The Economics and Finance Letters
2026 Vol. 13, No. 4, pp. 156-174
ISSN(e): 2312-430X
ISSN(p): 2312-6310
DOI: 10.18488/29.v13i4.5307
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Institutional quality, financial development, and dollarization: A Bayesian analysis of interaction and threshold effects

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Article History
Received: 1 June 2026
Revised: 8 September 2026
Accepted: 28 September 2026
Published: 23 October 2026

Keywords
De-dollarization
Dollarization
Financial development
Foreign currency deposit
International evidence.

JEL Classification:
G18; G19; G28; G32.

ABSTRACT

This paper examines how financial development across three dimensions, financial depth, financial access, and financial stability, shapes dollarization, with a particular focus on the moderating role of institutional quality. It further explores the nonlinear relationship between financial development and dollarization across countries. This paper employs a Bayesian regression approach to estimate interaction and threshold effects in the research models, allowing for full probabilistic inference regarding parameter uncertainty. To address the linear moderating effects of institutional quality, a baseline model incorporating interaction terms between institutional quality and each financial development dimension is adopted. Furthermore, a threshold model is adopted to explore potential nonlinear and regime-dependent effects of institutional quality. The research results show that financial development can generally lead to a decrease in dollarization, but this effect depends on institutional quality across countries. The interaction terms between financial depth and institutional quality indicate that stronger institutional environments can amplify the effect of financial development in reducing dollarization. Moreover, financial depth and financial access exhibit strong threshold effects at high levels of institutional quality across different countries. A notable finding is the surprising positive effect of financial stability (BANKZ) on dollarization across both institutional quality groups. Financial stability exhibits no statistically significant threshold dependence and remains stable across regimes.

Contribution/Originality: First, this study analyzes how financial development shapes dollarization. Second, this paper contributes to the literature by combining Bayesian interaction and threshold approaches to capture both linear and nonlinear effects of institutional quality. Third, adopting a Bayesian regression approach allows a flexible, probabilistic interpretation of parameter uncertainty amid substantial heterogeneity across varying institutional quality conditions.

1. INTRODUCTION

Dollarization of a financial system is widely regarded as a common and, in some contexts, inevitable phenomenon in national economies. It refers to the practice by financial institutions, particularly banks, of mobilizing capital and extending credit denominated in foreign currency. Dollarization helps shield the economy from inflation (Tello Carvache, Moncayo Correa, & Sempertegui Seminario, 2025). Developing countries often encourage attracting foreign investment in general and remittances in particular, especially from labor exports, to support economic development. De-dollarization has gradually unfolded in various forms, driven by BRICS and some commodity-

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exporting nations. However, significant challenges hinder substantial progress. Despite notable advancements, de-dollarization efforts remain limited and incomplete (Li, 2023). The de-dollarization trend is popular in developing countries, which choose to promote the use of domestic currencies and reduce the use of the US dollar in commercial and financial transactions (Ajide, Raheem, & Asongu, 2019).

Research on dollarization initially focused on Latin American economies during the period from 1980 to 1995, when many of these countries experienced severe inflation following prolonged economic recessions. A notable example of this process is Ecuador's adoption of full dollarization (Cachanosky, Ocampo, & Salter, 2023). On average, dollarized countries experience slower and more volatile economic growth, along with lower inflation rates, compared to non-dollarized nations. However, estimates vary significantly within and across studies. Fully dollarized economies tend to grow at a slower pace than both non-dollarized and partially dollarized economies (Koráb, Fidrmuc, & Dibooglu, 2023). De-dollarization is challenging for countries reliant on imports. The restricted convertibility of BRICS member nations' currencies poses challenges to fully replacing the US dollar in international trade. Nepal, with its economy heavily dependent on remittances and imports, may encounter significant difficulties in this transition (Bhattarai & Adhikari, 2025).

Agarwal (2023) provided an overview of the de-dollarization process in Southeast Asia, noting that countries in the region have increasingly sought to reduce their reliance on the U.S. dollar in cross-border and domestic transactions. Brunei exhibits the highest degree of dollarization among ASEAN member states, while Thailand demonstrates the lowest. Tackling dollarization in the Caucasus and Central Asia (CCA) region necessitates a comprehensive and well-coordinated strategy. This involves strengthening monetary policy frameworks, ensuring macroeconomic stability, deepening domestic financial markets, and carefully sequencing reforms to effectively promote broader use of the domestic currency (Ben Naceur, Hosny, & Hadjian, 2019). Tama and Wijayanti (2023) noted that Thailand, Indonesia, and Malaysia signed an agreement in 2016 to facilitate bilateral trade settlements using their respective local currencies. In contrast, dollarization has allowed Timor-Leste to sustain relatively low and stable inflation despite the country's post-conflict economic fragility (Huidrom & Smirnov, 2024).

Recent studies continue to assert that dollarization is not merely a monetary policy phenomenon but is also linked to the institutional characteristics of the economy. Dollarized countries typically experience high economic volatility and weaker policy effectiveness in financially constrained environments (Banik & Das, 2024; Castillo, Lama, & Medina, 2024; Huidrom & Smirnov, 2024). Studies also highlight the importance of financial development in relation to dollarization. Some argue that financial development reduces dollarization because improved access to finance for domestic services strengthens the role of the domestic currency (Demirgüç-Kunt & Levine, 2009; Levine, 2005). Meanwhile, financial deepening also helps develop the domestic financial system and thus increases the trend toward dollarization (Dabla-Norris & Srivisal, 2013).

This study assesses the full impact of financial development on dollarization through three proxies, including financial depth (MSC), financial access (ATM), and financial stability (BANKZ). However, the impact of financial development on dollarization is not uniform across countries with varying institutional quality characteristics. Institutional quality influences currency confidence, financial stability, and macroeconomic resilience (Acemoglu, Johnson, & Robinson, 2005; North, 1990). Countries with poor institutional quality are more prone to dollarization, as evidenced by their heavy reliance on foreign-currency assets (Castillo et al., 2024). Furthermore, when considering the impact of financial development on dollarization, nonlinear and regime-dependent characteristics may exist in the relationship between financial development, institutional quality, and dollarization (Hansen, 1999; Tong, 1983).

To address the aforementioned issues, this study employs a dual empirical strategy combining a Bayesian interaction model and a threshold model. The Bayesian interaction model is applied to determine the continuous moderating effects of institutional quality (INS) on the impact of financial development on dollarization. Meanwhile, the threshold model identifies regime-dependent heterogeneity among countries with high and low institutional quality. This approach is consistent with the macro-financial modeling method, emphasizing both the marginal and

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structural effects of economic and financial variables in the study (Gelman et al., 2013). The research paper comprises 5 parts: (1) Introduction, (2) Grounded theories and hypothesis development, (3) Method, (4) Results, and (5) Conclusion and implications.

2. GROUNDED THEORIES AND HYPOTHESIS DEVELOPMENT

2.1. Grounded Theories

Currently, there are several theories related to the study of the relationship between financial development and dollarization across countries, the most prominent of which are four theories: currency substitution theory, portfolio choice theory, financial deepening theory, and institutional theory.

