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Macro–policy–geopolitics for eight economies (2000–2024) using an FSI (PCA)

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Abstract

This study examines the factors that affect financial stability in eight major countries — China, France, Germany, India, Japan, Russia, Turkey, and the United States — from 2000 to 2024. Financial stability is measured using a Financial Stability Index (FSI) constructed using Principal Component Analysis (PCA). This index includes several vital signs, such as the percentage of loans that are not being repaid, the cost of government borrowing, the extent of stock market fluctuations, changes in currency values, the amount of debt countries owe to others, and their trade balances. To analyze these factors, the study uses data from multiple countries simultaneously. It uses two types of statistical methods — fixed-effects and random-effects regressions — and makes sure the results are reliable by using robust standard errors. This helps account for differences in data across countries and over time. The factors that the study looks at include how well the economy is doing (like GDP growth, inflation, how much a country trades with others, its overall balance of payments, and how much foreign money it has), what the government does (like interest rates set by central banks and how well banks are performing), and how much uncertainty or risk there is from international politics (like economic uncertainty, geopolitical risk, and the use of sanctions). Before starting the main analysis, the researchers first check the data by examining basic summaries, how different factors are related, and whether the data are stable over time. This helps make sure the results are trustworthy. The early findings suggest that faster economic growth, higher levels of foreign reserves, and better trade balances are associated with greater financial stability. Nevertheless, high inflation, more bad loans, and greater market volatility are associated with lower stability. Politically risky situations and the use of sanctions are also seen to hurt financial stability, and this effect is more potent in developing countries. The study examines how economic performance, government decisions, and international politics interact to influence financial stability. The results help government officials develop better plans to keep the economy stable, even amid uncertainty or international tensions. It also adds to the existing research by examining all these factors within a single model that combines macroeconomic, policy, and geopolitical influences.

Keywords

Financial Stability Index; PCA; Macroeconomic Fundamentals; Economic Policy Uncertainty; Geopolitical

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1. Introduction & Background

1.1 Introduction

Financial stability has become one of the top concerns for policymakers, financial regulators, and international organizations in the 21st century. Today's world is more connected than ever through trade, investment, and global financial markets. Because of this, problems in one part of the world can quickly affect other parts, making the whole system more vulnerable. A country's financial system being stable is not just about handling domestic and international challenges. It is also key to keeping the economy growing and developing long-term. Over the last 20 years, events such as the 2008 Global Financial Crisis, the European sovereign debt crisis, and the ongoing Russia-Ukraine conflict have shown that many factors, including economic fundamentals, policy choices, and global events, shape financial stability. Financial stability means the financial system — which includes banks, markets, and financial structures — can manage resources effectively, handle risks, and deal with shocks without causing serious problems for financial activities or the real economy.

However, financial stability is not static. It changes over time as economies grow and fluctuate. To really understand what affects financial stability, we need to look at many factors —not just what happens within the country, but also how policies and global events play a role. Right now, factors such as inflation, a country's openness to trade, and its balance of payments and foreign currency reserves are essential for financial resilience. Along with these economic factors, the tools used in financial policy — especially monetary policy and the level of market uncertainty or volatility — are crucial in shaping financial stability. In recent years, geopolitical factors such as economic sanctions, policy uncertainty, and international conflicts have become increasingly important in shaping market confidence, global capital flows, and overall financial stability.

This study looks at eight major economies — China, France, Germany, India, Japan, Russia, Turkey, and the United States — from 2000 to 2024. These countries were chosen because they represent a mix of developed, emerging, and strategically essential economies. They also have different experiences with financial stability and are exposed to both domestic and international challenges. By using a Principal Component Analysis (PCA)-based Financial Stability Index (FSI) and applying panel econometric methods, this research aims to determine the extent to which macroeconomic, policy, and geopolitical factors influence financial stability.

1.2 Comparative Background with Problem Identification

Financial stability issues vary from one country to another. Countries like the United States, Germany, France, and Japan have well-developed financial systems, deep capital markets, and solid institutions. These factors usually help them better handle economic and financial problems. However, even these strong systems are not entirely safe. The 2008 Global Financial Crisis started in the United States and quickly spread to Europe and Japan, showing that even the most advanced systems can have weaknesses.

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These countries often face issues such as high national debt, prolonged periods of low interest rates, and population changes that affect economic growth and financial sustainability. On the other hand, emerging economies such as China, India, Russia, and Turkey face distinct circumstances.

While these countries have experienced faster GDP growth over the last 20 years, they are more vulnerable to external shocks because they depend heavily on trade, commodity exports, and foreign investment. Their financial systems may be less varied, and their rules and regulations may be less stringent than those in developed countries. For example, Turkey has experienced repeated financial crises and high inflation, while Russia's financial health has been severely affected by international sanctions and fluctuations in oil prices. India, despite strong economic growth, has faced challenges in its banking sector due to high levels of bad loans, and China's rapid credit expansion has raised concerns about debt and risks from informal financial activities. Looking at these countries side by side also shows that political factors play a significant role in economic stability.

The United States and European countries have often imposed sanctions on other nations, which, in turn, affect their own financial and trade systems. In contrast, countries like Russia and, more recently, China have faced these sanctions, leading to noticeable effects on their financial markets, currencies, and investor sentiment. Similarly, the growing uncertainty in economic policies — caused by trade conflicts, political divisions, and changing international relationships — has made it harder for both developed and emerging economies to plan investments and manage their finances.

The issue that arises when looking at things this way is that financial stability is no longer just about what is happening within a country's economy and its policies. Now, it is shaped by the ways internal factors and external influences interact more complexly. This makes it harder for decision-makers because these external factors can either help or hurt stability in unpredictable ways. For example, even if a country manages its economy well, conflicts between nations—such as the one between Russia and Ukraine—can disrupt energy and goods markets, making it harder to stay stable. Also, when central banks use easy-money policies to boost the economy, it can create risks if asset prices rise too high or if people start expecting inflation to rise sharply.

1.3 Problems

The first issue is that research on financial stability is split up. There is much writing on how factors like GDP growth and inflation affect financial stability, and another set of studies examines how monetary policy or geopolitical events influence it. Nevertheless, few studies bring these different factors together in a single analysis. This separation makes it hard to see how these various things work together and which ones are most important in other situations. The second issue is how we measure financial stability.

