FINANCIAL AND FISCAL STRESS: MEASUREMENT, DETERMINANTS, AND INTERCONNECTION

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

IN THE NAME OF GOD,
THE MOST GRACIOUS, THE MOST MERCIFUL

Dedicated to my Mother, Father (Late), and Esteemed Supervisors

APPROVAL SHEET

Financial and Fiscal Stress: Measurement, Determinants and Interconnection

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Abstract

The global financial crisis of 2007-2008 and the accompanied Eurozone debt crisis of 2011 have substantially raised the systemic risk and rollover risks around the world. These events led to the failure of conventional policies and pinpointed flaws in the predictive power of the existing macroeconomic models. New models emphasized the role of financial frictions in the macroeconomy. Consequently, the financial and real sides of the economy are treated as interlinked with potential feedback loops in either direction. These changes in the economic environment require re-shaping macroeconomic policies. More recently, it is acknowledged that the success of macro-prudent policies requires consideration of political risks in the assessment of financial and fiscal stress. The present study proposes some extensions in the conceptual frameworks for the measurement of financial and fiscal stress. The newly proposed measures of systemic risk involve three types of risks, namely financial, economic, and political whereas the new fiscal stress index takes account of political risk besides short, medium, and long term dimensions of rollover risk. The findings suggest that a rise in political risk translates into high financial and fiscal risks in both emerging and developed economies. Thus, the present study equips the policymakers with novel yardsticks to monitor systemic financial risk and rollover risk. Another contribution of the present study is to extend the theoretical models for potential determinants of financial and fiscal stress to allow for the political shocks. In this regard our contribution is multifold. First, we propose a new extended theoretical framework to accommodate political shocks. Second, we conduct an empirical investigation for determining financial and fiscal stress. The study concludes that political shocks play a vital role in determining financial and fiscal stress besides macroeconomic vulnerabilities and global factors. Lastly, the interconnection between financial and fiscal stress for a sample of advanced and middle income emerging economies is analyzed within one block for developed and two blocks for emerging countries. The study finds feedback between sovereign and banks for BRICS if the shock appears in the real economy whereas a somewhat weak feedback loop is observed for other Emerging economies and absence of a feedback loop, in either direction, for financial and fiscal stress for G5 countries. However, fiscal and financial stress are self-explanatory.

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List of Abbreviations

FinSI	Financial Stress Index
FinSIA	Financial Stress Index for advanced countries
FinSIE	Financial Stress Index for emerging countries
FisSI	Fiscal Stress Index
EFisSI	Fiscal stress index for emerging countries
DFisSI	Fiscal stress indice developed countries
EMPI	Excange rate market pressure index
LTCM	Long-Term Capital Management
ICRG	International Country Risk Guide
QTM	Quadratic trend method
PRI	Political Risk Index
EWS	Early warning system
PCA	Principal Component Analysis
VAR	Vector Autoregressive models

Chapter 1

Introduction

1.1 Background of the Study

Financial systems around the world evolved significantly in the past three decades with major structural changes such as a high degree of connectedness, financial liberalization, improved regulations and innovations, portfolio diversification, and development of risk management tools to contain financial instability. The models of the financial system failed to handle the complexity of evolving structures and cast doubt on their ability to mitigate systemic risk.[1]

The financial disorder erupted in the subprime mortgage market in 2007 became the full-blown global financial crisis in September 2008 with the collapse of Lehman Brothers. This crisis engulfed the whole world through interconnections between the financial and real sides of the economy. It further exposed weaknesses in the existing macro-prudential regulations to effectively monitor, manage, and foresee such happenings. Regulatory authorities were either not fully aware of the potential triggers in financial markets or they were not well equipped with the regulatory tools to safeguard the stability of the financial system. Besides that, the crisis stimulated an intense debate on the importance and policy relevance of systemic risks. In this context, it appeared that the prevailing concept of systemic risk did not sufficiently encompass its various dimensions. Hence, a broader and more precise definition, measurement, and identification of systemic risks could serve as an important risk assessment tool to safeguard financial stability.

[1] Systemic risk refers to the risk involved in the whole financial system.

Before the global financial crisis, systemic risk was narrowly defined through the systemic episodes of the banking crisis where large banks faced extreme losses on their balance sheets. This definition relied on banking sector fragilities and overlooked the risks associated with monetary and credit conditions and the role of securities markets (Acharya Drechsler, & Schnabl., 2014). With the onset of the global financial crisis. a more global and complex approach was adopted for the assessment of systemic risk. This new approach emphasized to monitor and manage the risks involved in the financial system as a whole. Under this complex approach, systemic risk was defined as the risk involved in the overall financial system. Systemic risk was defined as events or actions that carry widespread adverse implications for the financial system and hence, for the overall economy (FSB_IBS_IMF., 2009). Such risks are endogenous and are further intensified by the system itself through various trigger factors. Trigger factors include the size of the financial system, the interconnection between real and financial sectors, the behavior of the investors and market segments, and inherent financial vulnerabilities (leverage. maturity mismatch. liquidity risk, complexity. information asymmetry, and moral hazard) [Technical Committee of the International Organization of Securities Commissions, 2011]. This approach builds financial fragility and financial stress indices (hereafter FinSIs) for the assessment of systemic risk. Such composite indicators provide a real-time examination of financial stability.

The global financial crisis and the subsequent European debt crisis also sent a reminder to academicians as well as policy-makers for a critical reassessment of fiscal policy as a tool to respond and recover from such crises. On one side. the efficacy of fiscal policy as the stabilizing tool became even more prominent. especially when the financial sector was weak and monetary policy failed to

stabilize the economies. On the other hand, a greater degree of uncertainty and deteriorated public balance sheet positions thwarted public debt sustainability. A higher stock of debt stayed unnoticed in developed countries until the full-blown crisis appeared in 2011. Both the developed and emerging countries experienced economic and productivity slowdowns, which required the design of fiscal policy to enhance employment, stimulate capital accumulation and promote economic growth IMF (2017a).

It was long perceived that concerns for fiscal sustainability are restricted to the emerging economies only. However, the eruption of the sovereign debt problems in the developed countries in 2011 has changed this conviction. Developed countries were characterized by structural vulnerabilities and soaring debt-to-GDP ratios in the pre-crisis periods. Further, they lacked fiscal buffers to tackle downturns and financial crises.[2] Risks associated with the rollover of public debt are crucial, which cannot be captured through any single dimension of fiscal events. This requires a more rigorous risk management framework to better understand rollover risks. An aggregate fiscal stress index (hereafter FisSI), incorporating short, medium, and long-run dimensions of baseline fiscal variables, can enrich the risk management toolkit.[3]

Many studies pointed out that political risk is an important element in elevation of financial and fiscal stresses (Qian, 2012; Reinhart, Rogoff, & Savastano, 2003). Researchers have identified recently that the existing regulatory framework ignores the role of politics in the conduct and execution of policies.[4] They believe that

[2] Fiscal sustainability problems refer to the inability of governments to rollover debt.

[3] Fiscal stress refers to the inability of the government to meet its debt obligations and maintain fiscal sustainability (Manasse, Roubini, & Schimmelpfenning, 2003).

[4] Research at Systemic Risk Centre, London School of Economics provided such critique to the regulatory frameworks. For details see opinion paper of Danielsson and Macrae, 2016.

political leaders generally interfere with the process of formulating macro-prudential policies that aim to monitor and manage systemic and rollover risks. Besides, the success of a policy requires political support and a consideration of how political leadership influences the process of formulating policies (Danielsson & Macrae, 2016). Additionally, the process of economic reforms also needs political support (WEF, 2015). Recently, Dziawgo (2013) and Waszkiewicz (2017) believe that political risk is a non-economic driver of uncertainty in financial markets. Herrera, Ordonez, and Trebesch (2014) find that political bubbles are far more important in foreseeing financial crisis than credit bubbles for emerging economies. Likewise, Waszkiewicz (2015) acknowledged the role of political uncertainty in the debt market. Political risk is regarded as a hazard for the debt markets in two ways. First, it affects the quality of the fiscal policy. A fiscal policy that encourages large outlays and high deficits exerts pressure on raising taxes and limiting the capability to pay back the debt. This ultimately raises the likelihood of a debt crisis, thereby raising fiscal stress. Second, political risk affects perceptions of investors about the economy. If risk is high, the credibility of the sovereign to pay back debt is low, which raises probability of debt default and fiscal stress (Waszkiewicz, 2015).

1.2 Issues in the Measurement of Financial and Fiscal Stress

The early literature on the measurement of financial and fiscal stress failed to capture the contemporaneous severity of stress. It relied on discrete measures of stress, mostly evaluated by binary variables, which indicates only the presence or absence of extreme events. This measure pinpoints the presence or absence of a fiscal crisis in probabilistic terms rather than evaluating the intensity of fiscal stress. Also, such a binary measure of stress conveyed information about a single segment of the financial system and a single dimension of the rollover risk that cannot be

aggregated (Sandahl, Holmfeldt, Ryden, & Stromqvist, 2011). This strand of literature was widely applicable for developing countries and was less suited for developed countries featuring relatively few stress incidences (Balakrishnan, Danninger, Elekdag, & Tytell, 2011; Illing & Liu, 2006).

Despite extensive research on building stress indices, identification of systemic risk did not get much attention until the global financial crisis. Most of the research focused on an event-based approach that tried to evaluate the performance of composite indices in capturing the known periods of systemic risk. Other approaches relied on building quantitative models to estimate thresholds.

Moreover, existing databases account for banking, currency, and debt crises with little attention paid to securities markets. An important lesson drawn from the global financial crisis is the recognition of inter-linkages between banking and securities markets in both emerging and developed countries. Thus, a systemic risk indicator should consider both of them together. Another lesson from the global financial crisis is to realize the importance of credit constraints and economic risks in fueling financial stress. Most of the cross country studies ignore the role of credit and economic risk, where the latter accounts for disruptions in the real economy.

Against this background, this study constructs composite FinSIs and FisSIs for emerging and developed countries respectively. We consider three types of risk, namely, economic, financial, and political risks. Economic and financial risks indicate vulnerabilities in the real and financial side of an economy respectively. They refer to the *ability* of the government to maintain financial stability. Political risk relates to the *political will* of a government to execute policies that safeguard financial stability. The present study measures financial and fiscal stress as continuous variables, which carry several advantages over discrete measures

indicating the presence or absence of stress. First, it enables us to study financial stability and fiscal conditions in both calm and crisis periods. Second, these indices help us identify the periods of low and high financial and fiscal stress. Finally, financial and fiscal stress indices better help in monitoring the level of systemic and rollover risk and guiding the policymakers to evaluate the role of financial authorities to ensure stability and size of fiscal policy to minimize rollover risk.

1.3 Factor Affecting Financial and Fiscal Stress

Empirical literature adopts two approaches to inquire about the sources of systemic and rollover risks. The first one is an *economic approach* that highlights structural imbalances and their possible resolution to pull the economy out of financial and fiscal crisis and/or periods of high financial and fiscal stress. This approach is widely followed by policymakers. However, it is flawed in terms of thoroughly ignoring the political economy aspects of the financial markets and public accounts. The second approach is the *political economy approach*, which relates systemic failure and rollover risks to the non-economic trigger factors, such as political support or will of the government. These non-economic triggers may cause the financial crisis and raise the debt-to-GDP ratio. Academic research rarely focuses on the political dimension of the problem.

The sources of financial stress received principal attention in academic as well as policy discussions after the eve of the global recession of 2007-2008. This incident posed serious challenges for policy institutions, such as the International Monetary Fund (hereafter IMF) and the World Bank (hereafter WB), as they failed to predict and explain the sources of such a widespread turmoil. Exploring the sources of financial stress is important from the perspective of ensuring financial stability in emerging countries. These economies attained central place as their

banking and non-banking financial services become more integrated with global markets. Nonetheless, a high degree of financial globalization carried some pitfalls in terms of escalated likelihood of financial crises and financial contagion. Additionally, these countries are relatively more vulnerable to exogenous shocks as compared to developed countries owing to their less resilient financial system (Balakrishnan et al., 2011). Financial disturbances also carry rollover risk besides raising the systemic risk. According to IMF (2017b), emerging countries are still exposed to tight conditions in the global economy and capital flow reversals as they are characterized by high corporate debt and weak balance sheets of the banking sector. This makes a strong case for analyzing the broader set of potential determinants of financial stress in emerging countries.

The financial and debt crises in late 2007 and 2011 have made the policymakers increasingly concerned about fiscal sustainability. In a financially globalized world, financial crises carry substantial cross-border implications for the public balance sheet which further raised the importance of coordinated responses to such vulnerabilities. In such an environment, a fiscal risk emerges not only from the fiscal imbalances and fiscal miss-management, but also from the driving forces of fiscal stress such as non-fiscal, financial, macroeconomic, and institutional factors. This viewpoint relies upon the fourth generation models of crisis that emphasize the role of institutional factors besides the macro-financial variables in determining the fiscal stress.[5] On the real side, the focus of building the fiscal sustainability framework

[5] The *first generation* or early theories to crisis emerged as a consequence of breakdown of the Bretton Wood system in 1973. They emphasized that weak fundamentals makes the countries vulnerability to balance of payment crisis (Krugman, 1979). In the context of fiscal crisis, Detragiache and Spilimbergo (2001) believed that weak fiscal fundamentals cause sovereign defaults and fiscal crisis. The *second generation* of crisis theories was partly developed in the wake of European Exchange Rate Mechanism crisis in the early 1990s. They stressed upon self-fulfilling expectations, multiple equilibria-based modeling and non-fiscal fundamentals (Obstfeld & Rogoff, 1986 ; Masson, 1999; Cole & Kehoe, 2000). *The third generation* crisis theories were originated in

suggests that macro-financial imbalances have a spillover effect in terms of raising fiscal imbalances. Overlooking such a complex inter-relationship between the macroeconomic, financial, and fiscal variables creates fiscal vulnerabilities and macroeconomic instability. A redefined role of fiscal policy, that is to minimize fiscal risk, besides the traditional role of supporting demand is desired in the changing scenario (Cottarelli, Gerson, & Senhadji, 2014).

The theoretical literature on the determinants of financial stress mainly relied upon the stress generated from the banking crisis. There is no consensus in the theoretical literature on figuring out the potential drivers of system-wide stress. Moreover, empirical literature suggests that the determinants of financial stress vary across countries and various episodes of financial stress (Vasicek, Zigraiova, Hoeberichts, Vermeulen, Smidkov, & de Haan, 2017). This is attributed to an uneven degree of financial integration and the absence of global financial regulations to discourage excessive risk-taking. The recent empirical literature on the determinants of financial stress recognizes the role of institutions in explaining the banking crisis. This strand postulates that quality of institutions mitigate financial stress that stems from the banking sector (Ben Gamra & Plihon, 2007; Demirguc-Kunt & Detragiache, 1998; Rodrik, 2008). In the broader context, the quality of institutions serves as a driving factor for financial stability as mentioned by Abdessatar and Rachida (2013). None of the existing studies recognizes the role of both macroeconomic vulnerabilities and the effectiveness of political institutions to determine financial stress for emerging and middle-income countries. The present study aims to explore this possibility.

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the wake of Asian financial crisis in 1997. They highlighted the vulnerabilities in financial sector, especially the banking sector, as the major trigger factors for crisis. Notable contributions are McKinnon and Pill, 1996; Krugman, 1998, and Burnside et al., 2001, 2004.

Most of the early literature on fiscal stress relies on early warning indicators of fiscal risk which stresses fiscal fundamentals in determining rollover risk and predicting the fiscal crisis (Detragiache and Spilimbergo, 2001; Hemming, Kell, and Schimmelpfennig, 2003). A drawback of the signaling approach, which is commonly applied in the existing literature, is that it ignores the interaction between different variables. However, a recent strand of literature acknowledges that macroeconomic and fiscal imbalances followed by debt crisis have serious implications, such as high cost of debt, risk of insolvency, and problems associated with fiscal sustainability. The public debt crisis not only becomes inimical to economic growth but also hampers macroeconomic stability. Besides, inter-linkages between fiscal, financial, and real variables are recognized in the recent literature by incorporating non-fiscal fundamentals as potential trigger factors for fiscal stress (Berti, Salto, & Lequien, 2012; Elgin & Uras, 2013; Koester, 2014).

A few recent studies mention the phenomenon of twin crisis, that is, the overlap between financial and fiscal crises, particularly in turbulent times (Gerling, Medas, Poghosyan, Farah-Yacoub, & Xu, 2017). The government bailouts to financial sectors in the periods of financial crisis raised fiscal stress (Acharya et al., 2014). Likewise, escalated risks may spillover from the sovereign to the banking system (Alter & Beyer, 2014). However, the existing literature on factors affecting fiscal stress does not incorporate financial stress in determining fiscal stress, while systemic financial risk serves as a non-contractual contingent liability in the fiscal sustainability framework (Cottarelli et al., 2014).

Likewise, political factors do play an important role as they interfere with the decision making process. This risk is more important, especially in the context of emerging countries (Bilson, Brailsford, & Hooper, 2002). Dziawgo (2013) and

Waszkiewicz (2017) believe that political risk is a non-economic driver of uncertainty in financial markets. Herrera et al. (2014) find that the political bubbles are far more important in foreseeing financial crisis than the credit bubbles for emerging countries. In the context of emerging countries, lower political risk helps countries attain high IMF program support and this in turn lowers fiscal stress (Ostry & Abiad, 2005).

The above discussion on the determinants of financial stress suggests that besides financial contagion, macroeconomic vulnerabilities, and poor quality of political institutions contribute towards escalating the levels of financial stress. Similarly, we expect that fiscal stress stems from a wide range of factors, such as macroeconomic vulnerabilities, overlapping crises, external and non-fiscal vulnerabilities, and high political risk. However, the empirical literature is limited in terms of accounting for a broader set of factors to conduct a comprehensive inquiry for the sources of financial and fiscal stress for emerging and middle-income countries. The present study is an attempt to fill this gap.

1.4 Connectedness between Financial and Fiscal Stress

The study of inter-linkages between the real and financial side of the economy remained prevalent in economic literature in the recent past. This became more prominent when the global financial crisis pointed out the presence of financial cycles, systemic risks, and business cycles. The ailing banking industries failed to play their intermediary role and squeezed the supply of private credit. This forced the governments to intervene in the financial markets. The fiscal authorities not only designed the fiscal support programs at national levels but also went to the IMF for it. Thus, a heated debate emerged as to whether the financial cycles are related to business cycles (Tagkalakis, 2013). These incidences confirmed the existence of

feedback loops between financial markets and government actions with the possibility of creating adverse feedback loops in either direction (Berti et al., 2012).

The governments were highly concerned about the challenge of crafting effective macro-prudential policies with a deeper understanding of financial markets, and the linkages between financial and real economy. As pointed out by Borio (2012), effective policymaking requires accounting for pro-cyclical financial systems in terms of credit and leverage as well as the existence of financial cycles.

The connectedness between the financial and fiscal crisis is not a new phenomenon. However, the nature of fiscal crises and their linkages to financial crises modified enormously over time. Before 1933, banking crises were regarded as banking panics or liquidity crises where depositors converted their deposits into currency (Schwartz, 1987). Such banking panics lowered the quantity of money supply and interfered with the process of financial intermediation. This further carried fiscal distress through lower real income and squeezed revenues of the government. Later, with the advent of deposit insurance, the nature of banking crises transformed from panic to crisis. A direct link between the banking sector and government finances was established where banking crises were resolved through fiscal bailouts since the *Great Depression*. A series of events, such as the breakdown of the Bretton Wood system in the 1970s and financial liberalization made the fiscal resolution to financial crises a more pronounced phenomenon. Emerging countries have faced banking and debt crises more frequently as compared to developed countries. However, the sovereign debt crises of 2011 in the European region raised the debt-to-GDP ratio to an unprecedented level for developed countries. A high degree of connectedness between financial and fiscal sectors originated from the banking crises in 2007 stirred up imbalances. In extreme circumstances, financial

crises may lead to sovereign defaults in the absence of resolution policies as guarantees involve moral hazard problems (Bordo & Meissner, 2016).

Most of the recent empirical literature on the subject has highlighted an inexorable connectedness between financial and fiscal stress for developed countries (Chau & Deesomsak, 2014; Mody & Sandri, 2012; Tagkalakis, 2013). Nonetheless, the empirical literature on the interconnection between financial and fiscal stress is scant in terms of modeling and country coverage. For example, Magkonis and Tsopanakis (2016) have gauged the international transmission between financial and fiscal stress for G5 countries. The present study aims to enrich the existing in the following direction. First, it brings novelty to the existing literature on the interconnection between financial and fiscal stress by incorporating political risk as an important control variable for interconnection analysis. Second, it explores the dynamic impact of financial and fiscal shocks through generalized impulse response functions and variance decomposition methodologies. Third, it extends the analysis of the interconnection between financial and fiscal stress for three blocks of countries, namely G5, BRICS, and other emerging countries; thus, helping to evaluate differences across emerging and developed countries.

1.5 Objectives of the Study

Based on the issues highlighted in the above discussion, the objectives of this study are:

1. To extend the conceptual frameworks for measuring and determining financial and fiscal stress by incorporating political shocks.
2. To modify the conceptual framework for determinants of financial and fiscal stress by incorporating the institutional quality as a source of financial stress.

3. To develop new indices of financial and fiscal stress at country, region, and composite levels for sampled emerging middle-income, and developed countries.
4. To empirically explore the determinants of financial and fiscal stress for sampled emerging middle-income countries.
5. To evaluate the conditional role of country-specific factors in the transmission of financial stress from developed to emerging and middle-income countries.
6. To understand how financial and fiscal stresses are dynamically related to each other.

This study relies on political economy aspects while measuring stress indices and determine their sources. The financial stress indices feature not only the financial risk but also include economic and political risks as the indicators of financial stress. Similarly, fiscal stress indices incorporate political risk as an important indicator of FisSI besides short, medium, and long term dimensions of rollover risk. The present study poses some serious questions. for example, either political risk is an important element in the construction of financial and fiscal stress indices or not.

The empirical inquiry for determinants of financial and fiscal stress got motivation from the theoretical frameworks that acknowledging the fourth-generation theoretical models of crisis. This study investigates how institutional factors are important to determine financial and fiscal stress. Further, the present study also answers the question as if there exist any differences in financial (or/and fiscal) stress across the sampled country grouping. It further explores as to how the

country characteristics play a role in the stress transmission process from developed to emerging countries?

This study further explores the interconnection between financial and fiscal stress within three blocks, namely BRICS, other emerging economies (OE), and a group of 5 developed countries (G5) covering the panel data for 2000-2016. In this exploration, we try to provide satisfactory answers to several questions. For example, whether financial and fiscal stress are interconnected in a dynamic setup within each block. To put it differently, either there exist any empirical inter-linkages between the financial and real side of the economy within two emerging and one developed country blocks.

1.6 Significance and Contribution of the Study

The present study can be helpful in several ways, First, newly developed composite FinSI and FisSI serve as a barometer that helps policymakers to study the stability of the financial system and the fiscal sustainability of the government. This can help to curtail systemic and rollover risk or even predict the future financial and fiscal crisis. Second, new stress indices serve as risk assessment tools for investors. They would prefer to invest in an environment where systemic and rollover risks are manageable. Third, stress indices enable the financial market regulators to distinguish between stressful and calm periods. This helps them formulate unconventional and well-coordinated policies to avert the financial crisis.

Fourth, the institutional factors are the trigger factors for financial and fiscal stress. The only study considering the institutional factors in explaining financial stress was conducted by Abdessatar and Rachida (2013). However, their model was miss-specified as they explicitly ignored the non-institutional determinants of financial stress in the context of emerging. The present study makes a strong case to

provide empirical insights that can help regulators as to how the efficacy of such institutions can be enhanced. Fifth, empirical investigative about the dynamic interlinkages between the financial and real economy within various regions suggests that regional policies and coordinated response can discourage the feedback loops between the sovereign and banks. Sixth, the present study attempts to evaluate the role of regional financial contagion in determining financial stress. This provides a caution to the monetary authorities to reassess the pace of financial globalization. Lastly, the present study enriches the literature on the interconnection between financial and fiscal stress within emerging and developed countries in several ways: First, we study the interconnection for various blocks which can help to design regional policies to counter adverse implications. Second, we employ VAR analysis to provide an assessment of feedback impacts to the policymakers. This assessment can help them better understand the inter-linkages between the real and financial sectors and hence, formulate policies to curb adverse feedback loops.

1.7 Organization of the Study

This study is organized in the following chapters. Chapter 2 reviews theoretical as well as empirical literature on measurement, determinants, and interconnection between financial and fiscal stress. We build an empirical model, develop an econometric methodology, and discuss data in Chapter 3. Chapter 4 documents results and discussion on the measurement of financial and fiscal stress. In Chapter 5 we report detailed empirical results on determinants of financial and fiscal stress. Chapter 6 analyse the findings of the interconnection between financial and fiscal stress. The last chapter concludes the study and proposes certain policy guidelines.

Chapter 2

Literature Review

This chapter is organized into the following sub-sections. The first sub-section discusses the literature on the identification and measurement of financial stress whereas the second sub-section documents literature on the construction and identification of fiscal stress. The third sub-section explores the determinants of financial stress while the fourth sub-section reviews the literature on the factors driving fiscal stress. The last sub-section describes the literature on the interconnection between financial and fiscal stress.

2.1 Literature on Identification and Measurement of FinSI

FinSI measures the degree of systemic risk in the financial system as a whole since separate indicators for various segments of the financial system cannot evaluate the systemic risk.

2.1.1 Identification of FinSI

The literature proposes two approaches to identify financial stress. The first approach, expert-based, relies on the judgment of the experts to identify quantitively known periods of financial stress. This approach depends on various arbitrary thresholds to identify stressful and calm periods. A few episodes likely remain uncaptured as the approach involves subjectivity. But owing to the simplicity of the approach, most of the existing literature is based on this methodology.

The second approach relies on model-based methodologies, where Markov-Switching (hereafter MS) and Threshold Autoregressive (hereafter TVAR) models distinguish between into high and low-stress regimes. This approach is more

rigorous and complex as it uses thresholds to identify when an episode of high stress is realized. More recent literature constructs FinSIs using model-based methodologies and identifies episodes of financial stress endogenously. For example, Duprey, Klaus, and Peltonen (2017) built country-specific FinSIs for the 27 European Union countries using portfolio theory that allows time-varying cross-correlations in sub-markets. They propose novel model-based methodologies to detect stressful periods. They believe that the expert-based chronology of events may be biased as it relies on the perceptions of the experts. Their study shows that a model-based approach explains 83 percent of the exert-based episodes of systemic stress. In a similar study, Chatterjee, Chiu, Duprey, and Hoke (2017) built monthly FinSI for United Kingdom (hereafter UKFinSI) for the period 1970-2015 and evaluate the systemic importance of stress components. They combine components of UKFinSI from six markets, namely equity, government bond, foreign exchange, corporate bond. money, and housing markets. They apply a correlation-based portfolio theory to construct FinSI. They apply a model-based methodology to conclude that small shocks create high stress if the economy is in a stressful regime. Likewise. Cambon and Estevez (2016) built monthly FinSI for Spain over the period April 1987-March 2015. They use both MS and TVAR to identify periods of high stress. MS methodology highlights three regimes, namely high, intermediate, and low stress. It identifies 12 percent of observations under high financial stress regimes. TVAR estimates threshold values as 0.2659 and 0.4903 where periods having values over 0.4903 are regarded as high-stress periods while periods consisting value below 0.2659 are ranked as a low-stress period.

2.1.2 Measurement of Financial Stress

Literature suggests four aggregation methodologies to combine the components of financial stress index across countries. These methodologies are variance equal weights, principal component weights, portfolio theoretic weights, and credit weights. However, the superiority of any methodology is not yet proven. Plenty of literature on FinSIs accumulated during the past decade for individuals as well as groups of countries. For example, in a seminal paper, Illing and Liu (2006) apply all the four aggregation methodologies in the construction of FinSI for Canada using daily data for the period 1981-2010. They show that the credit aggregation method is superior as it minimizes Type I and Type II errors[6] for the survey-based data. Yet in another study, Oet, Dooley, and Ong (2015) develop FinSI for the US economy and conduct the robustness analysis for alternative weighting schemes, namely equal market weights, credit weights, portfolio theoretic weights, and principal component weights. The study considers indicators from the credit, funding, real estate, securitization, foreign exchange, and equity markets and compares alternative weighting schemes against a volatility-based benchmark series, and identifies disruptions in the specific market through stress decomposition. They find a dynamic Principal Component Analysis (hereafter PCA) is a superior methodology. Most of the literature uses equal weight and PCA to check the robustness of the aggregated stress indices (Sandahl et al., 2011). Overall, the literature suggests that the computed indices are sensitive to the reference period and weighting schemes.

Another strand of literature applies correlation-based methodologies to capture abrupt changes in systemic risk. For Example, Hollo, Kremer, and Marco (2012) construct composite indicators of Systemic Stress (hereafter CISS) for the European

[6] Type I error is the probability of failure to signal a crises whereas Type II error refers to the probability of signaling a crises falsely.

financial system. They incorporate 5 sub-markets, namely banking, non-banking, money market, securities, and currency market. They consider 15 market-based individual stress indices based on five market segments. The constructed FinSI relies on aggregation methodology based on portfolio theory. A high correlation of the sub-indices reflects high systemic risk. They conclude that the index suits well for real-time measurement and monitoring of frictions in the financial system. Later on, many researchers develop FinSIs based on Hollo et al. (2012). For instance, Louzis and Vouldis (2012) measure systemic stress for the Greece economy. They capture time-varying correlations through data-driven multivariate GARCH models. Their study reveals that the index carries substantial predictive power to identify systemic events.

Numerous studies construct FinSIs and investigate the transmission of stress for emerging economies. For instance, Balakrishnan et al. (2011) measure FinSIs for 25 emerging economies and analyze the spillover of financial stress from advanced to emerging market economies. They infer that the transmission of financial stress is more intense during stressful periods than tranquil ones. Extending the evaluation of stress transmission. Park and Mercado (2014) compute FinSIs for 25 emerging economies and study the transmission of financial stress within the emerging countries. To measure FinSI, they select indicators from equity, debt, banking, and foreign exchange market. Their study uses quarterly data for the period 1992-2012. The results indicate that financial stress transmits to other emerging economies in the region. Moreover, the study infers that non-regional transmission is important for European and Latin American regions.

A few studies examine the role of economic factors and credit stress in constructing stress indices besides the financial components. For example, Cevik,

Dibooglu, and Kenc (2013a) develop monthly FinSI for Turkey for the period 1997-2010. They believe that external debt, an economic factor, deters the stability of the financial system through debt overhang.[7] They conclude that FinSI explains well all recessionary episodes in Turkey. Cevik, Dibooglu, and Kutan (2013b) build monthly FinSI for 5 emerging countries for the period 1995-2010 and acknowledge the role of economic factors besides financial factors. They include banking risk, stock market volatility, sovereign debt spreads, exchange rate market pressure index, external debt, and trade finance. They show that FinSIs account for 34-58 percent of the total variation in selected variables. A similar study for the Malaysian economy focusing on external debt as component of FinSI finds that the index reflects overheating of financial markets during episodes of higher financial stress. Such periods call for policy action to mitigate stress and stabilize the banking sector (Dahalan, Abdullah, & Umer, 2016).

The non-economic components for financial stress gained importance in the recent theoretical literature. Conceptually, higher political risk is regarded as a threat to financial stability as it alters the outcome of the economic policies (Waszkiewicz, 2017). Surprisingly, the empirical work on the measurement of financial stress thoroughly ignored the political dimension of risk as a component of financial stress.

To sum up, the current state of literature pinpoints several unsettled issues. First, the role of political risk, an important non-economic indicator of a composite index, is not yet incorporated in the empirical literature. Including political risk as a component of FinSI may improve the predictive power of FinSI (Danielsson & Macrae, 2016; Dziawgo, 2013; Waszkiewicz, 2015, 2017). Second, analyzing the

[7] Debt overhang refers to a situation when a country accumulates very large debt, which restricts its ability to take new loans. This diminishes the incentives to invest. Additionally, excessive liabilities hinder access to credit from international market.

severity of crisis gets little attention in the earlier literature as databases measured crisis by binary variables (Balakrishnan et al., 2011; Laeven & Valencia, 2013). They only point out the absence or presence of a crisis (Laeven & Valencia, 2008, 2012, 2013; Reinhart & Rogoff, 2009). Such measures fail to identify the periods of financial disruption and near-miss events (Oet et al., 2015). Third, existing studies assign little attention to system-wide events and securities markets and rely on crisis originating from currency, the banking sector, and the debt market. Finally, most of the cross- country literature ignores the role of credit stress in the construction of FinSI with a few notable exceptions at country level (Cevik et al., 2013a; Dahalan. Abdullah, & Umar, 2016). To account for these unsettled issues. this study builds FinSIs for emerging and developed countries.

2.2 Literature on Measurement and Identification of FisSI

Fiscal stress can be defined as the inability of the government to rollover the risk. Although the literature on fiscal stress dates back to 1975 at the municipal and state levels in US states, it has gained substantial importance after the European sovereign debt crisis in 2011. The recent literature mainly focuses on two aspects. namely measurement of fiscal stress and identification of its occurrence. Both these aspects are discussed below in some detail.

2.2.1 Literature on the Measurement of Fiscal Stress

The empirical and theoretical literature on fiscal crisis and early warning indicators started to flourish more rigorously after the European Sovereign debt crisis. Using the signaling approach, Baldacci, McHugh. and Petrova (2011a) construct aggregate FisSI by accounting for fiscal variables only. This pioneering study proposes two complementary tools to assess rollover risk. namely fiscal vulnerability index and FisSI. A combined measure of rollover risk is calculated by

averaging fiscal vulnerability and stress indices for a group of developed and emerging countries. The study shows that the pressure of the aging population and weak fundamentals amplify rollover risk in developed countries, whereas exposure to maturity, exchange rate risks, high debt levels, and fiscal imbalances contribute to rollover risk in emerging countries.

In a subsequent study, Baldacci, Petrova, Belhocine, Dobrescu, and Mazraani (2011b) extend the definition of fiscal crisis by incorporating an absolute fiscal crisis as well as extreme financing problems. They apply a new definition to quantify the risks associated with fiscal sustainability. The empirical results confirm an elevated level of fiscal stress for developed countries, especially in periods of financial stress. In contrast, fiscal stress stays low in emerging countries which are characterized by large fiscal buffers and positive growth.

Similarly, Berti et al. (2012) analyze fiscal stress over the period 1970-2010. The study applies a signaling approach to detect fiscal stress by focusing on 27 European Union (hereafter EU) counties. They incorporate financial, fiscal, and macroeconomic variables as indicators of fiscal stress. The findings suggest that financial and macroeconomic variables are far more important than the fiscal variables in predicting fiscal stress. The study further shows that composite fiscal stress indicators perform much better in assessing fiscal stress than the financial and fiscal variables alone.

Based on the work of Berti et al. (2012), De Cos, Moral-Benito, Koester, and Nickel (2014) introduce country-specific thresholds in early warning indicators of fiscal stress. They believe that country-specific thresholds suit well to the heterogeneous nature of the dataset. The study uses a signaling approach for 27 European countries covering the period 1975-2010. Overall, results indicate that

thresholds contribute significantly to the predictive power of the system. Also, country-specific thresholds carry higher signaling power than the common thresholds. Out of sample predictions conclude that country-specific thresholds improve the reliability of the indicators.

More recently, Magkonis and Tsopanakis (2016) built FisSIs for G5 countries by employing quarterly data for the period 1980-2014. The study uses PCA and variance equal approach.[8] The study combines five variables namely interest rate growth differential, structural balance, net debt, fertility rate, and age dependency ratio to construct composite FisSI. The empirical findings confirm the deterioration of fiscal stance and a rise in fiscal burden during the period of the global financial crisis.

A few studies emphasize the use of market-based measures of fiscal vulnerabilities. This view differs from the policymakers as it focuses on short-term vulnerabilities. For example, Dufrenot, Gente, and Monsia (2016) propose new methodologies to assess fiscal vulnerabilities in Euro Area countries.[9] Their study pinpoints that besides financial stress, macroeconomic imbalances are also important for the measurement of fiscal stress. Fiscal stress is defined in terms of deterioration in financing conditions in sovereign bond markets. Stress in public accounts is captured through the perception of investors about fiscal risk. The study shows that high financial stress and macroeconomic imbalances exert pressure on public finances, which raises fiscal stress for the selected countries. In such a situation, the fiscal policy fails to reduce fiscal stress.

[8] Variance equal approach assigns equal weigh to each variable while aggregating the variables as an index.

[9] Euro area countries considered for analysis are Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain.

Some of the existing literature on the measurement of fiscal distress focuses on the fiscal situation of the local government. For example, Gorina and Maher (2016) propose a new behavioral index of fiscal distress for city and state governments of the US covering the period 2007-2012. This index is based on the information from the Comprehensive Annual Financial Reports (hereafter CAFRs). They consider historic episodes of distress at the state level and built a dichotomous distress indicator based on the fiscal health of the states. The index reflects the actions and behaviors of the government and the difficulties faced by the governments to curtail fiscal distress. Similarly, Arnett (2012) constructs four-yearly indexes for fiscal stress at budget, cash, long-run, and service-level solvency for the USA states. The study uses eleven financial indicators calculated from state CAFRs. These indicators are used to create these indexes for all fifty states over the period 2002-2009. The descriptive analysis compares state fiscal stress levels (grouped into low, moderate, and high fiscal stress by cluster analysis) to state economic growth rates, state responses, and institutional factors yielding several findings. First, states do not use an incremental or punctuated equilibrium strategy in responding to fiscal stress; nor do their responses follow the pattern predicted by Cutback Management Second. institutional factors affect both the levels of fiscal stress and state responses to fiscal stress.

2.2.2 Identification of Fiscal Stress

Several studies are conducted to build a database for periods of fiscal stress. The first contribution to this end was made by Baldacci et al. (2011a). They identify fiscal stress by four criteria, namely default, and restructuring of public debt, financing needs in the shape of IMF-supported programs, implicit defaults, and worsening market access. Based on only fiscal indicators, they list down 39 and 135

episodes of fiscal stress in developed and emerging countries respectively over the period 1970-2010.

Taking the identification of fiscal step a step ahead, Kim, Kim, and Lee (2015) develop a new database for identifying fiscal crisis. The study extends the identification literature in various dimensions: First, it analyzes a large dataset of 188 IMF member states countries covering the period 1970-2015. Second. this study relies on an enhanced criterion for stress identification as it introduces two new sub-criterion namely domestic arrears accumulation and loss of market access. Third, it highlights a larger number of episodes compared to the previous studies. Fourth, the past studies focus on only default on debt while this study relies on fiscal crisis. The study reports 436 episodes of fiscal crises, with the largest number of episodes appearing in low-income countries (171) and developed countries account for only 25 episodes.

Later on, Bruns and Poghosyan (2018) also extend the database of Baldacci et al. (2011a) for fiscal stress episodes. They account for both fiscal and non-fiscal indicators to assess vulnerability for fiscal stress. Their study reports 41 and 160 episodes of fiscal distress for developed and emerging countries respectively. Their findings are robust to the early warning methodologies applied to identify various crises.

The empirical literature on the measurement of fiscal stress is developed mostly after the European debt crisis. Most of the studies rely on the economic risk that is transmitted into public accounts. Moreover. only fiscal factors are considered for the measurement of fiscal stress. The process of policymaking is governed by politicians and interest groups. Thus. poor quality of governance generates the political risk that may explicitly be taken as an indicator of fiscal stress. To date. no study has been

conducted by incorporating political risk in the construction of FisSI. This study considers the role of fiscal, macroeconomic as well as institutional factors in the construction of fiscal stress index.

2.3 Theoretical and Empirical Literature on Determinants of Financial Stress

Theoretical literature mentioned two approaches for conceptualizing the determinants of crisis, namely panic-based and fundamental-based approaches. The panic-based approach postulate that the financial crisis surface suddenly; it carries an element of panic (Friedman & Schwartz, 1963; Kindleberger & Aliber, 1978). Moreover, fundamentals do not matter rather crises reflected the failure of coordination. Later on, theoretical models for the banking crisis are designed on a panic-based approach (Bryant, 1980; Diamond & Dybvig, 1983). Such crises are self-fulfilling and they occurred only because investors perceive them to occur.

The second approach, fundamental-based, states that bad fundamentals are realized as negative information. This information further deteriorates the balance sheets of banks and governments (Allen & Gale, 1998; Chari & Jagannathan, 1988; Jacklin & Bhattacharya, 1988). These ideas are applied in the context of currency crises by Krugman (1979) and Obstfeld (1996). According to Krugman (1979), the crisis was an inevitable outcome of unsustainable fiscal and monetary policies. Thus, one may predict the currency crisis through weak fundamentals and balance of payments crisis.

Another strand of literature in the context of fundamental-based versus panic-based crisis relates to contagion. Contagion, the transmission of crisis from one to another nation, may origin purely from self-fulfilling beliefs. These beliefs were an

outcome of panic. However, theoretical literature supported fundamental for the spread of crises. For example, Kaminsky, Reinhart, and Vegh (2003) provide theoretical linkages between financial contagion and fundamentals. They believe that common information or similar conditions in various countries also contributed to contagion. Any collapse in one emerging country also forces investors to withdraw from other emerging countries characterized by similar conditions. Calvo and Mendoza (2000) present a model that highlighted learning and herd behavior about the fundamentals of other countries. This is regarded as another channel of contagion. Similarly, contagion can occur through trade linkages where the devaluation policy of export competing nation provokes retaliation from other countries Gerlach and Smets (1995). On the other hand, Kodres and Pritsker (2002) explain the financial linkage of portfolio rebalancing where a decrease in portfolio enforced rebalancing. This rebalancing reduced their holding in other countries and co-movement of prices. The fourth-generation models of financial crisis mention institutional factors besides the fundamentals and contagion process as potential determinants of a currency crisis.[10]

Empirical literature supports a fundamental based approach to the determination of crisis. Besides, as Gorton (1988) pinpoint the panic-based approach does not generate any testable implications. However, panics may weaken the fundamentals. This can amplify the existing crisis indirectly, that is, through failure in coordination.

Most of the existing empirical literature on the transmission of financial stress does not provide insights into the channels of transmission from developed and emerging countries to the domestic economy. As an exception, Balakrishnan et al.

[10] Ghosh and Ghosh (2003); Li and Inclan (2001); Rajan and Zingales (1998).

(2011) explore this issue for 26 emerging and 17 developed countries and conclude in favor of significant transmission of financial stress from developed to emerging countries. Their findings validate the viewpoint that emerging countries, which are characterized by deeper financial linkages with developed countries, are more affected by financial stress than developed countries. Financial stress in developed countries explains a 70 percent increase in the financial stress of emerging countries, indicating significant vertical financial contagion. Nonetheless, global factors and horizontal financial contagion transmit a little effect. Their study document an unprecedented increase in financial stress in the sampled countries during the global financial crisis of 2007-2008, surpassing the level during the Asian crisis. Interaction between country-specific vulnerabilities (current account surplus, fiscal surplus, and high foreign exchange reserves) and financial stress in developed countries indicate that strong macroeconomic conditions failed to shield emerging countries from stress transmission in periods of escalated financial stress as compared to calm periods.

Bussiere and Fratzscher (2006) propose a multivariate early warning system by pointing a bias in the existing binomial discrete dependent variable based early warning system (hereafter EWS). They believe that the existing EWS failed to distinguish between periods of financial stress and tranquility. This problem can be resolved either by dropping the crisis period from the sample and losing important information or by considering discrete dependent variables with more than two outcomes. The study especially tests EWS with three regimes; tranquil, pre-crisis, and post-crisis period; for 20 open emerging countries for the period 1993-2001. The findings show that multinomial EWS conveys better predictive power over binomial EWS. Moreover, these findings are robust.

Using the financial stress index (hereafter FinSI) developed by Illing and Liu (2006), Misina and Tkacz (2009) analyze whether business credit or asset prices determine financial stress in the Canadian economy. Both linear and non-linear models are estimated by exploiting quarterly data ranging from 1984 to 2006. They find that domestic credit is important in determining financial stress in linear models at both short and long horizons whereas asset prices better predict financial stress in the non-linear model.

Determinants of financial recovery and internal and external financial stress are analyzed by Aizenman and Pasricha (2012) for a sample of 107 developing and high- income countries. The study defines external stress as pressures from capital outflows and internal stress as pressures generated through falling stock prices. The study reveals that banking stress has increased the overall stress in developed countries more than in developing countries. Also, highly open countries with a large stock of debt face a huge reversal in capital inflow during the global recession. A high degree of openness enhances the exposure to global shocks but countries with developed financial markets, such as commodity exporters, experienced a little decline in stock prices. As far as internal financial stress is concerned, lower external debt, lower external assets, and liabilities yield a lower degree of internal financial stress. Furthermore, countries that possess greater external vulnerabilities before the crisis recovered slowly after the crisis.

Later on, Park and Mercado (2014) point out strikingly different findings in the existing literature that found financial stress to be transmitted from developed to emerging countries. They find that the shocks originating from emerging countries gained attention with the increasing presence of these countries in the global market. They analyze the determinants of financial stress for 25 emerging countries by

differentiating between the economic and geographic origin of countries. The finding confirms the existence of both horizontal and vertical financial contagion, the former originating from emerging countries and the latter from developed countries. Besides, sound macroeconomic conditions (current account surplus. fiscal surplus, and high foreign exchange reserves) help to mitigate the domestic financial stress in emerging countries. As far as global factors are concerned, a high global interest rate, indicating tight credit conditions in international credit markets, boosted financial stress whereas high global GDP, reflecting strong demand conditions in the global market, promote financial stability and lowered stress. Similarly, financial openness increased the vulnerability of countries to financial stress through more capital inflow and high volatility. In contrast, trade openness carried mitigating effects on financial stress through trade diversification. Impulse response and variance decomposition analyses confirm the findings of panel regression besides highlighting common regional factors for emerging Asia. Similarly, Fink and Schuler (2015) explore the transmission effects of the US financial shock for the eight emerging countries. They consider monthly data for the period Jan 1999 to Dec 2012 and observe that financial stress in the US not only brought significant volatility in emerging countries but also raised fluctuations at business cycle frequencies. The study finds evidence for spillovers from the US to emerging countries through financial linkages.

Yet in another study. Hwa (2015) investigate determinants of financial stress in ASEAN-5 countries by considering quarterly samples spanning from 1997 to 2013. The panel model is estimated by using global and country-specific variables in the first step. Residuals are extracted from the estimated model to strap away variations caused by global and domestic factors. Next. to extract common factors representing

financial contagion, principal component analysis on residuals is conducted. This common factor indicates the co-movement of stress amongst ASEN-5 countries. Results from various regression models show that an increase in World GDP (a measure of global business cycles) and the US financial stress carry a positive and significant influence on the financial stress index in open countries. The effect of financial contagion on financial stress is positive and significant. On the domestic front, ease in credit availability magnifies financial stress.

Inspired by fourth-generation models of crises, Abdessatar and Rachida (2013) emphasize the role of institutional quality in assessing financial stress in 21 emerging countries. They incorporate political instability, government effectiveness, voice and accountability, control of corruption, rule of law, and regulatory quality as the explanatory variables. Their findings suggest that better quality institutions stabilize the financial system. The study, however, ignores the role of other factors besides institutions.

In a recent study, Vasicek et al. (2017) pinpoint the leading indicators of financial stress for 13 OECD countries. They select 24 potential leading indicators of the financial crisis and applied the Bayesian model averaging. This averaging identifies the relevant variables. The selected variables are considered as determinants of financial stress in both the panel model and model at the individual country level. Both models performed well within the sample but failed to predict the financial crisis. Furthermore, potential determinants of financial stress vary across countries and various episodes of financial stress. These findings confirm the conclusions made by Slingenberg and De Haan (2011), that is, responding to events of financial stress is a formidable task for policymakers that require flexible policy tools.

In a recent study, Poonpatpibul, Tan, Liu Xinyi, and Cho (2018) construct FinSIs for 8 emerging countries, including ASEAN, Korea, Japan, and China. They employ daily data for 9 elements of financial stress encompassing five financial markets. The study applies PCA to construct individual country FinSIs which are aggregated using GDP and significant financial linkages as the weighting scheme. Their findings suggest that FinSIs predict well the global, regional, as well as country-specific episodes. The regression method indicates that the global financial crises affect the overall financial stress for all countries in the sample whereas Euro area crises only influence the ASEAN region. The further show that incidences in China's financial sector carried spillovers for the regional stock and currency markets

The above review of the literature highlights some issues. First, the literature concerning leading indicators of financial stress is limited as most of the literature is developed for banking crises and little is investigated about systemic risk. Second. the literature lacks a unique theoretical model that can guide the choice of indicators. Third. the choice of indicators is made by various criteria. making it difficult to predict financial stress and formulate the policies to curb such episodes. Fourth. how the quality of financial policies and institutions affects financial stress is a relatively novel but not fully resolved area of the research.

2.4 Theoretical and Empirical Literature on Determinants of Fiscal Stress

Theoretical studies concerning fiscal stress are based on the distinction between underlying vulnerabilities and fiscal crisis. The former simply reflects the risk that countries are highly vulnerable to crisis. However. a fiscal crisis may be realized

through external factors rather than domestic vulnerabilities. The early theoretical literature focuses on debt defaults and emphasizes the role of fiscal fundamentals in measuring underlying vulnerability. For fiscal crisis, a theoretical model developed by Detragiache and Spilimbergo (2001) states that the negative shocks to fundamentals generate an equilibrium response of sovereign default. The next generation of models emphasizes the role of non-fiscal fundamentals besides fiscal fundamentals. For instance, Calvo (1988) stresses that self-fulfilling expectations and non-fiscal factors served as potential sources of fiscal stress. Their model demonstrates the possibility of multiple equilibria when the government fails to service its debt.

A fiscal monitoring framework relying on an early warning system[11] to assess rollover risks is developed by Cottarelli (2011) and Cottarelli et al. (2014). The rollover risks stem from three broad dimensions, namely baseline fiscal variables, shocks to baseline variables, and other factors. Fiscal sustainability depends on non-fiscal country-specific factors that indirectly affect fiscal accounts. Several cautions are made while applying this framework to formulate a summary measure of risk, such as dependence in various dimensions of risk and varying the relevance of different dimensions for different countries. A caution about fiscal policy design is that fiscal risk is not all that matters in shaping fiscal policy rather fiscal policy at times serves as an automatic stabilizer to reduce business cycle fluctuations.

The empirical literature concerning the indicators of fiscal stress flourishes soon after the European debt crisis of 2011. Earlier studies on the determinants of crisis emphasize the role of fiscal determinants only. However, the empirical literature on

[11] Early warning system for fiscal stress is a complex process that signals building up of fiscal stress early on, provides time to formulate policies to counter adverse development to prevent occurrence of crisis De Cos, Koester, Moral-Benito, and Nickel (2014).

the determinants of the fiscal crisis is limited. In a seminal study, Hemming and Petrie (2002) propose the theoretical considerations for fiscal vulnerability. They pinpoint four vulnerability indicators, namely, wrong specification of initial fiscal position; sensitivity of short-term fiscal outcomes to risk; threats to fiscal sustainability, and weaker structure. But their work does not contribute to the methodological end of constructing a composite fiscal stress index. Similarly, Hemming et al. (2003) study the sovereign debt crises and showed that the short-term fiscal debt, debt denominated in foreign currency, and deficit are potential fiscal triggers for currency, debt, and banking crises in 29 emerging middle-income countries. Later on, Baldacci et al. (2011a) conduct a comparative study to assess rollover risk by explicitly constructing the fiscal stress index. They employ only fiscal indicators for both developed and emerging countries. Their study constructs two aggregate indices, namely fiscal vulnerability and fiscal stress, for both emerging and developed countries. The fiscal vulnerability index measures the risk that a variable diverges from its historic peer group average. The larger is the deviation worst is the performance of this index. The fiscal stress index measures the rollover risks associated with problems of unsustainable high levels of public debt. The empirical results indicate an elevation of rollover risk in developed countries characterized by weaker fiscal fundamentals. However, emerging countries that are characterized by strong fiscal balances, lower debt, positive growth, and favorable long-term demographic features are exposed to a relatively lower degree of rollover risks.

In a subsequent study, Baldacci et al. (2011b) study fiscal stress more extensively. Their work is based on a broader definition of fiscal crisis by incorporating both debt default and near default events. This index provides an early

warning indication of a fiscal crisis where a crisis is redefined to incorporate extreme financing problems besides fiscal distress. The fiscal stress index is constructed for 29 developed and 52 emerging countries from 1970 to 2010. Their findings confirm that gross financing needs, increased age-related expenses, and solvency risks are important for predicting fiscal stress in developed countries. Contrary to that, the main driver of fiscal stress is liquidity constraints for emerging countries. The regional analysis suggests that there exist significant regional differences within developed countries, with North America experiencing the highest degree of fiscal stress. While for emerging countries, the highest exposer to fiscal stress is observed in emerging Europe.

