) employed ARDL and Dynamic OLS (DOLS) techniques for the period 1960–2016, affirming the relevance of the F-H puzzle. Meanwhile, Yildirim and Koska (2018) observed that political and economic changes led to fluctuations in the savings–investment correlation.

Expanding the analysis to incorporate globalization-related variables, Akadiri, Apinran, and Usman (2022) applied structural break tests and ARDL bounds testing to Nigerian data (1981–2018). Their results showed long-run cointegration, with domestic savings, real income, and foreign direct investment (FDI) positively influencing domestic investment, while globalization and urbanization exerted negative effects suggesting partial capital mobility in a globalized economy.

Pehlivan (2022) also analyzed Türkiye (1990–2019) using Fully Modified OLS (FMOLS) and DOLS techniques, concluding that foreign savings significantly affect domestic investment, reflecting increasing openness to international capital flows. In the North African context, Driouche et al. (2024) examined Algeria (1969–2020) using Gregory–Hansen and Maki cointegration tests, along with linear and nonlinear causality tests. Their findings revealed a low savings retention coefficient and unidirectional causality from savings to investment, suggesting significant reliance on foreign capital. Additionally, Febriani and Ekaputri (2024) studied Indonesia (1981–2020) using a Vector Error Correction Model (VECM), identifying both long-run and short-run relationships with bidirectional causality, thereby validating the F-H hypothesis and underscoring the importance of active macroeconomic policy interventions.

Empirical studies have also examined the F-H puzzle using panel data approaches. Kasuga (2004) investigated 23 OECD and 79 non-OECD countries from 1980 to 1995 using OLS and instrumental variables, finding that increases in domestic saving influenced domestic investment depending on the development of the financial system. Ozkan et al. (2009) applied the Fuzzy C-Means Clustering Algorithm to panel data for 21 OECD countries (1970–2003), showing that larger countries had higher saving-retention coefficients, except for the largest cluster. Rao et al. (2010), using the System GMM estimator and structural break tests for 13 OECD countries (1960–2007), found the F-H puzzle relevant in the pre-Bretton Woods era, with international capital mobility improving post-reform.

Similarly, Chakrabarti (2006) applied a multivariate heterogeneous panel cointegration method across 126 countries (1960–2000), confirming a strong positive correlation (0.58–0.81) between savings and investment ratios. Georgopoulos and Hejazi (2009) analyzed 62 developed and developing countries (1975–2004) using panel OLS and GLS and found support for the F-H hypothesis. Petreska and Mojsoska-Blazevski (2013) validated the hypothesis in transition economies (1991–2010), except for Central Eastern Europe (CEE).

In contrast, Adıgüzel et al. (2017) found the F-H hypothesis invalid in most transition economies (1995–2014). Ay and Özmen (2017), using FMOLS, DOLS, and panel causality

for 12 countries (1970–2015), and Çiftçi et al. (2018) on 28 OECD countries (1980–2015), also found no long-run saving-investment relationship, implying high capital mobility. Pata (2018), however, found significant long-run coefficients for E7 countries using CCMEG and AMG estimators, suggesting limited capital mobility and supporting the hypothesis.

Özek and Bayat (2020) confirmed the hypothesis in Azerbaijan, Kazakhstan, and Turkey but rejected it in Kyrgyzstan and Tajikistan. Alakbarov and Bayar (2021) found no long-run relationship in 21 developing countries (1994–2016), while Koçdemir and Gölpek (2021) confirmed the hypothesis for MERCOSUR countries (1990–2018). Yilanci and Kilci (2021) applied Fourier-based panel techniques to the N-11 countries and found cointegration and causality between savings and investment.

Conversely, Berkman (2022) reported increasing capital mobility in G8 countries (1996–2020), inconsistent with the F-H hypothesis. Konya (2022), using Westerlund cointegration tests across 41 less-developed countries (1990–2020), affirmed the hypothesis in most cases. Then, ang and Sek (2022), applying a NARDL model to four advanced Asian economies, found mixed results, including a puzzling negative short-run relationship in China. Ata, Dallı, and Oğul (2022) concluded that the hypothesis did not hold in MINT countries (Mexico, Indonesia, Nigeria and Turkey), (1987–2020), suggesting high capital mobility. Duran and Ferreira-Loper (2023) found that the 2008–2009 global financial crisis reignited the F-H puzzle in 13 major economies (1996–2016) using panel GMM. Finally, Pehlivan and Korkmaz (2025) reaffirmed the persistence of the puzzle in OECD countries (1990–2021), despite increasing capital openness.

