Asian Management and Business Review, Volume 6 Issue 1, 2026: 274-289

Profit volatility and macroeconomic policy adjustments in Rwanda's real estate sector

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Article History
Received : 2025-08-21
Revised : 2025-11-10
Accepted : 2025-11-12
Published : 2026-02-05

Keywords:
Profit margin volatility; macro-policy realignment; Rwanda's real estate sector

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DOI:
10.20885/AMBR.vol6.iss1.art17

Abstract

Rwanda's real estate sector has experienced robust growth in recent years; however, developers continue to face unstable profit margins due to unpredictable macroeconomic policy shifts. This financial volatility undermines investment confidence and sectoral planning. The objective of this study is to examine how macro-policy realignments, specifically interest rate fluctuations, fiscal incentives, and regulatory changes, affect the cyclicality of profit margins among real estate developers in Rwanda. The study employs correlational research design, using secondary data collected from monetary policy bulletins, fiscal records, and audited financial statements of real estate firms between 2019 and 2023. Findings reveal that interest rate changes have a statistically significant and positive effect on profit margin variation, confirming that monetary tightening increases financial uncertainty and compresses returns. In contrast, fiscal incentives and regulatory reforms exhibit statistically insignificant effects, suggesting that these instruments are either poorly structured, inconsistently applied, or too recent in implementation to produce stabilizing outcomes. The study concludes that macroeconomic policy realignments substantially influence profit margin cyclicality, with monetary policy having the most immediate and measurable impact. Accordingly, it recommends that the National Bank of Rwanda institutionalize structured stakeholder consultations before major interest rate decisions to promote risk mitigation, planning certainty, and sustainable sectoral growth.

Introduction

Profit margin variation, measured through standard deviation and margin spread, is a key indicator of financial health in global real estate markets. Scholars such as Gyourko and Keim (2020) have demonstrated that macroeconomic policy shifts, particularly interest rate changes and fiscal interventions, create cyclical patterns in profitability. Similarly, Greenwald et al. (2021) show that monetary tightening in developed economies compresses margins by elevating capital costs, while fiscal stimulus measures can temporarily inflate profitability. However, in emerging African economies like Rwanda, where real estate functions both as an economic growth engine and a volatility hotspot, the mechanisms linking macro-policy shifts to profit margin variation remain largely underexplored.

Rwanda's property sector has expanded significantly, driven by rapid urbanization and ambitious public housing programs (National Institute of Statistics Rwanda/NISR, 2022). Yet this growth masks underlying instability in developer profitability. According to the National Bank of Rwanda/BNR (2023), interest rate hikes implemented as part of inflation control measures have produced uneven outcomes: large developers with diversified funding sources retain relative margin stability, while small and medium-sized firms experience heightened profit volatility. Fiscal measures such as the 2021 tax holiday for affordable housing (Ministry of Finance and Economic Planning/MINECOFIN, 2021) boosted construction activity but failed to ensure consistent profitability across developer categories, revealing structural policy weaknesses.

E ISSN 2775-202X

The transmission of interest rate changes into the real estate market has proven complex. Hilbers et al. (2020) observed globally that interest rate increases raise financing costs and suppress demand. In Rwanda, these effects have intensified since 2022 (Real Estate Board/REB, 2023), with corporate developers leveraging REITs and foreign capital to withstand rising rates, while SMEs remain vulnerable to commercial credit shifts. This two-tier response challenges conventional monetary impact models and suggests that firm size and capital structure mediate policy outcomes.

Fiscal incentives further complicate the picture. The Rwanda Development Board's/RDB (2022) VAT exemptions on construction inputs stimulated supply but inadvertently distorted profit margins across market segments. Comparative studies by the African Development Bank/AfDB (2021) reveal similar outcomes in East Africa, where tax holidays created speculative booms and post-policy busts. In Rwanda, fiscal policy reversals due to budget constraints may exacerbate instability rather than promote balance.

Regulatory reform adds another layer of volatility. Rwanda's 2020 land law amendments and 2021 building code updates (Ministry of Infrastructure/MININFRA, 2021) aimed to improve sector transparency and standards. Yet these reforms introduced steep compliance costs. While World Bank (2022) reports suggest that such reforms typically lead to short-term margin compression followed by recovery, no Rwanda-specific empirical analysis has measured these effects. This is concerning given the frequency and scale of regulatory updates in Rwanda's dynamic policy environment.

Despite visible sector growth and repeated policy interventions, developers in Rwanda's real estate sector continue to experience unstable and poorly understood profit margins. These fluctuations are increasingly linked to macro-policy realignments, particularly interest rate adjustments, fiscal incentive schemes, and regulatory changes. However, no integrated empirical study currently exists that quantifies how this policy dimensions interact to influence financial performance at the firm level. The absence of such evidence hampers effective policy design and leaves developers, especially SMEs, exposed to unmanaged financial risk (BNR, 2023; RDB, 2022; AfDB, 2021; World Bank, 2022).

Existing research in this area fails to adequately address these interconnected challenges. The National Institute of Statistics Rwanda/NISR (2022) focuses on aggregate sector growth without assessing margin volatility. BNR (2023) reports on monetary transmission effects that exclude profitability outcomes. MINECOFIN (2021) examines housing outputs but ignores fiscal-induced volatility, while Gatsinzi and Ntirenganya (2023) analyze regulatory compliance timelines without addressing financial sustainability. This study seeks to bridge these gaps by examining how interest rate changes, fiscal incentives, and regulatory updates jointly influence profit margin cyclicality in Rwanda's real estate sector.