Relatively recent literature suggests the role of non-fiscal determinants for determining fiscal crisis besides fiscal triggers. This literature is established with the viewpoint that the consideration of only fiscal fundamentals could miss-specify fiscal distress. For example, Berti et al. (2012) argue that fiscal, macroeconomic, and financial imbalances are interconnected. Their study investigates the joint role of fiscal, financial, and competitiveness variables to detect fiscal risk by applying a non-parametric signaling approach to 33 countries. They conclude in sharp contrast to earlier studies as they find financial-competitiveness factors are far more significant predictors of fiscal stress relative to fiscal factors. Further, the authors suggest that composite indicators of fiscal, financial, and macroeconomic variables have a far better signaling performance than individual variables. Later on, Sumner and Berti (2017) extend the dataset of Baldacci et al. (2011b) and stress the role of macro-financial variables in explaining fiscal distress events.

In a similar study, Koester (2014) claim that the interdependencies between fiscal, financial, and real sectors may be accounted to address the adverse impact of

feedback loops between the sovereign bond market, financial sector, and the real economy. They consider a sample of 33 developed countries for the period 1970-2013 and conclude that sustainability risks are directly stemming from fiscal imbalances as well indirectly from macroeconomic and financial imbalances. A major drawback of early warning methodologies is the consideration of fiscal vulnerability in a homogeneous fashion across all countries in the sample.

Allowing for country-specific fiscal vulnerability in the signaling approach of early warning methodologies, De Cos, et al. (2014) explore sources of fiscal stress for 11 Euro Area countries. Their study concludes in favor of both financial and fiscal variables as the potential drivers of fiscal stress. They further infer that the incorporation of country-level thresholds reduces the likelihood of prediction errors. Their analysis suggests that allowing for country-specific thresholds and efforts to improve access to fiscal data may improve the effectiveness of the early warning systems. However, the strict fiscal rule is recommended relative to the early warning indicator.

A new framework for fiscal vulnerability is developed by Stoian, Obreja Brasoveanu, Dumitrescu, and Brasoveanu (2015) for the European countries in which vulnerability is measured by two types of indicators. First are the level indicators, such as the size of cyclically adjusted balance and public debt. Second, are the change in the level indicators. The vulnerability index takes values between 4 and 0, with the former referring to extreme vulnerability and later reflects no vulnerability. In extreme vulnerability, both indicators signaled vulnerability, and values such as 1, 2, and 3 represent any one or both of the indicators detect vulnerability. They emphasize that the new framework is helpful in the provision of information as to how fiscal policy can be altered to avoid exposure to risks. Credit

default swaps (hereafter CDS) are used as a proxy for market sentiments and a correlation between market sentiments and fiscal vulnerability is assessed for 17 European Union countries covering the period 2008-2013. The analysis reveals that CDS are high and significant for cases of extreme vulnerability, forcing investors to demand a higher risk premium.

More recently, Magkonis and Tsopanakis (2016) perform Extreme Bound Analysis to determine robust indicators of fiscal distress. They mention that a major drawback of the early warning system is that it depends on a predetermined set of determinants while assessing leading indicators of fiscal distress. Their investigation considers 37 indicators of fiscal distress based on theoretical considerations and existing literature. This study updates the dataset of Baldacci et al. (2011b). Consideration of both fiscal and non-fiscal indicators enhances the predictive power of crises by 29 percent. Their findings are consistent with Berti et al. (2012).

Another strand of literature highlights the role of quality of governance on fiscal stress. However, the empirical literature in this strand is very limited. The only prominent study, to the best of our information, is conducted by Caceres and Kochanova (2012). Their study utilizes two aspects of governance by aggregating various indicators of governance into internal and external accountability. They find that both indices are significant for the incidence of fiscal stress. However, their study only accounts for the incidence of fiscal stress through a binary variable.

To sum up, a detailed review of the literature concerning the determinants of fiscal stress figures out various issues. First, existing studies for exploring determinants of fiscal are mostly conducted for European countries with limited literature on emerging countries. Second, there is no established theoretical literature concerning determinants of fiscal stress whereas empirical literature is broad but

largely inconclusive. Third, the empirical literature on how political risk affects the magnitude of fiscal stress is not yet established enough while the political risk is much more pronounced in emerging countries as compared to developed countries. Only the study of Caceres and Kochanova (2012) investigate the effects of good governance on the incidence of fiscal stress. Fourth, the phenomenon of crises overlap is yet to be empirically verified despite the realization that interconnections do exist between financial and fiscal variables. We take up these gaps to re-explore the sources of fiscal stress.

2.5 Literature on the Interconnection between Financial and Fiscal Stress

The literature on the subject is classified into two sub-sections. The first sub-section briefly documents theoretical developments in the literature on the interconnection between financial and fiscal stress while the second sub-section provides empirical evidence on the interconnection between financial and fiscal stress.

2.5.1 Theoretical Literature on the Interconnection between FinSI and FisSI

The theoretical literature on interconnection is very extensive. Pioneering works, under traditional approaches, quantified the effects of banking crises separately than financial and fiscal crises. There exists a fair degree of disagreement on the issue of whether banking panics reflected liquidity panics by causing monetary instability or over-indebtedness (Friedman & Schwartz, 1963; Minsky, Altman, & Sametz, 1977; Wyplosz, 2012).

By the mid-1980s, greater financial market integration and abandonment of financial repression leads to the development of new theoretical models. Based on

inherent banking instability, Escolano, Shabunina, and Woo (2011) emphasize the maturity mismatch originated from the inherent instability of banking. First-generation models attribute fundamental imbalances as a major cause of crises (Krugman, 1979). Their seminal work explains how the abandonment of a repressed financial system resulted in dynamic interaction between financial and fiscal crises. Fear of contagion raises the use of public guarantees of banking sector liabilities as well as contingent liabilities in turbulent periods. As a consequence, fiscal deficits and debt increase significantly. Over borrowing and fiscal deficits, financed via inflation tax, raises asset prices that collapse with foreign shocks bringing systemic banking and currency crises, abandonment of fixed exchange rate, and nationalization of the banking system. Similar results are quoted by Fedelino, Ivanova, and Horton (2009) for the emerging countries.

The decade of the 1990s was marked by the development of second-generation models of currency crises. These models stressed the role of expectations and multiple equilibria. Besides that, macroeconomic models with an explicit role of financial frictions dominated the economic landscape (Bernanke, Gertler, & Gilchrist, 1999; OECD, 2008). Later on, the third generation of models focused on the notion of 'contagion' where crisis beginning in a nation may transmit to other nations through liberalized global markets (Gorina & Maher, 2016).

More recently, a relatively more devastating Eurozone crisis regain interest in studying a strong connection between financial and fiscal (Sumner & Berti, 2017). European countries are engaged in bailout packages, either after transmission of sub-prime mortgage crises from the US or their house price booms driven by bank credits. Such bailouts increase the fiscal deficits and debt-to-GDP ratios. Reinhart and Rogoff (2009) explain that expansionary fiscal policy as a result of falling taxes

piled up the deficits much more than debt-to-GDP ratios. Such vulnerabilities shown by the European region reflects a lack of confidence in the international bonds market, limits of monetary union without fiscal unions and weaker banking union.

Another theoretical model developed by Cruces and Trebesch (2013) describes the interconnection between sovereign risk and the integrated banking sector. Financial integration is introduced in the model as a condition that government debt in a country may be used as collateral in the financial system of all countries that are part of monetary unions. In absence of fiscal integration, international financial integration help countries to diversify portfolio (thereby lowers the cost of default) and enjoy positive welfare gains but carried a risk of financial contagion. However, they highlight the need for further research to determine the optimal level of fiscal integration to maximize gains from financial integration. Similarly, Acharya et al. (2014) mention a loop between the bank and sovereign credit risks. An increased sovereign risk lowers the government guarantees and created the feedbacks into the financial sector.

2.5.2 Empirical Literature on Interconnection between FinSI and FisSI

Numerous studies are conducted to assess the linkages between financial and business cycles. For example, Claessens, Kose, and Terrones (2011), in a pioneering study, decompose financial cycles into credit, housing, and equity prices. Their study concludes that financial and business cycles are related to each other. Later on, similar results were confirmed by Claessens, Kose, and Terrones (2012). They extend the time dimension, country coverage, and consideration of both the up and downside of cycles and examine the duration and strength of recoveries and recessions.

Besides studying the relationship between financial cycles and fiscal position, a few studies analyze the characteristics of the financial cycles and inferred that equity and housing prices explain the financial cycles. Their findings further suggest that financial and business cycles are a related but different phenomenon in terms of their asymmetric responses in the contraction phase, with the former having a longer contraction phase than the latter (Drehmann, Borio, & Tsatsaronis, 2012).

Another line of research empirically tests the feedback loops in financial and fiscal instability. For instance, Tagkalakis (2013) considers a sample of 20 OECD countries and concludes that financial instability requires bailouts that stimulate fiscal imbalances and a subsequent sharp surge in debt. They show that countries with large financial sectors experience a more substantial increase in debt followed by the financial crisis. In a subsequent study, interdependence and interconnection of financial cycles on fiscal position are investigated by Magkonis and Tsopanakis (2014) for G7 countries. They use quarterly data and structural vector autoregressive model (hereafter SVAR) to analyze the effects of both financial and fiscal stress on the macroeconomy. They show that shocks to financial and fiscal stress generate a negative response of real GDP, inflation, and interest rate whereas the response of the nominal exchange rate is mixed. The response of fiscal stress to shocks in financial stress is unequivocally positive for all economies whereas reverse is not always true.

Following a relatively novel methodology based on variance decomposition and network diagrams, Diebold and Yilmaz (2014) examine the connectedness of stock returns of 13 major US financial institutions before and during global financial crises. They find a very high degree of total connectedness, that is, 78.3 percent for the full sample. Volatility connectedness reached its maximum value of 89.2 percent

during September 2008; thereafter it subsided down to 70 percent by October 2009. The network diagram suggests a substantial increase in net pairwise directional connectedness during global financial crises. Using the same methodology, Fernandez-Rodriguez, Gomez-Puig, and Sosvilla-Rivero (2016) measure the connectedness of bond market volatility for the European Monetary Union. They find that sovereign risk premium increased in Euro Area after the sovereign debt crisis in 2011. An interesting finding is that the origin of interconnectedness relations shifted to peripheral countries as they experience a decline in directional and total connectedness during crises.

The methodology of Diebold and Yilmaz (2014) is later applied in a macroeconomic context. For instance, Magkonis and Tsopanakis (2016) examine the interconnection between financial and fiscal crises for G5 countries. They use quarterly data to analyze total, directional, and net spillover effects within and across sample countries. The positive net spillover index for Canada and Japan stresses the predominance of financial stress whereas the negative net spillover for Germany emphasizes that fiscal stress determines financial stress. Their work further employs the dynamic causality index proposed by Billio, Getmansky, Lo, and Pelizzon (2012) to assess the interdependence of stress indices for pre and post-global financial crisis periods. They conclude that the international transmissions are intensified following the global financial crises and mention making policies that help in synchronization of the financial cycles.

To sum up, a review of existing literature highlights that the empirical studies on dynamic spillovers between financial and fiscal stress are limited to developed countries. The only study that empirically tested the interconnection between financial and fiscal stress is for G5 countries (Magkonis & Tsopanakis, 2016).

Investigating these spillovers within emerging and developed countries is not done yet. We take up this issue in this analysis.

Chapter 3

Methodology

This chapter consists of three sub-sectors. The first sub-section builds the theoretical (conceptual) framework for measurement, determinants, and interconnection between financial and fiscal stress. The second sub-section explains the econometric methodology for the empirical models specified in the first sub-section. The third sub-section describes data and the construction of variables.

3.1 Theoretical Framework and Model Specification

This section provides the theoretical underpinnings of the present study. It comprises four sub-sections. The first sub-section develops a conceptual framework for measuring financial stress. The second sub-section extends an existing theoretical framework for the measurement of fiscal stress indices. The third sub-section develops the conceptual framework for determining financial and fiscal stress. The last sub-section presents the theoretical model for the interconnection between financial and fiscal stress.

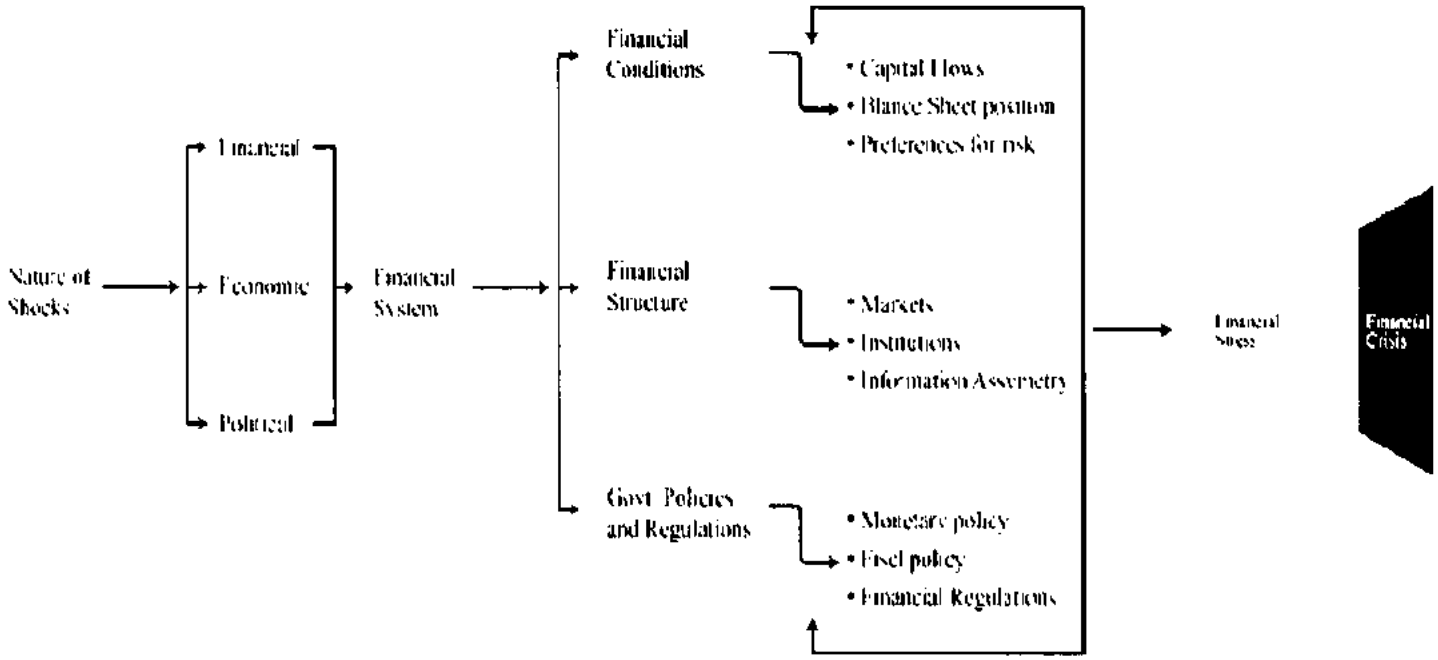
3.1.1 Definitions and Conceptual Framework for Measuring FinSI

Financial stress has no widely accepted definition and it is a very broad concept. Illing and Liu (2006) define it as a systemic continuous variable where extreme values indicate a crisis. According to Hakkio and Keeton (2009), financial stress refers to a state of increased uncertainty about the fundamental value of assets and behavior of investors, asymmetric information, and low preference to hold risky and illiquid assets. Balakrishnan et al. (2011) describe the periods of financial distress as the ones in which banks fail to play the expected intermediary role.

This study proposes a new conceptual framework for measuring financial stress that takes account of various types of risks faced by an economy. The diagrammatic elaboration is provided in Figure 3.1 is an extension of the pioneering work of Illing and Liu (2006) in several ways. First, the nature of shocks is explicitly defined in the new proposed framework for measuring the financial stress index. The figure reveals that shocks are broadly classified into financial, economic, and political nature. Financial shocks stem from various segments of the financial markets, such as banking, stock, foreign exchange, and debt markets whereas economic shocks originate from disturbances in real economic activity such as business cycles. Political shocks reflect the actions of the government that may stabilize or destabilize the financial system (Titman, Keown, & Martin, 2011). Second, the proposed framework differs from the existing conceptual underpinnings in the literature as it incorporates political shocks explicitly in the measurement of financial stress. We believe that the lack of political will on the part of policymakers, who are often politicians as well, exert pressures to conduct and execute sub-optimal policies. This generates political risk and, ultimately, deteriorates financial conditions and enhance financial stress in a financial system. Similarly, a recessionary output gap (this indicates economic risk) squeezes the supply of credit in the financial system. This credit crunch is translated into high financial stress. High financial stress encourages capital outflows, makes balance sheets highly levered, weakens the reserves position, and changes the risk preferences.

Figure 3.1 Proposed Conceptual Framework for Measuring Financial Stress

The figure elaborates on the impact of three types of shocks on the various dimensions of the financial system. These dimensions are financial conditions, financial structure, and government policies and regulations concerning the financial system. The intensity of the shocks determines the net outcome. If the shocks consist of low to moderate intensity, they generate higher financial stress. The shocks of higher intensity may create a financial crisis, a more severe outcome.



Source: Author's Constructions

Sometimes shocks may penetrate in a financial structure that is inclined to market failure, asymmetric information, and low quality of financial institutions. Additionally, sub-optimal policy responses and poor regulations impair the smooth functioning of financial systems in the wake of adverse shocks. For example, if monetary policy aims to stabilize prices without assigning due consideration to financial stability, the likelihood of financial stress increases. In extreme cases, this stress may become enormous and the economy may experience a financial crisis. Similarly, if the fiscal policy fails to minimize fiscal risks besides managing demand, fiscal stress increases. This may bring a feedback effect from fiscal to financial stress through linkages between the real economy and the financial system. Finally, poor regulations and excessive financial liberalization may enhance financial stress. Eventually, the magnitude of shocks and the extent of fragilities inherent in a financial system determines the intensity of financial stress.

Financial stress and financial crisis are related but different concepts. They are related as both signal disruptions in the financial system. However, they are different in terms of their severity. An adverse shock raises financial stress and makes the financial system highly vulnerable and unstable. Therefore, timely and optimal policy responses besides well regulated financial markets may help to avert crisis and financial stress stays manageable. On the other hand, if monetary and fiscal policies are not coordinated with financial market conditions, stress becomes enormous and this endangers the stability of the financial system with the possible occurrence of a financial crisis.[12] Besides, a highly integrated financial system makes it difficult to assess the severity of

[12] European debt crisis is a prime example of uncoordinated fiscal policies as the European Monetary Union lacks fiscal union and explicit commitments of bailouts.

stress and, hence, formulate appropriate responses that cater to adverse shocks. Thus, the remarkably high level of stress is an indication of a financial crisis.

Political risk is a widely acknowledged source of interruptions in financial markets. Quite often, political risk is a more serious concern besides financial and economic risks with a realization that this either shows a lack of will or increased or sub-optimal intervention of governments into economic affairs. Both these elements limit the scope and efficacy of economic regulations (Dziawgo, 2013). Likewise, Mei and Guo (2004) find that political risk contributes more than financial contagion during the financial crisis in emerging countries. Similar observations are made in another study that political bubbles carry more predictive power than credit bubbles in explaining the financial crisis (Herrera et al., 2014).

Politics create several problems in an economic system. These problems affect financial markets adversely. The first is the problem of public finance. Politicians often poorly manage public finances, which shapes up structural imbalances. These structural deficiencies impose a tight fiscal stance besides raising public debt, both of which have detrimental effects on financial markets. Fiscal authorities even lack vision as well as the will to resolve the debt problem, which creates a state of uncertainty in financial markets. As a consequence, the level of financial stress starts rising (Dziawgo, 2013). The second problem comes through political pressures to maneuver monetary policy, which limits the independence of central banks. Conceptually, central banks are regarded as independent entities to formulate monetary policy. But, in practice independence of the central bank is often compromised to the will and political support of politicians. Thus, pressure groups generally force the central banks to formulate sub-

optimal policies for their vested interests (Danielsson & Macrae, 2016; Dziawgo, 2013).[13]

The third problem is related to capital markets where corporate taxes are manipulated through political interventions. Tax-cut and exemptions are usually attained through political support for companies where politicians are the majority shareholders. Contrary to this, high taxes are imposed on other companies to generate revenues and to seek more support for doing politics (Dziawgo, 2013).[14] Waszkiewicz (2017) also raises similar concerns. These problems justify considering the political risk in the assessment of financial stability.

3.1.2 Definition and Conceptual Framework for Measurement of FisSI

3.1.2.1 Concepts of Fiscal Stress and Fiscal Crisis

Fiscal stress and fiscal crises are closely related concepts that are used interchangeably in the literature (Gold, 1995). However, based on the state of public financial conditions recent literature has differentiated between these concepts. Public financial condition is defined as the ability of the government to collect revenue, borrow funds, make public expenditures, and provide various public goods. Public financial conditions are a barometer of fiscal health, where the latter can be approached in a four-dimensional lens of solvencies (Jacob & Hendrick, 2013). These include the ability to meet immediate and or short-term obligations (cash solvency), meeting all financial obligations during a fiscal year (budgetary solvency), the capability to fulfill future

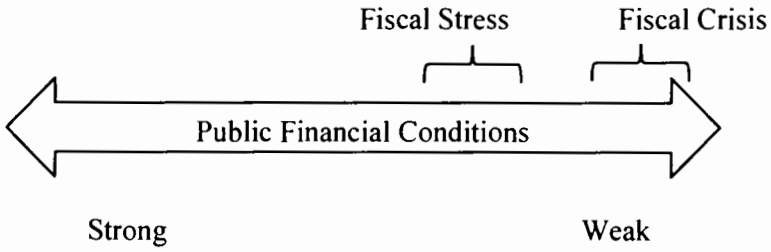
[13] It is believed that financial crises of 2007-2008 begins with failure of Federal Reserve to act against excessive mortgage loans provided to support home ownership policy of Congress. Thus, macro-prudential regulations are clearly constrained by political decisions.

[14] A few examples for such activities are Tobin tax on financial transaction in G-20 and mineral tax in Poland.

financial needs (long-term solvency), and the ability to finance services relating to the welfare of the society (service level solvency). Thus, fiscal health indicates the resilience of the government to weather external vulnerabilities, such as financial crises or economic downturn, and to cope with population dynamics and demographic changes.

Figure 3.2 Spectrums of Public Financial Conditions

This graphic illustration explains the state of financial conditions in the public sector accounts. If the public financial conditions deteriorate from a strong position, fiscal stress is generated. When these conditions become weak in extreme circumstances, it signals the outbreak of the fiscal crisis.



Source: Arnett (2012).

Figure 3.2 explains the spectrum of various states of public financial conditions. Both the fiscal stress and crisis reflect the inability of the government to meet its obligation and provide public services. However, the two terms reflect varying degrees of fiscal disorder. The former is defined as weak financial conditions whereas the latter depicts as an excessively weak financial condition of the government. Fiscal stress is defined, in general terms, as "the inability of the government to satisfy solvency, sustainability, flexibility and vulnerability conditions of the fiscal health".[15] Danziger (1991) defines fiscal stress as the widening disparity between the demand for public financial resources and private and public supply of those resources.

[15] Detailed discussion of the conditions of fiscal health is given in Jacob and Hendrick (2013)

In the more recent literature, fiscal stress is linked with the debt crisis. The traditional definition of fiscal stress revolves around debt defaults, implicit defaults, and restructuring. Debt crisis occurs if two conditions hold: firstly, arrears on payment of principal or interest surpass 5 percent of total debt, secondly, rescheduling of debt becomes inevitable (Hemming, et al., 2003). The drawbacks of this definition are highlighted by Manasse et al. (2003). They propose the inclusion of implicit default events as an indicator of a debt crisis. Such implicit defaults are avoided only by large non-concessional IMF support programs exceeding 100 percent of quota. The study defines the sovereign debt crisis as the one occurring when countries are default by Standards and Poor's definition.[16] Later on, besides traditional definitions of fiscal stress, Baldacci et al. (2011b) extend the definition of fiscal crisis to include extreme financial constraints of the sovereign. The fiscal crisis is defined as the inability of the government to repay interest on its debt and principal amount (Bordo & Meissner, 2016). Various factors affect the market perception of the risk of fiscal crises. Rollover problems refer to apprehensions about the government's ability to service its debt and possibly, raising the likelihood of government insolvency.[17]

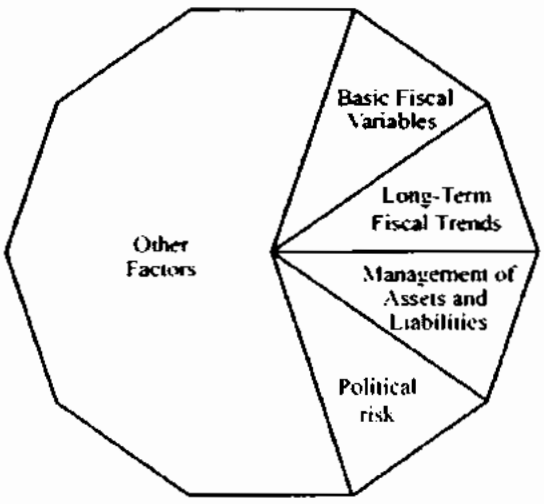
This study proposes a theoretical framework for the measurement of fiscal stress, which is an extended version of the Risk Octagon framework proposed by Cottarelli (2011) and Cottarelli et al. (2014). The new framework is based on a risk decagon as demonstrated in Figure 3.3. In contrast to the existing framework under risk Octagon, which measures 8 dimensions of rollover risk, our proposed framework takes account of

[16] According to Standards and Poor's, a country is in debt crises if it receives non-concessional loans from IMF over and above defined quota of 100 percent (Manasse & Roubini, 2009).
[17] Insolvency refers to a balance sheet condition where net worth of government is negative.

10 dimensions of rollover risk, each represented by a line segment in the risk decagon. The decagon is drawn with the perspective that role of fiscal policy is redefined. Besides traditional demand management and stabilizing role. a new role has been evolved especially after the debt crisis of recent decades in the European region. This new role is to correctly assess the basic fiscal variables and to minimize the fiscal risk originating from shocks to basic fiscal indicators. With this background. three main areas of the rollover risk are the baseline model for fiscal stress, shocks to the baseline fiscal stress model. and other factors.

Figure 3.3 Risk Decagon: Conceptual Framework for the Measurement of Fiscal Risk

This diagram indicates the four dimensions of fiscal risk that are used to measure fiscal stress. These dimensions include basic fiscal variables. long-term fiscal trends. and management of assets and liabilities. and political risk. The other six sides of the decagon indicate shocks to the baseline model that are not relevant as far as the measurement of fiscal stress is concerned.



Source: Author's Construction

As far as the measurement of fiscal stress is concerned. only four areas of risk decagon are relevant. The three dimensions are the same as proposed by Cottarelli et al.

(2014) but we take the political risk as an explicit component of rollover risk. This area refers to four dimensions of rollover risk associated with fiscal sustainability. These dimensions are explained below:

a) First Dimension: Basic Fiscal Variables

Basic fiscal variables explain whether debt dynamics are consistent with government solvency conditions. Fiscal solvency requires a primary balance that stabilizes the debt-to-GDP ratio. The high stock of debt is an indication that countries are more exposed to the interest rate and growth shocks. Assessment of the first dimension of fiscal sustainability requires examination of the fiscal variables such as growth adjusted interest rate on public debt, gross debt of the government as a percent of GDP, and cyclically adjusted primary balance. Growth adjusted interest rate is the difference between the nominal interest rate paid on government debt and growth in nominal GDP. A high debt rate raises the interest rate and requires more adjustment in the primary balance. Cyclically adjusted primary balance explains the extent to which countries adjust to fulfill inter-temporal budget constraints (Baldacci et al., 2011a; Cottarelli, 2011; Cottarelli et al., 2014).

b) Second Dimension: Long-Term Fiscal Trends

The second dimension explains long-term demographic and fiscal pressures that affect the budget. Demographic changes are important for long term fiscal pressures. The first indicator is the current fertility rate. It is an indicator of the potential tax base available to finance increased spending associated with the aging population. Lower fertility indicates a decline in the labor force and a lowers tax base, which results in a high risk of fiscal sustainability. The second indicator, the old-age dependency ratio, is

an indicator of the capacity to bear the cost of financing old people. A high dependency ratio exerts pressure on the budget and raises fiscal sustainability risks. The other indicators are old age-related expenditures that exert pressure on the inter-temporal budget and raise fiscal sustainability risks. Populating aging is used to account for the expenditure pressure as more aged people in the population indicates high fiscal pressures (Baldacci et al., 2011a; Cottarelli, 2011; Cottarelli et al., 2014).

c) Third Dimension: Management of Assets and Liabilities

The composition of assets and liabilities in public accounts affects the exposure of the government to rollover risk. Shocks to public balance sheet impair the conduct of good fiscal policy (IMF, 2016) Broadly, six indicators are suggested to capture rollover risk related to the management of assets and liabilities. The first one is gross financing needs, which is a measure of rollover risk and is given by the sum of the government's overall balance and stock of maturing public debt in a year or less. The greater the gross financing needs in the short-term, the higher is the solvency concern and, hence, rollover risk. The second indicator is short-term public debt as a ratio of total debt. A rise in the share of short-term in total debt indicates a higher vulnerability to rollover risk (Cottarelli, 2011; Cottarelli et al., 2014).

The third indicator is the debt held by non-residents as a proportion of total debt. Large debt held by non-residents escalates global market risk. High government debt held by non-residents is associated with a greater risk of default on debt held by non-residents. This global risk raises the likelihood of rollover risk. The fourth indicator of fiscal stress is maturity structure that is measured as the weighted average maturity of outstanding government debt. (Cottarelli, 2011; Cottarelli et al., 2014).

The last indicator of assets and liabilities management is short term external debt as a ratio of international reserves. It represents foreign currency claims needed to meet short-term servicing of external debt. This indicator is useful only for emerging countries where central banks of developed countries hold large precautionary foreign currency reserves intending to provide a cushion in times of crisis (Baldacci et al., 2011a; Cottarelli, 2011; Cottarelli et al., 2014).

d) Fourth Dimension: Political Risk

Besides the three dimensions of the baseline model prosed by Cottarelli (2011) and Cottarelli et al. (2014), the current framework proposes an explicit consideration of the impact of political risk as to the fourth dimension of rollover risk in the baseline fiscal model. It was pre-assumed that existing frameworks to measure economic risk accounts for such political uncertainties. However, this perception has changed now. Macroeconomic factors measure the economic ability to pay back debt whereas political factors are more closely related to political feasibility and, hence, the willingness of governments to do so. Modern investors account for both the ability and willingness of the government to pay back the debt in their decision-making as persistent political risk hampers the future solvency of the government, which in turn discourages investors to do business in politically unstable economies (Waszkiewicz, 2015). Thus, we believe that political risk is likely to raise fiscal risk, and hence, fiscal stress.

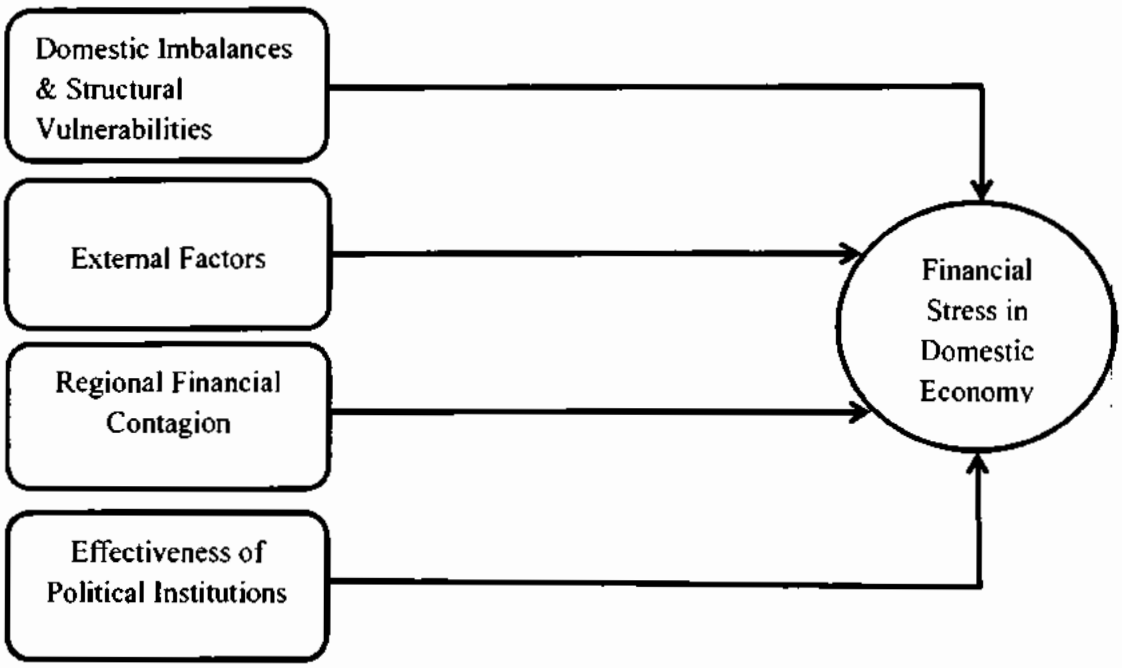
3.1.3 Conceptual Framework for Determinants of Financial Stress

This section explains presents the extended conceptual framework to analyze the determinants of financial stress in emerging and middle-income countries. To examine the determinants of fiscal stress, we classify the wide range of determinants of financial

stress into 4 broader categories. Figure 3.4 illustrates the schematic layout of these four categories of the determinants of financial stress as explained below.

Figure 3.4 Schematic of Determinants of Financial Stress

The figure indicates the various broader categories for the determinants of financial stress. We classified the determinants of financial stress into four categories, namely domestic imbalances and structural vulnerabilities, external factors, regional financial contagion, and the effectiveness of political institutions.



Source: Author's Construction

3.1.3.1 First Category: Domestic Imbalances and Structural Vulnerabilities

The first group of factors mentioned in the figure is macroeconomic imbalances and structural deficiencies in the domestic economy. Large imbalances and structural weaknesses raise the level of financial stress. Early warning literature suggests that crisis periods occur after an economic boom is characterized by a heated real economy. Foreign credit, easy credit conditions, and higher asset prices instigate a crisis further. Subsequently, an adverse event may reverse the flow of credit from foreign sources

along with credit crunch and falling prices at the domestic front. Such events exert pressure on the current account. Domestically, tight credit conditions discourage investment, thereby causing a slump in real economic activity. Growing current account deficits disturbs the external balance. In addition to that financial imbalances and structural vulnerabilities stir up financial stress.

The first indicator of macroeconomic imbalances in the domestic economy is the decline in growth in real GDP. Lower growth in GDP makes an economy more vulnerable to financial stress as the financial crisis is generally preceded by slumps in economic activity followed by boom periods (Guru, 2016). The deficit at the external account is the second factor that forces countries to rely on foreign financing which then raises their exposure to sudden stops, a feature of a currency crisis, and escalation of financial stress. Imbalances in the current account, ultimately, require large depreciation of exchange rates to improve competitiveness and sustainable reduction in the trade deficit. This further affects domestic balance sheets and initiates currency and banking crisis with a subsequent increase in financial stress (Claessens, Kose, & Terrones, 2009; Fratzscher, 2009).

The third indicator is the set of fiscal vulnerabilities in terms of large fiscal deficits and government debt. This makes a country more exposed to crises and limits its ability to mitigate stress in the financial sector. A high fiscal deficit magnifies financial stress as it limits the ability of fiscal authorities to enhance spending during periods of a financial crisis. High government indebtedness raises concerns about the ability of the government to pay back a debt. Falling prices of government bonds amplify rollover risk. Debt sustainability problems create repercussions for the financial side of the

economy through enhanced financial instability and financial stress as the government's ability to provide credit to the private sector is undermined (Afonso, Baxa, & Slavík, 2011; Cardarelli, Elekdag, & Lall, 2011). The fourth macroeconomic imbalance is a decline in the level of foreign exchange reserves held by central banks. A low level of reserves before the financial crisis exerts pressure on the banking system and local currency as monetary authority fails to support domestic currency (Olafsson & Petursson, 2010).

3.1.3.2 Second Category: External Factors

Disruptions in the global economy hamper the financial stability of the domestic economy. The first external factor is a rise in the global interest rate. An increase in the interest rate in the world economy indicates tight credit conditions in the global credit market which limits foreign financing for local imbalances. The second indicator is an increase in world output that lowers financial stress in the domestic economy. High world GDP pinpoints an improvement in the global demand conditions.

Similarly, an adverse shock to global commodity prices raises the likelihood of financial crisis through various channels as explained by Kinda, Mlachila, and Ouedraogo (2016). Negative commodity price shock lowers export earnings and income of domestic country that raises debt obligations and weakens the balance sheets of banks. Further, falling commodity prices built up fiscal deficits as revenues of commodity-exporting nations fall. Likewise, lower commodity prices bring a surge in bank withdrawals which lower the liquidity of banks. Through all these channels, the financial sector becomes fragile and the level of financial stress increases.

Shocks originating from a financial center may spillover to other centers through real and financial interdependencies between them. A high degree of financial integration fosters the transmission of financial stress through capital outflows, reduction in trade credit, and foreign direct investment. Financial stress increases when a crisis hits a financial center which forces international investors to withdraw capital from that financial center. Financial shocks spillover to the domestic economy through unfavorable shifts in the perception of international investors. Such portfolio rebalancing helps investors lower their exposure to portfolio risk but raises stress. Likewise, real international linkages, in terms of trade openness, improve economic performance by trade diversification. This brings financial stability and lowers financial stress in the domestic economy (Hwa, 2015; Park & Mercado, 2014).

3.1.3.3 Third Category: Regional Financial Contagion

Region-specific contagion refers to the spread of crisis within specific regions characterizing similar macroeconomic conditions, and common creditors (including international commercial banks). The first channel of regional propagation is adverse shocks to banks located in interconnected regions. The second one is the exposure to a common lender channel. A common lender in two or more regional countries serves as a common factor in the propagation of financial stress originated from one country in the region. The heavy reliance of the domestic country on a regional lender raises the possibility of regional contagion (Arvai & Driessen, 2009; Park & Mercado, 2014).

3.1.3.4 Fourth Category: Effectiveness of Political Institutions

The concept of institutions is multi-dimensional. It is a combination of non-market factors, such as social norms and public relations, politics, legal systems, culture, and

religion. According to North (1990), "Institutions are rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction." In the economic context, institutions shape up the behavior of economic agents and markets. The efficacy of political institutions is recognized as an important driving factor for the stability of a financial system. The poor quality of political institutions is regarded as a source of financial fragility. Institutional failure to regulate financial markets encourages excessive risk-taking behavior. Most of the existing literature evaluated the role of institutional quality as an important determinant of banking crises.[18] However, the literature does not consider the role of political institutions, which cannot be ignored as institutions play an important role in minimizing systemic risk. The present study is unique in terms of evaluating the effectiveness of institutional in assessing system-wide financial stress for emerging countries.

3.1.3.5 Model Specification

The empirical framework for analyzing the determinants of financial stress is represented by the following panel data baseline regression:

$$\text{FinSIE}_{i,t} = \beta\ \text{FinSIA}_t + \delta_i D_{i,t} + \gamma G_t + \omega_i PRI_{i,t} + \theta_i RD_i + u_i + \varepsilon_{i,t} \quad (3.1)$$

where FinSIE indicates the financial stress index for emerging countries. FinSIA is the consolidated financial stress index for developed countries. We use GDP PPP weights for aggregation of financial stress index for developed and emerging countries. The coefficient of AFinSI (β) is the average co-movement parameter that measures the intensity of the stress co-movement. Domestic factors include growth in real output (GRY), current account balance (CA), government balance (GB), change in foreign

[18] See Ben Gamra and Plihon (2007); Demirguc-Kunt and Detragiache (1998); Rodrik (2008)

exchange reserves (DRES), trade openness (TO), and financial openness (FO) Global factors (G) refers to changes in global interest rate, world real output, and global commodity price index. The effectiveness of political institutions is measured through the political risk prevalent in emerging countries. The role of political institutions is captured by the co-efficient ω_i. We incorporate 3 regional dummies (RD_i), namely, Emerging Asia, Latin America, and Emerging Europe. The country-specific effects are captured through unobservable shocks (u) that are time-invariant. The stochastic error term (ε) varies with countries and time. We further assume $\varepsilon_{i,t} \sim$ iid $(0, \sigma^2)$. The subscripts i and t denote country and time respectively.

For modeling the conditional effect of country-specific characteristics in the transmission of financial stress from developed to emerging countries, we introduce the interaction terms in (3.1). The model becomes

$$\text{FinSIE}_{i,t} = \beta \text{FinSIA}_t + \delta_i D_{i,t} + \sigma_i \text{AFinSI}_t \times D_{i,t} + \gamma G_t + \omega_i PRI_{i,t} + \theta_i RD_i + u_i + \varepsilon_{i,t} \quad (3.2)$$

where interaction term between FinSIA and domestic factors states that the effect of FinSI for developed countries on FinSI for emerging countries is conditional upon the country characteristics of the emerging countries. The coefficient of the interaction term between FinSIA and D (σ_i) measures the indirect effect of country characteristics on FinSIE.

3.1.4 Theoretical Framework for Determinants of Fiscal Stress

Theories of crisis determination highlight the presence of underlying vulnerabilities. Literature suggests that weak fundamentals, such as fiscal deficit and growing debt, fuels up the risk of fiscal sustainability, and escalates the level of fiscal

stress. Moreover, fiscal and macro-financial imbalances are interconnected employing that the set of determinants for fiscal stress should incorporate both macroeconomic imbalances and financial stress besides accounting fiscal fundamentals (Cottarelli, 2011; Cottarelli et al., 2014). Our choice of potential determinants of fiscal stress is guided by a modified analytical framework for fiscal risk presented in Figure 3.5. Shocks affecting the baseline fiscal model constitute the relevant portion in the risk decagon for the potential drivers of fiscal stress. We account for six types of shocks. Five types of shocks to the baseline fiscal model are similar to the ones proposed by (Cottarelli, 2011; Cottarelli et al., 2014). They are, namely contingent liabilities, shocks to the macroeconomy, shocks affecting fiscal fundamentals, non-fiscal vulnerabilities, and other factors.[19] This study extends the conceptual framework by incorporating institutional factors, as the sixth potential drivers of fiscal stress. We explain these dimensions of fiscal risk as under.

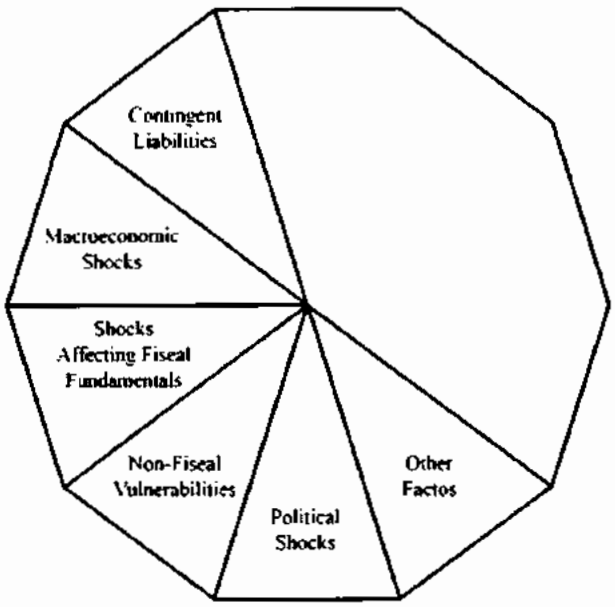
3.1.4.1 First Dimension: Systemic Risk as Contingent Liabilities

In the context of contingent liabilities, non-contractual liabilities are also critical besides contractual liabilities. One such non-contractual liability stems from adverse feedback from the financial sector to the fiscal account. Systemic risk, measured in terms of financial stress, is used to capture adverse feedbacks and associated fiscal costs. Thus, systemic risk can be viewed as a non-contractual contingent liability for the government. Failing banks impose costs for insured depositors and guarantees. Public.

[19] Baseline fiscal model refers to the unlabeled section of the risk decagon which we used for the measurement of fiscal risk. Hence, that part is not relevant for the potential determinants of fiscal stress.

Figure 3.5 Risk Decagon: Proposed Theoretical Framework for Determinants of Fiscal Stress

This diagram explains the broader set of determinants of fiscal stress. Five types of shocks are proposed for the present analysis, namely contingent liabilities, macroeconomic shocks, shocks affecting fiscal fundamentals, non-fiscal vulnerabilities, and political shocks.



Source: Author's construction

finances have direct exposure for systemic risk as the government provides guarantees in times of systemic risk for state-owned banks. Additionally, there are indirect fiscal costs in the form of bank recapitalizations to secure liquidity and ensures the supply of credit in a period of systemic crisis. These direct and indirect costs of systemic risk result in fiscal risk and a rise in the level of fiscal stress (Cottarelli, 2011; Cottarelli et al., 2014)

We can understand financial stress as a contingent liability of the government by recognizing the spillover effects of crises on the public balance sheet. There exists an

adverse feedback loop between banking and sovereign risk. Timely fiscal support to the ailing financial sector can mitigate the possibility of adverse feedback loops. However, government support to the financial sector, which we regard as a contingent liability, raises debt on the public balance sheets, which ultimately escalates fiscal stress. This is observed as a phenomenon of twin crises by Gerling et al. (2017).

We can understand financial stress as contingent liabilities of the government by recognizing the spillover effects of crises to the public balance sheet (Perotti, 1999). There exists an adverse feedback loop between banking and sovereign risk. Timely fiscal support to the ailing financial sector can mitigate the possibility of adverse feedback loops. However, government support to the financial sector, which we regard as a contingent liability, raises debt on the public balance sheets, which ultimately escalates fiscal stress. This is observed as a phenomenon of twin crises by Gerling et al. (2017).

3.1.4.2 Second Dimension: Macroeconomic Shocks

The first macroeconomic shock is the losses in output measured by the output gap. An increase in GDP growth is an indication of the overheating of the real economy, the building of financial imbalances, and the widening of the output gap. Such an increase in the output gap is detrimental for financial stability and indirectly amplifies fiscal distress (Borio, Disyatat, & Juselius, 2016, 2017; Bruns & Poghosyan, 2018). The second factor is interest rate growth differential. A positive interest rate growth differential exerts a sizable upward pressure on government debt ratios if governments run a deficit in primary balance. Continuously rising debt-to GDP ratio will end up in an unstable trajectory of debt that raises fiscal risk (Cottarelli, 2011; Cottarelli et al., 2014).

3.1.4.3 Third Dimension: Shocks to Fiscal Fundamentals

The third dimension of indicators of fiscal stress is fiscal fundamentals. We consider three fiscal fundamentals. The first is a high gross government debt as a percent of GDP implies the government has to devote more resources for debt service at the cost of growth-enhancing expenses. It raises concerns for solvency as unsustainable levels of debt trigger fiscal risks and a high level of fiscal stress. The second fiscal fundamental is the fiscal balance as a percent of GDP determines the level of fiscal stress. Larger is the deficit in public account more is the reliance of government on borrowing. This in turn increases the level of public debt-to-GDP ratio and fiscal stress. The third fiscal factor is the primary balance and its effect on fiscal stress depends on the debt sustainability condition. If the debt is unsustainable (real interest rate is lower than growth in real GDP) then a deficit in primary balance will lead to an explosive pattern in the debt-to-GDP ratio. This accelerates sovereignty risks and fiscal stress. Hence a deficit in primary balance is regarded as a weaker fiscal position to halt the financial crisis (Cottarelli, 2011; Cottarelli et al., 2014).

3.1.4.4 Fourth Dimension: Non-Fiscal Vulnerabilities

Non-fiscal factors are another area of risk dimension that indirectly affect fiscal risk. Two broader categorizations within non-fiscal factors are external and domestic factors. The first external factor, measuring the competitiveness of a country, is the current account balance as a percentage of GDP. A persistent deficit in the current account reflects a loss of competitiveness and risk of crisis. Such deficits in the current account are generally financed by a sharp increase in debt that fuels up default risk and ultimately brings a surge in fiscal stress. The second external factor is the level of

foreign exchange reserves held by the central bank that measures international liquidity. A lower level of foreign exchange reserves deteriorates the ability of the government to service its external obligations that subsequently raises external debt and fiscal stress (Bruns & Poghosyan, 2018). As far as domestic factors are concerned, a higher level of private credit as a percentage of GDP raises contingent liabilities of the government. Thus the private sector debt crisis may transmit to the public sector that will ultimately raise fiscal risk (Cottarelli, 2011; Cottarelli et al., 2014).

3.1.4.5 Fifth Dimension: Political Risk

Higher political risk is a non-economic trigger factor for fiscal stress. It is an institutional factor that indicates how the outcome of the decision taken by politicians and policymakers effects fiscal policy. An increase in political risk interferes with the quality of fiscal policy through generating micro and macro risk. It tends to enhance fiscal risk (Caceres & Kochanova, 2012; Waszkiewicz, 2015).

3.1.4.6 Sixth Dimension: Other Factors

This includes market sentiments or risk epeitite. A high risk eppitite can reduce the likelihood of a fiscal crisis and hence, can lower fiscal stress if a country is considered as safe heaven and vice versa.[20]

3.1.4.5 Model Specification

Based on the above discussion, the determinants of fiscal stress can be modeled by the following equation:

$$\text{FisSI}_{i,t} = \beta_i \text{FinSIE}_{i,t} + \delta_i Macro_{i,t} + \delta_i Fis_{i,t} + \theta_i NonFis_{i,t} + \omega_i PRI_{i,t} + u_i + \varepsilon_{i,t} \quad (3.3)$$

[20] Owing to data constraints on market sentiments we skipped this dimension from the empirical model.

where FisSI is a composite fiscal stress index for emerging countries whereas FinSIE is a composite financial stress index for emerging countries that is used as a measure of contingent liabilities. Shocks to macroeconomy are shown as $Macro$. Fiscal And non-fiscal fundamentals are denoted by Fis and $NonFis$ where PRI represent political shocks. The country-specific effects are denoted by u_i whereas $\varepsilon_{i,t}$ shows the random shock realized for the i^{th} country at time t. We use GDP PPP weights for aggregation of stress indices. PRI is calculated as a composite index by applying PCA.

3.1.5 Theoretical Framework for Interconnection between FinSI and FisSI

Recent theoretical models of crises have emphasized the interconnection between financial and fiscal crises. The present study will employ a theoretical model proposed by Acharya et al. (2014) that explains a two-way interconnection between bank bailouts and sovereign risk. Our theoretical model is based on three sectors, namely financial, non-financial, and government sectors. The financial sector plays the intermediation role whereas the non-financial sector, also known as the corporate sector, is engaged in productive investments. The objective of the government is to maximize the total output and welfare of society. A timeline of the model is illustrated in Figure 3.6. The Model consists of three periods namely t = 0, 1, 2.

Figure 3.6 Timeline of the Theoretical Model

The figure illustrates the dynamic behavior f macroeconomy with the role of the financial sector. The economy is sub-divided into three sub-sectors on the supply side, namely financial, non-financial, and government sectors. The financial sector provides t financial services whereas non-financial services buy the services of the financial sector. the government has a dual role to collect taxes and issue bonds.

	t = 0	t = 1	t = 2
Financial Sector	• Decides about the supply of financial services.	• Collection of revenues from the sale of services. • Realization of the value of risky assets. • Determination if the sector is solvent or not.	• Realization of output from future projects
Nonfinancial sector	• The decision to buy financial services	• Determination capital K_1 for investment in upcoming projects.	
Government	• Decides issuance of new bonds and tax rate for the period t = 2.		• Tax imposition on output. • Tax receipts are paid to bond-holders. • Insufficient revenues allow defaults & DW loss D.

Source: Acharya et al. (2014)

a) Financial Sector

The financial sector determines the supply financial services in period t = 0 to maximize its expected payoff net of effort cost to product financial services at time t=1, that is:

$$\max_{s_0^s} E_o\left[\left(w_s s_0^s - L_1 + \widetilde{A_1} + A_G + T_0\right) \times I_{\{-L_1+\widetilde{A_1}+A_0+T_0>0\}}\right] - c(s_0^s) \qquad (3.4)$$

The indicator function is I, which is equal to one if $-L_1 + \widetilde{A_1} + A_0 + +T_0 > 0$ holds and equal to zero otherwise.

The notations are as follows.

s_0^s= Amount of financial services supplied by financial sector at time t = 0;

w_s= Revenue per unit of a supply of financial services:

$c(s_0^s)$ = Cost of producing financial services in units of consumption goods at time zero;

L_1 = liabilities of the financial sector due at time t = 1

A_G = Value of the existing stock of government bonds;

$\widetilde{A_1}$ = Value of all other assets;

T_0 = Value of transfers made by the government to the financial sector at time t = 0.