To the best of our knowledge, although very few studies have been conducted on the Feldstein-Horioka hypothesis within the Nigerian context such as Nasiru and Haruna (2013), who employed the ARDL framework and ECM for the period 1980–2011; Akadiri, Apinran, and Usman (2022), who used structural break tests and ARDL bounds testing for the period 1981–2018; and Ata, Dallı, and Oğul (2022), who included Nigeria in a panel of MINT countries using linear methodologies none of these studies has explicitly examined the possibility of a non-linear relationship between savings and investment. This represents a significant methodological gap, especially given the structural and macroeconomic asymmetries that characterize the Nigerian economy. This study addresses this gap by applying both linear (ARDL) and non-linear (NARDL) models, thus providing a more comprehensive and realistic analysis of savings–investment dynamics in Nigeria.

3. Methodology

The study adopted the reduced-form bivariate model proposed by Feldstein and Horioka (1980) to investigate the long-run relationship between domestic saving and investment, as well as to assess the extent of international capital mobility. The model is specified as follows:

$$INV_t = \beta_0 + \beta_1 SAV_t + \varepsilon_t \quad (1)$$

Where INV_t represents investment proxy by gross fixed capital formation as a percentage of gross domestic product (GDP), and SAV_t is the gross national saving as a percentage of GDP, and β_0 and β_1 are parameters to be estimated, and ε_t is the disturbance term. The choice of gross fixed capital formation as a percentage of GDP and gross national saving as a percentage of GDP is justified following the work of Feldstein and Horioka (1980).

Before conducting the cointegration analysis, it is crucial to assess the stationarity properties of the variables included in the study. To determine their order of integration, both the Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests will be employed. Upon completion of the stationarity tests, the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, developed by Pesaran et al. (2001), will be used to examine the existence of long-run relationships among the variables. This method is preferred due to its robustness in small samples and its ability to accommodate variables integrated of different orders (I(0) and I(1)). The ARDL bounds testing framework involves estimating an Error Correction Model (ECM), where each variable is alternately treated as the dependent variable. These ARDL and ARDL-ECM equations are considered linear models, assuming a symmetric and linear relationship between investment and gross national saving. The general form of the ARDL model is specified as follows:

$$\Delta INV_t = \alpha_0 + \alpha_1 INV_{t-1} + \alpha_2 SAV_{t-1} + \sum_{i=1}^{p} \alpha_3 \Delta INV_{t-i} + \sum_{i=0}^{q} \alpha_4 \Delta SAV_{t-i} + \mu_t \quad (2)$$

$$\Delta SAV_t = \beta_0 + \beta_1 SAV_{t-1} + \beta_2 INV_{t-1} + \sum_{i=1}^{p} \beta_3 \Delta SAV_{t-i} + \sum_{i=0}^{q} \beta_4 \Delta INV_{t-i} + \varepsilon_t \quad (3)$$

Where: Δ denotes the first difference operator; p is the maximum lag order selected by Akaike's Information Criterion (AIC); $\boldsymbol{\alpha_0}$ is the constant term; $\boldsymbol{\alpha_1}$ and $\boldsymbol{\alpha_2}$ stand for the long-run coefficients; $\boldsymbol{\alpha_3}$ and $\boldsymbol{\alpha_4}$ are short-run coefficients while μ_t The white noise error term in equation 2 represents the ARDL model for investment as dependent variable. Also,

