

An analysis of the linkages among fiscal vulnerability, financial stress and macroeconomic policies: an econometric study

FVI, FSI and
MPI

35

Khurram Ejaz Chandia

*School of Public Affairs, University of Science and Technology of China,
Hefei, China and*

Department of Management Sciences,

COMSATS University Islamabad, Sahiwal Campus, Sahiwal, Pakistan

Muhammad Badar Iqbal

Department of Management Sciences,

COMSATS University Islamabad, Sahiwal Campus, Sahiwal, Pakistan, and

Waseem Bahadur

Business School, Xi'an International University, Xian, China

Received 23 June 2021
Revised 6 November 2021
27 December 2021
Accepted 14 March 2022

Abstract

Purpose – This study aims to analyze the imbalances in the public finance structure of Pakistan's economy and highlight the need for comprehensive reforms. Specifically, it aims to contribute to the empirical literature by analyzing the relationship between fiscal vulnerability, financial stress and macroeconomic policies in Pakistan's economy between 1971 and 2020.

Design/methodology/approach – The study develops an index of fiscal vulnerability, an index of financial stress and an index of macroeconomic policies. The fiscal vulnerability index is based on the patterns of fiscal indicators resulting from past trends of the selected variables in Pakistan's economy. The financial stress in Pakistan is caused from the financial disorders that are acknowledged in the composite index, which is based on variables with the potential to indicate periods of stress stemming from the foreign exchange market, the securities market and the monetary policy components. The macroeconomic policies index is developed to analyze the mechanism through which fiscal vulnerability and financial stress have influenced macroeconomic

JEL Classification — E02, H63, P35

© Khurram Ejaz Chandia, Muhammad Badar Iqbal and Waseem Bahadur. Published in *Fulbright Review of Economics and Policy*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licences/by/4.0/legalcode>

The authors are indebted to Prof. Dr Attiya Y. Javid (Pakistan Institute of Development Economics, Islamabad, Pakistan) for her guidance and support in completion of this paper. The authors are thankful to Dr Irem Batool (COMSATS University Islamabad, Sahiwal campus, Pakistan) for her valuable comments for improving econometric methodology and data analysis.

Availability of data and material: The article has used secondary data for the analysis which is readily available from the Website of the World Bank. Moreover, detailed analysis has been included in the paper.

Competing interests: Not Applicable.

Funding: Not Applicable.

Authors' contributions: Dr Khurram Ejaz Chandia conceived the idea of topic, conducted the analysis and combinedly prepared the write-up with Muhammad Badar Iqbal. Dr Waseem Bahadur supervised the overall research work.



Fulbright Review of Economics
and Policy
Vol. 2 No. 1, 2022
pp. 35-60
Emerald Publishing Limited
e-ISSN: 2635-0181
p-ISSN: 2635-0173
DOI 10.1108/FREP-06-2021-0036

policies in Pakistan. The causal association between fiscal vulnerability, financial stress and macroeconomic policies is analyzed using the auto-regressive distributive lags approach.

Findings – There exists a long-run relationship between the three indices, and a bi-directional causality between fiscal vulnerability and macroeconomic policies.

Originality/value – This study contributes to the development of a fiscal monitoring mechanism, which has the basic purpose of analyzing the refinancing risk of public liabilities. Moreover, it focuses on fiscal vulnerability from a macroeconomic perspective. The study tries to develop a framework to assess fiscal vulnerability in light of “The Risk Octagon” theory, which focuses on three risk components: fiscal variables, macroeconomic-disruption-associated shocks and non-fiscal country-specific variables. The initial contribution of this work to the literature is to develop a framework (a fiscal vulnerability index, financial stress index and macroeconomic policies index) for effective and result-oriented macro-fiscal surveillance. Moreover, empirical literature emphasized and advised developing countries to develop their own capacity mechanisms to assess their fiscal vulnerability in light of the IMF guidelines regarding vulnerability assessments. This study thus attempts to fulfill the said gap identified in literature.

Keywords Fiscal vulnerability, Financial stress, Macroeconomic policies, Pakistan

Paper type Research paper

1. Introduction

The previous economic and financial crisis – that prevailed until 2007, which led the economies to an unexpected reversal of satisfactory fiscal, financial and economic conditions – show asymmetric shocks with asymmetric implications. The situation affected the public finance structures of developing as well as advanced economies in an uneven manner. The budgetary, macro-fiscal and macro-financial imbalances arise in the weak economies and propelled sovereign risk premia that made the situation disproportionate. Due to the variations and differences in shock absorbance capacities, individual economic reactions toward crisis were highly asymmetric (Korliras & Monogios, 2010).

The weak structural conditions preceding the crisis combined with the absence of appropriate fiscal outlines (fiscal rules, budgetary procedures and institutions) contributed to the visible fiscal vulnerabilities in different countries. The deteriorating patterns in fiscal dynamics pointed out serious concerns and doubts for the sustainability of public finances of developing countries in the medium- and long-run economic prospects (Popova, Karlova, Ponomarenko, & Deryugina, 2017). The concerns of rollover and refinancing of public debt emerge when the policies of the government become unsustainable. It means a perception of widespread expectation that government and fiscal authorities would have to face short- or medium-term complications in maintaining the creditworthiness of an economy (Baldacci, McHugh, & Petrova, 2011).