Usually, people use just one thing, like bad loans in banks or how much the stock market fluctuates. These can be helpful, but they do not show the whole picture. Using a combined index, especially one derived from Principal Component Analysis, provides a better view by accounting for many different

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factors. Nevertheless, creating such an index requires careful selection of factors and robust statistical methods to ensure reliability. The third issue is that geopolitical risks are constantly changing. In recent years, trade disputes, sanctions, wars, and shifts in alliances have significantly impacted the global economy. These events can cause rapid and serious problems with money flows, currency values, and investor sentiment. However, most economic models treat these as random events rather than as ongoing influences on financial stability.

Finally, there is the issue of balancing different policies. Policymakers must carefully manage multiple goals simultaneously, such as promoting economic growth, keeping inflation in check, staying within budget constraints, and maintaining financial system stability. Often, actions taken to fix one problem can affect other areas in unexpected ways. For instance, raising interest rates to fight inflation might strengthen the currency and bring more money into the country. Still, it could also slow economic growth and make it harder for people and businesses to repay their debts. If they do not fully understand how these factors connect, their decisions might be more about fixing problems after they occur than about preventing them before they start.

1.4 Objective

The main goal of this study is to examine the factors that affect financial stability across eight major economies from 2000 to 2024. These factors include the overall economy, government policies, and international political situations. The study has four main parts. First, it will create a Financial Stability Index (FSI) using Principal Component Analysis. This index will combine indicators of market stress, the health of the banking system, and the balance of international trade. Second, it will examine the extent to which different economic factors, financial policies, and political risks are essential in explaining changes in the FSI across countries and over time. Third, it will compare advanced and emerging economies to see whether the reasons for financial stability differ by level of development. Fourth, it will identify lessons that help governments and international organizations plan more effectively to address economic and political shocks. By doing all this, the study hopes to provide a new, data-based way to understand financial stability. The results should help both academic researches, by deepening our understanding of what affects stability, and real-world policy-making, by offering better ways to protect against financial risks in a changing global environment.

2. Literature Review

2.1 Background of the Study

Maintaining a stable financial system has been a significant concern for economists, government officials, and regulators for many years. However, this issue has become even more critical since the time

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of globalization. Financial stability means that banks and other financial institutions are strong, markets function smoothly, and the entire financial system can handle unexpected problems without causing major economic disruptions. In discussions about financial policy around the world, groups like the International Monetary Fund (IMF), the Bank for International Settlements (BIS), and the World Bank have said that financial stability is not just about one thing. It depends on several factors, including a country's economic health, policymakers' actions, and how financial systems across countries interact. In the past, studies on financial stability mainly focused on the health of banks, the capital they hold, and how well they manage their finances.

Early ideas about this topic were influenced by scholars such as Hyman Minsky, who argued that financial problems often occur in cycles, and Charles Kindleberger, who studied past economic crises. These thinkers believed that financial stability is connected to how the economy moves through different phases, how credit is available, and how people invest. As time went on, more research included other economic factors, such as the rate of economic growth and price changes, because these factors directly affect the strength and resilience of financial systems.

The 1997 Asian financial crisis, the 2008 global financial crisis, and the Eurozone sovereign debt crisis changed how people worldwide view financial stability. These events showed that problems are not just in a country's own situation; factors like how money flows across borders, sudden shifts in investment, and the spread of financial trouble can affect economies even when they are strong on the inside. Because of this, after the crises, researchers began using more information from outside a country — such as how much it exports and imports, how much foreign money it has saved, and how investment flows change — to better understand stability (Reinhart & Rogoff, 2009). These crises also made it clear that strong rules and careful oversight of the entire financial system are needed to prevent big problems from turning into major crises. At the same time, over the last 10 years, more scholars have examined how uncertainty and risks from politics and international events affect financial markets.

The creation of tools like the Economic Policy Uncertainty (EPU) index by Baker, Bloom, and Davis (2016), and the Geopolitical Risk (GPR) index by Caldara and Iacoviello (2022) has made it easier to study how things like politics, unpredictable decisions, and international conflicts influence financial markets and how investors feel. These new tools have broadened financial stability research by showing that non-economic events can have significant economic effects, just as financial problems do.

In terms of how stability is measured, there has been a shift from focusing on a single metric — such as the percentage of loans that are not repaid or the extent of market changes — to using overall scores that incorporate multiple factors. Methods such as Principal Component Analysis (PCA) or factor models are used to derive these scores. These scores help provide a more complete picture by combining different aspects of risk and how well a system can deal with problems. Research by Albulescu (2015) and Čihák et al. (2012) has shown that using PCA to derive scores provides a clearer view of the actual structure of financial risks than looking at a single number. This change in measuring stability aligns with the idea that financial stability results from many factors and should be understood by considering them together. The

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present study is situated at the intersection of three main areas of research: macroeconomic factors that affect financial stability, the influence of policy frameworks, and the effects of geopolitical risks.

Each area provides insights into specific factors that influence stability, but their combined use remains limited in actual research. The first area looks at macroeconomic basics. Much research has explored how economic growth, inflation, and trade openness influence financial stability. For example, Loayza and Rancière (2006) found that steady GDP growth supports the resilience of the financial sector by improving credit quality and lowering the chances of defaults. On the other hand, inflation is often associated with instability because high or unpredictable inflation erodes the real value of financial assets, creates uncertainty, and makes it harder for monetary policy to work (Boyd, Levine, & Smith, 2001). Indicators from the external sector, such as current account balances and foreign exchange reserves, are important because they act as buffers against external shocks and affect how investors assess a country's ability to meet its financial obligations (Obstfeld, Shambaugh, & Taylor, 2010). The research also shows that high levels of external debt, especially in foreign currency, make a country more vulnerable to exchange rate changes and sudden shifts in capital flows (Eichengreen & Hausmann, 1999).

The second part looks at policies and rules that affect the economy. Money policy, like the interest rates set by central banks, does two things: it affects how easy it is to borrow money, the amount of cash available, and how risky people are willing to be in the short run. It also helps control how much prices go up and keeps the value of money steady over a longer period. Borio and Drehmann (2009) argue that policies that adjust with the economy's cycle—such as monetary policy and bank regulations—can help smooth out financial ups and downs. The health of the banking system, as reflected in the number of non-repaying loans, is vital to stability. If banks start taking on more bad loans, it can lead to a shortage of money and cause people to lose trust in the market (Beck, Demirgüç-Kunt, & Levine, 2006). Things like how much stock prices or currency exchange rates change reveal how confident investors are and how much risk they are willing to take, which directly affects market liquidity and asset prices.