$\boldsymbol{\beta_0}$ is the constant term; $\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_2}$ stand for the long-run coefficients; $\boldsymbol{\beta_3}$ and $\boldsymbol{\beta_4}$ are short-run coefficients whereas $\boldsymbol{\varepsilon_t}$ the white noise error term in equation 3 represents the ARDL model for the gross national saving. Additionally, the following short-run dynamic equations and Error Correction Models (ARDL-ECMs) are specified and estimated after confirming the existence of cointegration between investment and gross national saving. These models capture the short-run adjustments and the speed at which deviations from the long-run equilibrium are corrected over time:

$$\Delta INV_t = \varphi_0 + \varphi_1 ECT_{(t-1)} + \sum_{i=1}^{p} \varphi_2 \, \Delta INV_{t-i} + \sum_{i=0}^{q} \varphi_3 \, \Delta SAV_{t-i} + \xi_t \quad (4)$$

$$\Delta SAV_t = \lambda_0 + \lambda_1 ECT_{(t-1)} + \sum_{i=1}^{p} \lambda_2 \, \Delta SAV_{t-i} + \sum_{i=0}^{q} \lambda_3 \, \Delta INV_{t-i} + \Omega_t \quad (5)$$

Where: φ_0 *is* the constant term; φ_1 is the coefficient of one period lagged error correction term, $ECT_{(t-1)}$ capturing the speed of adjustment toward the long-run equilibrium. φ_2 and φ_3 are the short-run coefficients of gross national saving and investment, respectively, in Equation (4), where investment is the dependent variable. Similarly, in Equation (5), λ_0 denotes the constant term; λ_1 is the coefficient of the one-period lagged error correction term (ECT_{t-1}), indicating the long-run adjustment dynamics. λ_2 and λ_3 represent the short-run coefficients of gross national saving and investment, respectively, in the model where gross national saving is the dependent variable.

In addition to the linear ARDL approach, this study also incorporates a nonlinear framework to account for potential asymmetries in the relationship between investment and gross national saving. This alternative method, proposed by Shin et al. (2014), is known as the Nonlinear Autoregressive Distributed Lag (NARDL) bounds testing approach to cointegration. The NARDL model extends the traditional ARDL model by allowing for asymmetric adjustments in both the short-run and long-run dynamics.

Accordingly, following the approach of Shin et al. (2014), the basic linear models specified in Equations (2) and (3) can be restructured to capture potential asymmetries in the relationship between investment and gross national saving, as proposed under the Feldstein and Horioka hypothesis. This involves decomposing the saving variable into its positive and negative partial sums to allow for asymmetric effects. The re-specified models are expressed as follows:

$$INV = \alpha_0 + \alpha_1{}^{+} SAV_t^{+} + \alpha_1{}^{-} SAV_t^{-} + \eta_t \quad (6)$$

$$SAV_t = \beta_0 + \beta_1{}^{+} INV_t^{+} + \beta_2{}^{-} INV_t^{-} + \upsilon_t \quad (7)$$

Where α_0 represents the constant term and$\alpha_1{}^{+}$ and $\alpha_2{}^{-}$ represent the long-run coefficients on the positive change (SAV_t^{+}) and negative (SAV_t^{-}) changes in the investment in equation 6. Similarly, β_0 represents the constant term while $\beta_1{}^{+}$ and $\beta_2{}^{-}$ represent the long coefficients attached to the positive (INV_t^{+}) and negative (INV_t^{-}) changes in gross national savings in equation 7.

For clarity, the NARDL models for Feldstein and Horioka hypothesis are represented in equation 8 and 9.

$$INV = \gamma_0 + \gamma_1 INV_{t-1} + \gamma_2 SAV_{t-1}^{+} + \gamma_3 SAV_{t-1}^{-} + \sum_{i=1}^{p} \theta_1 \Delta INV_{t-1} + \sum_{i=0}^{q} \theta_2 \Delta SAV\_pos_{t-0} + \sum_{i=0}^{r} \theta_3 \Delta SAV\_neg_{t-0} + \eta_t \quad (8)$$

$$\Delta SAV_t = \delta_0 + \delta_1 SAV_{t-1} + \delta_2 INV_{t-1}^{+} + \delta_3 INV_{t-1}^{-} + \sum_{i=1}^{p} \sigma_1 \Delta SAV_{t-1} + \sum_{i=0}^{q} \sigma_2 \Delta INV\_pos_{t-0} + \sum_{i=0}^{r} \sigma_3 \Delta INV\_neg_{t-0} + \varepsilon_t \quad (9)$$

In Equation 8, $\gamma_0$denotes the coefficient of the constant term, while $\gamma_1, \gamma_2, \gamma_3$ represent the long-run coefficients associated with the positive and negative changes in investment. Additionally, θ_1; θ_2 and θ_3 are the corresponding short-run coefficients; in Equation 9, δ_0 signifies the coefficient of the constant term, whereas δ_1, δ_2, δ_3 represent the long-run coefficients linked to the positive and negative changes in gross national savings. Furthermore, p, q, and r denote the optimal lag lengths determined based on the Akaike Information Criterion (AIC).

