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Measuring Financial Stress for Emerging and Developed Countries

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Abstract

The current study adopted a comprehensive approach by developing monthly Financial Stress Indices (FSIs) for emerging and developed countries. The study built indices for 20 emerging economies at the country, aggregate, and region levels from January 1997 to December 2016. Similarly, the study constructed monthly FSIs at country and aggregate levels for 23 developed countries, covering the period from January 1993 to December 2016. Principal Component Analysis (PCA) was applied to develop these FSIs. The study determined that political risk is crucial in systemic Financial Stress (FS) in emerging countries, whereas financial and economic risk contribute significantly more to FS in developed countries. The study's unique contribution is the inclusion of political risks in constructing stress indices alongside economic and financial risks. It underscores the importance of promoting regional policy coordination and reducing domestic vulnerabilities to maintain financial stability.

Keywords: developed countries, emerging countries, financial crisis, financial stress, political risk, Principal Component Analysis, systemic risk

Introduction

The financial turmoil that originated in the subprime mortgage market in 2007 and peaked in September 2008, leading to a global financial crisis (GFC), had profound real-world implications. This crisis significantly impacted both the financial and real sides of the economy. It also exposed weaknesses in existing macroprudential regulations. These regulations monitor, manage, and predict financial turbulence ineffectively. Consequently, these flaws compelled financial regulators to increase vigilance towards potential trigger factors and equip themselves with better tools to ensure financial stability. This crisis sparked a heated discussion on the importance of systemic Financial Stress (FS) and its policy implications. However, the prevailing understanding of systemic FS was inadequate. A

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comprehensive definition, measurement, and identification of systemic FS are vital for maintaining financial stability.

Before the eve of the GFC, the researchers had a narrow definition of a financial crisis. It refers to a situation of systemic episodes of banking crises. The large banks experiencing these episodes suffered extreme balance sheet losses. This definition overlooked the risks associated with monetary and credit conditions, as well as the significance of securities markets. With the onset of the GFC, financial regulators adopted a broad but relatively more complex approach to evaluate systemic FS. This approach builds financial fragility and stress indices (hereafter FSIs) to monitor systemic FS. Composite indices assess financial instability in real-time (International Monetary Fund, 2009a). Despite extensive research on developing stress indices, identifying systemic FS got little attention until the GFC. Most studies focused on evaluating performance using known periods of systemic FS using the composite index. However, a few researchers have built quantitative models to estimate threshold levels.

The early literature on measuring FS relies on discrete measures of stress, such as binary variables. These variables indicate only the presence or absence of extreme events, failing to capture the severity of FS. Hence, dating and identifying crises were possible only by mere judgment. In addition, such binary measures of stress conveyed information about a single segment of the financial system, disregarding the overall risk to the entire system (Sandahl et al., 2011).

Several studies have highlighted the inadequacy of regulatory frameworks because they ignore the impact of politics on policy conduct and execution. Political leaders often interfere in the formulation of macroprudential policies, leading to undesirable outcomes. These interventions can create political risk and cause systemic FS (Danielsson & Macrae, 2016; Herrera et al., 2020; Waszkiewicz, 2017). Moreover, credit constraints and economic risk contribute to FS; however, unfortunately, most cross-country studies do not consider them.

This study addressed the limitations of computing FSIs for emerging and developed

countries. Moreover, the study aimed to construct comprehensive monthly FSIs at the country, aggregate, and region levels. These stress indices account for financial, economic, and political risks. Economic and

financial risks indicate vulnerabilities in the real and financial sides of the economy, respectively. They reflect the government's ability to preserve financial stability. Political risk refers to the willingness of governments to implement policies that safeguard financial stability. In addition, the study aimed to identify episodes of FS in the sampled countries through newly developed FSIs. These FSIs are a timely signal for an imminent FS in the financial system.

Furthermore, these FSIs can help distinguish between stressful and calm periods. Therefore, they could be a tool for designing unconventional policy responses to prevent a financial crisis. In addition, the macroprudential policymaking process fails to consider political risk as a component of systemic FS. Following Sadia et al. (2019), this research incorporated political risk while measuring FS for emerging and developed countries. Prior studies examining FSI for emerging and developed countries have not considered this non-economic component.

The study is organized as follows: section 2 documents the literature review, whereas section 3 describes the methodology. The succeeding section reports empirical findings. The last section concludes the study and recommends policies to stabilize the financial system.

Literature Review

This section documents the measurement of systemic FS in the existing literature. FSIs measure the intensity of systemic FS in the financial system. A considerable amount of literature focused on four broad aggregation methodologies to combine the components of FSI. They include Principal Component Analysis (PCA), variance equal weights, portfolio theoretical approach, and credit weights. However, the superiority of any methodology has yet to be proven. Most of the pioneering research focused on measuring FSI for the developed countries. For instance, Illing and Liu (2006) applied all these aggregation methodologies to construct FSI for Canada. They found that the credit aggregation method is superior. Another study by Oet et al. (2015) developed FSI for the US. They proved the superiority of the principal component over other schemes. Some studies applied correlation-based methodologies (Hollo et al., 2012). They stated that FSI carries substantial predictive power to identify systemic events.

A recent study considered house price growth, exchange rate, banking risk, equity volatility, sovereign rate spread, and inflation expectations to

construct the Australian FSI. The study found that foreign factors account for 57% of FS in the Australian economy (Gomis-Porqueras et al., 2023). Furthermore, the stress index helped to forecast bank credit growth and sales growth. Likewise, Ahir et al. (2023) constructed FSI for 110 countries worldwide, including both developed and emerging countries. Global FSIs captured global events, country and regional heterogeneity, and higher FSI in advanced countries than in emerging countries.

A few empirical studies have used economic factors and credit stress as components of FSI for emerging countries (Cevik, Diboogl & Kenc, 2013; Cevik, Diboogl & Kutan, 2013). A survey by Dahalan et al. (2016) constructed FSI for the Malaysian economy. They incorporated external debt as an economic factor. The study revealed that FSI indicates overheated financial markets during episodes of high FS. The non-economic components of FSI have gained importance in recent literature. Theoretically, high political risk poses a threat to financial stability, as it alters the outcome of economic policies (Ma et al., 2024; Waszkiewicz, 2017). Surprisingly, most empirical studies on measuring FSI ignored the political dimension of systemic FS, except for Sadia et al. (2019). A recent strand of literature relies on sensitivity analysis to build FSI. For instance, Stolbov and Shchepeleva (2025) developed a monthly FSI for Russia and highlighted how sensitivity analysis effectively captured episodes of FS in Russia.

Literature pinpoints numerous unsettled issues. Firstly, it ignores political risk while measuring FSIs at the cross-country level. Secondly, analyzing the severity of a crisis gets little attention in the earlier literature as databases measure crises through binary variables (Balakrishnan et al., 2011; Laeven & Valencia, 2013). Thirdly, existing studies must consider securities markets and systemic events, relying solely on currency and debt markets and banking sector crises. Finally, most of the cross-country literature needs to focus more on the role of credit stress while developing FSIs, with some exceptions at the country level (Cevik, Diboogl & Kenc, 2013; Dahalan et al., 2016). This study proposed a systemic measure of FSIs for emerging and developed countries, including political dimensions besides economic and financial risk.

Methodology

This section explains the conceptual framework, data, and econometric procedure to build FSIs for emerging and developed countries.

Analytical Framework

Various types of shocks disturb the stability of the financial system. This study classified shocks into financial, economic, and political risks. Financial shocks originate from various financial markets, such as the banking sector, the stock market, the foreign exchange market, and the debt market. Economic shocks arise from disturbances in the real economy, such as fluctuations in business cycles. Political shocks reflect the government's actions, which may stabilize or destabilize the financial system (Titman et al., 2011).

Figure 1

Proposed Analytical Framework for Financial Stress (FS)
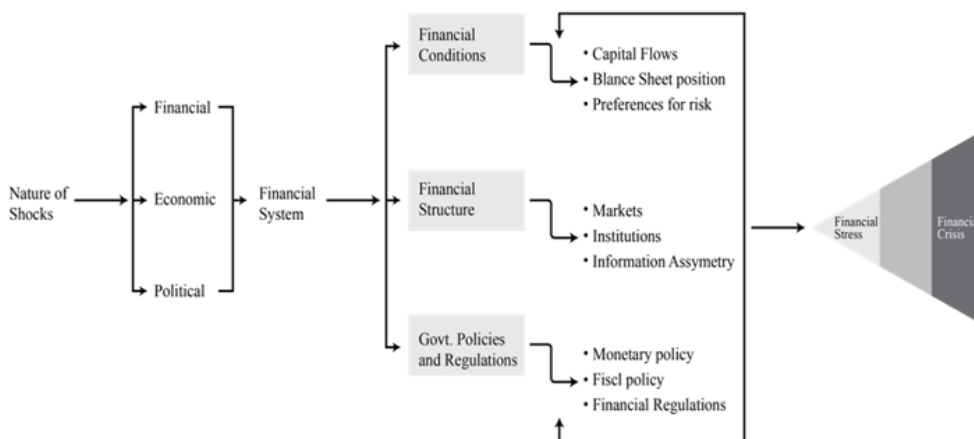
Note. The figure elaborates on the impact of three types of shocks on various dimensions of the financial system. These dimensions encompass financial conditions, financial structure, and government policies and regulations related to the financial system. The intensity of the shocks determines the net outcome. If the shocks are low to moderate, they generate higher FS. At the same time, the high-intensity shocks may create a financial crisis, a more severe outcome.