Girton and Roper (1981) developed a theoretical framework that connects currency substitution with macroeconomic instability, individual and institutional portfolio choices, and the effectiveness of monetary policy. The study emphasizes that, in economies with substantial currency substitution, conventional monetary policy instruments may lose effectiveness. Central banks may struggle to manage the domestic money supply and interest rates because high demand for foreign currency can constrain the influence of domestic policy actions. Economic agents tend to choose between domestic and foreign currencies depending on the economic conditions of each country. Countries with high inflation, low levels of financial development, and weak monetary institutions typically use foreign currencies for circulation and storage within the economy, thus requiring individuals and businesses to use foreign currencies for transactions and savings (Calvo, 1996).

Financial development influences the trend of dollarization, while weak policy credibility and unstable macroeconomic conditions also affect this trend (Reinhart, Rogoff, & Savastano, 2003). Economies with more developed financial systems demonstrate better institutional quality, which helps reduce inflation and strengthens the tendency to use the domestic currency while reducing dollarization. Therefore, the higher the level of financial development, the more countries tend to reduce incentives for currency substitution and, consequently, lower the degree of dollarization.

The portfolio choice framework states that investors tend to choose asset portfolios oriented toward maximizing returns and minimizing investment risk (Markowitz, 2009). For countries with high inflation and unstable economic conditions, holding foreign currency is also an option for investors. Therefore, dollarization arises from these investment decisions under uncertain economic conditions, and financial development tends to play a significant role when investors make such decisions. If the economy has a high level of financial development, investors tend to choose channels such as bonds, stocks, and derivatives to diversify investment risk rather than hold foreign currency (Ize & Yeyati, 2003). Thus, financial development and innovation also help reduce the tendency to hold foreign currency.

Another theory also highlights the role of financial development in reducing transaction costs in an economy. McKinnon (1973) and Shaw (1973) argue that financial deepening influences investors' savings and investment decisions. In economies with low levels of financial development, using the domestic currency becomes costly and unattractive to investors. Conversely, economies with more developed financial systems, liberalization policies, better financial services, and payment systems reduce the cost of using the domestic currency and enhance its position in the economy. Therefore, financial deepening reduces the advantage of foreign currencies and consequently reduces dollarization.

Institutional theory suggests that the rules governing the economy are the primary factors determining economic performance (North, 1990). Countries with weak institutional-quality frameworks tend to experience persistent dollarization. Countries with high inflation and fiscal policy imbalances often experience economic instability, leading to a demand for holding and using foreign currency in long-term transactions (Calvo & Reinhart, 2002). Thus, institutional quality plays a mediating role in regulating the relationship between financial development and dollarization. Countries with good institutional quality typically demonstrate developed financial systems, which promote the development of domestic currency-denominated assets, and vice versa. Furthermore, institutional theory

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explains that not only financial dedollarization but also government efforts through clear policies and good institutional quality contribute to dedollarization. Therefore, institutional quality plays a crucial role in countries with high financial development, enabling them to reduce dollarization.

2.2. Hypothesis Development

2.2.1. Financial Development and Dollarization

Financial development reflects the depth, access, and efficiency of financial institutions and financial markets. Improvements in these dimensions enhance access to financial services and promote more efficient capital allocation (Svirydzenka, 2016). Financial development enhances access to external finance by improving information production and corporate governance (Levine, 2005) and reduces market frictions that disproportionately constrain poor households and small firms (Demirgüç-Kunt & Levine, 2009). Grounded theories affirm the role of financial development in influencing dollarization, but the extent of this impact depends on the economic conditions and institutional quality of different countries.

A country with substantial financial depth enables banks and financial markets to offer a wide range of domestic-currency instruments for saving, lending, and investment, thereby diminishing the need to rely on foreign currency. Strengthening domestic-currency financial markets and maintaining macroeconomic credibility can reduce financial dollarization by encouraging residents to hold savings and conduct financial transactions in the local currency (Levy Yeyati, 2021). Financial depth supports de-dollarization by enhancing the domestic financial system and expanding access to local-currency-denominated financial instruments (Levy Yeyati, Sturzenegger, & Reggio, 2010). High levels of deposit dollarization are associated with lower levels of financial development. Conversely, successful de-dollarization is often accompanied by deeper domestic financial systems, broader access to local-currency financial services, and stronger financial development (Bannister, Turunen, & Gardberg, 2018).

Financial access represents a key aspect of financial development, reflecting how easily households and businesses can obtain and utilize formal financial products and services to fulfill their economic requirements. Enhancing financial access contributes to reducing inequality by broadening participation in the financial system (Beck, Demirgüç-Kunt, & Honohan, 2009). Financial dollarization often develops in countries with a history of high inflation, macroeconomic instability, and weak confidence in the domestic currency. Once foreign currency deposits become available through the banking system, dollarization may persist even after macroeconomic conditions improve because of hysteresis and the slow restoration of confidence in the local currency (Reinhart et al., 2003). Moreover, even when prices are stable, a lack of public confidence in the long-term stability of the domestic currency can cause financial deepening to increase the use of foreign currency instruments (Ize & Yeyati, 2003).

Financial stability, a vital aspect of financial development, refers to the capacity of the financial system to absorb shocks and maintain its functions, thus fostering sustainable economic growth. A resilient financial system lowers the risk of crises and enhances confidence among both investors and consumers (Claessens & Kose, 2013). Financial dollarization is largely driven by a history of macroeconomic instability and weak confidence in the domestic currency (Reinhart et al., 2003). Furthermore, even with overall financial stability, if confidence in domestic monetary policy is weak, economic agents may favor foreign-currency assets as a safeguard against currency risk (Ize & Yeyati, 2003). Countries with more open capital accounts tend to experience greater cross-border capital flows, including both inflows and outflows of foreign currency (Edwards, 2006). In nations with a legacy of economic instability, achieving financial stability does not necessarily lead to an immediate decline in dollarization. Both households and businesses may persist in holding foreign-currency assets due to ingrained habits or as a precautionary measure, thereby sustaining dollarization even as financial conditions improve. Thus, the first research hypothesis is:

H_1: Financial development (MSC, ATM and BANKZ) can help countries reduce dollarization.

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2.2.2. Institutional Moderation and Threshold Effects

Institutional quality is a fundamental determinant of long-run economic and financial development, shaping property rights, contract enforcement, and overall economic incentives (Acemoglu et al., 2005; North, 1990). Stronger institutions may indirectly support the use of domestic currency by improving macroeconomic stability and financial system development. Countries with high levels of financial dollarization may face persistent macro-financial vulnerabilities, as weak policy credibility and limited policy tools can reinforce the use of foreign currencies. Recent evidence suggests that well-designed foreign exchange interventions can help mitigate dollarization pressures and support financial de-dollarization (Castillo et al., 2024). Thus, the second hypothesis is:

H_2: Institutional quality moderates the relationship between financial development and dollarization.