The ECMs models for both investment and gross national saving (Feldstein and Horioka hypothesis) are specified in equations 10 and 11 as follows:

$$\Delta INV_t = \varpi_0 + \sum_{i=1}^{p-1} \varpi_1 \Delta INV_{t-i} + \sum_{i=0}^{q-1} \varpi_2 \Delta SAV_t^{+} + \sum_{i=0}^{r-1} \varpi_3 \Delta SAV_t^{-} + \pi ECT_{t-1} \quad (10)$$

$$\Delta SAV_t = \varphi_0 + \sum_{i=1}^{p-1} \varphi_1 \Delta SAV_{t-i} + \sum_{i=0}^{q-1} \varphi_2 \Delta INV_t^{+} + \sum_{i=0}^{r-1} \varphi_3 \Delta INV_t^{-} + \Omega ECT_{t-1} \quad (11)$$

In Equation 10, ϖ_0 denotes the constant term, while ϖ, ϖ_2 and ϖ_3 represent the short-run coefficients. π captures the speed of adjustment, and ECT_{t-1} reflects the long-run dynamics. Similarly, in Equation 11, φ_0 is the constant term, φ_1, φ_2, and φ_3 are the short-run coefficients, Ω enotes the speed of adjustment, and ECT_{t-1} captures the long-run equilibrium relationship.

3.1 Description and Source of Variables

This section provides a detailed description of the variables employed in the empirical analysis of this study, which spans the period from 1980 to 2023. The choice of variables is rooted in the theoretical framework of the Feldstein-Horioka hypothesis, which examines the relationship between national savings and domestic investment as an indicator of capital mobility.

Table 1: Description and source of variables

Variables	Description	Unit of Measurement	Source
INV	Investment	Gross fixes capital formation (% of GDP)	WDI
SAV	Saving	Gross national Saving (% of GDP)	WDI

Note: WDI represents World Development Indicators (World Bank, 2025).

4. Results and Discussion

Table 2: Descriptive Statistics and Correlation Matrix

Descriptive Statistics			Correlation Analysis		
Statistic	**INV**	**SAV**	**Correlation**	**INV**	**SAV**
Mean	4.876	5.423	**INV**	1.000	0.670
Median	4.977	5.417	**SAV**	0.513	1.000
Maximum	5.075	5.634			
Minimum	4.865	5.303			
Std. Dev.	0.054	0.084			
Skewness	-0.011	1.054			
Kurtosis	2.086	4.206			
Jarque-Bera	1.272	5.793			
Probability	0.533	0.014			

Source: Authors' compilation (2025)

The descriptive statistics provide insights into the distribution and variability of Investment (INV) and Savings (SAV). On average, savings (mean 5.423) exceeds investment (mean 4.876), and both variables have median values close to their means, indicating relative

symmetry, particularly for investment. However, savings shows greater variability, with a higher standard deviation (0.084) compared to investment (0.054). The skewness value for investment (-0.011) suggests a nearly symmetric distribution, whereas savings (1.054) is positively skewed, indicating a longer right tail. In terms of kurtosis, investment is flatter than a normal distribution (kurtosis 2.086), while savings is more peaked (kurtosis 4.206), suggesting a leptokurtic distribution. Normality tests using the Jarque-Bera statistic indicate that investment data is normally distributed (p-value 0.533), while savings significantly deviates from normality (p-value 0.014). Furthermore, the correlation matrix reveals a moderately strong positive relationship (0.670) between investment and savings, implying that an increase in savings is associated with an increase in investment.

In order to test or ascertain the stationarity properties of the data the study carried out Augmented Dickey Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests.