The financial sector receives revenues in period 1 from the sale of financial services in the previous period if the value of assets in period 1 exceeds liabilities in period 1, that is, $-L_1 + \widetilde{A_1} + A_0 + +T_0 > 0$. If the solvency condition fails to hold deposit-holders will receive the value of financial sector assets and wage income by the liquidation of banks. The financial sector is highly levered and exposed to debt overhang. The nature of debt is hard as it is difficult to restructure it. Resources needed to address crises in the financial sector are large as the sector itself is very large.

b) Non-Financial Sector

The non-financial sector holds existing capital stock K_0 and decides about allocation of capital in productive projects in periods 0 and 1 respectively. Its objective is to maximize expected net payoff between period 1 and 2:

$$\max_{s_0^d, K1} E_o\left[f\left(K_0, s_0^d\right) - w_s s_0^d + (1-\theta_0)\tilde{V}(K_1) - (K_1 - K_0)\right] \qquad (3.5)$$

The notations are as under.

s_0^d = Demand of financial services by non-financial sector in period 0

K_1= Stock of capital invested in $\tilde{V}$ at t =1;

$V(K_1) = E_1[\tilde{V}(K_1)]$ = Expected payoff for project $\tilde{V}$ at t = 1;

θ_0= Proportion of payoff taxed by the government to pay its debt;

$(K_1 - K_0)$= Cost of the project $\tilde{V}$.

Production function f is increasing and concave in both arguments. The non-financial sector decides how much to invest in a project at t = 1 that yields a payoff in t = 2. This expected pay off in time t = 1 is increasing and concave in investment. Production of non- financial sector increases in period t = 0. provides K_1 level of capital stock by the start of first period. The non-financial sector invests K_1 in future projects. Capital is more productive at low levels of production. Thus, new investments in period 1 will yield a high expected payoff. But as the production increases, the productivity of the capital stock declines. The new capital stock invested in future projects may provide negative payoffs. Thus, how much to invest in future projects is a decision made by the non-financial sector. The production of the non-financial sector and the investments will increase as long as the expected pay off from future projects is positive.

c) Government

The objective of the government is to maximize the total output of the economy, and hence, the welfare of consumers. It issues new bonds and transfers them to the balance sheet of the financial sector. This is done to reduce the debt overhang problem of the financial sector. This increases the supply of financial services. Besides that, the government sets tax at the rate θ_0 on investments in future projects in t = 0 that is levied in second period once the expected payoff $\tilde{V}(K_1)$ is realized. We denote the number of outstanding bonds and newly issued bonds by N_D and N_T respectively and the price for both is P_0. Tax of $\theta_0\tilde{V}(K_1)$ is realized in t = 2 that is used to pay bond-holders $N_D + N_T$. If $\theta_0 V(K_1) > N_D + N_T$, the government generates a surplus that is used to finance consumer programs. Sovereign default arises if tax revenue falls short of payments to all debt-holders. In this case, bond-holders receive all taxes and the government will default. The government's problem is

$$\max_{\theta_0, N_T} E_o\left[f(K_0, s_0) + \tilde{V}(K_1) - c[s_0] - (K_1 - K_0) - I_{def}D + \tilde{A}_1\right] \qquad (3.6)$$

where

s_0= Equilibrium provision of financial services

I_{def} = Indicator function set equal to one if the government defaults and equal to zero otherwise;

D = cost of default or deadweight loss D proxied as the government's repute internationally and credibility loss domestically.

$c[s_0]$= consumption of financial services

Equilibrium provision is maximized with budget constraint

$$T_0 = P_0 N_T \tag{3.7}$$

and simultaneous choice of output made by financial and non-financial sectors.

d) Consumer

A representative consumer consumes part of its wealth W and invests the rest in bonds and equity of government, financial and non-financial sectors. Consumers choose the optimal portfolio (n_i) by solving the following problem:

$$\max_{n_i} E_o[\sum_i n_i \tilde{P}(i) + (W - \sum_i n_i P(i))] \tag{3.8}$$

where $\tilde{P}(i)$ and $P(i)$ are pay-off and price of the ith asset respectively. The first-order condition is that the equilibrium price of an asset is equal to its expected pay-off, that is, $P(i) = E_o[\tilde{P}(i)]$.

3.1.5.1 Equilibrium Outcome

For maximization problem of the financial sector, denote the probability density of $\tilde{A}$ by $P(\tilde{A})$. It has a minimum realization $\underbrace{A_1} = L_1 - A_G - T_G$ indicating that the financial sector does not default. The first-order condition for (3.4) is

$$w_s P_{solv} - \acute{c}(s_0^s) = 0 \tag{3.9}$$

where $P_{solv} = \int_{\underbrace{A_1}}^{-\infty} P(\tilde{A}).d\tilde{A}$ represent the probability that the financial sector becomes solvent at t=1.

Consider the maximization problem of the non-financial sector. Demand for financial services is determined by the following first-order condition:

$$\frac{\partial f(K_0, s_0^d)}{\partial s_0^d} = w_s \tag{3.10}$$

At equilibrium, demand and supply of financial services are equated to determine equilibrium quantity of financial services s_0.

a) Transfers and Under-provision of Financial Sector

By (3.9), marginal cost per unit of financial services $\acute{c}(s_0^s)$ exceeds marginal benefits of those services (w_s) if there is a positive probability of insolvency. Possibility of liquidation ($P_{solv} < 1$) results in a sub-optimal equilibrium quantity of financial services. The under-provision of the financial sector in turn poses serious implications for corporate sectors' ability to undertake profitable investment projects. This will inevitably lower investment and output growth, thereby reducing the tax base available to service government debt. The government can alleviate this under-provision of the financial sector by transfers to the sector in the form of bailouts.

b) Laffer Curve

To understand government problem, consider the relationship between expected tax revenue and tax rate. An increase in the tax rate θ_0 has two effects: first, a higher tax rate will increase future expected tax revenue [$\mathcal{T} = \theta_0 V(K_1)$]. Second, an increase in θ_0 will lower investment in future projects and hence lowers $\mathcal{T}$. Taking the derivative of (3.5) with respect to K_1 yields the first-order condition for investment in the non-financial sector, that is.

$$(1 - \theta_0)\acute{V}(K_1) - 1 = 0 \qquad (3.11)$$

Differentiating this condition further concerning tax rate yields:

$$(1 - \theta_0)V''(K_1).\frac{dK_1}{d\theta_0} + V'(K_1)(-1) = 1.$$

Rearranging yields,

$$\frac{dK_1}{d\theta_0} = \frac{V'(K_1)}{(1-\theta_0)V''(K_1)} \qquad (3.11a)$$

Since $V'(K_1) > 0$ and $V''(K_1) < 0$, investment decrease with an increase in the tax rate.

Tax revenue satisfies Laffer Curve property, that is, it is increasing up to a certain tax rate and beyond that $\mathcal{T}$ starts declining with an increase in tax rate and eventually becomes zero. The maximum tax rate is denoted by θ_0^{max}. $\mathcal{T}$ is increasing in θ_0 on [0, θ_0^{max}] and decreasing on [θ_0^{max}, 1].

c) Optimal Transfer under Certainty: *Case of Solvency*

To analyze the optimal policy of the government, consider two simplifying assumptions: First, the variance of output in period 2 is zero and known with certainty, therefore, $V(K_1) = \bar{V}(K_1)$. Second, the government maintains a policy of solvency, that is, it will be constrained to issue at maximum N_T bonds for which it can pay the bondholders in full. The first assumption implies that tax revenue equals to optimal level $\mathcal{T}$ and the second assumption implies to $N_D + N_T = \mathcal{T}$. Price of bond $P_0 = 1$ and transfer to the financial sector are $T_0 = P_0 N_T = \mathcal{T} - N_D = \theta_0 V(K_1) - N_D$ with no probability of default. Hence, the tax rate is the only choice variable.

The government's optimal policy is analyzed by the first-order condition for optimal tax rate $\mathcal{T}$. Optimal tax equates the marginal gain and loss of increasing tax revenue, that is,

$$\frac{dG}{d\mathcal{T}} + \frac{dL}{d\mathcal{T}} = 0 \qquad (3.12)$$

Marginal gain from the increase in tax revenue is realized in terms of increased transfers to the financial sector. These transfers increase the supply of financial services. It will be higher with a low probability of solvency and a more severe debt overhang problem. Severe debt overhang induces the government to raise more tax revenue to do large transfers. Marginal loss of an increase in tax revenue represents losses associated with underinvestment in the economy. Thus, optimal tax revenue $\hat{\mathcal{T}}$ corresponds to an

optimal tax rate that is below θ_0^{max} and optimal transfer equals $T_0 = \hat{\mathcal{T}} - N_D$. If outstanding government debt (N_D) is a large government that can generate less tax revenue and then effective transfers will be lower.

d) Optimal Transfer under Certainty: ***Case of Default***

Government optimal policy now involves only one assumption, that is, the variance of output is zero and known. Default occurs when new bonds are issued over $\mathcal{T} - N_D$. Government's decision about the number of new bonds issued depends on the sovereign's insolvency ratio:

$$H = \frac{N_T + N_D}{\mathcal{T}} \tag{3.13}$$

where $N_T + N_D$= face value of debt

Defaults occur if the face value of debt exceeds expected tax revenue, that is, H > 1. An increase in is costly as it involves deadweight default loss D. Further, an increase in H generates higher transfers by diluting existing debt, allowing the government to increase transfers without increasing taxes.

3.1.5.2 Sovereign-Bank Loop

A loop exists between the financial sector and sovereign credit risk. To alleviate debt overhang in the financial sector, the government makes large transfers either by bailouts or by diluting the existing stock of debt. Bailouts are costly when the cost of under-investments is high and, hence, raising taxes to finance bailouts is not efficient. In that scenario, the government raises the insolvency ratio and dilutes the existing debt by accepting a positive probability of default. This will establish a positive relationship between sovereign debt and financial sector credit risk. Credit risk of the financial

sector spillover and becomes a credit risk of the sovereign. Likewise, exposure of the sovereign to the rollover risks feedbacks into the financial sector and vice versa.

3.2 Econometric Methodology

Once we build a theoretical framework and specify the empirical models. the next task is to choose an appropriate econometric methodology to estimate those models. The first sub-section describes the econometric methodology to aggregate financial and fiscal stress indices. The second sub-section explains the econometric methodology for determinants of financial and fiscal stress while the last sub-section discusses the methodology for interconnection between financial and fiscal stress

3.2.1 Econometric Methodology for Aggregation of Stress Indices

In multivariate analysis, the structure of data can be studied concerning two dimensions, namely individual indicators and country-wide composite indicators. There exist various methodological choices for the aggregation of individual indicators into composite indices for financial and fiscal stress. These choices are broadly classified into three schemes, namely principal component analysis, factor analysis. and cluster analysis. In the present context, we apply PCA as this aggregation method has many advantages. First, it allows us to preserve the maximum possible variations in data. Second, it assigns the highest factor loading to the individual indicator that possesses the highest variation across countries. This makes PCA highly relevant for cross-country comparisons. A detailed survey of the weighing and aggregation schemes is provided in OECD (2008).

Principal Component Analysis

The Principal Component Analysis approach is used to aggregate stock market volatility, banking risk, currency risk, sovereign bond spreads, growth in private sector credit (credit risk), output gap (economic risk), and political risk. It is developed by Pearson (1901) and Hotelling (1933). All the components of financial stress are standardized before aggregation. This approach is outlined below.

The variables depend on few linear combinations of original data to describe variation in observed data. The linear combinations of original data rely on a large number of mutually correlated variables. Let there are K observed variables. The entire variation in data can be captured through K linear combinations of the original variables, that is,

$$Z_1 = a_{11}x_1 + a_{12}x_2 \ldots + a_{1K}x_K$$

$$Z_2 = a_{21}x_1 + a_{22}x_2 \ldots + a_{2K}x_K$$

$$\ldots \qquad (3.14)$$

$$Z_K = a_{K1}x_1 + a_{K2}x_2 \ldots + a_{KK}x_K$$

where $Z_1, Z_2, \ldots, Z_K$ are principal components; $x_1, x_2, \ldots, x_K$ are original variables. a_{ij} is the weight assigned to j^{th} variable in i^{th} linear combination. The coefficient a_{ij} refer factor loadings.

Variation in observed data can be explained through a small number of variables known as principal components. A small number of principal components (P) may explain a high proportion of variation in original data (P < K). However, the maximum number of principal components can be K. The choice of weights should satisfy the following properties.

i) All the principal components are mutually uncorrelated.

ii) The first principal component captures the maximum proportion of variation in the original variables.

iii) The second component explains the maximum of the remaining variation and so on.

For normalization sum of squares of all the factor loadings equal one. Symbolically,

$$a_{i1}^2 + a_{i2}^2 + \cdots + a_{iK}^2 = 1 \text{ for all } i = 1,2,\ldots,K \tag{3.15}$$

PCA involves extracting the variances of principal components from the covariance matrix of the original data. We try to extract the highest possible variation in observed data using the smallest possible linear combinations. Such variances are also known as eigenvalues, $\gamma_j, j = 1,2,\ldots,K$. Eigenvector cannot take negative values. The covariance matrix is expressed as;

$$CM = \begin{bmatrix} cm_{11} & cm_{12} & \cdots & cm_{1K} \\ cm_{21} & cm_{22} & \ldots & cm_{2K} \\ \vdots & \vdots & \ddots & \vdots \\ cm_{1K} & cm_{2K} & \cdots & cm_{KK} \end{bmatrix} \tag{3.16}$$

The diagonal entry cm_{ii} represent variance of x_i whereas off-diagonal elements cm_{ij} with $i \neq j$ represent covariance between x_i and x_j. Eigenvalues can be traced by solving the characteristic equation $|CM - \gamma I| = 0$ where I refer to an identity matrix of the same order as the matrix CM. Eigenvalues follow an important property that their sum equals the sum of the diagonal entries in CM. that is, $\gamma_1 + \gamma_{2+\ldots+}\gamma_K = cm_{11} + cm_{22} + \cdots + cm_{KK}$.[21]

[21] For details, see OECD (2008) on construction of composite indicators.

3.2.2 Econometric Methodology for Determinants of Financial and Fiscal Stress

To estimate the equation (3.1) to (3.3), we use several econometric techniques, namely Pooled Ordinary Least Square (POLS), Fixed Effects (FE), Two-Stage Least Squares (2SLS), system and difference GMM.

3.2.2.1 Pooled Ordinary Least Square (POLS) Estimation

This method pools together the individual observations as we ignore the cross-section and time-series nature of data. It relies on the assumption that country-specific effects do not exist. Thus, both intercept and slope coefficients are constant. This model provides consistent estimates if the assumption of strict heterogeneity and orthogonality holds (Greene, 2018). Equation 3.1 becomes the POLS model with $u_i = 0$.

3.2.2.2 Fixed Effect (FE) Estimation

This model allows for country-specific effects as every country has some special characteristics. The intercepts are varying across each country for FE model. But they are time-invariant. Equation (3.1) to (3.2) can be converted into the Fixed Effect model by incorporating dummy variables for each cross-section. This method is impractical, especially in large cross-sections, as it consumes a lot of degrees of freedom. A more practical approach is to eliminate the unobservable country heterogeneity by transforming each variable into deviational form and applying the Ordinary Least Square method on the transformed model. The resultant estimates will be consistent as the Fixed Effect model is based on the strict endogeneity of the transformed regressors and these regressors are not correlated with the disturbance term. We consider robust standard errors to cater to cross-section heterogeneity and serial correlation. This model

seems more suitable in the present context that the time-period for the analysis is more than a few cross-sections (Greene, 2018).

3.2.2.3 Instrumental Variable Regression

POLS as well FE method are applicable if the regressors are exogenous. If one or more regressors are endogenous and unobserved time-varying effects are present then Two-Stage Least Square/Instrumental Variable (hereafter IV) method may be applied in panel data. This model is explained as under.

Consider the following panel data model:

$$y_{it} = \beta_0 + \beta_1 x_{i,t} + \beta_2 w_{i,t} + u_{i,t} \tag{3.17}$$

If we consider $w_{i,t}$ is the exogenous whereas $x_{i,t}$ is endogenous then OLS fails to give unbiased and consistent estimates. We need to instrument $x_{i,t}$ in such a way that the instrument follows the two properties: first, it is not correlated with $u_{i,t}$. Second, the instrument is highly correlated with $x_{i,t}$. IV regression involves two steps:

i- To get rid of the correlation between $x_{i,t}$ and $u_{i,t}$, regress $x_{i,t}$ on the exogenous explanatory variable $w_{i,t}$. This gives the predicted value of $x_{i,t}$, that is $\widehat{x_{i,t}}$.

ii- Replacing $x_{i,t}$ with $\widehat{x_{i,t}}$ in (i) and estimating the final equation by OLS yields estimates for Two-Stage Least Squares. The resultant estimates will be consistent and unbiased as the sample size increases indefinitely (Gujarati & Porter, 2009).

3.2.2.4 Generalized Method of Moment

If the determinants of financial stress are endogenous, it is quite likely that the higher financial stress carries feedback effects in the model. To cater to this possibility, we estimate the difference GMM model originally proposed by Arellano and Bond

(1991). Rewriting equations (3.1) to (3.2) in AR(1) representation and applying the first difference eliminates the unobservable country-specific heterogeneity. The disturbance term $\Delta\varepsilon_{i,t} = \varepsilon_{i,t} - \varepsilon_{i,t-1}$ in the dynamic model is MA(1) process. Applying the first difference further generates the instruments for the endogenous regressors (lagged dependent variable). Arellano and Bond (1991) suggest at least two period lags for the current difference of the endogenous variable. The instruments will be valid if they are uncorrelated with the differenced error term. Thus, the following moment conditions must be satisfied.

$$E[fsi_{i,t-s}, \Delta\varepsilon_{i,t}] = 0. \text{ for all } s\geq 2;\ t= 3,\ldots,T$$

$$E[X_{i,t-s}, \Delta\varepsilon_{i,t}] = 0. \text{ for all } s\geq 2;\ t= 3,\ldots,T \qquad (3.18)$$

where $X_{i,t}$ is the list of regressors in the model.

Next, we consider system GMM as suggested by Das (2017) and Blundell and Bond (1998). Idea is to estimate the level and first difference of the equations together with the first difference used as instruments in the level equation and the level used as instruments in the first difference equation. Thus, we can utilize the information contained in the level equation (3.17) by using appropriate instruments along with moment conditions (3.18).

Further instead of vanishing country-specific effects (u_i) from the model (3.17) and (3.18), we can control them with some additional moment conditions.

$$E[\Delta fsi_{i,t-s}, (u_i + \varepsilon_{i,t})] = 0, \text{ for all } s\geq 2;\ t= 3, \ldots,T$$

$$E[\Delta X_{i,t-s}, (u_i + \varepsilon_{i,t})] = 0. \text{ for all } s\geq 2;\ t= 3. \ldots, T \qquad (3.19)$$

Given the moment conditions (3.18) and (3.19), we can get efficient and consistent estimates of (3.1) and (3.2) by system GMM. A problem in estimating the model (3.17) with system GMM is the possibility of overfitting the instrumented variable. Thus, we follow Tagkalakis (2013) and Edward (2009) to use a matrix of instruments in such a way that it creates just one instrument for one variable and lag. Difference and system GMM are implemented with robust standard errors for heteroscedasticity.

The presence or absence of substantial dynamics and the nature of regressors determines an appropriate method. In case our models lack any dynamic and regressors are exogenous then Fixed Effect and Pooled least Square methods without lagged dependent variables remains the best choice with $T \rightarrow \infty$. If regressors are endogenous without any substantial dynamic effects then the Instrumental variable method suits best the data. However, system and difference GMM will be the preferred method with the presence of dynamic effects, country-specific effects, and endogeneity. As our sample involves 18 countries and 17 time periods, system GMM is the preferred model of estimation as difference GMM performs poorly when T is smaller than N. Our strategy is to estimate the Fixed Effects model and then check the robustness of our results to the choice of various estimators.

3.2.2.5 Diagnostics

Consistency of the GMM estimates depends on the validity of the instruments as well as the assumption that the error term is serially uncorrelated. Das (2017) proposed two diagnostics: The first test rejects the null hypothesis of no first-order serial correlation and must accept the null hypothesis of no second-order serial correlation. The second test. Hansen J, is designed to test for over-identifying restriction. The null

hypothesis states, that is the instruments are not correlated with the error term, should be accepted. This test follows χ^2distribution with J-K degree of freedom where J accounts for the number of instruments while K refers to the number of endogenous variables.

3.2.2.6 Treatment of Outliers

We apply Hampel Identifiers (hereafter HI)to control for the outliers in data (Wilcox, 2005). HI defines X as an outlier if

$$HI = \frac{|X_i - M|}{MAD/0.6745} > b \qquad (3.20)$$

where X is a particular observation which we suspect as an outlier, M is the median of X_i observations. Median of entered absolute values $(|X_1 - m|, |X_2 - M|, \ldots, |X_N - M|)$ is MAD while 0.6745 is the 75^{th} quantile of the normal distribution. The cutoff to declare an observation as outliers are b. In practice, a cutoff value of 2.24 is commonly used as suggested by Wilcox, (2003). However, this value results in a large number of identified outliers. Thus, we followed the procedure used by Hampel to use 3.5 as the cutoff. The detailed elaboration of the procedures is provided by Bhatti. Haque. and Osborn (2014).

3.2.3 Econometric Methodology for Interconnection between FinSI and FisSI

To study the dynamic response of financial and fiscal stress, we estimate a model where financial and fiscal stress indices are treated as endogenous variables. The appropriate methodology is the vector autoregressive model as we are keen to study generalized responses.

3.2.3.1 Vector Autoregressive Models

Vector Autoregressive models (hereafter VAR) are proposed by Sims (1980). These models were developed as the byproduct of the critique of simultaneous equation models. They explore the dynamic impact of random shocks on the system of variables. Simultaneous equation models are regarded as flawed as they rely on the ad-hoc classification of the exogenous and endogenous variables. While simultaneity proposes that each variable in the model may be treated similarly, that is, they are endogenous. In this regard, we analyze the systematic impacts of shocks in stress indices on financial and fiscal stress through the unrestricted VAR Model. In the present context, the VAR model is as following;

$$\alpha y_{it} = \beta_0 + \beta_1 y_{it-1} + C x_{it} + \varepsilon_t \tag{3.21}$$

where y_{it} and x_{it} are the vectors of endogenous and exogenous variables respectively. While ε_t is the vector of shocks in financial and fiscal stress indices. This can be re-written in matrix notation as:

$$\begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \begin{bmatrix} fsi_{it} \\ fisi_{it} \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} fsi_{it-j} \\ fisi_{it-j} \end{bmatrix} + \begin{bmatrix} \delta_{11} & \delta_{12} \\ \delta_{21} & \delta_{22} \end{bmatrix} \begin{bmatrix} X_{it-j} \\ X_{it-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{3.22}$$

where fsi and $fisi$ denote the financial stress and fiscal stress indices.

We include the level and lags of the growth in global commodity prices (gcpg), the level and lag of political risk index (pri), and gross debt (gd) as the exogenous variables in both the VAR equations. Since the VAR model is atheoretical, its coefficients carry no economic meaning. However, the advantage of the VAR model is that it does not require any restrictions and the model is not over-parameterized. The estimated VAR model is generally interpreted through impulse response functions and variance decomposition. An impulse response function traces out the impact of one time exogenous shock in a variable on the current and future values of the endogenous variables through the dynamic structure of VAR. The variance decomposition indicates the contribution of shocks in various variables of the model to forecast the variance of any one variable in the model.

An important aspect of the VAR models is the selection of optimal lag length through various model selection criteria. The general procedure is to fit a VAR model of higher-order and evaluate the model selection criteria. The optimal lag length in the VAR model is the one that optimizes the model selection criteria. We further test for lag exclusion for endogenous variables in the VAR model to supplement the lag selection criteria. For the lag selection of exogenous variables, we estimate the VAR model with a higher lag length of stress indices and control variables as a system. Then, we apply the Wald test to finalize the optimal lag length. Exogenous variables with the optimal lag length are finally incorporated in the chosen VAR models

3.3 Data

This section is classified into five sub-sections. The first and second sub-sections explain data and choice of variables for the construction of FinSIs and FisSIs

respectively. The third and fourth sub-sections describe data on the determinants of financial and fiscal stress. The last sub-section explains some transformations performed on data.

3.3.1 Data and Choice Variables for FinSIs

This study constructs two composite FinSIs. The first composite FinSI is constructed for 20 emerging and middle-income countries for the period 1997M1-2016M12, whereas the second FinSI is based on 23 developed countries for the period 1993M1-2016M12.[22] Our sample consists of 4800 monthly observations for emerging countries, which on average covers 76 percent of the emerging countries' GDP since 1997. For developed countries, 23 sampled countries constitute 91 percent of their GDP since 1993, covering a total of 6624 monthly observations.

The constructed FinSIs rely on three types of risks faced by the economy, namely financial, economic, and political. We borrow 5 essential components of financial risk from banking, equity, currency, and debt markets. The 6th essential component is the economic risk that is measured through the output gap, whereas the explicit role of political risk, the seventh risk component, is quantified through the political and socio-economic attributes. The detailed measurement and data sources for the components are explained below.

Stock market risk

An abrupt decline in the overall stock index indicates a crisis in the stock market and a high degree of stress in the securities market. Tumbling in stock index signals expected losses or increased risk or a rise in uncertainty about future returns. We take

[22] Table A1 in Appendix A provides list of selected sampled countries for measurement of financial and fiscal stress. We use high frequency monthly data as changes in financial markets occur on even daily basis.

the log first difference of closing stock prices of consecutive days to compute daily stock returns. This study measures the volatility of stock returns using the GARCH model (Bollerslev, Chou, & Kroner, 1992). The most widely used specification of the GARCH model, that is GARCH (1,1) is applied.[23] The conditional mean equation is,

$$sr_t = \alpha_{i,t} + \beta sr_{t-1} + \varepsilon_{i,t} \quad (3.23)$$

where sr represents daily stock returns. To trace out monthly volatility, this study takes a monthly average of the conditional variance. The conditional variance equation is.

$$\sigma_t^2 = \gamma_0 + \gamma_1 \varepsilon_{t-1}^2 + \gamma \sigma_{t-1}^2 \quad (3.24)$$

where σ^2 refers to conditional variance and ε represents error term in equation (3.23). Equation (3.24) states that the existing conditional variance of stock returns relies on conditional variances and squared errors of previous periods. Daily data on stock price indices are taken from *Thomson Reuters DataStream* (Reuters, 2017).

The riskiness of the banking sector

Existing literature suggests that a fragile banking sector is an igniting factor for the financial crisis (Turner, 2007). Thus, we regard banking risk as an essential element of FinSI. This study estimates the Capital Asset Pricing Model to account for banking sector risk, that is,

$$(br_{i,t} - r_{fi,t}) = \alpha_{i,t} + \beta_{i,t}(sr_{i,t} - r_{fi,t}) + \varepsilon_t \quad (3.25)$$

where br and sr refer to returns to banking and stock price indices for the i^{th} country at time t respectively. $\varepsilon_{i,t}$ represents error term at time t. Daily returns are obtained by taking the log first difference in banking and stock indices. We take a monthly period

[23] For every country, a higher order GARCH model is estimated and significance of lagged coefficients is used as a criterion for finalizing the order of GARCH model. Further, we also tested for ARCH effects in residuals through ARCH LM test.

average to convert the daily returns into monthly frequency. The risk-free rate of return (r_f) is the short-term interest rate. According to the OECD definition, it is measured by returns on a 3-month treasury rate for most of the countries in the sample. For countries where data are unavailable on treasury rate, returns on a 3-month interbank rate are used as a proxy for short-term interest rates. We yield excess stock (bank) returns by subtracting risk-free returns from stock (bank) returns. The volatility coefficient, β, takes different values. If it is larger than 1, we infer that returns for the banking sector are more volatile than the stock market index. A higher value of β indicates more stress in the banking sector and vice versa. High frequency (daily) data are taken to assess risk in low frequency (monthly) data. Daily data on the banking price index and overall stock price index is extracted from *Datastream*. Data on risk-free rates are collected from the online database of *International Financial Statistics* (hereafter *IFS*) (IMF, 2018). *IFS* fails to provide data on short term interest rate for all countries. We consult the *Organization of Economic Cooperation Database* (OECD, 2018) and national data for such countries.

Currency risk

The devaluation of currency and fall in FOREX often indicates the emergence of the currency crisis. It brings capital outflow as it shakes the confidence of the consumers, investors, and entrepreneurs. We build an exchange rate market pressure index (hereafter EMPI) introduced by Girton and Roper (1977) and empirically used by Eichengreen, Rose, and Wyplosz (1996) and Burnside, Eichenbaum, and Rebelo (2004). The idea is that how monetary authority reacts to excess demand for foreign currency. It has two policy choices: first is a depreciation of the domestic currency.

whereas the second is accommodating excess demand for foreign currency through the sale of foreign currency reserves. EMPI captures the accumulated effect of the devaluation of currencies and dwindling reserves through sales of the foreign currency . It is defined as under.

$$EMPI_{i,t} = \frac{(\Delta E_{i,t} - \mu_{i\Delta E})}{\sigma_{i\Delta E}} - \frac{(\Delta R_{i,t} - \mu_{i\Delta R})}{\sigma_{i\Delta R}} \quad (3.26)$$

where $\Delta E_{i,t}$ and refers to percentage changes in the exchange rate and foreign exchange reserves of the i^{th} country at time t. μ and σ denote the mean and standard deviation of the percentage changes. We gather monthly data on the exchange rate and foreign exchange reserves from the latest online database of *IFS* (IMF. 2018).

Sovereign risk

Sovereign risk becomes imminent when a nation fails to service foreign liabilities. The spread between risky bond yield and risk-free bond yield is a commonly used indicator of sovereign risk. It is measured by yield differential between long run (10 years) local bond and long term US Treasuries. The US bonds are regarded as risk-free bonds as they are guaranteed by the US government who can print dollars. Moreover, the US bonds market is well established and stable, which makes the likelihood of default very low. The higher bond differential shows a higher risk of default for local government concerning the US government. A bullish trend in the local bond market makes local markets riskier. Investors demand higher bond yields which reduce the prices of local bonds. This raise bond yield spread increases and financial stress in that period where prices of government securities fall (Sandahl et al.. 2011). We extract monthly data on long-term government bond yield (10 years maturity) from *Datastream*

and *IFS*. We take daily data on the US long-term treasury (maturity of 10 years) from the website of the *Federal Reserve Bank*.[24] Monthly averages are taken for the US daily Treasury rate.

Credit stress

Credit risk refers to the risk of losses generated by the failure of the counterparty to meet contractual obligations. Every country experiences a credit cycles parallel to the stages of the business cycle. Credit booms refer to the periods of excessive supply of credit. Such periods are associated with periods of financial boom and an overheated economy. In a credit cycle, booms are often followed by busts that are characterized by periods of credit strains and an onset of a financial crisis. Thus, a lower supply of credit raises credit risk that helps in fueling financial stress (Misina & Tkacz, 2009). We measure credit risk by the growth rate of claims in the private sector (Cevik et al., 2013a). We take monthly data from the latest online tables of the database of *IFS* (IMF, 2018).[25]

Accounting for economic risk: Output gap

This study considers the output gap as an indicator of economic risk. A positive output gap shows an overheated real economy that is featuring a credit boom, rising asset prices, and an unsustainably high level of output above potential output. Financial markets also respond to this expansionary impetus in the financial sector as currency gains value. Such trends get reverse once credit booms turn into bust and asset prices and hence, overall inflation starts falling as observed during the global financial crisis of

[24] For details see https://www.federalreserve.gov/releases/h15/.
[25] Data for claims are available at annual frequency for Belgium, UK and USA that are converted into monthly frequency.

2007. The real economy experiences recessionary trends. Such developments cause financial instability, which is transformed into higher financial stress (Borio et al., 2017).

At the measurement end of the output gap, this study is constrained by the non-availability of monthly national income accounts. Furthermore, we did not consider the monthly industrial production index (hereafter IPI) for several reasons: First, data on IPI are not available for some of the selected countries. Second, IPI does not capture important features of cross-sectional variation inherent in panel data. Thus, we select monthly data on industrial production measured at constant 2010 US$. Data are taken from the *Global Economic Monitor* database published by the WB (WB, 2017).

We estimate the output gap through the quadratic trend method (hereafter QTM). This method is superior to the linear trend model as it relaxes the assumption of a constant growth rate of GDP. Moreover, QTM decomposes the output gap into structural and cyclical components by modeling observed behavior, which makes the estimates more realistic (Cerra & Saxena, 2000). We include monthly seasonal dummies in the QTM specification to factor out any seasonality in the output gap.

Political risk

Political risk refers to "a political decisions' influence on the economy, which can be stabilizing or destabilizing for the free market" (Titman et al., 2011). Such risks originate from the operations of the government. It stimulates stock prices in both developed and emerging countries (Diamonte, Liew, & Stevens, 1996). We construct a political risk index (hereafter PRI) that takes account of various quantitative attributes as indicated in *ICRG* methodology. The choice of the *ICRG* database carries the

advantage that it provides cross-country information for various attributes for a wider group of countries. It highlights 12 dimensions of political risk based on political and social attributes. Each attribute is quantified through risk rating points proposed in the *ICRG* methodology. These rating points range between 0 and 100. We sum up these rating points for each country to obtain PRI. Higher values of PRI show lower risk and vice versa. We collect annual data from the *ICRG*, PRS group (PRS, 2016). This index is converted into monthly frequency using the following formula:

$$PRI_{i,t} = PRI_{t-1} * \left[\frac{PRI_t}{PRI_{t-1}}\right]^{\wedge\left(\frac{i}{12}\right)}, \text{ i=1, 2,...,1} \qquad (3.27)$$

where $PRI_{i,t}$ = Political risk index in the ith month of year t

PRI_t= Political risk index in year t

PRI_{t-1}= Political risk index in year t-1

The list of countries is reported in Table A1 in Appendix A whereas Table A2 in Appendix A lists the indicators, their description, and the data sources applied in this study

3.3.2 Data and Choice of Variables for FisSIs

To compute FisSI, we initially considered a large sample starting from 1990 for 35 emerging and 40 developed countries. But our choice of sample is shrunk for two reasons. First, data on short-term debt and debt held by non-residents are available only from 2000 onwards in the *OECD database* and *Quarterly Public Debt* and *Joint External Debt Hub* respectively. Second, we dropped those countries from the analysis where consistent data from 2000 onwards are not available. Finally, we base our analysis on 17 emerging and 19 developed countries covering the period 2000-2016, which comprise 289 and 323 annual observations respectively. The list of countries is

reported in Table A1 in Appendix A whereas Table A3 in Appendix A lists the indicators, their description, and the data sources applied in this study.[26]

To construct FisSIs we incorporate both rollover and political risk. We capture the rollover risk through three dimensions, each consist of a set of components. Specifically, we consider rollover risk comprising 12 and 11 components for emerging and developed countries respectively. These components are interest-rate growth difference, gross debt by the general government, cyclically adjusted primary balance, fertility rate, age dependency ratio, population aging, gross financing needs, short-run debt as a ratio of total debt, debt held by non-residents, weighted-average maturity of total government debt, short-term external debt as a ratio of reserves, and political risk. Data on cyclically adjusted primary balance[27] (hereafter CAPB) is not available for all the countries in the selected sample. We applied the methodology proposed by Fedelino, Ivanova, and Horton (2009) to compute the variable for Pakistan and Venezuela.[28] We incorporate pension expenditure pressures indirectly through population aging, which we define as long-term fiscal pressures variable. To compute the share of short-term debt in total debt, we applied the WB definition to define short-term debt as the debt with the original maturity of one year or less.

[26] Out of 40 and 35 selected developed and emerging countries, the list shrunk down to 23 and 20 for developed and emerging countries as country coverage for data on debt held by non-residents is very limited. The list further trimmed down when data on short-term debt for four developed countries, namely Cyprus, Israel, Japan, and Korea and three emerging countries namely, Chile, Hungary and Poland were missing for the whole sample period. We finally left with 17 emerging and 19 developed countries as shown in Table A2 in Appendix A.

[27] CAPB is the structural balance. Deterioration in CAPB signals the structural imbalances are growing (Fernandez-Rodriguez, Gomez-Puig, & Sosvilla-Rivero, 2016).

[28] To take care of the methodological differences, we compute CAPB for some countries where data are available and confirm that the discrepancy is very minimal.

3.3.3 Data on Determinants of Financial Stress

This study considers panel data for 18 emerging countries over 2000-2016, comprising 306 annual observations. The list of selected countries is presented in Appendix B Table B1. Data availability remains the main concern in the selection of countries. Initially, a large sample was selected which get trimmed on the availability of consistent data later on. A list of variables, definitions, and measurement, and data sources are given in Table B2 in Appendix B.

Measuring Financial Stress

We construct financial stress indices for emerging and developed countries using PCA.[29] For each group of countries, three types of risks namely, financial, economic, and political risk, are considered as components of financial stress indices. These components are banking sector risk, stock market volatility, currency risk, sovereign risk, credit stress, output gap, and political risk.

Measuring the Effectiveness of Political Institutions

The measurement of institutional factors did not receive considerable attention in the literature. Abdessatar and Rachida (2013) take six institutional factors as the regressors to assess how the quality of instructions affects financial stress. We use a composite index approach based on data from the International Country Risk Guide (hereafter ICRG) to account for the effectiveness of political institutions. ICRG methodology is based on 12 variables, each explaining either political or social attributes. These attributes are government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics,

[29] We borrow these indices from the Chapter 4 for exploring determinants of FISSI in chapter 5.

religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. We apply PCA to compute a composite index known as the political risk index. This composite index is a barometer for the effectiveness of political institutions. A higher value of PRI (that refers to lower political risk) indicates political institutions are strong enough to mitigate financial stress. This mitigation comes through optimal decision making and policy designs that ensure financial stability.

3.3.4 Data on Determinants of Fiscal Stress

This study considers annual data spanning from 2000 to 2016 for selected emerging countries. We aim to investigate potential determinants of fiscal stress for a panel of 17 emerging middle-income countries, this constitutes a total of 289 annual observations. The main concern in the selection of countries was that FisSI is computed for the period 2000-2016. Thus initially, we select a large sample that gets trimmed owing to constraints for constructed FisSI. Table C1 in Appendix C provides the list of sampled countries for determinants of fiscal stress.

To account for the quality of institutions, we use a composite index approach based on data from the *International Country Risk Guide* (henceforth ICRG). Its methodology is based on 12 variables explaining either political or social attributes. These attributes are government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. We apply PCA to compute a composite index known as the political risk index. Table C2 in

Appendix C provides a detailed list of variables, their definitions, and data sources for the construction of fiscal stress.

3.3.5 Data for Interconnection between Financial and Fiscal Stress

This study explores the interconnection between financial and fiscal stress within three blocks, namely BRICS, other emerging economies (hereafter OE), and a group of developed countries (hereafter G5) covering the panel data covering for 2000-2016.[30] Our analysis includes 14 countries that are subdivided into three blocks. We borrowed monthly and annual components of FinSI and FisSI for each sampled emerging and developed country from Chapter 4. The financial and fiscal stress indices are then constructed for each block using PCA. Since FinSIs are constructed on a monthly frequency, we take period averages to annualize these indices. On the other hand, FisSIs are computed for annual data because data on monthly public accounts is not readily available for public accounts.

To avoid misspecifications, several control variables are considered in the VAR model besides block-wise FinSI and FisSI. In general, a wide range of factors are responsible to alter the patterns of financial and fiscal stress, but we include exogenous factors based on insights provided in Chapter 4. Refer to Chapter 4, political risk and global commodity prices are potential drivers of financial stress whereas political risk and debt-to GDP ratio play a vital role in determining fiscal stress. Thus, we consider

[30] First block (BRICS) refers to block of leading emerging economies that are part of a multilateral trade agreement. They include Brazil, Russian Foundation, India, China and South Africa. Other emerging economies include some large countries and Asian tigers, namely Argentina, Indonesia, Malaysia, Mexico and Turkey. Finally, the third blocks (G5) consist of developed countries, namely Canada, Germany, United Kingdom, and the US. Japan is not included in the G5 analysis owing to lack of data on components of fiscal stress.

the past and current value of the political risk index, global commodity prices, and debt-to-GDP ratio as the control variables within each block.

3.3.6 Normalization of Data

Once we collect data and construct the various indicators of financial and fiscal stress, and political risk the next step is to normalize those indicators. It is desirable to normalize the various indicators that might differ in terms of the unit of measurement. A detailed survey for the normalization method is provided by OECD (2008) We choose min-max normalization, which is defined as:

$$I_{norm} = \frac{I_t - I_{min,to}}{I_{max,to} - I_{min,to}} \tag{3.28}$$

where I_t = value of stress indicator at time t

$I_{min,to}$ = Minimum value of stress indicator over the sampled period t_o

$I_{max,to}$ = Maximum value of stress indicator over the sampled period t_o

The sampled period for the financial stress period covers 4800 and 6624 monthly observations for emerging and developed countries respectively. For fiscal stress, the sampled period consists of 289 and 306 annual observations for both groups of countries respectively.

3.3.7 Panel Unit Root Tests

To evaluate the interconnection between financial and fiscal stress, we first test the stationarity of the stress indices. We apply stationarity tests for this purpose. A brief description of them is as under:

a) Levin, Lin, and Chu Test

Levin, Lin, and Chu's (hereafter LLC) test is appropriate for the panel of moderate size. These test statistics consider cross-section varying first-difference terms and

common co-efficient for lagged dependent variables. The test statistic is based on the following ADF regression equation.

$$y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + X_{it}\delta' + \varepsilon_{it}; i = 1.2 \ldots\ldots N; t = 1,2, \ldots,T \quad (3.29)$$

The null and alternative hypotheses are as under

$$H_0: \alpha = 0$$

$$H_1: \alpha < 0$$

The LLC test has several flaws. First, it does not allow for cross-sectoral dependence. Second, it assumes identical autoregressive parameters across countries (Maddala & Wu, 1999).

b) Im, Pesaran, and Shin Test

Im, Pesaran, and Shin (1997, 2003) proposed a test known as Im, Pesaran, and Shin (IPS) test that overcomes the problem of identical first-order autoregressive parameters across countries in LLC. Consider the following regression equation.

$$\Delta y_{it} = \alpha_{0i} + \rho_i y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + \varepsilon_{it}; \text{ with } i = 1,2, \ldots, N; t = 1,2, \ldots, \quad (3.30)$$

The null hypothesis is:

$$H_0: \rho_i = 0 \, for \, all \, i$$

$$H_1: \rho_i \leq 0, for \, all \, i$$

The test is based on the mean of the estimates of all the parameters ρ_i obtained separately for each cross-sectional unit.

c) Fisher ADF and PP Tests

These two types of tests rely on an alternative approach. They combine the p-values of the individual test stats for each cross-section. The Fisher test statistic is as under.

$$P = -2 \sum_{i=1}^{N} \ln p_i \quad (3.31)$$

where p_i is the p-value for the i^{th} cross-section. Under the null hypothesis of unit root, this test follows a chi-square distribution with a degree of freedom 2N. There are several advantages of the Fisher type tests over IPS. First, it does not require a balanced panel. Second, it allows for variable lag lengths for the ADF test at each cross-section (Maddala & Wu, 1999).

Chapter 4

Results and Discussion:

Measurement of Financial and Fiscal Stress

In this chapter, we deal with the first four objectives outlined in Chapter 1. The analysis is divided into three sub-sections. The first sub-section aims to develop FinSIs for both developed and emerging countries. The second sub-section builds FisSIs in both the country groups and explores the stress contributions of various components of FisSIs for both developed and emerging countries. The last sub-section compares the composite FinSIs for both the country groups under analysis.

4.1 Results and Discussion for Measurement of Financial Stress

We apply PCA, as explained in Chapter 3, to construct composite indices for financial stress for emerging and advanced economies. These market-based composite FinSIs aggregate seven sub-indices related to risks rooted in stocks, banking, currency, debt markets, and the political landscape. An important aspect concerning PCA is to decide how many components should be retained for the construction of the composite index. An index that captures at least 50-60 percent of the cumulative proportion of explained variation is recommended (Park & Mercado, 2014). The PCA results for emerging and developed countries are reported in Table 4.1.

The first component explains only 22.56 and 22.78 percent variation, FinSIs for emerging and middle-income countries, and developed countries are constructed by taking a non-standardized average of the first three components having eigenvalues

greater than 1. These constructed FinSIs explain 55.20 and 51.5 percent of the cumulative proportion of variation for emerging and developed countries respectively.

Table 4.1 Results for Principal Component Analysis: Financial Stress Indices

Country Groups / Components	Emerging and Middle-income countries		Developed countries	
	Eigenvalues	Proportion	Eigenvalues	Proportion
Component 1	1.7892	0.2256	1.595	0.2278
Component 2	1.0603	0.1515	1.0110	0.1414
Component 3	1.0146	0.1449	1.0010	0.1427
Component 4	0.9563	0.1366	0.9710	0.1387
Component 5	0.8865	0.1266	0.9537	0.1363
Component 6	0.7717	0.1102	0.8648	0.1236
Component 7	0.5213	0.0745	0.6056	0.0867

Source: Author's Estimates

4.1.1 Evolution of FinSI in Emerging and Middle-income Countries

Once composite FinSIs are computed, the next task is to evaluate the periods of high stress. By doing so we determine either peaks in FinSIs are consistent with the known periods of stress. This sub-section explains evolution patterns of individual, composite, and regional FinSIs for 20 emerging middle-income countries spanning the

period 1997M1-2016M12. Figure 4.1 explains the country-wise patterns of financial stress in emerging and middle-income countries.

A visual analysis offers several interesting observations. First, emerging middle-income countries experience more financial crises and, hence, high financial stress in the late 1990s and early 2000s as compared to the late 2000s and onward. Second, the Asian financial crisis in July 1997, Russian Default and Long-Term Capital Management (hereafter LTCM) collapse in August 1998 carried spillover effects across other emerging middle-income countries whereas spillover effects from the Argentinian debt crisis in 2001 were very limited. Argentina and Brazil experienced high financial stress owing to the Argentinian debt crisis. This effect is attributed to strong direct trade ties between Argentina and Brazil prior to the crisis. Third, shocks emanating from a single emerging economy may have precipitously spread across countries. However, the magnitude of disruptions was heterogeneous as the peaks of individual countries vary. For example, the Asian financial crisis originated from Thailand tended to increase financial stress across all the Asian emerging countries in the sample whereas only three non-Asian countries, namely Brazil, Mexico, and Russia, caught the contagion. This heterogeneous response may explain the varying degree of trade and financial linkages as well as dissimilar domestic vulnerabilities prevailing before the stressful episodes. Fourth, stress originating from developed countries transmitted to emerging middle-income countries as it happened in the global financial crisis. However, these effects have been marginal for most of the individual emerging middle-income countries.

Figure 4.1 Country-specific FinSIs for Emerging and Middle-Income Countries

This figure plots financial stress indices at the country-level in the sample of emerging and middle-income countries. The horizontal axis measures the period of analysis whereas the vertical axis plots the financial stress index.

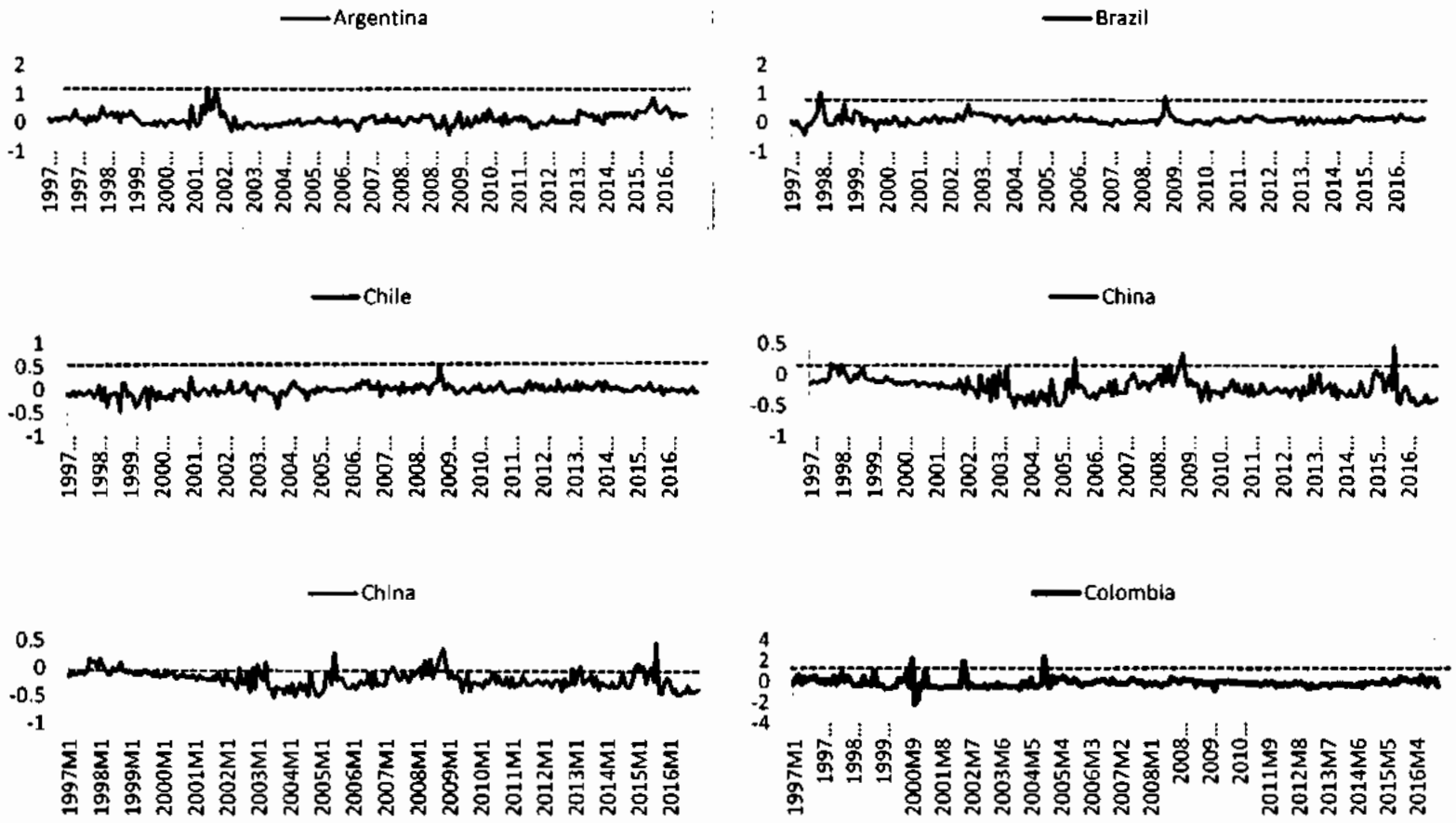


Table 4.1 Country-wise Financial Stress Indices for Emerging and Middle-Income Countries Continued...

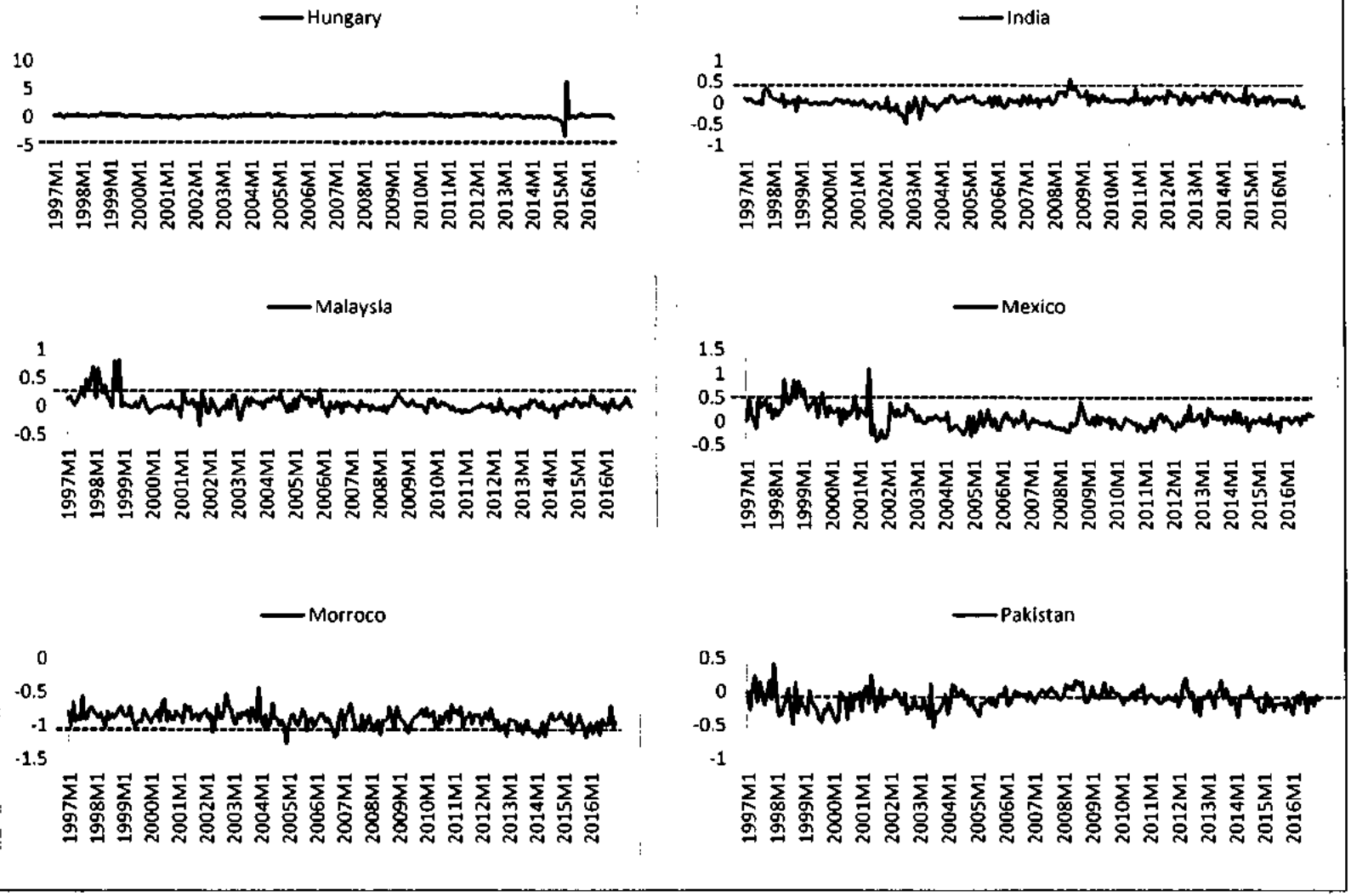


Table 4.1 Country-wise Financial Stress Indices for Emerging and Middle-Income Countries Continued...