It is important to understand the extent and degree of refinancing risks, as the problems of refinancing of public debt are often followed by the fiscal crisis with the prediction of disorders in fiscal adjustment. During the phases of stress in financial markets, the effects of fiscal policies on the economy may be different than the normal times. The duration of financial stress where the economy faces a downward direction can be perceived as “bad times” for the country. Literature suggests that “bad times” are often linked to the phases of financial stress and financial crisis (Afonso, Baxa, & Slavík, 2018). Such situations make it necessary to analyze the effects of fiscal policies and macroeconomic developments during stress phases of the market.

The fiscal vulnerability goes beyond the economic situation, where governments and fiscal authorities implement inappropriate macroeconomic strategies and fiscal policies. This represents an inability of the government to implement suitable policies in the country. It is obvious that poor policies and lack of implementation capacity would give signs of vulnerability (Hemming & Petrie, 2000). The governments may not realize that they become vulnerable on two fronts: first, underlying weaknesses which may not affect the current fiscal outcomes but have the potential to create hurdles for government in achieving the objectives of its fiscal policy; second, such issues and weaknesses might restrict the government’s

ability to handle the upcoming challenges for the fiscal position, e.g. a response toward an external shock.

For the surveillance of macroeconomic issues, fiscal vulnerability reflects a situation, where the government and fiscal authorities of a country are exposed to the possibility of failure to attain macro-fiscal objectives: first, a government must try to avoid the high level of the budget deficit and public debt accumulation which directly influences macroeconomic stability in short-run and fiscal sustainability in long-run; second, a government must make sure that its fiscal policy is capable enough to retain reasonable flexibility for in-time and appropriate response toward internal and external macroeconomic imbalances; and third, a government must maintain reasonable and stable tax rates for its revenues generation.

According to the framework of [Cottarelli \(2011\)](#), the risk of fiscal sustainability that is associated with a potential inability of a government to rollover its outstanding public debt depends upon the relationship among (1) existing level and baseline predictions of major fiscal indicators; (2) shocks around the baseline predictions associated with macro-fiscal disruptions, variations in fiscal stance, comprehension of contingent liabilities which could result in worsening of fiscal position (the worsening of fiscal position means an increase in the possibility of refinancing and rollover problems); and (3) the other factors which include non-fiscal variables of a particular country, such as high imbalances in the current account, a large amount of private loans, variations/disturbances in international market sentiments which have the potential to initiate a situation of turmoil.

The fiscal variables must give early warning signals about rollover and refinancing problems, that is how it provides an opportunity to adapt governmental policies ahead of fiscal vulnerabilities which would ultimately result in fiscal stress events. The fiscal vulnerability could be mitigated through a tight fiscal policy, which includes steps like an increase in tax rates or a decrease in government expenditure ([Baldacci et al., 2011](#)). The phase, occurrence or an event of financial stress is defined in literature as a situation, where the financial system of the country is under pressure and its primary characteristic of financial intermediation becomes weak. According to [Balakrishnan, Danninger, Elekdag, and Tytell \(2011\)](#), the financial stress period can be classified to have four basic characteristics: huge swings in asset prices; a sudden unexpected rise in risk and uncertainty; the issue of liquidity; and fears about the strength of banking sector.

Recently, the governments are more concerned about the difficulties in policymaking and these difficulties arise from the fluctuating financial cycles. The current problems of systematic risks have emerged as a risk for financial markets and banking sectors. The trend of implementation of suitable macro-prudential policies is in practice for the protection of financial markets ([Magkonis & Tsopanakis, 2016](#)). [Borio \(2017\)](#) wrote “Macroeconomics without the financial cycle is very much like Hamlet without the Prince: a play that has lost its main character,” which means that macroeconomic policies are of no use or would be ineffective, as far as the financial cycle and its characteristics are not considered by the governments while devising a policy.

In the context of the previous financial slump, performance of Pakistan’s economy and existing literature on the interaction between the macroeconomic phases and structure of the financial system, the current study devotes its focus toward the construction of Financial Stress Index for the case of Pakistan in the light of the available data and aims to answer a query that why the phases of financial stress are linked with economic slump and how it disturbs Pakistan’s economy? The current study examines the experiences from the events of financial stress and macroeconomic stages of Pakistan’s economy over the period from 1971 to 2020. The events of financial disorders have been acknowledged from the composite index that is based on the variables which have the potential to indicate periods of stress stemming from the foreign exchange market, securities market and the components of monetary policy.

The establishment of the causal relationship between economic recessions and financial stress is a difficult challenge. So, the empirical analysis of this study has tried to discourse this matter by clearly picking the common variables and comprehensive estimation techniques mentioned in macroeconomic literature.

The current study has the following objectives:

- (1) To develop an index of fiscal vulnerability.
- (2) To develop an index of financial stress.
- (3) To develop macroeconomic policies index.
- (4) To test and examine the interaction between fiscal vulnerability, financial stress and macroeconomic policies in the case of Pakistan.