Figure 1 illustrates the analytical framework for constructing FSIs. An adverse shock to the financial system changes its dynamics in numerous

ways. It worsens financial conditions via capital outflows, highly leveraged balance sheets, and a weak reserve position. Such shocks alter financial structure through market failure, lowering the quality of financial institutions, and leading to asymmetric information. Additionally, sub-optimal policy responses and poor regulations impair the smooth functioning of financial systems in the wake of adverse shocks.

FS and financial crisis relate to each other but differ in severity. An adverse shock raises FS, making the financial system highly vulnerable and unstable. Untimely and poorly coordinated monetary and fiscal policies generate enormous stress. The European debt crisis was a clear example of how the lack of coordinated fiscal policies within the European Monetary Union highlighted the need for a fiscal union and a clear commitment to bailouts.

Assessing the severity of FS is challenging due to the highly integrated nature of financial systems. Thus, the remarkably high level of stress signals a financial crisis. This study developed FSIs that consider three types of risks. These are financial, economic, and political risks. The study considered seven essential components of FSIs. These are explained as below:

Stock Market Risk

A sudden fall in the stock market price index refers to stock market crises that generate risk. Falling prices bring unexpected losses and raise uncertainties about firms' future returns. The study measured stock market risk through the GARCH model proposed by Bollerslev et al. (1992). Moreover, the study confirmed the presence of ARCH effects through the LM test. Initially, a higher-order GARCH model was estimated, and then the choice of GARCH (1,1) was made based on the significance of lagged coefficients. The monthly average of conditional variance accounts for stock market volatility.

Banking Sector Risk

The study relied on the Capital Asset Pricing Model (CAPM) to account for risk in the banking sector. The risk premium was calculated by taking the difference between the rate of return of the banking sector and the risk-free asset (T-bills). If the banking sector's volatility coefficient (CAPM β) exceeds 1, it indicates stress in the banking sector.

Currency Risk

Currency risk refers to a fall in a nation's currency value. Currency devaluation causes capital flight and lowers consumers' and investors' confidence. Currency risk is accounted through the Exchange Rate Market Pressure Index (ERMPI) introduced by Girton and Roper and empirically applied by Hrifa and Mehdi (2023).

Sovereign Risk

The inability of a nation to service its foreign debt liabilities generates sovereign risk. This refers to the spread between the long-term yields of risky and a risk-free long-term bond. The US bond market is well-developed and stable. In the current context, long-term US Treasuries can be considered a safe asset (Kadiric, 2022). A high spread indicates high sovereign risk, hence, a high FS.

Credit Stress

An excessive supply of credit characterizes boom periods in the credit market. Once the boom turns into a bust, the credit supply squeezes out, which creates credit stress (International Monetary Fund, 2024; Misina & Tkacz, 2009)

Output Gap

The credit boom reflects an overheating of the real economy. Once the credit market melts, the real economy also experiences a slowdown in economic activity. This generates economic risk when actual output falls below potential output, leading to a negative Output Gap (OG) (Van Norden, 2024). Thus, economic risk contributes to high FS.

Political Risk

Government decisions that destabilize market outcomes are referred to as political risk. Political risk affects financial stability through uncertainty channels, as high PR creates uncertainty regarding investment decisions and stock prices. Excessive capital flight further impacts financial system stability as foreign investors delay investments in politically- unstable economies. Furthermore, political risk in the form of elections and a change in government creates FS as investors delay investments in the unstable political environment. The cumulative impact of all the political risks is high FS (Ma et al., 2024).

Data and Econometric Procedure

This study aimed to construct two composite FSIs, one each for emerging and developed countries. The study initially took a broader list of 75 countries, comprising 35 emerging and 40 developed countries. These classifications rely on the Fiscal Monitor for April 2017, published by the International Monetary Fund (IMF). However, data availability confined the analysis to finally building the indices of FS for 20 emerging and 23 developed countries. The selected data for emerging countries constituted 4,800 monthly observations from January 1997 to December 2016. The lack of consistent data compelled us to restrict the analysis to 2016. These emerging countries, on average, account for 76% of the emerging countries' GDP since 199. Thus, the selected sample reflects FS well in emerging economies (FSIE hereafter). For the developed countries' FSI (hereafter FSID), the data for 23 developed countries were collected from January 1993 to December 2016, comprising 6,624 monthly observations. The lack of consistent data on all seven components of FS before 1993 and after 2016 rationalized the choice of a sample from 1993 to 2016. These sampled developed countries cover 91% of the developed countries' GDP since 1993. Table A1 in the appendix provides the list of sampled countries.

The study extracted daily banking sector, overall stock market indices, and long-term government bond yields from Thomson Reuters DataStream[1]. The study took monthly averages to convert the daily data into monthly frequency. The monthly data for the risk-free rate of return, foreign exchange rate, private credit claims, and foreign exchange reserves were sourced from the International Financial Statistics published by the IMF (hereafter IFS). The study used daily data from the Federal Reserve Bank on US long-term Treasury bonds to calculate sovereign spread.

There are several reasons for not using the monthly Index of Industrial Production (IIP) to calculate the OG. Firstly, data on monthly IIP is unavailable for some of the sampled countries. Secondly, IIP does not account for the unique feature of cross-sectional variation inherent in panel data. Thus, the study took monthly data on industrial production (measured in constant 2000 US$) from the World Bank's (2017) publication, Global Economic Monitor. The study applied the log quadratic trend method (hereafter QTM) to estimate OG. This method is superior as it does not

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[1]https://www.thomsonreuters.com/en-gb/help/digita-accounts-production-advanced/database

assume constant Gross Domestic Product (GDP) growth. Moreover, it provides more realistic OG estimates (Cerra & Saxena, 2000; van Norden, 2024). The study incorporated monthly dummies to factor out seasonality while estimating OG. Additionally, the study constructed a Political Risk Index (hereafter PRI) based on 12 political and social attributes. Annual data was used from the International Country Risk Guide. A high value of PRI indicates low risk. The study used the following formula to convert PRI into a monthly frequency:

$$PRI_{i,t} = PRI_{t-1} * \left[\frac{PRI_t}{PRI_{t-1}}\right]^{\wedge(\frac{i}{12})}, \text{i=1, 2, ... ,12} \tag{1}$$

where PRI_t and PRI_{t-1} indicate PRI for the current and previous years. $PRI_{i,t}$ denotes computed monthly PRI for the ith country. The components of FSI are standardized before applying PCA. The number of components considered for developing a composite index is a crucial issue in PCA. The study followed the recommendation of Park and Mercado (2014) that an index should capture at least 50 to 60% of the cumulative proportion of variation. Table A2 in the appendix lists indicators, their description, and data sources.

Results and Discussion

The study used PCA to construct composite FSIE and FSID. Table 1 reports the PCA results for these indices. Thus, the study considered a non-standardized average of the first three components whose eigenvalues were more than unity for both country groupings. The constructed FSIE and FSID explain 55.20% and 51.5% of the cumulative variation, respectively. These computed FSIs are helpful in studying the patterns of FSI, especially during periods of high stress. The first component explains 22.56% and 22.78% of the variation for emerging and developed countries, respectively. This study was based on the quantitatively known episodes of FS for this analysis. It assessed whether the peaks in FSIs are consistent with the known periods of stress.

Table 1

Results for Principal Component Analysis (PCA)

Components	Emerging Countries		Developed Countries	
	Eigenvalues	Proportion	Eigenvalues	Proportion
1st Component	1.7892	0.2256	1.595	0.2278

| Components	Emerging Countries		Developed Countries	
	Eigenvalues	Proportion	Eigenvalues	Proportion
2nd Component	1.0603	0.1515	1.0110	0.1414
3rd Component	1.0146	0.1449	1.0010	0.1427
4th Component	0.9563	0.1366	0.9710	0.1387
5th Component	0.8865	0.1266	0.9537	0.1363
6th Component	0.7717	0.1102	0.8648	0.1236
7th Component	0.5213	0.0745	0.6056	0.0867

Evolution of Financial Stress (FS) in Emerging Countries

This section presents the evolution patterns of country, composite, and regional FSIs for 20 emerging countries from January 1997 to December 2016. Figure 2 illustrates country FSIs for emerging countries. A visual analysis offers several interesting observations. Firstly, these countries experienced more frequent financial crises and higher FS in the late 1990s and early 2000s than in the late 2000s and beyond. Secondly, the nature of spillover effects is heterogeneous. For instance, the Asian financial crisis occurred in July 1997, followed by the Russian default and the collapse of Long-Term Capital Management (hereafter LTCM) in August 1998. These events had spillover effects on other emerging countries. However, the spillover effects of the Argentinian debt crisis (in 2001) were very restricted.

Argentina and Brazil experienced high FS after the Argentine debt crisis. These countries characterize strong trade ties before the Argentine debt crisis. Thirdly, shocks from a single emerging economy quickly spillovers to other emerging countries. Individual countries experienced disruptions of varying magnitudes, resulting in different peaks. The Asian financial crisis, originating from Thailand, increased FS across all the Asian countries in the sample. Only Brazil, Mexico, and Russia experienced contagion outside of Asia. These responses account for varying degrees of trade and financial linkages and distinct domestic vulnerabilities prevalent before the stressful episodes. Fourthly, stress originating from developed countries was transmitted to emerging countries, as was the case during the GFC. However, these effects stayed marginal for most of the individual emerging countries.

