نشریه علمی-پژوهشی
مطالعات کشورها
شاپای الکترونیکی: ۹۱۹۳-۲۹۸۰

پویایی بدهی خارجی و محرک‌های بحران مالی؛ تحلیلی ساختاری در چارچوب مدل اقتصاد ملی

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مشخصات مقاله

مقالهٔ پژوهشی
موضوع: اقتصاد
حوزهٔ موضوعی: اندونزی، آرژانتین، برزیل، تایلند، ترکیه، روسیه، فیلیپین، کرهٔ جنوبی، مالزی، مکزیک

تاریخ دریافت: ۱۴۰۴/۱۲/۰۶
تاریخ بازنگری: ۱۴۰۵/۰۲/۱۲
تاریخ پذیرش: ۱۴۰۵/۰۲/۱۵
تاریخ انتشار: ۱۴۰۵/۰۶/۲۵

واژگان کلیدی:
بحران‌های مالی،
بدهی خارجی،
پول داغ،
داده‌های پانلی.

چکیده

در این پژوهش تأثیر پویایی‌های بدهی خارجی بر بحران‌های مالی در کشورهای درحال‌توسعه از منظر مدل اقتصادی باش (Baş, 2018) بررسی شده است. بدین‌منظور، تحلیل داده‌های پانلی، تأثیربار فزایندهٔ بدهی خارجی و ناترازی‌های کلان اقتصادی بر احتمال وقوع بحران واکاوی شده است. جامعهٔ آماری پژوهش متشکل است از ده کشور درحال‌توسعهٔ منتخب (اندونزی، آرژانتین، برزیل، تایلند، ترکیه، روسیه، فیلیپین، کرهٔ جنوبی، مالزی، مکزیک) در بازهٔ زمانی ۱۹۹۰ تا ۲۰۲۲م. مدل به‌کاررفته در این پژوهش متغیرهای زیر را در بر دارد: کل ملفندهٔ بدهی خارجی، ذخایر ارزی، نسبت خدمات بدهی خارجی، نرخ مؤثر واقعی ارز، و جریان‌های پول داغ. یافته‌ها حاکی از آن است که هم‌بستگی مثبت قوی میان افزایش ملفندهٔ بدهی خارجی و احتمال بروز بحران وجود دارد. ازاین‌رو، نتایج پژوهش مؤید این دیدگاه است که استقراض بی‌رویهٔ خارجی، اقتصاد را شکننده می‌کند و به‌طور مستقیم به بحران‌های مالی دامن می‌زند و یکی از محرک‌های اصلی در بروز آن است.

ارجاع به این مقاله: توران ا، کیلاووز ص، کوماری و. (۱۴۰۶). «پویایی بدهی خارجی و محرک‌های بحران مالی؛ تحلیلی ساختاری در چارچوب مدل اقتصاد ملی». *مطالعات کشورها*. ۵(۳): ۵۸۱- ۶۰۰. doi: https://doi.org/10.22059/jcountst.2026.411937.1458.

وبگاه: https://jcountst.ut.ac.ir/ | رایانامه: jcountst@ut.ac.ir
شاپای الکترونیکی: ۹۱۹۳- ۲۹۸۰ | ناشر: دانشگاه تهران

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Journal of
Countries Studies
EISSN: 2980-9193

External debt dynamics and financial crisis triggers: A structural analysis within the framework of the national economy model

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Article Info

Original Article

Main Object: Economics
Scope: Argentina, Brazil, Indonesia, Malaysia, Mexico, Philippine, Russia, South Korea, Thailand, Turkiye.

Received: 25 February 2026
Revised: 02 May 2026
Accepted: 05 May 2026
Published online: 16 September 2026

Keywords:
external debt,
financial crises,
hot money,
panel data.

Abstract

This study examines the impact of external debt dynamics on financial crises in developing countries from the perspective of Baş's (2018) national economic model. To this end, the study investigates how increasing external debt burden and macroeconomic imbalances affect the probability of a crisis using Panel Data Analysis. The study covers 10 selected developing countries (Turkiye, Argentina, Brazil, Mexico, Russia, Indonesia, South Korea, Thailand, Malaysia, and the Philippines) for the period 1990-2022. The model utilises Total External Debt Stock, Foreign Exchange Reserves, External Debt Service Ratio, Real Effective Exchange Rate, and Hot Money movements as variables. The findings show a strong positive correlation between the increase in external debt stock and the probability of a crisis. Therefore, the results support the idea that excessive external borrowing makes economies fragile, directly leading to financial crises and acting as a major trigger for them.

Cite this article: Torun E, Kılavuz S, Kumarı V. (2027). "External debt dynamics and financial crisis triggers: A structural analysis within the framework of the national economy model". *Countries Studies*. 5(3): 581-600. doi: https://doi.org/10.22059/jcountst.2026.411937.1458.

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Website: https://jcountst.ut.ac.ir/ | Email: jcountst@ut.ac.ir |
EISSN: 2980-9193
Publisher: University of Tehran

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Countries Studies, Vol 5, No 2, Fall 2027

1. Introduction

Neoliberal policies have been the dominant economic approach worldwide since the 1980s. With the impact of the Industrial Revolution, the world economy developed rapidly, and the position of the capitalist system strengthened. However, throughout its development, the capitalist system has frequently encountered political and economic crises. The 20th century was marked by frequent economic crises. After 1980, the financial dimension of economic crises began to become more pronounced. The countries most affected by economic crises are developing countries, and in these countries, the destructive effects of crises tend to last longer. The neoliberal economic policies implemented by developing countries after 1980 are considered a primary cause of the financial crises of the 1990s.