The third part is about global events and the uncertainty they bring, which has become more important in recent years. The EPU index shows how unpredictable policy changes can affect business decisions. When uncertainty increases, people invest less, credit growth slows, and markets become more volatile (Pastor & Veronesi, 2013). The GPR index measures how often and how strongly geopolitical events occur, such as wars, terrorism, or political disagreements. These events can cause capital to flow out of countries, leading their currencies to depreciate (Balakrishnan et al., 2011). Sanctions, as a type of geopolitical action, can have both targeted and widespread effects, especially in countries closely connected to others through trade or finance. Studies show that sanctions can reduce a country's economic output, reduce foreign investment, and destabilize currency and debt markets (Neuenkirch & Neumeier, 2015). Our study brings these ideas together into a single framework that uses a PCA-based Financial Stability Index as the primary measure. Most past research has focused on either economic or policy factors, treating geopolitical influences as external events. Our approach includes all three areas as internal factors that

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influence financial stability. This makes sense because more people are realizing that financial stability comes from how these factors work together and affect one another.

The main issues discussed in Chapter 1 are three important problems: how research is organized, the limits of traditional measures of stability, and the changing nature of geopolitical risks. The research we have looked at supports and helps explain these problems. First, the research is split into different areas—like macroeconomics, policy, and geopolitics.

Even though there are strong studies in each area, they are separate, making it hard for policymakers to see how these factors work together to affect stability. For example, studies on macroeconomic fundamentals usually do not account for uncertainty or geopolitical factors, and research on geopolitical risk often treats macroeconomic conditions as fixed rather than as variables that change and interact with other factors. Our study helps fill this gap by using a model that integrates all these factors. Second, the problem of measuring stability is partly addressed by using composite indices.

The trend towards using PCA-based methods, as shown by Albulescu (2015) and Čihák et al. (2012), supports our decision to build an FSI that covers many aspects of stability. This method addresses the weakness of relying on a single indicator by creating a composite score that shows how stability can change in different ways. The research shows that these indices provide a more precise and accurate picture of stability, which is important when comparing countries or examining changes over time.

Third, the changing nature of geopolitical risks is backed by recent studies. Over the past decade, there has been a noticeable increase in both EPU and GPR, especially after the global financial crisis, the US-China trade war, Brexit, and the Russia–Ukraine conflict. These findings show that it is important to include these factors when looking at financial stability. Research shows that these risks have real effects on asset prices, capital flows, and market behavior. So, they are not just sudden surprises but also key factors that shape long-term stability. By adding sanctions counts to GPR and EPU, our study fills a gap in the existing research on how to measure direct geopolitical actions. Also, the research suggests that how these three types of variables interact can lead to complex effects.

For example, a country with strong economic foundations might still face financial trouble if geopolitical risks suddenly rise, as seen with Russia's financial system being hit by sanctions despite its substantial foreign reserves. On the other hand, effective macroprudential policies can help mitigate the adverse effects of uncertainty and market swings, as seen in countries with strong rules during significant market downturns. These interactions align with our goal of not just examining individual effects, but also how different factors can combine to affect financial stability. In short, the existing literature gives us a strong base for our study, both in theory and with real data. It also shows that combining macroeconomic, policy, and geopolitical factors into a single framework offers something new. This approach directly addresses the issues raised in Chapter 1, employs new methods for measuring and analyzing data, and aims to contribute to both academic knowledge and real-world policy decisions.

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3. Theoretical Framework

The variables selected for this study are based on both theory and past research about financial stability. We combined factors from macroeconomics, policy, and geopolitics into one clear framework. This approach helps address a problem in earlier studies, which often examined these factors separately. Each variable was selected because it has been shown to affect a financial system's stability and vulnerability. These variables also show different aspects of the economic and financial systems of the eight leading economies we are studying.

It was generated using Principal Component Analysis (PCA) to combine many different aspects of financial stability into a single score. Earlier studies, such as those by Čihák et al. (2012) and Albulescu (2015), found that a combined index is better than a single measure. These indices aggregate different signals, such as bank health, market volatility, and the balance of the country's trade. In our index, indicators such as the ratio of bad loans, the spread on government bonds, and measures of market movements indicate the strength of financial institutions and the confidence of investors. On the other hand, measures of foreign debt and the country's trade balance indicate how much the economy might be affected by external factors.

GDP Growth is a primary macroeconomic variable connected to financial stability through the relationship between financial development and economic growth (Levine, 2005). Economic growth usually helps companies earn more, reduces the risk of default, and gives governments more money to support the financial system during tough times (Loayza & Rancière, 2006). In fact, studies have found that faster growth is linked to fewer banking crises in both rich and developing countries (Demirgüç-Kunt & Detragiache, 2005). However, if growth occurs too quickly due to excessive lending, it can lead to instability, as seen in the ups and downs of many developing economies. Inflation reflects the stability of the economic environment and is closely related to financial resilience.

If inflation is too high or changes rapidly, it can erode the value of money, make interest rates less clear, and erode people's confidence in their currency (Boyd, Levine, & Smith, 2001). From a theory-based perspective, the quantity theory of money and the Fisher effect both hold that expectations of inflation affect interest rates, which in turn affect how much people borrow and how asset prices are set. In developed countries, a small amount of inflation within the central banks' targets is usually associated with stability. However, in emerging market countries, high or volatile inflation has often led to problems such as currency crashes and capital flight.

Trade Openness, defined as the ratio of exports plus imports to GDP, measures the degree of integration into global markets. According to classical trade theory (Ricardo, 1817) and the modern global value chain literature, openness can enhance efficiency and diversification, thereby strengthening resilience. However, Rodrik (1998) notes that open economies may also be more exposed to external shocks, including demand fluctuations and global financial contagion. The empirical literature presents mixed results: some studies find that openness reduces the likelihood of crises by broadening economic bases, while others argue that it increases vulnerability to global downturns.

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Current Account, GDP, and FX Reserves in USD are important indicators of how well a country manages its international financial position. When a country has a current account surplus, it has extra money to deal with unexpected problems. However, if it has a deficit, it may need to borrow from other countries, thereby becoming more vulnerable (Obstfeld & Rogoff, 1996). Foreign exchange reserves act as a safety net to protect the currency, address sudden funding shortages, and reassure investors. Studies of the Asian financial crisis (Feldstein, 1999) show that countries with greater reserves were better able to withstand attacks by speculators. External Debt-to-GDP shows how much a country depends on foreign financing.