The current study has moved one step ahead and extended the existing body of knowledge in terms of a modeling approach by incorporating three aggregate indices. The three aggregate indices have the capacity to capture the fiscal position, financial conditions and the nature of macroeconomic policies of Pakistan's economy. These are the fiscal vulnerability index, financial stress index and macroeconomic policies index (hereafter FVI, FSI and MPI, respectively). These three indices are important to study the public finance imbalances of Pakistan. These indices present the broad coverage of stand-alone indicators, thus representing the various causes/origins of instability that lead toward the episodes of financial turmoil/disorder, fiscal pressure and macroeconomic disruptions into one single variable.

The study employs a comprehensive set of information for the analysis of data to have a precise and true portrayal of the key risks toward the stability of Pakistan's economy. Furthermore, the said indices are a good representation of the conditions prevalent in the fiscal stance, financial cycles and the macroeconomic situation of the any economy (Magkonis & Tsopanakis, 2014). The set of aggregate indicators, namely, the fiscal vulnerability, financial stress and macroeconomic policies indices have been used as proxies of the swings within the economy, effects of financial cycles and the effectiveness of macroeconomic policies. The innovative approach of constructing these indices can capture the stress volatility spillovers within an economy (Magkonis & Tsopanakis, 2016). The study focuses on the country-level analysis and analyzes potential national spillover effects. Moreover, the indices have the capacity to shed light on the potential channels of instability transmission within an economy.

This study contributes to the development of a fiscal monitoring mechanism, which has the basic purpose of analyzing the refinancing risk of public liabilities. The current study focuses on fiscal vulnerability from a macro-economic perspective. The study has tried to develop a framework for the assessment of fiscal vulnerability in the light of "The Risk Octagon" theory, which focuses on three risk components, i.e. fiscal variables, shocks associated with macroeconomic disruption and non-fiscal country-specific variables. The initial contribution of this work is to develop a framework (an FVI) for an effective and result-oriented macro-fiscal surveillance. Moreover, Hemming and Petrie (2000) emphasized and advised the developing countries to develop their own capacity mechanism for the assessment of fiscal vulnerability in the light of IMF guidelines for vulnerability assessment. The current study tries to fulfil the gap identified in Hemming and Petrie (2000).

Another contribution of this study is to analyze the linkages between fiscal vulnerability and financial stress. Ötker, Downes, and Marston (1999) argued that fiscal vulnerability could be the result of financial sector problems. The suggested linkage between fiscal vulnerability and financial stress has been empirically tested in the current study which is another contribution toward the existing body of literature. The incorporation of aggregate indices in modeling framework and empirical testing of their inter-linkage would have greater implications and advantages for the academicians, the policymakers and the fiscal

authorities. The key benefit of indices is that these serve as stand-alone indicators, thus including various sources of instability, which have the potential to lead towards the events/phases of financial turmoil and fiscal disturbances into a single composite indicator.

Moreover, a much-refined set of information has been employed, and a much accurate representation of threats (toward economic stability) can be gained through the aggregate indices. Additionally, the indices mentioned above are a much better representation of the situation prevailing in financial/business cycles and the fiscal stance. This study is the first attempt to assess and analyze the linkages between fiscal vulnerabilities and financial stress through aggregate indices in the context of any developing country. The available literature is mostly on European countries or other advanced countries (G-7, G-20, etc.) or panel datasets of developed countries.

This study emphasizes that the macroeconomic and macro-fiscal dynamics of advanced and developing countries are much different from each other and the same framework cannot be uniformly applied to developing and advanced countries (Chandia, Gul, Aziz, Sarwar, & Zulfiqar, 2018a; Chandia, Iqbal, Aziz, Gul, & Sarwar, 2018b). The study of Schaechter *et al.* (2014) focused on country groups (advanced countries) for vulnerability assessments and calls for the need to focus on developing countries with an agreement that vulnerability assessment will remain incomplete if it focuses on a group of countries and ignores the individual country analysis.

2. Literature review

2.1 Some conceptual considerations

The macro-fiscal aspects which determine the assessment of fiscal vulnerability include the preliminary fiscal situation (the degree to which the objectives of fiscal policy are fulfilled or not); short-run fiscal risk (sensitivity of fiscal consequences as result of fluctuations in key macro-economic factors); long-run fiscal sustainability (broader macroeconomic challenges due to persistent budget deficits and accumulated debt); and structural weaknesses (the structure of government spending and government revenues). Accordingly, Hemming and Petrie (2000) defined fiscal vulnerability as a point, when fiscal authorities are exposed to the possibility of failure to achieve the overall objectives and aims of their fiscal policy. Moreover, those fiscal policy objectives can also be called macro-fiscal objectives. The World Bank (1998) report provides comprehensive details about the fiscal policy objectives.