According to North (1990) institutional quality is a factor influencing the efficiency of an economy and its financial policies. Countries with low institutional quality typically have poor economic and financial policies, which limit financial development and, consequently, affect dollarization. In this case, investors usually choose to invest in and use foreign currency because they do not trust the domestic currency, owing to the quality of institutions, an unstable domestic economic situation, and high inflation. Conversely, countries with high institutional quality usually have modern financial systems and strong monetary policies, which give investors more confidence in using the domestic currency in transactions, thereby reducing dollarization. In addition, when institutional quality reaches a certain threshold, financial development helps increase the use of the domestic currency and thus reduce dollarization. Calvo and Reinhart (2002) show that in economies with significant liability dollarization, exchange rate flexibility is often limited due to balance-sheet effects and concerns over financial stability. Therefore, this study further assesses the potential threshold effect of institutional quality in relation to the impact of financial development on dollarization. The next hypothesis is as follows:

H_3: There is a non-linear (threshold) relationship between financial development and dollarization under high and low institutional regimes.

3. METHOD

3.1. Empirical Framework

This study assesses the impact of financial development, measured through various proxies (MSC, ATM, and BANKZ), on dollarization (DOR). This assessment considers the moderating role of institutional bodies across different countries while examining both linear and nonlinear heterogeneity in this relationship. Therefore, this study uses an integrated approach combining interaction and threshold models.

First, the model applied is one that considers the interaction between financial development proxies (MSC, ATM, and BANKZ) and institutional quality (INS). The empirical model examines whether the effect of financial development on dollarization depends on institutional quality by incorporating an interaction term between financial development and institutional quality. This approach follows the standard moderator analysis framework (Aiken & West, 1991; Baron & Kenny, 1986). Additionally, a threshold model is used to examine the possibility of a non-linear relationship between financial development and dollarization based on the threshold impact of institutional quality. The threshold model was proposed by Hansen (1999) to identify differences when evaluating relationships between variables based on the threshold values of one or more defined variables. The addition of a threshold model helps this paper examine whether the impact of financial development through different proxies (MSC, ATM, and BANKZ) on dollarization (DOR) differs across regimes of institutional quality.

3.2. Model Specification

This study uses an unbalanced panel dataset comprising countries from 1990 to 2024. Financial development is treated as a multidimensional concept, captured by three proxies: financial depth (MSC), financial access (ATM), and financial stability (BANKZ).

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(i) Interaction Model

The baseline interaction model is specified as follows:

$$DOR_{it} = \alpha + \beta_1 \mathrm{FD}_{it} + \beta_2 \mathrm{INS}_{it} + \beta_3 (\mathrm{FD}_{it} x \mathrm{INS}_{it}) + \gamma \mathrm{X}_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

Where: DOR_{it} is the dependent variable for country i at time t, representing dollarization; FD_{it} represents financial development proxies, MSC_{it}, ATM_{it} and BANKZ_{it}. The interaction term captures the interaction between financial development proxies and institutional quality, as well as a vector of control variables (X_{it}), including GDP_{it}, INF_{it} and POS_{it}). Appendix 1 provides descriptions, measurement units, and sources for those variables.

(ii) Threshold Model

The threshold model is used to examine the potential nonlinear effects of institutional quality when assessing the impact of financial development on dollarization. The threshold model is illustrated below.

$$DOR_{it} = \alpha + \beta_1 \mathrm{FD}_{it}.I(\mathrm{INS}_{it} \leq \varphi) + \beta_2 \mathrm{FD}_{it}.I(\mathrm{INS}_{it} > \varphi) + \delta \mathrm{X}_{it} + \varepsilon_{it} \quad (2)$$

Where δ is the estimated threshold level of institutional quality, while $I(\mathrm{INS}_{it} \leq \varphi)$ and $I(\mathrm{INS}_{it} > \varphi)$ represent two thresholds of institutional quality. The threshold modeling approach helps identify the marginal effect of financial development on dollarization at low and high institutional-quality thresholds across countries.

3.3. Bayesian Estimation Approach

Given the unbalanced data, the small number of observations, and the sample of 10 countries from Asia, Europe, Latin America, and Africa, drawn from IMF and World Bank data, applying a Bayesian regression approach is more appropriate than using traditional frequentist statistics. Furthermore, the research data may contain uncertainty in parameter estimation and endogeneity across countries, making the Bayesian framework more suitable.

According to Gelman et al. (2013) applying Bayesian inference helps determine the full probabilistic interpretation of parameters, especially when parameter uncertainty is likely to exist. Markov Chain Monte Carlo (MCMC) simulation is used to compute posterior distributions within the Bayesian framework.

3.4. Identification Strategy

As discussed in Section 1, this study employs a dual strategy that combines a Bayesian interaction model with a threshold model. Combining interaction and threshold models allows for a clearer analysis of the role of institutions in moderating the relationship between financial development and dollarization under different institutional regimes. The interaction model identifies the smooth heterogeneity of institutional quality in the research model, while the threshold model examines potential structural breaks in the relationship. The simultaneous use of these two models is not redundant; rather, it helps the study provide a comprehensive assessment of the impact of financial development on dollarization under the influence of institutional quality.

3.5. Data

Data were collected from the IMF and the World Development Indicators database of the World Bank during the period 1990–2024. The data include ten countries in Asia (Laos, Cambodia, Vietnam, and Afghanistan), Europe (Ukraine and Romania), Latin America (Argentina and El Salvador), and Africa (Angola and Liberia), comprising 244 observations. The data set includes dollarized countries from three different continents for comparison and to ensure data diversity.

Table 1 represents descriptive statistics for certain variables used in regression models (1 and 2). The numbers of observations for each variable differs across countries during the period 1990–2024 due to data constraints, and the dataset is organized in an unbalanced panel format. The trend in dollarization (DOR) shows substantial variation in the level of dollarization across countries, with a minimum value of 5.95%, a maximum value of 85.625%, and a standard deviation of 21.773%. This indicates that the Bayesian model is appropriate for this study.

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Furthermore, the research results also show that the financial development indicators exhibit varying values. Specifically, the MSC variable shows the highest average value (29.127%) and a maximum value of 132.817%. Due to unique differences in financial and banking infrastructure, the ATM variable also shows significant variation between countries and across years, as evidenced by a high standard deviation of 29,380 ATMs per 100,000 adults (with a lowest value of 0.122 and a highest value of 104.057). The BANKZ variable has a lower average value (13.423%) and shows greater stability, with a standard deviation of 7.518%.

The economic control variables also exhibit considerable volatility. Specifically, the GDP variable shows significant fluctuations, ranging from a severe contraction (-30.70) to a maximum of 17.043, reflecting the macroeconomic instability of the countries in the sample over the years. In addition, inflation (INF) shows extreme variation, with values ranging from negative inflation (-6.811) to a very high inflation level (324.996), indicating high inflation rates in these countries. This characteristic instability is typically associated with unstable economic and financial environments, especially in low-income countries.