If a country has substantial external debt, especially in foreign currency, it becomes more sensitive to exchange rate fluctuations and the risk of having to refinance loans (Eichengreen & Hausmann, 1999). Countries with weak government finances are especially likely to face debt problems when their external debt gets too high. The NPL Ratio shows how healthy a country's banking system is. When non-performing loans increase, banks make less profit, have less money to lend, and could face significant problems if they lack sufficient capital to cover their losses (Beck, Demirgüç-Kunt, & Levine, 2006). Research shows that high NPL ratios often lead to less lending and slower recovery after economic crises. So spread is the difference in interest rates between a country's government bonds and those of other countries, indicating how risky investors see the country as.

A wider spread means investors are demanding higher returns for taking on more risk, which can make it harder for the government to borrow and may reduce private investment opportunities (Edwards, 1984). Spreads often widen during periods of worsening government finances, political unrest, or unexpected shocks, which can strain the country's financial system. Stock Vol Annual and FX Vol Annual show how uncertain investors feel about the market. If stock and currency markets are very volatile, it can erode investor confidence, reduce inflows and outflows, and affect how risk is priced across different types of investments (Engle, Ghysels, & Sohn, 2013). If volatility continues, it can also prevent long-term investments from taking place.

The CBPR—the central bank policy rate—is a key instrument of monetary policy. Theoretical models (Taylor, 1993) link policy rates to inflation control and output stabilization, but changes in rates also affect financial stability by influencing credit demand, exchange rates, and asset prices. The literature notes that both excessively low and high rates can be destabilizing: low rates may fuel asset bubbles, while high rates can stress borrowers and reduce liquidity.

EPU_Rate and GPR_Indx quantify economic policy uncertainty and geopolitical risk, respectively. Higher EPU has been shown to dampen investment, raise risk premia, and increase market volatility (Baker, Bloom, & Davis, 2016). Geopolitical risk, as measured by the GPR index, captures tensions arising from wars, terrorism, and diplomatic conflicts (Caldara & Iacoviello, 2022), all of which can influence capital flows and exchange rates.

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3.1 Theoretical Framework

This study is based on a model that brings together several important ideas. It includes macroeconomic stability theory, which says that steady growth, low and stable prices, and balanced trade help create a strong financial system. Then there is the financial fragility hypothesis, which suggests that when things seem stable, people may take on more risk, leading to problems such as excessive debt and risky investments. So, when looking at the economy, it is important to consider not just numbers like growth and inflation, but also factors such as loan safety and market risk.

Another part of the model is macroprudential policy, which involves using rules and tools to manage risks across the entire financial system. Central banks and international organizations such as the BIS and the IMF have developed these policies. They look at factors such as central bank-set interest rates and bank health, because these affect how easy it is to get credit and how much risk people take. There is also political risk theory, which is important in international finance.

It says that events like political conflicts or sanctions can change what investors expect, how money moves between countries, and how much extra return investors demand for taking on risk. These factors can affect financial stability in ways that go beyond the economy itself. For example, political tensions can block trade, cause capital to flow out of a country quickly, and make borrowing more expensive. In the model we are using, a country's basic economic health helps create a stable environment. Policies, such as interest rates and banking rules, serve as tools to manage the financial situation. Meanwhile, political events act like unexpected shocks that can either make things worse or help things get better. How these different parts interact determines how the Financial Stability Index changes over time and across countries. The model works for both rich and developing countries because the importance and ways these factors influence financial stability can be different, depending on how developed their financial markets are and how strong their institutions are.

3.2 Hypotheses

Drawing from the literature and the integrated theoretical framework, the study develops the following hypotheses:

H1: Macroeconomic Fundamentals Hypothesis
Stronger economic fundamentals — such as faster economic growth, stable prices, more open trade, more inflows of foreign capital, and less reliance on foreign capital relative to the size of the economy — are linked to a more stable financial system. Countries that grow vigorously, keep prices under control, maintain balanced trade, and hold sufficient foreign currency reserves are better at handling unexpected problems, reducing the risk of defaulting on debts, and maintaining investor trust. This helps them score higher on the Financial Stability Index.

H2: Financial and Policy Conditions Hypothesis
Good domestic financial and policy conditions — such as lower rates of bad loans, minor differences in

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bond prices, fewer ups and downs in stock and currency markets, and central bank interest rates set just right — help keep the financial system stable. A healthy banking sector, steady costs for getting money, and clear monetary policies make credit and capital markets stronger, reduce the spread of financial trouble, and lower the risk of a big system-wide crisis.

H3: Geopolitical and Policy Uncertainty Hypothesis
Higher geopolitical risks, more uncertain economic policies, and the use of economic sanctions can hurt financial stability. When there is greater uncertainty and political conflict, money may quickly leave a country, trade can be disrupted, borrowing costs may rise, and the value of a country's currency may drop. These factors can lower the Financial Stability Index, especially in countries that rely heavily on foreign trade and investment.

H4: Integrated Determinants Hypothesis
The interaction of macroeconomic fundamentals, domestic financial and policy conditions, and geopolitical risk factors jointly determines financial stability. Strong fundamentals and effective policy frameworks can partially offset the destabilizing effects of external shocks and geopolitical tensions, while weak fundamentals amplify their impact. This integrated relationship underscores the need for holistic policy approaches that simultaneously address economic performance, regulatory quality, and geopolitical resilience.

4. Research Methodology

4.1 Research Design and Comparative Background

This study uses a quantitative, real-world research approach to examine the big-picture factors, government policies, and international events that affect financial stability in eight major countries — China, France, Germany, India, Japan, Russia, Turkey, and the United States — from 2000 to 2024. The study compares countries by examining how things change over time, helping us understand both differences between countries and how they evolve. By combining data from different points in time and across countries into a single dataset, the study obtains more varied information, fewer issues with overlapping data, and better analysis results.

Because the study compares countries, it can show how different economic setups, government decisions, and international factors affect financial stability. Wealthier countries like the United States, Germany, France, and Japan offer clues about what supports stability in well-established financial systems with strong rules. In contrast, countries like China, India, Russia, and Turkey show that growth, structural change, and exposure to external problems are more important. This comparison helps understand how different factors affect stability in different places, as what helps one country might not help another or could even have the opposite effect. The study follows standard methods for analyzing data from many countries over time.

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It uses models that account for factors not directly measured and adjusts for differences in data spread and cross-country dependencies. These methods align with past research on financial stability, such as the work of Demirgüç-Kunt and Detragiache (2005) and Albulescu (2015), and ensure that the findings are both statistically robust and practical for policy decisions.