Developing countries that pursued financial liberalization under the influence of post-1980 neoliberal policies turned to external savings (external debt) in order to overcome the problem of capital accumulation. However, rather than delivering the promised sustainable growth, this process left economies vulnerable to the volatility of global capital movements.

Global capital holders and developed countries, which advise states to finance investments and public expenditures through long-term, interest-bearing loans, push countries into a debt spiral by providing loans through private financial institutions, primarily via the World Bank. Countries that undertake investments such as dams, bridges, and roads with the goal of development often find themselves, over time, trapped in an inescapable debt quagmire (Perkins, 2004: 15-17). These states, which borrow from countries considered developed, see their policy space increasingly constrained over time by the actors from whom they have borrowed.

The main objective of this study is to demonstrate that the root cause of financial crises lies not in countries' macroeconomic imbalances (such as budget deficits), but rather in the financing model itself. As emphasized from the perspective of the National Economy Model (NEM), borrowing in foreign currency instead of one's own currency and relying on interest-based "hot money" inflows rather than production push developing countries into a chronic cycle of crises (Baş, 2018). In this context, NEM is utilized in this study as a foundational theoretical framework to identify the structural triggers of financial instability. Our objective is to empirically test whether the NEM's specific assertions regarding 'liquidity thresholds' and 'maturity mismatches' serve as statistically significant predictors of crisis events. By integrating variables such as the Debt-to-Reserves ratio and Short-Term Debt ratio into a Panel Logit framework, we aim to provide econometric validation for how these structural mechanisms directly trigger financial crises.

In this study, the manner in which external debt stock triggers crises

will be analyzed in the light of leading studies in the international literature and supported by empirical data. The rest of the manuscript presents the theoretical framework (Section 2), review of literature (Section 3), data and methods (Section 4), empirical findings (Section 5), and conclusion (Section 6).

2. Theoretical framework

The process of globalization, together with the liberalization of capital movements, has given rise to a structural dependency relationship that narrows the economic sovereignty of developing countries. This cycle of dependency, frequently discussed in the literature, operates primarily through debt-accumulation dynamics and financial crisis mechanisms.

2.1. Borrowing method

At the core of the economic fragilities of developing countries lie long-term external borrowing strategies, promoted under the label of "development financing" and directed toward infrastructure investments. Over time, this mechanism drags countries into an unsustainable debt spiral and paves the way for interventions by international financial institutions (IMF/World Bank). The structural reforms and privatization policies imposed in order to manage debt crises led to the transfer of national resources (mines, public enterprises) to global capital; as a result, the process culminates in a structural dependency relationship in which not only the economic but also the political decision-making mechanisms of states are placed under tutelage (Baş, 2018).

In this context, countries that have chosen a development path based on externally sourced borrowed funds have been driven toward economic instability and potential bankruptcy.

According to data published by the World Bank on December 3, 2025, in its International Debt Report 2025, the total external debt stock of low- and middle-income countries reached $ 8.9 trillion by the end of 2024. Between 2022 and 2024, developing countries made an additional $ 741 billion in external debt repayments (interest plus principal). This means that they repaid far more than the new financing they received, representing the largest net outflow of the last 50 years (World Bank, 2025).

The vast majority of the countries that constitute the sample group of our study exhibited a continuous tendency to increase their external debt stocks throughout the period under review (Appendix, Table A1). Particularly in the cases of Türkiye and Mexico, it is observed that the external debt stock rose uninterruptedly within the framework of the Neoliberal Debt Spiral from 2005 to 2013 and from 2013 to 2025. While Türkiye's external debt stock amounted to $389 billion in 2013, it reached $547.7 billion by 2025. This demonstrates that as long as integration into the existing financial system is maintained, debt

repayments do not reduce the principal amount; on the contrary, they exacerbate the debt burden through an interest spiral. The most striking indicator in Appendix, Table A1 is the data of the Russian Federation, which statistically diverges in a negative direction from the other countries. Russia's external debt stock increased during the period when it operated in an integrated manner within the global system, reaching a historical peak of $728.9 billion by the end of 2013. However, after this date, a radical change in trend occurred, and by 2025, the debt stock had declined to $ 305 billion, corresponding to a debt reduction (deleveraging) of 58%.

A significant factor behind the decline in Russia's debt stock is the restriction of access to external financing as a result of international sanctions imposed following the 2014 Crimea and Ukraine war. When economic history and comparative country analyses are examined, it is observed that economies such as Venezuela, Iran, and Argentina, which have similarly been subjected to severe financial embargoes and international isolation, rapidly depleted their reserves in the face of external shocks, entered hyperinflationary spirals, and defaulted on their external debt obligations (sovereign default) **(**Reinhart & Rogoff, 2011; Weisbrot & Sachs, 2019). However, Russia managed these severe sanctions process without entering a debt crisis by choosing to "repay" its debt rather than "roll it over", through increasing its foreign exchange reserves and shifting toward gold (World Gold Council, 2024). From 2013 onward, the implementation of a NEM perspective—by increasing gold reserves, transitioning to trade in national currencies, and reducing dollarization—indicates that this process was not a forced contraction, but rather a deliberate strategy of "financial independence".

2.2. Financial crisis

According to Baş (2018), the economic crises faced by developing countries should be defined not as market failures, but rather as a systematic process of "indebtedness and dependency" constructed by the global financial system. This process begins with rendering countries' financial structures vulnerable to external interventions and culminates in the transfer of resources through financial crises.