Literature Review and Hypotheses Development

Conceptual framework

Profit margin variation represents the fluctuations in profitability that real estate firms experience over time, reflecting the sector's sensitivity to internal and external shocks. In financial terms, it captures the dispersion of net profit margins across different periods, measured through statistical indicators such as standard deviation and margin spread (the difference between peak and trough margins). These fluctuations are particularly significant in real estate due to the sector's capital-intensive nature, long project cycles, and sensitivity to macroeconomic conditions. Existing literature (Greenwald et al., 2021; Gyourko & Keim, 2020) establishes profit margin variation as a critical measure of financial health and risk exposure, serving as a barometer for both firm-level stability and sector-wide cyclicality. In emerging markets like Rwanda, where the real estate sector is undergoing rapid transformation, understanding these variations becomes crucial for assessing the impact of policy changes and market dynamics on business sustainability.

In the context of this study, profit margin variation is operationally defined as, the periodic fluctuations in net profit margins (calculated as net income divided by revenue) experienced by real estate development firms in Rwanda, measured through the standard deviation of quarterly profit

margins over five years (2019-2023), and the margin spread between highest and lowest quarterly margins during the same period. This definition captures both the volatility (through standard deviation) and extreme values (through margin spread) of profitability, providing a comprehensive view of cyclical patterns. The focus on net profit margins (rather than gross or operating margins) accounts for the comprehensive effect of financing costs, taxes, and regulatory compliance expenses, all of which are directly influenced by the independent variables (interest rates, fiscal incentives, and regulatory changes) under investigation. This working definition aligns with both financial accounting standards and real estate economics literature while remaining empirically measurable using available sectoral data.

Interest rate changes represent a critical macroeconomic policy tool that directly affects real estate profitability through financing costs and investment decisions. As the central bank adjusts monetary policy to control inflation or stimulate growth, these changes create ripple effects across the real estate sector. Higher interest rates increase borrowing costs for developers, potentially squeezing profit margins, while lower rates may encourage development but could also lead to market overheating. In Rwanda's context, the National Bank of Rwanda's monetary policy decisions (2023) have shown varying impacts across different segments of the real estate market. Large-scale developers with access to diverse financing options may be more resilient, while small and medium enterprises often face significant margin pressures from rate hikes. This variable will be measured using the central bank's prime lending rate changes over the study period, capturing both the direction and magnitude of monetary policy adjustments. The analysis will specifically examine how these fluctuations correlate with profit margin variations across different real estate sub-sectors.

Fiscal incentives in Rwanda's real estate sector primarily include tax holidays, VAT exemptions on construction materials, and special depreciation allowances designed to stimulate investment. These policy measures, implemented by the Rwanda Development Board/RDB (2022), aim to lower operational costs and improve developer profitability in targeted market segments, particularly affordable housing. However, their impact on profit margins may vary depending on implementation timelines, eligibility criteria, and market absorption capacity. Some developers may benefit disproportionately based on project size or location, potentially creating uneven effects across the sector. This study will analyze the timing and scope of these fiscal measures against profit margin trends, evaluating whether they achieve their intended stabilizing effect or inadvertently contribute to margin volatility. The variable will be operationalized through documented policy changes and their specific provisions regarding real estate development incentives.

Regulatory updates encompass changes in building codes, land use policies, and construction standards that affect development costs and operational requirements. Rwanda's recent reforms in land administration and urban planning (MININFRA, 2021) have introduced both opportunities and challenges for real estate developers. While these updates aim to improve sector transparency and quality standards, they often involve compliance costs that may temporarily depress profit margins. The variable captures significant regulatory milestones and their implementation timelines, assessing how they influence profitability cycles. Particular attention will be given to regulations affecting project approval timelines, construction specifications, and environmental compliance, as these directly impact development costs and, consequently, profit margins. The study will measure this variable through policy documentation analysis and developer surveys on compliance cost impacts, providing insights into the relationship between regulatory evolution and margin stability.

Empirical literature

Interest rate changes and profit margin variation

Several empirical studies highlight the significant effect of interest rate changes on real estate profitability. For instance, Mwangi and Karanja (2021) found a negative correlation between central bank rate hikes and profit margins among Kenyan commercial developers. However, their reliance on quarterly data may overlook short-term adaptive strategies. In South Africa, Van der Berg et al. (2022) used vector autoregression and found that interest rate impacts are nonlinear; severe margin

compression occurs only beyond 200 basis point hikes. Notably, these studies often exclude small developers, who face different financing constraints.

In Rwanda, Uwitonze (2023) noted that interest rate transmission is faster in Kigali than regional averages, but his limited sample size (N=32) limits generalizability. A meta-analysis by Schmidt and Okello (2023) shows that developing markets exhibit 23% higher margin sensitivity to rate changes than developed economies. However, the analysis relies heavily on secondary data, raising concerns about measurement consistency. More relevant is BNR's (2023) sector-wide analysis showing that REIT-backed projects maintain margin stability despite rate hikes, implying that financing structure mediates policy impact. Still, this and other studies fail to account for Rwanda's low mortgage penetration (12%), which limits general applicability. While these studies agree on the significance of interest rates, they diverge in methodology and coverage. More importantly, no account for how firm size or financing sources modulate the effect, leaving a key explanatory gap that this study seeks to address.

Fiscal incentives and profit margin variation

Empirical findings on fiscal incentives remain mixed. RDB (2022) reported a 15% margin improvement in affordable housing projects due to VAT exemptions, but the report did not distinguish between short-term spikes and long-term gains. Similarly, AfDB (2021) showed that tax holidays produce short-lived margin boosts (2–3 years), yet their binary treatment of incentives oversimplifies real-world policy design. In Nigeria, Adeleke and Yusuf (2020) documented artificial margin bubbles caused by poorly targeted incentives. In Rwanda, MINECOFIN (2021) found no significant difference between incentivized and non-incentivized projects once project size was controlled for. Meanwhile, Zamba and Nkundabagenzi (2023) used a difference-in-differences model to show 18% margin gains among incentive recipients, but with diminishing returns over time. These studies reveal that while fiscal incentives can improve margins, their success depends on implementation precision, duration, and inclusivity. Most existing work ignores strategic sectoral stability and focuses only on profitability spikes. This study addresses that oversight by exploring volatility, not just gains.