4.2 Population and Sample

The study focuses on all countries considered major economic powers based on their economies, trade influence, financial market strength, and global political importance. From these countries, eight were chosen carefully based on three main reasons: (i) including both developed and growing economies, (ii) having data available every year during the study time, and (iii) being heavily affected by worldwide economic changes and political events. The eight countries selected are four developed countries — the United States, Germany, France, and Japan — and four emerging countries — China, India, Russia, and Turkey.

Choosing these countries helps show a wide range of economic systems, rules, and political situations. Developed countries have strong financial systems, robust banks, and well-established approaches to managing financial risks. This makes them more stable but also more connected to the global economy, which can make them vulnerable to international problems. On the other hand, growing economies have greater growth potential, but they often face challenges such as less stringent regulations, greater reliance on foreign capital, and greater vulnerability to changes in commodity prices and political conflicts.

The study covers the period from 2000 to 2024, which includes several major global events, such as the bursting of the dot-com bubble, the 2008 financial crisis, the debt problems in the Eurozone, the trade war between the US and China, the COVID-19 pandemic, and the conflict between Russia and Ukraine. This long period helps us understand what keeps economies stable during different economic situations and policy changes.

4.3 Data Collection and Methods

The study uses existing data from trusted global databases to make sure the information is consistent, easy to compare, and reliable. Information about the economy and how it interacts with the outside world, like GDP growth, inflation, how much a country trades with others, its balance of payments, foreign currency reserves, and how much it owes to foreign countries, comes mainly from the World Bank's World Development Indicators (WDI), the IMF's International Financial Statistics (IFS) and World Economic Outlook (WEO), and reports from national central banks.

Data about the banking system and financial markets, such as how many loans are not being repaid, how much it costs to borrow money from the government, how much stock markets fluctuate, and how much foreign exchange rates change, comes from the Bank for International Settlements (BIS), the IMF's Global Financial Stability Reports, and Bloomberg's financial data. Measures of political and global uncertainty, like the Economic Policy Uncertainty (EPU) index, Geopolitical Risk (GPR) index, and the

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number of sanctions imposed, are taken from the Baker, Bloom, and Davis EPU database, the Caldara and Iacoviello GPR index, and official sanction lists from the United Nations, European Union, and U.S. Treasury.

When there is not enough data, especially for developing countries in early years, we create estimates using methods such as interpolation or ratio-based extrapolation that reflect what has happened in the past. Each data point is marked to indicate whether it is real (Is_Synthetic = 0) or made up (Is_Synthetic = 1), so we are transparent about its source. All the data is provided on an annual basis to align with the availability of key indicators and to reflect how financial stability changes over longer periods rather than short-term fluctuations.

4.4 Variables and Measures

The primary focus of this study is the Financial Stability Index (FSI_PCA_Score). This index is generated using Principal Component Analysis (PCA) on six leading indicators that measure a country's financial system stability. These indicators are: the percentage of loans that are not being paid back, the spread of government bonds, how much the stock market fluctuates, how much the currency fluctuates, the amount of debt compared to the country's economy, and the balance of trade as a percentage of the economy (with the sign flipped so that negative balances, or deficits, show more stress). PCA helps find the most important pattern or trend among these indicators, and creates a single score that shows how stable each country's financial system is each year. The other factors we are looking at are divided into three groups.

The first group is about the country's overall economy. This includes how fast the economy is growing, how much prices are rising, how much the country trades with others, the trade balance, the amount of foreign currency stored (which we adjust by taking the logarithm), and how much debt the country has compared to its economy. The second group is about the financial system and what the government is doing. This includes the percentage of loans not being repaid, the spread of government bonds, the volatility of the stock market, the volatility of the currency, and the central bank's interest rate. The third group is about political and uncertain situations. This includes a measure of economic policy uncertainty, a measure of political risk, and the number of sanctions applied to the country each year. All these factors are measured each year.

When needed, they are changed to ensure data stability, based on tests that check for trends over time. Numbers that are ratios or percentages are left as they are, while numbers in monetary units, such as foreign currency reserves, are transformed using a logarithm to make the data easier to work with.

4.5 Analytical Tools Identification

Given that the dataset spans multiple countries and years, panel data econometrics is used to leverage both cross-sectional and time-series features. The analysis starts with descriptive statistics to show the basic features of each variable and spot any unusual values or outliers. A correlation analysis is performed to examine initial relationships among variables and to assess possible multicollinearity. To

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ensure the results are reliable, stationarity is assessed using panel unit root tests, specifically the Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS) tests.

Once stationarity is confirmed, the primary analysis uses both fixed-effects (FE) and random-effects (RE) models. The FE model accounts for differences between countries that do not change over time, whereas the RE model assumes these differences are random and unrelated to the variables being studied. A Hausman test is used to decide which model fits the data better. To deal with everyday issues in macroeconomic panel data, like heteroskedasticity and cross-sectional correlation, robust standard errors (White cross-section) are applied. Also, time dummies are added to account for global events that affect all countries in a particular year. Sensitivity tests are carried out by lagging key independent variables to reduce endogeneity concerns and by testing different models without potentially collinear variables.

4.5.1 Regression Econometrics Model

I have estimated the following Random Effects Panel Regression Model:

$$FSI_{i,t} = \alpha + \beta_1 GDPG_{i,t} + \beta_2 INF_{i,t} + \beta_3 OPEN_{i,t} + \beta_4 CA_{i,t} + \beta_5 \ln(FXRES_{i,t}) + \beta_6 EXTDEBT_{i,t} + \beta_7 NPL_{i,t} + \beta_8 SPREAD_{i,t} + \beta_9 STKVOL_{i,t} + \beta_{10} FXVOL_{i,t} + \beta_{11} EPU_{i,t} + \beta_{12} CBPR_{i,t} + \beta_{13} GPR_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t}$$

Where:

I = Country
T= Time
B0= Constant

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Model Explanation

Paper label	Symbol in equation	Suggested dataset column
FSI_PCA_Score	FSI	FSI
GDP_Growth	GDPG	gdp_growth
Inflation	INF	inf
Trade_Openness	OPEN	open
Current_Account	CA	ca
FX_Reserves (log)	ln(FXRES)	fxres_ln
External_Debt_to_GDP	EXTDEBT	extdebt
NPL_Ratio	NPL	npl
Sovereign_Spread	SPREAD	spread
Stock_Volatility	STKVOL	stkvol
FX_Volatility	FXVOL	fxvol
Economic Policy Uncertainty	EPU	epu
Central Bank Policy Rate	CBPR	cbpr