According to World Bank (1998), the objectives of fiscal policy could be divided into three border categories: the first objective of fiscal policy is the avoidance of persistent fiscal imbalances (deficits) and accumulation of government liabilities; second, the government should work for effective demand management for a suitable and sensible response toward external and internal macroeconomic disruptions; and third, fiscal authorities must be able to increase revenue collection in such a way that tax rates must remain stable. Hence, it can be concluded that fiscal vulnerability could be the inability of the government to achieve any or all the objectives of fiscal policy. The work of Cottarelli (2011) defined risks associated with fiscal sustainability as the risks connected with an inability of the fiscal authorities and government to roll over its outstanding debt obligations.

Furthermore, Hatzius, Hooper, Mishkin, Schoenholtz, and Watson (2010) defined “financial conditions” as the existing situation, where different financial indicators influence current economic behavior and (thereby) the prospects of an economy. The existing literature states that those financial indicators might include anything that represents the demand or supply of financial tools which are related to economic activity. The list may include an extensive range of asset prices and quantities (both stocks and flows), as well as factors of asset supply and demand. The literature has extensively defined the episodes of financial stress in several ways. The phenomenon of financial stress can be

defined as the level of connection/linkages between the financial vulnerabilities and the magnitude of shocks (Grimaldi, 2010). The study of Balakrishnan *et al.* (2011) highlighted four major features of the financial stress which include huge movements in asset prices, an unexpected or sudden rise in uncertainty and risk, liquidity challenges/deficiencies and apprehensions regarding the strength of the banking system.

In addition to all these, Hakkio and Keeton (2009) emphasized that events of financial stress should involve at least any one of the following conditions: an increase in uncertainty in asset valuation; an increase in information asymmetry; a less or low inclination for holding risky assets; and a lessening readiness to invest in less liquid assets. The studies on the issue of financial stress in the existing literature usually anticipate five crucial components: the money market, the debt market, the financial intermediaries, the equity market and the foreign exchange markets. So, the financial stress in developing countries is associated with financial markets as well as variables related to external flow. However, according to Cevik, Dibooglu, and Kenc (2016), the only focus toward financial markets might not be suitable in development of financial stress indices as there could be some other foundations of financial stress, which include foreign liabilities, sovereign risks and the imbalances in the current account.

2.2 Detailed survey of literature

The work of Bartolini and Cottarelli (1994) reconsidered the scenarios, which lead the governments to engage in roll-over options of debt to finance their debt-servicing expenditures through the issuance of new liabilities/loans. The government remains solvent, while the asymptotic economic growth rate surpasses the asymptotic rate of interest on debt, which is a normal extension of a recognized standard in a deterministic situation. The empirical examination of the association among business cycles and different components of the economy of the USA is the part of Stock and Watson (1999). The findings suggest that business cycles of the American economy are comprised of prolonged phases of ups and downs due to different events in different decades. These events include wars, recessions, recoveries, oil price hikes, etc.

The framework presented by Hemming, Kell, and Schimmelfennig (2003) highlights the four perspectives of vulnerability, which include an inappropriate description of the preliminary fiscal situation; pressure/stress on long-run fiscal sustainability; the sensitivity of short-run fiscal consequences toward risk; and structural and institutional weaknesses, which influence fiscal policy. As suggested by Gilchrist and Zakrajsek (2008), the effects of financial turbulences and their influence on the growth patterns of the economy are in line with past insights into the probable effects of tight credit conditions on economic activity. The study considered the recent financial crisis as a shock to the financial sector, which showed a 75-basis point rise in the external finance premium, which directed a severe slowdown in the output growth and investment in the initial years of recession.

While investigating the connection between emerging and advanced economies, Balakrishnan *et al.* (2011) stated that the degree of transfer and spread of financial stress from one country to another is based on the deepness of financial connections. Low current account balances and fiscal balances provided a little shield to emerging countries from the transmission of financial stress in advanced countries. The stress indices for advanced and emerging countries co-move strongly with crisis nurturing in both simultaneously. Moreover, the study by Zhan and York (2009) elaborated on the way the fiscal policies and handling of oil wealth in oil-producing countries within sub-Saharan Africa have changed. The study focused on the non-oil primary balance as the pertinent variable of how initial circumstances and resource legacies could affect fiscal sustainability over the long run in diverse models of fiscal rules. The global recession of the previous decade has raised the risk level for emerging as well as developed economies.

An important study by [Adrian, Estrella, and Shin \(2010\)](#) argued that the degree of changes in short-term interest rates affects real macroeconomic results. It means that tight policy lead toward a low term spread of 93 basis points, which ends up in unemployment. The findings of [Basurto, Caceres, and Guzzo \(2010\)](#) represent that an initial surge in risk aversion at the global level appeared as a noteworthy aspect that influenced sovereign spreads. The country-specific features start playing a more vital part in influencing the volatility of sovereign spread. The study concludes that the sustainability of public debt and sovereign balance sheets management is essential for the prevention of sovereign risk from nourishing into wider concerns about financial stability.