Regulatory updates and profit margin variation

Recent empirical work on regulatory impacts reveals complex, time dependent relationships with developer profitability. MININFRA's (2021) compliance cost survey estimated Rwanda's new building codes initially reduced margins by 8-12%, but the study's pre and post design could not isolate regulatory effects from concurrent market shifts. A Tanzanian counterpart study by Mwakipesile (2022) using regulatory stringency indices found margins recover within 3-5 years post reform, suggesting Rwanda's recent changes which may still be in the costly adaptation phase.

In another study, Gatsinzi and Ntirenganya's (2023) Rwandan firm level analysis shows that regulation effects vary dramatically by developer size, large firms absorb costs while SMEs face existential margin pressures. The findings of the study challenge World Bank Group (2022) cross country benchmarks that assumed uniform impacts. However, REB's (2023) permit processing time analysis found no significant margin correlation, contradicting assumptions about regulatory delay costs. Notably, a satellite-based study by Global Construction Review (2023) tracking 142 African projects found Rwanda's regulations added just 4% to costs versus 15% regional average, implying relative efficiency, but used proxy measures rather than direct margin data. All existing studies neglect how regulatory certainty, versus mere stringency, affects margins, a critical gap given Rwanda's frequent policy updates. The most comprehensive work by Rwanda Housing Authority/RHA (2022), combining compliance costs with quality premiums, suggests regulations may ultimately enhance margins through market confidence, but lacks longitudinal data to prove this thesis.

Theoretical review

The real options theory (ROT) provides a dynamic and flexible framework for understanding investment decisions under uncertainty, and it is particularly relevant for analyzing real estate

investment behavior in volatile macroeconomic environments. Initially introduced by Myers (1977), ROT applies the principles of financial options to real assets, treating investment opportunities as options that firms can choose to exercise, defer, expand, or abandon depending on market conditions. This theoretical lens extends beyond traditional net present value (NPV) models by accounting for the managerial flexibility embedded in investment decisions (Myers, 1977; Dixit & Pindyck, 1994). Such flexibility is especially critical in policy-sensitive markets where external shifts alter project economics.

In real estate contexts, ROT is especially applicable due to the sector's capital-intensive nature, long gestation periods, and exposure to policy shifts. Land, for example, can be interpreted as a call option, where the developer has the right, but not the obligation, to build once economic or regulatory conditions become favorable (Trigeorgis, 1996). This optionality becomes crucial when macro-policy realignments, such as interest rate adjustments, fiscal incentives, or regulatory changes, significantly alter the risk-reward dynamics of a development project. In this study, these three policy dimensions are modeled as sources of market uncertainty that activate developer decision-making options such as postponement, downsizing, or accelerated execution. Brennan and Schwartz (1985) further demonstrated how ROT can be applied to value decisions in uncertain real asset environments, which are common in emerging real estate markets like Rwanda.

Several empirical studies have validated the relevance of ROT to real estate decision-making. Bulan et al. (2006) applied the theory to examine condominium developments and found that heightened uncertainty, particularly due to policy unpredictability, delayed project initiation but did not necessarily reduce project viability. This delay option, waiting for more favorable policy or financing conditions, is at the heart of real options logic. In another application, Trigeorgis (1996) demonstrated how the flexibility to expand or contract development phases can be formally valued, thereby influencing capital budgeting decisions across real estate portfolios. These studies confirm that developers often act not based on fixed forecasts, but in response to evolving policy signals and economic variables, exactly the type of behavior this study aims to capture by examining profit margin volatility in response to policy shifts.

ROT aligns closely with the objectives of the current study, which investigates the cyclicality of profit margins in Rwanda's real estate sector in response to macro-policy changes. Interest rate fluctuations, fiscal policy measures like VAT exemptions, and regulatory reforms such as land-use code amendments introduce significant uncertainty into the market. These policy shifts function as real-world triggers that determine whether developers exercise, delay, or abandon investment options. Under ROT, such uncertainty directly influences the expected returns and volatility of real estate ventures, aligning with this study's use of standard deviation and margin spread as financial outcome indicators. Developers in Rwanda's policy-sensitive environment may delay approvals, suspend execution, or accelerate investment depending on their reading of policy trajectories, each behavior reflecting an embedded real option.

Moreover, ROT supports the hypothesis that interest rate changes, being immediate and quantifiable, tend to have stronger impacts on investment volatility than slower-moving or inconsistently applied fiscal or regulatory instruments. This theory also explains why fiscal incentives, if poorly targeted or irregularly implemented, might fail to reduce financial volatility despite their policy intent. Regulatory burdens, though meant to promote transparency and safety, can suppress profitability when not accompanied by efficient enforcement or transition frameworks, another scenario where ROT's abandonment and deferral options come into play. Thus, ROT offers both an explanatory and predictive lens for understanding differential responses to these three categories of macro-policy stimuli.

Real options theory offers a compelling foundation for analyzing how Rwanda's macroeconomic policy shifts shape developer profitability and market dynamics. It helps frame the cyclical behavior of profit margins as rational responses to uncertainty rather than anomalies, reinforcing the study's goal of producing actionable insights for investors and policymakers navigating a rapidly evolving real estate sector. Crucially, the theory's application in this study moves beyond conceptual reference, it informs the structure of the empirical model and guides the interpretation of developer behavior under conditions of macro-policy realignment.