Institutional quality (INS) also exhibits wide dispersion, with mean values ranging from -2.478 to 1.320, indicating that the study sample includes countries with low and varying levels of institutional quality. This is crucial for analyzing data using a dual-strategy approach to examine both the interaction and threshold effects of institutional quality. Similarly, political stability (POS) also shows significant variation, from a minimum value of -4.245 to a maximum value of 0.866, indicating differences among countries in terms of political stability and the absence of violence or terrorism.

Table 1. Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
DOR	244	41.049	21.773	5.945	85.625
MSC	244	29.127	29.073	0.962	132.817
ATM	236	26.727	29.380	0.122	104.057
BANKZ	244	13.423	7.518	2.690	39.380
GDP	244	2.706	5.573	-30.699	17.043
INF	244	15.941	32.334	-6.811	324.996
INS	244	-0.595	0.663	-2.478	1.320
POS	244	-0.543	1.033	-4.245	0.866

Thus, the descriptive statistics of the variables show cross-sectional and temporal heterogeneity across the variables in the research models, indicating that variability is important for applying the identification strategy of this study. These statistics also confirm that using both interaction and threshold models to capture nonlinear and regime-dependent relationships between financial development, institutional quality, and dollarization across different countries is appropriate in the context of this research.

4. RESULTS

4.1. Diagnostic Test Results

Considering the correlation matrix and the possibility of multicollinearity remains necessary for exploring the initial data before running Bayesian statistical models; this step does not necessarily require removing variables if multicollinearity occurs in Bayesian statistics.

Table 2 shows that most variables are correlated with the dollarization variable, except for GDP. Furthermore, the correlation coefficients between the independent variables and the control variable are not very high, so multicollinearity is unlikely. To test more accurately for multicollinearity, this study uses the variance inflation factor test.

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Table 2. Correlation Matrix.

Variables	DOR	MSC	ATM	BANKZ	GDP	INF	INS	POS
DOR	1							
MSC	-0.251	1						
	0.000							
ATM	-0.535	0.581	1					
	0.000	0.000						
BANKZ	0.437	0.222	-0.201	1				
	0.000	0.0005	0.002					
GDP	0.003	0.087	-0.057	0.114	1			
	0.954	0.171	0.376	0.075				
INF	-0.150	-0.175	-0.053	-0.235	-0.085	1		
	0.018	0.006	0.421	0.0002	0.183			
INS	-0.317	0.306	0.332	-0.134	0.192	-0.201	1	
	0.000	0.000	0.000	0.036	0.003	0.002		
POS	-0.189	0.238	0.237	-0.091	0.102	-0.197	0.661	1
	0.003	0.000	0.000	0.155	0.110	0.002	0.000	

Table 3. Multicollinearity test using the variance inflation factor.

Variables	VIF	1/VIF
INS	1.97	0.508
MSC	1.89	0.529
ATM	1.89	0.530
POS	1.75	0.572
BANKZ	1.4	0.715
INF	1.15	0.871
GDP	1.08	0.925
Mean VIF	1.59	

Variance Inflation Factor (VIF) is a statistical measure used to detect multicollinearity in a multiple regression model. It quantifies how much the variance (i.e., uncertainty) of an estimated regression coefficient increases due to collinearity among the independent variables. Multicollinearity was assessed using Variance Inflation Factors (VIFs), with values above 10 indicating serious concern (Kutner, Nachtsheim, Neter, & Li, 2005). According to Hair, Black, Babin, and Anderson (2010), VIF values exceeding 10 suggest problematic multicollinearity that can distort regression coefficient estimates. Table 3 shows that VIF values are less than 10, indicating that no multicollinearity issue exists in the regression analysis.

4.2. Interaction Effects between Financial Development and Institutional Quality on Dollarization

We first examine whether institutional quality moderates the effect of financial development on dollarization.

Table 4. Model selection.

Model	ELPD_diff.	SE_diff.
hier_model	0.0	0.0
flat_model	-65.8	8.8
hier_info_model	-90.9	12.8

Table 4 shows the results of testing the selection among three models, including the hierarchical model, flat model, and hierarchical informative model, using the expected log pointwise predictive density (ELPD). This index assesses out-of-sample predictive performance; a higher value indicates greater predictive ability when comparing the models (Gelman et al., 2013).

The results show that the hierarchical model was selected for its highest predictive ability, with an ELPD difference of zero, while the flat model and the hierarchical information model were not selected due to ELPD

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differences of -65.8 and -90.9, respectively. These research results confirm the importance of considering structural heterogeneity in macro-financial data, especially the distinct role of institutional quality in examining the relationships between financial and economic variables (Acemoglu et al., 2005; North, 1990).

Table 5. Posterior inference results (Hierarchical Model).

Variables	Mean	Std. dev.	CI_2.5	CI_97.5	P_gt_0
Intercept	36.839	3.162	30.735	43.051	1.000
MSC	-0.297	0.079	-0.451	-0.140	0.000
ATM	-0.104	0.082	-0.263	0.056	0.102
BANKZ	0.977	0.212	0.564	1.385	1.000
INS	0.004	0.962	-1.817	1.904	0.488
MSCINS	-0.672	0.163	-0.986	-0.357	0.00002
ATMINS	0.347	0.166	0.027	0.6705	0.983
BANKZINS	0.006	0.147	-0.285	0.2902	0.512
GDP	-0.217	0.195	-0.598	0.174	0.126
INF	-0.061	0.065	-0.191	0.068	0.171
POS	0.071	0.848	-1.586	1.7422	0.541

Table 5 shows the results of posterior inference in the hierarchical Bayesian model, including information on the mean, standard deviation, credible intervals, and the probability that each coefficient is greater than zero.

The study results show that financial depth (MSC) has a statistically significant inverse effect on dollarization, with a posterior mean of -0.2971 and a 95% interval entirely below zero [-0.4507, -0.140], and a posterior probability equal to 1.000. This result indicates an inverse relationship between the MSC variable and dollarization, confirming that increased financial deepening promotes a reduction in the use of foreign currency, thereby reducing the level of dollarization in countries where institutional quality and economic conditions are ensured.

On the contrary, financial stability (BANKZ) also has a strong positive impact on dollarization, with a mean of 0.977, an entire credible interval above zero [0.5644, 1.385], and a posterior probability equal to 1.000. Thus, financial stability plays a role in promoting dollarization.

Conversely, financial access (ATM) has an inverse effect, but it is not statistically significant because its credible interval includes zero, and the probability of a positive effect is only 0.102. This result is also contrary to previous studies, which suggested that financial access influences dollarization in countries and that the effects of financial inclusion depend on many other economic and financial factors, including institutional conditions.

The research results from Table 5 show that the institutional quality (INS) variable has no direct impact on dollarization, with a credible interval spanning zero and a posterior probability close to 0.5. Notably, the interaction between institutional quality (INS) and financial depth (MSC) has a strongly negative and highly credible impact on dollarization. Therefore, institutional quality plays a role in strengthening the negative relationship between financial development and dollarization. This result further confirms that countries and stages with better institutional conditions generally promote the impact of financial depth on dollarization more than countries with poorer institutional conditions (Acemoglu et al., 2005; North, 1990).