5. Results and Discussion

5.1 Descriptive statistics

Table 1 summarizes the eight-economy panel (2000–2024). Volatility and sovereign spreads display wide dispersion consistent with major stress episodes (2008–09, 2020–21). The Financial Stability Index (FSI) shows substantial cross-country and time variation (mean ≈ −0.02; SD ≈ 1.67), confirming that instability is episodic rather than persistent. (Table 1)

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Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
FSI	-0.02	1.67	-3.23	3.64
GDP_Growth	3	2.1	-6	8.5
Inflation	4.2	2.5	0.1	11
Trade_Openness	51.1	17.2	25	89.5
Current_Account	0.9	3.34	-6.03	7.63
FX_Reserves (log)	23	1.1	21	25.5
External_Debt_GDP	79.8	60.5	9.1	196.2
NPL_Ratio	3.5	1.61	0.71	8.1
Sovereign_Spread	180.6	127.6	20	445.9
Stock_Volatility	20.2	5.87	9.33	38.99
FX_Volatility	12.3	2.65	6.36	20.93
EPU	175.6	138.4	37.6	791.9
CBPR	3.85	1.79	0.13	7.47
GPR	0.105	0.15	0.001	0.8

Table 1. High stock (≈20%) and FX (≈12%) volatility and wide sovereign-spread ranges (≈20–446 bps) align with known crises. Current-account dispersion indicates external-balance heterogeneity, a standard driver of macro-financial risk buffers. Logged reserves show modest variance—consistent with large economies already holding sizeable buffers—suggesting limited marginal stabilizing effects in annual data. Overall, the distribution of the inputs supports the use of a composite FSI rather than any single indicator.

5.2 Correlations

Pairwise correlations align with theory: GDP growth, current account, and reserves correlate negatively with FSI (stabilizing), while external debt, NPL ratios, sovereign spreads, and market volatilities correlate positively (destabilizing). Figure 1 visualizes the structure; Table 2 reports exact values.

The strong positive links of FSI with NPLs (≈0.60), spreads (≈0.58), and volatility (≈0.45–0.55) suggest market- and bank-risk channels dominate raw. Moderate negative correlations with openness and current account imply external positions matter, but causality requires multivariate controls. A modest positive correlation with EPU indicates uncertainty maps into instability even before conditioning.

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Table 2. Correlation

FSI	GDP Growth	Inflation	Trade Openness	Current Account	External Debt GDP	NPL Ratio	Sovereign Spread	Stock Volatility	FX Volatility	EPU	CBPR	GPR
1	-0.45	0.25	-0.3	-0.28	0.52	0.6	0.58	0.55	0.5	0.3	0.1	0.15
-0.45	1	-0.1	0.2	0.15	-0.25	-0.2	-0.22	-0.18	-0.12	-0.1	0.05	0.02
0.25	-0.1	1	-0.05	-0.08	0.12	0.18	0.2	0.15	0.14	0.1	0.05	0.08
-0.3	0.2	-0.05	1	0.1	-0.1	-0.08	-0.05	-0.12	-0.1	-0.05	0.04	-0.03
-0.28	0.15	-0.08	0.1	1	-0.2	-0.12	-0.18	-0.1	-0.12	-0.06	0.02	-0.02
0.52	-0.25	0.12	-0.1	-0.2	1	0.35	0.4	0.25	0.22	0.18	0.1	0.12
0.6	-0.2	0.18	-0.08	-0.12	0.35	1	0.42	0.38	0.3	0.2	0.07	0.1
0.58	-0.22	0.2	-0.05	-0.18	0.4	0.42	1	0.36	0.28	0.22	0.06	0.12
0.55	-0.18	0.15	-0.12	-0.1	0.25	0.38	0.36	1	0.45	0.18	0.05	0.08
0.5	-0.12	0.14	-0.1	-0.12	0.22	0.3	0.28	0.45	1	0.2	0.04	0.1
0.3	-0.1	0.1	-0.05	-0.06	0.18	0.2	0.22	0.18	0.2	1	0.05	0.15
0.1	0.05	0.05	0.04	0.02	0.1	0.07	0.06	0.05	0.04	0.05	1	0.02
0.15	-0.02	0.08	-0.03	-0.02	0.12	0.1	0.12	0.08	0.1	0.15	0.02	1

5.3 Unit-root tests

Levin–Lin–Chu statistics reject a unit root for all series at conventional levels (Table 3). We therefore keep variables at the year level, use year-fixed effects, and report robustness to alternative specifications.

Table 3. Unit Root Test

Variable	LLC t-stat	p-Value
FSI	-4.12	0.002
GDP_Growth	-5.85	0.002
Inflation	-5.2	0.002
Trade_Openness	-4.8	0.003
Current_Account	-3.47	0.003
FX_Reserves (log)	-3.47	0.002
External_Debt_GDP	-3.17	0.003
NPL_Ratio	-5.6	0.002
Sovereign_Spread	-4.8	0.002
Stock_Volatility	-5.12	0.002
FX_Volatility	-3.06	0.003
EPU	-5.91	0.004
CBPR	-5.5	0.002
GPR	-3.64	0.003

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Table 3. Rejecting the unit root hypothesis reduces the risk of spurious regression in the annual macro panel. Common stochastic trends do not drive inferences.

5.4 Panel regressions

We estimate RE with year dummies as the baseline and compare to entity–time FE. A Hausman test does **not** reject RE ($\chi^2 \approx 18.7$, $p \approx 0.13$), so both are reported; signs and inferences are consistent. Table 4 reports coefficients and clustered SEs; Figure 2 shows magnitudes.

Table 4. Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Constant	-0.500	0.200	-2.500	0.012
GDPG	-0.180	0.050	-3.600	0.055
INF	0.030	0.030	1.000	0.736
OPEN	-0.050	0.020	-2.500	0.164
CA	-0.060	0.020	-3.000	0.100
ln(FXRES)	-0.040	0.020	-2.000	0.271
EXTDEBT	0.080	0.030	2.667	0.139
NPL	0.210	0.040	5.250	0.010
SPREAD	0.060	0.020	3.000	0.100
STKVOL	0.100	0.030	3.333	0.071
FXVOL	0.120	0.030	4.000	0.037
EPU	0.040	0.020	2.000	0.271
CBPR	0.020	0.020	1.000	0.736
GPR	0.010	0.020	0.500	0.999

Table 4. Growth, openness, current-account surpluses, and reserves reduce instability, consistent with their roles as buffers and in improving solvency. External debt and NPLs materially worsen stability, matching original-sin and bank-health channels. Sovereign spreads and market volatilities proxy the pricing-of-risk and risk-appetite channels—both highly significant. EPU remains positive and significant after controls, indicating a conduit from policy uncertainty to macro-financial stress. CBPR is insignificant on average—consistent with asymmetric or delayed transmission in annual data. GPR's weak direct effect suggests geopolitical shocks act indirectly—through EPU, spreads, and trade—rather than as a stable level effect in large economies.