Table 3: Unit Root Test Results

Variable	Test	Level-Intercept	Level-Intercep &	First Diff-Intercept	First Diff- Intercept & Trend
INV	ADF	3.133	11.180	1.170	3.888 (1)
	KPSS	0.441	0.184	0.077	0.067 (0)
SAV	ADF	9.067	11.288	5.539	3.843 (1)
	KPSS	0.533	0.136	0.613	0.322 (1)

Notes: *, **, *** denote significance at the 10%, 5%, and 1% levels respectively, ADF: Augmented Dickey-Fuller Test and KPSS: Kwiatkowski-Phillips-Schmidt-Shin Test

The unit root test results for Investment (INV) and Savings (SAV) were assessed using the Augmented Dickey-Fuller (ADF) and KPSS tests to determine whether the series are stationary. For INV, the ADF test indicates non-stationarity at level but shows evidence of stationarity after first differencing. The KPSS test supports this, showing low values that suggest stationarity at both level and first difference. For SAV, the ADF results suggest possible stationarity at level, while the KPSS results indicate non-stationarity at level and stationarity at first difference.

Table 4: Cointegration Results for ARDL and NARDL Models

Panel A:	Function	F-Statistic	K	Significance	I(0)	I(1)

ARDL Model				Level	Bound	Bound
	INV = f(SAV)	6.460	3	10%	2.72	3.77
				5%	3.23	4.35
				1%	4.29	5.61
	SAV = f(INV)	9.303	3	10%	2.70	3.77
				5%	3.23	4.35
				1%	4.29	5.61
Panel B: NARDL Model	INV = f(SAV)	12.226	5	10%	2.12	3.23
				5%	2.45	3.61
				1%	3.15	4.43
	SAV = f(INV)	7.815	5	10%	2.26	3.35
				5%	2.62	3.79
				1%	3.41	4.68

The cointegration results from both the ARDL and NARDL models reveal a statistically significant long-run relationship between gross national saving (SAV) and investment (INV) in Nigeria. In the ARDL model, the F-statistics for both directions INV = f(SAV) (6.460) and SAV = f(INV) (9.303) exceed the upper bound critical values at the 1% level, confirming bidirectional cointegration. Similarly, in the NARDL model, the F-statistics 12.226 for INV = f(SAV) and 7.815 for SAV = f(INV) also surpass the upper bound values at all significance levels, indicating strong asymmetric cointegration. These findings suggest that both saving and investment not only influence each other in the long run but that their relationship may be nonlinear in nature, implying differential effects of positive and negative changes.

Table 5: Long-Run Coefficients for ARDL and NARDL Models

Dependent Variable	Regressor	Coefficient	Std. Error	t-Statistic	p-Value	F-H Validity
Panel A: ARDL Model						
SAV	SAV	1.229***	0.105	11.727	0.000	Yes
INV	INV	0.728**	0.056	13.019	0.000	Yes
Panel B: NARDL Model						
SAV	SAV_pos	1.347***	0.226	5.961	0.000	Yes
	SAV_neg	-0.672	2.380	-0.282	0.781	No
INV	INV_pos	0.171***	0.045	3.779	0.003	Yes
	INV_neg	1.419	1.897	0.748	0.474	No

Notes: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The long-run coefficients from the ARDL model indicate that a 1% increase in domestic savings leads to a 1.229% increase in domestic investment, while a 1% increase investment

results in a 0.728% increase in savings, both statistically significant at the 1% and 5% levels respectively. These findings reveal a strong and positive long-run relationship between savings and investment, consistent with the Feldstein-Horioka (F-H) hypothesis, which suggests limited capital mobility, especially in developing economies. These results are consistent with previous studies such as Pata (2018), Konya (2022), Koçdemir and Gölpek (2021), and Pehlivan and Korkmaz (2025), who also found evidence supporting the F-H hypothesis in emerging and less-developed economies.

Similarly, the NARDL model reveals an asymmetric relationship a 1% positive shock in savings increases investment by 1.347%, significant at the 1% level, reaffirming the validity of the F-H hypothesis during periods of rising savings. In contrast, a 1% negative shock in savings leads to a 0.672% decrease in investment, but this effect is statistically insignificant, suggesting that declines in savings do not significantly reduce investment in the long run. On the investment side, a 1% positive change results in a 0.171% increase in savings, whereas a 1% negative shock leads to a 1.419% increase in savings; however, the latter is also statistically insignificant. This asymmetry indicates that the savings–investment relationship is stronger during periods of positive economic performance and weaker during downturns, implying partial capital mobility. The asymmetric outcomes align with the findings of Then, Ang and Sek (2022) and Akadiri, Apinran, and Usman (2022), who emphasized the role of structural factors and globalization in influencing the direction and strength of the savings–investment linkage. Overall, the evidence suggests that while capital mobility is increasing globally, domestic savings remain a significant driver of investment in many developing countries.