Conversely, the interaction between financial access (ATM) and institutional quality (INS) has a positive impact on dollarization, suggesting that financial access helps reduce dollarization in countries with stronger institutional environments. Furthermore, the interaction between financial stability (BANKZ) and institutional quality (INS) has no impact on dollarization in these countries. The control variables (GDP, INF, POS) have no statistically significant impact on dollarization, with wide credible intervals that include zero.

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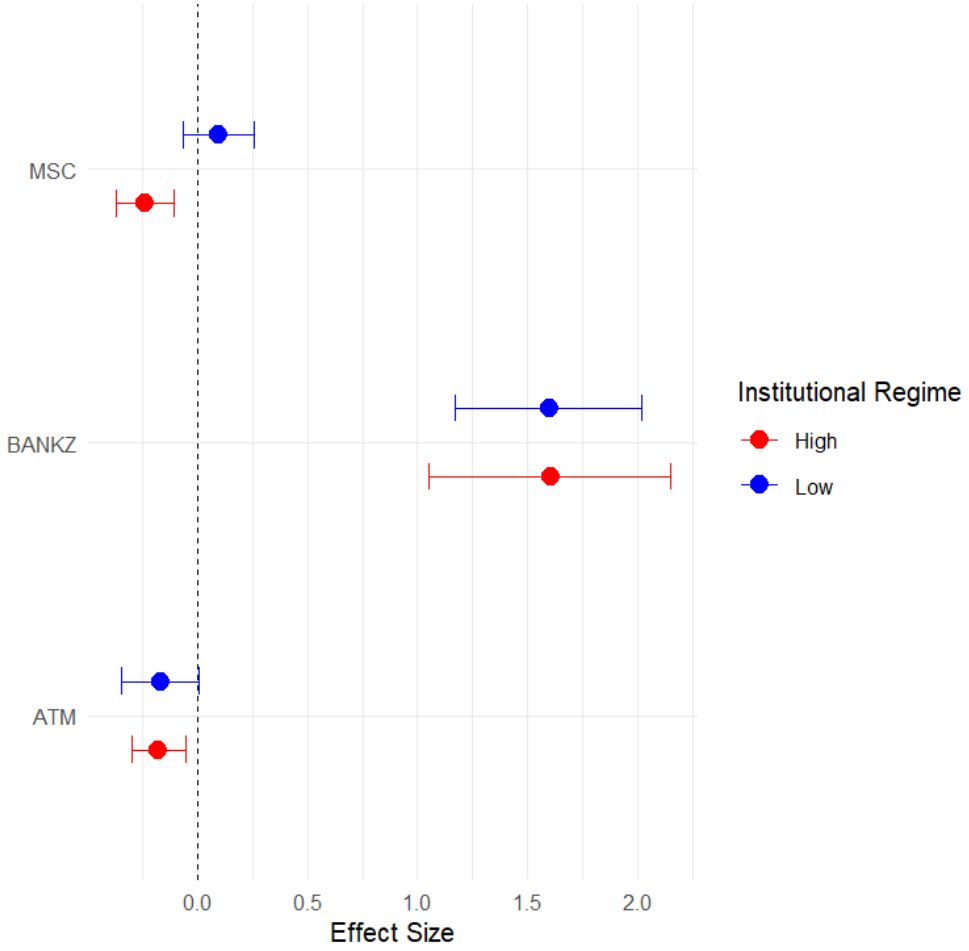


Figure 1. The marginal effects of financial development on dollarization.

Figure 1 illustrates the marginal effects of financial development on dollarization when categorized by levels of institutional quality. The results in Figure 1 show that institution-dependent heterogeneity occurs. In countries with low institutional quality, the marginal effects of financial development are close to zero or slightly positive, with credible intervals often including zero, indicating that financial development has little impact on reducing dollarization under weak institutional conditions. This finding is consistent with previous studies suggesting that financial development is insufficient to reduce dollarization when a country has low institutional quality and weak corporate governance (Acemoglu et al., 2005; North, 1990).

When institutional quality conditions increase, the marginal effect of financial development becomes increasingly negative and statistically significant, with the credible interval entirely below zero in higher institutional regimes (when considering MSC and ATM). This result shows that, in countries with high institutional quality, financial development (MSC and ATM) helps reduce dollarization; in such cases, higher institutional quality increases the efficiency of financial intermediation and promotes the use of the local currency in transactions and for investors' safekeeping (Levine, 2005). However, financial stability (BANKZ) shows that the marginal effect becomes positive and statistically significant, with the credible interval entirely above zero in higher institutional regimes.

The results of the marginal effects of financial development on dollarization demonstrate a nonlinear and regime-dependent relationship, consistent with threshold theory (Hansen, 1999; Tong, 1983). Therefore, evaluating the impact of financial development on dollarization as moderated by institutional quality reveals not only a linear but also a nonlinear relationship, and the application of the threshold model is appropriate for this study.

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4.3. Threshold Effects of Institutional Quality on Dollarization

The interaction model (1) assesses only the linear effects of financial development on dollarization across groups with low and high institutional quality. To identify a potential nonlinear relationship, this study also applies the threshold model (2) to assess this impact comprehensively.

Table 6. Posterior estimates of variable effects under high and low INS regimes.

Variables	INS = High (Mean [95% CI])	INS = Low (Mean [95% CI])
MSC	-0.235 [-0.366, -0.107]	0.095 [-0.064, 0.257]
ATM	-0.175 [-0.295, -0.055]	-0.166 [-0.345, 0.008]
BANKZ	1.600 [1.050, 2.150]	1.601 [1.170, 2.020]

Note: Values represent posterior means with 95% credible intervals in brackets.

Table 6 shows that, under high- and low-institutional-quality regimes, the impact of financial development on dollarization differs. This result indicates heterogeneity in the impact of financial development on dollarization under different institutional-quality conditions.

For financial depth (MSC), the impact is divided into two different areas of institutional quality. In the high-institutional-quality regime, MSC shows a statistically significant inverse impact on dollarization, with a posterior mean of -0.235 and a 95% credible interval excluding zero [-0.366, -0.107]. This result shows that, in countries with better institutional conditions, financial deepening helps reduce dollarization. Conversely, in countries with low institutional quality, MSC has a positive but not statistically significant impact because its credible interval includes zero [-0.064, 0.257]. This result confirms that financial deepening does not help reduce dollarization in countries with low institutional quality. Thus, MSC does not help reduce the use of foreign currency in weak institutional environments.