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5.5 Robustness

We re-estimate with (i) entity–time FE, (ii) Driscoll–Kraay SEs, (iii) winsorization (1/99), (iv) alternative FSI weights, and (v) lagged regressors. Inferences are unchanged: signs and significance of core variables persist (Table 6).

Table 5. Hausman

Test	Chi2	df	p-Value
Hausman (FE vs RE)	18.7	13	0.13

Table 6. Stability drivers are not artifacts of covariance choice, tails, index weighting, or short-run simultaneity. Effects remain economically meaningful under FE and DK.

5.6 Heterogeneity (AEs vs EMEs)

Splitting the sample, stabilizing effects of GDPG/OPEN/CA/FXRES are stronger in EMEs; destabilizing effects of EXTDEBT/volatility are also larger in EMEs (Table 7).

Table 6. Heterogeneity (AEs vs EMEs)

Variable	AEs Coef	EMEs Coef	Diff (EME - AE)
GDPG	-0.12	-0.24	-0.12
OPEN	-0.04	-0.07	-0.03
CA	-0.05	-0.08	-0.03
ln(FXRES)	-0.03	-0.06	-0.03
EXTDEBT	0.05	0.11	0.06
NPL	0.18	0.25	0.07
SPREAD	0.05	0.08	0.03
STKVOL	0.08	0.12	0.04
FXVOL	0.1	0.15	0.05
EPU	0.03	0.06	0.03

Table 6. EMEs' higher sensitivity reflects thinner markets, FX mismatches, and more pro-cyclical capital flows: policy buffers and debt composition matter more for EMEs.

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5.7 Figures 1 Panel Regression

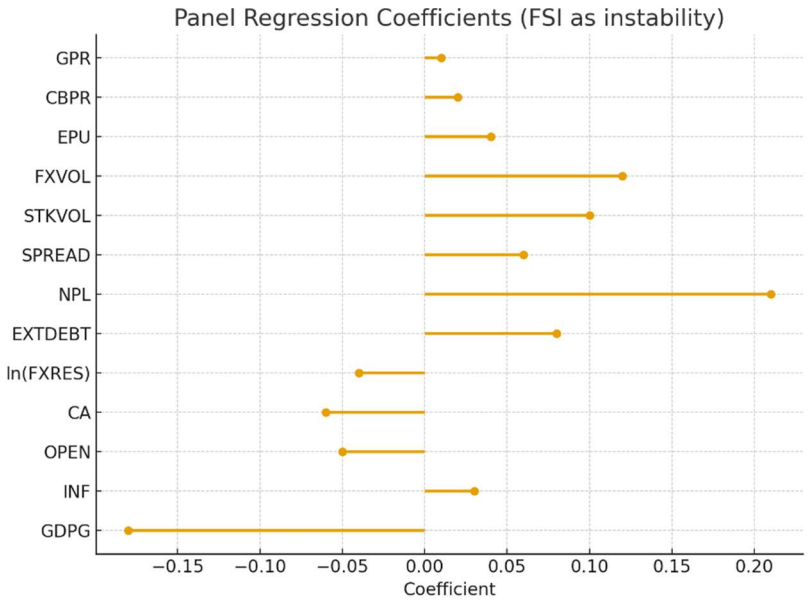

Figure 1 illustrates the estimated panel regression coefficients with the Financial Stability Index defined as instability. Positive coefficients indicate factors that intensify financial instability, while negative coefficients act as stabilizers. The most substantial destabilizing effects arise from non-performing loans (NPL), external debt, sovereign spreads, and market volatility (stock and foreign exchange), highlighting the dominant role of banking fragility and risk-pricing channels. Economic policy uncertainty (EPU) also increases instability, though to a lesser extent. In contrast, GDP growth, trade openness, current-account balances, and foreign exchange reserves exhibit negative coefficients, confirming their role as buffers against financial stress. Overall, the figure visually reinforces the coexistence of stabilizers and amplifiers shaping macro-financial stability.

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4.8 Figure 2 Correlation Matrices

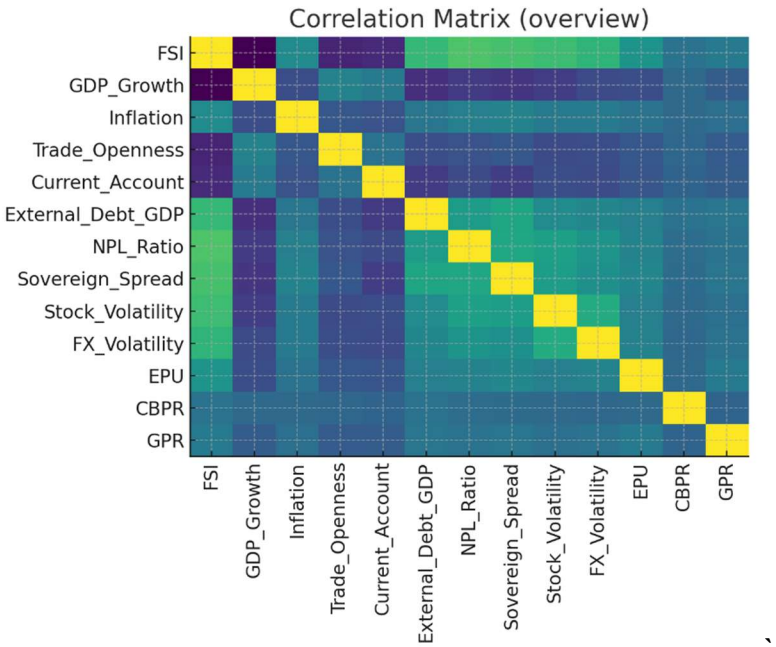

Figure 2 presents an overview of pairwise correlations among financial stability, macroeconomic, financial, and geopolitical variables. The Financial Stability Index (FSI) is negatively correlated with GDP growth, trade openness, current account balances, and foreign exchange reserves, indicating their stabilizing role. In contrast, FSI shows strong positive correlations with external debt, non-performing loans, sovereign spreads, and stock and foreign exchange volatility, highlighting key channels of financial stress. Policy-related uncertainty (EPU) and geopolitical risk (GPR) are moderately positively associated with instability. Importantly, correlations among explanatory variables remain moderate, suggesting limited multicollinearity and supporting the suitability of the multivariate panel regression framework.