While conventional economic theories generally attribute financial crises to market imperfections or governance failures, the NEM approach defines crises as a deliberate mechanism of the global financial system.

Moreover, developing countries that liberalize their financial markets are left vulnerable to hot money inflows and outflows as well as speculative attacks. In this process, foreign capital—initially attracted into the country by stock markets and the appeal of high interest rates—transfers domestic resources to itself; it then triggers collapses in exchange rates and financial markets through a sudden exit

(sudden stop). In the post-crisis period, institutions such as the IMF and the World Bank intervene and, under the label of "structural reforms," facilitate the transfer of countries' resources to global capital. The purpose of this study is to empirically test the debt–crisis relationship created by this mechanism.

2.3. Post-neoliberal period crises in developing countries

Following the Second World War, developing countries obtained financial support for their economic development processes by borrowing from the International Monetary Fund (IMF) and the World Bank. However, by the 1970s, due to the effects of increasing global liquidity, a tendency emerged to borrow from the commercial banks of early-industrialized countries. As of 1980, not only public borrowing but also the shift of the private sector and banks toward external financing led to a significant increase in indebtedness levels, which resulted in a debt crisis in the early 1980s (Siddiqui, 2012: 13).

Between 1970 and 2011, a total of 147 systemic banking crises, 218 currency crises, and 66 debt crises occurred worldwide. Moreover, in certain periods, two or even all three of these types of crises took place simultaneously, leaving profound impacts on economic structures. This situation increased both the number and the scope of crises associated with the neoliberal period, causing this era to be remembered for financial turbulence (Laeven & Valencia, 2013).

The liberalization movements brought about by neoliberal policies disrupted macroeconomic balances in these countries. Consequently, neoliberal policies, which began to be adopted in developing countries in the 1980s, were regarded as the cause of the crises experienced in the 1990s (Şahin, 2020: 258).

The liberalization introduced by neoliberal policies continuously generates externally dependent growth. In the long run, this has created problems in developing countries and led to crises. Today, trade liberalization in developing countries has failed to deliver the benefits promised by neoliberal policies. On the contrary, while trade imbalances have emerged, countries running trade deficits have also become internationally indebted (Chang, 2007: 68-73).

2.4. Latin American crisis

The fundamental policies adopted within the scope of the neoliberal transformation process (financial liberalization, a floating exchange rate regime, and a high-interest–low-exchange-rate strategy) led to the emergence of structural imbalances in national economies. With financial liberalization, borrowing in foreign currency became more attractive, which increased domestic consumption in Latin America but also made it necessary for this consumption to be financed through foreign resources. Declining savings rates and rising consumption tendencies increased the need for external financing; when sufficient

capital inflows could not be secured, the debt burden inevitably rose (Díaz-Alejandro, 1985: 8-12).

In Latin American countries that pursued financial liberalization along the lines of IMF policies, short-term funds obtained from abroad (hot money) were converted into local currency and directed toward government domestic debt instruments in pursuit of high real interest returns. This speculative financing model left economies vulnerable to external shocks, as seen particularly in the cases of Argentina and Chile, transforming the phenomenon of crisis from a temporary condition into a chronic structural problem (Akyüz, 2017: 88-96).

The region's current account balance also deteriorated significantly during this period. While the total current account deficit stood at $9,160 million between 1985 and 1989, it increased gradually between 1990 and 1994, reaching $1,096 million, $17,086 million, $35,008 million, $44,566 million, and $46,038 million, respectively. These developments increased the external financing needs of Latin American economies and intensified the pressure on debt mechanisms (ECLAC, 1996).

Indeed, between 1987 and 1994, the national currencies of Latin American countries appreciated by approximately 40%. During this period, as international competitiveness declined, import volumes increased by about 80%, while exports rose by only 35%. To finance current account deficits and encourage capital inflows, domestic interest rates were kept high; however, when capital inflows were interrupted, devaluation pressures became inevitable (Benderli & Görenel, 2014: 194).

Despite their high growth rates, East Asian countries exhibited a pattern similar to that of Latin America in terms of financial fragility, and the consequences of the crises they experienced were largely shared.

2.5. 1997 Asian Crisis

The Asian Crisis, which began with the devaluation of the Thai baht on July 2, 1997, occurred as an inevitable consequence of a growth model based on external debt and hot money.

The crisis initially manifested itself in East Asia in the form of devaluations and stock market collapses. As its effects deepened, the currencies of other Asian countries, such as Hong Kong and South Korea, also came under intense speculative pressure, and regional financial instability increased progressively (Kayarkaya, 2006: 64).

Prior to the crisis, regional economies that were praised by the IMF and credit rating agencies were, in fact, financing their high current account deficits with short-term and high-cost external borrowing. According to 1996 data, while current account deficits in countries such as Thailand (7.9%) and Malaysia (4.9%) had reached critical levels, the region's total short-term debt burden had risen to $736.6 billion (IMF, 1997).

The fundamental trigger of the crisis was the pegging of national

currencies to the US dollar. The appreciation of the dollar following interest rate hikes by the United States weakened the export competitiveness of Asian countries, pushing firms into difficulties in servicing their debts. In countries such as Indonesia, which raised interest rates in line with IMF directives, the majority of companies went bankrupt, the banking sector collapsed, and domestic assets were transferred to global capital at values far below their true worth. In contrast, Malaysia, which rejected IMF prescriptions, prevented speculative attacks by imposing restrictions on capital outflows and halting privatizations, thereby protecting national assets and managing to emerge from the crisis with minimal damage.