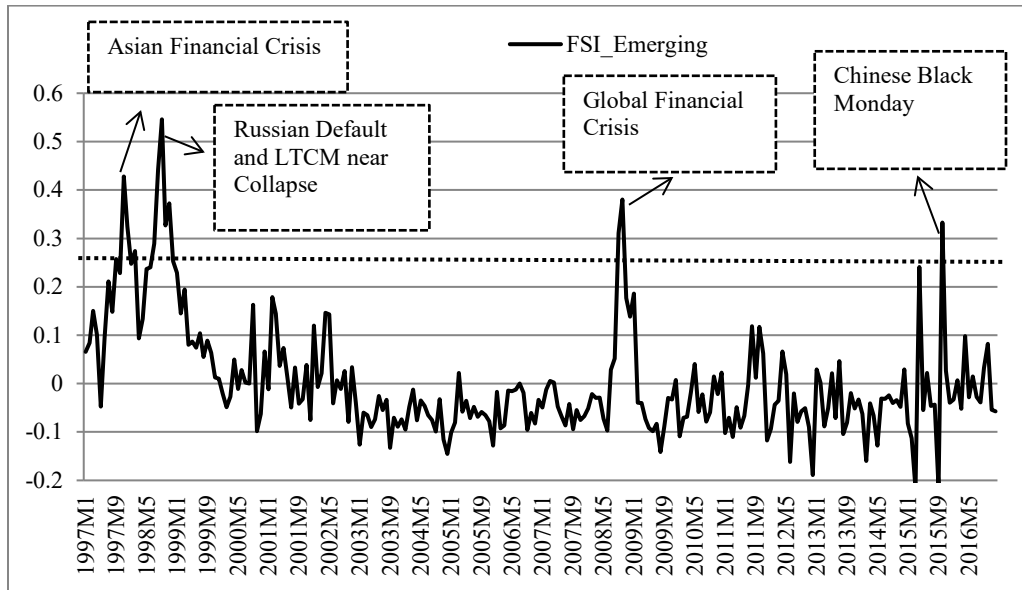**Figure 2**

Country FSIs for Emerging Countries
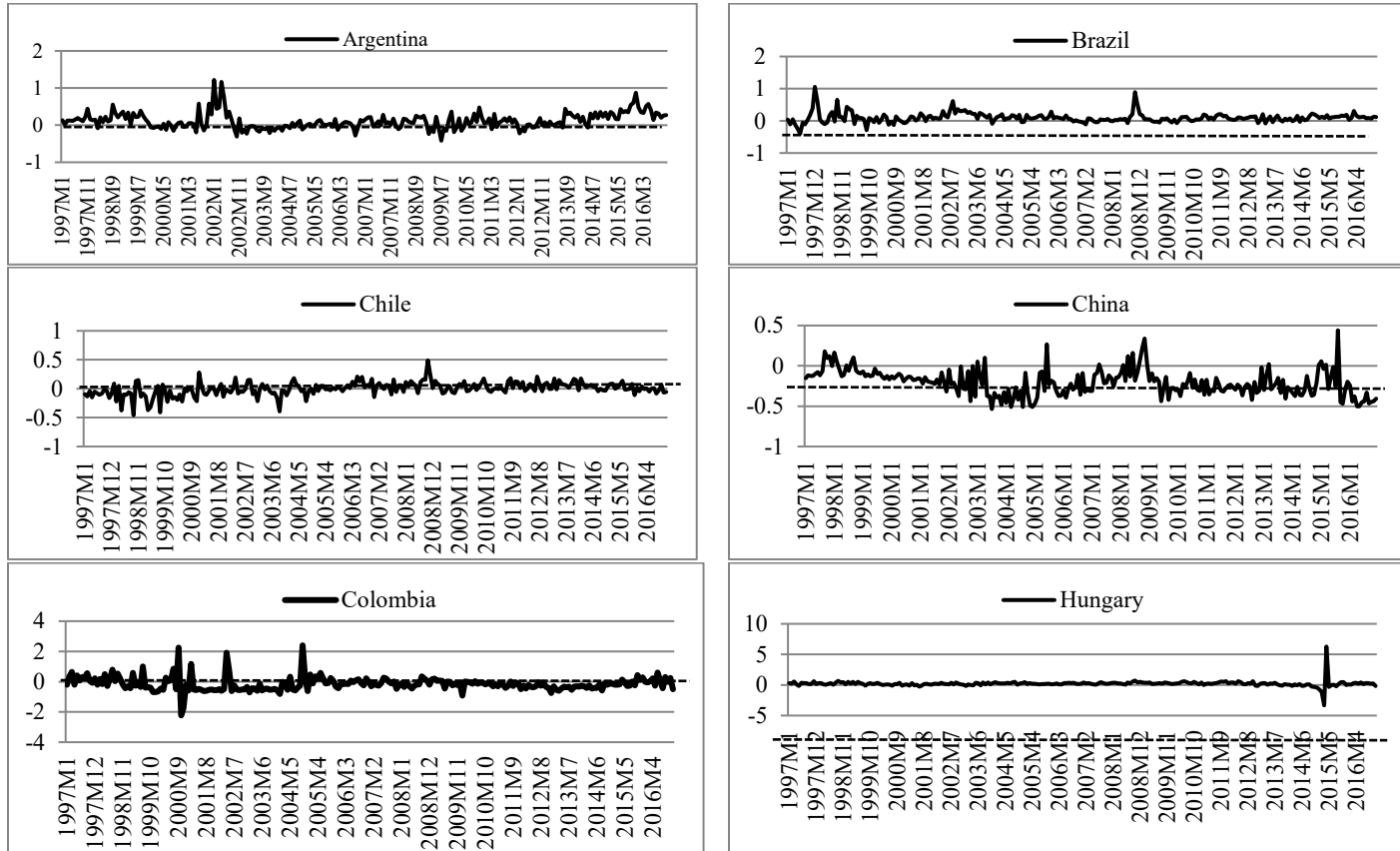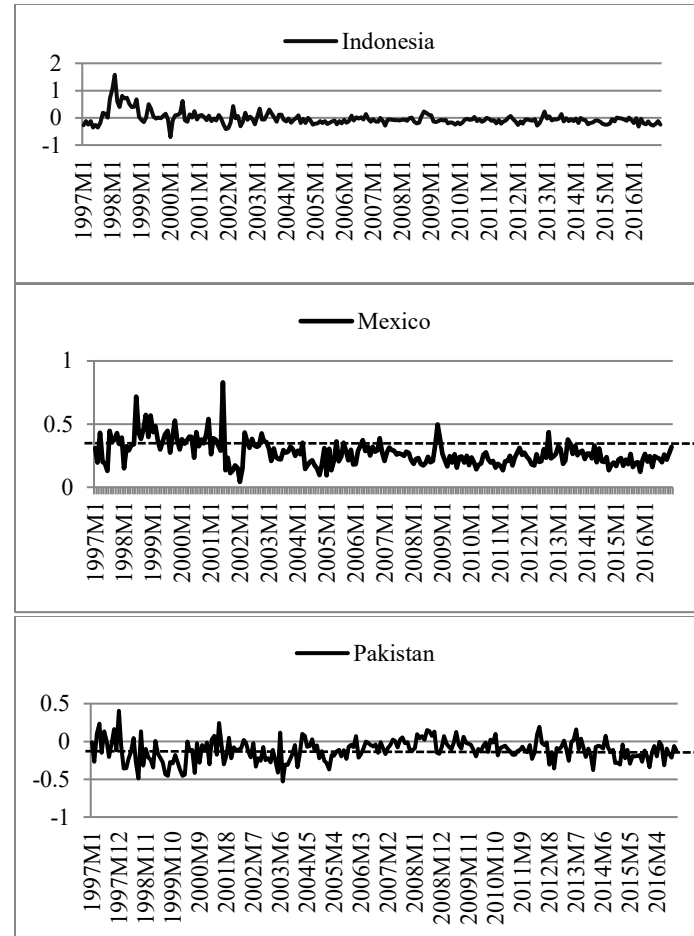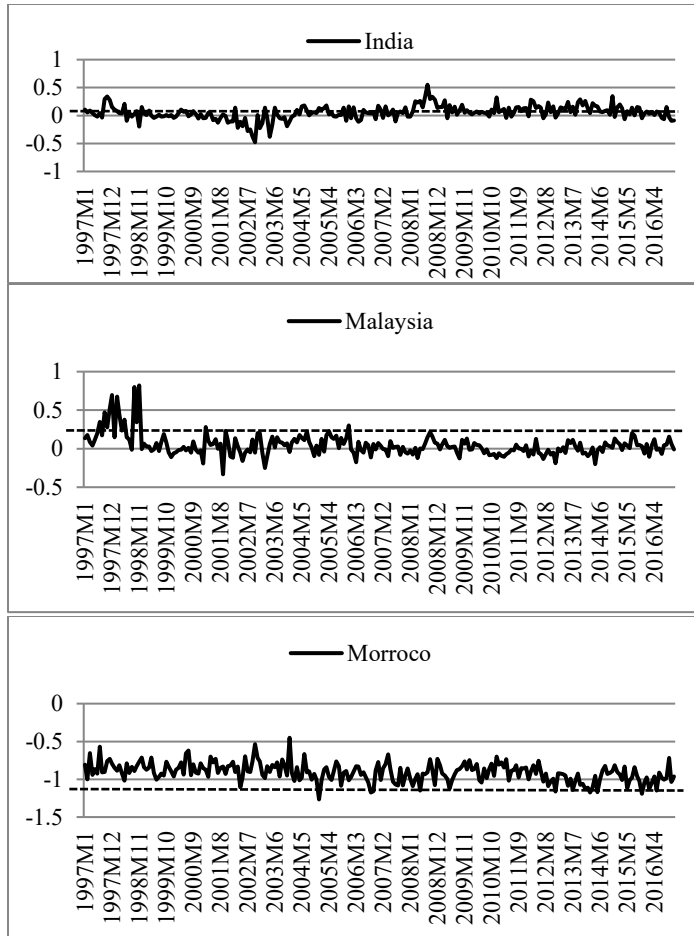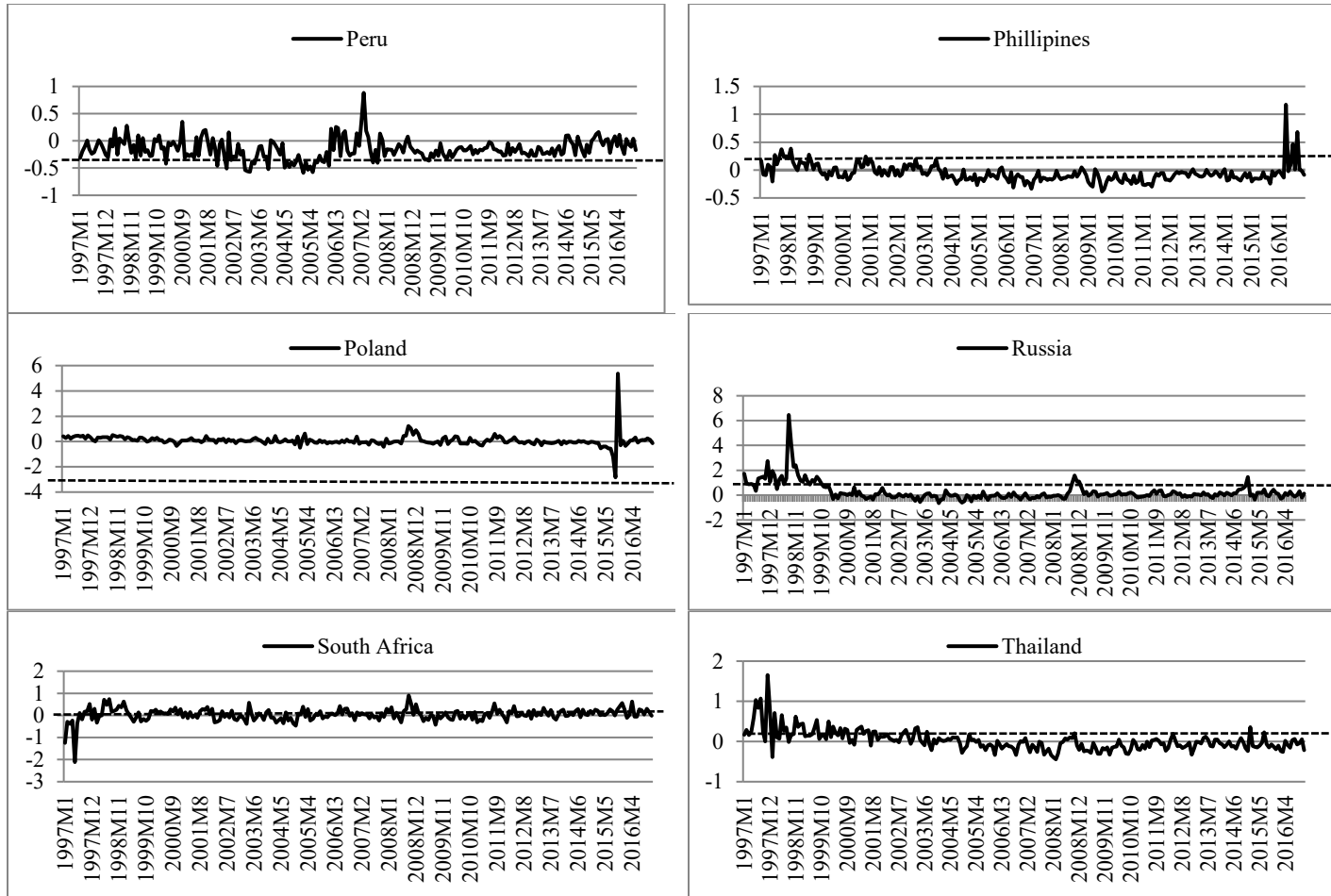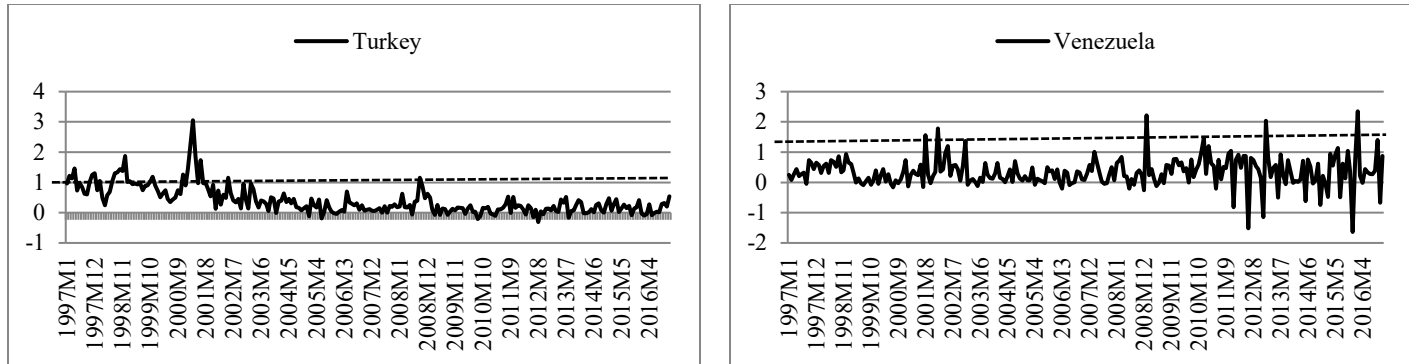
Note. This figure plots FSIs at the country level for the sampled emerging countries. The horizontal axis measures the analysis period, whereas the vertical axis plots country FSIs. The study applied PCA to compute FSI for each emerging country. The dotted line represents a 95% confidence interval. A nation is experiencing a stressful episode if the FSI exceeds the two standard deviation thresholds from its trend.