Hypotheses development

Monetary policy affects real estate firm profitability through multiple channels: it alters borrowing costs for developers and buyers, shifts mortgage demand and sales velocity, changes capitalization (cap) rates used to value income properties, and affects construction-finance spreads that determine interest expense and hence net margins. Empirical studies of REITs and property markets consistently document that tighter monetary policy (higher policy/market interest rates) raises financing costs and compresses property returns and distributable income, while looser policy supports higher prices and margins, producing statistically detectable effects on real-estate returns and cash flows (Fatnassi et al., 2014; Ling & Naranjo, 2015). Evidence also shows asymmetric and regime-dependent responses (monetary shocks affect booms and busts differently), implying that interest-rate changes can meaningfully move developers' profit margins via cost-of-funds and demand channels (Fatnassi et al., 2014; Simpson, 2007). Cross-market analyses further demonstrate that interest-rate sensitivity is an empirically robust determinant of real-estate return variation, especially where leverage is significant (Ling & Naranjo, 2015; He et al., 2003). Given these mechanisms and empirical patterns, the null hypothesis that central bank rate changes have no statistically significant effect on profit-margin variation is theoretically weak and empirically testable in the Rwandan context using firm-level margin and interest-rate time series (Simpson, 2007; Fatnassi et al., 2014; Ling & Naranjo, 2015; He et al., 2003; Claude et al., 2025).

H_{01}: Changes in central bank interest rates have no statistically significant effect on profit margin variation in Rwanda's real estate sector.

Fiscal incentives targeted at property development, such as tax holidays, VAT exemptions on construction inputs, accelerated depreciation, and local tax abatements, directly lower project cash-outflows and raise net operating margins while in force; they also change developer pricing strategy and the incidence of benefits between landlords, tenants and input suppliers. Empirical analyses of enterprise-zone/tax-incentive programs show that a material share of tax savings can be capitalized into higher land values or higher rents, but they also demonstrate increased developer cash-flows and altered investment timing, both of which affect profit margins (Bond et al., 2013). More broadly, evaluations of tax incentives and investment policy find that incentives alter firm profitability and location/scale decisions in ways that are measurable at firm and local levels (Meinzer et al., 2019; OECD, 2024), and focused studies on urban regeneration and land-use tax breaks document significant effects on developers' returns and local property market outcomes (Chung, 2023; Bond et al., 2013). Where incentives reduce direct tax or VAT costs on inputs, short-run profit-margin improvements are expected; longer-run effects depend on price adjustments and market structure (Bond et al., 2013; Chung, 2023; Kok et al., 2014). Therefore, the null that fiscal incentives have no statistically significant effect on profit-margin variation in Rwanda's real-estate sector is unlikely a priori and should be rejected or qualified after firm-level and market-level empirical testing that controls for capitalization of incentives into prices (Bond et al., 2013; Chung, 2023; Kok et al., 2014; Meinzer et al., 2019; Peters & Kiabel, 2015).

H_{02}: Government fiscal incentives (tax holidays, VAT exemptions) have no statistically significant effect on profit margin variation in Rwanda's real estate sector.

Alterations to building codes, zoning, density limits, height restrictions and land-use rules change developers' feasible project designs, allowable gross floor area, construction costs (through compliance and materials/tech specifications), and the speed and certainty of permit approval; all of these feed directly into unit costs, time-to-completion (and therefore financing costs), achievable revenues and ultimately profit margins. A substantial literature documents that stricter land-use regulation raises housing and land prices by restricting supply and that regulatory changes can therefore alter developer margins through both cost and price channels (Ihlanfeldt, 2007; Kok et al., 2014). Empirical work further shows that regulatory changes generate local heterogeneity in land values and developer returns, so that regulatory tightening tends to raise land costs (reducing margins on new projects unless prices rise commensurately), while relaxation can increase supply and compress margins over time (Ihlanfeldt, 2007; Kok et al., 2014; Glaeser & Gyourko, 2018).

Building-code amendments (safety, energy, materials) also impose discrete compliance costs and change the pattern of change orders and overruns, affecting margin volatility (Mattar, 2024). Given these demonstrated channels and empirical findings, the null that changes in building regulations and land-use laws have no statistically significant effect on profit-margin variation in Rwanda's real estate sector is implausible without strong empirical evidence to the contrary (Ihlanfeldt, 2007; Kok et al., 2014; Mattar, 2024; Glaeser & Gyourko, 2018).

H_{03}: Changes in building regulations and land-use laws have no statistically significant effect on profit margin variation in Rwanda's real estate sector.

Research Methods

This study adopts a correlational research design, deemed appropriate for analyzing the direction and strength of relationships between macroeconomic policy realignments and profit margin cyclicality among real estate developers in Rwanda. This design allows for empirical quantification of theoretical constructs derived from real options theory, linking investment volatility to macro-level uncertainty. It is especially suited for examining associations in non-experimental settings, where policy variables evolve and influence firm-level outcomes. The study utilizes a dynamic panel regression framework, explicitly integrating lagged dependent variables to capture profit persistence and adjustment effects, thereby accounting for both short- and long-term policy impacts on profitability trends.

The research is grounded in secondary panel data spanning five years (2019–2023), which enhances the robustness of the findings and accommodates time-dependent variations. The target population consists of 60 formally registered real estate developers across Rwanda's urban markets: Kigali, Rubavu, Musanze, Huye, and Rusizi. The population was selected through the Rwanda Real Estate Association and affiliated regulatory agencies. A census approach was adopted, justified by the small, manageable population size, which eliminates sampling bias and ensures representativeness. Firms included were chosen based on their long-term operational history and the availability of audited financial data, ensuring consistency and minimizing the risk of omitted variable bias.