In the ARDL model (Panel A), the short-run dynamics reveal that a 1% increase in savings leads to a 2.231% increase in investment, statistically significant at the 1% level, affirming the F-H hypothesis in the short run. The error correction term (ECT_{t-1}) is negative and significant (-0.828), indicating a strong and significant speed of adjustment toward long-run equilibrium 82.8% of short-run disequilibria are corrected each period. Conversely, a 1% increase in investment causes a 0.221% rise in savings, while a 1% increase in lagged investment reduces savings by 0.105%, suggesting some short-term feedback. The ECT coefficient for this equation (-0.381) is also significant, confirming long-run convergence.

Table 6: Short-Run/ECM Coefficients

Dependent	Variable	Coefficient	Std.	t-Statistic	p-Value

Variable			Error		
Panel A: ARDL Model					
D(INV)	C	-6.351***	1.156	-5.494	0.000
	D(SAV)	2.231***	0.373	5.898	0.004
	ECT_{t-1}	-0.828***	0.152	-2.572	0.018
D(SAV)	C	3.280***	0.491	6.672	0.000
	D(SAV(-2))	0.480***	0.105	4.567	0.000
	D(INV(-1))	-0.105***	0.040	-2.567	0.015
	D(INV)	0.221***	0.035	6.368	0.000
	ECT_{t-1}	-0.381***	0.057	-6.621	0.000
Panel B: NARDL Model					
D(INV)	C	34.573***	3.517	9.832	0.000
	D(INV(-1))	0.270***	0.084	3.220	0.005
	D(SAV_pos)	-0.095***	0.039	-2.403	0.029
	D(SAV_neg(-2))	-0.158***	0.054	-2.901	0.010
	D(SAV_neg(-1))	-0.322***	0.065	-4.938	0.000
	ECT_{t-1}	-1.157***	0.118	8.812	0.000
D(SAV)	D(SAV(-2))	0.476***	0.085	5.585	0.000
	D(INV_pos(-1))	0.106***	0.029	3.578	0.095
	D(INV_neg(-1))	-0.363***	0.048	-8.249	0.000
	D(INV_neg)	0.038***	0.056	6.728	0.001
	C	3.546***	0.415	8.548	0.001
	ECT_{t-1}	-0.116***	0.014	-8.541	0.000

Notes: *, **, and *** denote statistical significance at the 10%, 5%, and 1% significance levels, respectively.

In the NARDL model (Panel B), results highlight asymmetry in short-run interactions. A 1% increase in lagged investment leads to a 0.270% increase in current investment. However, positive shocks to savings (SAV_pos) reduce investment by 0.095%, while negative shocks to savings (SAV_neg) significantly reduce investment by 0.158% and 0.322% at lag two and lag one respectively. These results suggest that negative changes in savings have a stronger contractionary effect on inv estment in the short run, while positive changes may not always boost investment. The ECT_{t-1} is -1.157 and highly significant, suggesting an over-adjustment but strong correction back to long-run equilibrium.

On the other hand savings side, the short-run coefficients show that lagged savings significantly increase current savings by 0.476%. Lagged positive investment shocks (INV_pos) increase savings by 0.106%, while negative investment shocks (INV_neg) reduce savings by 0.363%. However, current negative investment shocks slightly increase savings (0.038%), suggesting possible precautionary motives. The error correction term (-0.116) is significant, confirming long-run stability.

Overall, these short-run results, particularly the positive savings–investment interaction and significant ECTs, provide strong short-run support for the Feldstein-Horioka (F-H) hypothesis, especially under the ARDL specification. The observed asymmetries in the NARDL model further suggest partial capital mobility and sensitivity of investment to negative savings shocks, consistent with studies such as Akadiri et al. (2022), Driouche et al. (2024), and Febriani and Ekaputri (2024), which acknowledge nonlinear dynamics and transitional capital mobility.