2.6. Mexico (1994 Tequila crisis)

The 1994 Mexican Crisis constitutes a critical example for analyzing the temporary appearance of stability created by growth strategies in developing economies based on short-term capital movements (hot money) and the inevitable economic collapse that followed this process. In the pre-crisis period of 1990–1993, the privatization of public banks was completed, the NAFTA accession process was finalized, and GDP recorded an average growth rate of 4%. However, the $72.5 billion in short-term foreign capital inflows during this period generated speculative dynamism and artificial asset pricing in financial markets, rather than providing a structural and lasting macroeconomic improvement (IMF, 1995).

One of the primary factors contributing to the depreciation of the Mexican peso was credit expansion, which led to a rapid increase in the share of non-performing loans in the portfolios of commercial banks. The Mexican experience demonstrates that issuing short-term government debt securities denominated in a foreign currency entails significant risks to financial stability. When the volume of these bonds exceeded international reserves, the risk emerged that the government would be unable to meet its obligations, prompting foreign investors to rapidly liquidate their holdings and trigger capital outflows. As official reserves proved insufficient to meet these outflows, the country faced a severe foreign exchange crisis in 1994.

The trigger of the crisis was the redirection of global capital following the US Federal Reserve's decision to hike interest rates. In the face of the sudden and massive outflow of hot money (sudden stop), the Central Bank of Mexico's reserves declined from $25.1 billion in 1993 to $6.2 billion by the end of 1994 (Pilbeam, 1998). As reserves were depleted, the national currency, the peso, was forced to float; the shock increase in interest rates and the loss of value in securities pushed the economy into a deep debt crisis. This case illustrates that financing the current account deficit with hot money is unsustainable and that crises are inevitable in a structure where market control is transferred to global capital.

The crisis also showed that sterilization policies aimed at reducing the vulnerability of the financial system to capital flows were not sufficiently effective. The situation in Mexico revealed the repetition of a process previously observed in other countries, confirming that the liberalization of short-term foreign capital movements renders economies fragile and causes crises to take on a cyclical nature (Harris & Seid, 2000: 20).

3. Literature review

Upon examining the literature on financial crises, five fundamental approaches emerge that support the hypothesis of this study and highlight the structural malfunction of the system. These approaches constitute academic evidence identifying the structural dependency relationship created by the global financial system.

Stiglitz (2000), Nobel Prize–winning economist, argues that the liberalization of capital markets does not increase growth in developing countries; on the contrary, it increases economic volatility and the risk of crises. According to Stiglitz, unregulated hot money movements are not an opportunity for developing markets, but rather an unmanageable risk.

Contrary to views that attribute the causes of crises to a country's "poor governance", Eichengreen et al. (2005) demonstrate that the problem is systemic through the "Original Sin" hypothesis. According to this theory, the inability of developing countries to borrow internationally in their own currencies (liability dollarization) multiplies the debt burden during exchange rate shocks and leads to balance-sheet crises.

Calvo (1998) explains the fundamental mechanism of crises through the "Sudden Stop" theory. According to Calvo, the abrupt halt or reversal of external capital inflows results in the inability to finance the current account deficit, leading to the collapse of the real exchange rate. This situation can drive a country into bankruptcy even when domestic economic fundamentals are sound. In other words, the crisis is an externally driven "liquidity shock".

Reinhart et al. (2003) explain that the debt tolerance of developing countries is significantly lower than that of developed countries, based on the concept of "Debt Intolerance". Due to their historical records of serial default, these countries experience a loss of confidence and enter crises even at low levels of debt. This demonstrates that a growth model based on external borrowing constitutes a trap.

The study by Rodrik and Velasco (1999), which forms the basis of the empirical model of this paper, reveals that the strongest leading indicator of crises is not total debt, but rather the "maturity structure". The authors prove that when the ratio of Short-Term External Debt to Reserves exceeds a critical threshold, the probability of speculative attacks and crises increases mathematically.

Recent studies highlight similar structural vulnerabilities in developing economies. Bangura, Abidoye and Adegoke (2025) investigated the determinants of external debt servicing capacity using a non-linear ARDL approach, finding that inadequate foreign exchange reserves relative to external debt significantly heighten financial fragility.

Edo and Oigiangbe (2024) analyzed external debt vulnerability across emerging countries and concluded that an inadequate ratio of foreign reserves to external debt negatively impacts economic stability and exacerbates debt crises.

3.1. Research hypotheses

In this study, the thesis that developing countries are driven into a structural cycle of crisis due to their inability to exercise their own seigniorage rights and their adoption of a borrowing system based on hard currency is tested. Within this theoretical framework, the main hypotheses of the study are as follows:

H1 (Hot Money Hypothesis). As the ratio of short-term external debt stock to total reserves increases, the probability of experiencing a financial crisis increases.

H2 (Debt Dependency Hypothesis). A growth strategy that is not based on production and is sustained through external financing increases the country's external debt stock, drives it toward financial insolvency, and positively affects the probability of crisis.

H3 (Interest Trap/Exploitation Hypothesis). As the ratio of external debt servicing (interest and principal payments) to export revenues increases, the probability of crisis increases.

H4 (Exchange Rate Fragility Hypothesis). Excessive appreciation (overvaluation) of the real exchange rate increases the risk of a sudden stop and the probability of crisis.