Furthermore, [Caner, Grennes, and Koehler-Geib \(2010\)](#) tried to find the tipping point where sovereign debt turns to harm the economy. The findings recommend that when the debt-to-gross domestic product (GDP) ratio rises above the threshold level of 77%; every additional percentage point of public debt cost 0.017% to the economic growth. On other hand, the threshold of debt-to-GDP ratio for emerging countries is 64%, which brings 0.02% loss in GDP. The exploration of the interactions between economic activity and financial conditions is an important phenomenon. The study of [Hatzius *et al.* \(2010\)](#) developed a comprehensive Financial Conditions Index (FCI) on monthly basis. The major drawback of the newly developed FCI is that its estimation and size make it awkward to use and update. The study concluded that FCIs can help in predicting the patterns of economic activity.

The proposal of a fiscal monitoring framework for the assessment of rollover risks, which are associated with developing economies, is the part of work conducted by [Baldacci *et al.* \(2011\)](#). The study proposed an approach for monitoring framework that is based on three clusters: current and future fiscal policies; long-term fiscal trends; and characteristics of government assets and liabilities. Moreover, the work of [Baldacci, Petrova, Belhocine, Dobrescu, and Mazraani \(2011\)](#) stated that solvency of any economy is endangered during the fiscal stress period, and fiscal authorities must change their policies to attain fiscal sustainability. The study defined the fiscal crisis period as the episodes of fiscal stress (default or restructuring of public liabilities), adoption of IMF structural adjustment program, high inflationary pressure and the rise in bonds spread.

The empirical literature provides the guidance on different techniques of computing structural and cyclically adjusted fiscal balances comprehensively. The study of [Bornhorst, Dobrescu, Fedelino, Gottschalk, and Nakata \(2011\)](#) argued that structural balances provide strong information because structural balances consider country-specific conditions to measure basic fiscal stance. The different economic variables such as asset prices and commodity prices at the normal level help in determining the basic fiscal stance. The identification of the events of financial disorder in advanced countries has been discussed in the work of [Cardarelli, Elekdag, and Lall \(2011\)](#). The study utilized a FSI and offered an investigative outline for an assessment of the effect of financial stress particularly focusing on the distress in the banking sector and the economic performance of an economy. The financial disorder due to distress in the banking system is more probable to result in profound and lengthier slumps than the stress in foreign exchange and securities markets.

The detailed discussion about the conceptual framework for the assessment of fiscal sustainability is part of [Cottarelli \(2011\)](#). The study has identified two unpleasant events which any economy should try to avoid. The two events include “rollover crisis” (ranging from the uprising in interest rate to the default of public liabilities) and “the Japan Syndrome” (a situation where there is no risk of default, but persistent fiscal deficits and debt burden influence economic performance of country). The risk framework has been named as “risk octagon,” which includes the expected value of different fiscal variables (based on different assumptions) and the risk that could affect assumptions mentioned above and some other factors, e.g. pension spending trends, health care spending trends, etc.

The study of [Ait-Sahalia, Andritzky, Jobst, Nowak, and Tamirisa \(2012\)](#) examined the effects of the financial sector and macroeconomic policy announcements and could not prove the role of financial and macroeconomic policies in relaxing interbank markets. However, foreign policy measures have noteworthy behavior on credit and liquidity risk premia in local interbank markets. Furthermore, an early warning system, i.e. an index of the fiscal stress which incorporates financial, fiscal and competitiveness indicators can possibly be used for the surveillance of macroeconomic disproportions and inconsistencies ([Berti, Salto, & Lequien, 2012](#)). The financial-competitiveness indicators seem to accomplish better outcomes as compared to fiscal indicators in the early warning mechanism of fiscal stress. Consequently, the signaling power of the indices is always greater than the individual variables.

The existing literature suggests strong interactions between the various stages of financial and business cycles. This interaction plays a vital role in determining the recoveries and recessions in economies. The phases of financial slumps are connected to low levels of output growth; however, expansions in financial markets are linked to quicker economic developments ([Claessens, Kose, & Terrones, 2012](#)). A comprehensive discussion about the multivariate unobserved components model for analyzing the linkages of output, credit, asset prices and interest rates for the case of the USA has been conducted in [Chen, Kontonikas, and Montagnoli \(2012\)](#). The study found close connections between cyclical variations in the indicators. In the long run, the cyclical components of the said variables are concurrent and asset prices have been in line with the fundamentals, which are consistent with the present value mechanism of valuation of assets.

Similarly, [Campolongo, Marchesi, and De Lisa \(2012\)](#) used an application of the Systematic Model of Banking Originated Losses (SYMBOL) for the analysis of the impact of the banking sector crisis on public finances. The recent global crisis has revealed that the balance sheets of banking as well as the government sector are highly interrelated and have a tendency to affect each other. While making any assessment about financial stress within an economy, it is necessary to consider the possible consequences of the financial sector's condition on public finances ([Estrella & Schich, 2012](#)). The work of [Mallick and Sousa \(2013\)](#) focuses on the assessment of macroeconomic effects of financial stress and monetary policy shocks. The study found that the tightening of monetary policy strongly worsens the financial stress conditions in the economy. Moreover, the study also revealed the significance of adopting a cautious stance toward the financial stress conditions, as well as the need for macroprudential management of risk.