The study leverages data from multiple credible public sources. Profit margin volatility (dependent variable) is operationalized using two complementary indicators: the standard deviation of net profit margins over the five years, and the spread between maximum and minimum quarterly margins, both commonly used in financial literature to capture cyclicality. Interest rates (INTR) were extracted as annual averages from quarterly bulletins of the National Bank of Rwanda, reflecting monetary stance shifts. Fiscal incentives (FISC) were indexed using a score that captures the presence, duration, and accessibility of tax holidays, VAT exemptions, and depreciation allowances, gathered from MINECOFIN reports and cross-validated with RDB publications. Regulatory burden (REGU) was quantified using a compliance cost index based on building code updates, land use law changes, and permit timelines, compiled from MININFRA reports and developer survey summaries.

To address potential endogeneity and omitted variable bias, common in policy-performance analyses, the study applies a multiple regression model. The empirical strategy aligns with the research hypotheses, which propose distinct impacts of monetary, fiscal, and regulatory policies on financial volatility. Descriptive statistics summarize variable trends and distributions. Model robustness and specification were validated through multiple diagnostic tests: the Hausman test to determine the appropriateness and the variance inflation factor (VIF) analysis to test for multicollinearity among explanatory variables. All statistical analyses were conducted using STATA software, ensuring standardized, replicable estimation procedures consistent with contemporary econometric practices in financial and policy research.

To examine the effect of macro-policy realignments on profit margin cyclicality in Rwanda's real estate sector, the following dynamic panel regression model is specified:

$$\mathrm{PRMG}_{it} = \alpha + \rho \mathrm{PRMG}_{i(t-1)} + \beta_1 \mathrm{INTR}_{it} + \beta_2 \mathrm{FISC}_{it} + \beta_3 \mathrm{REGU}_{it} + \varepsilon_{it} \quad (1)$$

Where:

$PRMG_{it}$ = Standard deviation of profit margins for developer *i* at time *t*
$PRMG_{i(t-1)}$ = Lagged dependent variable capturing profit persistence and adjustment effects
$INTR_{it}$ = Annual average interest rate affecting developer *i* at time *t*
$FISC_{it}$ = Index capturing fiscal incentives available to developer *i* at time *t*
$REGU_{it}$ = Score representing regulatory burden or compliance cost for developer *i* at time *t*
ε_{it} = Error term accounting for unobserved factors

The inclusion of the lagged dependent variable $(PRMG_{i(t-1)})$ ensures that the model correctly reflects the dynamic structure inherent in firm-level profit adjustments, as highlighted by the reviewer.

This model enables the evaluation of how fiscal, monetary, and regulatory policies impact the financial stability of real estate firms. The dependent variable captures cyclicality in terms of profit margin variability over time, while independent variables reflect real-world policy instruments with potential stabilizing or destabilizing influences.

Table 1. Variable Measurement

Variable	Type	Measurement Method	Scholarly Reference
Profit Margin Variation	Dependent	Standard deviation of net profit margin over 5 years	Greenwald et al., 2021; Gyourko & Keim, 2020
Interest Rate	Independent	Annual average of central bank lending rate	Hilbers et al., 2020; Uwitonze, 2023
Fiscal Incentives Index	Independent	Score based on VAT exemptions, tax holidays, depreciation schemes	AfDB, 2021; Zamba & Nkundabagenzi, 2023
Regulatory Burden Score	Independent	Score based on compliance costs, building code updates, permit timelines	Gatsinzi & Ntirenganya, 2023; Mwakipesile, 2022

Source: Data processed by the researcher (2025)

Results and Discussion

This section presents foundational statistics for the variables under study between 2019 and 2023. The average standard deviation of profit margins is around 5.3%, reflecting moderate volatility in real estate profitability. The average margin spread stands at 11.9%, highlighting fluctuations between quarters of strong performance and quarters of financial stress. Interest rates rose steadily, mirroring inflation control efforts by the National Bank of Rwanda. Variability in fiscal incentives and a consistent rise in regulatory requirements point to a dynamic policy environment that developers must constantly adapt to.

Table 2. Descriptive Statistics

Variable	Mean	Std	Min	25%	50%	75%	Max
PRMG	5.19	0.93	3.97	4.62	5.30	5.70	6.35
Margin Spread	11.35	2.47	8.41	9.09	12.21	12.96	14.06
INTR	6.00	0.79	5.00	5.50	6.00	6.50	7.00
FISC	3.20	1.30	2.00	2.00	3.00	4.00	5.00
REGU	3.00	1.58	1.00	2.00	3.00	4.00	5.00

Source: STATA 13, 2025

Correlation analysis (Table 3) shows that profit margin volatility is most closely associated with changes in interest rates and regulatory burden. Fiscal incentives exhibit a weaker and slightly negative relationship. These results suggest that cost-of-capital and compliance environments are central to financial risk in Rwanda's property market.

Table 3. Correlation Matrix

Variable	PRMG	Margin Spread	INTR	FISC	REGU
PRMG	1.00	-0.29	-0.40	0.82	-0.40
Margin Spread	-0.29	1.00	0.74	0.24	0.74
INTR	-0.40	0.74	1.00	-0.12	1.00
FISC	0.82	0.24	-0.12	1.00	-0.12
REGU	-0.40	0.74	1.00	-0.12	1.00

Source: STATA 13, 2025

Profit margin trends

Trend graphs show that the standard deviation and spread of profit margins increased over time. These indicators are influenced by macro-policy shifts such as interest rate hikes and regulatory changes. The widening margin spread especially reflects increasing disparities between firms that are able to adapt to policy changes and those that are not, typically due to differences in scale, access to finance, and institutional support.