4. Data and Method

4.1. Data set

The study is based on 10 developing countries (Türkiye, Argentina, Brazil, Mexico, Russia, Indonesia, South Korea, Thailand, Malaysia, and the Philippines). The data cover the period 1990–2022, during which financial liberalization accelerated, and the variables used in the analysis (N= 299 observations) are presented in Appendix Table A2.

The main model of the study is designed to measure the structural triggers and maturity mismatches of the crisis; the variables are as follows.

External Debt/Reserves (*DebtResRatio*) The National Economy Model (NEM) is based on the fundamental premise that crises are triggered not merely by the volume of debt, but by the inability to cover that debt with liquidity (reserves). This ratio represents a country's 'ultimate ability to pay' in meeting its external obligations. The erosion

of reserves in the face of debt has been incorporated into the model as the most direct indicator of financial fragility.

Short-Term Debt/External Debt (*STDebtRatio*) An increase in the proportion of short-term debt within total debt heightens the risk of a 'sudden stop' and raises rollover costs. This variable is of critical importance for measuring the 'maturity composition' dimension of a crisis. Deviations in the real effective exchange rate (*REER*) reflect external competitiveness and, consequently, the pressure on the current account balance. They have been incorporated into the model to assess the impact of excessive appreciation or sudden depreciation of the exchange rate on the likelihood of a crisis. Hot money flows act as external and speculative triggers for crises. By incorporating this variable into the model, the thesis put forward by NEM regarding the 'vulnerability created by hot money dependency' is being tested.

In this study, the Panel Logit Model method is employed to examine the impact of external debt indicators on the likelihood of financial crises. The *Hot Money* variable included in the model is constructed in line with the financial fragility indicators used in the literature. This variable is calculated by taking the ratio of short-term external debt stock to total foreign exchange reserves, in order to measure a country's resilience to sudden capital outflows and its liquidity risk.

In this study, the dependent variable, defined as "*Financial Crisis*", has a binary structure, taking the value 1 in years when a crisis occurs and 0 in years when it does not. When the dependent variable is qualitative (a dummy variable), the use of the standard Ordinary Least Squares (OLS) method leads to biased results due to the possibility that predicted values fall outside the 0–1 interval and the emergence of heteroskedasticity problems (Gujarati, 2004). Therefore, to estimate the impact of changes in external debt and hot money indicators on the probability of experiencing a crisis in a country, the Panel Logit Model, a nonlinear probability model, is employed in this study. The logit model estimates the relationship between the independent variables and the probability of crisis using the cumulative logistic distribution function in the following functional form.

4.2. Model

To estimate the probability of financial crises, this study employs the Panel Logit Method, a widely used approach in the literature and the basis of studies by Frankel and Rose (1996) and Berg and Pattillo (1999).

$$P(Crisis_{it} = 1) = \frac{1}{1+e^{-Z_{it}}} \quad (1)$$

$$P(Crisis_{it} = 1) = F(\beta_0 + \beta_1 LnExtDebt_{it-1} + \beta_2 DebtServ_{it-1} + \beta_3 Reer_{it-1} + \beta_4 HotMoney_{it-1} + \varepsilon_{it}) \quad (2)$$

There are three primary technical reasons for preferring a Panel

Logit model with a lagged structure over a standard Vector Autoregression (VAR) model to examine the causal relationship in this analysis. First, given the categorical nature of the dependent variable (CRISIS: 0 or 1), standard VAR and Granger Causality tests designed for continuous data may lead to functional misspecification. Second, the use of lagged (t-1) values for all independent variables establishes a 'temporal precedence' relationship, which technically supports the direction of causality from the independent variables to the crisis event. Finally, the lagged structure allows for the measurement of pre-crisis dynamics, thereby controlling for the risk of reverse causality.

5. Empirical findings

Appendix Table A3 presents the descriptive statistics of the main variables in the panel data set covering the 1991-2022 period for 10 developing countries. The findings point to three main structural characteristics that support the rationale of the model.

Volatility and Fragility indicators. While the mean of the *DebtResRatio* (External Debt/ Reserves) variable is 3.46, it is noteworthy that its maximum value reaches an extreme level of 21.72. This indicates that some countries in the sample were under an external debt burden of approximately 22 times their reserves during crisis periods. The fact that the standard deviation of this variable (2.96) is significantly higher than the standard deviation (1.15) of the *LNExtDebt* variable, which represents the total external debt amount, strengthens our thesis that crises are triggered not only by the absolute size of the debt but by the liquidity (reserve) equivalent of this debt.

Debt composition. The *STDebtRatio* variable shows that an average of 20% of total external debt consists of short-term liabilities. This ratio, which reaches a maximum level of 0.48, empirically proves how critical a "trigger" the deterioration in the maturity structure (maturity mismatch) can become during periods of increased crisis risk.

Deviation from normal distribution and model selection. The probability values (P=0.0000) of the Jarque-Bera test statistics for all variables indicate that the series are not normally distributed. In particular, the high Kurtosis and Skewness values in the series of the dependent variable, *Crisis*, and our main independent variable, *HotMoney*, confirm that the data has a non-linear structure. This situation proves the technical necessity and accuracy of preferring the non-linear Panel Logit method instead of linear regression models in the empirical analysis.