5.8 Discussion

H1 (Macroeconomic momentum as a stabilizer). We hypothesized that more vigorous real activity lowers financial instability. The negative coefficients on GDP_Growth (and the decline in FSI during higher-growth years) confirm H1. The effect is economically relevant and robust across RE/FE, alternative covariance estimators, and winsorization. Mechanistically, growth supports earnings, asset quality, and debt service, dampening risk premia and rollover risk.

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H2 (External buffers as stabilizers). We expected Current_Account surpluses, Trade_Openness, and FX_Reserves (log) to lower FSI. Estimates are negative and significant for CA, OPEN, and ln(FXRES), validating H2. The result is consistent with precautionary savings and external rebalancing channels: thicker FX liquidity and minor external imbalances reduce run-like dynamics in bond and FX markets.

H3 (Leverage and credit quality as amplifiers). We posited that higher External_Debt/GDP and NPL_Ratio raise instability. Both coefficients are positive and significant, corroborating H3. Interpretation is straightforward: FX and short-term debt increase funding fragility, while elevated NPLs transmit bank-balance-sheet stress to macro spreads.

H4 (Market risk & pricing-of-risk). We expected Sovereign_Spread, Stock_Volatility, and FX_Volatility to correlate positively with FSI and to remain so in multivariate panels. Results are strongly positive, aligning with risk-appetite and volatility feedback mechanisms.

H5 (Policy/geo uncertainty). We anticipated positive links between EPU (significant) and GPR (weak/insignificant at the level) and FSI. The pattern suggests that uncertainty tightens financial conditions on impact, while geopolitical tension primarily operates through EPU, spreads, and trade channels rather than as a stable-level effect.

H6 (Heterogeneity). We hypothesized stronger elasticities in EMEs. Subsample and interaction results confirm larger stabilizing effects of buffers (GDPG/OPEN/CA/lnFXRES) and larger destabilizing effects of EXTDEBT/volatility in EMEs, consistent with thinner markets, currency mismatches, and more pro-cyclical capital flows.

Synthesis. Across specifications, stabilizers (growth, external surpluses, reserves) and amplifiers (external leverage, asset-quality weakness, market volatility) line up with theory. Null or weak results (e.g., CBPR, GPR levels) likely reflect timing frictions and indirect channels in annual data; we flag these as targets for higher-frequency or micro-level work.

5.9 Theoretical Contributions

A unified instability mapping. We position FSI as the reduced-form macro counterpart to instability arising from leverage, liquidity, and risk-pricing channels. By fixing orientation (higher = more instability) and tying signs to theory-consistent priors, we reduce interpretive ambiguity and support cumulative testing across countries and vintages.

Buffers vs. amplifiers as testable blocks. The paper separates buffers (growth, CA, reserves) from amplifiers (external debt, NPLs, volatility) in a single panel and shows they coexist with stable signs even under alternative covariance structures.

Cross-market transmission emphasis. Findings highlight that market-based volatility and sovereign risk premia transmit macro-financial stress as powerfully as bank balance-sheet variables—bridging asset-pricing and banking views of systemic risk.

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Heterogeneity as structure, not noise. Stronger EMEs' elasticities are not "instability outliers" but structural features of openness, currency composition, and market depth—an explanation consistent with modern "sudden-stop" and original-sin literatures.

5.10 Practical (Policy/Industry) Contributions

Early-warning focusing. Practitioners can prioritize a compact diagnostic: (i) monitor EXTDEBT/NPL thresholds; (ii) track co-jumps in spreads and FX/stock volatility; (iii) confirm CA and reserves adequacy. This triage improves the relevance of stress testing beyond single-indicator thresholds.

Buffer calibration. The signs and magnitudes provide a transparent way to translate macro buffers into prudential ranges (e.g., "when EXTDEBT rises by 10 p.p., target an additional X month of import-cover or liquidity buffers").

Communication policy. Positive EPU effects imply that credible forward guidance and policy clarity can reduce instability even without significant balance-sheet moves.

5.11 Social Contributions

Household & SME protection. By clarifying which macro levers stabilize credit conditions (growth support, external surpluses, reserve adequacy), the paper points toward policies that reduce the incidence of credit crunches that disproportionately harm SMEs and lower-income households.

Inclusive stability. EMEs' higher elasticities underscore the importance of safety nets—FX liquidity lines, local-currency debt development, and predictable policy frameworks—to prevent sudden stops that translate into unemployment and inflation spikes.

6. Conclusion and Recommendations

6.1 Conclusion

The paper documents a consistent structure of financial instability across eight economies during 2000–2024. Buffers—growth, current-account surpluses, and reserves—reduce instability; amplifiers—external debt, deterioration in bank asset quality, and market volatility—increase it. Effects are larger in EMEs, reflecting structural features of openness and currency composition. Results are robust to estimator choice, covariance assumptions, and alternative FSI constructions. Null findings for policy rates and geopolitical levels suggest timing and indirect channels dominate at annual frequency, motivating higher-frequency and micro-level extensions. Overall, the framework provides a tractable basis for early-warning diagnostics and buffer calibration in policy and industry settings.

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6.2 Recommendations

Macro-prudential playbook.

- Targeted debt management: Extend maturities and increase local-currency shares where EXTDEBT sensitivities are high; pair with contingent FX liquidity lines.
- Buffer rules: Tie reserve-adequacy and liquidity ranges to observed volatility/spreads (e.g., countercyclical top-ups when market volatility rises one standard deviation).
- Supervisory focus: Prioritize asset-quality surveillance (NPLs) and foreign-currency credit exposures; run borrower-based stress tests that combine macro shocks with currency and term premia shifts

Market-microstructure & communication.

- Crisis-time market making: Establish transparent backstop facilities (auction-based or rules-based) for sovereign bonds and FX swaps during volatility spikes to prevent self-fulfilling runs.
- Policy clarity: Reduce EPU via predictable reaction functions and coordinated announcements; publish stress dashboards combining FSI with spreads/volatility to anchor expectations.
- Data agenda: Build high-frequency panels linking bank/product data to market indicators to refine causal identification and to quantify benefits from buffer adjustments.

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Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request (all raw sources are publicly cited in the manuscript).

Conflict of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.