In the case of the financial access (ATM) variable, it has a statistically significant and inverse impact on dollarization in high-institutional-quality regimes, with an impact of -0.175 and a credible interval excluding zero [-0.295, -0.055]. Meanwhile, in low-institutional-quality regimes, the ATM variable has no statistically significant impact on dollarization because, although the impact is -0.166, the credible interval [-0.345, 0.008] slightly overlaps zero. This result suggests that financial access plays a role in reducing dollarization in countries with good institutional quality. This study shows that financial inclusion contributes to reducing dependence on foreign currency by increasing access to domestic financial services, specifically through the number of ATMs. However, the results also show that financial access does not reduce dollarization in weak institutional environments, and this finding is consistent with previous research (Dabla-Norris & Srivisal, 2013).

A notable finding is that financial stability (BANKZ) exhibits a strong and positive impact on dollarization in both low- and high-institutional-quality groups. BANKZ has an impact coefficient of 1.600, with a credible interval excluding zero [1.050, 2.150] in the high-institutional-quality regime group. Similarly, BANKZ also has a strong positive impact, with a posterior mean of 1.601 [1.170, 2.020]. Thus, the impact of this variable shows a robust and statistically significant positive association with dollarization. This result suggests that greater banking stability may be associated with higher levels of dollarization and that countries with high financial stability may generally have a high demand for foreign currency.

Table 7. Magnitude and probability of threshold effects (INS moderation).

Variables	Difference (Low − High)	P (Effect increases)
MSC	0.331	1
ATM	0.009	0.537
BANKZ	-0.003	0.493

Note: Difference represents the posterior mean of Low minus High INS effects. P (Effect increases) indicates the posterior probability that the effect under low INS exceeds that under high INS.

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Table 7 shows the magnitude and probability of threshold effects (INS moderation), indicating that the effect of financial development on dollarization is larger under low institutional quality than under high institutional quality. This result also confirms the threshold effects of financial development when applying the Bayesian framework.

In the case of the MSC variable, the difference between the effects in low- and high-institutional-quality regimes is positive (0.331), indicating that the impact of financial depth on dollarization is stronger in low-institutional-quality environments. The probability of occurrence is high (1.00), demonstrating certainty regarding the extent of this impact. This result further confirms the institutional threshold effect when considering the impact of financial depth on dollarization and is consistent with the findings of previous studies (Acemoglu et al., 2005; North, 1990). In countries with poor institutional quality, financial deepening does not help reduce the use or hoarding of foreign currency because of poor policy quality and weak institutional conditions.

For the financial access (ATM) variable, the results show a negligible difference, which is close to zero (0.009), with a posterior probability of 0.537. This result indicates that the impact of financial access does not differ significantly across institutional regimes. The research results are consistent with previous studies suggesting that financial access affects dollarization, but the magnitude of this impact may not differ significantly across institutional contexts (Dabla-Norris & Srivisal, 2013; Demirgüç-Kunt & Levine, 2009).

For financial stability (BANKZ), the estimated value is slightly negative (-0.003), with a posterior probability of 0.493, indicating no meaningful regime dependence. This result suggests that the impact of financial stability on dollarization is relatively uniform across institutional environments. Therefore, this result is quite similar to previous results, which suggest that the effects of dollarization are shaped by a range of structural and institutional factors, rather than by financial stability alone (Huidrom & Smirnov, 2024).

Thus, the research results from Table 7 help examine and supplement the differences in the magnitude and probability of threshold effects, considering the mediating role of institutional quality. This result supplements the research results from Table 6 and provides evidence for the suitability of applying nonlinear and threshold settings using Bayesian inference (Gelman et al., 2013).

4.4. Discussion

The research results show that both the interaction and threshold models recognize the role of financial development in reducing dollarization, depending on institutional regimes. The research results are quite similar to those of related grounded theories, including currency substitution theory, portfolio choice theory, and financial deepening theory.

The marginal effect results indicate that financial depth (MSC) helps reduce dollarization in countries, but only when institutional quality is sufficiently strong. Conversely, in weak institutional environments, financial development (MSC and ATM) does not reduce dollarization in countries with low institutional quality. The research results show that the impact of financial development on dollarization depends on different institutional regimes. This is consistent with institutional theories that consider institutional quality a factor influencing financial development and macroeconomic stability (Acemoglu et al., 2005; North, 1990). The results show regime-dependent effects when assessing the impact of financial development on dollarization, and this impact demonstrates a nonlinear relationship between financial development and dollarization. Hansen (1999) and Tong (1983) argue that economic relationships are complex and can change under different contexts. Dollarization is typically related to economic conditions and external shocks (Huidrom & Smirnov, 2024). The research findings support the conclusion that, in order to reduce dollarization, countries need not only to consider the level of financial development but also to improve the quality of their national institutions. However, financial stability (BANKZ) promotes dollarization across both low- and high-institutional environments. The persistence of financial dollarization cannot be explained solely by current macroeconomic stability. Historical inflation, exchange-rate risk, and weak confidence in the domestic currency continue to influence the demand for foreign-currency-denominated assets (Edwards, 2006; Ize & Yeyati, 2003;

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Reinhart et al., 2003). The threshold model results are similar, indicating that financial depth (MSC) and financial access (ATM) significantly reduce dollarization in countries with high institutional quality, whereas financial stability promotes dollarization across both institutional regimes. Therefore, hypothesis 1 is partially rejected based on the research results.

Research results from the interaction and threshold models demonstrate that institutional quality plays a role in moderating the relationship between financial development and dollarization and in shaping threshold effects. These results are quite similar to those of institutional theory. Countries with strong institutional quality enhance monetary credibility, encouraging the use of domestic currency and lowering dollarization (Acemoglu et al., 2005; North, 1990). Therefore, hypothesis 2 is accepted based on these research results.

The results of the threshold model analysis further strengthen this conclusion by suggesting that institutional quality acts as a regime-defining factor in the impact of financial development on dollarization. At a certain institutional quality threshold, financial depth (MSC) and financial access (ATM) significantly reduce dollarization. However, financial stability (BANKZ) significantly increases dollarization at both low and high institutional thresholds. Overall, the results indicate that institutional quality plays a crucial role in regulating how financial development influences dollarization, and that ensuring dedollarization requires financial reforms alongside strong institutional improvements across countries. The threshold effect identified in this study indicates that the impact of financial development on dollarization varies with institutional quality, supporting the broader view that institutional conditions shape economic outcomes (North, 1990), and hypothesis 3 is accepted.

4.5. Robustness Checks

To test the robustness of the research results, this study applies two techniques to the Bayesian framework: prior sensitivity analysis and a dual strategy combining interaction effects and threshold models.

First, the study applies a prior sensitivity analysis by re-estimating the models using alternative weakly informative and diffuse priors. The results show that the posterior estimates for variables in the model, such as MSC and the interaction variable between MSC and institutional quality (MSCINS), have similar, statistically significant effects. This indicates consistency in the posterior estimates.

Second, this study uses a dual strategy by applying the interaction model (1) and the threshold model (2) to assess the impact of financial development on dollarization across different institutional regimes. The research results simultaneously examine the linear and nonlinear relationships between financial development and dollarization. For the interaction model (1), the results use different control variables and show that the interaction terms remain qualitatively unchanged, confirming that the moderating role of institutional quality is not sensitive to model specification or multicollinearity concerns. For the threshold model (2), a robustness check is performed by examining the stability of the estimated threshold and regime-specific effects. The posterior distribution of the threshold parameter is well-defined and concentrated, and the regime-dependent coefficients remain consistent across specifications.