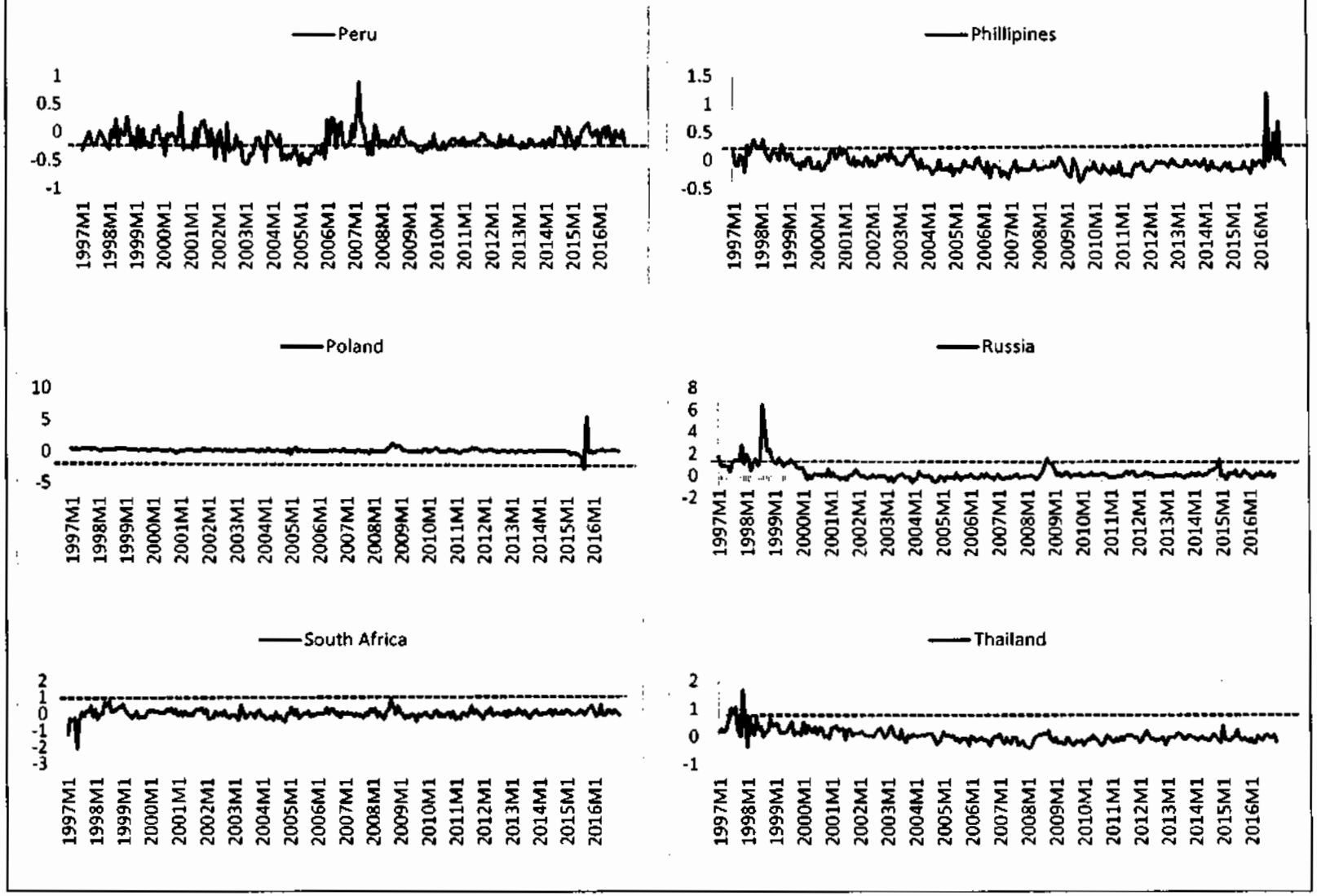
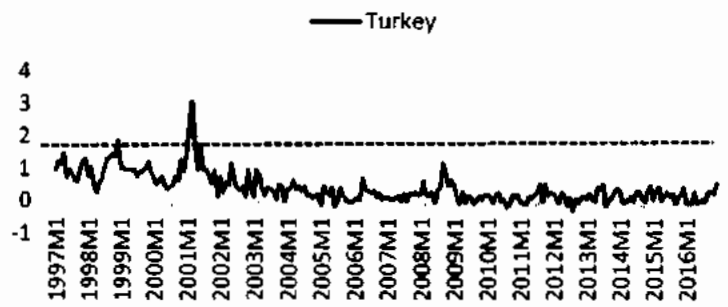
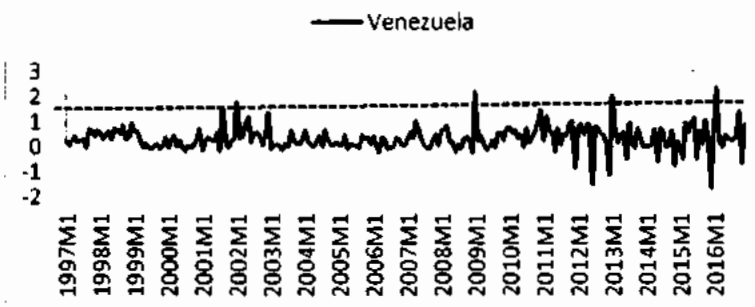


Table 4.1 Country-wise Financial Stress Indices for Emerging and Middle-Income Countries Continued...





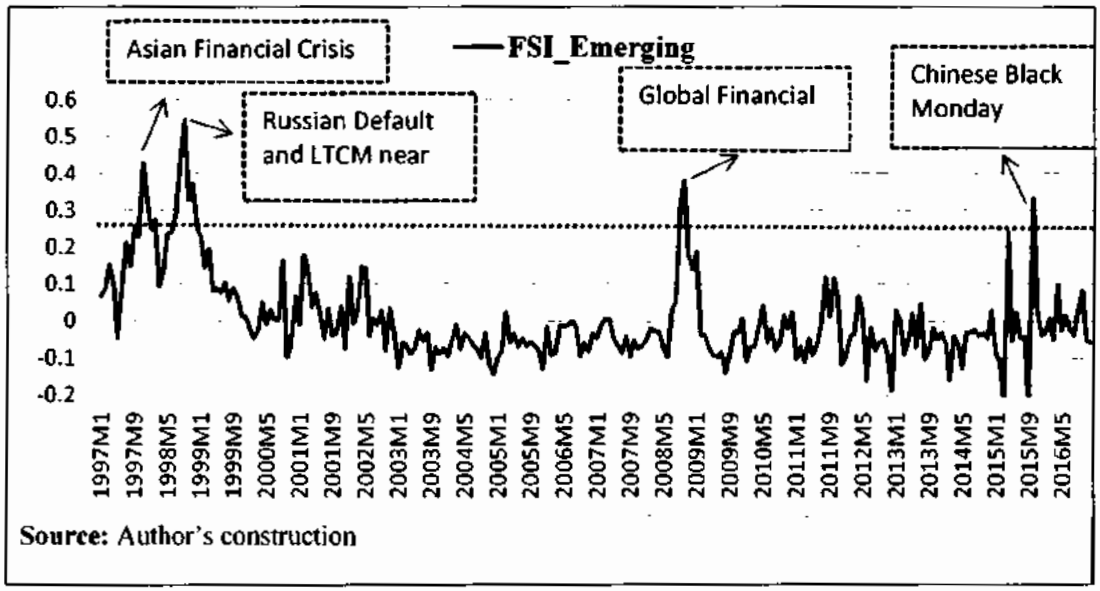
Note: Individual FinSIs for emerging and middle-income countries are computed by applying PCA. The dotted line represents a 95 percent confidence interval. A country is experiencing stressful episodes if FinSI exceeds 2 standard deviations threshold from its trend.

Source: Author's constructions

Next, we examine the composite FinSI index for all the sampled emerging and middle-income countries. Figure 4.2 presents FinSI for emerging middle-income countries. An important issue is to identify episodes of financial stress. Identification is important as stressful episodes indicate failure of the financial system to perform its tasks, thus raising the systemic risk. We construct a 95 percent confidence interval to distinguish between stressful and calm periods. A stressful episode is realized when FinSI exceeds two standards deviation thresholds from its mean value. Overall, the index mentions four episodes of high stress over the sample period of 1997M1-2016M12.

Figure 4.2 Overall FinSI for Emerging and Middle-Income Countries

The figure explains the patterns of financial stress for emerging and middle-income countries through composite FinSI. The horizontal axis plots the period of analysis whereas the vertical axis measures the financial stress index.



Source: Author's construction

The first spike in the index appeared in July 1997 as stock markets in emerging middle-income countries of Asia plunged. Asian financial crisis originated from the

Thai economy, felt more strongly across the Asian region in particular and emerging middle-income countries in general. In the 1990s, Asian economies witnessed massive capital inflows and followed a fixed exchange rate regime until the financial crisis in 1997. Fixed exchange rate regimes encouraged excessive risk-taking as investors were guaranteed for any untoward situation. However, Asian economies lacked the credibility to maintain the peg with the dollar, which encouraged speculative attacks on their currencies. This crisis was broadly categorized as the currency crisis, where many Asian economies followed the financial contagion. Capital flight (sudden stop) and depleted reserves pushed these economies to devalue their currencies. This led to the start of a turbulent period in Asia with a majority of stock indices plummeted by more than 30 percent. As a consequence, high financial stress thwarted financial stability.

Apart from financial contagion, recent literature on the political economy provides striking insights regarding the causes of the financial crisis. This strand highlights that political factors matter in explaining the financial crisis, especially in the context of emerging middle-income countries. It detects the political bubbles by assessment of political risk building up in five years prior to the crisis (Herrera et al., 2014). Our findings confirm this notion as most of the Asian economies faced high political risk five years before the financial crisis in 1997. This first episode of financial stress leads to conclude that apart from risks associated with financial markets, political risk was an important driver of the Asian financial crisis, which raised the financial stress across the Asian region.

The second episode of high financial stress surfaced with the collapse of Russian stocks, bonds, and currency markets and the subsequent collapse of LTCM. This

episode brought the highest spike in the computed FinSI for emerging middle-income countries. Russia announced financial globalization in 1997 while the economy was characterized by weaker fiscal fundamentals coupled with rising interest rates and deteriorating growth prospects. Such domestic vulnerabilities deteriorated the investor's confidence as they anticipated a Ruble devaluation and default on domestic debt in August 1998. Russian government tried to restore investor's confidence in domestic currency by losing hefty amounts of FOREX. Despite all the preventive measures, stock markets plunged nearly 70 percent within a month immediately after the government announcement of the exchange rate float. The government defaulted on domestic debt in December 1998 and the country halted its payments on debt denominated in domestic currency. The Russian crisis enveloped other emerging middle-income countries as sovereign risk rose to unprecedented levels.

Once again political risk became substantial during this period as street demonstrations and social unrest prevailed in the economy owing to high inflation rates after devaluation. Another joint event following the Russian default was a bailout of the LTCM, a hedge fund, which further compounded the financial instability and raised the financial stress (Pinto & Ulatov, 2010).

The third episode of high financial stress emerged in the wake of the global financial crisis in October 2008. Financial stress became intense in emerging middle-income countries following the high FinSI in developed economies. The crisis was originated from the US housing sector where mortgaged loans were provided at cheap interest rates. These loans were sold as a bundle with mortgaged-backed securities. House prices drove upward owing to demand pressures, which created a housing price

bubble. Once the bubble busted, the consumers lost confidence in sub-prime mortgages and the value of mortgages fell sharply. Falling housing prices signaled a drastic fall in the mortgage-backed securities owned by financial institutions around the world. Besides this, banks who invested in such securities faced a liquidity crunch and went bankrupt. These incidences raised financial instability all around the world.

The political economy aspect of this crisis was the promotion of easy loans to support the homeownership policy of Congress. Thus, the willingness of the government to provide homeownership also escalated the political risk, which destabilized the financial markets. A high degree of stress in developed countries was transmitted to emerging middle-income countries through financial globalization. Another source of stress transmission was inter-linkage between the financial sectors of emerging and developed economies. Moreover, domestic vulnerabilities in the emerging middle-income countries further fuelled the transmission of financial stress (IMF, 2009a).

The last episode of higher financial stress took place in August 2015 when China's stock market crashed as the stock market index fell by 8.5 percent on 24th August 2015. This crash was known as China's black Monday (concerning the 1987 stock market crash in the United States). The Chinese economy moved towards a market-based financial system in May 2015, and China devalued its currency to cushion the economic slowdown. Before the crisis, risks of financial instability rotated from developed to emerging middle-income countries, which were characterized by domestic vulnerabilities, weaker balance sheets, and lower growth prospects. This raised the prospects of heightened financial stress for emerging middle-income countries (IMF,

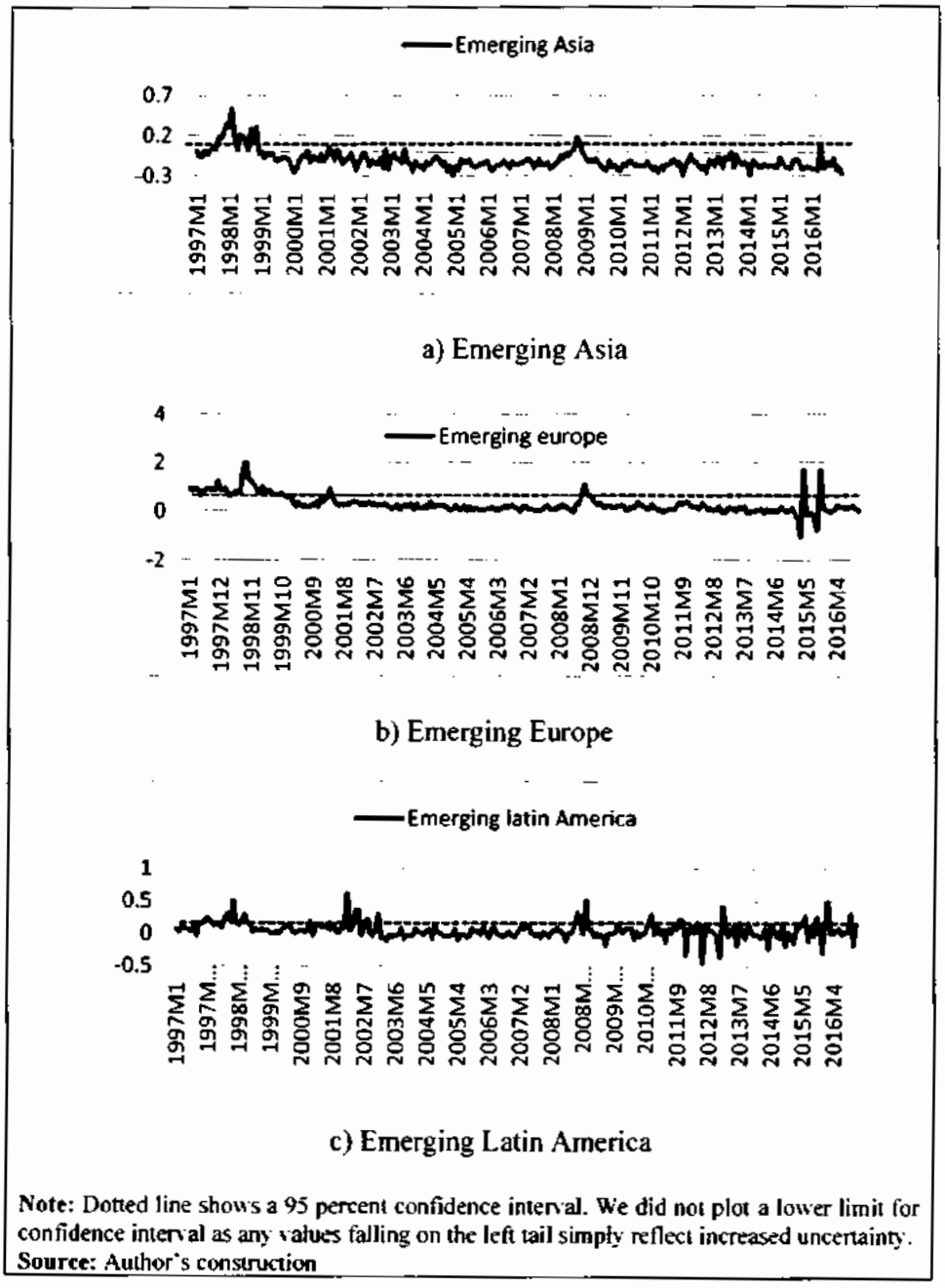
2015b). Chinese economy experienced recessionary trends in 2015 in which financial and corporate sector vulnerabilities magnified substantially. The stock market reached record high levels and Chinese companies faced high liquidity risk and risks of losing FOREX reserves. Since financial linkages became stronger since 2010, the stock market boom in China went into a bust, and a crash in the Chinese stock market was translated into a steep fall in stock price indices worldwide. This raised the level of financial stress in emerging middle-income countries. Thus, we find financial stress spillover within emerging middle-income countries spillover. This finding is in line with Park and Mercado (2014).

Next, we divide the sample of 20 emerging middle-income countries into 3 sub-regions, namely, Emerging Asia (hereafter EA), Emerging Europe (hereafter EE), and Emerging Latin America (hereafter ELA). We dropped Emerging Africa as the sample consists of only two African countries, which restricts us to conduct any meaningful analysis for African countries. Emerging Asia includes China, India, Indonesia, Malaysia, Pakistan, the Philippines, and Thailand. Emerging Latin America consists of Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Finally emerging Europe comprises Hungary, Poland, Russia, and Turkey. These classifications are based on Fiscal Monitor (2017) published by the IMF.

Regional sub-indices for emerging and middle-income countries are drawn in Figure 4.3. Panel (a) draws FinSI for the EA region. This graph captures all four episodes of financial stress experienced by the emerging middle-income countries as a whole. Chinese showdown adversely affected the Asian region as it was a major

Figure 4.3 Regional FinSIs for Emerging and Middle-Income Countries

This figure plots the regional FinSIs for emerging countries. The sampled emerging countries are sub-categorized into three regions, namely emerging Asia, emerging Europe, and emerging Latin America. The horizontal axis measures the period of analysis whereas the vertical axis labels FinSI.



Note: Dotted line shows a 95 percent confidence interval. We did not plot a lower limit for confidence interval as any values falling on the left tail simply reflect increased uncertainty.
Source: Author's construction

exporter of raw materials from EA. For the EE region (see Figure 4.3b), four episodes were realized and three of them were regional as shown in Figure 4.3b.

The first period of high stress was realized in August 1998. This corresponds to the Russian financial crisis, which carried strong repercussions for the region. The second rise in financial stress came into the picture as an aftermath of Turkish banking and currency crises, and political unrest. The fragile banking sector in late 2000 flared up the excessive purchase of government bonds.

Another igniting factor in the banking crisis was delays in banking reforms in the region. FinSI increased as the accumulated effect of these domestic vulnerabilities. The financial crisis further intensified with a political crisis in early 2001 as a controversy between the president and prime minister on corruption in the banking sector surfaced. This crisis ended in the float of the Turkish Lira in February 2001, and the resultant 14 percent depreciation of the currency. However, this crisis did not spillover to other emerging regions but raised financial stress in the European region through financial contagion.

The next peak in FinSI for the EE region occurred in October 2008 when the global financial crisis sent shockwaves to the European region amid the housing price bubble and burst00s. However, the impact was short-lived for the European 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 financial stress (IMF, 2015a).

Patterns of financial stress in the ELA region are demonstrated in Figure 4.3c. First, Russian Default and LTCM exacerbated financial stress through financial contagion.

The second period of escalated financial stress corresponds to the region-specific shock of the Argentinian debt crisis in 2001. This episode did not spillover to other regions owing to underdeveloped financial markets. The third period of heightened financial stress was attributed to the global financial crisis. The initial impact of the global financial crisis was marginal for the region, which supported the decoupling hypothesis. However, the crisis deepened after the bankruptcy of the investment bank Lehman Brothers, which ultimately reversed the capital inflows, raised spread on external financing and intensified the liquidity crunch in the local market.

The next episode of financial stress emerged from the European debt crisis. Latin America was characterized by domestic vulnerabilities, which contributed to the transmission of the Euro debt crisis into the LA region. This enhanced financial stress in LA. The last episode of high financial stress was related to the depreciation of the Chinese currency in 2015 and the enhanced volatility of the Chinese stock market. Stock markets in the Latin American region followed the volatility in the Chinese stock market. Thus, the valuation of the shares of Latin American companies investing in China fell drastically and financial stress escalated across the Latin American region.

Overall, we find evidence for stress transmission from developed to emerging middle-income countries. We further infer that financial stress has been transmitting within regions as well across emerging middle-income countries. These results are consistent with Balakrishnan et al. (2011), and Park and Mercado (2014).

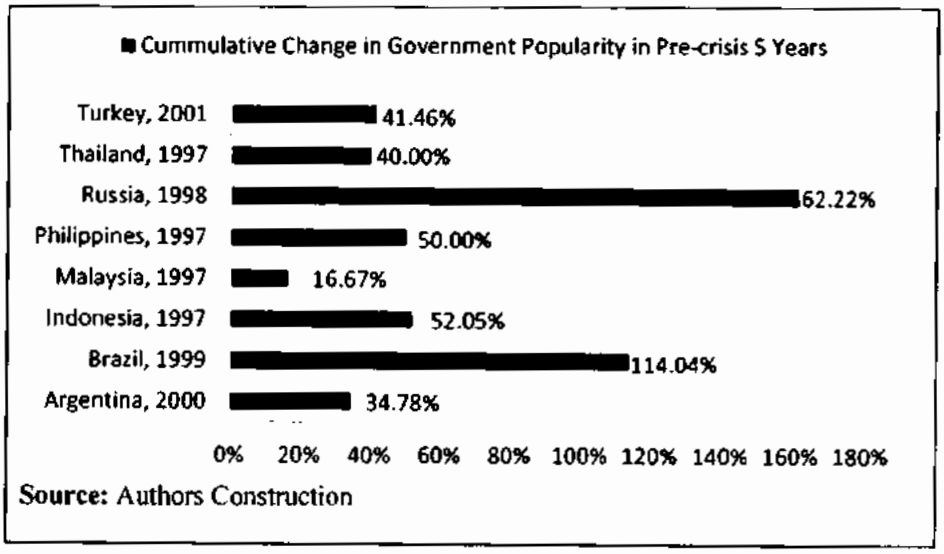
4.1.1.1 Role of political risk in Emerging countries

Political risk is an important driver of financial stress in emerging middle-income countries. This can be verified by analyzing the geopolitical risks before financial

turbulence in these economies. We apply the definition of the political bubble proposed by Herrera et al. (2014). The political bubble is generated if the popularity of a government increases 5 years prior to the financial crisis. We use ICRG data to assess the popularity of governments. This is done by accounting for a cumulative change in government stability 5 years before the financing crisis. Figure 4.4 shows a substantial increase in the popularity of a government before the crisis in emerging countries. On average, the popularity of the government increased by 63.90 percent 5 years preceding the financial crisis in emerging and middle-income countries.[31]

Figure 4.4 Political Bubbles in Emerging Middle-Income Countries

The bar chart explains the political bubbles that appeared in the selected emerging countries. The popularity of the government in 5 years before the crisis is used as an indicator that the political bubble is present.



Source: Authors Construction

[31] The Figure 4.4 covers all major crises originating from the selected group of 20 countries.

4.1.2 Patterns of Financial Stress in Developed Countries

Individual FinSIs for developed countries are drawn in Figure 4.5. A quick look at country-specific FinSIs reveals certain important features. First, the period of 1993-1997 was regarded as a tranquil period when developed countries were characterized by

Figure 4.5 Country-specific FinSIs for Developed Countries

This figure plots financial stress indices for each selected country in the sample of emerging and middle-income countries. The horizontal axis measures the period of analysis whereas vertical axis mentions the financial stress index.

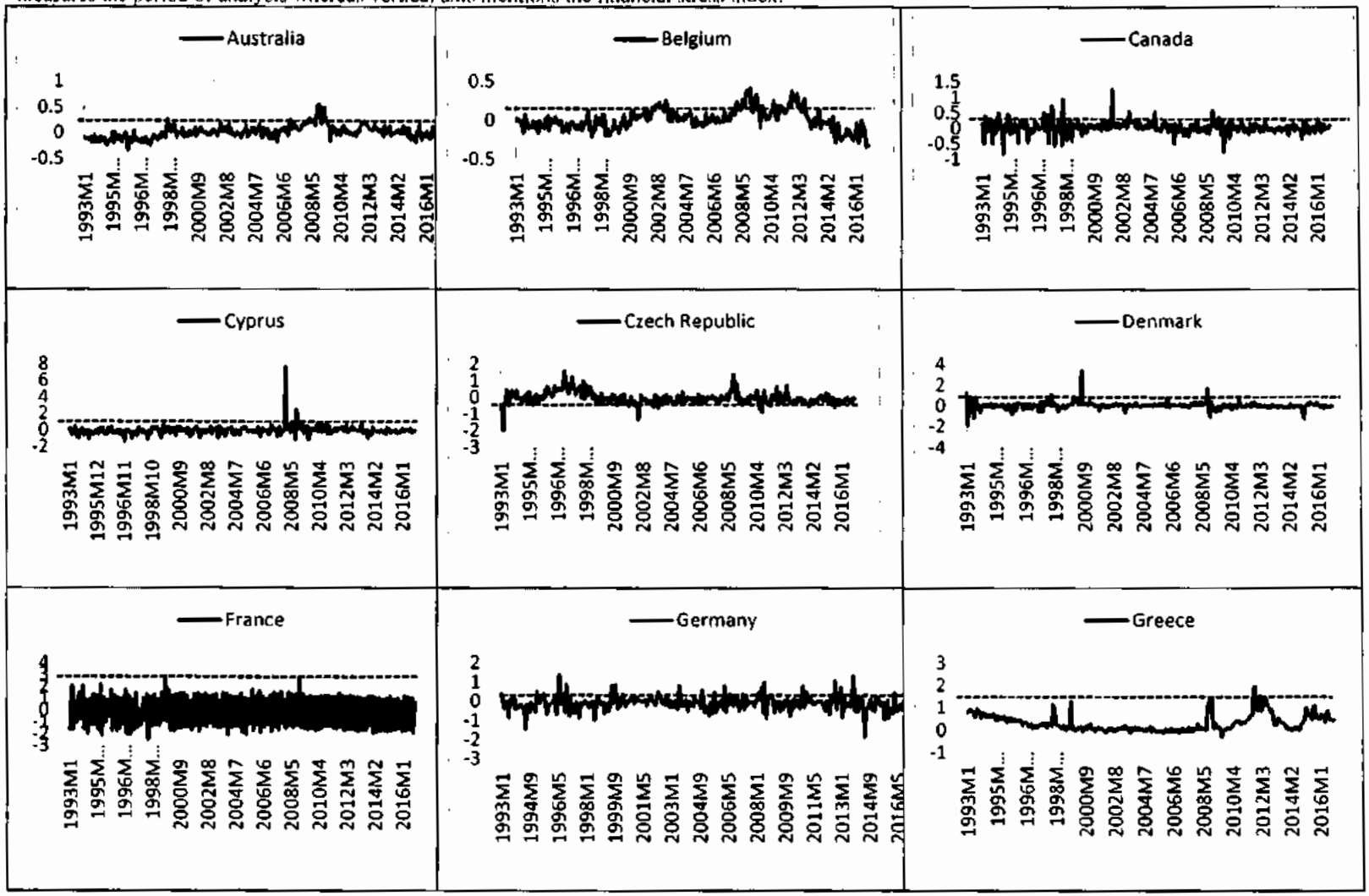


Figure 4.5 Country-wise FinSIs for Developed Countries

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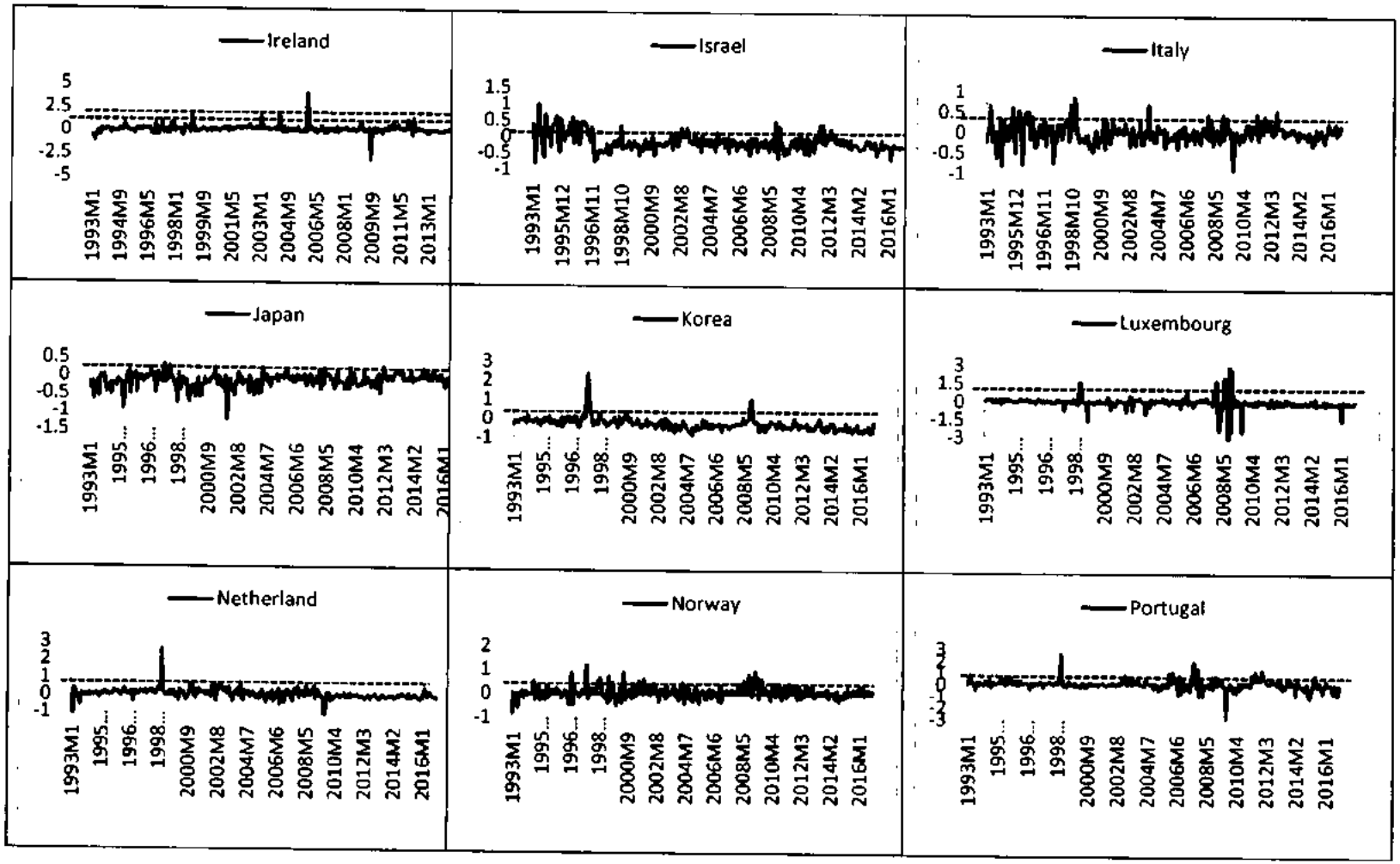
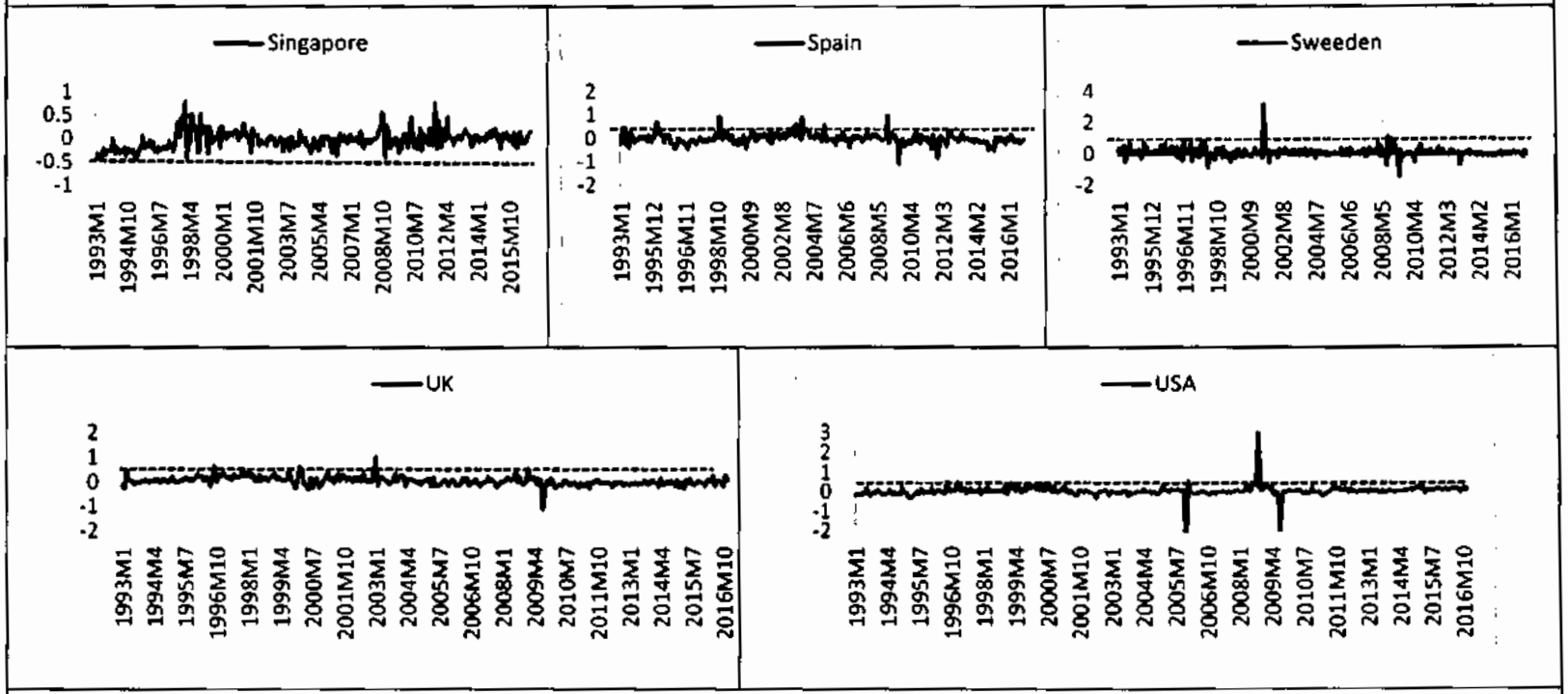


Figure 4.5 Country-wise FinSIs for Developed Countries Continued...



Note: Individual FinSIs for developed countries are computed by applying PCA. The dotted line represents a 95 percent confidence interval.

A country is experiencing stressful episodes if FinSI exceeds 2 standard deviations threshold from its trend.

Source: Author's construction

highly stable financial markets except for France that faced highly volatile financial stress.

Second, developed countries received spillovers from the Asian financial crisis in late 1997 when FinSIs increased marginally. Third, FinSIs demonstrate substantial stress following the collapse of LTCM, a US hedge fund. This effect was extensive for the US and the European developed countries. Fourth, the dotcom bubble escalated individual FinSIs for developed countries for the period 2001-2003. But this effect was limited to a few economies. Fifth, developed countries experienced financial stability since 2003 until the global financial crisis disrupted the smooth functioning of the financial system. The crisis began in 2007 and FinSI peaked in October 2008.

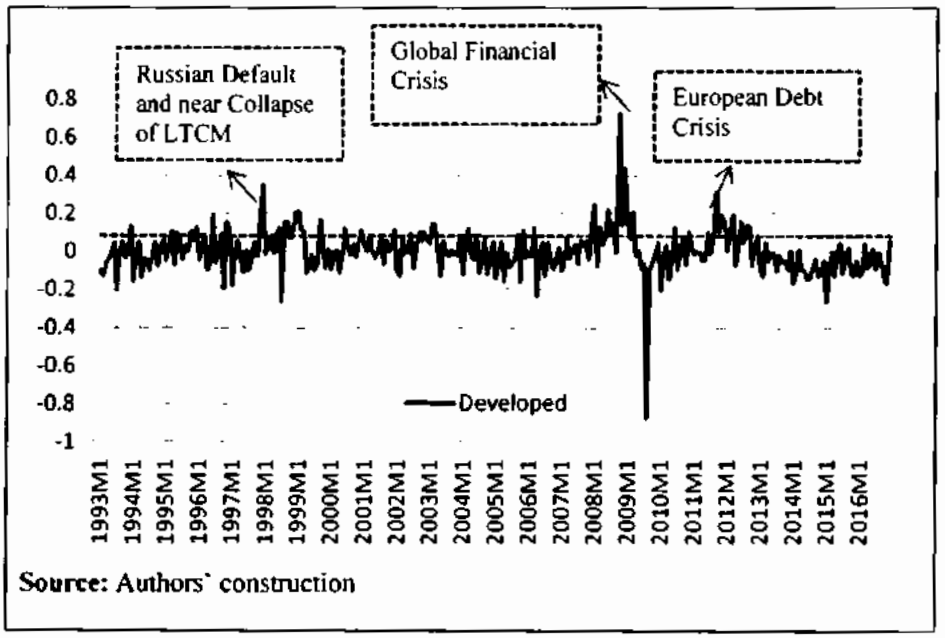
A high degree of stress was transmitted to nearly all the developed countries. Sixth, financial stress intensified once again in 2011. This episode corresponded to the European sovereign debt crisis. Almost all the European countries experienced strikes, protests in response to austerity measures. Political instability raised political risk and a magnified bottleneck in the financial system. Eventually, financial stress became intense in the region. Overall, the patterns of financial stress are well documenting the known periods of financial stress in developed countries. Thus, individual FinSI carries substantive predictive power to identify stressful and calm periods.

Next, we construct overall FinSI for selected 23 developed countries to observe whether such episodes of financial stress are significant enough to halt the financial stability of the developed countries. The constructed FinSI is plotted in Figure 4.6. The first episode of high financial stress was observed in 1998 with the Russian bond default in August 1998 and near collapse of LTCM in September 1998. Russian default raised

credit risk and widened the spread of long-term bond yield in developed countries. This, in turn, elevated the volatility in the stock markets of developed countries. Near default of LTCM, a US-hedge fund sparked liquidity concerns. Our findings support financial contagion from emerging (Russian economy) to developed countries.

Figure 4.6 Overall FinSI for Developed Countries

The figure explains the patterns of financial stress for developed countries through composite FinSI. The horizontal axis labels the period of analysis whereas the vertical axis plots the financial stress index.



Source: Authors' construction

These findings are in line with Dungey, Fry, Gonzalez-Hermosillo, and Martin (2002). Thus, both events together raised the stock market, sovereign, currency, and political risks that further raised financial stress. The next spike in FinSI for developed countries came during the global financial crisis in October 2008. Interaction of factors such as global developments, a high level of interconnectedness, segmented regulatory mechanism, and failure of large banks generated insolvency risks. This crisis was much

beyond the liquidity crisis. Similar findings are reported by Thakor (2015).[32] Systemic instability of the developed countries became manifest with the collapse of Lehman Brothers. This triggered a series of banking defaults despite government plans to inject more funds into private banks to insulate them from failure. Despite the bailout packages by the Fed Reserve bank, the crisis marked its effect on other developed countries. The major stock markets tumbled substantially. This raised financial stress in nearly all the developed countries, forcing them to opt for bailouts.

The last period for a high level of financial instability came once the European region was trapped in a sovereign debt crisis in 2011. The European debt crisis was linked with the global financial crisis as the financial crisis followed the reoccurring patterns. The global financial crisis made the balance sheets highly levered. European countries experienced credit booms with excessive mortgage loans and a low rate of interest. These countries were characterized by structural issues of trade deficit, high debt, reliance on external capital, monetary union without fiscal union. and fragile banking. In the wake of the great recession in 2009, European countries faced a sudden stop of capital, the balance of payment problems, and tight financial conditions. Eurozone lacked any financial institution that could serve as a lender of last resort. Moreover, the devaluation was not an available policy option under the European Monetary Union (hereafter EMU). Large banks in the European regions faced liquidity risk and credit stress, which were bailed out by the states through recapitalization loans. Banks' recapitalization together with domestic vulnerabilities raised the debt-to-GDP

[32] Political factors refer to the house ownership policy of congress through excessive mortgage lending that raised credit stress.

ratio to unsustainably high levels. Thus, banking failure and credit stress were translated into sovereign default risks for the countries. The sovereign debt crisis became a concern when the Greece government failed to finance its debt in 2010 and was bailed out by the IMF and the European Commission. This followed a series of bailouts in the European countries, such as Ireland, Portugal, Italy, Spain, and Cyrus. As a result sovereign risk rose significantly, which led to high financial stress.

Another aspect of the European crisis underlines the factor that EMU was a political project of incomplete economic integration. The union itself inherited some flaws. First, EMU formulated a coordinated monetary policy but regional integration was not yet complete. The member countries lacked fiscal union. Second, the member countries were characterized by divergent macroeconomic fundamentals. Third, European financial markets became a single financial market very quickly but financial regulations remained decentralized. Fourth, it was perceived that in times of financial difficulties in one member state, other member states would be forced to bailout the turbulent member. However, no explicit commitments were taken in the EMU for a bailout. Thus, surplus economies were reluctant to bailout the countries that accumulated high debts. The European crisis was not only the outcome of the global financial crisis and recession rather it was also a manifestation of the tensions prevailing in the EMU since its formation.

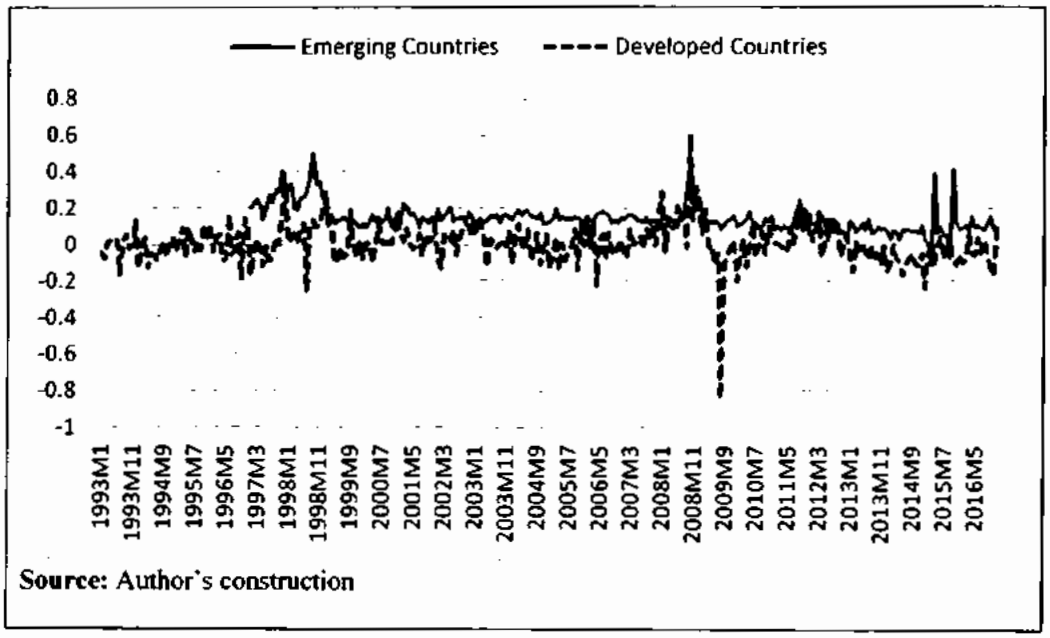
4.1.3 Comparison of FinSIs for Emerging and Developed Countries

Finally, we compare FinSIs for emerging and developed countries. Figure 4.7 plots FinSIs for both types of economies. The graphic analysis depicts the following

observations. First, both the FinSIs tend to follow similar patterns. However, their co-movement is not strong. For most of the periods, local peaks in indices are not coinciding.

Figure 4.7 Comparing FinSIs for Emerging and Developed Countries

Patterns of FinSIs for emerging and developed countries are compared in the graph below. The horizontal axis shows the period of analysis whereas the vertical axis mentions composite FinSIs for each country groupings.



Source: Author's construction

Second, the highest peak in FinSI for emerging middle-income countries corresponds to the Russian financial crisis, whereas FinSI reached its peak in 2008 for developed countries. Third, FinSIs coincide with each other in the early years of the 2000s. These years are largely defined as tranquil periods. Fourth, FinSI for emerging and middle-income countries suggests that the index rose substantially in the last 2 years of analysis. This can be explained through increasing political risk in the emerging middle-income countries in the recent past. Thus, we conclude that high

political risk is regarded as an important element in raising FinSI in emerging economies.

4.2 Results and Discussion for Measurement of Fiscal Stress

We apply PCA on the normalized components of fiscal stress to construct composite FisSIs for emerging and developed economies. These stress indices combine 12 and 11 variables to construct composite FisSI for emerging and developed economies respectively. These variables are interest-rate-growth difference, gross debt by the general government, cyclically adjusted primary balance, fertility rate, age dependency ratio, population aging, gross financing needs, short-run debt as a ratio of total debt, debt held by non-residents, weighted-average maturity of total government debt, short-term external debt as a ratio of reserves and political risk for emerging countries. The results are shown in Table 4.2.

While constructing FisSI for developed countries only relies on the 11 variables as short-term external debt as a ratio of reserves is not relevant for developed countries. Table 4.2 shows that the first principal component captures about one-fourth of the variation in data. The standard literature suggests that a composite index for emerging and developed countries should be constructed in such a way that it may at least accounts for at least 50-60 percent of the total variation. Thus, we take a non-standardized average of the components having eigenvalues greater than 1. In the present context, we take an average of the first three components to construct FisSI for both the set of countries. Our constructed FisSIs explain 54.53 and 60.17 percent of the cumulative proportion of variation for emerging and developed countries respectively.

Table 4.2 Results for Principal Component Analysis: Fiscal Stress Indices[33]

Country Groups	Emerging and Middle-income countries			Developed countries		
Components	Eigenvalues	Proportion	Cumulative Proportion	Eigenvalues	Proportion	Cumulative Proportion
Component 1	3.0191	0.2516	0.2516	2.6353	0.2396	0.2396
Component 2	2.0749	0.1729	0.4245	2.5438	0.2313	0.4708
Component 3	1.4502	0.1208	0.5453	1.4395	0.1309	0.6017
Component 4	1.3417	0.1118	0.657	0.9862	0.0897	0.6913
Component 5	0.9740	0.0812	0.7383	0.9014	0.0819	0.7733
Component 6	0.8235	0.0686	0.8069	0.7005	0.0637	0.8370
Component 7	0.7676	0.0640	0.8709	0.6376	0.0580	0.8949
Component 8	0.6506	0.0542	0.9251	0.6270	0.0570	0.9519
Component 9	0.4207	0.0351	0.9602	0.3210	0.0292	0.9811
Component 10	0.3071	0.0256	0.9858	0.1126	0.0102	0.9913
Component 11	0.1303	0.0109	0.9966	0.0953	0.0087	1
Component 12	0.0405	0.00034	1	-	-	-

Source: Author's Estimates

Next, we conduct a graphic analysis to analyze the periods of high fiscal stress. For the sake of simplicity, we used an expert-based approach for this analysis and exploit

[33] Short term external debt is relevant only for emerging middle-income countries.

the chronology of fiscal stress and fiscal crisis events provided by Baldacci et al. (2011b) and Kim et al. (2015). For political risk, we make use of the political stress events listed in Caceres and Kochanova (2012).

4.2.1 Analyzing FisSIs for Emerging and Middle-Income Countries

Once we construct the newly proposed indices based on the methodology explained in Chapter 3, the next task is to conduct a detailed discussion on patterns of fiscal stress for the sampled emerging economies. For this purpose, this section is subdivided into three sub-sections. The first sub-section documents the country-specific FisSIs for the sampled emerging countries whereas sub-section two and three explain the composite and regional FisSIs for the selected emerging countries.

4.2.1.1 Country-Specific FisSIs

This sub-section explains patterns of individual FisSIs for 17 emerging and middle-income countries over the period 2000-2016, which constitutes 289 observations.[34] We report the country-wise patterns of fiscal stress in emerging and middle-income countries in Figure 4.8. The graphic analysis pinpoints several important observations. First, country-specific FisSIs show that emerging countries experienced a high degree of fiscal stress in the early 2000s owing to sovereign debt problems. Second, fiscal stress stayed low in most of the countries during 2004-2008. However, exceptions do exist in the case of Turkey (2005) where the country approached the IMF for a bailout and experienced high fiscal stress. Third, fiscal stress regained momentum as an

[34] We faced serious constraint, in terms of length as well as country coverage, on availability of data for short term debt as the ratio of total debt for emerging middle-income countries. This reduced the final sample to 17 countries, categorized into four sub-regions.

aftermath of global financial crises as countries faced extreme financial constraints with the

Figure 4.8 Country-specific FisSIs Stress Indices for Emerging and Middle-Income Countries

This figure plots fiscal stress indices at the country-level in the sample of emerging and middle-income countries. The horizontal axis measures the period of analysis whereas the vertical axis labels the fiscal stress index.