Next, the study examined composite FSI for the sampled emerging countries. Figure 3 presents a composite FSIE. Identifying the stressful episodes is essential.

Figure 3

Composite Financial Stress Index (FSI) for Emerging Countries

Note. The figure explains the patterns of FS for emerging countries through composite FSI. The horizontal axis

Identification is vital as stressful episodes indicate the financial system's failure to perform its tasks, thus raising systemic FS. The study constructed a 95% confidence interval to distinguish between stressful and calm periods. Furthermore, the study identified a stressful episode when FSIE exceeded two standard deviations from the mean value threshold. The composite FSIE points out four episodes of high stress over the sampled period. The first spike in FSIE occurred in July 1997, when stock markets in emerging Asian economies experienced a significant decline. The Asian Financial Crisis originated in the Thai economy, substantially impacting the Asian region more than the emerging countries. In the 1990s, Asian economies experienced a significant increase in foreign investment. They maintained fixed exchange rates until the 1997 financial crisis. This system protected the investors by preventing them from taking on excessive risk in

unpredictable market conditions. However, Asian countries lacked the credibility to maintain a peg with the US dollar, which encouraged speculative attacks on their currencies. This crisis is known as the currency crisis, which affected many Asian countries through financial contagion. These countries faced a situation where their reserves were depleted due to capital flight (a sudden stop). As a result, they had to devalue their currencies. Ultimately, a turbulent period began in Asia as various stock indices dropped by more than 30%. Thus, high FS thwarted financial stability.

Apart from financial contagion, political economy literature provides striking insights. Political factors play a significant role in explaining financial turmoil in emerging countries. A political bubble is detected if political risk builds up five years before any crisis occurs (Herrera et al., 2020). The findings confirmed the existence of political bubbles, as most Asian countries faced high political risk five years prior to the Asian financial crisis.

The second episode of high FS surfaced when the Russian economy experienced a collapse of its stock, bond, and currency markets. It led to the failure of the hedge fund LTCM, resulting in the highest spike in the FSIE. Russia declared financial globalization in 1997 despite weak fiscal fundamentals, rising interest rates, and deteriorating growth prospects. Investors' confidence dwindled as they feared a Ruble devaluation and domestic debt default in August 1998. The government attempted to restore investors' confidence in the domestic currency by spending large amounts of foreign exchange. Despite all the preventive measures, stock markets plunged by nearly 70% within a month of adopting a floating exchange rate. After defaulting on domestic debt in December 1998, the government ceased domestic currency debt payments. The crisis in Russia had a ripple effect on other emerging countries, causing a significant increase in sovereign risk. Political risk became substantial during this period, as street demonstrations and social unrest prevailed in the economy in response to high inflation following the devaluation. Following the Russian default, a bailout of the LTCM compounded financial instability and stress (Pinto & Ulatov, 2010).

The third episode of high FS emerged after the GFC in October 2008. FSIE became intense in emerging countries following the high FSID. The crisis originated from the cheap mortgage loans in the US housing sector.

The housing sector issued mortgage-backed securities to bundle these loans. Demand pressures drive house prices upward, creating a housing price bubble. Once the bubble burst, the consumers lost confidence in subprime mortgages. The value of mortgages owned by worldwide financial institutions fell sharply. Additionally, banks that invested in such securities faced a liquidity crisis and went bankrupt. These incidents raised financial instability. This episode of FS also had political origins. The US Congress supported affordable mortgage loans for US citizens to promote homeownership. These loans increased political risk and led to instability in the financial markets (International Monetary Fund, 2009b).