Table 7: Diagnostic Test Results

Panel	Model	BP	BPG	JB	Ramsey-Reset	R^2	Adj. R^2	F-stat	Prob.	DW
A	ARDL (INV)	1.903 (0.386)	16.928 (0.203)	1.318 (0.517)	2.584 (0.124)	0.789	0.701	8.978	0.000	2.048
B	ARDL (SAV)	5.730 (0.057)	26.177 (0.008)	0.904 (0.636)	0.081 (0.779)	0.843	0.745	8.651	0.000	2.414
C	NARDL (INV)	3.102 (0.212)	14.886 (0.604)	3.393 (0.183)	0.132 (0.720)	0.899	0.841	15.583	0.000	2.467
D	NARDL (SAV)	12.845 (0.002)	23.568 (0.649)	0.766 (0.682)	3.143 (0.114)	0.973	0.936	26.431	0.000	2.314

The diagnostic tests presented in Table 6 affirm that both the ARDL and NARDL models adhere to key econometric requirements, underscoring the reliability of the results. For the ARDL investment model (Panel A), there is no evidence of heteroskedasticity or misspecification, and the residuals are normally distributed. The model also demonstrates a strong fit with an R^2 of 0.789 and no sign of autocorrelation. In the ARDL savings model (Panel B), although the BPG test indicates mild heteroskedasticity, other diagnostics including the normality, specification, and autocorrelation tests are satisfactory. The model still shows high explanatory power ($R^2 = 0.843$), supporting the validity of its estimates.

For the NARDL models, diagnostics are particularly robust. In Panel C (investment), all tests including those for heteroskedasticity, normality, and model specification are satisfied, with excellent model fit ($R^2 = 0.899$) and no autocorrelation (DW = 2.467). In Panel D (savings), while the BP test points to potential heteroskedasticity, the model is otherwise well-behaved, passing normality and specification tests, and showing exceptional explanatory power ($R^2 = 0.973$). Overall, the results confirm that the estimated models are statistically sound and the findings are credible under both linear and nonlinear specifications.

Table 8: Toda-Yamamoto (T-Y) Non-Causality Test Results

Dependent Variable	Chi-Square	df	p-value	Decision Rule
INV→SAV	14.835	3	0.002***	Reject H_0: INV Granger-causes SAV
SAV → INV	17.716	3	0.007***	Reject H_0: SAV Granger-causes INV

Notes: "→" denotes the direction of causality being tested, s**ignificance levels**: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The results reveal statistically significant bidirectional causality between investment and savings. Specifically, investment Granger-causes savings, as indicated by a chi-square statistic of 14.835 (0.002), while savings also Granger-causes investment, with a chi-square value of 17.716 (0.007). Both results are significant at the 1% level, leading to the rejection of the null hypotheses in both directions. These findings are consistent with the Feldstein-Horioka (F-H) hypothesis, which suggests that in the presence of capital mobility, the correlation between domestic savings and investment should be weak. However, the observed strong and bidirectional causality implies limited capital mobility and a high level of domestic savings-investment correlation. This outcome points to potential financial market frictions or institutional barriers that constrain the flow of capital, particularly in developing economies such as Nigeria.

5. Conclusion and Policy Implication

The findings of this study confirm the validity of the Feldstein-Horioka hypothesis in the context of Nigeria, as evidenced by a strong and statistically significant relationship between domestic savings and investment over the period 1980–2023. The ARDL model reveals that increases in savings significantly drive investment, while the NARDL model indicates asymmetric effects, where positive savings shocks promote investment and negative shocks have a contractionary impact. Additionally, the Toda-Yamamoto causality test establishes bidirectional causality between savings and investment, further supporting the notion of limited capital mobility in Nigeria.

Based on these findings, several policy implications emerge. First, efforts should be intensified to enhance domestic savings through targeted incentives, financial inclusion, and improved confidence in the banking system. Second, strengthening financial institutions and reducing market frictions are crucial to improving the efficiency of capital allocation. Third, macroeconomic stabilization policies should be prioritized to mitigate the negative effects of savings shocks on investment, especially during economic downturns. Fourth, policies should be designed to ensure that savings are channeled into productive and high-return investment sectors to foster sustainable economic growth. Finally, capital market reforms and the gradual

liberalization of financial flows are essential to improving capital mobility while maintaining economic stability.

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