The findings of [Matheson \(2012\)](#) suggested that the FCIs can give valuable summary measures of the financial conditions and suitable information regarding the progress of real-time economic activity. The examination of the association between output growth and real credit at business-cycle frequencies for the economy of Greece is conducted by [Karfakis \(2013\)](#). The results show that in the presence of a trade deficit ratio, real credit is necessary for the understanding of impending movements in output growth. The credit failure during the outbreak of the debt crisis in Greece appears to be one of the forces which are accountable for the downfall or failure of an economy.

Moreover, [Tagkalakis \(2013\)](#) has tried to assess the effects of financial turmoil on fiscal position and public finances of 20 Organization for Economic Co-operation and Development (OECD) countries. The rationale behind the evaluation was the economic and fiscal costs of bailout packages, which exerts high pressure on public finances in a couple of industrialized countries. The results showed that episodes of the financial crisis had increased the debt stock by 2.7% to 4.0% of GDP in OECD countries. It is notable to mention here that crisis episodes do not only influence the debt ratio in the current period but also the succeeding period. Concurrently, [Dabla-Norris and Gündüz \(2014\)](#) have presented a composite measure for indication of early warning mechanism of detecting growth challenges/turmoil in low-income economies. The findings revealed that institutional quality, exchange rate regimes,

size of shock and country-specific indicators are the major contributing indicators of growth issues in poor countries with low-income levels.

The study of [Hernández de Cos, Koester, Moral-Benito, and Nickel \(2014\)](#) presents possible enhancements and improvements in the current warning system for the detection of financial stress for countries in the European Union. The modifications and improvements include the determination of thresholds (country-specific) in a signaling method and the development of the signaling window. The study concludes that a detection mechanism for fiscal stress must consist of thresholds (that must be country-specific) for the signaling indicators; a signaling window of more than one year that includes financial, fiscal and macro indicators. In addition to it, it is very necessary to have sound public finances for economic development. European debt crisis revealed the importance of economic growth and financial stability for any country/economy. The situation highlights the need for institutional reforms for integrating risk and vulnerability analysis with surveillance mechanisms ([Kastrop, Ciaglia, Ebert, Stoßberg, & Wolff-Hamacher, 2014](#)).

To probe the issue further, [Magkonis and Tsopanakis \(2014\)](#) have examined the effects of fiscal and financial shocks on the macroeconomy and investigated the relationship between the fiscal and financial vulnerability of an economy. The fiscal and financial shocks have been captured through the construction of respective indices. The results indicate that growth responds negatively to an increase in the fiscal and financial stress indicators. The negative effects of shocks on the economy highlight the need for highly focused policies to avoid vulnerability. Additionally, the existing literature focuses on the use of FSI in collecting information about the channels of financial transmission in developing countries. The results presented in [Park and Mercado \(2014\)](#) proposed that the regional specific characteristics affect domestic FSI in emerging economies of Europe and Asia significantly.

In the case of advanced economies, [Schaechter et al. \(2014\)](#) have presented tools and indicators for the analysis of risks and fiscal vulnerabilities associated with advanced economies. The study elaborates short-term pressures could be captured through financing requirements, default risk perspectives in the market and sovereign stress dependence. The European sovereign debt crisis has revealed that financial market stress is an essential ingredient for examining and predicting the patterns of economic activity. Concurrently, [van Roye \(2014\)](#) concluded that the phenomenon of the financial stress which cannot be directly measured rather the financial market variables reflect the intensity of financial stress and it is convenient to derive an indicator that could summarize the stress component of the drivers of the financial market.

The “Macroeconomic Imbalances Procedure (MIP)” suggests that factors, such as trade-off among sovereign and corporate bonds by investors, the risk of short-term bonds and equity indices return relative to bond prices are considered the reason for macro-financial imbalances ([Dufrénot, Gente, & Monsia, 2016](#)). Similarly, the linkages between fiscal and financial conditions of G-5 economies have also been examined by [Magkonis and Tsopanakis \(2016\)](#). The findings of the study indicate intensive inter-connectivity between fiscal and financial distress of G-5 countries. The study calls for the coordination of macro-prudential policies to handle adverse outcomes of fiscal and financial distress.

Studying the financial stress in UK, [Chatterjee, Gibson, and Rioja \(2017\)](#) developed an index for monitoring the degree of financial stress for the period of 45 years. The feedback loops exist in the shock proliferation/spread between the financial and real sectors of UK's economy. The literature suggests the threshold level of debt-to-GDP ratio is 40–55% and exceeding this threshold would signal the exposure toward insolvency. The threshold level needs to be interpreted in the light of judgment-based approaches of assessment of debt sustainability ([Tran, 2018](#)). The empirical findings of [Afonso et al. \(2018\)](#) indicate that economic growth responds positively to fiscal shocks in financial stress regimes and financial stress negatively affects output growth and deteriorates the fiscal position.

3. Methodology

This section provides the detailed mechanism which has been used for developing three indices, i.e. the FVI, the FSI and the MPI. Moreover, the detailed procedure for analyzing the long-run equilibrium relationship among these indices is also the part of the current section.