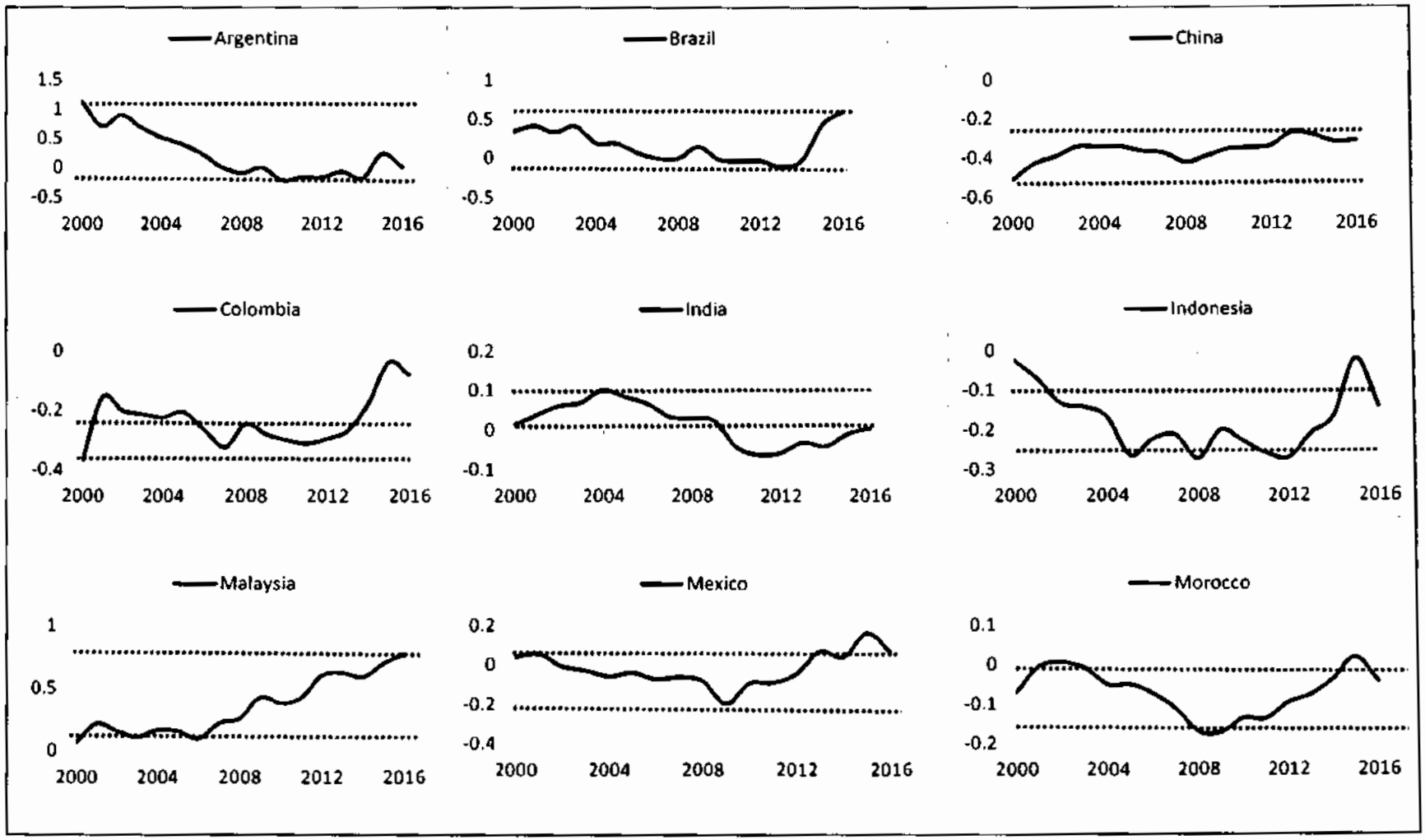


Table 4.8 Country-wise Fiscal Stress Indices for Emerging and Middle-Income Countries

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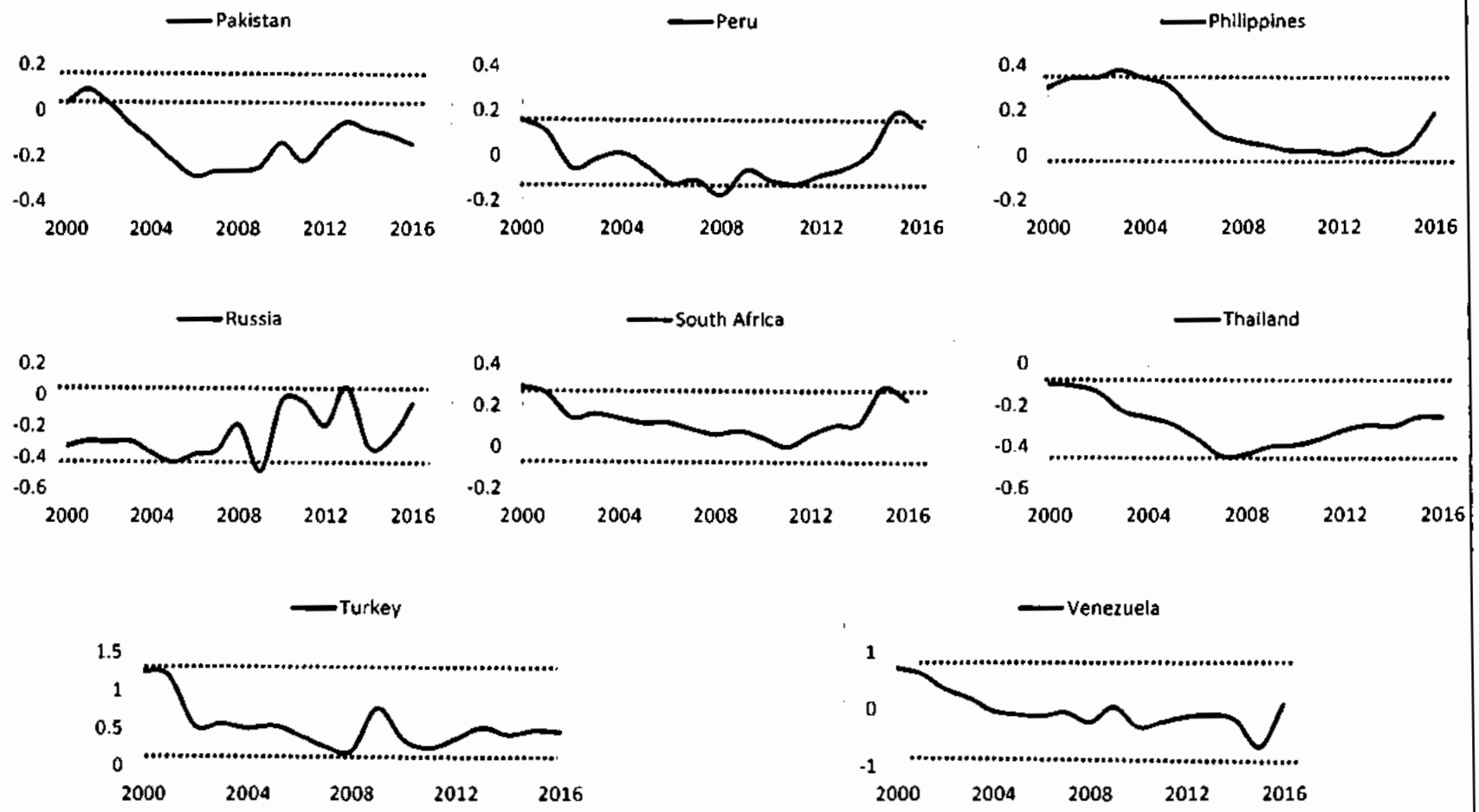


Source: Author's construction

decline in global liquidity. Another exception is China where fiscal discipline enabled the country to keep fiscal stress manageable.

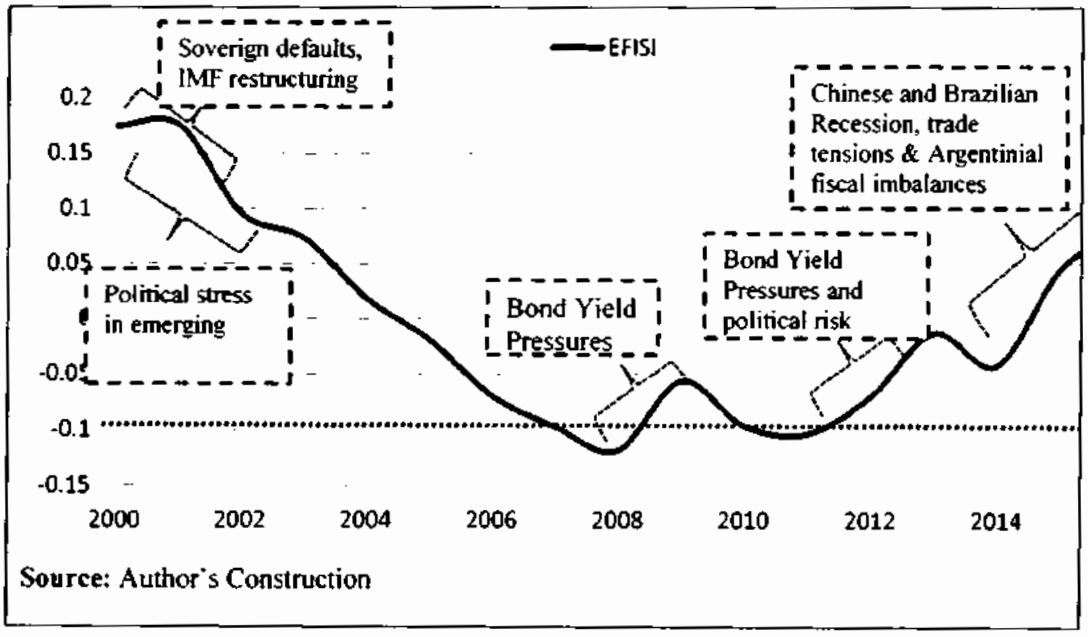
However, these effects were short-lived and fiscal stress was not extreme in most of the countries. Lastly, during the last three years of analysis, most of the countries realized high fiscal stress that can be attributed to various factors, such as inflation targeting regimes, falling commodity prices, and debt crises.

4.2.1.2 Composite FisSSI

*Next, we develop aggregate FisSI for emerging and middle-income countries. Figure 4.9 plots the annual FisSI for emerging and middle-income countries over the period 2000-2016.

Figure 4.9 Overall FisSI for Emerging and Middle-Income Countries

The figure explains the patterns of fiscal stress for emerging and middle-income countries through composite FisSI (EFisSI). The horizontal axis measures the period of analysis whereas the vertical axis mentions the fiscal stress index.



Source: Author's Construction

The overall index identifies 5 broader peaks in fiscal stress. The first spike in composite FisSI for emerging middle-income countries appeared in the early 2000s when several emerging middle-income countries were trapped into sovereign default

and restructuring. The first and the most important debt crisis surfaced in Argentina when Argentinian Peso devaluated and a deposit freeze was imposed in December 2001 besides severe fiscal imbalances. Interest rates and, hence, sovereign bond spread rose steeply. Finally, the government announced sovereign default in December 2001. The second country that faced sovereign debt crises was Brazil where the Brazilian economy experienced a high degree of fiscal imbalances and rising interest rates as an aftermath of the financial contagion from the Argentinian economy. The reason for the spread of crises was the close direct trade linkages between Argentina and Brazil. Thus, both these economies experienced overlapping financial and fiscal crises when currency and sovereign bond risks started to pile up. The third serial sovereign default emerged for Indonesia in 2001 and 2002.[35] The first crisis in Indonesia originated from the external shock from the Asian crisis where the Indonesian currency devalued sharply. Besides that, vulnerabilities in banking and corporate sectors raised banking crises which were transmitted into sovereign debt crises in 2001. Almost half of the Indonesian corporations became insolvent and they underwent external debt restructuring. This raised fiscal stress to unprecedented levels. However, the duration of the fiscal crises was short-lived (1-2 years) for Brazil whereas Argentinian and Indonesian sovereign defaults lasted for several years as defaults or restructurings forced them to receive IMF supported bailouts, which further raised fiscal stress.

The second cluster of fiscal stress episodes in the early 2000s partially overlapped with the first episodes explained above. The political environment in Indonesia exacerbated the problems of fiscal stress as the government failed to

[35] According to Asonuma (2016), serial sovereign default refers the situation where past history of default on debt repayments makes a country more likely to default again in future. Emerging middle-income economies are more vulnerable to this possibility.

restore investors' confidence through a stable policy environment. Likewise, banking panics and sovereign default in Argentina raised political risk as bad policymaking ultimately forced the President to tender resignation. Thus, we find empirical support to the notion that political and fiscal stress overlap as mentioned by Caceres and Kochanova (2012). Additionally, political instability in Colombia (2003), Peru (2000), Turkey (2001), and Venezuela (2002) stimulated fiscal stress in emerging middle-income countries in the early half of the 2000s. These findings are in sharp contrast to the existing literature in terms of highlighting the role of political risk as an important variable affecting fiscal stress.

The next couple of years were marked as tranquil periods when rollover risk stayed low for emerging middle-income countries. The third stressful period appeared in 2008 with excessive risk aversion and the deleveraging process in the global market squeezed the credit supply from international markets.[36] Emerging middle-income countries were confronted by two types of adverse shocks, namely a fall in export demand and squeezed credit from the international market in the wake of global financial crises. Excessive liquidation in domestic bond markets exerted pressures on bond yields and fiscal stress.

The fourth spike in the FisSI for emerging middle-income countries originated from the crisis prevalent in Venezuela. Bond yield pressures in 2012 initiated the fiscal crisis which was coupled with a growing public deficit and an excessively overvalued currency. The economy faced a series of problems, such as currency crises, heavy dependence on oil, mass mismanagement, and corruption. The presidential elections in 2013 were marred by fraud and corruption charges. Falling oil prices in 2014 further dented the revenues from oil-exports, especially as the

[36] Global financial crises raised fiscal stress in Colombia in 2009; Malaysia in 2009; Mexico in 2009; Pakistan in 2008; Russia in 2009, and Venezuela in 2008.

government decided to cut down the supply of oil. Thus, revenue shortfalls grew with hyperinflationary trends. This economic crisis turned into a political crisis with street protests on economic mismanagement and corruption of the government. Thus, economic and political crisis pushed the country into fiscal crises, which raised fiscal stress in emerging middle-income countries.

The last episode of fiscal stress in FisSI for emerging middle-income countries was realized from 2014 to 2016. This episode captured many events, which were Brazilian default, accompanying Argentinian excessive fiscal imbalances, and trade slowdown. Brazilian economy mired in severe recession as the commodity prices fell. This recession not only lowered down real GDP but also raised inflation. Since Brazil, Colombia and Mexico followed inflation targeting policies. They raised interest rates to subside rising inflationary pressure. A high inflation rate was compromised with huge government yield spreads that elevated the default risks, and hence, fiscal stress in these economies (Arellano, Bai, & Mihalache, 2019). Moreover, record huge fiscal imbalances (6.7 percent of GDP as compared to 2.7 percent in the 2001 Argentinian crisis) in Argentina created sustainability problems and higher fiscal stress during 2015. Another important factor that exacerbated fiscal stress was trade slowdown with tariff war between China and the US, which lowered revenues for both the economies and adversely affected the fiscal revenues. Overall, FisSI for emerging middle-income countries shows that fiscal stress stayed very high owing to debt crises, fiscal imbalances, implications from global markets, and political risks prevelant in these countries.

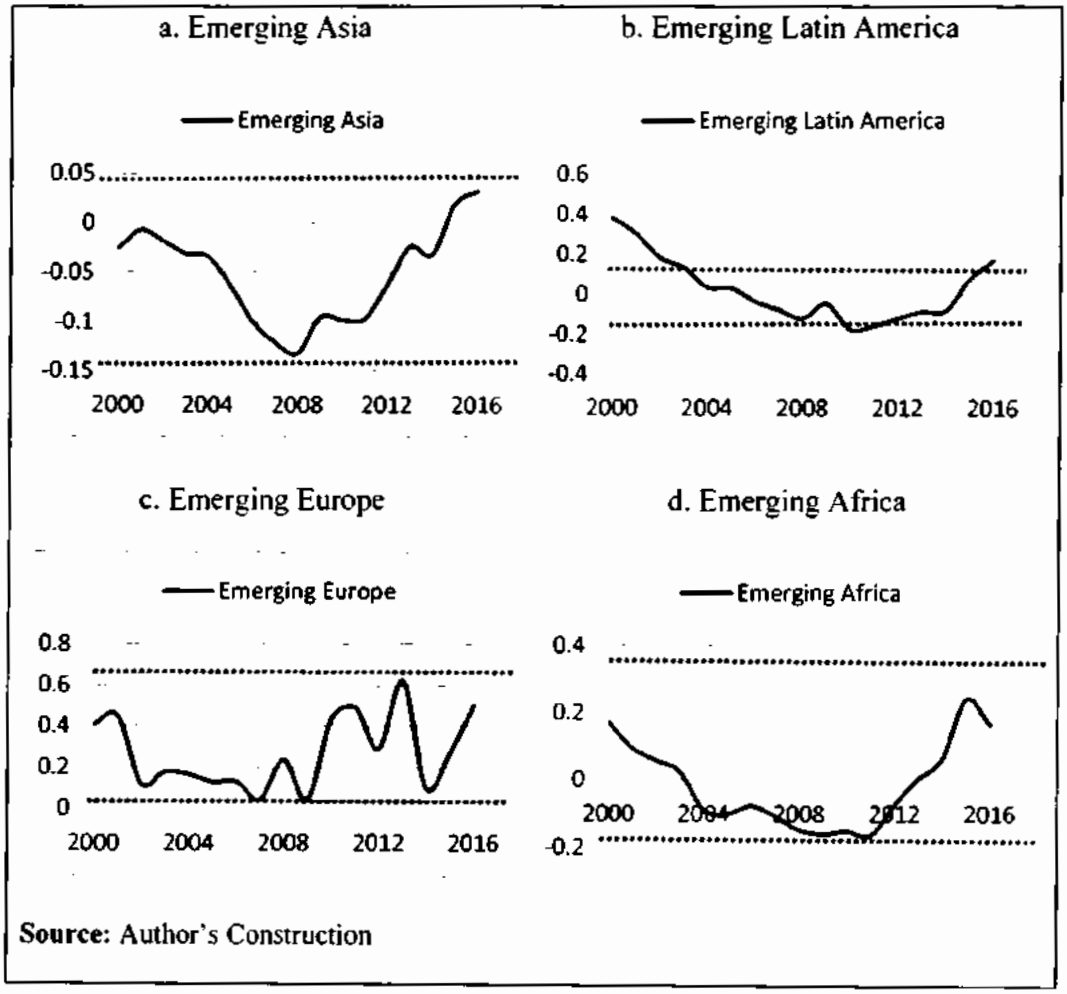
4.2.1.3 Regional FisSIs

Next, to account for regional contributions, we divide the sampled countries into four regions: namely Emerging Asia, Emerging Latin America, Emerging

Europe, and Emerging Africa (hereafter EA, ELA, EE, and EAF respectively). Figure 4.10 draws regional FisSIs for the period covering 2000-2016.

Figure 4.10 Regional Patterns of Fiscal Stress in Emerging Countries

This figure elaborates on the regional patterns of FisSI for emerging countries. The sampled emerging countries are sub-categorized into four regions, namely emerging Asia, emerging Latin America, emerging Europe, and emerging Africa. The horizontal axis measures the period of analysis whereas the vertical axis measures the fiscal stress index.



Source: Author's Construction

Panel (a) indicates that fiscal stress followed a declining trajectory in EA until the global financial crisis surfaced in 2007. Despite deep trade linkages between China and the USA, the Chinese economy stayed highly resilient to the financial crisis. However, higher fiscal stress in the Malaysian economy was a trigger factor for higher fiscal stress in EA. Panel (b) plots regional FisSI for ELA. The figure shows that fiscal stress was high in the early 2000s owing to sovereign debt

problems in Argentina and Brazil, and political risk in emerging middle-income countries. However, stress stayed manageable after the global financial crises as these economies put substantial efforts to lower down debt-to-GDP ratio, built fiscal buffers, and enjoyed positive growth.

Panel (c) portrays FisSI for Emerging Europe which was high in 2001 owing to the financial crisis in Turkey that carried negative feedback effects when the banking sector was given bailouts to avoid default. This raised public debt and hence, fiscal stress in the region. After a period of a relatively calm fiscal environment, fiscal stress raised again in the wake of global financial crises as European countries caught contagion from the US. Fiscal stress reached unprecedented heights after the European debt crises surfaced in 2011.

Panel (d) draw FisSI for EAF. The index followed a downward trend in the early 2000s owing to a falling debt trajectory in the region. This trend halted when the governments in Emerging African countries adopted counter-cyclical fiscal policy after the financial crisis in 2008. On the one side, recessionary trends lowered the tax receipts, while on the other hand government ran a deficit budget. This forced the governments to borrow, thereby public debt started to rise. The ultimate impact of such actions was higher fiscal stress after the global financial crises. In the last two years of analysis burden of fiscal stimulus reduced and fiscal deficits and debt started to decline and fiscal stress subsided. Regional analysis suggests that ELA contributed the most in higher fiscal stress in the early 2000s whereas elevated levels of fiscal stress in EE regions accounted for higher FisSI in emerging countries for 2008 and onwards. The regional analysis supports the viewpoint of Gerling et al. (2017) that various crises episodes (financial, political, and fiscal crises) overlapped each other through bank-sovereign feedback loops and political uncertainty.

4.2.2 Evolution of Fiscal Stress in Developed Countries

This section is sub-divided into three sub-sections. The first sub-section document results for the country-specific FisSIs. The second sub-section provide a detailed ananlysis for composite FisSI for developed countries. The last sub-section discuss results for regional FisSIs.

4.2.2.1 Country-Specific FisSIs

This sub-section explores the patterns of FisSI for the sampled developed countries. Country-specific FisSIs for developed countries are graphed in Figure 4.11. A close look at the country's FisSIs reveals the following observations. First, there exists a lot of heterogeneity in the pattern of fiscal stress. This heterogeneity reflects the varying fiscal positions of the developed countries. Countries characterized by strong expenditure growth (Greece, Ireland, and Portugal) were the ones that faced higher fiscal stress in the last years of analysis as their fiscal buffers were not sufficient to combat the crisis. In some cases, strong revenue growth was driven by the asset and real estate boom (Ireland and Spain prior to the 2007 crisis), which raised the downside risks (Cottarelli et al., 2014).[37] Second, fiscal stress stayed low in most countries during the period 2000-2008 with a few exceptions (Austria, France, Germany, Greece, Italy, Norway, and Portugal) where fiscal stress was substantial.

Third, a hike in fiscal stress appeared in 2009 in almost all the developed countries as the global financial crisis spread across the US. However, the response to global financial crises depends on the state of fiscal discipline in the pre-crisis period. For example, countries that obeyed strict fiscal discipline (Belgium, Canada,

[37] Downside fiscal risk refers to adverse macroeconomic shocks that call for higher contingent liabilities.

Czech Republic, Denmark, Ireland, Netherlands, and Sweden) through a set of fiscal rules and institutions experienced a very short-lived increase in fiscal stress in the wake of global financial crisis. These countries can be characterized as fiscally sustainable countries. On the other hand, the countries characterized by a long-term history of fiscal deficits, high debt-to-GDP ratio, and fiscal indiscipline (Austria, France, Germany, Greece, Italy, Portugal, the UK, and the USA) suffered the most as they were already facing sustainability problems. The impact of global crises on fiscal stress, however, damped down in one to two years in most of the countries that maintained fiscal discipline (Canada, Czech Republic, Denmark, and Ireland). For the countries that lack fiscal discipline, the effects lasted for longer periods (Greece, Italy, Portugal, the UK, and the USA). Fourth, the European debt crisis affected not only the countries with an established history of persistent deficits and public debt; it did not even spare the countries with a history successful fight back against debt accumulation.

The reason was the accumulation of the private sector debt as a house price bubble blew up. Thus, excessive private debt compelled the governments to bailout their ailing banking sectors. Fifth, fiscal stress stayed very low for certain countries during global financial and debt crises. For example, Canada lowered the budget deficit as well as the debt-to-GDP ratio in the 1990s. This helped Canada maintain fiscal sustainability during the financial and debt crises. Fiscal stress stayed manageable and after a rise in public debt and fiscal deficits in 2009, the trend reversed and Canada followed the trajectory of fiscal surplus and low debt. Likewise higher intergenerational savings in the Petroleum fund helped the Norwegian government to maintain fiscal order. These findings are consistent with Wyplosz (2012).

Figure 4.11 Country-specific FisSIs for Developed Countries

This figure plots fiscal stress indices at the country-level in the sample of developed countries. The horizontal axis measures the period of analysis whereas the vertical axis measures the fiscal stress index.

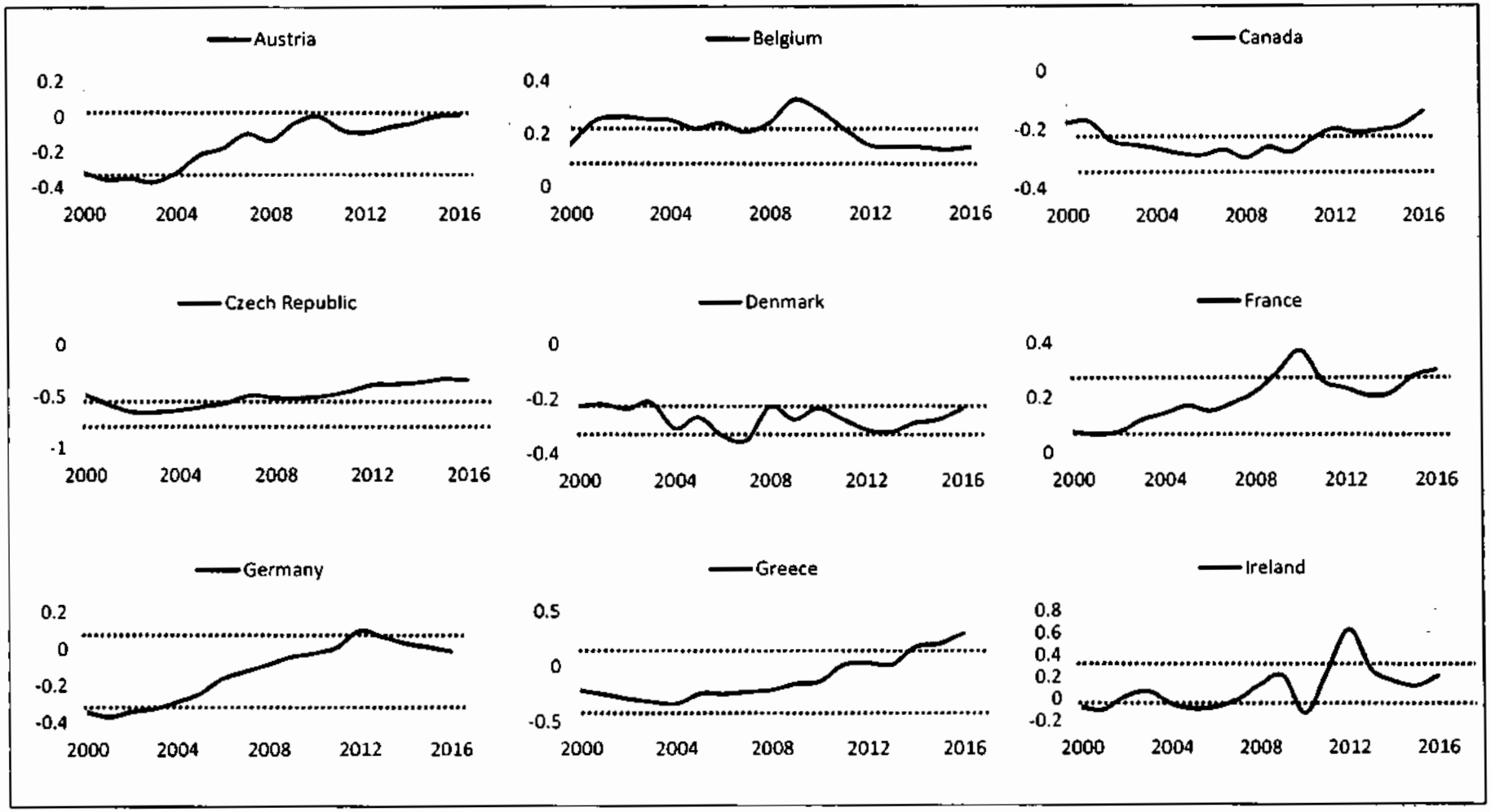


Figure 4.11 Country-wise Fiscal stress Indices fro Developed Countries

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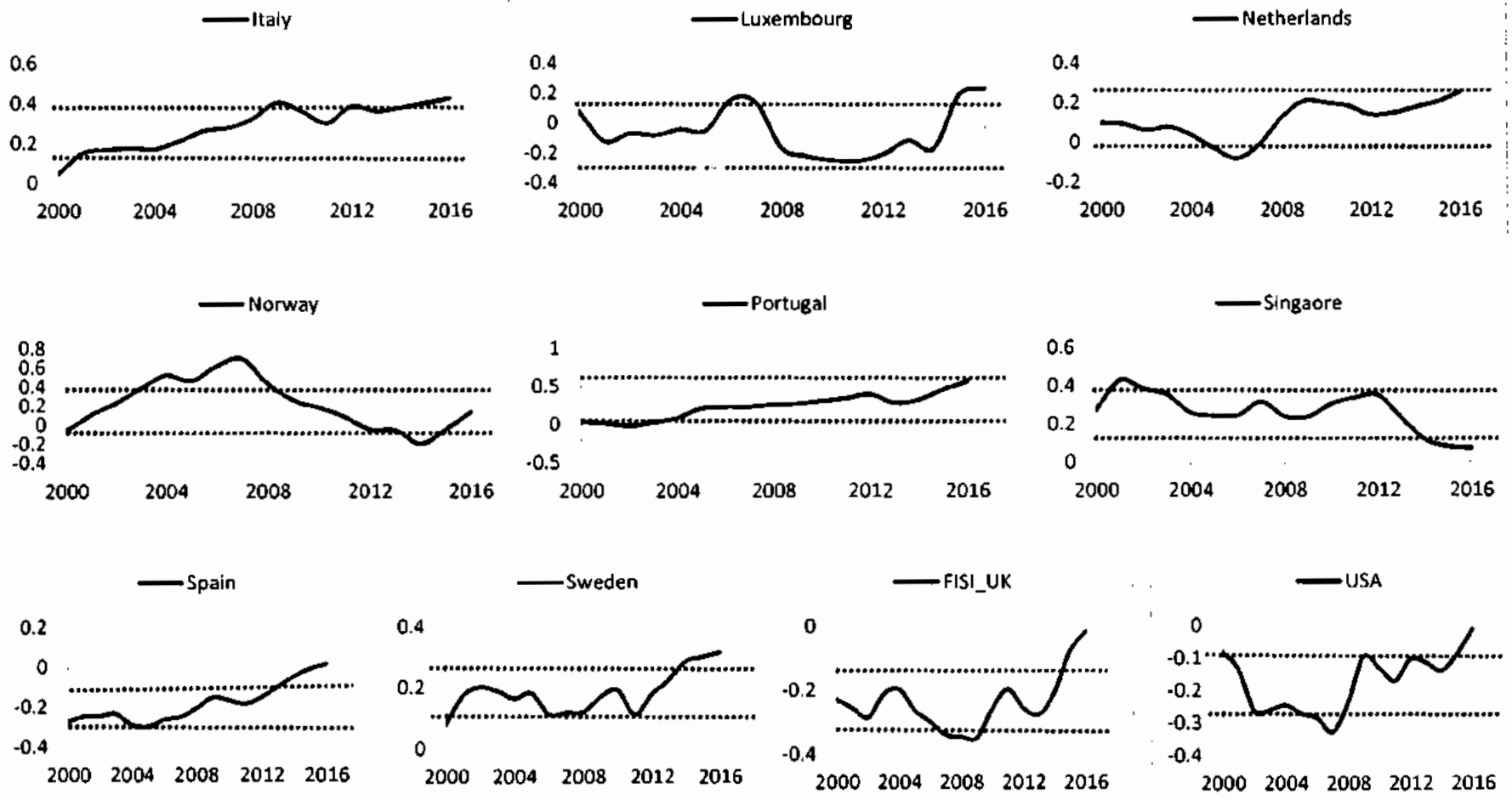


Source: Author's Construction

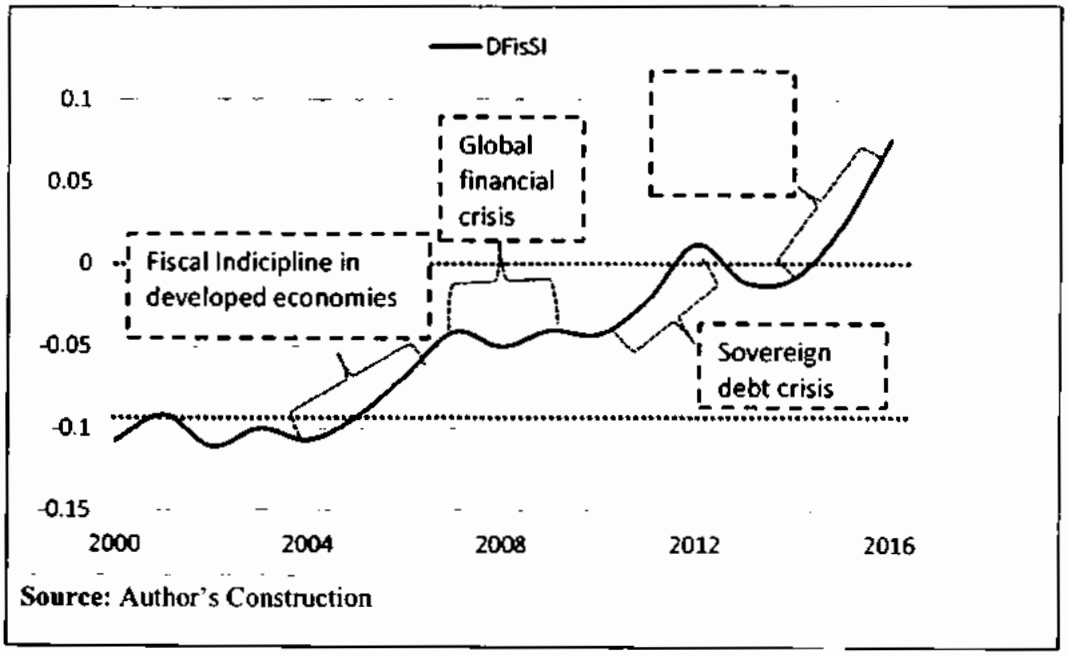
4.2.2.2 Composite FisSI

We draw the composite FisSI for developed economies in Figure 4.12. The figure shows that fiscal deficits followed a declining trend in the late 1990s and early 2000s but this trend halted with a mild recession and increasing expenditures pressures for health and public pensions in the early 2000s. Though a little improvement in fiscal balance was observed during the period 2004-2007 public debt stayed at an unsustainably high level, indicating fiscal indiscipline. Although the stance of fiscal policy was countercyclical the magnitude of the policy measures was insufficient. Developed economies realized a steady rise in FisSI in the early 2000s. This higher FisSI for developed countries was attributed to one of the major vulnerabilities, higher public debt. The elevated debt level was largely ignored by the developed countries as it was misperceived that emerging middle-income countries are more prone to sovereign debt crises. In reality, emerging middle-income countries' debt was relatively sustainable as their interest-rate growth differential stayed negative in the early 2000s which helped them reduce the debt-to-GDP ratio. In contrast, this differential stayed positive for developed countries, reflecting that despite temporary improvements in fiscal balance[38], the debt-to-GDP ratio remained very high. This ratio stood at 60 percent of GDP in 2007 whereas it was as low as 44 percent in emerging middle-income countries in the same year.[39]

[38] Strong economic growth, lower cost of borrowing and credit-driven growth in assets prices and relevant surge in revenues attributed to transient improvement in fiscal balance during 2004-2007.
[39] Table A3 in Appendix A demonstrates the evolution of debt-to GDP ratio for both the country groupings.

Figure 4.12 Overall FisSI for Developed Countries

The figure explains the patterns of fiscal stress for developed countries through composite FisSI (DFisSI). The horizontal axis measures the period of analysis whereas the vertical axis measures the fiscal stress index.



Source: Author's Construction

A higher fiscal stress episode surfaced in 2009 owing to the global financial crisis. This episode pinpointed that the fiscal improvements in the pre-crisis period overstated the structural fiscal improvements. These recoveries did not signal fiscal order as the developed countries lacked sufficient fiscal buffers to manage the next economic downturn and financial crisis. Gross financing needs rose immediately after the global financial crisis as governments decided to rescue financial institutions from bankruptcy to avoid the feedback loops from financial to real economy. To complicate the matters further, a decline in asset prices reversed the healthy trends in government revenues in countries like Spain and Ireland where a temporary rise in government revenue for driven by rising asset prices and capital gains. These incidences placed public debt at unprecedented high levels besides

deteriorating in cyclically adjusted primary balance. Higher rollover risks ended up with a higher level of FisSI for developed countries.

The next spike in FisSI for developed countries appeared in the wake of the sovereign debt crisis in the Euro Area in 2011. This crisis initiated from Greece with a loss of investor confidence as debt and deficit rose steeply in late 2009. Fiscal vulnerabilities in other EU countries triggered contagion to them in less than 3 years. The debt crisis highlighted several flaws in the fiscal surveillance framework of the EU. First, since its initiation, the EU was an incomplete and compromised union. It was an international monetary union where the task of fiscal discipline was assigned to the institutional setups at the national level. Second, it lacked any central banking supervision and debt restructuring mechanisms, which limited its efficacy as a policy entity to curb banking-sovereign adverse feedback loops. Sovereigns shared the inordinate burden of adjustments even in the wake of systemic events.[40] Third, the member countries (especially those with large banking sector) recorded divergent fiscal positions and policy actions without any regulation on part of the EU to build for fiscal buffers in good times and to monitor debt trajectory in bad times. Rather, institutional adjustments were left at the mercy of market forces or national governments. All these intrinsic institutional weaknesses in the EU set the stage for the sovereign debt crisis. Fiscal stress followed an increasing trajectory until December 2012 when the EU crafted policies to share the adjustment burden with the national governments.

Another risk prevalent in the European debt market was a political risk. Political uncertainty in France and the breakdown of the coalition government in the

[40] Owing to close trade ties with the UK and the US, banking crisis surfaced in Ireland in early 2008. Country was left alone to bailout banks through private credit and to combat recession. Soaring private debt went unchecked as EU lacked any mechanism to monitor building for private sector imbalances.

Netherlands intensified debt crises further during the sampled years. Our analysis is the first empirical inquiry that highlighted political uncertainty as an important component in measuring fiscal stress. Further, our findings conform to the theoretical insights provided by Waszkiewicz (2015).

The last escalation in fiscal stress was observed in 2015 with a series of events. First was the recession in China, which lowered commodity prices and aggravated the fiscal position of the commodity-exporting developed countries.[41] Most of the developed countries caught the contagion of slow growth in China. Moreover, debt reached to record high levels of 106 percent of GDP in developed countries which raised rollover risks and, hence, fiscal stress. Second, a decrease in trade volumes in many emerging countries also directly influenced fiscal position as export revenue fell significantly.

4.2.2.3 Regional FisSIs

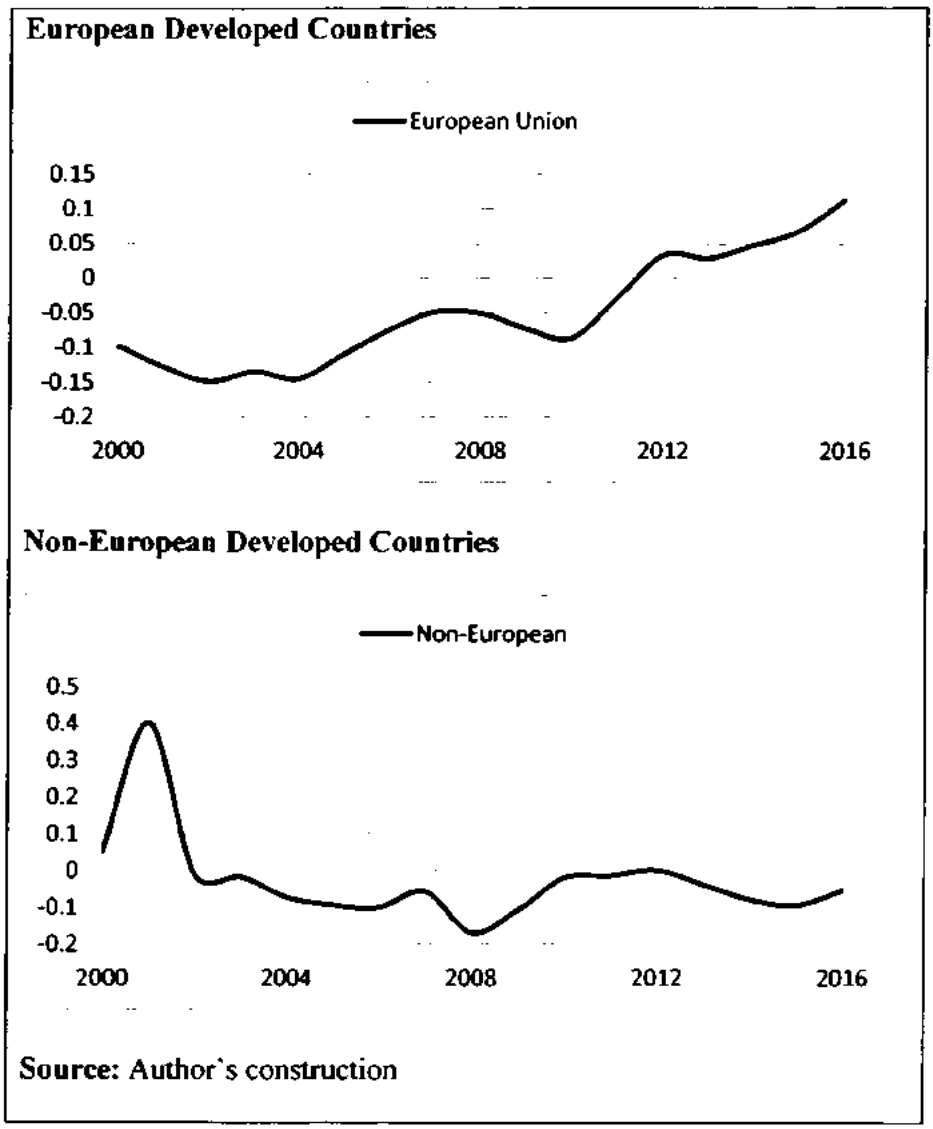
Next, we study the regional FisSIs for developed countries. For regional analysis, we sub-divide the developed countries into two regions, namely European and Non-European regions. Figure 4.13 describes the evolution of regional FisSIs. Panel a explain evolution of FisSI in EU regions. This index follows the patterns similar to aggregate FisSI, which indicates that fiscal risks remained concentrated on the European countries as pointed by the EU (2018). Fiscal stress had been increasing in the region since 2004 owing to fiscal indiscipline, sovereign defaults, structural vulnerabilities, and higher debt. Panel b of the figure draws FisSI for non-EU developed countries. This index shows declining patterns of FisSI in the region, except in the early 2000s, which can be attributed to economic slowdown and

[41] Canada, Denmark, Italy, Norway and the US

expansionary fiscal policy stance in Singapore during 2001-02 that raised fiscal deficits.

Figure 4.13 Regional Patterns of Fiscal Stress in Developed Countries

This figure depicts regional patterns of FisSIs for developed countries. The sampled developed countries are sub-categorized into two broader regions, namely the European and non-European developed countries. The horizontal axis measures the period of analysis whereas the vertical axis measures the fiscal stress index.



Source: Author's construction

Besides that public debt was very high in Singapore in that era. This raised fiscal stress in the early 2000s. The other spike in FisSI for the Non-EU region

occurred in 2009 with the global financial crisis. These countries recovered quickly and fiscal stress subsided in one to two years. The regional index reflected a period of low fiscal stress after 2010 owing to fiscal discipline in the non-European countries.

4.2.3 Contributions of Fiscal Stress Components

The basic fiscal variables that affect the rollover risk are plotted in Figure 4.14. They show deteriorating trends for emerging and developed countries. We observe that interest rate growth differential has been negative for the emerging countries in Panel a. This occurred because these countries were financially repressed and growth was low during the period of analysis. Lower interest rate hinders borrowing and makes debt ratios non-exploding. This differential is positive for developed countries which highlight the large rollover requirements as public debt in these countries has been very high. Panel b mentions the upsurge in debt burden for the developed countries, especially after the year 2008. On the other hand, the debt burden in emerging countries has been much lower than in developed countries. This implies a higher resilience of emerging countries to adverse shocks. Panel c indicates that cyclically adjusted primary balance follows a deterioration in both emerging and developed countries.

Long term fiscal trends are captured in panels d to f. The visual analysis suggests rising trends in demographic variables, which impose long-term fiscal costs for developed as well as emerging countries. Fertility rates have been low and almost stagnant in developed countries as compared to the emerging countries, whereas the dependency ratio has been higher and rising for developed economies. This explains the long term expenditure pressures for developed countries. Despite being initially high, fertility rates have been declining for emerging countries. Panel

Figure 4.14 Contributions of Fiscal Stress Components

This figure explains and compares the contribution of various indicators of fiscal stress for the two selected country groupings that are developed and emerging countries. The horizontal axis measures years of analysis while the vertical axis measures the indicator of fiscal stress.

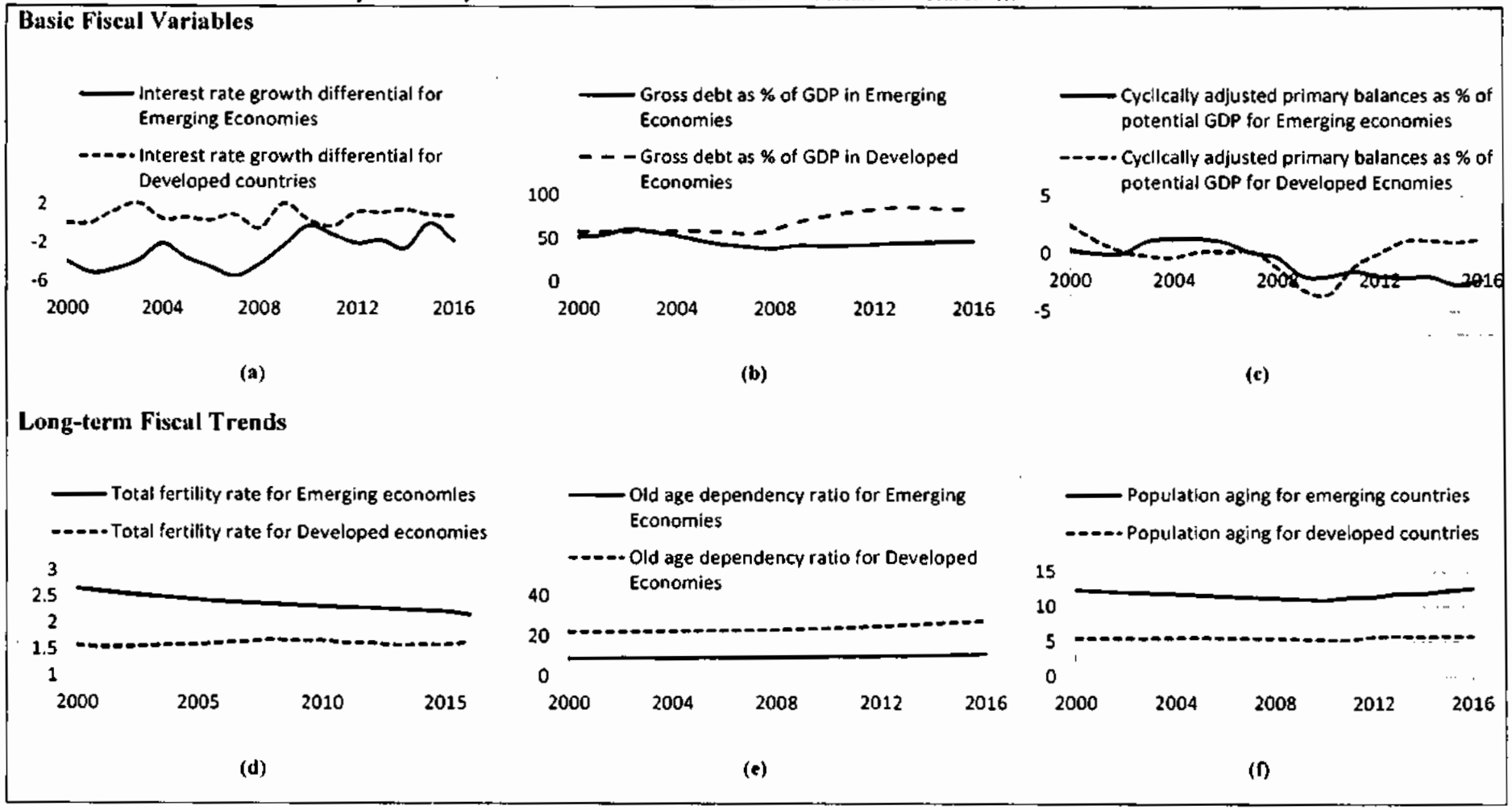
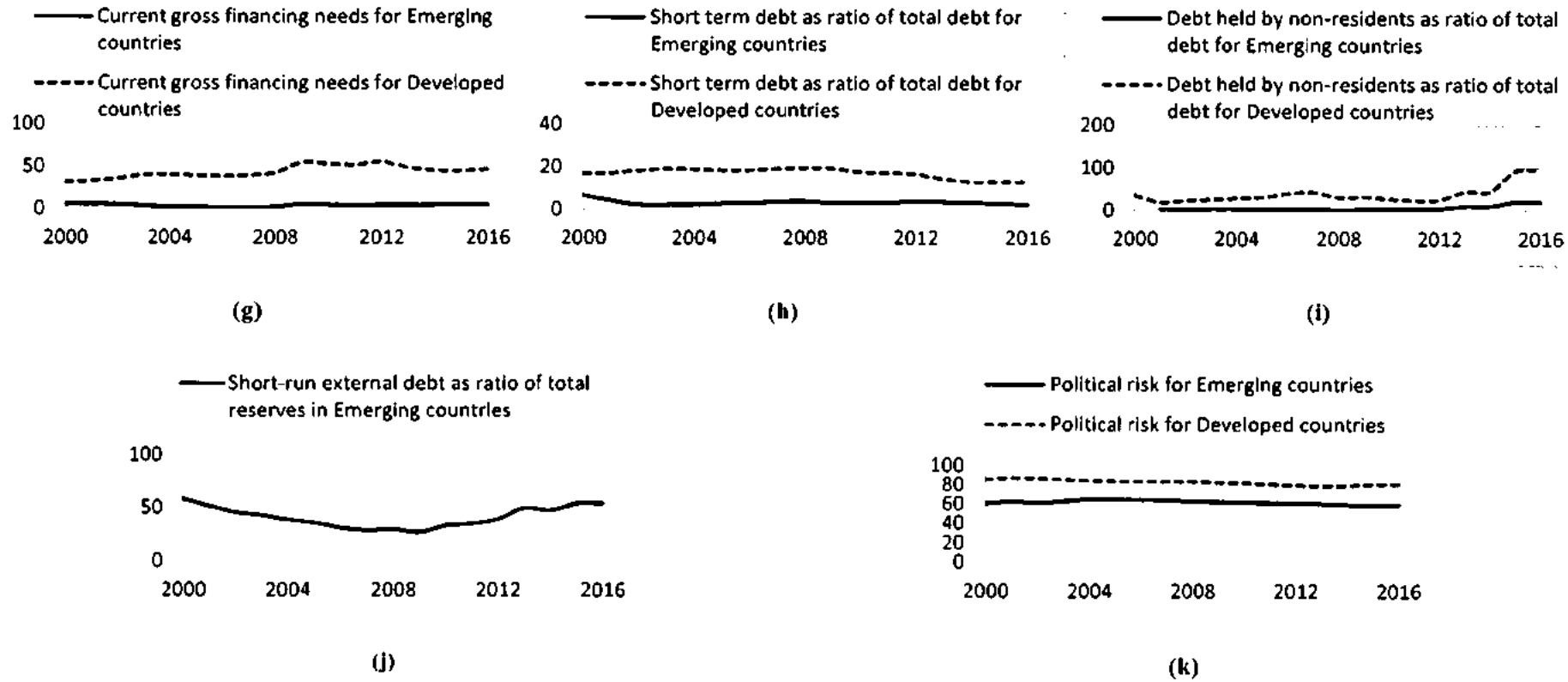


Figure 4.14 Contribution of Fiscal Stress Components

Continued...

Assets and Liabilities Management



Source: Author's construction

f depicts the phenomenon of population aging. Thus, both groups of countries faced long-term expenditure pressures, with developed countries encountered higher pressures.

Medium-term solvency indicators are plotted in panels g to j. Panel g reveals that gross financing needs have been substantially higher in developed countries as compared to emerging ones. The next panel (panel h) portrays short term debt as a ratio of total debt. A higher share of short term debt in the total debt indicates vulnerability to rollover risk. A higher ratio for developed countries exhibits more serious fiscal sustainability problems and higher rollover risks as compared to emerging countries. Likewise, debt held by non-residents has been high and rising for developed countries (panel i). This shows that developed countries have been highly affected by the risks prevalent in global markets. However, this risk has been low for emerging countries. Panel j plots short term external debt as a ratio of reserves for emerging countries only. The graph reflects that emerging middle-income countries have been borrowing from foreign sources to meet their short term debt servicing costs. This variable is not relevant for the developed countries as they are the net lenders.