The last episode of high FS was attributed to the Chinese stock market crash in August 2015. The stock prices fell by a massive 8.5% on 24th August 2015. This crash was known as China's Black Monday (referring to the US's 1987 stock market crash). The Chinese economy transitioned towards a market-based financial system in May 2015, following a period of recessionary trends. The country devalued its currency to cushion the economic slowdown. Before the crisis, risks of financial instability tilted from developed to emerging countries. Domestic vulnerabilities, weak balance sheets, and low growth prospects characterized emerging countries. These conditions escalated FSIE (International Monetary Fund, 2015b). Thus, the financial and corporate sector vulnerabilities magnified substantially. The stock market reached record-high levels, and local companies faced higher liquidity risks, in addition to the risk of losses in FOREX reserves. Financial linkages intensified in 2010 when a stock market boom in the country turned into a bust. The stock market crash resulted in a steep decline in stock price indices worldwide, increasing the level of FSIE. Thus, the findings confirm FS spillovers within emerging countries. This finding is in line with Park and Mercado (2014).

Next, the study divides the sample of 20 emerging countries into three subregions: Emerging Asia (hereafter EA), Emerging Europe (hereafter EE), and Emerging Latin America (hereafter ELA). Figure 4 evaluates regional FSIs for emerging countries. Emerging Africa has been excluded from the sampled countries, as the sample consists of only two African countries, which restricts the conduct of meaningful regional analysis. EA includes China, India, Indonesia, Malaysia, Pakistan, the Philippines, and Thailand. ELA comprises Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Finally, EE comprises Hungary, Poland, Russia, and

Turkey. These classifications rely on the Fiscal Monitor for April 2017, published by the IMF.

Figure 4a draws FSI for the EA region. The figure captures all four episodes of FS appearing in the sample of emerging countries. The Chinese economic slowdown adversely affected the EA as China was the major exporter of raw materials to the EU countries. The EE region realized four episodes of FS, as shown in Figure 4b. Three out of four episodes were regional. In August 1998, the first episode of high FS emerged when the Russian economy experienced a financial crisis. This crisis carried repercussions for the region. The second surge in FS occurred due to the Turkish banking and currency crises, as well as political unrest. The fragile banking sector in the late 2000s fueled the excessive purchase of government bonds. Another igniting factor for the banking crisis was the delayed sectoral reforms in the region. FS increased as an accumulated effect of these domestic vulnerabilities.

Figure 4

Regional Financial Stress Indices (FSIs) for Emerging Countries
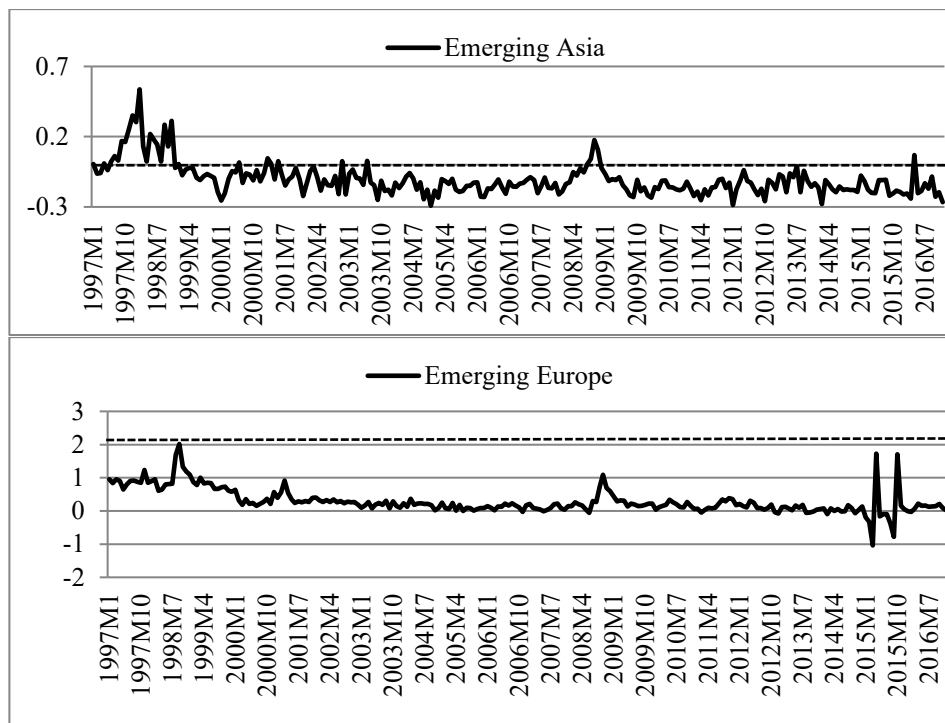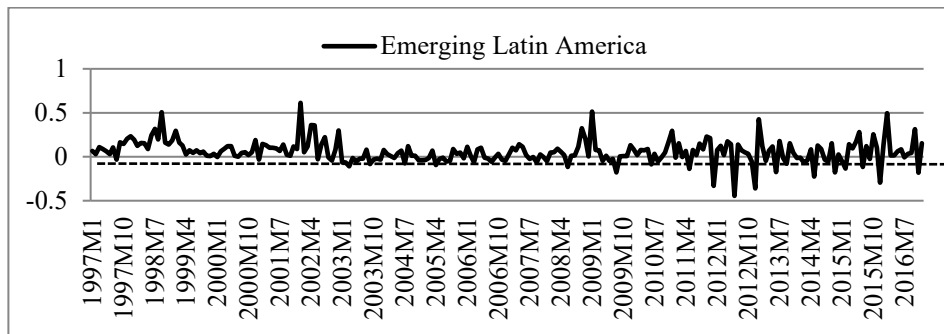
Note. This figure plots the regional FSIs for emerging countries. The sampled emerging countries are sub-categorized into three regions: Asia, Europe, and Latin America. The horizontal axis measures the analysis period, whereas the vertical axis measures the financial stress index. The dotted line shows a 95% confidence interval. The study did not plot the lower limit for confidence interval as any values falling on the left tail reflect increased uncertainty.

The financial crisis further intensified with a political crisis in early 2001 as controversy appeared between the president and prime minister on corruption in the banking sector. This crisis ended in a float of the Turkish Lira in February 2001 and a subsequent 14% currency depreciation. However, it did not transmit to the other regions; instead, it raised FS in Europe through financial contagion. The next peak in FSI for the EE region occurred in October 2008, when the GFC sent shockwaves through Europe amid the house price bubble and its subsequent burst. Nevertheless, the impact was short-lived for the EE region. Finally, the last episode of financial stress corresponds to adverse spillovers from the correction in the Chinese stock market in August 2015. The region experienced capital outflows, which raised FS (International Monetary Fund, 2015a).

Next, the study documented patterns of FS in the ELA region, as shown in Figure 4c. Firstly, the Russian Default and LTCM exacerbated FS through financial contagion. The second period of escalated FS was regional, the Argentinian debt crisis in 2001. This episode did not spillover to other regions owing to underdeveloped financial markets. The third period of heightened FS was related to the GFC. The initial impact of the crisis was marginal, which supported the decoupling hypothesis. However, the crisis deepened after the bankruptcy of the Lehman Brothers (investment bank), which ultimately reversed the capital inflows, raised the

spread of external financing, and intensified the liquidity crunch in the local market (Bank of International Settlements, 2009). The next episode of FS emerged from the European debt crisis. Domestic vulnerabilities in the ELA region caused the transmission of the Euro debt crisis, escalating FS in the ELA. The last episode of high FS relates to the massive depreciation of the Chinese currency in 2015. Stock markets in the ELA region followed the volatility in the Chinese stock market. Thus, the share valuation of Latin American companies investing in China fell drastically. The study finds evidence for stress transmission from developed to emerging countries. The results indicate that FS transmits within and across emerging countries. These results are consistent with Balakrishnan et al. (2011) and Park and Mercado (2014).