3.1 The issue of fiscal vulnerability (the fiscal vulnerability index)

According to [Baldacci et al. \(2011\)](#), an efficient monetary framework must give an acceptable and satisfactory warning mechanism for fiscal vulnerability and should analyze the probability of rollover and refinancing issues for developing countries. This part of the study has highlighted the development of an instrument for signaling fiscal vulnerability. The factors that which fiscal baseline scenario and act as the determining factors for measuring rollover/refinancing risk have been categorized into three groups: basic fiscal variables (Are the debt dynamics based on current and expected medium-term policies consistent with fiscal solvency?); long-term fiscal trends (To what extent will long-term economic and demographic related challenges affect predicted fiscal variables and impact fiscal solvency?); and asset and liability management (Given the conditions/situation of fiscal solvency: does the composition of governments assets and liabilities expose countries to large rollover needs? Does it increase or decrease rollover risk?)

For developing a composite indicator of fiscal vulnerability, every variable x_t has been changed into a standardized score z_t :

$$z_t = (x_t - \mu) / \delta \quad (1)$$

here μ is an average, which has been calculated separately for the indicator x_t and δ is an associated standard deviation.

3.1.1 Basic fiscal variables. The three variables $r - g$, PBB and PD have been included in the set of basic fiscal variables. The $r - g$ indicates the impact of interest rate-growth rate differential on fiscal creditworthiness of an economy, PBB shows the primary budget balance (deficit or surplus), whereas PD shows the burden of liabilities on the economy.

3.1.2 Long-term fiscal trends. The long-term fiscal trends include two variables, which include TFL and $OAOR$. The TFL indicate total fertility rate, which is representative of population momentum in the country. The $OAOR$ represents the old-age dependency ratio, which captures the burden of the old-age population on the economy.

3.1.3 Asset and liability management. This section includes four variables, which include gross funding requirements (BN) for financing fiscal deficit (measures the borrowing needs); proportion of short-term loans (STL) in overall debt (measures vulnerability to transfer or extension in debt burden); external debt burden (ED), which measures exposure to exchange rate risk; and short-term foreign liabilities ($STFL$), which measures the claims on foreign exchange reserves.

The formula for fiscal vulnerability takes the following form:

$$FVI = (r - g) + PBB + PD + TFL + OAOR + BN + STL + ED + STFL \quad (2)$$

The metrics involved in [Equation \(2\)](#) represent the three key characteristics: first, the level of burden on the fiscal position of the economy; second, the long-term demographic trends which pose a burden on the economic situation of the country (based on the fertility rate in the country and the funding requirements for the problems related to social security challenges); and third, the country's financing requirements. Based on the work of [Baldacci et al. \(2011\)](#) and the data availability for the economy of Pakistan, the indices of the current study consist of five variables. In the first case, the difference of the rate of payment of government debt (r) from the economic growth rate of the country (g). This indicator provides a strong idea about the degree of solvency of a particular economy whether it is heading toward the fiscal crisis or

not. Apparently, in an economy that is experiencing a high debt burden, its debt servicing ability depends on the pace of its economic growth. The study has also included the general government structural balance, which is defined as the cyclically adjusted balance, including any temporary revenue or expenditure items. Finally, the general government net debt is calculated as the difference between the gross debt of the country from any relevant financial assets that correspond to debt instruments. All three variables are expressed as percentages of the country's GDP. The last two variables concern the long-term fiscal trends. Here, the total fertility rate and the old-age dependency ratio have been used. Both variables are crucial because they offer an anticipated tax base of the economy, together with the number of people able to contribute to the fiscal sustainability of a country through their contribution to the healthcare and pension systems. The aggregation method for index development is principal component analysis (PCA).

3.2 *The issue of financial stress (a financial stress index)*

An index of financial stress (FSI) has been developed by using the equal-variance approach highlighted in the study of [Cardarelli et al. \(2011\)](#). In the said approach, the FSI is a composite variable that considers the standardized value of each indicator. It means that we have deducted the average value and divided it by the standard deviation. This procedure avoids the measurement issues, whereas the role and involvement of every indicator are used as a deviation from the average value of an indicator. In the end, we have assigned equal weights to every factor which contributes toward the development of composite indicator/aggregate index. Even though the literature about index construction/development put forward several techniques of index aggregation; however, the equal-variance technique is equally effective and useful in terms of the precise and correct representation of financial stress events/phases. The statistical representation of the FSI is as follows:

$$\text{FSI} = \text{TED Spread} + \text{Inverted Term Spread} + \text{Stock Market Return} \\ + \text{Stock Market Volatility} + \text{Exchange Rate Volatility} + \text{Money Supply} \quad (3)$$

The Treasury-EuroDollar rate (TED) spread is a difference between the interest rates on secured and unsecured interbank loans. Here, in the case of Pakistan, the variable is defined as a difference between three-month KIBOR (KIBOR refers to Karachi Inter Bank Offer Rate) and Treasury bills rate (three months). Furthermore, the inverted term spread captures the liquidity in the financial market for the current study, it has been defined as a difference between the rate of return of long-term (the government in Pakistan issues "Pakistan Investment Bonds" as their long-term security) and short-term (*t*-bills) government securities. The volatility of the stock market has been captured through the coefficient of variation of the Karachi Stock Exchange (KSE) 100 index. To capture the angle of stress in the foreign exchange market, exchange rate volatility is as measured as coefficient of variation of Pakistan Rupee Exchange Rate vis-à-vis US dollar.