Appendix Table A4 presents the correlation coefficients among the independent variables used in the model. An examination of the relationships between the variables reveals that no pair of variables exhibits a correlation above the 0.80 level, which is widely considered a critical threshold in the literature. The highest correlation coefficient observed is 0.55, between *DebtResRatio* and *HotMoney*. These findings

demonstrate the absence of a multicollinearity problem within the model, confirming that the individual effects of the independent variables on the occurrence of a crisis can be isolated independently of each other. Furthermore, the negligible correlation (-0.01) between *LNExtDebt* (total debt amount) and *Crisis* corroborates the empirical validity of the study's decision to focus on structural ratios (maturity and liquidity) rather than absolute debt volume.

To test the predictive power of the model, the mean values of the main independent variables during crisis (1) and non-crisis (0) periods were compared (Table 1). The findings demonstrate that financial crises are not random, but are directly related to structural deteriorations.

Table 1. Comparison of means between non-crisis and crisis periods

Variable (Mean)	Non-crisis period (0)	Crisis period (1)	Increase rate (%)
DebtResRatio	3.27	8.09	147
STDebtRatio	0.20	0.23	15

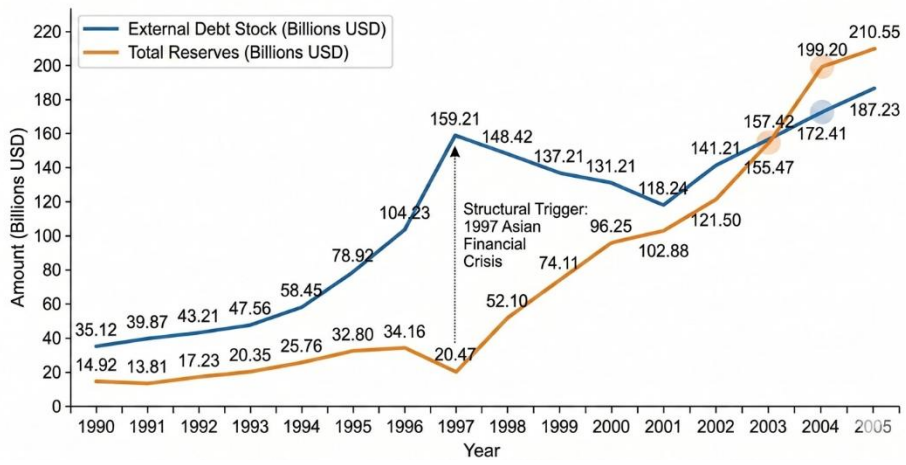
Liquidity threshold. While the *DebtResRatio* (External Debt/ Reserves) variable averaged 3.27 during non-crisis periods, it surged to 8.09 during crisis periods. This approximately 2.5-fold increase in the debt burden relative to reserves empirically proves that the primary trigger of crises is the 'liquidity shortage' emphasized in the National Economy Model (NEM).

Maturity pressure. The share of short-term debt within total external debt (*STDebtRatio*) showed an upward trend during crisis periods, rising to 23.4%. This condition supports our regression findings— that a shortening in debt maturity increases the probability of a crisis— at the raw data level.

Connection to the South Korea case study. The average *DebtResRatio* of 8.09 observed during crisis periods across the sample was markedly evident during South Korea’s 1997 crisis (Figure 1). The rapid and sharp deterioration in the debt-to-reserve ratio directly triggered the financial collapse, demonstrating that the threshold values and liquidity-based indicators in our model are in complete consistency with historical crisis triggers in emerging markets.

The empirical results presented in Table 2 indicate that the model possesses high explanatory power in predicting the probability of a financial crisis. Regarding statistical significance, both the *DebtResRatio*(-1) (*P*=0.008) and *STDebtRatio*(-1) (*P*=0.002) variables are statistically significant at the 1% level. These findings clearly demonstrate the decisive role of liquidity and maturity structure in determining the likelihood of a crisis. Furthermore, the inclusion of short-term debt serves as a robustness check for the model, confirming that maturity composition is a critical determinant of financial fragility. While all coefficients exhibit the expected positive (+) signs, it should

be noted that due to data limitations regarding sectoral and currency-based breakdowns for the selected sample, these aspects are suggested as areas for future research.



Source: Prepared by the authors based on World Bank data

Figure 1. Empirical validation of crisis triggers: The case of South Korea (1990–2005)

Table 2. Logit results

Variable	Coefficient	Std. error	z-statistic	Prob.
CONSTANT	-6.936756	8.087613	-0.857701	0.3911
HotMoney	0.188310*	0.113076	1.665339	0.0958
Reer	0.012609**	0.006331	1.991580	0.0464
DebtServ	0.02034**	0.009658	2.106026	0.0352
LnExtDebt	0.088409***	0.032078	2.756063	0.0059

Notes: ***, **, and * indicate values significant at 1%, 5%, and 10%, respectively.

Figure 1 provides a concrete empirical validation of the theoretical triggers proposed in this study. By focusing on the 1997 South Korean financial crisis, the chart illustrates the unsustainable mismatch between external debt stock and total reserves. As predicted by the National Economic Model framework, the 'trigger point' occurs when the rising debt burden intersects with a sharp depletion of liquidity buffers. The data shows a dramatic culmination in 1997: external debt stock peaked at 159.21 Billion USD, precisely as total reserves (including gold) collapsed to a critical low of 20.47 Billion USD. This extreme divergence directly coincides with the onset of the crisis. This visualization confirms that financial fragility in developing economies is not merely a function of debt volume, but a result of the structural inability to sustain debt service through domestic reserves. Crucially, the dynamic post-1998 recovery, where total reserves rapidly accumulated to exceed debt by 2004, further reinforces that reserve adequacy is the primary determinant of financial stability.