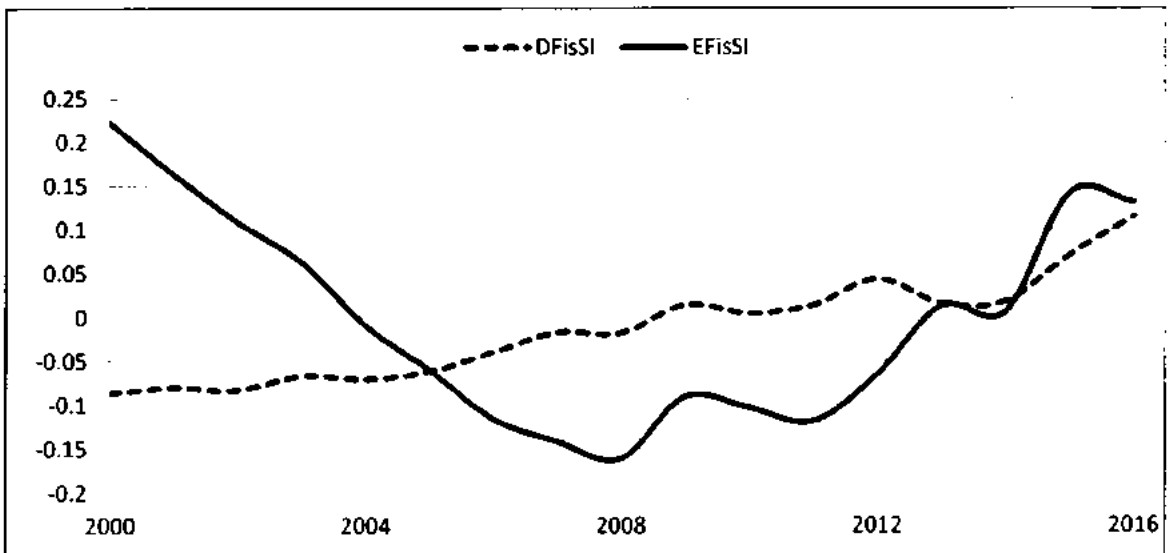
Finally, panel k plots the political risk index for emerging and developed countries. The index follows a declining trend, which shows that political risk is increasing in both country groupings. This reconfirms the logic of of including political risk as an important variable for the construction of fiscal stress. However, it is higher in emerging countries as compared to developed countries.

4.3 Comparing FisSIs for Emerging and Developed Countries

Aggregate FisSIs for emerging and developed countries are plotted in Figure 4.15. The comparison of the two indices offers few interesting observations. First, spikes in fiscal stress tend to overlap pretty frequently with the financial stress episodes in developed and emerging middle-income countries. This confirms the negative feedback loops between banks and sovereigns. This finding is in line with Bruns and Poghosyan (2018). Second, there have been prolonged periods of fiscal stress in developed countries since the global financial crisis.

Figure 4.15 Comparing FisSIs for Emerging and Developed Countries

This figure draws and compares the composite fiscal stress indices for emerging and developed countries. The horizontal axis measures the period of analysis whereas the vertical axis measures composite FisSIs for each country groupings.



Note: FISCrespectively.

Source: Author's construction

On the other hand, FisSI for emerging countries shows the shorter duration of stress episodes as these economies experienced better economic growth, low public debt, and a lower degree of fiscal imbalances and fiscal buffers before the global financial crisis. Third, despite a series of debt crises in the early 2000s, FisSI in emerging countries followed a declining trend before 2008 owing to a relatively lower intensity of debt crises that remained mostly country-specific and short-lived. In contrast, FisSI in developed countries has shown a persistent long term trend owing to the legacy of twin problems, namely fiscal deficit and higher public debt over many decades. Fourth, FisSI in emerging countries has exceeded that in developed countries in recent years as a former group of countries faced higher political risk and accumulation of private debt alongside recessionary trends in major emerging countries (Argentina, Brazil, China).

Chapter 5

Results and Discussion:

Determinants of Financial and Fiscal Stress

This chapter is divided into three sub-sections. The first sub-section layouts the preliminary analysis for financial stress in emerging countries. The second sub-section discusses the empirical results for the determinants of financial stress as well as conditional effects of country characteristics on the transmission of financial stress. The third sub-section analyzes the determinants of fiscal stress and the stress contribution of various components.

5.1 Preliminary Analysis for Financial Stress Indices

We conduct a simple correlation-based analysis for financial stress and its determinants.[42] Financial stress in emerging and middle-income countries is negatively correlated with growth in real output (GRY). The scatter plot in Figure 5.1 (a) shows that the relationship is nonlinear U shaped. Current account balance (CA) and financial openness (FO) are positively associated with financial stress and the plot in Figure 5.1(b) and 5.1(f) indicate that the relationship is linear in the former case and nonlinear in the latter case. Government balance (GB), changes in reserves (DRES), and trade openness (TO) correlate with FinSIE negatively. These correlations are somewhat linear as shown in panel c, d. and e of Figure 5.1 respectively. Political risk (PRI) demonstrates the highest correlation with financial stress in the emerging and middle-income countries. This correlation is linear as demonstrated by panel g in Figure 5.1.

[42] Simple correlations are reported in Appendix B Table B3.1

Figure 5.1 Scatter Plot for Financial Stress and its Determinants

The figure consist of eight panels, each provides the scatter plot of the financial stress index for emerging economies with the sources of financial stress. This graph helps us to visualize the nature of the relationship between FinSIE and its determinants.

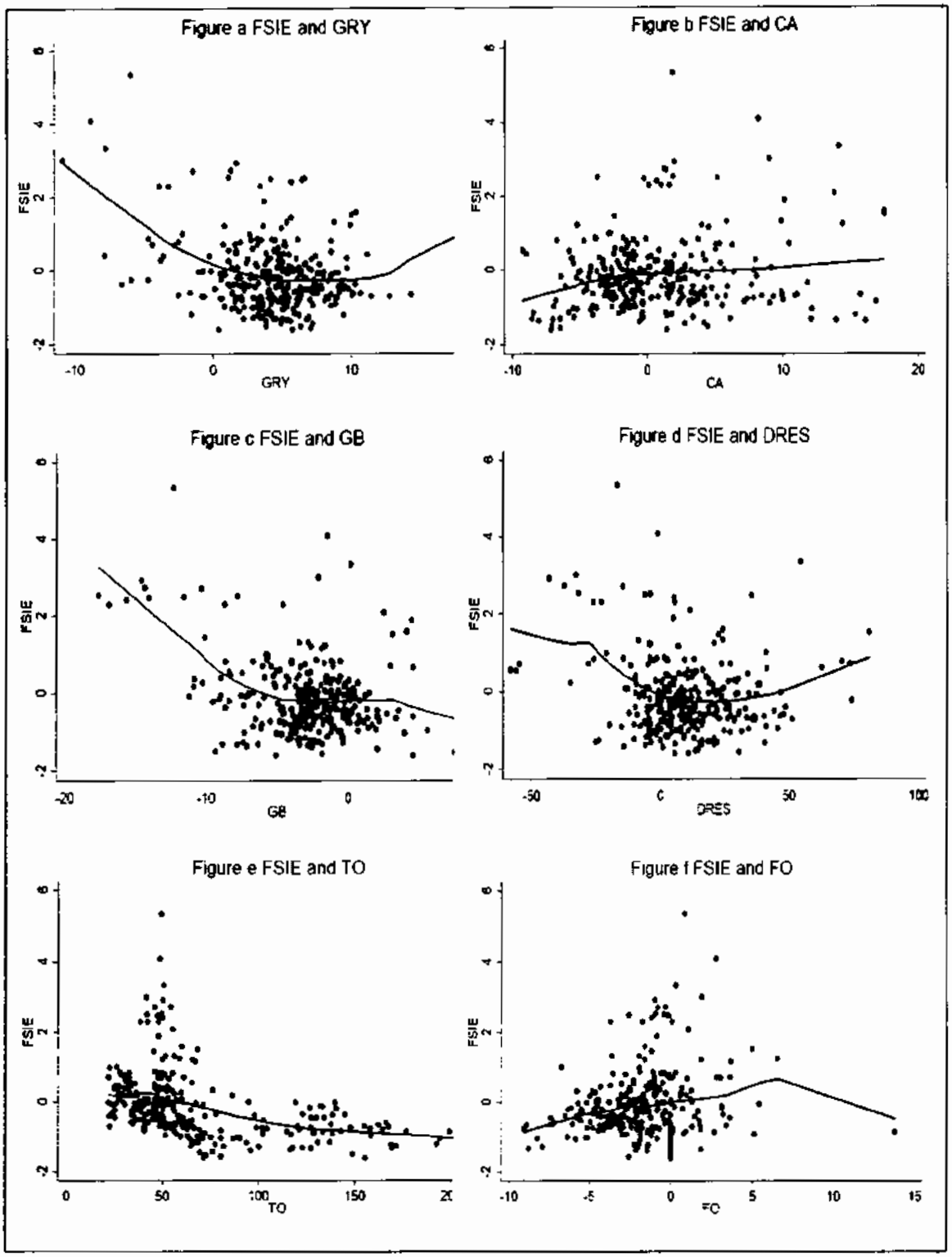
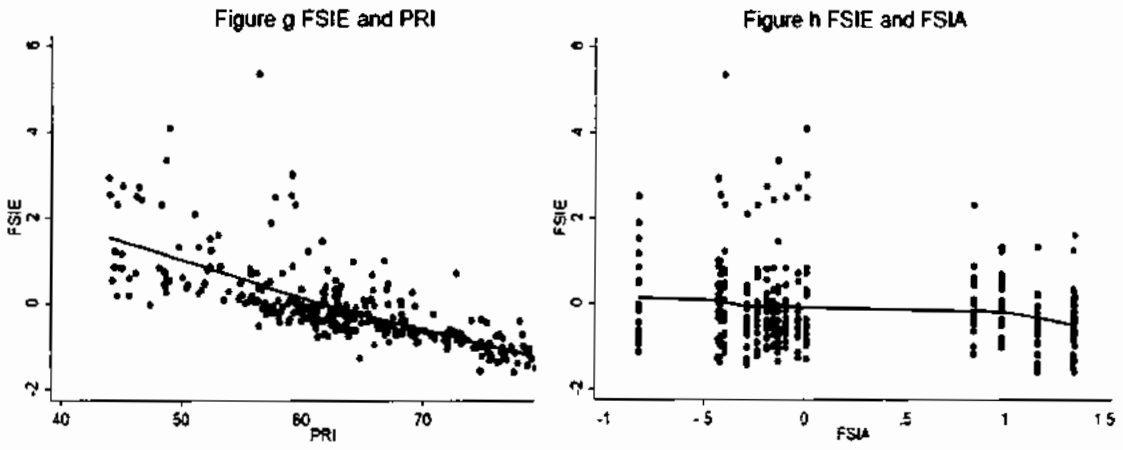


Figure 5.1 Scatter Plot for Financial Stress and its Determinants Continued...



Note: FinSIE is the financial stress index (FinSIE) for emerging middle-income countries. GRY is growth in real output, CA is current account balance, GB and DRES are government balance and change in foreign exchange reserves respectively. TO and FO refer to trade and financial openness respectively. PRI denotes political risk index whereas FinSIA is the financial stress index for developed countries.
Source: Author's construction

Finally, financial stress in developed countries (FinSIA) correlates weakly with financial stress in emerging middle-income countries as this correlation is flat or possibility negative as shown in Figure 5.1(h). The visual analysis of all the scatter plots confirms the presence of outliers. These outliers cast doubt about the actual relationship between financial stress and its determinants. Identification of these outliers in the multiple regressions is not possible merely by visual analysis. Rather our analysis adopts the strategy to guard against the unwarranted role of outliers as outlined in Chapter 3.

5.2 Regression-Based Analysis for Determinants of Financial Stress

A panel regression analysis is conducted in this section to explore the determinants of financial stress for emerging and middle-income countries. The analysis is divided into two sub-sections. The first sub-section explores the role of

macroeconomic vulnerabilities and the effectiveness of political institutions in determining financial stress in emerging middle-income countries. The second sub-section probes the role of country characteristics in the process of stress transmission from developed to emerging middle-income countries. For each subsection, the scheme is to estimate both static as well as dynamic models. We apply various econometric methods for robustness checks.

5.2.1 Analyzing Determinants of Financial Stress

To deal with the first objective. that is to explore determinants of financial stress, we consider the model specified as equation (3.1) in Chapter 3. We apply the Pooled Ordinary Least Square method to inquiry a broader set of determinants categorized into domestic. global. and institutional factors besides regional dummies. The results are reported in Table 5.1. Our econometric procedure involves estimation using all the observations which are given in columns (2) and (4). Next. we estimate both the general and specific models after removing outliers. The results are placed in the third and fifth columns respectively. The findings suggest that the ineffectiveness of political institutions magnify financial stress across all the models in Table 5.1. This failure of political institutions can be interpreted as a rise in political risk that in turn enhances financial stress in emerging and middle-income countries.

Table 5.1 Determinants of Financial Stress for Emerging and Middle-Income Countries, Pooled Ordinary Least Squares Method

Variables	General Model		Specific Model	
	(1)	(2)	(3)	(4)
	All Observations	Excludes Outliers	All Observations	Excludes Outliers
PRI	-0.068***	-0.066***	-0.068***	-0.066***
	(0.000)	(0.000)	(0.000)	(0.000)
FinSIA	0.007	0.023	-0.217	0.0154
	(0.884)	(0.567)	(0.607)	(0.663)
GRY	-0.050**	-0.016	-0.050**	-0.015
	(0.013)	(0.106)	(0.012)	(0.112)
CA	0.066***	0.042***	0.065***	0.045***
	(0.000)	(0.000)	(0.000)	(0.000)
GB	-0.067***	-0.059***	-0.067***	-0.060***
	(0.000)	(0.000)	(0.000)	(0.000)
DRES	-0.004**	-0.003**	-0.004**	-0.004**
	(0.069)	(0.026)	(0.035)	(0.016)
TO	-0.004***	-0.003***	-0.004***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
GYG	-0.070**	-0.060**	-0.039	-0.060***
	(0.060)	(0.049)	(0.163)	(0.004)
GCPG	0.006***	0.0047***	0.006***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
DUMAS	-0.597***	-0.475***	-0.594***	-0.488***
	(0.000)	(0.000)	(0.000)	(0.000)

Table 5.1 Determinants of Financial Stress for Emerging and Middle-Income Countries, Pooled Ordinary Least Squares Continued...

DUMLA	-0.257** (0.023)	-0.166** (0.010)	-0.252** (0.023)	-0.175* (0.006)
FO	-0.004*** (0.069)	0.003 (0.733)	-	-
GGIR	-0.001** (0.030)	-0.0007 (0.968)	-	-
Constant	5.11* (0.000)	4.573* (0.000)	5.015* (0.000)	4.56* (0.000)
Observations	288	278	288	277
R-Squared	0.775	0.832	0.7740	0.8341
Number of Countries	18	18	18	18
F-test Stat	57.99* (0.000)	84.30* (0.000)	75.63* (0.000)	101* (0.000)

Notes: The dependent variable is the financial stress index for emerging and middle-income countries (FinSIE). PRI denotes political risk index. FinSIA refers to the financial stress index for developed countries. Country-specific characteristics are growth in real output (GRY). current account balance (CA). government balance (GB). change in the foreign exchange reserves (DRES). trade openness (TO), and financial openness (FO). Global factors include the growth rate of global output (GYG), changes in the global commodity price index (GCPG), and changes in the global interest rate (GGIR). DUMAS refer to a regional dummy for Asia whereas DUMLA represents a regional dummy for Latin America. The base category is a regional dummy for Europe. Significance at 1. 5. and 10 percent are denoted by ***, **, and ** respectively. P-values of individual coefficients are presented in parenthesis. All models are estimated using robust standard errors. We remove outliers from Model (2) and Model (4) through *Hampel Identifiers* to the residuals of model (1) and (3) respectively.

A fall in PRI indicates an increase in political risk. Alternatively, this means a decrease in the efficacy of political institutions. This finding confirms the notion that political economy aspects are crucial in terms of adopting correct policies to avoid financial crises. Political pressures generally force policymakers to pursue sub-optimal policies that contribute to financial instability.

Next, we find supportive evidence for the transmission of financial stress from developed to emerging countries. However, the co-efficient of the co-movement parameter is once again quite low as well as insignificant. Higher financial stress transmits very little to emerging and middle-income countries. Our results are contrary to Balakrishnan et al. (2011) and Park and Mercado (2014). This may occur as the political and economic atmosphere has changed significantly in both the group of countries after the global financial crises. Emerging and middle-income countries have become more resilient to external shocks but they are more prone to political risk and problems inherent to them.

These countries are particularly exposed to domestic vulnerabilities which hamper the stability of the financial system. The first domestic factor affecting financial stress is the growth of real output (GIR). A decline in real output growth raises financial stress in emerging countries. This lower growth is reversed by credit expansions to raise economic activity. Once the slum in economic activity is converted into an economic boom, asset prices start increasing. This signals an escalation in financial stress.

The second macroeconomic determinant of FinSIE is the decline in the current account balance. Deterioration in the current account remained a permanent feature in the selected Emerging Latin American economies especially after 2008. This elevated financial stress in emerging and middle-income countries. A deficit in the

current account induces currency depreciation to improve competitiveness. These downward pressures on currencies of major emerging middle-income countries were very pronounced. As a consequence, these economies experience an increase in currency risk and banking crises. Panics in the banking sector raised financial stress in emerging and middle-income countries. These findings conform to previous studies such as Claessens et al. (2009) and Fratzscher (2009).

The third factor is the worsening of the government balance. Fiscal deficits have been persistent phenomena in most of the selected Latin American countries besides major Emerging Asian Economies (for example, China, India, and Malaysia). This weakens the government's ability to finance its spending and compel the government to borrow. Additionally, it also undermines the supply of credit to the private sector. Higher debt generates sustainability problems which create repercussions from real to the financial side of the economy. This raises financial instability, and hence, financial stress. Next, a decline in foreign exchange reserves carries a positive and significant impact on financial stress. Emerging middle-income countries experience several currency crises in the decade of the 2000s. Dwindling reserves confined the authority of their central banks to stabilize the value of the currency. This further creates the banking sector panics and raises financial stress.

Trade and financial liberalization provide crucial linkages for the spread of financial stress. Trade openness appears to have a significant negative impact on financial stress in emerging and middle-income countries. Periods of financial crises usually lower down their exports to the developed countries in anticipation to lower demand. Thus, a fall in exports and, hence, a lower degree of trade openness raises financial stress. A higher degree of financial openness, on the other hand, makes

countries more vulnerable to adverse shocks to capital account. This greater degree of financial globalization imposes the cost in terms of higher financial stress as the financial linkages between developed and emerging middle-income countries enhance volatilities in the former group of countries. But this impact is not statistically significant. Thus we conclude that both these linkages carry the opposite effect on financial stress.

Global factors play an important role in exacerbating financial stress in emerging and middle-income countries, particularly after the global financial crises in 2008. The first global factor is adverse changes in world commodity prices. These prices fell significantly in 2014 that hit hard the major exporting nations (Argentina, Brazil in our sample). Falling prices not only limit the growth prospects for the emerging middle-income countries rather it also lowers export earning of commodity-exporting nations. This made terms of trade unfavorable for them and put upward pressure on exchange rates especially after 2014. Consequently, financial stress rose substantially in emerging middle-income countries. This finding is statistically significant at 1 percent. The second factor is the growth in world output. Changes in global output manifest the changing demand in the world market as compared to emerging and middle-income countries. Lower growth in the world economy has increased the financial stress in emerging middle-income countries significantly after the global financial crisis of 2008. Further, devaluation in the Chinese economy and slowdown in its GDP also accounted for lower growth in major emerging middle-income countries such as Argentina, Brazil, India, Indonesia, and Turkey. Thus, the share of major emerging and middle-income countries in global GDP fell sharply post-global financial crisis period. The third factor affecting financial stress in emerging and middle-income countries is the

global interest rate. A higher world interest rate lowers financial stress as it shows credit from the world market to emerging countries squeeze up. The impact of the global interest rate remains insignificant even after removing outliers that force us to drop it from the final specific model.

Next, we discuss how various regions in our selected sample propagate financial stress in emerging middle-income countries. Regional dummy for Asia indicates that average financial stress in the emerging and middle-income countries goes down by 0.488 points if the region is Asia as compared to Europe. Likewise, financial stress in emerging and middle-income countries falls by 0.175 points if the region is Latin America as compared to Europe. Both the dummy variables are statistically insignificant which exhibits that Emerging Asian and Emerging Latin American regions pacify the financial stress in emerging middle-income countries.

Overall, our analysis suggests that besides political risk, global common factors, and domestic vulnerabilities play a significant role in determining financial stress in emerging and middle-income countries. Results show that financial stress in emerging and middle-income countries is not regional by nature. The lower part of Table 5.1 reports the goodness of fit and overall significance of the results. The reasonably higher value of R^2 indicates the model is a good fit. F-statistics confirms the overall significance across all the models.

We reinvestigate the determinants of financial stress by various estimation methods for robustness. Hausman test results indicate that the probability of chi-square stat is less than 5 percent which confirms that the Fixed Effect model is more appropriate to capture country-specific effects. Thus, Table 5.2 checks the robustness of Table 5.1 by using the Fixed Effect and 2SLS methods. We apply the general to specific methodologies for each method.

Table 5.2 Static Models for Determinants of Financial Stress for Emerging and Middle-Income Countries

Variables	Fixed Effect Model				Two-Stage Least Squares			
	General Model		Specific Model		General Model		Specific Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Observations	Excludes Outliers	All Observations	Excludes Outliers	All Observations	Excludes Outliers	All Observations	Excludes Outliers
PRI	-0.034*** (0.000)	-0.040*** (0.000)	-0.037*** (0.000)	-0.040*** (0.000)	-0.068*** (0.000)	-0.069*** (0.000)	-0.071*** (0.000)	-0.061*** (0.000)
FinSIA	-0.042 (0.414)	-0.028 (0.406)	-0.091 (0.119)	-0.044 (0.143)	0.188 (0.351)	0.015 (0.785)	0.168 (0.305)	0.168 (0.104)
GRY	-0.076*** (0.000)	-0.061*** (0.000)	-0.078*** (0.000)	-0.056*** (0.000)	-0.053 (0.160)	-0.007 (0.870)	-	-
CA	0.050** (0.029)	0.023** (0.030)	0.044** (0.037)	0.024** (0.025)	0.050*** (0.003)	0.051*** (0.000)	0.061*** (0.000)	0.044*** (0.001)
GB	-0.039 (0.205)	-0.021** (0.030)	-0.037 (0.210)	-0.020** (0.037)	-0.055*** (0.001)	-0.070*** (0.000)	-0.091*** (0.000)	-0.091*** (0.000)
DRES	-0.001 (0.343)	0.001 (0.358)	-	-	0.0009 (1.000)	-0.001 (0.607)	-	-
TO	-0.005** (0.022)	-0.005** (0.012)	-0.006** (0.027)	-0.004*** (0.006)	-0.003* (0.097)	-0.002* (0.085)	-0.003* (0.088)	-0.003** (0.042)
GYG	-0.063** (0.046)	-0.046** (0.018)	-0.019 (0.496)	-0.037** (0.013)	0.516 (0.421)	-0.399 (0.432)	-	-
GCPG	0.005*** (0.007)	0.003*** (0.006)	0.005*** (0.005)	0.003*** (0.004)	-0.029 (0.417)	0.0201 (0.472)	-	-
DUMAS	NA	NA	NA	NA	-0.475** (0.014)	-0.572*** (0.000)	-0.570*** (0.000)	-0.380*** (0.000)

Table 5.2 Static Models for Determinants of Financial Stress for Emerging and Middle-Income Countrie Continued...								
DUMLA	NA	NA	NA	NA	-0.146 (0.328)	-0.115 (0.241)	-	-
FO	0.001 (0.933)	-0.001 (0.981)	-	-	0.010 (0.614)	-0.002 (0.915)	-	-
GGIR	0.001 (0.135)	0.001 (0.484)	-	-	-0.001 (0.433)	0.001* (0.070)	0.001 (0.337)	0.003* (0.098)
Constant	2.867*** (0.000)	2.908*** (0.000)	2.857*** (0.000)	2.923*** (0.000)	2.847 (0.253)	5.927*** (0.001)	4.63*** (0.000)	3.868*** (0.000)
Observations	288	252	288	278	270	226	270	239
R-Squared	0.706	0.849	0.7057	0.859	0.3211	0.7005	0.6076	0.2532
Number of Countries	18	18	18	18	18	18	18	18
F-test Statistics	121.65*** (0.000)	27.85*** (0.000)	110.78*** (0.000)	36.18*** (0.000)	17.52*** (0.000)	39.29*** (0.000)	62.60*** (0.000)	64.75*** (0.000)
Notes: As for Table 5.1								

We drop insignificant variables and obtain the specific model yielding the results presented in Table 5.2. The findings of both models confirm that emerging and middle-income countries are exposed to financial stress as their political institutions are not well functioning.

Specifically, a lower value of PRI raises financial stress in these countries. Similarly, the impacts of changes in the current account, government balance, and trade openness on FinSIE are once again consistent with the theoretical predictions as well as statistically significant in both the methods. All the results in the specific model are consistent with the theoretical predictions except for a few striking

differences. First, the co-movement parameter is negative and statistically insignificant. Thus, we lack support for the transmission of FinSI from developed to emerging and middle-income countries. Second, change in foreign reserves is not important in explaining financial stress in the specific models. Once again R^2 is reasonably high and F statistic confirms the joint significance across all the models. Model (5) to (8) in Table 5.2 shows the estimation output for 2SLS. We use global factors as instruments in 2SLS. Financial stress in developed countries transmits to financial stress in emerging middle-income countries but the co-movement parameter is once again insignificant.

As far as global factors are concerned, findings of the Fixed Effect are robust to the POLS model reported in Table 5.1 whereas Model (8) considers only GGIR is significant. This difference in global factors appears as the 2SLS model treats global factors as instruments while estimating the determinants of FinSIE. Regional dummy for Emerging Asia states that financial stress in emerging middle-income countries declines by 0.380 points if the region is Asia as compared to the benchmark region of Europe.

Till now, we applied various estimation procedures by ignoring any dynamics present in data. Next, we explore the determinants of financial stress using dynamic panel data models to One-Step System GMM and Difference GMM. Table 5.3 presents the results for the determinants of financial stress using a one-step system and difference GMM. The coefficient of the lagged value of financial stress in emerging middle-income countries is positive and statistically significant at a probability of 1 percent in most of the models. This confirms the presence of dynamic effects as FinSIE follows inertia.

Table 5.3 Dynamic Models for Determinants of Financial Stress for Emerging Markets and Middle-Income Countries

Variables	One Step System GMM				Difference GMM			
	General Model		Specific Model		General Model		Specific Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Observations	Excludes Outliers	All Observations	Excludes Outliers	All Observations	Excludes Outliers	All Observations	Excludes Outliers
L.FinSIE	0.4089**	0.5293***	0.5404***	0.7109***	0.3999***	0.4634***	0.4858***	0.3480***
	(0.012)	(0.003)	(0.009)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)
PRI	-0.0205	-0.037***	-0.0132	-0.0235**	-0.0180	-0.030*	-0.0214**	-0.0231**
	(0.148)	(0.002)	(0.231)	(0.027)	(0.112)	(0.059)	(0.024)	(0.038)
FinSIA	0.0323	0.0915*	0.0497	0.0885*	0.0245	0.0183	0.0366	0.0105
	(0.409)	(0.041)	(0.606)	(0.032)	(0.546)	(0.674)	(0.295)	(0.763)
GRY	-0.0721	-0.026***	-0.0631***	-0.0579***	-0.072***	-0.0350*	-0.081***	-0.069***
	(0.152)	(0.357)	(0.000)	(0.000)	(0.000)	(0.051)	(0.000)	(0.000)
CA	0.0299	0.0253	-	-	0.0287	-0.011	-	-
	(0.335)	(0.405)			(0312)	(0.497)		
GB	0.0104	-0.0049	0.0008	0.0236**	0.0028	0.0100	-	-
	(0.670)	(0.870)	(0.975)	(0.018)	(0.888)	(0.543)		
DRES	-0.0088	-0.0110**	-0.0098*	-0.0098***	-0.009**	-0.004	-0.007**	-0.0040*
	(0.102)	(0.024)	(0.055)	(0.007)	(0.042)	(0.169)	(0.021)	(0.098)
TO	-0.0085	-0.0074	-	-	-0.0039	0.006	-	-
	(0.202)	(0.258)			(0.550)	(0.182)		
GYG	-0.0227	-0.0312	-	-	-0.0208	-0.0220	-	-
	(0.381)	(0.176)			(0.406)	(0.397)		
GCPG	0.0045***	0.0045***	0.0036**	0.0034***	0.0044**	0.0023**	0.0045***	0.0031**
	(0.003)	(0.003)	(0.026)	(0.003)	(0.023)	(0.026)	(0.008)	(0.012)

Table 5.3 Dynamic Models for Determinants of Financial Stress for Emerging Markets and Middle-Income Countries Continued...

Variables	General Model		Specific Model		General Model		Specific Model	
FO	0.0215	0.0276	-	-	0.0291	0.0352	-	-
	(0.603)	(0.537)			(0.437)	(0.291)		
GGIR	0.0001	-	-	-	0.0001	-0.001	-	-
	(0.495)				(0.393)	(0.797)		
DUMAS	0.2210	0.0915	-	-	-	-	-	-
	(0.353)	(0.770)						
DUMLA	0.2266	-0.0577	-	-	-	-	-	-
	(0.690)	(0.880)						
Constant	2.1559**	3.141***	1.1364*	1.8385***	-	-	-	-
	(0.049)	(0.001)	(0.085)	(0.007)				
Observations	288	286	288	282	270	256	270	260
Countries	18	18	18	18	18	18	18	18
F-test Statistics	52.44***	193.41***	32.63***	41.45***	30.08***	120.84***	27.6***	51.88***
	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(1)	Z= -2.65	Z= -2.2	Z= -2.29	Z= -3.2	Z= -2.54	Z= -2.39	Z= -2.42	Z= -2.21
	(0.008)	(0.023)	(0.022)	(0.001)	(0.011)	(0.017)	(0.015)	(0.027)
AR(2)	Z= 0.34	Z= -0.69	Z= 0.5	Z= -1.43	Z=0.19	Z=-0.42	Z= 0.67	Z= -0.36
	(0.733)	(0.493)	(0.6150)	(0.153)	(0.5200)	(0.674)	(0.506)	(0.720)
Hansen Test	6.82	2.35	9.67	16.57	9.51	7.18	15.98	14.77
	(1.000)	(1.000)	(1.000)	(0.968)	(0.994)	(1.000)	(0.771)	(0.903)

Notes: As for Table 5.1

The institutional variable (PRI) indicates a negative and highly significant relation with FinSIE. Higher political risk creates uncertainty in emerging countries that hampers the stability of the financial system. This finding supports the notion

provided by Herrera et al. (2014) that political cycles generate financial stress in emerging economies.

Higher financial stress in developed economies tends to increase the financial stress in emerging and middle-income countries for all the models. Thus, we find conclusive evidence in favor of non-regional contagion/transmission of financial stress. However, this impact is significant for only the system GMM model. This finding partially conforms with IMF (2009a); Balakrishnan et al. (2011) and Park and Mercado (2014).

Similarly, an increase in real output (GRY) lowers FinSI across all the models. It indicates an economic boom but once the boom turns into a bust, it makes the financial system highly unstable, and, hence, FinSIE increases. This finding is consistent with economic theory and well as statistically significant at 1 percent level of significance. Likewise, a fall in foreign exchange reserves (DRES) tends to enhance FinSIE significantly across all the models. Emerging middle-income countries are often characterized by enormous debt liabilities which are denominated in foreign currencies besides heavy imports. A fall in foreign reserves increases their debt liability and forces their governments to borrow foreign currency on account of interest repayments and import bills. This exerts pressure on the exchange rate and the stability of the financial system is compromised.

Both the dynamic models confirm that current account, trade and financial linkages, growth in global GDP, and global interest rate are insignificant in explaining financial stress in emerging and middle-income countries. These findings are in sharp contrast to Balakrishnan et al. (2011) and Park and Mercado (2014) which state that deeper financial linkages between developed and emerging middle-income countries enhance financial stress in emerging middle-income countries.

This could be rationalized as the emerging middle-income countries are facing new perils in the shape of external imbalances and political risks that become much more dominant in recent years.

We performed two diagnostic tests. The first is a serial correlation test. Table 5.3 shows that the probability for AR(2) is higher than 0.05. This means the null hypothesis of no second-order serial correlation is accepted. However, both the models confirm the presence of first-order serial correlation. The second is the Hansen test for over-identifying restrictions. Test results reveal that the null hypothesis of invalid instruments is rejected as the probability is greater than 5 percent. Thus, we find that instruments are valid in both models.

5.2.2 Role of Country Characteristics in the Process of Stress Transmission

In this section, investigate either the transmission of financial stress from developed to emerging middle-income countries is conditional upon the country's characteristics. Table 5.4 presents the Pooled Least Squares estimation results for the extended model (3.2). We estimated 6 extended models, each representing interaction of FinSIA with one of the six-country characteristics. We find that across all six models, the institutional factor is negative and statistically significant at 1 percent level of significance. This confirms the notion that political risk endangers the stability of the financial system, thereby raises the financial stress in emerging and middle-income countries.

We find a more pronounced role of global factors in all the six extended models. An adverse shock in global commodity prices enhances financial stress.

Table 5.4 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress,

Pooled Ordinary Least Squares

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
PRI	-0.083***	-0.068***	-0.085***	-0.073***	-0.079***	-0.071***	-0.084***	-0.073***	-0.087***	-0.068***	-0.084***	-0.068***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FSA	0.067**	-0.268***	-0.0664	0.001	0.077	0.121***	-0.129	-0.032	-0.183**	0.011	-0.076	0.0548
	(0.017)	(0.000)	(0.187)	(0.973)	(0.194)	(0.002)	(0.107)	(0.825)	(0.042)	(0.766)	(0.233)	(0.207)
GRY	-0.074***	-0.053***	-	-	-	-	-	-	-	-	-	-
	(0.004)	(0.000)										
GRY*FSA	-0.437***	0.046***	-	-	-	-	-	-	-	-	-	-
	(0.008)	(0.001)										
CA	-	-	0.043***	0.021***	-	-	-	-	-	-	-	-
			(0.000)	(0.005)								
CA*FSA	-	-	-0.008	0.004	-	-	-	-	-	-	-	-
			(0.403)	(0.620)								
GB	-	-	-	-	-0.066***	-0.056***	-	-	-	-	-	-
					(0.000)	(0.000)						

Table 5.4 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Pooled Ordinary Least Squares												Continued...
Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GB*FSA	-	-	-	-	0.055*** (0.002)	0.043*** (0.000)	-	-	-	-	-	-
DRES	-	-	-	-	-	-	-0.005* (0.082)	-0.004** (0.024)	-	-	-	-
DRES*FSA	-	-	-	-	-	-	0.005 (0.156)	0.0034 (0.239)	-	-	-	-
TO	-	-	-	-	-	-	-	-	0.001 (0.398)	-0.001 (0.334)	-	-
TO*FSA	-	-	-	-	-	-	-	-	0.002** (0.026)	0.001 (0.653)	-	-
FO	-	-	-	-	-	-	-	-	-	-	0.050** (0.003)	0.015** (0.036)
FO*FSA	-	-	-	-	-	-	-	-	-	-	-0.011 (0.543)	0.001 (0.383)

Table 5.4 Determining Financial Stress: Role of Country Charecteristics in Transmission of Financial Stress, Pooled Ordinary Least Squares Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GCPG	0.007***	0.005***	0.004**	0.003***	0.006***	0.004***	0.006***	0.004**	0.004**	0.0026**	0.005***	0.003**
	(0.002)	(0.001)	(0.025)	(0.007)	(0.001)	(0.002)	(0.004)	(0.027)	(0.019)	(0.025)	(0.016)	(0.025)
GYG	-0.044	-	-0.155***	-0.102***	-0.113**	-0.095***	-0.123**	-	-	-0.101***	-0.124**	-
	(0.307)		(0.000)	(0.000)	(0.010)	(0.000)	(0.011)	0.108***	0.135***	(0.000)	(0.011)	0.081***
								(0.000)	(0.007)			(0.000)
GGIR	-0.001*	-0.001***	0.0002	-	-0.0001	-	-0.0001	-	0.0001	-	0.0001	-
	(0.071)	(0.000)	(0.420)		(0.692)		(0.660)		(0.825)		(0.832)	
DUMAS	-0.457***	-0.245***	-0.731***	-0.478***	-0.552***	-0.407***	-0.578***	-	-	-0.348***	-0.599***	0.349***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	0.324***	0.628***	(0.000)	(0.000)	(0.000)
								(0.000)	(0.000)			
DUMLA	-0.165	-0.120**	-0.157	-0.155**	-0.101	-0.126**	-0.129	-	-0.101	-0.151**	-0.077	-0.137**
	(0.137)	(0.036)	(0.184)	(0.010)	(0.299)	(0.034)	(0.247)		(0.405)	(0.019)	(0.481)	(0.017)
Constant	5.826***	4.446***	6.173***	5.051***	5.373***	4.692	5.988***	5.009***	6.164***	4.663***	6.037***	4.626***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 5.4 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Pooled Ordinary Least Squares Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
Obs	288	273	288	271	288	277	288	276	288	271	288	271
R^2	0.693	0.759	0.675	0.778	0.697	0.807	0.648	0.756	0.643	0.762	0.655	0.763
F Statistics	48.37*** (0.000)	83.16*** (0.000)	64.26*** (0.000)	108.87*** (0.000)	56.46 (0.000)	112.26 (0.000)	46.05 (0.000)	81.15 (0.000)	60.99 (0.000)	123.67 (0.000)	51.49 (0.000)	105.59 (0.000)

Note: As for Table 5.1, except the interaction between FinSIA and the country characteristics GRY, CA, GB, DRES, TO and FO are introduced to trace out the conditional effect of FinSIA on FinSIE.

The magnitude of this effect is very negligible but the effect is significant at 1 percent in most of the models. Likewise, in 5 out of 6 models higher growth in the global economy indicates an economic recovery that improves demand conditions. This lowers the financial stress in emerging and middle-income countries. This effect is statistically significant at 1 percent in most of the models. Lastly, growth in the global interest rate is dropped out in all the specific models except the first model. Thus, we claim that changes in the global interest rate do not affect the financial stress in emerging and middle-income countries. Regional dummy for Asia indicates financial stress goes down in all the six models if the region is Emerging Asia. Similar effects exist for the Latin American region as compared to the base category of the European region. These findings are also statistically significant at 1 percent and 5 percent respectively. These findings for regional effects are consistent with Park and Mercado (2014) and UNCTAD (2019).

Next, we discuss the transmission of financial stress from developed to emerging and middle-income countries that are conditional on the country-characteristics. The first effect is for the growth in real output of the emerging middle-income countries. The first and second columns in Table 5.4 document these results. The findings suggest that a decline in real GDP (GRY) raises financial stress in emerging and middle-income countries. This is the direct effect which is statistically significant at 1 percent. However, the transmission of FinSIA to FinSIE, conditioned upon growth in real output turns out to be positive. This indirect effect indicates that financial stress in developed economies compliments the financial stress in emerging middle-income countries if emerging middle-income countries face economic downturns. This effect attributes to recessionary trends in major emerging middle-income countries since 2013 which makes a strong case for

financial turmoil and heightened financial stress as pointed by UNCTAD (2019). These direct and indirect effects are statistically significant at 1 percent level of significance. None of the previous studies consider this interaction term in their analysis. We consider this as the growing recessionary trends since 2013 makes this interaction highly relevant.

Next, column (3) and (4) in Table 5.4 account for the stress transmission (from developed to emerging countries) conditional upon the current account balance of the emerging and middle-income countries. In line with the baseline model, the direct effect of deterioration in the current account on FinSIE is positive and statistically significant at 1 percent level of significance. Emerging Europe and Latin American countries explain most of the deteriorations in the early 2000s. Moreover, the indirect effect of CA is positive but once again the effect turns out to be statistically insignificant. This shows the current account balance does not play any significant role in the process of stress transmission process developed to merging countries.

The role of government balance (GB) in the transmission of FinSI from developed to emerging middle-income countries is documented in columns (5) and (6). The direct effect of GB on financial stress in emerging middle-income countries is negative and statistically significant at a 1 percent level of significance. This implies a fall in government balance raises FinSIE. Interaction terms show that the higher financial stress in developed economies spillover to the emerging middle-income countries if the government faces a fiscal deficit. This effect attributes to Latin American and leading Asian regions for the selected emerging middle-income countries which characterized persistent fiscal deficits. This finding is also significant at 1 percent level of significance.

The fourth model (Columns 7 and 8) explores the direct and indirect role of change in FOREX on financial stress in emerging middle-income countries. Our model witnesses a negative and significant direct effect. This means falling foreign exchange reserves increase FinSI in emerging middle-income countries. The indirect effect is positive, indicating a complementarity between financial stress in developed and emerging middle-income countries. This effect is not statistically significant. The next four columns (columns 9 to 12) analyzed the role of trade and financial openness in the stress transformation process respectively. More open economies in terms of trade flows experience lesser financial stress as openness improves their competitive position and brings stability in financial markets. However, the findings reveal that deeper trade linkages contribute insignificantly in the process of stress transmission. Higher financial openness makes the emerging middle-income countries more vulnerable to adverse capital account shocks and this enhances FinSI in emerging middle-income countries. This effect is significant at 5 percent level of significance. However, countries that tend to be more open financially do not facilitate the process of FinSI transmission from developed to emerging middle-income countries.

Overall, our results confirm that real economy macroeconomic fundamentals, such as lower growth and fiscal deficits, and political factors weigh more in the transmission of financial stress from developed to emerging middle-income countries rather than trade and financial linkages. This is further supported by the fact that 5 out of 7 selected Emerging Latin American and 3 out of 4 selected Emerging European countries are experiencing problems of twin deficits during the sample period. This finding is a sharp contrast to the previous studies of IMF (2009a) and Balakrishnan et al. (2011). Across all the six models. R^2 is considerably

high indicating the models explain well the variations in data. Further, F statistics reveal the overall significance of all the six models.

For robustness checks, we re-estimate the extended model (3.2) by using the Fixed Effects Model and Two-Stage Least Squares. The estimation results are presented in Table 5.5 and Table 5.6 respectively. In both the tables and across all the models higher political risk once again proves to be detrimental for the stability of the financial system. The findings appear to be different in the process of stress transmission. Across all the models of both the tables. we lack support for the transmission of stress from developed to emerging middle-income countries. but this effect is not significant across all models.

All the other findings using the Fixed Effects method are robust to POLS with an exception that the direct effect of both trade and financial linkage is significant. Thus we find evidence consistent with the notion the deeper trade, particularly between China, India, and the US, helps in reducing financial stress in emerging middle-income countries.

Table 5.5 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Fixed Effect Model

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
PRI	-0.038***	-0.039***	-0.048***	-0.050***	-0.049***	-0.047***	-0.041***	-0.045***	-0.052***	-0.050***	-0.045**	-0.043***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FSA	-0.310**	-0.155*	-0.084**	-0.042	-0.0004	-0.004	-0.1083*	-0.039	-0.202**	-0.079	-0.142	-0.064
	(0.017)	(0.094)	(0.044)	(0.317)	(0.996)	(0.918)	(0.093)	(0.554)	(0.036)	(0.249)	(0.112)	(0.331)
GRY	-0.092***	-0.061***	-	-	-	-	-	-	-	-	-	-
	(0.000)	(0.000)										
GRY*FSA	-0.031	0.021*	-	-	-	-	-	-	-	-	-	-
	(0.139)	(0.083)										
CA	-	-	0.037*	0.011	-	-	-	-	-	-	-	-
			(0.091)	(0.123)								
CA*FSA	-	-	-0.017	0.003	-	-	-	-	-	-	-	-
			(0.217)	(0.669)								
GB	-	-	-	-	-0.041	-0.028***	-	-	-	-	-	-
					(0.197)	(0.003)						

Table 5.5 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Fixed Effect Model Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GB*FSA	-	-	-	-	0.027	0.013*	-	-	-	-	-	-
					(0.199)	(0.097)						
DRES	-	-	-	-	-	-	-0.002	-0.002	-	-	-	-
							(0.297)	(0.498)				
DRES*FSA	-	-	-	-	-	-	0.002	0.0002	-	-	-	-
							(0.490)	(0.934)				
TO	-	-	-	-	-	-	-	-	-0.003	-0.003*	-	-
									(0.117)	(0.050)		
TO*FSA	-	-	-	-	-	-	-	-	0.002*	0.001	-	-
									(0.067)	(0.249)		
FO	-	-	-	-	-	-	-	-	-	-	0.043*	0.027**
											(0.094)	(0.023)
FS*FSA	-	-	-	-	-	-	-	-	-	-	-0.024	0.009
											(0.251)	(0.420)

Table 5.5 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Fixed Effect Model Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GCPG	0.005***	0.003**	0.003	0.003**	0.004**	0.003***	0.004**	0.003**	0.003**	0.003***	0.003*	0.003***
	(0.007)	(0.010)	(0.151)	(0.014)	(0.010)	(0.003)	(0.029)	(0.011)	(0.021)	(0.004)	(0.066)	(0.007)
GYG	-0.042	-0.048**	-0.166***	-0.095***	-0.135***	-0.094***	-0.145***	-0.096***	-0.149***	-0.094***	-0.147***	0.093***
	(0.166)	(0.020)	(0.003)	(0.000)	(0.001)	(0.000)	(0.003)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)
GGIR	-0.0001	-	0.0003	-	0.0001	-	0.0001	-	0.0002	-	0.0002	-
	(0.615)		(0.281)		(0.554)		(0.513)		(0.432)		(0.463)	
Constant	2.844***	2.641***	3.547***	3.255***	3.358***	2.945***	3.600***	2.961***	3.891***	3.442***	3.368***	2.841***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs	288	271	288	266	288	252	288	266	288	264	288	267
R^2	0.5905	0.6784	0.675	0.778	0.6271	0.8021	0.5718	0.7185	0.5695	0.7623	0.5603	0.7092
F Statistics	97.91***	67.15***	16.87***	22.13***	14.32***	44.59***	16.28***	41.44***	18.51***	22.60***	17.62***	27.22***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: As for Table 5.1, except the interaction between FinSIA and the country characteristics GRY, CA, GB, DRES, TO, and FO are introduced to trace out the conditional effect of FinSIA on FinSIE.

Likewise higher financial connectedness between developed and emerging middle-income countries facilitates the stress transmission through bank lending and higher financial liabilities of the emerging middle-income countries channels. This finding conforms to Balakrishnan et al. (2011).

Next, we document results for conditional effects. Only two out of 6 country characteristics play a significant role in stress spillover. First, Model (1) and (2) in Table 5.5 show the direct and indirect effects of fall in real output of emerging middle-income countries. A decline in real output carries a negative direct effect on financial stress in emerging middle-income countries. This finding is statistically significant as well. The indirect effect of decline in real output is once again positive as well as statistically significant at 10 percent level of significance. This reconfirms the findings in Table 5.4.

Second, column (5) and (6) provide estimates of the conditional role of government balance in the financial stress transmission process. We find a negative and statistically significant direct effect of deterioration in fiscal balance on FinSI in emerging and middle-income countries. This effect is significant at 1 percent level of significance. The indirect effect is positive indicating higher fiscal deficits tend to enhance the transmission of stress from developed to emerging middle-income countries. Leading Emerging Asian and most of the Latin American countries faced large fiscal deficits that speed up the stress transmission. Our results are in sharp contrast to IMF (2009a) and Balakrishnan et al. (2011) which state none of the domestic vulnerability contributes to the transmission of financial stress from developed to emerging middle-income countries.

Table 5.6 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress,

Two-Stage Least Squares

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
PRI	-0.083***	-0.072***	-0.085*	0.078***	-0.078***	-0.069***	-0.083***	-0.069***	-0.088***	-0.078***	-0.083**	-0.070***
	(0.000)	(0.000)	(0.091)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FSA	-0.295	-0.134*	-0.091	-0.035	0.131	0.092***	-0.288	0.061	-0.207	-0.094	-0.173	-0.018
	(0.523)	(0.092)	(0.646)	(0.349)	(0.315)	(0.007)	(0.641)	(0.245)	(0.337)	(0.188)	(0.579)	(0.642)
GRY	-0.053*	-0.065***	-	-	-	-	-	-	-	-	-	-
	(0.051)	(0.000)										
GRY*FSA	0.047	0.021**	-	-	-	-	-	-	-	-	-	-
	(0.387)	(0.039)										
CA	-	-	0.041***	0.024***	-	-	-	-	-	-	-	-
			(0.001)	(0.000)								
CA*FSA	-	-	-0.006	-0.0003	-	-	-	-	-	-	-	-
			(0.715)	(0.964)								
GB	-	-	-	-	-0.052***	-0.061***	-	-	-	-	-	-
					(0.000)	(0.000)						

Table 5.6 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Two-Stage Least Squares Continued....

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GB*FSA	-	-	-	-	0.038 (0.126)	0.031*** (0.000)	-	-	-	-	-	-
DRES	-	-	-	-	-	-	-0.005 (0.586)	-0.001 (0.690)	-	-	-	-
DRES*FSA	-	-	-	-	-	-	0.011 (0.655)	-0.003 (0.191)	-	-	-	-
TO	-	-	-	-	-	-	-	-	0.0014 (0.220)	-0.0004 (0.598)	-	-
TO*FSA	-	-	-	-	-	-	-	-	0.002 (0.144)	0.001 (0.109)	-	-
FO	-	-	-	-	-	-	-	-	-	-	0.048** (0.029)	0.025*** (0.001)
FO*FSA	-	-	-	-	-	-	-	-	-	-	-0.026 (0.642)	0.008 (0.434)
GCPG	0.003 (0.924)	-	0.010 (0.7561)	-	0.006 (0.807)	-	0.021 (0.634)	-	0.017 (0.629)	-	0.019 (0.600)	-

Table 5.6 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Two-Stage Least Squares Continued....

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GYG	-0.001 (0.980)	-	-0.236 (0.656)	-	0.046 (0.913)	-	-0.360 (0.545)	-	-0.361 (0.537)	-	-0.352 (0.550)	-
GGIR	-0.0004 (0.286)	-	0.0001 (0.892)	-	-0.0003 (0.468)	-	-0.0001 (0.895)	-	0.0002 (0.833)	-	0.0001 (0.846)	-
DUMAS	-0.412*** (0.000)	-	-0.661*** (0.000)	0.545*** (0.000)	-0.470*** (0.000)	-0.332*** (0.000)	-0.490*** (0.000)	-0.296*** (0.000)	-0.554*** (0.000)	-0.415*** (0.000)	-0.520*** (0.000)	-0.314*** (0.000)
DUMLA	-0.091 (0.303)	-	-0.112 (0.209)	-0.111* (0.083)	-0.042 (0.587)	-	-0.058 (0.538)	-	-0.029 (0.759)	-	-0.022 (0.806)	-
Constant	5.465*** (0.001)	4.656*** (0.000)	6.378*** (0.000)	5.048*** (0.000)	4.666*** (0.007)	4.129*** (0.000)	6.685*** (0.004)	4.307*** (0.000)	6.912*** (0.004)	4.918*** (0.000)	6.742*** (0.004)	4.422*** (0.000)
Obs	270	298	270	298	270	287	270	286	270	299	270	285
R^2	0.7124	0.7289	0.6985	0.7398	0.6823	0.8134	0.5785	0.7466	0.5986	0.7118	0.5977	0.7637
F statistics	47.82*** (0.000)	99.12*** (0.000)	62.26*** (0.000)	116.27*** (0.000)	60.18*** (0.000)	170.64*** (0.000)	34.41*** (0.000)	131.19*** (0.000)	42.62*** (0.000)	150.24*** (0.000)	36.38*** (0.000)	129.55*** (0.000)

Note: As for Table 5.1, except the interaction between FinSIA and the country characteristics GRY, CA, GB, DRES, TO and FO are introduced to trace out the conditional

effect of FinSIA on FinSIE.

This lack of evidence may attribute to the sample which did not fully capture the post-global financial crisis effects. Our unique finding enriches the existing evidence.

For Two-Stage Least Square, we consider global factors as instruments. In all the models, global factors completely vanish out after the removal of outliers. Finally, we end up with OLS estimates. Once again fall in real output and fiscal deficits elevate stress in emerging middle-income countries directly as well as indirectly. Both the direct and indirect effects of fall in real output and fiscal balance are statistically significant at 1 percent level. We show that our findings for the conditional effect in Table 5.5 and Table 5.6 are robust to Table 5.4. Only one regional dummy for Emerging Asia is retained after removing outliers in five out of six models which indicates financial stress in the Emerging middle-income countries goes down if Asian regional effects are analyzed.

The results further indicate that the two other direct effects are significant using 2SLS. First is a current account deficit that enhances the transmission of financial stress to emerging middle-income countries. A deficit results either from a fall in exports or a rise in imports. Decline in exports lowers the FOREX earning while higher imports require more foreign currency for the import bill. The resultant depreciation of currency provokes currency crises which elevate financial stress in emerging middle-income countries. Second, Financial openness speeds up the process of stress transmission. This confirms the notion that financial linkages in the stress transmission. Both effects are statistically significant as well at 1 percent level of significance. The bottom part of both tables reports the goodness of fit and overall significance of the models. Both the

models are a good fit as R^2 is reasonably high. F-statistics confirms the overall significance of regressors across all the models.