Role of Political Risk in Emerging Countries

Political risk is an essential driver of FSIE. Substantial geopolitical risks precede financial turbulence in emerging countries. This study applies the definition of a political bubble proposed by Herrera et al. (2020). According to them, a political bubble occurs when the government's popularity increases five years before the financial crisis. The study uses International Country Risk Guide (ICRG) data to assess the popularity of governments. The analysis accounts for the cumulative change in government stability five years before the financial crisis. Figure 5 shows that, on average, the government's popularity increased by 63.90 percent in the five years preceding the financial crisis in these countries. Figure 5 covers all the crises realized in the selected group of 20 countries.
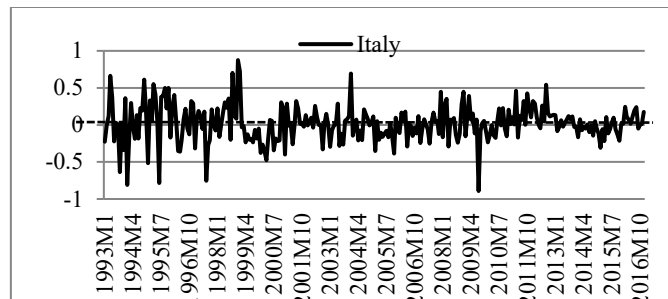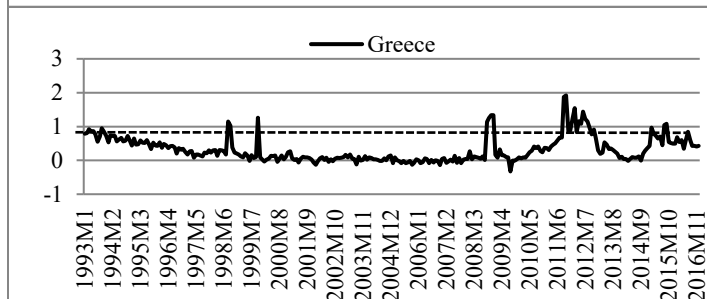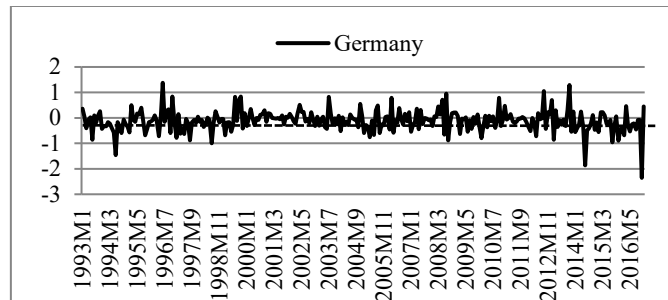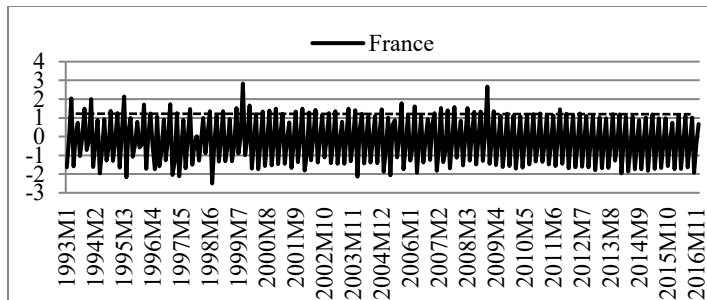
Figure 5
Political Bubbles in Emerging Countries
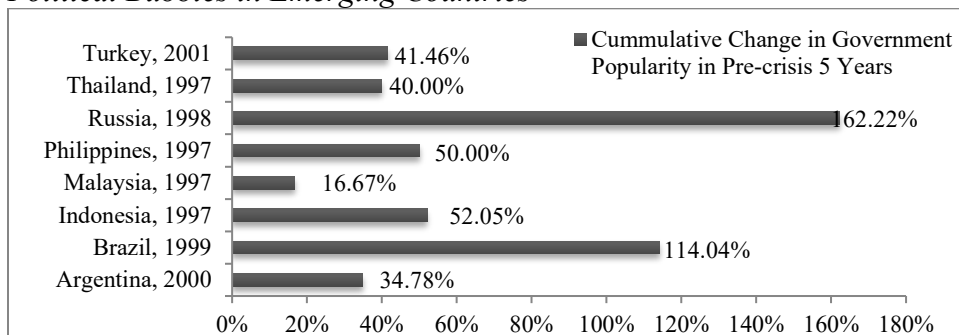
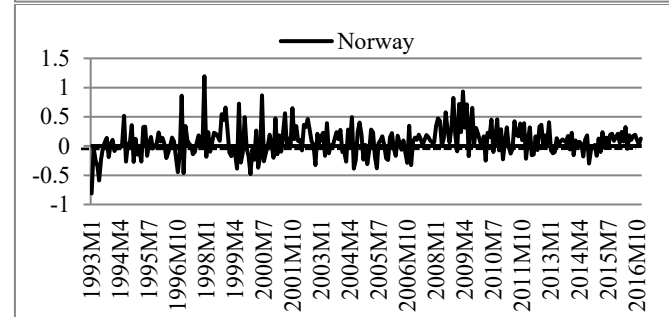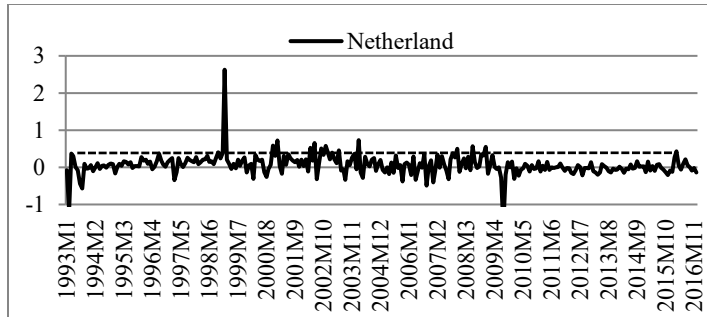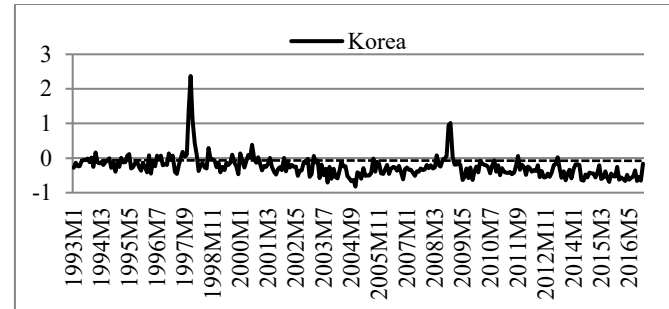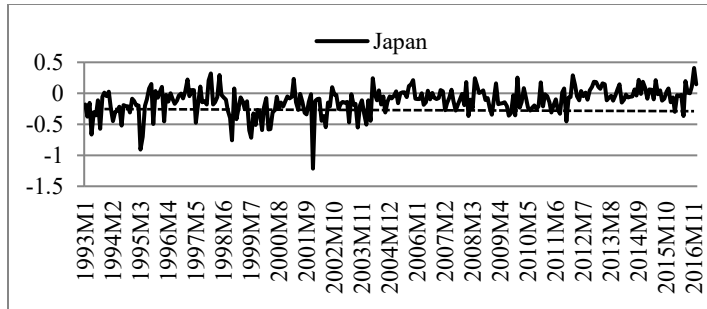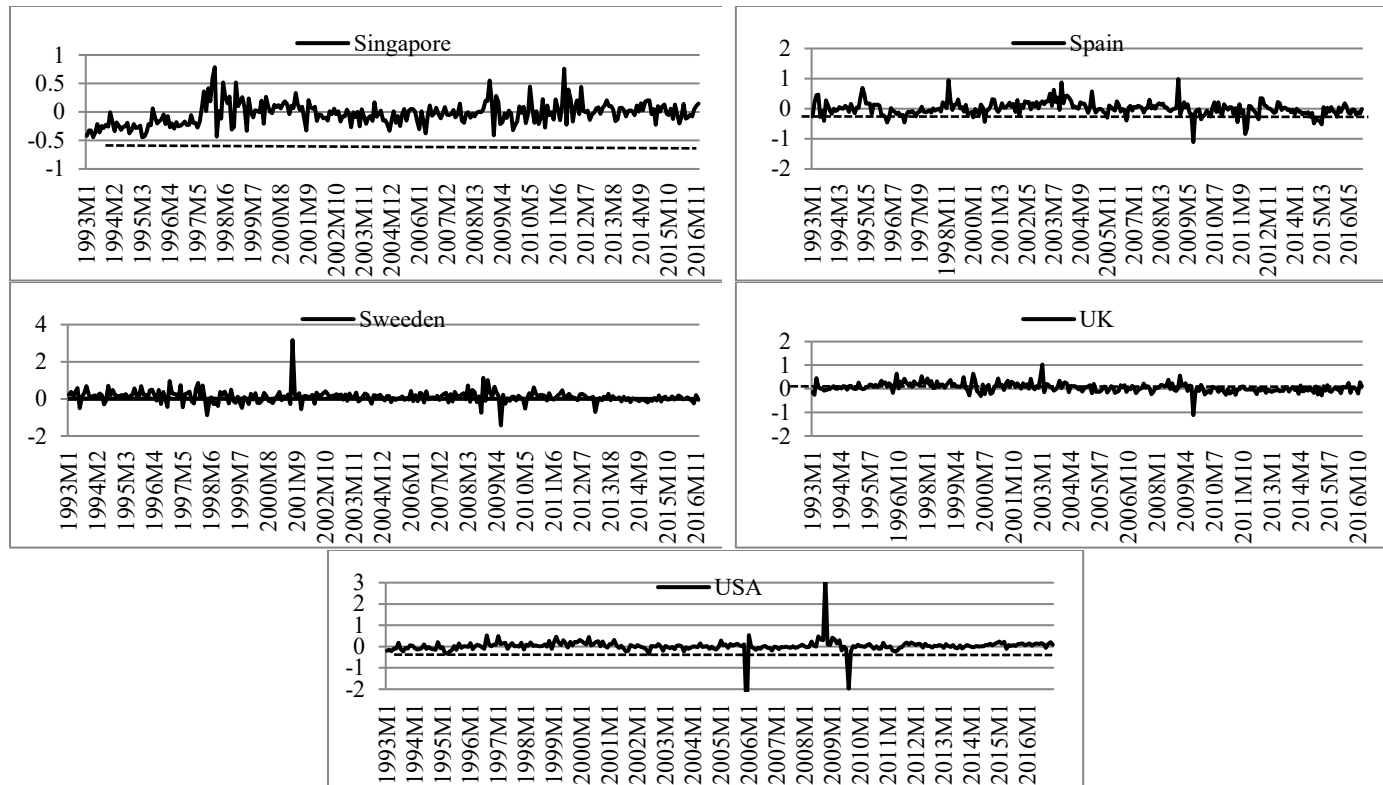*Note.* This figure reflects the incidence of political bubbles in emerging countries.