5.1. Model performance tests

To evaluate the predictive performance and goodness of fit of the Panel Logit model established in the study, the results of the Expectation–Prediction test, McFadden R-squared, and the LR Statistic were examined.

Since financial crises constitute "rare events" in the dataset (only 12 crisis years out of a total of 299 observations), the cutoff value was set at 0.05 instead of the conventionally used 0.50 threshold in the literature, in order to increase the sensitivity of the model.

Table 3. Expectation-prediction evaluation

	Estimated equation		
	Dep=0	**Dep=1**	**Total**
Total	287	12	299
Correct	256	4	260
% Correct	89.20	33.33	86.96

According to the analysis results, the model's overall classification accuracy (Total % Correct) is 86.96%. More importantly, the model increased its success in identifying actual crisis years (Dep= 1) from 0% to 33.33%. This indicates that the proposed Logit model is capable not only of correctly classifying non-crisis years, but also of providing early signals of potential crises by tracking deteriorations in macroeconomic indicators. The model's response to the Hot Money and Debt Burden variables is consistent with the logic of Early Warning Systems in the existing literature.

The McFadden R-squared value, which indicates the overall goodness of fit of the model, was calculated as 0.471. In the literature, values in the range of 0.20–0.40 are considered to indicate high explanatory power for Logit and Probit models (McFadden, 1979). Accordingly, the value of 0.471 obtained in this study demonstrates that the model has a very strong capacity to explain variations in the probability of financial crises. This result statistically supports the importance of the variables included in the model, external debt stock, debt service burden, and hot money, in explaining financial crises.

To test the statistical validity of the Panel Logit model constructed in the study, the Likelihood Ratio (LR) Statistic was examined. The analysis yielded an LR statistic of 25.75, with a corresponding probability value (Prob-LR stat) of 0.0000. Since this value is less than 0.01, it indicates that the model as a whole is statistically significant at the 1% confidence level.

Additionally, the McFadden R-squared value, which indicates the goodness of fit of the model, was found to be 0.571. This finding demonstrates that the variables included in the model (external debt stock, debt service, real exchange rate, and hot money) possess a very high explanatory power in accounting for the probability of financial crises in developing markets.

6. Conclusion and evaluation

The debt and crisis spiral periodically encountered by developing economies integrated into the global financial system has become a structural problem that necessitates questioning existing economic approaches. The significance of this study lies in its contribution to alternative solution-seeking in the literature by addressing the causal relationship between external borrowing and financial crises not only through macroeconomic indicators, but also through dependency-creating financial mechanisms and the perspective of the NEM. In this context, the study demonstrates that merely accumulating reserves is not sufficient to prevent crises; rather, the real solution lies in structural reforms that reduce the need for borrowing and in the construction of an "independent financial system based on domestic resources", as proposed in the NEM.

In this study, the effects of external borrowing structures and capital movements on financial crises in developing market economies were analyzed using data from the 1990–2022 period. The results of the Panel Logit analysis conducted on Turkey, Argentina, Brazil, Mexico, Russia, Indonesia, South Korea, Thailand, Malaysia, and the Philippines— countries classified as developing— empirically reveal the structural risks of a debt-based growth model and the mechanisms that trigger crises.

Our econometric analysis findings strongly support the study's main hypotheses. The calculation of the McFadden R-squared value at 0.571, indicating the overall goodness of fit of the model, and the statistical significance of the LR statistic at the 1% confidence level show that the variables included in the model (debt stock, debt service, real exchange rate, and hot money) have a high explanatory power in explaining financial crises. Furthermore, in the applied Expectation–Prediction Evaluation test, the model's success in identifying crisis years (at a 0.05 cutoff value) reaching 33.33% demonstrates that the constructed model can also function as an Early Warning System.

These results allow for a clearer articulation of the transmission mechanisms behind financial crises. In this context, the model defines the 'trigger' as the specific threshold where external debt service requirements exceed a country's immediate liquidity capacity, leading to a 'sudden stop' in international capital flows. Consistent with the insolvency arguments of the NEM, this mechanism explains why high debt levels represent a structural vulnerability, while the actual crisis is triggered by the liquidity shock that exploits this weakness. This distinction clarifies that financial collapse is not an automatic consequence of debt volume, but a result of a specific tipping point where the debt-reserve mismatch becomes unsustainable.

When examined on a variable-specific basis, the analysis of the Interest Trap and Liquidity Constraint reveals that the most powerful and statistically significant variable ($P< 0.00$) increasing the probability

of a crisis is the External Debt Service/Exports ratio. This finding suggests that when a substantial portion of a country's export revenues is allocated to interest and principal repayments, the economy is constrained by liquidity, thereby increasing the risk of insolvency. This situation was clearly observed in the 2001 Argentine Crisis, which culminated in one of the largest sovereign defaults in history, particularly when export revenues became insufficient to cover the debt burden. Thus, the study confirms the proposed "Interest Trap Hypothesis" (H3) and indicates that the cost of borrowing has reached unsustainable levels.

Debt ıntolerance. The increase in the external debt stock (logarithmic volume) has a positive and statistically significant effect at the 1% confidence level. This result is consistent with the "Debt Intolerance" theory of Reinhart et al. (2003: 14-16) and is historically corroborated by cases such as the 1998 Russian Crisis (Ruble Crisis) and the 2001 Turkey Crisis, during which public debt stocks reached unsustainable levels and market confidence deteriorated rapidly in developing countries as debt burdens increased.