5. CONCLUSION AND IMPLICATIONS

This study assesses the impact of financial development dimensions on dollarization while identifying the moderating role of institutional quality. The study also proposes a research framework for determining the nonlinear relationship between financial development and dollarization across countries. To achieve this, the study employs a Bayesian regression approach, along with underlying theories concerning the relationship between financial development and dollarization, including currency substitution theory, portfolio choice theory, financial deepening theory, and institutional theory. The threshold model shows that financial depth (MSC) and financial access (ATM) significantly reduce dollarization only in countries with high institutional quality, whereas financial stability (BANKZ) promotes dollarization across both institutional regimes. Taken together, the interaction and threshold

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model results indicate that institutional quality exerts both moderating and threshold effects on the relationship between financial development and dollarization. Based on these findings, this study proposes several policy implications for reducing dollarization.

5.1. Policy Implications

While most Asian countries still maintain high levels of dollarization, some European countries, such as Ukraine and Romania, tend to pursue de-dollarization for economic stability. Countries should promote financial development through financial depth and access to increase local-currency use and reduce dollarization.

First, in countries with weak institutional environments, low regulatory credibility, corruption, or ineffective law enforcement, governments should focus on improving institutional quality and government effectiveness, specifically regulatory quality, to promote de-dollarization alongside improvements in the financial sector. This conclusion stems from research suggesting that improved institutional quality leads to greater financial depth and access, which, in turn, helps reduce dollarization.

Secondly, research results show that financial stability promotes dollarization across different institutional regimes. Although banking stability plays a crucial role in economic development, the findings suggest that financial stability does not necessarily reduce the use of foreign currency. Therefore, governments need to consider the role of financial stability within the financial system when seeking to control dollarization. Policies to be implemented in the financial system include establishing regulations on foreign-currency lending and the use of foreign currency in domestic transactions, as well as developing a financial system in which the role of the domestic currency is emphasized or, at least, balanced through state control.

Finally, the results show that countries need effective strategies to simultaneously develop institutional quality and financial development.

This suggests that governments should not focus only on expanding financial markets or increasing financial access, but also on improving institutional capacity to promote de-dollarization. Pursuing these two goals simultaneously helps increase the use of the domestic currency, enhance its strength, and reduce dependence on foreign currencies, thus contributing to a reduction in dollarization. To minimize dependence on foreign currencies, countries need to reduce the use of foreign currencies, including the US dollar, in trade transactions by increasing the required reserve ratio for foreign-currency deposits.

The required reserve ratio is considered by economists to be a powerful monetary policy tool for implementing a tightening or expansion of the money supply, thereby sending signals about increasing credit or reducing funding for the economy. However, central banks can also use the required reserve ratio for foreign-currency deposits as a powerful tool to control and prevent dollarization.

5.2. Research Limitations

In addition to its contributions, this paper has some limitations due to data constraints related to dollarization.

First, this paper does not consider how financial policy affects dollarization because such policies can demonstrate how dollarization differs in various contexts.

Second, the study may not consider other proxies for financial development because it focuses only on MSC, ATM, and BANKZ.

Third, there may be potential reverse causality among financial development, institutional quality, and dollarization. The two models applied in this study could not address the possibility that dollarization itself may influence financial development and institutional dynamics. Thus, this paper calls for further research to address the above-mentioned limitations.

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Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: The corresponding author can provide the supporting data of this study upon a reasonable request.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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Appendix 1.

Appendix A. Variables with descriptions.

Variables	Description	Measurement units	Source
DOR	Dollarization	Foreign currency deposits/Broad money (%)	International Monetary Fund (2025)
MSC	Financial development (Depth)	Monetary sector credit to the private sector (% GDP)	World Bank (2025)
ATM	Financial development (Financial Access)	ATMs per 100,000 adults	World Bank (2025)
BANKZ	Financial development (Financial Stability)	Bank Z-score	World Bank (2025)
GDP	Economic development	GDP per capita growth (annual %)	World Bank (2025)
INF	Inflation rate	Inflation, consumer prices (Annual %)	World Bank (2025)
INS	Institutional quality	Government Effectiveness: Estimate	World Bank (2025)
POS	Political stability	Political Stability and Absence of Violence/Terrorism: Estimate	World Bank (2025)

Appendix A presents variables in research models, including descriptions, measurement units, and sources of data.

Appendix B. Posterior Probability **P(β>0)** across Bayesian Models.

Probability P(β>0)	Bayesian Model		
	Flat	Hierarchical	Hierarchical Informative
b_MSC-> DOR	0.0000	0.000	0.917
b_ATM-> DOR	0.1025	0.102	0.901
b_BANKZ-> DOR	1.0000	1.000	0.9872
b_INS-> DOR	0.4882	0.488	0.9742
b_MSCINS-> DOR	0.0000	0.00002	0.9630
b_ATMINS-> DOR	0.9835	0.983	0.9768
b_BANKZINS-> DOR	0.5128	0.512	0.9548
b_GDP-> DOR	0.1262	0.1262	0.4938
b_INF-> DOR	0.1718	0.171	0.3960
b_POS-> DOR	0.5415	0.541	0.4995

Appendix B assesses the posterior probability that each coefficient (β) has an effect on DOR across three Bayesian models: Flat, Hierarchical, and Hierarchical Informative. The results show that the Hierarchical Informative model generally provides stronger evidence of positive effects, particularly for MSCINS, MSC, BANKZ, ATMINS, ATM, and INS, while GDP, INF, and POS remain uncertain with probabilities close to 0.5.

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Appendix C. Posterior estimates and effects of financial development on DOR by INS group

Appendix C illustrates posterior estimates and effects of financial development on DOR by INS group.