Figure 6

Country FSIs for Developed Countries
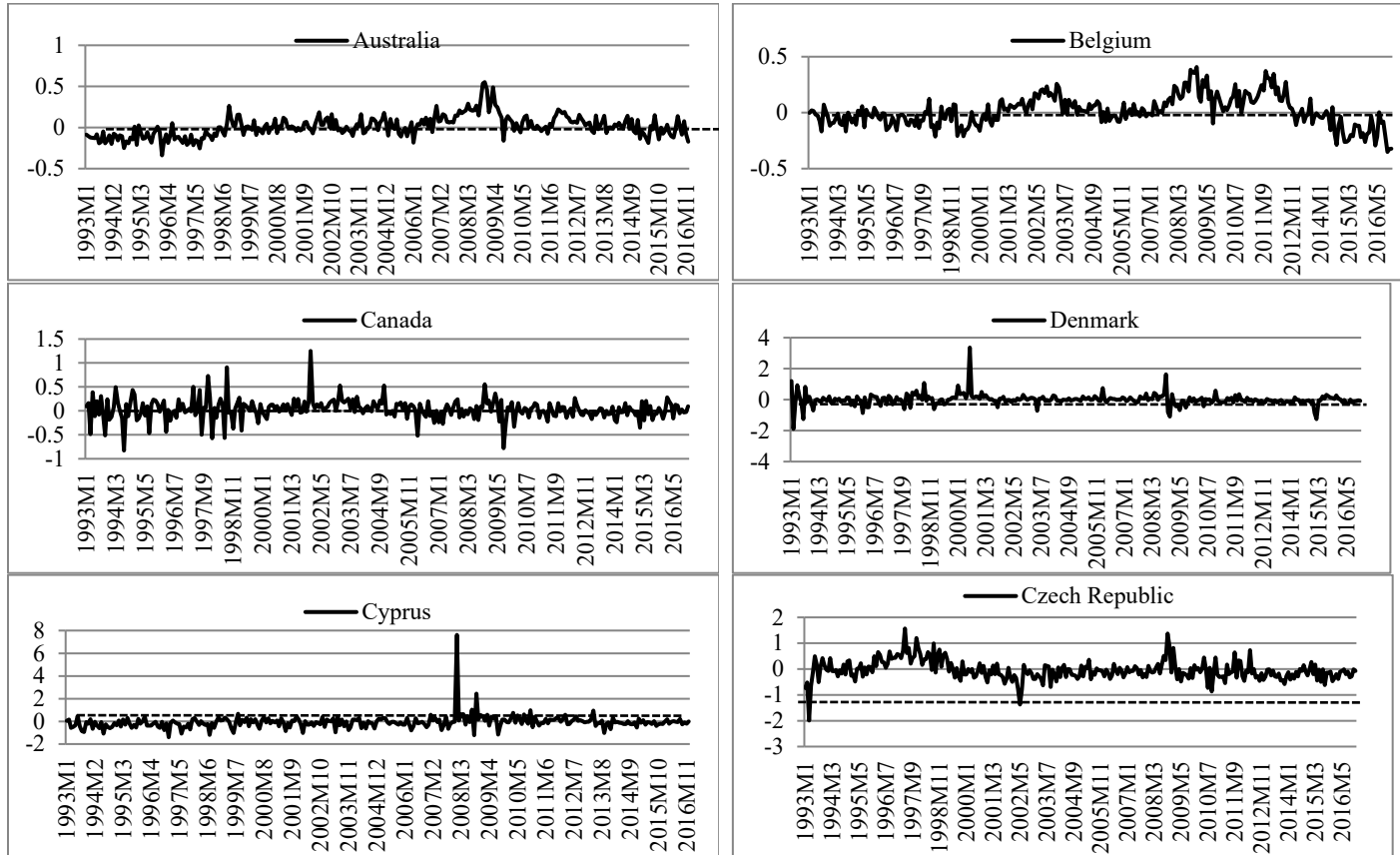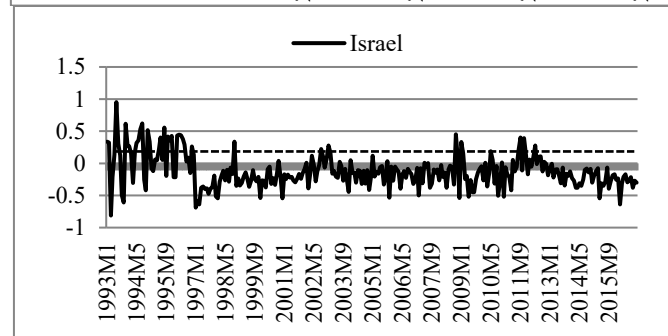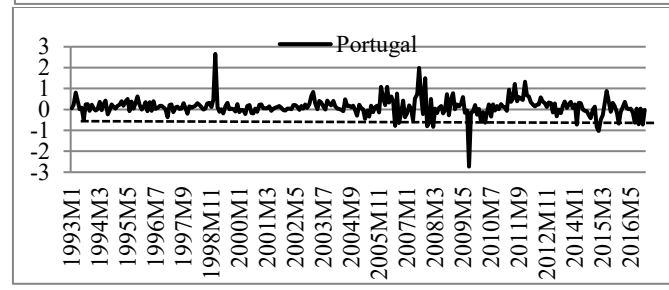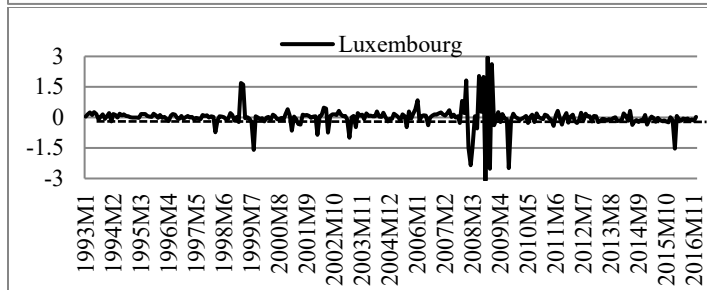
Note. This figure plots FSIs for each country in the sample of developed countries. Horizontal axis = analysis period, vertical axis = country FSIs. The study used PCA to compute country FSIs for developed countries. The dotted line represents a 95% confidence interval. A nation is experiencing stressful episodes if FSI exceeds the two standard deviation thresholds from its trend.

Patterns of Financial Stress (FS) in Developed Countries

This section draws individual FSIs for developed countries in Figure 6. A quick look at country FSIs reveals certain features. First, the study regards the period from 1993 to 1997 as a tranquil period. Financial markets in developed countries were generally stable, except for those in France. Second, these countries received spillovers from the Asian Financial Crisis in late 1997, when FSIs increased marginally. Third, FSIs demonstrate substantial stress following the collapse of LTCM. This effect was particularly pronounced in the developed countries of the US and Europe. Fourth, the dot-com bubble escalated individual FSIs for these countries from 2001 to 2003, but only for a few countries. Fifth, developed countries experienced financial stability from 2003 until the GFC disrupted the smooth functioning of the financial system. The crisis began in 2007, while FSIs peaked in October 2008 in nearly all the developed countries.

Sixth, FS intensified once again in 2011. This episode corresponded to the European sovereign debt crisis. Almost all the European countries experienced strikes and protests in response to austerity measures. Political instability raised political risk and magnified financial system bottlenecks, intensifying regional FS. Overall, the FS patterns explain all the known periods of FS in developed countries.

Figure 7

Composite Financial Stress Index (FSI) for Developed Countries
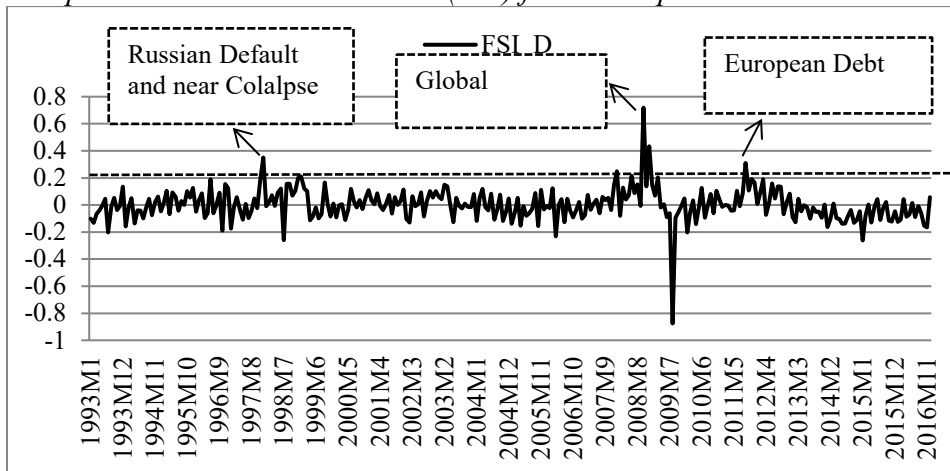
Note. The figure explains the patterns of FS for developed countries through composite FSI. The horizontal axis measures the analysis period, whereas

the vertical axis measures the FSI. FSI_D refers to the composite FSI for developed countries.

Next, the study develops a composite FSID to observe whether episodes of FS significantly halt financial stability. Figure 7 demonstrates three episodes of FSID.

The first episode of a high FS features two events. The first was the Russian bond default in August 1998, and the second was the near collapse of LTCM in September of the same year. Russian default raised credit risk and widened the spread of long-term bond yields in developed countries. Ultimately, volatility in stock markets has elevated. The high bankruptcy risk of LTCM sparked concerns about liquidity. These events raised stock market, sovereign, currency, and political risks that increased FS. The next spike in FSID came during the GFC in October 2008. Various factors, such as global developments, higher interconnectedness, segmented regulatory mechanisms, and the failure of large banks, generated insolvency risks. This crisis was much beyond the liquidity crisis (Thakor, 2015). The systemic financial instability became manifest with the collapse of Lehman Brothers, followed by a series of banking defaults.