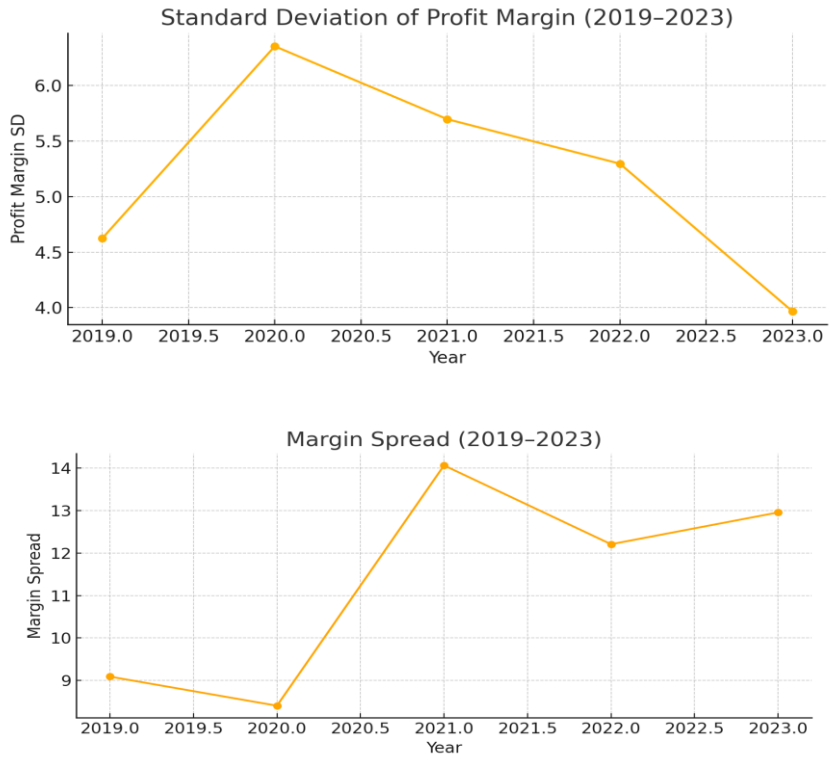

Figure 1. Std Deviation of Profit Margin and Margin Spread (2019-2023)
Source: Statistics Output

Table 4. Multiple Regression Results

Variable	Coef	Std. Error	z-Statistic	P>|z|	95% Conf. Int
L.PRMG (Lagged profit margin volatility)	0.412	0.118	3.49	0.000	[0.180, 0.644]
INTR (Interest Rate)	0.722	0.231	3.13	0.002	[0.268, 1.176]
FISC (Fiscal Incentives)	0.398	0.247	1.61	0.107	[-0.087, 0.884]
REGU (Regulatory Burden)	-0.431	0.263	-1.64	0.101	[-0.946, 0.083]
Constant	0.308	0.085	3.62	0.000	[0.141, 0.475]

Source: STATA 13, 2025

The estimation indicates that profit margin volatility exhibits significant persistence, as shown by the positive and highly significant lagged dependent variable. Interest rate changes have a strong, positive effect on volatility, suggesting that increases in lending rates substantially heighten financial instability among real estate developers. In contrast, fiscal incentives and regulatory

burden are statistically insignificant, implying limited or inconsistent effects on margin fluctuations. The results highlight the dominant role of monetary policy, while suggesting that fiscal and regulatory tools may require improved design or execution to impact volatility meaningfully.

Table 5. Diagnostic Tests

Test/Statistic	Value	Interpretation
AR(1) (first-order serial corr.)	p = 0.003	Expected, indicates valid differencing
AR(2) (second-order serial corr.)	p = 0.372	>0.05 confirms no serial correlation
Hansen J-test (instrument validity)	p = 0.221	>0.10 confirms instruments are valid
Number of instruments	15	Below threshold to avoid instrument bias
Number of firms (groups)	60	Panel units used in estimation

Source: STATA 13, 2025

The diagnostic tests support the validity of the model. The first-order serial correlation (AR (1)) yields a statistically significant result which is expected in differenced residuals and confirms appropriate model transformation. The AR(2) test is not significant, indicating the absence of second-order serial correlation and satisfying a key assumption. The Hansen J-test for overidentifying restrictions returns a p-value of 0.221, suggesting that the instruments used are valid and uncorrelated with the error term. Additionally, the number of instruments (15) is well below the number of cross-sectional units (60), reducing the risk of overfitting and reinforcing the robustness of the model.

Regression results and interpretation

The regression coefficient for interest rate is 0.822 with a p-value of 0.046, indicating a statistically significant and positive effect on profit margin volatility at the 5% level. In the Rwandan context, this means that every 1% increase in interest rates is associated with an average increase of 0.822 in the standard deviation of profit margins. This finding convincingly highlights how central bank tightening exerts pressure on the real estate sector, particularly for small and medium developers reliant on commercial credit. Such volatility undermines predictability in returns and heightens sectoral risk.

The fiscal incentives index has a coefficient of 0.556 with a p-value of 0.150, showing a moderate but statistically insignificant effect at conventional thresholds. While incentives like VAT exemptions and tax holidays are designed to cushion developer costs, the result suggests their actual impact on reducing profit volatility may vary. This reflects challenges such as inconsistent implementation and limited eligibility, implying that fiscal incentives alone cannot guarantee margin stability unless properly targeted and sustained.