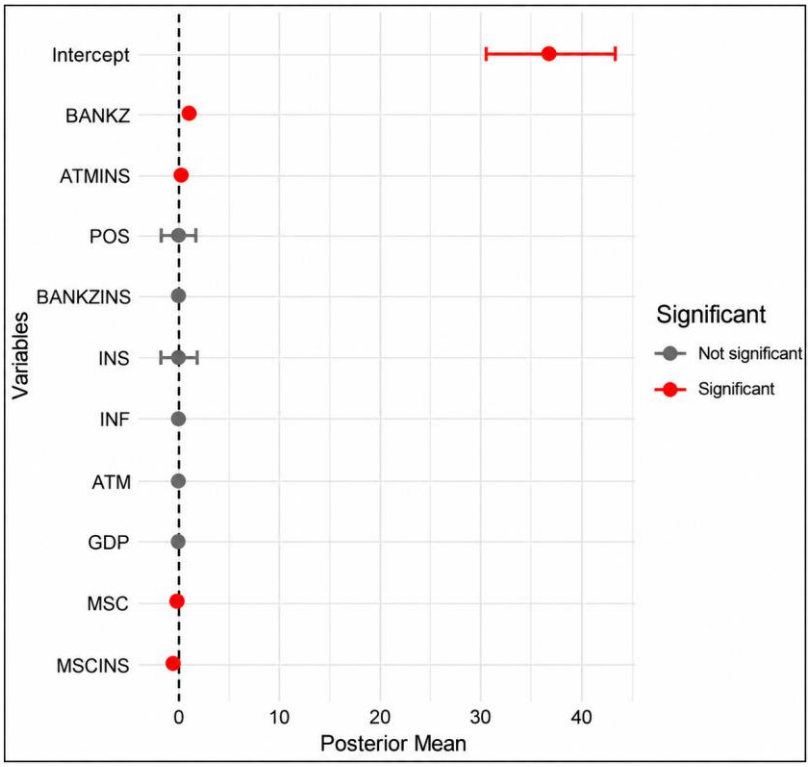


Figure C1. Posterior estimates with significance highlighted (95% CI) in an interaction model.

Figure C1 presents the posterior means and statistical significance of the estimated coefficients across the variables. The results show that BANKZ, ATMINS, MSC, and MSCINS have significant effects, while POS, BANKZINS, INS, INF, ATM, and GDP are not statistically significant; the intercept has the largest positive posterior mean.

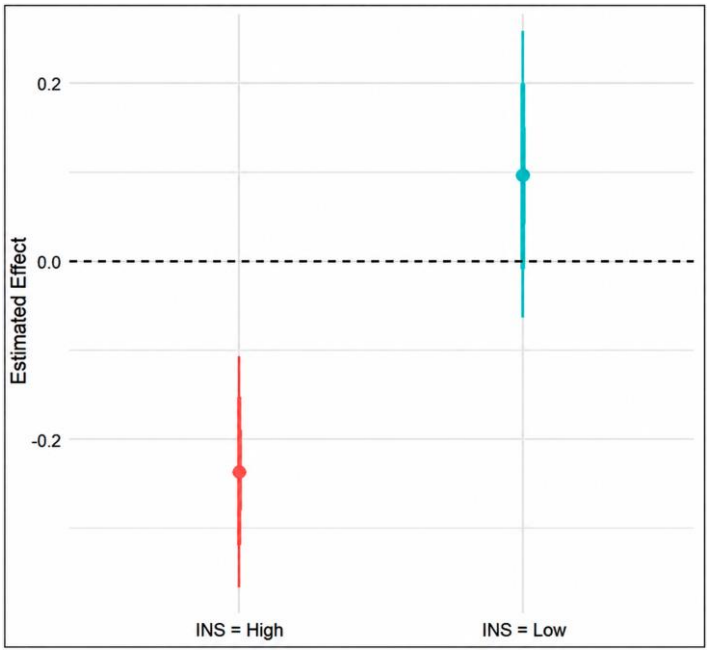


Figure C2. Effect of MSC on DOR by INS group in a threshold model.

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Figure C2 presents the estimated effect of INS under high and low conditions.

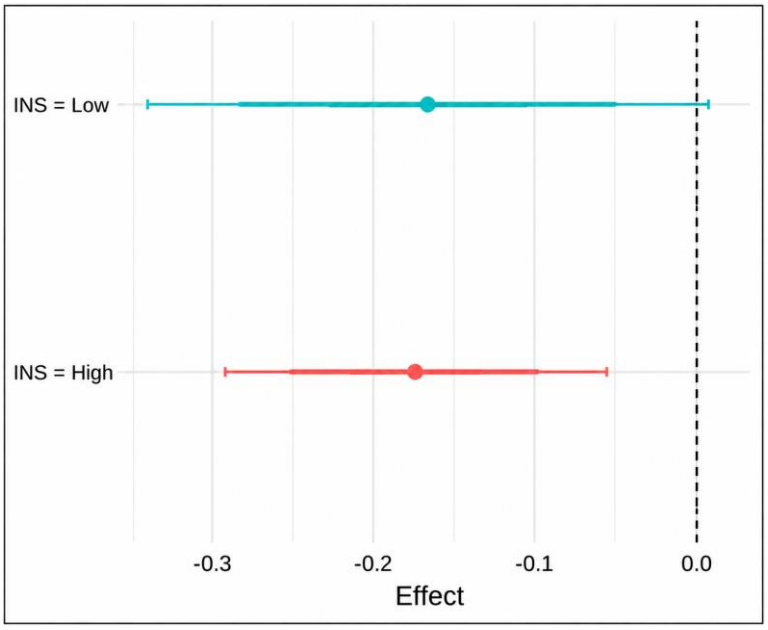


Figure C3. Effect of ATM on DOR by INS group in a threshold model.

Figure C3 compares the estimated effects of INS at low and high levels, showing that both effects are negative.

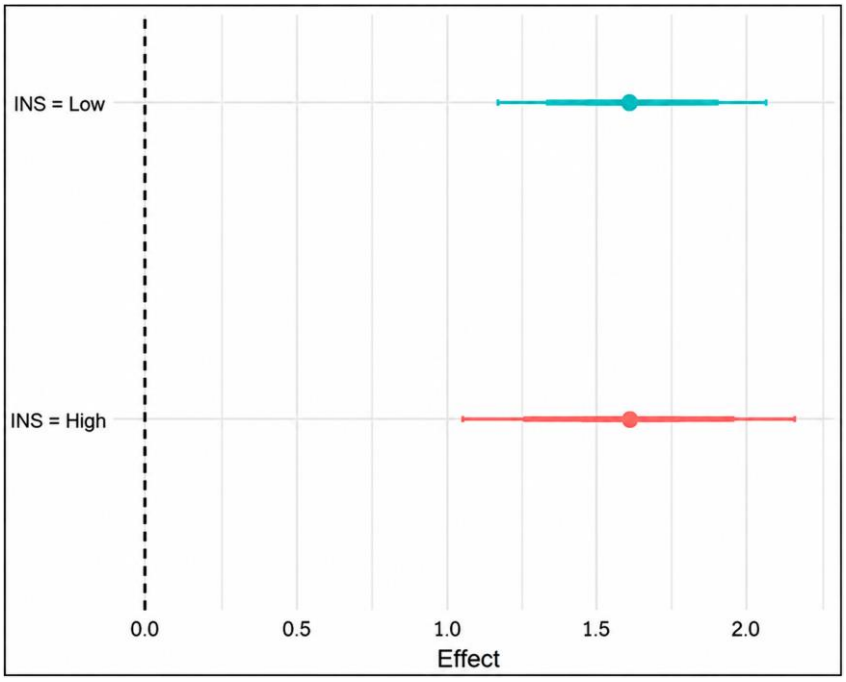


Figure C4. Effect of BANKZ on DOR by INS group in a threshold model.

Figure C4 evaluates and compares the effect estimates between the low and high groups of INS, while assessing the uncertainty of the estimates using their confidence intervals.

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