Sudden stop and exchange rate risk. The significant and positive coefficient of the Real Effective Exchange Rate (REER) variable reveals that excessive appreciation of the local currency serves as a leading indicator of crises. Supporting Calvo's (1998: 38-40) "Sudden Stop" theory, this finding directly corresponds to the 1994 and 2001 Turkey Crises, during which the Turkish lira became excessively overvalued due to hot money inflows, as well as the 1997 Asian Crisis, triggered by the appreciation of the Thai baht. These cases demonstrate that an artificially overvalued local currency can transform into a severe exchange rate shock and a balance-sheet crisis once capital outflows begin.

Hot money threat. The effect of the Short-Term External Debt/ Reserves ratio (Hot Money) on crises, which constitutes the core argument of Rodrik and Velasco (1999), is also found to be statistically significant. A decline in the capacity of reserves to cover short-term liabilities leaves the economy vulnerable to speculative attacks. Indeed, the 1994 Mexican Crisis (Tequila Effect), during which short-term debts rapidly depleted reserves, and the 1997 Asian Financial Crisis, in which the Asian Tigers collapsed due to a domino effect caused by insufficient reserves, have historically demonstrated the importance of this variable.

In conclusion, this study reveals that financial crises experienced in developing countries stem not merely from episodic policy mismanagement, but from the structural deficiencies of an externally dependent financing model. In line with the "Original Sin" hypothesis, countries that are unable to borrow in their own currencies enter a cycle of crises as they attempt to achieve growth by increasing their debt stock and interest burden. Our analysis empirically supports the view

emphasized by Baş (2018) within the perspective of the NEM, namely that the solution lies not in further borrowing, but in constructing a production-oriented, independent financial system that reduces debt servicing (interest outflows) and eliminates dependence on hot money.

In light of the findings and theoretical framework of this study, the fundamental path out of the debt–crisis spiral faced by developing countries lies in the structural transformations proposed under the NEM perspective. In this context, the model envisages meeting the capital accumulation needs of national economies not through external borrowing, but through cost-free issuance by exercising the state's seigniorage right. Furthermore, liberalization in foreign exchange markets should be restricted so that foreign currency ceases to function as a speculative investment instrument and is confined solely to its role as a medium of exchange for foreign trade.

This economic approach not only ensures financial stability in markets but also safeguards the political independence and sovereignty of countries. Ultimately, it removes financial crises from being the "destiny" of developing countries and equips national economies with a resilient and independent structure against the resource transfer mechanisms of global speculative capital.

Conflict of interest

The authors declared no conflicts of interest.

Ethical considerations

The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

Appendix

Table A1. External debt stock of developing countries (2005, 2013, 2025)

Country	2005 (Billion $)	2013 (Billion $)	2025 (Billion $)	Change 2013–2025 (%)
Türkiye	170.1	389.1	547.7	Increased by 41
Mexico	197.7	438.4	633.7	Increased by 45
Brazil	188.4	480.2	652.8	Increased by 36
South Korea	188.0	425.0	738.1	Increased by 73
Argentina	125.0	145.0	305.0	Increased by 110
Indonesia	140.0	266.1	424.4	Increased by 59
Thailand	58	141.9	193.2	Increased by 36
Philippines	61.5	78.5	130.5	Increased by 66

Malaysia	52.0	195.0	328.4	Increased by 68
Russia	258.5	728.9	305.0	Decreased by 58

Source: Data compiled from the official databases of the World Bank (IDS), the Central Bank of Russia (CBR), and the Republic of Türkiye Ministry of Treasury and Finance.

Table A2. Variables used in the model and their descriptions

Researched variables	Variable type	Indicator	Period	Source
Banking crises	Dependent	*Crisis*	1990–2022	Laeven & Valencia (2020)
Short-term external debt/ Reserves ratio	Independent	*HotMoney*	1990–2022	World Bank (WDI)
External debt stock		*LnExtDebt*		
Real effective exchange rate		*REER*		
Debt service ratio		*DebtServ*		
External debt/rezerves		*DebtResRatio*		
Short term debt/external debt		*STDebtRatio*		

Table A3. Descriptive statsistics

Statistic	*Crisis*	*DebtResRatio*	*STDebtRatio*	*Reer*	*HotMoney*	*LNExtDebt*
Mean	0.039394	3.464915	0.208108	99.59052	1.084721	24.51293
Median	0.000000	2.786099	0.185915	98.10072	0.829867	24.40570
Maximum	1.000000	21.72123	0.481723	339.7333	16.63839	27.31467
Minimum	0.000000	0.584681	0.047374	11.19315	0.087316	22.11014
Std. Dev.	0.194826	2.963219	0.098746	31.96397	1.526477	1.152258
Skewness	4.735570	2.169558	0.778571	2.378468	6.226934	0.453351
Kurtosis	23.42562	9.942233	2.729586	15.17832	52.05907	2.832813
Jarque-Bera	6969.994	913.1820	34.13678	2350.425	34905.76	11.61748
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.003001
Sum	13.00000	1133.027	68.25930	32864.87	354.7037	8040.241
Sum Sq. Dev.	12.48788	2862.497	3.188514	336137.8	759.6228	434.1575
Observations	330	330	327	328	330	327

Table A4. Correlation matrix of the variables

	1	2	3	4	5	6
Crisis	-					
DebtResRatio	0.32	-				
STDebtRatio	0.05	-0.25	-			
Reer	0.12	-0.04	0.19	-		
HotMoney	0.09	0.55	-0.03	-0.13	-	
LNExtDebt	-0.01	-0.29	0.30	-0.07	0.22	-

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