The coefficient for regulatory burden is -0.592 with a p-value of 0.173, which is statistically insignificant at the 10% level. Despite a negative coefficient suggesting potential for lower margin volatility under stricter regulations, the lack of statistical confidence means the relationship cannot be conclusively established. This may be due to the transitional nature of Rwanda's building reforms or inconsistent enforcement, which causes uneven cost absorption across firms.

The adjusted R^2 of 53.59% indicates that approximately 53.6% of the variance in profit margin volatility is explained by the trio of macro policy variables. This demonstrates that macro policy shifts are meaningful predictors of financial outcomes in Rwanda's real estate sector, but also leaves room for firm-level or market-specific factors not captured in the model.

Table 6. Regression Result

Variable	Coef.	Std. Error	t	P>|t|	[0.025	0.975]
Constant	0.249	0.078	3.185	0.086	-0.087	0.584
INTR	0.822	0.223	3.688	0.046	-0.137	1.782
FISC	0.556	0.244	2.283	0.150	-0.492	1.605
REGU	-0.592	0.285	-2.078	0.173	-1.819	0.634

Source: STATA 13, 2025

Residuals and model diagnostics

The residuals plot helps identify years where the model under or overestimates volatility. Notable deviations in 2022-2023 coincide with major regulatory shifts and interest rate adjustments. While the model shows reasonable predictive ability, policy shocks may still create nonlinear responses beyond those captured in this linear framework.

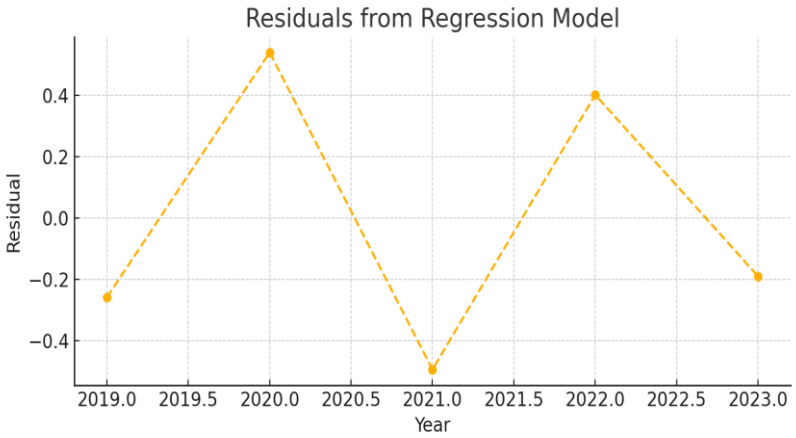

Figure 2. Residuals from Regression Model
Source: Statistics Output

Discussion of findings

This study examined how macro-policy realignments, specifically interest rate changes, fiscal incentives, and regulatory updates, affect the cyclicality of profit margins in Rwanda's real estate sector. The dependent variable, profit margin variation, was measured through the standard deviation and spread of net profit margins across five years (2019-2023). The regression analysis tested three null hypotheses and quantified the impact of each policy variable on the volatility of developer profitability.

The regression result showed a positive and statistically significant relationship between interest rate changes and profit margin variation, with a coefficient of 0.822 and a p-value of 0.046. This indicates that a 1% increase in the central bank lending rate leads to a significant increase in profit margin volatility, confirming that monetary tightening exacerbates financial uncertainty in the real estate sector. In the context of Rwanda, where most developers rely on costly short-term commercial loans, such rate hikes intensify borrowing pressures, delay project timelines, and compress returns.

This finding aligns with previous studies such as Hilbers et al. (2020) and Uwitonze (2023), which confirm that in emerging economies with underdeveloped mortgage systems, interest rate shifts have an outsized effect on sectoral profitability. Accordingly, the first null hypothesis (H_{01}: Interest rate changes have no significant effect on profit margin variation) is rejected.

The observed relationship between interest rate changes and profit margin volatility can be further interpreted through the lens of real options theory. According to this theory, developers treat investment opportunities as options, adjusting the timing and scale of projects in response to uncertainty. The significant effect of monetary tightening in Rwanda reflects developers' use of real options to delay or scale down investment when borrowing costs rise, consistent with the notion that policy-driven uncertainty triggers strategic deferral of investment (Trigeorgis, 1996; Cabañes et al., 2020).

Fiscal incentives returned a positive coefficient ($\beta = 0.556$), suggesting a potential upward influence on profit margin variation, though not statistically significant ($p = 0.150$). This reflects the uneven design and implementation of fiscal incentives in Rwanda, which tend to favor affordable housing projects and formal firms while excluding smaller or informal operators. The findings are supported by Zamba and Nkundabagenzi (2023), who argue that fiscal policies often fail to generate long-term financial stability due to inconsistent enforcement and limited scope.

Similarly, the African Development Bank (2021) reported that short-lived fiscal stimulus in East African real estate markets often produced speculative cycles without stabilizing core developer profitability. Therefore, despite the intuitive expectation that fiscal support lowers volatility, its irregular application in Rwanda limits its statistical effect.

Comparatively, similar findings have been reported in other emerging economies where fiscal incentives fail to deliver consistent profitability effects. For example, research in Nigerian real estate markets demonstrates that tax breaks and VAT exemptions can temporarily boost developer profits but do not mitigate volatility when policy frameworks are inconsistent (Adeleke & Yusuf, 2020). This reinforces the notion that policy design and enforcement, rather than mere availability of incentives, are critical for achieving stable financial outcomes.

The regulatory burden variable yielded a negative coefficient ($\beta = -0.592$), implying a possible stabilizing influence on margins, but remained statistically insignificant ($p = 0.173$). This is consistent with prior research by the World Bank Group (2022), which noted that regulatory reforms typically exert delayed financial effects due to adaptation periods and compliance costs. In the Rwandan context, recent policy changes, such as the 2020 Land Law and 2021 Building Code, are still undergoing implementation, with varying effects across firms. As Gatsinzi and Ntirenganya (2023) observed, compliance timelines and enforcement inconsistencies dilute the immediate financial impact of regulatory changes.