Despite the Federal Reserve Bank's bailout packages, the crisis had a significant impact on other developed countries. The major stock markets tumbled substantially, raising FS in nearly all the sampled countries. These countries were forced to opt for bailouts. The last episode of high FS appeared in 2011 when the European region faced a sovereign debt crisis. The crisis was linked to the GFC as the financial crisis followed recurring patterns (Reinhart & Rogoff, 2009). This crisis made the balance sheets of European countries highly-leveraged. They experienced credit booms characterized by excessive mortgage loans and low interest rates. These countries faced structural issues, including trade deficits, high debt, reliance on external capital, a monetary union without fiscal coordination, and fragile banking systems. In the wake of the 2009 recession, European countries faced a sudden stop, balance of payment problems, and tight financial conditions. The Eurozone lacked a financial institution that could serve as a lender of last resort, and devaluation was not an available policy option under the European Monetary Union (hereafter EMU). Large regional banks faced liquidity risk and credit stress, resulting in bailouts through the recapitalization of loans. Bank recapitalization and domestic vulnerabilities raised the debt-to-GDP ratio to unsustainable levels. Thus,

banking failure and credit stress translated into sovereign default risks. The sovereign debt crisis became a concern when the Greek government failed to finance its debt in 2010 and went for IMF and EMU bailouts. It followed a series of bailouts in European countries, such as Ireland, Portugal, Italy, Spain, and Cyprus. Ultimately, these events raised sovereign risk and, hence, FS.

The European crisis underlines that the EMU was a political project with incomplete economic integration. EMU has several flaws. First, the union typically coordinates monetary policy but requires more coordination of fiscal policy. Second, member states characterize varying macroeconomic fundamentals hindering their suitability as a union. Third, European markets embraced a common currency and financial markets, but financial regulations remain decentralized. Fourth, a common perception prevails that member countries bail out those struggling financially. However, no explicit commitments exist in EMU litigations. Thus, surplus countries were reluctant to bail out the countries with high debts. The European crisis was not only the outcome of the GFC and recession but also manifested the tensions prevailing in EMU since its formation (Copelovitch et al., 2016).

Figure 8

FSI in Emerging and Developed Countries
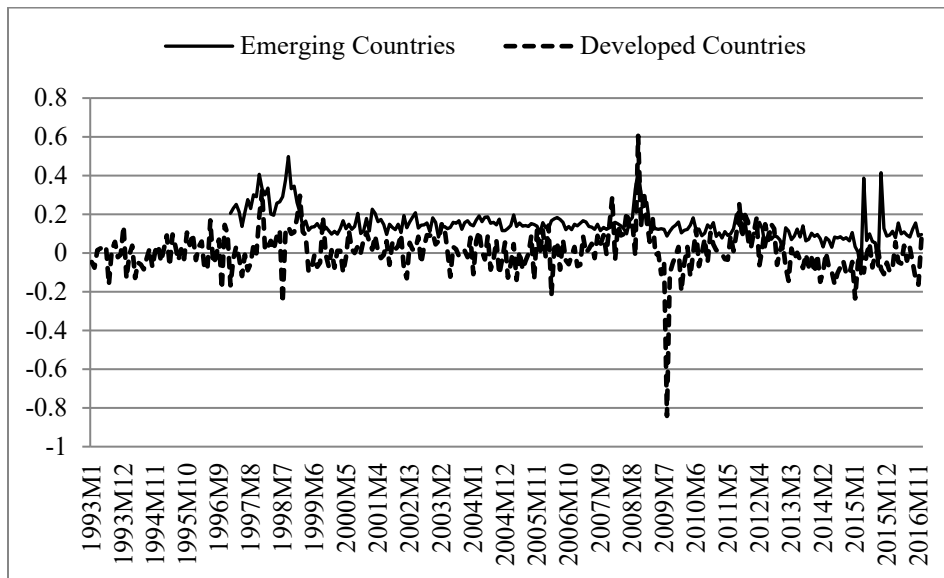
Comparison of Financial Stress (FS) for Emerging and Developed Countries

Finally, we compare FSIs for emerging and developed countries. Figure 8 plots FSIs for both types of economies. The weighted average of FSIs for developed and emerging economies is constructed using PPP-based GDP weights.

Graphic analysis depicts the following observations. Firstly, both the FSIs tend to follow similar patterns. However, the co-movement is not strong. For most periods, local peaks in the indices do not coincide. Secondly, the highest peak in FSI for emerging middle-income countries corresponds to the Russian financial crisis, whereas FSI reached its peak in 2008 for developed countries. Thirdly, FSIs coincide with each other in the early years of the 2000s. These years are primarily defined as a tranquil period. Fourthly, FSI for emerging and middle-income countries suggest that the index rose substantially in the last 2 years of analysis. This can be attributed to the recent rise in political risk in emerging countries. Political risk is an essential element in raising FSI in emerging economies.

Conclusion and Policy Recommendations

This study developed monthly FSIE and FSID to evaluate systemic FS. These indices account for three types of risks: economic, financial, and political. The study applied PCA to construct aggregate FSIs. The findings suggested that political risk is a dominant contributor to FS, alongside financial and economic risk in emerging countries. Most financial turmoil were associated with economic meltdowns and periods of high political risk. This study provided some striking results in the sphere of political economy. The findings revealed that the political economy aspect of the financial crisis explains periods of high FS well. Moreover, FSID predominantly relates to economic and financial risks. Instability in developed countries appears through financial linkages and excessive debt. The study found evidence that a crisis in one group of countries transmits to the other group. Previous studies only examined stress transmission from emerging to developed countries (Balakrishnan et al., 2011; Park & Mercado, 2014). Thus, the origin of the crisis is not vital in its spillover. However, domestic vulnerabilities and the degree of financial globalization significantly influence stress transmission. The regional analysis concluded that global and regional factors drive regional FSIs.

The current analysis cautioned about the rapid pace of financial globalization by establishing international regulatory authority. Furthermore, the study highlighted the importance of overcoming domestic vulnerabilities to become resilient to adverse shocks. It further called to intensify regional coordination through regional economic and political cooperation and develop regulatory frameworks that may help manage and predict risks. Finally, political leaders and policymakers may develop a consensus on policy issues to avoid political risk that endangers financial stability. Adapting to macroprudential policies is challenging in a politically-unstable environment. However, a strategic approach requires concrete actions and careful design of policies and responses. For instance, central banks should act more independently to safeguard against financial instability. Governments in emerging markets must engage various stakeholders, including policy institutes, financial institutions, and the public.

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Appendix

Table A1

List of Countries

Emerging Countries	Developed Countries
1. Argentina	1. Austria
2. Brazil	2. Belgium
3. China	3. Canada
4. Chile	4. Cyprus
5. Colombia	5. Czech Republic
6. Hungary	6. Denmark
7. India	7. France
8. Indonesia	8. Germany
9. Malaysia	9. Greece
10. Mexico	10. Ireland
11. Morocco	11. Israel
12. Pakistan	12. Italy
13. Peru	13. Japan
14. The Philippines	14. Korea
15. Poland	15. Luxembourg
16. Russian Federation	16. Netherlands
17. South Africa	17. Norway
18. Thailand	18. Portugal
19. Turkey	19. Singapore
20. Venezuela	20. Spain
	21. Sweden
	22. The UK
	23. The USA

Table A2
Components of Financial Stress

Types of risk	Components	Description and Measurement	Data Sources
Financial risk	Stock market risk (SMR)	An abrupt decline in the overall stock index indicates a rise in SMR. The GARCH Model measures the SMR	*Thomson Reuter's DataStream*

Types of risk	Components	Description and Measurement	Data Sources
	Banking sector risk (BSR)	A fragile banking sector ignited the financial crisis (Turner, 2007). The Capital Asset Pricing Model measures BSR.	*Thomson Reuter's DataStream, IFS, IMF, and OECD*
	Currency risk (CR)	Depreciation in ER and falling reserves generate currency crises. The study measure currency crises through the Exchange rate Market Pressure Index (Burnside *et al*., 2004).	*IFS, IMF*
	Sovereign risk (SR)	It indicates the risk of losses generated by the counterparty's failure to meet contractual obligations. The yield differential between risky long-run local bonds and risk-free long-run US Treasuries measures SR.	*Thomson Reuters' DataStream, IFS, IMF, and Fed Reserve Bank*
	Credit stress (CS)	It refers to liquidity and credit crunch. According to Cevik *et al*. (2013a), the growth of private sector claims measures CS.	*IFS, IMF*
Economic risk	Output gap (OG)	A positive output gap shows an overheated real economy that generates a credit boom. The study estimates OG using the log-quadratic trend method (hereafter QTM).	*Global Economic Monitor, WB*
Political risk	Political risk index (PRI)	PRI refers to the influence of political decisions on the economy (Titman *et al*., 2011). The study constructs a PRI using PCA and considers 12 quantitative risk attributes.	*ICRG, PRS Group*

Table A3

Episodes of Stress

Emerging Countries	Developed Countries
Argentina 2001, 2015; Brazil 1997, 2001, 2008, 2015; Chile 2001, 2008; China 1997, 2001, 2008, 2014-2016; Colombia 2000, 2004; Hungary 2015; India 1997, 1998; Mexico 1998, 2001, 2008, 2014; Morocco 2002, 2004; Pakistan 1997, 1998, 2005, 2008; Peru 1998, 2007; Philippines 1997, 2015, 2016; Poland 2015; Russia 1998, 2007, 2014; South Africa 2007; Thailand 1997; Turkey 2001, 2007, 2014-2016; Venezuela 2007, 2012	Australia 1998, 2007; Belgium 1998, 2002, 2008, 2011; Canada 1997, 2001, 2007; Czech Republic 1996, 2007, 2011; Denmark 1997, 2007; Germany 1997, 2012; Greece 1997, 2007, 2011; Ireland 2007; Israel 1993, 2007, 2011; Italy 1997, 1998; Korea 1997, 2007; Luxembourg 1998, 2007; Netherlands 1998; Norway 1997, 2007; Portugal 1998, 2007, 2011; Singapore 1998, 2007; Spain 1995, 1997, 2002, 2007; Sweden 2001, 2007; United Kingdom 202; United States 2008