The conditional role of the country-characteristics in the transmission of financial stress is also evaluated using the dynamic models. We apply two variants of dynamic panel data models, namely System GMM and Difference GMM. Results are presented in Table 5.7 and Table 5.8 respectively. We confirm the presence of dynamics effects as the lagged value of FinSIE is positive and statistically significant. The dynamic model also reconfirms the claim that political institutions play a vital role in financial stability. This finding holds for all the models using both the dynamic estimation methods. This finding provides support to the theoretical viewpoints of Waszkiewicz (2017). We find that the co-movement parameter is positive across most of the models in both Table 5.7 and Table 5.8. This confirms the presence of non-regional financial contagion. This contagion is, however, not statistically significant. Both the dynamic models recognized the role of common factors in the escalation of FinSI in the emerging region. First, a fall in global commodity prices lowered the growth prospects of exporting nations and depreciated their currencies. This results in higher currency risk and financial stress. Second, lower global GDP shows lower demand and higher financial stress. Third, higher global interest rate signals credit squeeze and lower activity which enhances financial stress. These findings are similar to Park and Mercado (2014) and UNCTAD (2019).

Now we discuss the conditional effects using system GMM. Table 5.7 reports that once again a fall in real output helps in raising financial stress in emerging middle-income countries.

Table 5.7 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress,

One Step System GMM

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	Genera l Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
L.FSI	0.524***	0.465***	0.505	0.378**	0.821	0.579***	0.527**	0.738***	0.274	0.474**	0.084	0.412***
	(0.000)	(0.002)	(0.156)	(0.028)	(0.114)	(0.007)	(0.011)	(0.000)	(0.515)	(0.034)	(0.712)	(0.00)
PRI	0.007	-0.042**	0.005	-0.081***	-0.139	0.078***	-0.032	-0.027*	0.064	-0.098**	-0.067***	-0.057***
	(0.781)	(0.025)	(0.928)	(0.004)	(0.181)	(0.000)	(0.024)	(0.067)	(0.376)	(0.027)	(0.007)	(0.000)
FSA	-0.203	-0.353	0.123	0.076	1.534	0.418**	0.050	0.202**	-4.463	1.561	-0.435	0.251*
	(0.503)	(0.632)	(0.482)	(0.271)	(0.263)	(0.010)	(0.710)	(0.012)	(0.543)	(0.293)	(0.224)	(0.064)
GRY	-0.043**	-0.031	-	-	-	-	-	-	-	-	-	-
	(0.025)	(0.308)										
GRY*FSA	-0.033	0.046*	-	-	-	-	-	-	-	-	-	-
	(0.409)	(0.075)										
CA	-	-	0.021	-0.003	-	-	-	-	-	-	-	-
			(0.855)	(0.927)								
CA*FSA	-	-	-0.091**	-0.001	-	-	-	-	-	-	-	-
			(0.017)	(0.948)								

Table 5.7 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, One Step System GMM Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GB	-	-	-	-	-0.0220 (0.902)	-0.028 (0.485)	-	-	-	-	-	-
GB*FSA	-	-	-	-	0.8242 (0.147)	0.096*** (0.007)	-	-	-	-	-	-
DRES	-	-	-	-	-	-	-0.013** (0.016)	-0.013** (0.029)	-	-	-	-
DRES*FSA	-	-	-	-	-	-	0.0024 (0.476)	-0.0004 (0.876)	-	-	-	-
TO	-	-	-	-	-	-	-	-	0.005 (0.931)	0.021 (0.365)	-	-
TO*FSA	-	-	-	-	-	-	-	-	-0.064 (0.556)	-0.028 (0.272)	-	-
FO	-	-	-	-	-	-	-	-	-	-	0.1442** (0.02)	0.020 (0.674)

Table 5.7 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, One Step System GMM Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
FO*FSA	-	-	-	-	-	-	-	-	-	-	-0.1961	0.083
											(0.237)	(0.118)
GCPG	0.005	0.002***	-0.001	0.004***	0.0118	0.0036**	0.005*	0.003**	-0.003	0.008**	0.0066*	-
	(0.474)	(0.085)	(0.857)	(0.002)	(0.108)	(0.044)	(0.059)	(0.020)	(0.422)	(0.027)	(0.073)	
GYG	-0.151	-0.0852*	-0.185**	-0.083***	-0.0044	-0.088***	-0.111*	-0.040*	-0.154	-0.173**	-0.157**	-0.037**
	(0.113)	(0.090)	(0.025)	(0.000)	(0.975)	(0.001)	(0.066)	(0.060)	(0.268)	(0.016)	(0.049)	(0.034)
GGIR	-0.001**	0.001*	0.001*	-	-0.0026	-	0.0001	-	0.0004	-	0.0001	-
	(0.036)	(0.052)	(0.060)		(0.176)		(0.589)		(0.597)		(0.843)	
Constant	0.238	3.025***	0.340	5.345***	8.305	5.085***	2.479**	1.916**	-4.039	5.435*	4.982***	3.696***
	(0.884)	(0.010)	(0.921)	(0.001)	(0.158)	(0.000)	(0.013)	(0.044)	(0.428)	(0.067)	(0.000)	(0.000)
Obs	288	282	288	280	288	276	288	278	288	273	288	278
Countries	18	18	18	18	18	18	18	18	18	18	18	18

Diagnostic Tests												
F statistics	46.24***	60.62***	112.6***	28.68***	4.05***	23.40***	17.47***	154.5***	3.28**	12.02***	4.67***	38.31***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)	(0.007)	(0.000)	(0.019)	(0.000)	(0.000)	(0.000)
AR(1)	-2.81	-2.85	-1.72	-3.07	-0.88	-2.37	-2.51	-3.02	-0.51	-1.93	-2.18	-2.50
	(0.029)	(0.004)	(0.086)	(0.002)	(0.379)	(0.018)	(0.012)	(0.003)	(0.612)	(0.054)	(0.290)	(0.012)
AR(2)	0.72	0.19	-0.95	0.91	-1.4	-1.28	-0.08	-1.2	-0.6	-0.57	-0.64	0.32
	(0.469)	(0.846)	(0.343)	(0.362)	(0.163)	(0.201)	(0.940)	(0.229)	(0.550)	(0.569)	(0.520)	(0.746)
Hansen Test	14.21	14.42	12.63	12.91	6.3	13.48	15.75	13.48	3.16	7.39	9.53	16.10
	(0.048)	(0.044)	(0.614)	(0.142)	(0.614)	(0.142)	(0.028)	(0.128)	(0.087)	(0.049)	(0.299)	(0.097)

Note: The upper portion of the table is as for Table 5.1, except the interaction between FinSIA and the country characteristics GRY, CA, GB, DRES, TO, and FO are introduced to trace out the conditional effect of FinSIA on FinSIE. The lower part of the table presents the diagnostic tests.

The interaction terms, although small in magnitude, is positive and statistically significant at 1 percent. The second significant characteristic is the deteriorating fiscal balance. The direct effect of fiscal deficit is not significant but once we incorporate the interaction of fiscal balance with FinSI for emerging the coefficient becomes significant. This implies that fiscal vulnerabilities are crucial in the transmission of FinSI from developed to emerging middle-income countries. Our findings are once again robust to POLS, FE, and 2SLS models. It is interesting to observe that once we apply Difference GMM the results differ from all the previous models.

Column (3) and (4) in Table 5.8 reports the conditional effect of the current account balance on stress transmission using Difference GMM. This effect is negative and significant. That implies an improvement in the current account mitigate the transmission of FinSI. Similarly, the conditional effect of fall in real output is positive and statistically significant, confirming the findings of previous models that the financial stress transmits from developed to emerging middle-income countries if emerging middle-income countries face recession. All other conditional effects are insignificant for Difference GMM. The bottom part of Table 5.7 and Table 5.8 discuss the results for diagnostic tests. Test for serial correlation confirms the absence of second-order serial correlation as indicated by probability for AR(2) higher than 5 percent. The Hansen test for over-identifying restriction shows that instruments are valid in both the models.

Table 5.8 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Difference GMM

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
L.FSE	0.532***	0.699**	0.122	0.385**	0.594***	0.447**	0.632**	0.318**	0.495**	0.322***	0.382**	0.237**
	(0.000)	(0.017)	(0.618)	(0.014)	(0.001)	(0.030)	(0.016)	(0.028)	(0.018)	(0.006)	(0.020)	(0.019)
PRI	0.011	-0.019	-0.058*	-0.056***	-0.078*	-0.101***	-0.0236**	-0.042***	-0.030	-0.063**	-0.034	-0.058**
	(0.539)	(0.347)	(0.098)	(0.004)	(0.063)	(0.001)	(0.043)	(0.000)	(0.517)	(0.050)	(0.282)	(0.010)
FSA	-0.565**	-0.517*	-0.088	0.086	0.190	0.207**	0.1834	0.194	0.398	0.390	-0.062	0.0001
	(0.033)	(0.097)	(0.566)	(0.406)	(0.102)	(0.035)	(0.357)	(0.211)	(0.171)	(0.154)	(0.320)	(0.999)
GRY	-0.105	-0.048	-	-	-	-	-	-	-	-	-	-
	(0.181)	(0.533)										
GRY*FSA	0.076**	0.088*	-	-	-	-	-	-	-	-	-	-
	(0.015)	(0.086)										
CA	-	-	0.128***	0.090***	-	-	-	-	-	-	-	-
			(0.00)	(0.00)								
CA*FSA	-	-	-0.051**	-0.045***	-	-	-	-	-	-	-	-
			(0.00)	(0.00)								

Table 5.8 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Difference GMM Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
GB	-	-	-	-	-0.023 (0.597)	0.014 (0.697)	-	-	-	-	-	-
GB*FSA	-	-	-	-	0.045 (0.225)	0.027 (0.307)	-	-	-	-	-	-
DRES	-	-	-	-	-	-	-0.0179** (0.025)	-0.006 (0.370)	-	-	-	-
DRES*FSA	-	-	-	-	-	-	-0.007 (0.371)	-0.010 (0.247)	-	-	-	-
TO	-	-	-	-	-	-	-	-	0.006 (0.702)	0.009 (0.579)	-	-
TO*FSA	-	-	-	-	-	-	-	-	-0.005 (0.188)	-0.005 (0.166)	-	-

Table 5.8 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Difference GMM Continued...

Variables	General Model (1)	Specific Model (2)	General Model (3)	Specific Model (4)	General Model (5)	Specific Model (6)	General Model (7)	Specific Model (8)	General Model (9)	Specific Model (10)	General Model (11)	Specific Model (12)
FO	-	-	-	-	-	-	-	-	-	-	0.065	0.045
											(0.187)	(0.125)
FO*FSA	-	-	-	-	-	-	-	-	-	-	-0.042**	-0.026
											(0.042)	(0.112)
GCPG	0.012*	0.014**	0.003**	0.004**	0.004*	0.005***	0.003**	-	0.004	0.004**	0.003*	0.003**
	(0.078)	(0.016)	(0.019)	(0.010)	(0.088)	(0.003)	(0.021)		(0.167)	(0.029)	(0.094)	(0.014)
GYG	-0.103*	-0.164*	-0.2106**	-0.088***	-0.050	-	-0.0532	-0.044*	-0.194**	-0.092***	-0.153***	-0.081***
	(0.050)	(0.067)	(0.016)	(0.000)	(0.381)		(0.312)	(0.060)	(0.022)	(0.000)	(0.004)	(0.000)
GGIR	0.0001	-	0.0004	-	-0.0003	-0.001***	0.0007	-	0.0004	-	0.0003	-
	(0.712)		(0.261)		(0.439)	(0.001)	(0.901)		(0.302)		(0.324)	
Obs	270	260	270	262	270	268	260	271	270	260	270	259
Countries	18	18	18	18	18	18	18	18	18	18	18	18

Table 5.8 Determining Financial Stress: Role of Country Characteristics in Transmission of Financial Stress, Difference GMM Continued...

Diagnostic Tests												
F Statistics	136.9*** (0.000)	19.77*** (0.000)	5.83*** (0.001)	23.5*** (0.000)	15.85*** (0.000)	7.98*** (0.000)	14.83*** (0.000)	107.98*** (0.000)	9.82*** (0.000)	32.69*** (0.000)	11.59*** (0.00)	21.12*** (0.00)
AR(1)	-2.19 (0.028)	-1.65 (0.099)	1.79 (0.049)	2.43 (0.015)	-1.86 (0.062)	-1.95 (0.052)	-2.47 (0.014)	-1.76 (0.078)	-2.19 (0.029)	-2.52 (0.012)	-2.19 (0.029)	-2.43 (0.015)
AR(2)	0.93 (0.352)	0.24 (0.810)	-0.61 (0.541)	-0.11 (0.911)	0.62 (0.441)	0.65 (0.513)	0.63 (0.529)	-0.55 (0.584)	0.54 (0.587)	0.52 (0.600)	0.03 (0.979)	0.02 (0.981)
Hansen Test	5.64 (0.228)	4.78 (0.687)	12.92 (0.248)	6.12 (0.295)	5.75 (0.569)	4.42 (0.815)	14.45 (0.071)	13.55 (0.195)	10.23 (0.115)	5.55 (0.593)	15.75 (0.113)	14.75 (0.019)

Note: The upper portion of the table is as for Table 5.1, except the interaction between FinSIA and the country characteristics GRY, CA, GB, DRES, TO and FO are introduced to trace out the conditional effect of FinSIA on FinSIE. The lower part of the table presents the diagnostic tests.

5.2.3 Comparison of Conditional Effects

To compare the results, we reproduced the unconditional (direct) and conditional effects from Table 5.4 to Table 5.8 in Table 5.9.

Table 5.9 Comparison of Conditional Effect

Interaction Terms	POLS Model (1)	FE Model (2)	2SLS Model (3)	System GMM Model (4)	Difference GMM Model (5)
FSA	**-0.268*** **	**-0.155***	**-0.134***	-0.353	**-0.517***
GRY	**-0.053*** **	**-0.061*** **	**-0.065*** **	-0.031	**-0.048**
GRY*FSA	**-0.046*** **	**0.025***	**0.021** **	**0.046***	**0.088***
FSA	0.001	-0.042	-0.035	0.076	**0.086**
CA	0.021***	0.001	0.024***	0.003	**0.090*** **
CA*FSA	0.004	0.003	-0.003	-0.001	**-0.045*** **
FSA	**0.121*** **	**-0.004**	**0.092*** **	**0.418** **	0.207**
GB	**-0..056*** **	**-0.028*** **	**-0.061*** **	**-0.028**	0.014
GB*FSA	**0.043*** **	**0.013***	**0.031*** **	**0.096*** **	0.027
FSA	-0.032	-0.039	-0.061	0.202**	0.194
DRES	0.004***	0.002	-0.001	-0.013**	-0.006
DRES*FSA	0.0034	0.0002	-0.003	-0.0004	-0.010
FSA	0.011	-0.079	-0.094	1.561	0.390
TO	-0.001	-0.003*	-0.0004	0.021	0.009
TO*FSA	0.001	0.001	0.001	0.028	-0.005
FSA	0.0548	-0.064	-0.018	0.251*	0.001
FO	0.015**	0.027**	0.025**	0.020	0.045
FO*FSA	0.001	0.009	0.008	0.083	-0.026

Note: The dependent variable is FinSI for emerging and middle-income countries. Significance levels at 1, 5, and 10 percent are represented by ***, **, and * respectively.

The results show that a fall in real output of the emerging middle-income countries has significant direct and indirect effects across all the models, with an exception that the respective direct effect is not significant for System GMM. Similarly, the effects of the government balance on FinSI of emerging middle-income countries are significant in 4 out of 5 methods. While for the fifth method, the Difference GMM, the effect for current account balance is significant rather than government balance. In general, the coefficient estimates from system GMM are larger than the other models. Overall our findings are robust to the estimation method applied.

5.3 Regression-Based Analysis for the Determinants of Fiscal Stress

In this section, we aim to analyze the determinants of fiscal stress for emerging and middle-income countries. We collect panel data for 17 emerging middle-income countries covering the period 2000-2016. This constitutes 289 annual observations. Once again, we estimate both static and dynamic models and checked the robustness of the results to host panel data estimation methods. Equation (3.3) is estimated by the Pooled Ordinary Least Square (POLS) method and the results are assembled in Table 5.10. We apply an econometric procedure that involves estimating general and specific models based on all the observations. The results are documented in columns (2) and (4) of Table 5.10. Next, we estimate the general and specific models after removing outliers. Hampel Identifier is used to cater to the problem of outlier observations. The results are placed in the third and fifth columns of Table 5.10 respectively.

Table 5.10 Determinants of Fiscal Stress for Emerging and Middle-Income Countries, Pooled Ordinary Least Squares Method

Model	General Model		Specific Model	
	(1)	(2)	(3)	(4)
Variables	All Observations	Excludes Outliers	All Observations	Excludes Outliers
PRI	5.7197**	5.1963***	3.2930	4.5096**
	(0.016)	(0.003)	(0.179)	(0.011)
L.PRI	-4.3726*	-3.2479*	-1.0266	-0.8839
	(0.064)	(0.064)	(0.658)	(0.597)
FinSIE	0.5924***	0.5905***	0.6117***	0.6144***
	(0.000)	(0.000)	(0.000)	(0.000)
OG	0.0204	0.5990**	-	-
	(0.965)	(0.026)		
IRGD	1.7220**	1.3639***	2.1268***	2.0172***
	(0.013)	(0.008)	(0.005)	(0.007)
GD	0.0505***	0.0337***	0.0394***	0.0271***
	(0.000)	(0.000)	(0.000)	(0.000)
GOB	-1.9259***	-2.3643***	-2.1546***	-2.3824***
	(0.009)	(0.000)	(0.000)	(0.000)
CA	-0.0758***	-0.0360***	-0.0673***	-0.0210*
	(0.000)	(0.002)	(0.001)	(0.072)
RES	0.7930***	0.7624***	-	-
	(0.000)	(0.000)		
DC	0.4215*	0.3771**	0.2220**	0.2847***
	(0.0505)	(0.0337)	(0.032)	(0.000)

Table 5.10 Determinants of Fiscal Stress for Emerging and Middle-Income Countries, Pooled Ordinary Least Squares (POLS) Method Continued...

Constant	-0.0263*** (0.000)	-0.0266*** (0.000)	-0.0122*** (0.007)	-0.0160*** (0.000)
Observations	272	236	272	236
R-Squared	0.995	0.997	0.995	0.996
F-Statistics	1799.21*** (0.000)	2630.30** (0.000)	1749.87*** (0.000)	1567.87*** (0.000)

Notes: The dependent variable is the fiscal stress index for emerging middle-income countries (FisSI). PRI denotes political risk index. FinSIE refers to the financial stress index for emerging middle-income countries. Macroeconomic factors driving FisSI are the output gap as a percent of potential GDP (OG) and interest rate growth differential (IRGD). Fiscal fundamentals include gross debt as a ratio of GDP (GD) and government overall balance as a percent of GDP (GOB). Non-fiscal fundamentals include two external factors, namely current account balance as a percent of GDP (CA) and foreign exchange reserves (RES), and one domestic factor, namely domestic credit to the banking sector as percent of GDP (DC) ***,**, and * represent significance at 1, 5, and 10 percent respectively. P-values of individual coefficients are presented in parenthesis. All models are estimated using robust standard errors. We remove outliers from Model (2) and Model (4) through *Hampel Identifier* to the residuals of model (1) and (3) respectively.

Next, we explain the factors driving fiscal stress one by one. Political risk (PRI) is the first source of disruptions in public accounts. We included the current value of political risk in the model initially which was insignificant. Then we considered both the current and lag value of political risk to evaluate either the risk in the previous period triggers the fiscal stress in the current period. We find that a higher value of political risk index in the previous period, which exhibits lower political risk, tends

to lower fiscal stress. Political risk affects the fiscal stress by creating uncertainty about the stance of public policy besides hampering the future solvency of the government and lowering investments. Our findings are in line with Waszkiewicz (2015).

The coefficient for the financial stress index (FinSIE) of the emerging markets is positive and significant across all the models. This illustrates that higher financial stress in emerging markets ultimately raises fiscal stress in these economies as there exist important interactions between the financial and real sides of the economy. Vulnerabilities in the financial sector require support to the financial sector at the cost of deterioration in public balance sheets. This lowers the bond prices while these bonds constitute a major weight in the bank's balance sheet and squeezes the supply of credit. Thus, an adverse feedback loop is created between the sovereign bond market, the financial sector, and the real economy. Our finding conforms to the literature on crises overlap, that is, financial and fiscal crises do overlap with each other, with one preceding the other. Further, the coefficients are statistically significant in all the models at a 1 percent level (Acharya et al., 2014; Gerling et al., 2017).

The second set of variables is the macroeconomic factors affecting fiscal stress. The first macroeconomic factor, output gap (OG), positively but insignificantly affects fiscal stress. The widening output gap is, in fact, a reflection of the overheated economy characterized by financial imbalances. This indirectly accelerates fiscal stress through adverse feedbacks from financial vulnerabilities. However, the variable is dropped from a specific model as its effect is weakly significant. The next macroeconomic factor in determining fiscal stress in emerging markets is interest rate growth differential (IRGD). This is an indicator of debt

sustainability. Negative IRGD stayed a pervasive feature for debt dynamics in such economies but that trend reversed in the late 2000s owing to turbulences in European regions, financial developments. and rising interest rates. Any rise in this differential signals a destabilizing debt to GDP ratio which in turn raises the likelihood of sovereign debt crises, and hence fiscal stress. A higher ratio shows that more efforts and resources are required to bring down the debt trajectory.

Another set of variables affecting fiscal stress is fiscal fundamentals. The first factor is gross debt in emerging economies (GD). Higher GD raises interest payments that crowd out investment and signals the markets panics. After a certain level excessive debt hampers growth and impedes the ability of the government to formulate countercyclical fiscal policy. Thus, growing debt shows inefficiency in fiscal management which in turn raises fiscal risks and hence. fiscal stress. The second fiscal factor that drives fiscal stress is the overall government balance (GOB). A deficit in fiscal accounts raises fiscal stress. Deficit makes the government more reliant on borrowing which raises public debt. A higher debt trajectory is translated into higher fiscal stress.

Non-fiscal fundamentals are characterized by external and domestic factors. The first external factor is the current account balance of the government (CA). Any deterioration in the current account balance reflects the loss of competitive position for emerging economies. Lower is the competitiveness; higher is the need for debt financing which raises default risks and ultimately fiscal stress. This coefficient is statistically significant across all the models. Likewise. the second factor is the fall in the central bank's foreign exchange (RES) which halts the ability of the government to finance external liabilities. This raises public debt as well as fiscal

stress. However, the impact is highly insignificant in the general model, forcing us to drop international reserves from a specific model.

Finally, the coefficient of private credit to the banking sector (DC), a domestic factor, is positive and significant at 1 percent. This reflects the fact that higher private credit tends to raise fiscal stress as the effect of private credit spillovers on the public sector. In periods of financial turmoil, most of the private credit of the banking sector is financed by the government through government bailouts. Higher demand for private credit exerts pressures on pubic credit when supply for private credit is squeezed through the banking system. Thus, government rescues the banking crisis and curtails the possibility of adverse feedback loops from banking to sovereign defaults.

To sum up, this analysis shows that along with fiscal triggers, political risk, crisis spillover, and debt sustainability (a macroeconomic factor) do play an important role in determining fiscal stress. The lower part of the table reports the overall goodness of fit and R-Squared. Both F statistics and R^2 are reasonably high. This confirms that the model is a good fit and explains the variation in FisSI quite well.

Next, we re-estimate equation (3.3) by employing the Fixed Effect model. Before that, we chose between Fixed and Random effect models through the Hausman test. The null hypothesis for the Hausman test states that the difference in coefficients is not systematic. The value of Chi-Square test statistics is 42.03 with probability zero. A higher value of the test stat (or lower probability) confirms the rejection of the null hypothesis. Thus, the Fixed Effect is our preferred model over the Random effect. Table 5.11 reports the results for the determinants of fiscal stress using the Fixed Effect Model. The coefficient of financial stress in emerging

markets is once again positive and statistically significant across all the models. This confirms the existence of complex dynamics between financial and fiscal sectors.

Table 5.11 Determinants of Fiscal Stress for Emerging and Middle-income Countries, Fixed Effect Model

Model	General Model	Specific Model	General Model	Specific Model
	(1)	(2)	(3)	(4)
Variables	All Observations	Excludes Outliers	All Observations	Excludes Outliers
PRI	1.4431	2.7671**	0.8021	2.8463**
	(0.468)	(0.019)	(0.679)	(0.025)
L.PRI	-0.9276	0.1607	-0.5922	-0.007
	(0.612)	(0.882)	(0.743)	(0.995)
FinSIE	0.6576***	0.5787***	0.6516***	0.5885***
	(0.000)	(0.000)	(0.000)	(0.000)
OG	1.8625***	1.0687***	1.9424***	1.0852***
	(0.000)	(0.000)	(0.000)	(0.000)
IRGD	1.3124***	0.3866	1.2516***	0.4260*
	(0.003)	(0.103)	(0.004)	(0.097)
GD	0.0204***	0.0204***	0.0191***	0.0197***
	(0.000)	(0.000)	(0.002)	(0.000)
GOB	1.2594**	-1.4837***	-1.2908**	-1.3800***
	(0.015)	(0.000)	(0.0150)	(0.000)
CA	0.0101	0.0048	-	-
	(0.696)	(0.739)		
RES	-0.8240***	-0.4267***	-0.7456***	-0.3939***
	(0.000)	(0.000)	(0.000)	(0.000)
DC	0.5429	0.1197	-	-
	(0.155)	(0.633)		

Table 5.11 Determinants of Fiscal Stress for Emerging and Middle-income Countries, Fixed Effect Model Continued...				
Model	General Model	Specific Model	General Model	Specific Model
Observations	272	236	272	219
R-Squared	0.995	0.997	0.995	0.9945
F-Statistics	367.49***(0.000)	162.32*** (0.000)	459.59***(0.000)	206.69*** (0.000)
Notes: As for Table 5.10				

Higher systemic financial risk transmits into systemic fiscal risk which poses a threat to the fiscal sustainability of the emerging economies. The findings are statistically significant at 1 percent. This confirms the notion of crises overlap as pinpointed by Acharya et al. (2014), Tagkalakis (2013), and Elgin and Uras (2013). We consider two macroeconomic factors driving fiscal stress. The first is the output gap, its coefficient indicates that a higher output gap tends to increase fiscal stress. When the actual output is above the trend line, the economic boom raises monetary imbalances.

To avoid massive disruptions government finances those imbalances which raises fiscal risks. Our findings are once again robust to POLS, FE, and 2SLS models. It is interesting to observe that once we apply Difference GMM the results differ from all the previous models. This ultimately generates a feedback loop from financial to fiscal imbalances and intensifies fiscal stress (Borio et al., 2016; Bruns & Poghosyan, 2018).

Next, we examine the impact of interest rate growth differential of fiscal stress. A positive coefficient reflects that any rise in this differential ultimately ends up in higher fiscal stress. The coefficient is significant at 10 percent level of significance

only in the specific model. This confirms that public debt is at a sustainable level, which keeps the fiscal stress low in emerging middle-income countries.

As far as fiscal factors are concerned, higher gross debt as a percent of GDP tends to raise fiscal stress. The interplay of interest rate and growth rate of the economy drives the debt ratio. Higher public debt is inimical to stability as it raises fiscal stress in two ways: First, it raises the sovereign risk directly through the higher principal amount of debt. Second, interest payments on public debt require a fiscal surplus to finance debt. Thus, a higher debt burden requires the government to allocate more funds for maintaining fiscal sustainability, which puts pressure on fiscal policy by raising fiscal risk and hence, fiscal stress. The next fiscal factor is the overall fiscal balance. Deterioration in fiscal balance curtails the government's ability to respond to business cycles. Deficits lower national savings and raises the interest rate. The ability of the government to service its debt becomes questionable when the interest rate is high. This raises fiscal stress as fiscal sustainability is compromised.

Non-fiscal fundamentals influence fiscal stress moderately. Firstly, deficits in the current account once again appear to have a positive but statistically insignificant impact on fiscal stress. Thus, we dropped the current account deficit from the general model. However, the second external factor, foreign exchange reserves, is negative and statistically significant at 1 percent across all the models. This shows that higher accumulation of foreign exchange reserves lessens the burden on fiscal sustainability as these reserves can help to pay debt denominated in foreign currency which constituted a major part of overall debt in emerging middle-income countries. The next factor is domestic, that is, private credit to the banking sector. An increase in private credit to the banking sector raises the fiscal risk in periods of the financial

crisis. In fact supply of credit through the banking sector squeezes in such periods and the government intervenes to support the banking sector. This consumes government resources and raises government debt avert negative feedback loops from financial to the real economy. This puts pressure on the government balance sheet and raises fiscal stress.

Overall, our findings once again confirm that apart from fiscal fundamentals, macroeconomic factors, crisis spillovers, and political risk are important driving factors for fiscal stress. More or less, our findings are robust to Table 5.10. A few diagnostics are also performed which are reported at the bottom part of Table 5.11. A higher value of R^2 and F statistics confirms that the model explains the variation in data quite well and the coefficients are jointly significant. Next, we explore the determinants of fiscal stress using dynamic models. Table 5.12 presents results for the determinants of fiscal stress using a one-step system generalized methods of moment (henceforth System GMM). The lagged value of fiscal stress tends to raise fiscal stress in the current period. This confirms the presence of a significant dynamic effect in our model. Moreover, the coefficient for lagged fiscal stress is statistically significant at 1 percent level.

To explore the impact of PRI we include level and lagged values of PRI. The coefficient for PRI in THE previous period is negative and significant. This shows that the higher is the value of political risk in the previous year (lower political risk), the lower is the fiscal stress. Lower political risk is a barometer of lesser uncertainty in the process of formulating fiscal policy. Once again we find the evidence for crisis overlaps in the dynamic model. However, the magnitude of this impact is smaller in the dynamic model as compared to static models presented in Tables 5.10 and 5.11.

Table 5.12 Determinants of Fiscal Stress for Emerging and Middle-income Countries, One Step Generalized System GMM

Model	General Model		Specific Model	
	(1)	(2)	(3)	(4)
Variables	All Observations	Excludes Outliers	All Observations	Excludes Outliers
L.FisSI	0.6242***	0.6498***	0.5301***	0.5515***
	(0.000)	(0.000)	(0.000)	(0.000)
PRI	5.3954**	5.1509**	5.8943**	4.6727***
	(0.036)	(0.012)	(0.031)	(0.005)
L.PRI	-6.8959***	-5.1856***	-6.1053**	-4.6749***
	(0.007)	(0.000)	(0.015)	(0.000)
FinSIE	0.2404***	0.2300***	0.2907**	0.2770***
	(0.000)	(0.000)	(0.000)	(0.000)
OG	0.3085	0.2984	0.5632*	0.2602*
	(0.225)	(0.214)	(0.062)	(0.053)
IRGD	0.5290	0.2396	0.3797*	0.3985*
	(0.125)	(0.127)	(0.052)	(0.074)
GD	0.0145*	0.0109	0.0250**	0.0129***
	(0.075)	(0.131)	(0.020)	(0.001)
GOB	0.8861	0.5726	-	-
	(0.295)	(0.228)		
CA	0.0616**	-0.0587*	-0.0360*	-0.0276**
	(0.021)	(0.055)	(0.068)	(0.030)

Table 5.12 Determinants of Fiscal Stress for Emerging and Middle-income Countries, One Step Generalized System GMM Continued....				
RES	-0.0852 (0.612)	-0.0877 (0.612)	-	-
DC	0.2189 (0.595)	0.1003 (0.736)	-	-
Constant	0.0030 (0.689)	-0.001 (0.956)	0.001 (0.934)	-0.001 (0.769)
Observations	272	237	272	235
R Squared	0.3211	-0.0075	0.7255	0.7916
F-test Statistics	225.23*** (0.000)	125.38*** (0.000)	216.36*** (0.000)	171.91*** (0.000)
AR(1)	Z= -1.76* (0.079)	Z=-2.21** (0.027)	Z=-1.68* (0.093)	Z=-1.87** 0.061)
AR(2)	Z= -0.67 (0.500)	Z= 0.07 (0.948)	Z= -0.81 (0.420)	Z= -0.52 (0.603)
Hansen Test	10 (1.000)	4.11 (1.000)	12.36 (0.983)	12.06 (0.986)
Notes: As for Table 5.10				

Once again we find that IRGD, a fiscal fundamental, contributes significantly to determining fiscal stress while the non-fiscal factors appear to have little impact on fiscal stress. Overall, political risk, crisis spillover, fiscal fundamentals, and debt sustainability are regarded as trigger factors for fiscal stress. The lower part of the Table reports the two diagnostic tests. The first test for serial correlation exhibit that the AR(1) term is significant which shows that the null of no first-order serial correlation is rejected at 10 percent. Whereas, the null of no second-order serial

correlation is not rejected as the probability for AR(2) is more than 10 percent. The second, Hansen J test for over-identifying restrictions confirms that the null hypothesis is not rejected. Thus, instruments and error terms are not correlated.

Finally, we estimate equation (3.3) by difference GMM method. This method caters to the problem of endogeneity in the model. We include lagged dependent variables to assess the possible dynamics in the model. Table 5.13 the present results of the difference GMM. Overall, the results confirm once again that that political risk, crises spillover systemic risk, and gross debt are the important determinants of fiscal stress. The diagnostic tests confirm the presence of first-order serial correlation and the absence of second-order serial correlation. J test confirms that the restrictions are valid.

Table 5.13 Determinants of Fiscal Stress for Emerging and Middle-Income Countries, Difference Generalized Method of Moments

Model	General Model		Specific Model	
	(1)	(2)	(3)	(4)
Variables	All Observations	Excludes Outliers	All Observations	Excludes Outliers
L.FisSI	0.4632***	0.2904***	0.4826***	0.5221***
	(0.003)	(0.000)	(0.000)	(0.000)
PRI	5.3251	6.2873**	9.3858**	6.1980**
	(0.105)	(0.036)	(0.013)	(0.010)
L.PRI	-5.8004**	-5.2062**	-7.1330***	-5.0485**
	(0.018)	(0.017)	(0.004)	(0.028)
FinSIE	0.3748***	0.4980***	0.3587***	0.3897**
	(0.004)	(0.000)	(0.001)	(0.028)
OG	1.1077**	0.7531***	0.9414**	0.8127***
	(0.011)	(0.009)	(0.014)	(0.006)
IRGD	1.4522	3.1142**	-	-
	(0.479)	(0.047)		
GD	0.0096	0.0205**	0.0310**	0.0218**
	(0.436)	(0.023)	(0.033)	(0.012)
GOB	-0.1440	-0.1196	-	-
	(0.858)	(0.872)		
CA	0.0157	0.0168	-	-
	(0.772)	(0.628)		
RES	0.5951**	0.3265	-	-
	(0.016)	(0.136)		
DC	0.3882	0.6310	-	-
	(0.526)	(0.433)		

Table 5.13 Determinants of Fiscal Stress for Emerging and Middle-Income Countries, Difference Generalized Method of Moments Continued...				
Observations	255	208	255	202
F-test Statistics	124.38 (0.000)***	58.92 (0.000)***	58.95 (0.000)***	42.82 (0.000)***
AR(1)	Z= -1.51 (0.131)	Z= -2.08 (0.038)	Z=-1.83 (0.067)	Z=-1.98 (0.048)
AR(2)	Z=-1.04 (0.300)	Z=-0.55 (0.585)	Z= -0.96 (0.338)	Z= 1.42 (0.155)
Hansen Test	9.46 (0.994)	11.50 (0.977)	11.20 (0.886)	13.07 (0.787)
Note: As for Table 5.10.				

To sum up, the analysis of driving factors for financial stress helps us draw some basic conclusions. First, we find considerable evidence in favor of the hypothesis that the financial institutions are important in determining financial and fiscal stress. The finding is robust across various models and methodologies. Secondly, external factors, such as global commodity prices and global output, do play a vital factor in explaining the financial stress in emerging middle-income countries. We further provided the evidence for the transmission process of financial stress from developed to the emerging countries. We explicitly deal with the question as to how the country characteristics in emerging economies facilitate this transmission of stress. Findings suggest that fall in real output and fiscal imbalances serve as the important country conditions that expedite the process of stress transmission. An interesting finding is that trade and financial open do carry a direct significant impact of Financial stress. But the indirect effect is not significant.

Our analysis concerning the determinants of fiscal stress brings forth the conclusion that fiscal fundamentals helps to determine fiscal stress. We further show that the emerging economies that mired by the problem of debt sustainability experienced higher fiscal stress. Similar to findings for determinants of financial stress. we find the novel evidence in favor or role of political factors in explaining fiscal stress as well. The final interesting outcome we reach is that the non-contractual contingent liabilities induce higher fiscal stress.

Chapter 6

Results and Discussion:

Interconnection between Financial and Fiscal Stress

This chapter aims to explore the interconnection between financial and fiscal stress within three blocks, namely BRICS, other emerging economies (OE), and a group of 5 developed countries (G5). The interconnection is explored through graphic and econometric analysis. Accordingly, this chapter is classified into two sub-sections. The first sub-section presents the graphic analysis to explore either there exist a relationship between FinSI and FisSI for each block. The second sub-section estimates a VAR model to explore the dynamic responses to shocks, interpreted through impulse response function and variance decomposition analysis.

6.1 Block-Specific Graphic Analysis for FinSIs and FisSIs

The graphs for the financial and fiscal stress over the sampled period are plotted for BRICS in Figure 6.1 (a). The most prominent impact on financial stress appeared in 2008 with the inception of the global financial crisis. More recently economic recession in China during 2015 halted the trends in financial stress but economic fundamentals worsened as fiscal surplus in China and other leading economies turned into a deficit. Overall fiscal stress stayed lower than the financial stress throughout the analysis. However, fiscal stress has escalated since 2010 in almost all the countries in the region. The second block, other emerging economies followed a manageable trajectory of fiscal stress for most of the countries owing to strong fundamentals and a lower deficit.

Figure 6.1 Block-Specific Financial and Fiscal Stress Indices

The figure plots the country-specific financial and fiscal indices for the period of analysis. The graphs are presented block-wise as we consider three blocks, namely BRICS, Other Emerging, and G5 countries for the interconnectedness analysis. The horizontal axis measures years of analysis and the vertical axis mentions the FinSI and FisSI for each country within each block.

Figure 6.1 a) Block I: BRICS

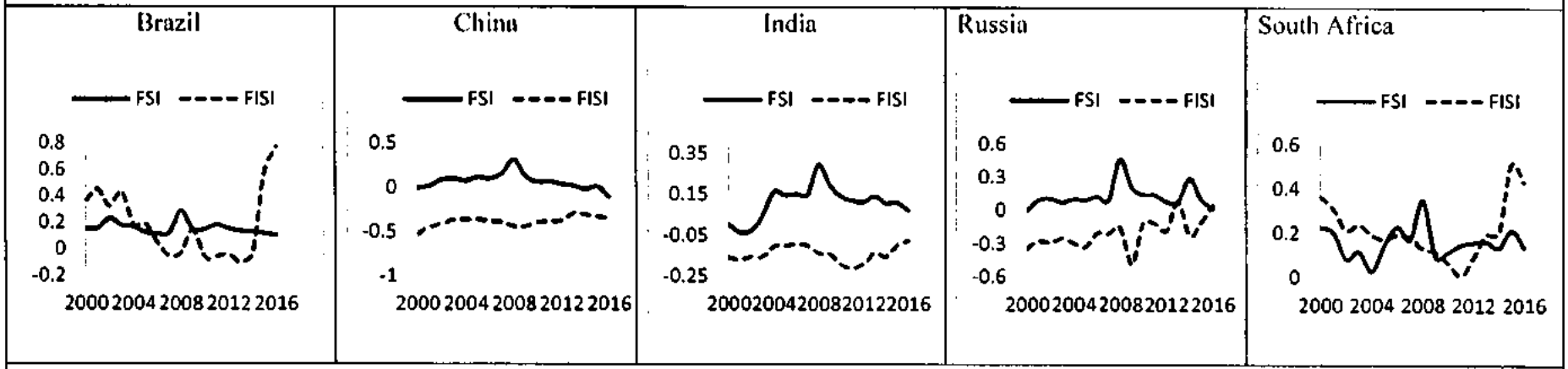


Figure 6.1 b) Block II: Other Emerging Economies

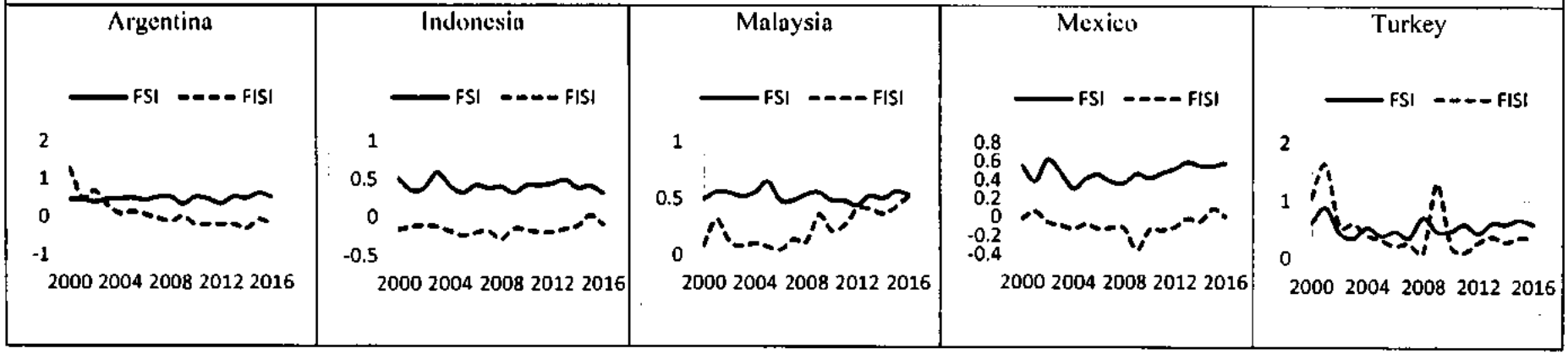
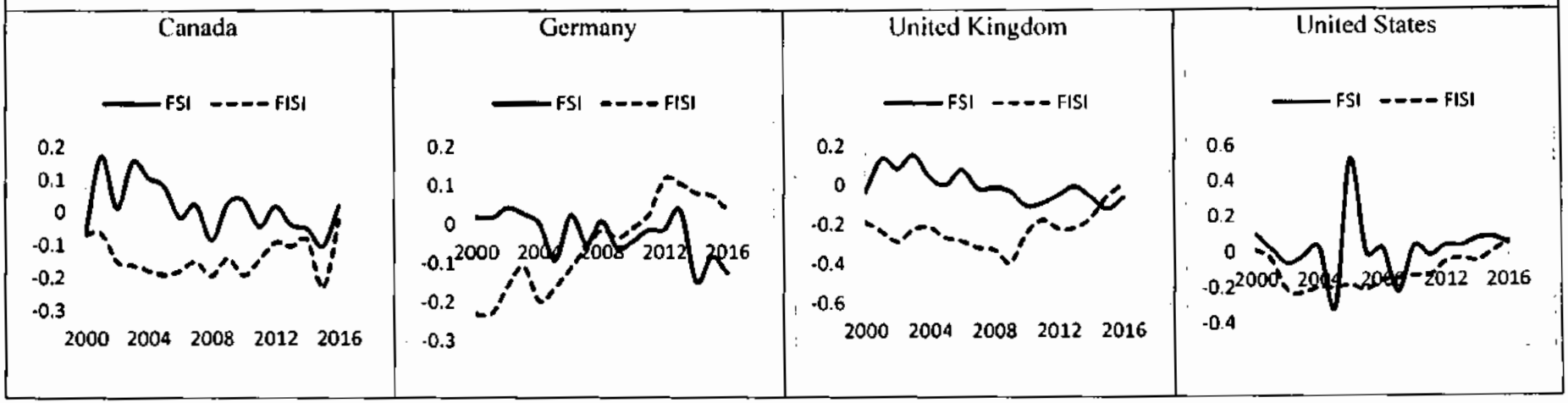


Figure 6.1 c) Block III: Advanced Economies (G5)



Most of these economies coped well with the financial crises as well as sorted out fiscal resolutions to disturbances in the financial system. Contrary to OE, the third block (G5) experienced higher financial and fiscal stress throughout the analysis. Most of these countries faced problems of fiscal indiscipline. Thus, the impact of financial stress halted down but the heavy bailout costs raised fiscal stress in this block. The debt-to-GDP ratios rose and ultimately sovereign debt crises hit the European countries in 2011. Strong trade ties between European developed countries (Germany and UK) and the US intensified the stress transmission.

6.2 Econometric Analysis for the Interconnection between FinSI and FisSI

We apply the impulse function and variance decomposition analysis to interpret the estimated VAR model. For the estimation of VAR, the first step is to test the stationarity of both the indices. The results are reported in Table 6.1. Test results unanimously confirm that financial and fiscal stress variables are stationary at the level for all the country blocks. The test statistics are significant either at 1 percent or 5 percent level in all the cases except PP fisher test for FisSI that reports non-stationarity.

Overall, we confirm, with a fair degree of agreement, that both the indices are stationary at level. Once we confirm that the stress indices are stationary. We are, therefore, ready to probe the systematic relation between the financial and fiscal stress indices through the VAR model. We sub-divide the VAR analysis into three subsections, one each for BRICS, other emerging, and G5 sets of countries.

Table 6.1 Panel Unit Root Tests

Test Stats/Blocks	Set of BRICS		OE Countries		Set of G5	
	FinSI	*FisSI*	*FinSI*	*FisSI*	*FinSI*	*FisSI*
Levin, Lin & Chu Test	-3.002*** (0.001)	-1.988** (0.023)	-4.989*** (0.000)	-4.4820*** (0.000)	-2.9716*** (0.003)	-5.1193*** (0.000)
IPS Test	-2.925*** (0.002)	-2.106** (0.018)	-3.876*** (0.000)	-2.5107*** (0.006)	-4.186*** (0.000)	-3.762*** (0.000)
ADF Fisher Test	26.411*** (0.003)	20.678** (0.024)	36.26*** (0.000)	26.962*** (0.003)	31.373*** (0.000)	28.781*** (0.000)
PP Fisher Test	26.251*** (0.003)	14.598 (0.147)	41.569*** (0.000)	27.172*** (0.002)	36.037*** (0.000)	34.8217*** (0.000)

Note: Financial and fiscal stress indices are symbolized as *FinSI* and *FisSI* respectively. The level of significance for the unit root tests at 1. and 5 percent are denoted by *** and ** respectively.

6.2.1 Interconnection between FinSI and FisSI in BRICS

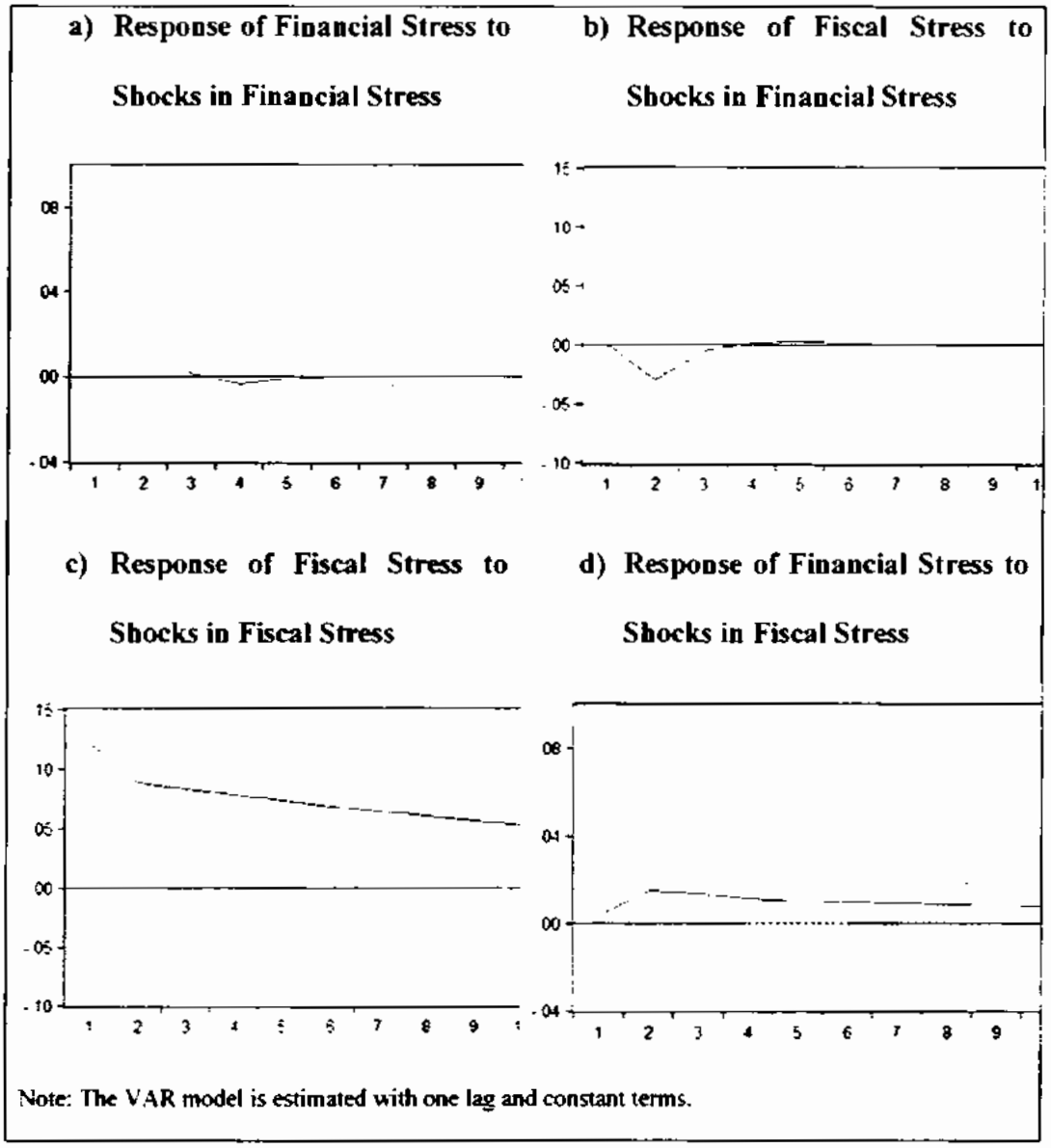
In this section the estimates for the VAR model for a panel of BRICS countries over the period 2000-2016. The selection of lag length for the VAR model relies on various lag selection criteria. Table D1 in Appendix D reveals that most of the criteria confirm the optimal lag length for the VAR model to be equal to one. We determine the lag length for the exogenous variable through the Wald test on system OLS estimates. Table D4 in Appendix D confirms the optimal lag order for the exogenous variables is also equal to one. Thus, we estimate a VAR model with the optimal lag length of endogenous and exogenous variables equals one.

Figure 6.2 reports the impulse response function for the one standard deviation shocks in financial and fiscal stress on the current and future values of the financial and fiscal stress.

Figure 6.2 Dynamic Own and Cross effects of Stress Indices in BRICS

This figure draws the impulse response functions to one-standard deviation shocks in financial and fiscal stress for BRICS. The dotted lines plot a 95 percent confidence interval while the black complete lines indicate the impulse response functions.

Response of Cholesky One S.D Innovations ± 2 S.E.



Note: The VAR model is estimated with one lag and constant terms.

Panel 6.2 (a) indicates the response of financial stress to the one standard deviation innovation in financial stress itself. The impulse response is positive and statistically significant instantaneously for the first year before it declines for the next two years and then fades away by the end of the third year. We find that the dynamic response of financial stress to its past shocks is short-lived. On the other hand, the response of fiscal stress to innovations in financial stress does not appear in the first period. The response is somewhat present and it is negative, though still insignificant with one-period lag. However, the responses are insignificant throughout the analysis. This shows financial stress has a very short-lived and insignificant impact on fiscal stress. Thus, it is apparent from the first two panels that the financial crisis raises the systemic risk in the BRICS countries without causing serious concerns for fiscal sustainability.

Panel c of the figure shows the impulse response function of the fiscal stress index to its shock. Fiscal stress increases immediately in the first period after its shock. This is attributed to the higher need for public borrowing instantaneously after the period of fiscal crisis. This finding is consistent with the inertia effect that persists for merely I period. The graph shows that the impact is statistically significant and lasts until the 10^{th} period. Thus, any disturbances in the real economy carry long-term fiscal costs as compared to costs involved with financial crises (that lasted for 2 years). Next, panel 6.2(d) shows the dynamic response of financial stress to the one standard deviation shock in fiscal stress. Higher fiscal stress tends to raise the likelihood of financial stress in the future. This happens when government debt enters into the balance sheets of the banking sector as the government opts for the bank bailouts to rescue the sovereign defaults. The size of the impulse response is highest at two years lag but it is still insignificant. The significant impulse response

is observed with lags of three and four years. Thus, we conclude that fiscal stress feedback into financial stress through sovereign-bank relationship. Our finding confirms the theoretical viewpoints presented in notions documented by Acharya et al. (2014). However, the bank to sovereign feedback loop is not observed as shown in panel b.