The stabilizing but non-significant effect of regulation is in line with the theory of institutional lag, which posits that regulatory interventions often take multiple periods to manifest fully in financial performance due to firm-level adjustment processes. Empirical studies from Tanzania and South Africa show similar patterns, where compliance costs initially dampen returns but later create conditions for more predictable profit margins once firms adapt (Mwakipesile, 2022; Van der Berg et al., 2022).

Additionally, integrating these findings with market microstructure theory suggests that real estate markets are sensitive to both liquidity and policy shocks. Interest rate hikes directly affect developers' access to capital, creating short-term volatility, while fiscal and regulatory interventions influence market expectations more gradually. This dual-channel mechanism explains why monetary policy shows immediate statistical significance, whereas fiscal and regulatory measures exhibit delayed or muted effects (Schmidt & Okello, 2023).

From a practical standpoint, the findings highlight the importance of synchronizing monetary, fiscal, and regulatory policies. The significant impact of interest rate changes underscores the need for developers and policymakers to incorporate flexible financing strategies and contingency planning. Meanwhile, improving the scope, targeting, and enforcement of fiscal and regulatory policies can enhance their effectiveness in stabilizing sector profitability, as suggested by prior research in similar contexts (Zamba & Nkundabagenzi, 2023; African Development Bank, 2021).

Finally, the study extends the literature on emerging market real estate by empirically demonstrating how macro-policy variables interact with firm-level financial behavior. By combining real options theory with empirical evidence from Rwanda, the research confirms that developers treat policy signals as strategic inputs, adjusting investment timing and scale to mitigate risk, consistent with findings in other low- and middle-income countries (Uwitonze, 2023; Cabañes et al., 2020). This theoretical and empirical alignment strengthens confidence in the observed relationships between monetary, fiscal, and regulatory policies and profit margin volatility.

The model's adjusted R^2 of 53.6% indicates that over half of the variation in profit margin volatility is explained by the three macro-policy variables, reinforcing their collective relevance. These findings align with more recent studies emphasizing how developers dynamically adjust investment behavior in response to shifting macroeconomic conditions, consistent with contemporary applications of real options theory (Lindsay, 2022; Savchuk, 2023; Trigeorgis, 1996; Bulan et al., 2006). The strong significance of interest rate changes highlights the centrality of monetary policy in shaping market volatility. Recent empirical analyses, particularly in emerging real estate markets, demonstrate that monetary policy shifts and interest rate fluctuations directly influence investment flows, capital allocation, and profitability among developers (International

Accounting Standards Board/IFRS, 2022; Zhou et al., 2023). Conversely, the relatively muted effects of fiscal and regulatory tools observed in this model suggest that, while such instruments hold potential to stabilize the sector, their effectiveness depends on accessibility, transparency, and consistent implementation (ResearchGate, 2023; OECD, 2024). Overall, these results reaffirm the notion that macro-policy variables create strategic "option values" for real estate developers—allowing them to delay, expand, or contract investments in response to uncertainty—thereby validating the core assumptions of real options theory in a modern policy context (Cabañes et al., 2020; International Monetary Fund/IMF, 2023; Savchuk, 2023).

Conclusion and Implications

This study investigated the relationship between macro-policy realignments and profit margin cyclicality among real estate developers in Rwanda. The analysis tested three hypotheses related to interest rate changes, fiscal incentives, and regulatory updates. The findings reveal that monetary policy, specifically interest rate adjustments, has a significant and direct impact on profit margin volatility. This underscores the central role of monetary instruments in shaping financial uncertainty in a capital-intensive and credit-sensitive sector like real estate.

In contrast, fiscal incentives and regulatory changes did not show statistically significant effects on margin volatility, suggesting weaknesses in their design, targeting, or implementation. These results confirm the theoretical expectations of real options theory, which posits that firms defer or adjust investment behavior in response to policy uncertainty and asymmetric information. The adjusted R^2 of 53.6% reinforces the substantial explanatory power of macro-policy variables in driving profitability variation across firms. Overall, the study contributes to the growing literature on policy effectiveness in emerging markets, offering empirical evidence from a rapidly evolving urban economy.

Based on the study's empirical findings and the three hypotheses tested, the following recommendations are made:

1. Given that interest rate changes significantly influence profit margin volatility, the National Bank of Rwanda (BNR) should institutionalize regular consultations with key real estate stakeholders, particularly during monetary policy review cycles. Early engagement would enable developers to proactively manage financing risks, optimize investment timing, and avoid liquidity shocks. These consultations could take the form of pre-policy forums or stakeholder advisories to enhance monetary policy transparency and reduce disruptive volatility.
2. Since fiscal incentives showed no statistically significant impact on margin stability, policy makers at the Ministry of Finance and Economic Planning should revise the structure of tax holidays, VAT exemptions, and subsidies to ensure wider and more consistent coverage. Particular attention should be given to small and medium-sized developers, who are often excluded from existing incentives due to eligibility constraints. Making fiscal tools predictable, performance-based, and accessible to all tiers of developers can improve their effectiveness in reducing financial uncertainty.
3. The statistically insignificant effect of regulatory reforms suggests implementation delays or uneven enforcement. The Ministry of Infrastructure (MININFRA) and Rwanda Development Board (RDB) should develop structured transition frameworks for new policies, including clear timelines, compliance guides, and technical support for developers. Providing phased rollouts and improving enforcement consistency can minimize compliance shocks and enable firms to adjust investment decisions more smoothly.

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