Further Table 6.2 reports the decomposition of variances of FisSI and FinSI for BRICS. Most of the variation in FisSI is explained by FisSI itself, suggesting that higher shocks in fiscal stress in BRICS explain the overall variations in fiscal stress the most, with the contribution of shocks in financial stress being negligible. Similarly, financial stress contributes the most in explaining variation in financial stress but as we move far in time the variations in fiscal stress also play an important role in explaining variability in financial stress. Thus, we find that both the fiscal stress and financial stress contribute to explaining variation in financial stress.

Table 6.2 Variance Decomposition of FinSI and FisSI: Case of BRICS

Variance Decomposition of FisSI			Variance Decomposition of FinSI		
Periods	FisSI	FinSI	Periods	FisSI	FinSI
1	100.0000	0.000000	1	0.423243	99.57676
2	95.52642	4.473582	2	2.536821	97.46318
3	96.47707	3.522929	3	4.639977	95.36002
4	97.06342	2.936582	4	6.529828	93.47017
5	97.44450	2.555498	5	8.149260	91.85074
6	97.70808	2.291922	6	9.540654	90.45935
7	97.90026	2.099745	7	10.74047	89.25953
8	98.04568	1.954320	8	11.77906	88.22094
9	98.15885	1.841154	9	12.68092	87.31908
10	98.24884	1.751161	10	13.46615	86.53385
Note: Cholesky ordering is FisSI FinSI					

6.2.2 Interconnection between FinSI and FisSI in Other Emerging Countries

We identify the lag order in VAR through various model selection criteria. Table D2 in Appendix D confirms the optimal order for endogenous variables is 1. Furthermore, we apply the Wald test on system OLS to confirm lag length for exogenous variables. Table D4 in Appendix D indicates that lags are not significant. Finally, we estimate the unrestricted VAR model with 1 lag of endogenous variables and no lags for exogenous variables. The dynamic impacts of shocks in financial and fiscal stress for other emerging countries are visualized in Figure 6.3.

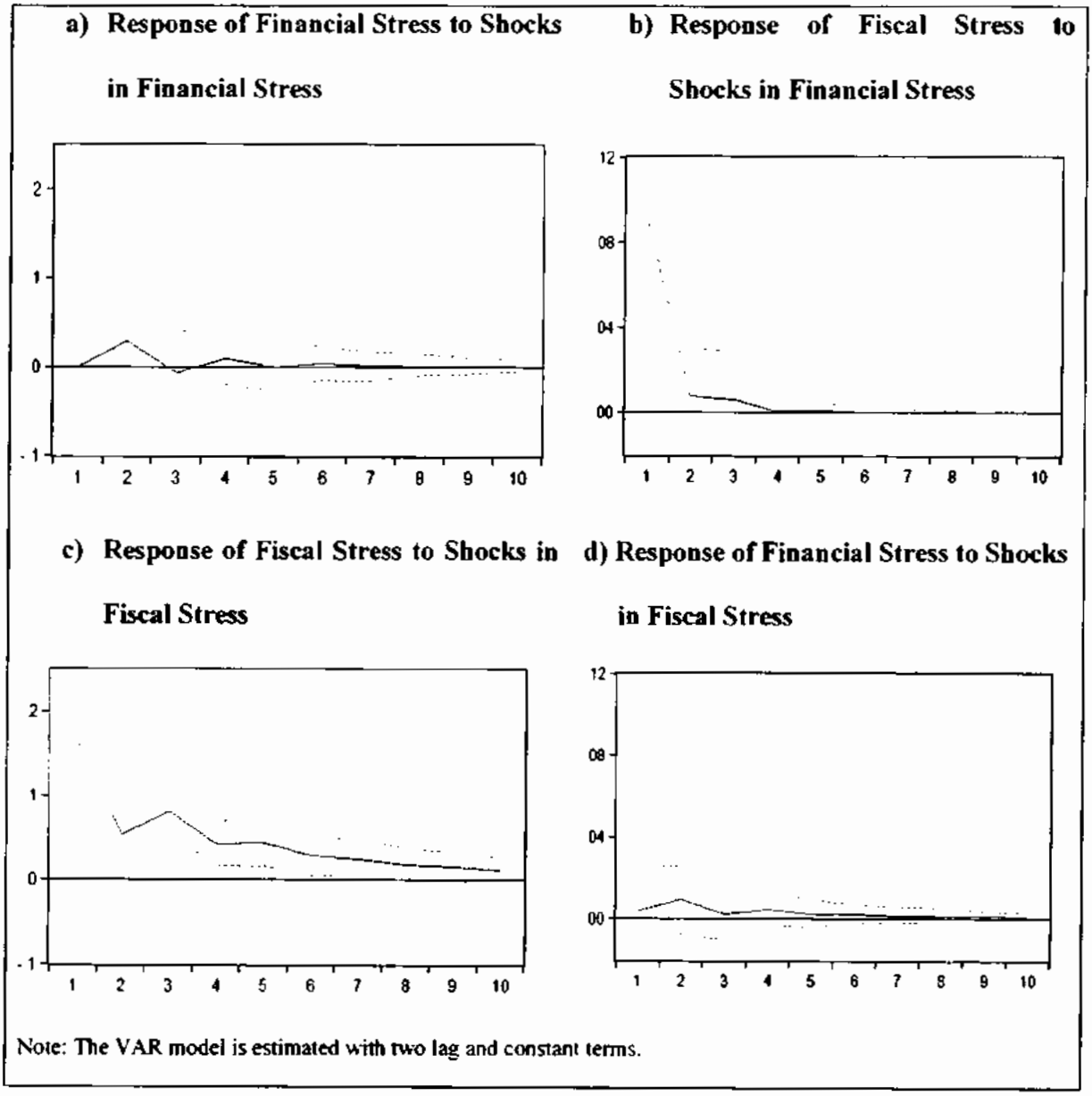
Panel a shows the response of financial stress to its own one standard deviation shock. We find some increase in financial stress with two years lag, which is short-lived, and equilibrium is retained in the 5th period. The weak response is attributed to strong macroeconomic fundamentals and low deficits in this block of countries. The next panel of the figure shows the impulse response of fiscal stress to one standard deviation innovation to financial stress.

A stimulus in financial stress raises fiscal stress instantaneously in the first period but the trend is halted thereafter and equilibrium is re-attained after the lag of four years. Thus a financial shock is coped with immediate government support. Strong macroeconomic fundamentals enabled them to respond promptly to financial disturbances. The third and fourth panels trace out the response of financial and fiscal stress to one standard deviation shock in fiscal stress. A fiscal shock tends to raise fiscal stress in OE countries. This also lowers the government's income and revenues and elevates fiscal stress with the accumulation of a stock of debt. It takes the economy almost 10 years to regain fiscal sustainability.

Figure 6.3 Dynamic Own and Cross Effects of Stress Indices in OE Countries

This figure draws the impulse response functions to one-standard deviation shocks in financial and fiscal stress for Other Emerging (OE) countries. The dotted lines plot a 95 percent confidence interval while the black complete lines indicate the impulse response functions.

Response of Cholesky One S.D Innovations ± 2 S.E.



Note: The VAR model is estimated with two lag and constant terms.

The last panel displays the response of financial stress to innovations in fiscal stress. The impulse response is positive but statistically insignificant. This positive response prevails for up to 5 years. As compared to BRICS, the responses of

financial and fiscal stress to financial stress are short-lived as the financial stress surface out in these high growth economies. On the other hand, just like BRICS countries, fiscal stress imposed huge long-run costs in the shape of frequent debt restructuring. A stimulus in financial stress raises fiscal stress instantaneously in the first period but the trend is halted thereafter and equilibrium is re-attained after the lag of four years. Thus a financial shock is coped with immediate government support. Strong macroeconomic fundamentals enabled them to respond promptly to financial disturbances.

From panel (b) and (d) we conclude that although the adverse feedback loop is long-lasting from financial to fiscal stress whereas the feedbacks from fiscal to financial stress is not statistically significant. The variance decomposition analysis in Table 6.3 confirms that financial and fiscal stress shocks explain most of the variations in themselves. We lack support for the impact of the fiscal shock on financial stress and vice versa.

Table 6.3 Variance Decomposition of FinSI and FisSI: Case of OE Countries

Variance Decomposition of FisSI			Variance Decomposition of FinSI		
Periods	FisSI	FinSI	Periods	FisSI	FinSI
1	100 0000	0 000000	1	0 171218	99 82878
2	99 06816	0.931842	2	3.001611	96 99839
3	99 02976	0.970243	3	2.539195	97 46080
4	98 81847	1.181531	4	2.689867	97 31013
5	98 77663	1 223365	5	2 578248	97 42175
6	98 72107	1 278926	6	2 572770	97 42723
7	98 70058	1 299417	7	2.543653	97 45635
8	98 68354	1.316463	8	2.535646	97 46435
9	98 67528	1.324723	9	2 527128	97 47287
10	98 66959	1 330406	10	2 523484	97 47652
Note: Cholesky ordering is FisSI FinSI					

6.2.3 Interconnection between FinSI and FisSI in G5

A VAR model is identified through various model selection criteria. Table D3 in Appendix D confirms the optimal order for endogenous variables is 1. Furthermore, we apply the Wald test on system OLS to confirm lag length for exogenous variables is 1 as shown in Table D4 in Appendix D. We record the dynamic response of the financial stress to its own shocks in Figure 6.4 (a). The impulse response function demonstrates a positive response in the first period, which slowly falls in the subsequent periods. An interesting feature of the response is that before vanishing out completely at the lag of five years, it resurfaced slightly at the lag of three years. This behavior is in stark contrast to the response for BRICS countries where the impact declines smoothly. Panel b shows the behavior of fiscal stress in response to one standard deviation innovation in financial stress. The response throughout is negative and insignificant and it gets even closed to zero as lag length increases.

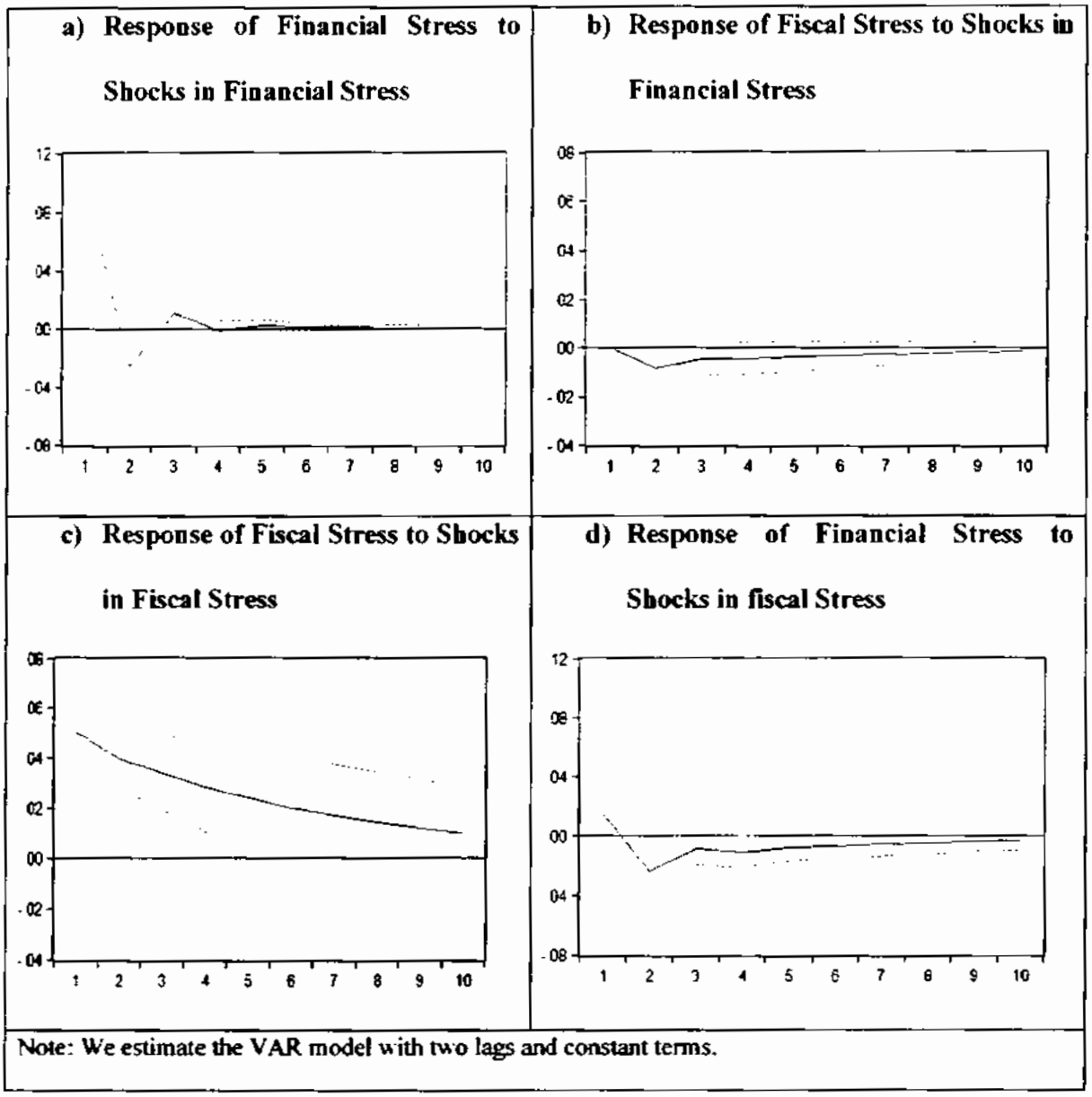
Panel (c) shows the dynamic response of fiscal stress to its own shock. The figure shows that the response of fiscal stress to fiscal innovation remains positive but continues to decline. The impact remained significant until the lag five. It becomes statistically insignificant at the lag of six years and onwards. This finding confirms the existence of the inertia effect. Finally, the last panel draws the impulse response function for financial stress to fiscal shocks. A positive shock in fiscal stress leads to higher financial stress immediately after the shock. However, once again the impact becomes negative and statistically insignificant at lag two before it dies down completely. However, a fair degree of variation in financial stress is explained by fiscal stress as we accumulate responses to higher lag lengths. This

confirms the interconnection through the feedback loop from fiscal to financial stress.

Figure 6.4 Dynamic Own and Cross Effects of Stress Indices in G5

This figure draws the impulse response functions to one-standard deviation shocks in financial and fiscal stress for five developed (G5) countries. The dotted lines plot a 95 percent confidence interval while the black complete lines indicate the impulse response functions.

Response of Cholesky One S.D Innovations ± 2 S.E.



Note: We estimate the VAR model with two lags and constant terms.

Next. the other method to interpret the VAR model is variance decomposition. as reported in Table 6.4. Once again financial and fiscal stress indices explain their

own variations the most. However, a fair degree of variation in financial stress is explained by fiscal stress as we accumulate responses to higher lag lengths. This confirms the interconnection through the feedback loop from fiscal to financial stress.

Table 6.4 Variance Decomposition of FinSI and FisSI: Case of G5

Variance Decomposition of FisSI			Variance Decomposition of FinSI		
Periods	FisSI	FinSI	Periods	FisSI	FinSI
1	100 0000	0 000000	1	2 115389	97 88461
2	98 23209	1 767907	2	7 291056	92 70894
3	98 23380	1 766197	3	7 920657	92 07934
4	98 11920	1 880800	4	8 950250	91 04975
5	98 08422	1 915777	5	9 507029	90 49297
6	98 05598	1 944017	6	9 935840	90 06416
7	98 03968	1 960315	7	10 22561	89 77439
8	98 02848	1 971519	8	10 43166	89 56834
9	98 02104	1 978959	9	10 57581	89 42419
10	98 01593	1 984075	10	10 67744	89 32256
Note: Cholesky ordering is FisSI FinSI					

The comparison of three blocks suggests the following observations. First, patterns of financial and fiscal stress are more pronounced in G5 as compared to BRICS and OE. Second, a fiscal shock carries a long-term and significant impact on fiscal stress and a delayed response in the shape of a high level of financial stress. Thus we find support for feedback of fiscal shocks into the financial stress for both BRICS and G5 regions. Third, financial and fiscal stresses are a self-explanatory phenomenon where financial and fiscal shocks influence systemic risk and fiscal sustainability, without any spillover impacts of financial (real) shocks to the real (financial) side of the economy.

To conclude, the chapter provides some take away inferences. We find a strong feedback loop is present from bank to sovereign for the BRICS countries while the

reverse feedback is weak. Concerning other emerging economies, the adverse feedback loop from the financial to the real side of the economy appears to be stronger than BRICS. The reverse feedback is missing for these economies. The analysis further reveal the absence of feedback loop from financial to real side of the economy for developed countries.

Chapter 7

Conclusion and Policy Recommendations

This chapter is divided into two sub-sections. Section 7.1 documents the major findings of our analysis for measurement, determinants, and interconnection between financial and fiscal stress. Section 7.2 infers the policy implications based on our analysis.

7.1 Conclusion

Th present study is broadly classified into various dimensions. The first dimension is to extend the existing conceptual frameworks for measuring and determining financial and fiscal stress. The second dimension tries to provide empirical support to the extended theoretical models for emerging countries. The third broader theme is explored whether financial and fiscal stress is interconnected or not.

This study constructs monthly FinSIs for emerging and developed countries. These indices are useful tools to assess systemic risk. We take monthly data for the panels of emerging and developed economies. The study considers 7 indicators of FinSI that are grouped into three types of risks. We consider three types of risk, namely economic, financial, and political. We apply PCA to construct aggregate FinSI indices. Our findings suggest that besides financial and economic risk, political risk is a dominant factor in raising financial stress in emerging and middle-income countries. Most of the financial turmoils are associated with economic meltdowns and periods of high political risk. This study provides some striking results in the sphere of political economy. We show that the political economy

aspect of the financial crisis explains well the periods of high financial stress. We further infer that financial stress in developed countries mostly relates to economic and financial risks. Most of the stress in developed countries appears through financial linkages and excessive debt.

Earlier studies focused on the transmission of stress from emerging to developed countries or within emerging middle-income countries (Balakrishnan et al., 2011; Park & Mercado, 2014). We find evidence that stress transmission is a bi-directional phenomenon whereby a crisis in one group of countries easily transmits to the other group. Thus, the origin of the crisis is not important in the spillover of shocks, rather domestic vulnerabilities and the degree of financial globalization plays a significant role. Our regional analysis suggests that FinSI in all the regions is driven by global as well as regional factors.

We further built fiscal stress indices for emerging and developed countries for the periods 2000-2016. We develop country-specific, regional, and overall FisSIs for both developed and emerging middle-income countries. Our study considers fiscal and political risks to build a composite measure of rollover risk. We apply PCA to construct aggregate, regional, and country-specific indices from the normalized components of fiscal stress. The findings suggest that FisSIs explain well the state of fiscal distress in emerging and developed economies. Our findings further confirm that political risk contributes to fiscal stress, particularly for emerging middle-income countries as political risk changes the perception of the investors and serves as a yardstick for the credibility of the government.

Regional analysis suggests that the European region for both emerging and developed samples explains the fiscal stress in the post-global financial crises period, whereas the emerging Latin American region explains fiscal stress in the

early 2000s. Our findings highlight that global events exert more pressure on the developed countries characterized by a long history of fiscal deficits and high debt. Short term debt and gross financing need help to explain fiscal stress in developed countries besides population aging-related pressures whereas cyclically adjusted balance and political risk trigger fiscal stress in emerging countries.

Next, this study analyzes the potential determinants of financial stress for a panel of emerging and middle-income countries. Our inquiry is inspired by fourth-generation models of crises which postulate that financial institutions are important drivers of financial and fiscal stress. We are also interested to see if there is any conditional role of country characteristics of the emerging middle-income countries in the transmission of financial stress from developed to emerging middle-income countries. We utilize a broader set of potential determinants of financial stress, such as domestic vulnerabilities, external factors, emerging middle-income countries, the effectiveness of political institutions, regional financial contagion. The sample consists of 18 emerging middle-income countries is selected for the period 2000-2016, which comprises 306 annual observations. This study applies various estimation methodologies to explore the potential determinants of financial and fiscal stress. The purpose of applying various techniques is to see whether our findings are sensitive to the method of estimation or not.

As far as potential determinants of financial stress are concerned, our results show that the effectiveness of political institutions is a highly significant determinant of financial stress across all the models and all the estimation methodologies. This shows that well-functioning political institutions lower the financial stress in emerging countries. We find very little support for the co-movement of financial stress from developed to emerging middle-income countries.

This finding is a stark contrast from previous studies of IMF (2009a); Balakrishnan et al. (2011); and Park and Mercado (2014). This result may be justified on grounds that financial stress in emerging is largely driven by political uncertainty and external factors. Similarly, most of the models acknowledge the increasing role of external factors in explaining financial stress in emerging middle-income countries. Particularly, changes in global commodity prices and the global output are highly significant in all the static models. However, in dynamic models, only changes in commodity prices play a vital role in explaining financial stress in emerging middle-income countries.

The present study provides evidence as to how country characteristics help to transmit stress from developed to emerging middle-income countries. We estimate six conditional models using five different estimation methodologies. In almost all the models fall in real output and fiscal imbalances have a significant impact on the spillover of financial crises. Thus, we conclude the vulnerabilities in the real economy are significant in stress transmission rather than trade and financial linkages. We further conclude that trade and financial linkages affect financial stress directly, but indirect effects are not significant. Thus, real vulnerabilities, global factors, and institutional effectiveness are important in explaining financial stress in emerging middle-income countries.

Moreover, this study explores the potential factors driving fiscal stress for a panel of emerging and middle-income countries. We utilize a broader set of potential determinants of financial stress, such as political risk, crisis spillovers, macroeconomic imbalances, fiscal fundamentals, and non-fiscal factors. The present study selects a sample of 17 emerging middle-income countries for the period 2000-2016. This study is unique in terms of considering political risk and non-contractual

contingent liabilities for the determination of fiscal stress. We investigate the determinants of fiscal stress by applying a host of panel data estimation methods to do sensitivity analysis. We use an econometric procedure involving estimation of general and specific models twice, once with all observations and then after removing the outliers. The outlier observations are detected through Hampel Identifiers.

The major findings for the above section of this study as under: First, we find that the fiscal fundamentals are important to fiscal stress. This is in line with Baldacci et al. (2011a). Second, lower debt sustainability measured through an increase in IRGD raises fiscal stress. Third, political risk plays an important role in determining fiscal stress. A high level of political risk puts upward pressure on rollover risk in emerging middle-income countries. Lastly, non-contractual contingent liabilities are an important source of fiscal stress.

Finally, we examine the dynamic inter-linkages between the real and financial side of the economy within various country blocks. We consider three blocks, namely BRICS, Other emerging countries, and a group of 5 developed countries. The analysis covers the annual observations from 2000-2016. We exploit the unrestricted panel VAR model to explore how shocks on the financial side create the responses on the real side of the economy and vice versa. Based on our analysis we draw the following inferences. First, we confirm the existence of a feedback loop from bank to sovereign in the case of BRICS countries if crises stem from financial markets. However, the adverse feedback loop is weakly established if a shock, at first instance, appears in the real economy. Second, the adverse feedback loop from the financial to the real side of the economy is much more pronounced in the other emerging countries as compared to BRICS. This may reflect high growth in the

other emerging countries is financed through high debt. However, the feedback loop from real to the financial side is not observed as these economies experienced higher growth and a decline in the fiscal deficit. Third, the feedback loop from financial to fiscal stress does not exist for G5 countries as financial and fiscal stresses are a self-explanatory phenomenon for these economies.

7.2 Policy Recommendations

Based on our analysis for measuring financial stress, we may derive the following policy guidelines. First, financial globalization carries some unforeseen risks such as financial contagion and capital flights in periods of financial stress. Thus, the extent of financial globalization may be monitored more closely. Second, structural vulnerabilities in real and financial sectors, such as trade and fiscal deficits, a high debt-to-GDP ratio, and a high inflation rate, serve as trigger factors for the transmission of crisis. Countries may focus on reducing such vulnerabilities to enhance their resilience to adverse shocks and to safeguard financial stability. Third, domestic and global policy coordination may be supplemented with regional coordination in policies and regulatory frameworks in managing, mitigating, and predicting risks. This may help to monitor the regional disruptions more closely. Furthermore, coordinated fiscal policies may provide policy options to the government in mitigating risks of financial instability. Fourth, macro-prudent regulatory frameworks should account for political risks in the assessment of systemic risk. The clash of interests between political leaders and policymakers may be minimized, if not completely resolved.

Developing fiscal stress may infer the following policy recommendations. First, fiscal policy should be countercyclical to ensure its stabilizing role during a recession and financial crisis. This countercyclical policy should be combined with

the accumulation of fiscal buffers that help to eradicate or minimize the risk of contagion and adverse bank-sovereign loops. Second, European developed countries triggered fiscal stress and sustainability concerns in the developed countries as their integration was incomplete. To better cope with future crises and economic downturns EU may adopt such fiscal sustainability framework and design policies that impose some kind of fiscal discipline for the member states. This can help to restrict the contagion of crisis amongst EU member states as well as the rest of the world through trade and financial linkages. Third, easy lending conditions led to the private credit boom in emerging middle-income countries. Well designed and fiscal policy should provide some mechanisms that can manage private sector leverage in emerging middle-income countries. For example, subsidizing the creditors to provide loans with longer maturities can help to lower leverage in the private sector.

Based on the factor driving financial stress in emerging middle-income countries, we extract the following policy implications. First, emerging middle-income countries should design policies that strengthen the institutional setup of these economies. Better quality of institutions may discourage the spread and intensity of financial stress. Second, coordinated policy responses may help emerging middle-income countries to lower down financial stress through external factors. Third, policies should focus on curbing fiscal imbalances and recessionary trends in the emerging middle-income countries as this can safeguard them from stress transmission.

Empirical assessment for determinants of fiscal stress may recommend the following policy implications. First, fiscal sustainability is closely related to public debt sustainability. Public debt may be curtailed to ensure fiscal sustainability, with special focus to reduce external borrowing that is subject to exchange rate risks.

Second, fiscal vulnerabilities contribute significantly to building fiscal stress. Fiscal discipline may help emerging middle-income economies to lower rollover risks. In this regard adoption of fiscal rules may have far-reaching implications. Third. in the era of financial globalization. financial crises spread very quickly and this puts a burden on local governments in terms of costly fiscal adjustments. Emerging countries lack a central authority that can ensure fiscal discipline and fiscal sustainability. The coordinated fiscal policy may have far-reaching implications.

Based on the findings for the interconnection between financial and fiscal stress. we propose the following policy guidelines. First. building enough fiscal buffers can help the governments to avoid banks to sovereign feedback loops. Second. fiscal deficits and debt may be managed in such a way that fiscal sustainability is retained.

In the context of Pakistan economy. the study pinpoints that the fundamental problem of unsustainable debt may be checked to restre fiscal sustainability. Beside that the independence of entral bank may be enhanced to ensure conduct of such monetary policy that safeguards financial stability besides price stabilization. The political uncertainty may be reduced. if not eliminated. to avoid systemic risk and build the credibility of the governmnets regaring fiscal sustainability. There is need to bridge a gap between the process of policy-making and their succuessful implementation which reuires political support and will.

Future Directions

The present study can be further extended in several directions. First. analysis can be further refined by exploring a better measurement of political risks (Waszkiewicz. 2017). Second. newly constructed financial stress indices can be used to explore the interdependencies between monetary policy and financial stress in the context of emerging and developed countries. Third. the conditional role for the

quality of institutions in the transmission of financial stress across various country groups is yet to be explored.

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Appendix A: Measurement of Financial and Fiscal Stress

Table A1: List of Countries

Emerging and Middle-Income Countries	**Developed Countries**
Argentina	Austria
Brazil	Belgium
China	Canada
Colombia	Czech Republic
India	Denmark
Indonesia	France
Malaysia	Germany
Mexico	Greece
Morocco	Ireland
Pakistan	Italy
Peru	Luxembourg
Philippines	Netherlands
Russian Federation	Norway.
South Africa	Portugal
Thailand	Singapore
Turkey	Spain
Venezuela	Sweden
	UK
	USA

TableA2: Components of Financial Stress

Type of risk	Components	Description and Measurement	Data Source
Financial risk	Stock market risk	An abrupt decline in the overall stock index indicates a crisis in the stock market and a high degree of stress in the securities market. Volatility of stock returns is measured through the GARCH model (Bollerslev, Chou, & Kroner, 1992).	*Thomson Reuters' DataStream*
	The riskiness of the banking sector	A fragile banking sector is an igniting factor for the financial crisis (Turner, 2007). The Capital Asset Pricing Model for banking sector is estimated.	*Thomson Reuters' Datastream, IFS,IMF and OECD database*
	Currency risk	Depreciation in ER and/or falling reserves generates currency crises. We build an EMPI introduced by Girton and Roper (1977) and empirically used by Eichengreen, Rose, and Wyplosz (1996) and Burnside, Eichenbaum, and Rebelo (2004).	IFS, IMF
	Sovereign risk	Credit risk refers to the risk of losses generated by the failure of the counterparty to meet contractual obligations It is measured by yield differential between long run (10 years) local bond (risky asset) and long term US Treasuries (risk-free asset).	*Thomson Reuters' Datastream, IFS,IMF and Fed Reserve Bank*

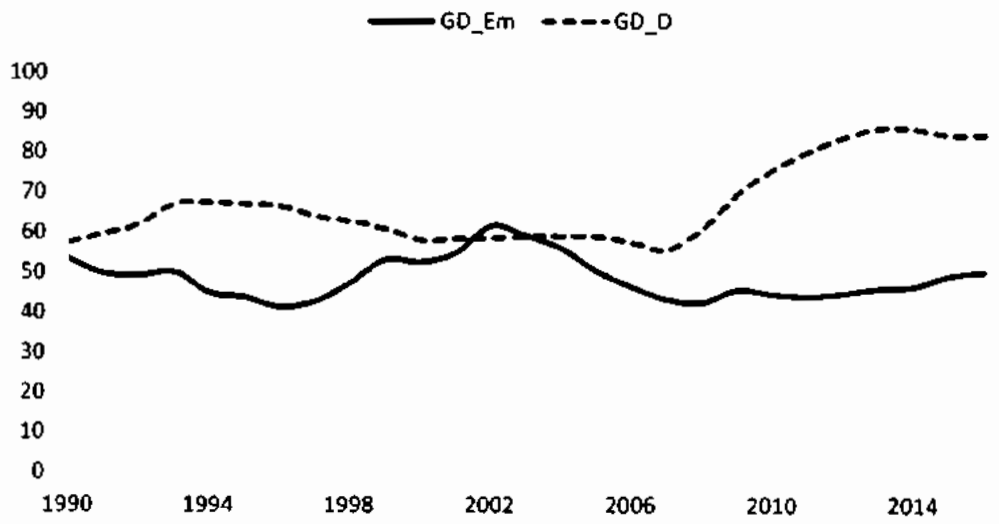
	Table A2: Components of Financial Stress		Continued…
	Credit stress	Credit risk is measured through growth rate of claims in the private sector (Cevik et al., 2013a).	*IFS, IMF*
Economic risk	*Output gap*	A positive output gap shows an overheated real economy that generates credit boom that turns into bust and raises financial instability. We estimate the output gap through the quadratic trend method.	*Global Economic Monitor, WB*
Political risk	*Political risk index*	Political risk refers to "a political decisions' influence on the economy, which can be stabilizing or destabilizing for the free market" (Titman et al., 2011). We construct a political risk index through PCA that takes account of 12 quantitative attributes as indicated in *ICRG* methodology.	ICRG, PRS Group

Table A3: Components of Fiscal Stress

Components	Description	Source
Basic Fiscal Variables		
Interest rate on general government debt, deflated by the GDP deflator, minus real GDP growth rate (r-g)	An indicator of solvency, 5 years forward moving average	WEO, IMF
General government gross/net debt as a percent of GDP	It reflects the debt burden of the economy. It	WEO, IMF
Cyclically adjusted primary balances expressed as a percentage of potential GDP	corrects overall balance to cyclical factors	FM; WEO
Long-term Fiscal Trends	It shows the average number of children per	UN Database
Total fertility Rate	women	UN Database
Old-Age Dependency Ratio	Population over 65 divided by adults. It is an indication of population aging momentum	UN World Population Prospects
Population Aging	It reflects the population burden.	Data

Table A3: Components of Fiscal Stress		Continued...
Components	Description	Source
Assets and Liabilities Management		
Current Gross Financing Needs as a percent of GDP	General government overall debt plus general government debt with a maturity of less than 1 year. It indicates vulnerability to rollover risk	WEO and Vulnerability Exercises for Emerging (VEE), IMF
Share of Short Term Debt as Ratio of Total Debt	It indicates vulnerability to rollover risk	Euromonitor International, Quarterly Public Debt Statistics, WDI
Debt held by Non-Residents as Ratio of Total Debt	It indicates the global market risk	Joint External Debt Hub
Weighted Average Maturity of General Government Debt	It is an indicator of vulnerability changes in market sentiments	Bloomberg
Short term External Debt as Ratio of Total Reserves	It measures claims on foreign resources to meet the short-term cost of foreign debt servicing (Applied only to emerging middle-income countries)	WDI
Political Risk Index	The composite index that captures 12 socio-economic and political dimensions of risk	International Country Risk Guide, Political Risk Services Group

Table A4: Evolution of Gross Debt in Emerging and Developed Countries (1990-2016)



Note: Gross debt is taken as a ratio of GDP

Appendix B: Determinants of Financial Stress

Table B1 List of Countries

1. Argentina	7. India	13. Philippines
2. Brazil	8. Indonesia	14. Poland
3. Chile	9. Malaysia	15. Russia
4. China	10. Mexico	16. Thailand
5. Colombia	11. Pakistan	17. Turkey
6. Hungary	12. Peru	18. Venezuela

Table B2 List of Variables, Measurement, and Data Sources

Variables	Measurement	Source
Financial stress index for developed economies (consolidated)	The weighted average of financial stress index for developed economies by using PPP based GDP weights. Initially, FinSI for developed countries is built by employing PCA on 7 components.	Author's calculation
Financial stress index for emerging economies	The weighted average of financial stress index for emerging middle-income countries by using PPP based GDP weights. Initially, FinSI for emerging countries is built by employing PCA on 7 components.	Author's calculation
Growth in real GDP	Annual percentage change in Real GDP	World Development Indicators, WB
Current account balance as a percent of GDP	Ratio of the sum of exports and imports as a ratio of GDP	World Development Indicators, WB
General government overall balance as a percent of GDP	General government expenditures net of taxes as a percent of GDP	World Development Indicators, WB
Change in foreign exchange reserves	Growth in the level of foreign exchange reserves	International Financial Statistics, IMF
Global real interest rate	LIBOR (three months)	World Economic Outlook, IMF
Global GDP	Growth in world output	World Economic Outlook, IMF

Table B2 List of Variables, Measurement, and Data Sources		Continued...
Variables	**Measurement**	**Source**
Global commodity price index	Global Price Index of All Commodities Not Seasonally Adjusted	Federal Reserve Bank of St. Louis
Trade openness	Ratio of the sum of exports and imports to GDP	World Development Indicators. WB
Financial openness	The ratio of the sum of portfolio and foreign direct investment to GDP	World Development Indicators. WB
Global financial contagion	Financial stress index of developed countries	Author's calculations
Regional financial contagion	Regional Dummies for Asia. Latin America. and Europe	Author's calculations
Effectiveness of Political Institutions	Political risk index constructed for 12 components of political risk	Author's calculations based on ICRG. PRS

Table B3.1 Univariate Descriptive Statistics and Correlations

Descriptive Statistics

Variables	Observations	Mean	Median	SD	Minimum	Maximum
FinSIE	306	-0.1233	-0.3014	0.9715	-1.6128	5.3330
GRY	306	4.3739	4.7189	3.6768	-10.8945	18.2866
CA	306	0.6943	-0.3523	4.9720	-9.2043	17.4881
GB	306	-2.7562	-2.5356	3.7425	-17.5817	7.9133
DRES	306	9.5690	8.0817	19.1474	-58.1684	80.8214
TO	306	67.1725	50.8070	42.2633	21.8524	220.4073
FO	306	-1.7527	-1.6923	2.6567	-9.0842	13.7723
GYG	288	3.4938	3.7162	1.3777	-0.3456	5.1948
GCPG	288	0.7311	5.1622	21.9292	-54.5054	21.7540
GGIR	288	-86.5128	-10.6131	269.5712	-1100	66.0000
PRI	306	63.9226	63.3125	9.3046	44	83.5833
DUMAS	306	0.3889	0	0.4883	0	1
DUMLA	306	0.3889	0	0.4883	0	1
FinSIA	306	0.1484	-0.1304	0.6745	-0.8257	1.3513

Correlations

	FinSIE	GRY	CA	GB	DRES	TO	FO	PRI	GGIR	GCPG	GYG	DLA	DAS	FinSIA
FinSIE	1.0000													
GRY	-0 3072	1 0000												
CA	0.1228	0.1004	1.0000											
GB	-0 3737	0 3068	0 2568	1 0000										
DRES	-0.1865	0.3070	0.1736	0.2534	1 0000									
TO	-0 4153	-0.0300	0.3432	0 0427	-0 0424	1.0000								
FO	0.1377	-0.1890	0.4239	0.0087	-0 2203	0.2234	1.0000							
PRI	**-0.7413**	0.0203	-0.0411	0 2054	0.0884	0.4855	-0 0263	1.0000						
GGIR	-0 0623	0.3494	-0 0417	0.1271	-0.0331	0.0276	-0.0769	-0.0182	1 0000					
GCPG	-0 1115	0.3937	0.0552	0.2363	0 2570	0 0546	-0.0999	0 1066	0 4574	1 0000				
GYG	-0 1696	0 5004	0.0440	0.2278	0 1961	0.0492	-0.1296	0.0565	0 7752	0.6160	1.0000			
DLA	0 1279	-0 2129	-0.1235	0.0752	-0.0906	-0.4060	-0.1689	0.0030	-0 0000	0.0000	0.0000	1.0000		
DAS	-0 0667	0 3071	0 2841	-0 0454	0 0871	0 2385	0 1088	-0 2440	-0 0000	0.0000	-0 000	-0 6364	1 0000	
FinSIA	-0 1374	0.1574	0 1267	0 2285	0 2702	0.0502	-0.0405	0.1246	-0 2432	0 3015	0 1224	0.0000	0 0000	1.0000

Table B3.2 Details of Excluded Outlier Observations

Table 5.1	
Model (2)	Argentina 2002. 2015. 2016: Turkey 2001. 2002. 2006: Venezuela 2001-2004
Model (4)	Argentina 2002. 2015. 2016: Thailand 2005: Turkey 2001. 2002. 2006; Venezuela 2001-2004
Table 5.2	
Model (2)	Argentina 2002. 2009. 2015: Brazil 2008: Chile 2009: Malaysia 2009: Philippines 2016: Russia 2008: Turkey 2001-2008. 2010. 2011. 2013-2016: Venezuela 2001-2005. 2007, 2009-2013. 2015. 2016
Model (4)	Argentina 2001. 2009. 2015-2016; Brazil 2008: Chile 2009; Indonesia 2008; Malaysia 2009; Philippines 2007. 08. 2016: Russia 2008: Turkey 2001-2008. 2010. 2011. 2013-2016: Venezuela 2001-2007. 2009-2013. 2015. 2016
Model (6)	Argentina 2002. Brazil 2008. 2015: Chile 2015: China 2008. 2015: Colombia 2015: Hungary 2015: Indonesia 2008. 2015: Mexico 2015: Pakistan 2015, Peru 2015. Philippines 2008. 2015. Poland 2015. Russia 2008, 2015; Thailand 2015; Turkey 2001.2002, 2008 : Venezuela 2001. 2002
Model (8)	Argentina 2001. 2002: Brazil 2009: China 2009: Hungary 2009: Indonesia 2009: Mexico 2009: Philippines 2008. 2009: Poland 2009: Russia 2008: Thailand 2009: Turkey 2001. 2002. 2008. 2009:

	Venezuela 2001-2003, 2009
Table 5.3	
Model (2)	Argentina 2003; Malaysia 2002. 2004. 2007; Pakistan 2003. 2013; Russia 2001,2005, 2009, 2010, 2012. 2013. 2015. 2016; Turkey 2001; Venezuela 2001, 2002. 2004. 2012
Model (4)	Argentina 2001-2003. 2015; Brazil 2008; China 2007. 2008; Pakistan 2003, 2005-2008; Poland 2008; Russia 2008; Turkey 2001. 2003. 2006. 2008, 2013; Venezuela 2001. 2002. 2004. 2005. 2012. 2013. 2016
Model (6)	Argentina 2003; Turkey 2001. 2013; Venezuela 2001. 2002.2012
Model (8)	Argentina 2002; Turkey 2001; Venezuela 2002. 2004
Table 5.4	
Model (2)	Argentina 2002, 2015; Turkey 2001-2004. Venezuela 2001-2004. 2011-2013, 2015, 2016
Model (4)	Argentina 2001, 2002. 2015. 2016; Colombia 2009; Russia 2007; Thailand 2016; Turkey 2001-2003; Venezuela 2001-2003. 2010. 2013. 2015, 2016
Model (6)	Argentina 2001, 2002. 2015. 2016; Turkey 2001, 2002; Venezuela 2001-2004, 2010
Model (8)	Argentina 2002. 2015. 2016; Colombia 2009; Turkey 2001-2003; Venezuela 2001-2004. 2010
Model (10)	Argentina 2001, 2002. 2015. 2016; Colombia 2009; Turkey 2001-2003; Venezuela 2001-2004. 2010. 2011. 2013. 2015. 2016

Model (12)	Argentina 2001, 2002, 2015, 2016; Turkey 2001-2003; Venezuela 2001-2004, 2010-2013, 2015, 2016
Table 5.5	
Model (2)	Argentina 2002; Turkey 2001-2003, Venezuela 2001-2005, 2007, 2009-2013, 2015, 2016
Model (4)	Argentina 2001, 2002, 2015, 2016; Turkey 2001-2003, 2008, Venezuela 2001-2005, 2007, 2009-2016
Model (6)	Argentina 2001, 2002, 2014-2016; Brazil 2008; Philippines 2007, 2016; Russia 2001, 2008, 2014, 2015; Turkey 2001-2004, 2006-2008, 2015; Venezuela 2001-2016
Model (8)	Argentina 2002, 2015, 2016; Turkey 2001-2003, 2008; Venezuela 2001-2007, 2009-2016
Model (10)	Argentina 2001, 2002, 2015, 2016; Philippines 2016; Turkey 2001-2003, 2008; Venezuela 2001-2007, 2009-2016
Model (12)	Argentina 2002, 2015, 2016; Turkey 2001-2003, 2008; Venezuela 2001-2005, 2007, 2009-2016
Table 5.6	
Model (2)	Argentina 2002; Turkey 2000-2003; Venezuela 2001, 2002, 2004
Model (4)	Argentina 2001, 2002; Turkey 2000-2002; Venezuela 2001-2003
Model (6)	Argentina 2001, 2002, 2016; China 2008; Colombia 2007; Philippines 2009; Russia 2000, 2008; Turkey 2000-2002, 2008; Venezuela 2000-2005, 2009
Model (8)	Argentina 2001, 2002, 2016; China 2008; Colombia 2007; Philippines

	2009; Turkey 2000-2003; Venezuela 2000-2004, 2010-2013, 2016
Model (10)	Argentina 2002; Turkey 2000-2002; Venezuela 2001-2003
Model (12)	Argentina 2001, 2002, 2015, 2016; China 2008; Colombia 2007; Philippines 2009; Turkey 2000-2003, 2008; Venezuela 2000-2003, 2009-2011, 2013, 2016
Table 5.7	
Model (2)	Argentina 2002; Turkey 2001; Venezuela 2002
Model (4)	Argentina 2001-2003, 2015; Russia 2008; Turkey 2001; Venezuela 2001, 2002, 2010
Model (6)	Argentina 2002; Turkey 2001
Model (8)	Argentina 2002, 2003, 2016; Pakistan 2013; Turkey 2001; Venezuela 2002, 2003
Model (10)	Hungary 2005-2009; Malaysia 2005-2009; Thailand 2005, 2006
Model (12)	Argentina 2002, 2016; Malaysia 2008; Turkey 2001; Venezuela 2001, 2002
Table 5.8	
Model 2	Turkey 2001; Venezuela 2004, 2009, 2015
Model (4)	Argentina 2002; Turkey 2001; Venezuela 2002
Model (6)	Turkey 2001
Model (8)	Argentina 2002; Turkey 2001, 2002; Venezuela 2001-2004, 2010-16
Model (10)	Argentina 2001, 2002, 2015; Turkey 2001; Venezuela 2001, 2002
Model (12)	Argentina 2001-2003, 2015,2016; Turkey 2001; Venezuela 2001, 2002

Appendix C: Determinants of Fiscal stress

Table C1 List of Countries

1. Argentina	10. Mexico
2. Brazil	11. Pakistan
3. Chile	12. Peru
4. China	13. Philippines
5. Colombia	14. Poland
6. Hungary	15. Russia
7. India	16. Thailand
8. Indonesia	17. Turkey
9. Malaysia	18. Venezuela

Table C2 List of Variables, Measurement, and Data Sources

Variables	Measurement	Source
Fiscal stress index for emerging middle-income countries	The weighted average index of fiscal stress for emerging middle-income countries based on GDP PPP weights	Author's calculations
Financial Stress Index for emerging middle-income countries	The weighted average index of fiscal stress for emerging middle-income countries based on GDP PPP weights	Author's calculations
Output gap	Percentage deviation of real GDP from potential GDP	Author's estimates
Interest rate growth differential	The interest rate on general government Debt (deflated by the GDP deflator) minus real GDP growth rate	Author's calculations
Government debt as a percent of GDP	Gross general government debt as a percent of GDP	World Development Indicators, WB
General government overall balance as a percent of GDP	General government expenditures net of taxes plus interest payments	World Development Indicators, WB
Current account balance as a percent of GDP	Ratio of the sum of exports and imports as percent of GDP	World Development Indicators, WB

Table C2 List of Variables, Measurement, and Data Sources		Continued...
Variables	**Measurement**	**Source**
Foreign exchange reserves held by the central bank	Level of foreign exchange reserves in $. and SDRs including gold	World Development Indicators. WB
Domestic credit to the private sector as percent of GDP	Credit provided by the monetary authority. banks. and other corporations to the private sector	World Development Indicators. WB
Political Risk Index	Composite index through PCA	ICRG. PRS

Table C3 Univariate Descriptive Statistics and Correlations

Descriptive Statistics

Variables	Observations	Mean	Median	SD	Minimum	Maximum
FisSI	289	0.0184	0.0078	0.0228	0.0018	0.1157
FinSIE	289	0.0279	0.0111	0.0374	0.00173	0.1829
OG	289	3.5850	3.6923	0.4381	0.9590	4.2152
IRGD	289	4.6256	4.6178	0.1778	2.1249	5.2233
GOB	289	3.0843	3.1126	0.1922	2.0040	3.4899
CA	289	2.7157	2.6906	0.3041	1.6601	3.4809
RES	289	24.802	24.5772	1.3316	21.4591	28.992
DC	289	3.7001	3.5851	0.7511	2.1715	5.0760
GD	288	3.7677	3.7825	0.4464	2.0050	5.0246
PRI	289	4.1198	4.1418	0.1303	3.7842	4.3390

Correlations

	FisSI	PRI	FinSIE	OG	IRGD	GOB	CA	RES	DC	GD
FisSI	1.0000									
PRI	0.0717	1.0000								
FinSIE	0.9955	0.0671	1.0000							
OG	-0.2944	0.1663	-0.2940	1.0000						
IRDG	0.0585	0.1967	0.0342	0.1758	1.0000					
GOB	-0.0063	0.3126	0.0208	0.2415	0.2179	1.0000				
CA	0.1114	0.0658	0.1344	0.0494	-0.1227	0.1863	1.0000			
RES	0.7587	0.2224	0.7580	-0.4951	0.0705	0.1058	0.1353	1.0000		
DC	0.2737	0.3427	0.2872	-0.3829	0.0262	0.0553	0.0273	0.4264	1.0000	
GD	-0.0478	-0.0887	-0.0929	0.1386	0.1540	-0.3729	-0.0782	-0.2879	-0.2136	1.0000

Table C4 Details of Excluded Outlier Observations

Table 5.10	
Model (2)	Argentina 2001; Brazil 2001, 2003; China 2001,2002, 2007-2009, 2013, 2014, 2016; India 2001-2006, 2015, 2016; Indonesia 2015, South Africa 2002, Turkey 2013-2016; Venezuela 2012
Model (4)	Brazil 2001; China 2001,2002, 2007-2009, 2013, 2014, 2016; India 2001-2007, 2015, 2016; Indonesia 2015; Russia 2011, 2013; Turkey 2013-2016; Venezuela 2012
Table 5.11	
Model (2)	Argentina 2001; Brazil 2001, 2003, 2015, 2016; China 2001, 2002, 2008, 2014-2016; India 2011, 2004, 2007, 2016; Mexico 2001, 2013-2016; Russia 2013; Turkey 2001, 2002, 2014-2016
Model (4)	Argentina 2001; Brazil 2001, 2003, 2015, 2016; China 2001, 2002, 2008, 2014-2016; India 2001, 2004, 2007, 2016; Mexico 2013-201; Russia 2013; Turkey 2001, 2002, 2014-2016
Table 5.12	
Model (2)	Brazil 2015; China 2008, 2011, 2013; India 2002-2005,2009, 2015, 2016; Indonesia 2015; Malaysia 2007, 2008; Mexico 2015; Russia 2009, 2010, 2013, 2014; Turkey 2013, 2015
Model (4)	Brazil 2001; China 2003, 2008, 2013, 2016; India 2001-2006, 2009, 2015, 2016; Indonesia 2015; Mexico 2015; Russia 2009, 2010, 2013, 2014; Turkey 2009, 2012-2016

Table 5.13	
Model (2)	Brazil 2011; China 2001-2002, 2008, 2014-2016; India 2008, 2010-2012; Indonesia 2015; Russia 2001, 2002, 2005, 2009, 2014; Turkey 2009, 2012-2016
Model (4)	Brazil 2006, 2011-2013; China 2001, 2002, 2008, 2014-2016; India 2008, 2010-2012; Indonesia 2015; Mexico 2015; Russia 2001, 2005, 2009, 2014; Turkey 2009, 2012-2016

Appendix D: Interconnection between Financial and Fiscal Stress

Table D1 VAR Lag Order Selection Criteria for BRICS

Lag	LogL	LR	FPE	AIC	SC	HQ
0	74.30352	NA	0.000430	-2.076784	-1.657915	-1.912941
1	113.1312	67.30124*	0.000135	-3.237705	-2.679213*	-3.019248*
2	118.0114	8.133745	0.000131*	-3.267047*	-2.568932	-2.993976
3	119.5048	2.389461	0.000144	-3.183494	-2.345756	-2.855809
4	121.2458	2.669520	0.000156	-3.108194	-2.130833	-2.725894
5	123.4800	3.276798	0.000167	-3.049333	-1.932349	-2.612419

Optimal lag order by the selected criterion is shown by *

Table D2 VAR Lag Order Selection Criteria for Other Emerging Countries

Lag	LogL	LR	FPE	AIC	SC	HQ
0	61.43050	NA	0.000578	-1.781017	-1.501771	-1.671788
1	84.64521	41.78647	0.000305	-2.421507	-2.002638	-2.257664
2	93.06450	14.59343*	0.000264*	-2.568817*	-2.010325*	-2.350360*
3	97.05321	6.647849	0.000264	-2.568440	-1.870325	-2.295369
4	100.7422	5.902427	0.000268	-2.558074	-1.720336	-2.230389
5	104.6739	6.028514	0.000271	-2.555795	-1.578435	-2.173496

Optimal lag order by the selected criterion is shown by *.

Table D3 VAR Lag Order Selection Criteria for G5

Lag	LogL	LR	FPE	AIC	SC	HQ
0	85.91931	NA	0.000133	-3.246638	-2.934771	-3.128783
1	117.7518	55.70681*	4.19e-05*	-4.406324*	-3.938524*	-4.229542*
2	119.7082	3.260722	4.58e-05	-4.321175	-3.697442	-4.085466
3	121.2462	2.435148	5.11e-05	-4.218592	-3.438925	-3.923954
4	124.0240	4.166694	5.43e-05	-4.167666	-3.232066	-3.814102
5	129.4215	7.646504	5.19e-05	-4.225897	-3.134363	-3.813405

Optimal lag order by the selected criterion is shown by *

Table D4 Wald Test Results for Lag Selection of Exogenous Variables

Lag Selection for Exogenous Variables for BRICS

H_0: First lag of exogenous variables is insignificant

Test Statistic	Value	Df	Probability
Chi-square	6.721064	9	0.08652

Lag Selection for Exogenous Variables for Other Emerging Countries

H_0: First lag of exogenous variables is insignificant

Test Statistic	Value	Df	Probability
Chi-square	3.743726	6	0.7114

Lag Selection for Exogenous Variables for G5

H_0: First lag of exogenous variables is insignificant

Test Statistic	Value	Df	Probability
Chi-square	6.891257	9	0.06288