In more detail, [Equation \(2\)](#), which is about the depiction of FSI, has been developed by following the equal-variance approach presented by [Cardarelli, Levine, and Kapetanios \(2006\)](#) and [Cardarelli et al. \(2011\)](#). Finally, we have assigned equal weights to each contributor of the aggregate index. Though the relevant theoretical and empirical literature have various methods about index aggregation, it is obvious that the equal-variance approach is as efficient as any other methodology, in terms of the accurate depiction of financial stress episodes.

3.3 *Macroeconomic policy index*

The studies of [Burnside and Dollar \(1997\)](#), [Burnside and Dollar \(2000\)](#) and [Burnside and Dollar \(2004\)](#) provide an insight into the development of MPI. The three different policies have

been included in the current study for capturing the overall cumulative effect of macroeconomic policies, i.e. the monetary policy, the fiscal policy and the trade policy. The effect of monetary policy has been captured through inflation, the effect of fiscal policy has been captured through fiscal deficit and the effect of trade policy has been captured through trade openness in Pakistan. The PCA approach reduces the matrix of variables (which have strong correlation) into less dimensions. The primary purpose of PCA is to decrease dimensions in the data. Hence, the formula for MPI takes the following form:

$$\text{MPI} = \text{Rate of Inflation} + \text{Fiscal Deficit} + \text{Trade Openness} \quad (4)$$

In practice, we found it difficult to obtain precise estimates (even in OLS regressions) of the vector of coefficients through the three empirical equations to capture the effect of fiscal vulnerability and fiscal stress on various macroeconomic factors. Additionally, in terms of exposition and simplicity, it would be useful if we had one indicator of economic policy rather than three separate variables. The methodology is a simple principal component technique, which employs the first principal component in the analysis rather than all three policy variables. Thus, the principal components approach helps in leading toward a natural single index measure of policy. The method of PCA effectively includes the variables, i.e. budget balance, trade openness and inflation in our MPI. Thus, the key characteristic of the policy index is that it gives equal weights to the policy variables in a single composite indicator.

3.4 The relationship between fiscal vulnerability, financial stress and macroeconomic policies in the economy of Pakistan

The current study has followed the concept given in [Magkonis and Tsopanakis \(2014\)](#) and [Magkonis and Tsopanakis \(2016\)](#) to analyze the impact of fiscal vulnerability and financial stress within the economy of Pakistan on macroeconomic policies and employs the following linear model to examine the association among FVI, FSI and MPI in an economy of Pakistan:

$$\text{MPI}_t = \alpha_0 + \alpha_1 \text{FVI}_t + \alpha_2 \text{FSI}_t + \mu_t \quad (5)$$

MPI_t = Macroeconomic Policies Index

FVI_t = Fiscal Vulnerability Index

FSI_t = Financial Stress Index

The model has been used to estimate the relationship among MPI, FVI and FSI.

The study has used auto-regressive distributive lag (ARDL) test of cointegration of [Pesaran, Shin, and Smith \(2001\)](#) to capture the long-run and short-run causal relationship between the indices of Pakistan, which are specified in the above-mentioned equation. An ARDL approach is known to overcome the limitations of other co-integration techniques. An ARDL model uses enough lag numbers to specific modeling framework. All other co-integration techniques need the variables, included in the model, to be integrated in the same order, but the ARDL approach gives accurate and robust results, even if the variables are integrated in different order but not $I(2)$. ARDL approach is known for simultaneous testing of a long-run and short-run association among variables even in small sample sizes. The ARDL test gives unbiased estimates of variables with true t -values, even if explanatory variables are endogenous. The ARDL model of co-integration has been estimated to the following specification:

$$\begin{aligned} \Delta \text{MPI} = & \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta \text{MPI}_{t-i} + \sum_{i=0}^p \alpha_{2i} \Delta \text{FVI}_{t-i} + \sum_{i=0}^p \alpha_{3i} \Delta \text{FSI}_{t-i} \\ & + \alpha_4 \text{MPI}_{t-1} + \alpha_5 \text{FVI}_{t-1} + \alpha_6 \text{FSI}_{t-1} + \mu_t \end{aligned} \quad (6)$$

According to [Pesaran and Shin \(1999\)](#), modeling the ARDL with the appropriate lags will correct for both serial correlation and endogeneity problems. [Jalil and Ma \(2008\)](#) argued that endogeneity is less of a problem if the estimated ARDL model is free of serial correlation. In the said approach, all the variables are assumed to be endogenous, and the long-run and short-run parameters of the model are estimated simultaneously ([Khan, Qayyum, Sheikh, & Siddique, 2005](#)). The issue of endogeneity is particularly relevant since the causal relationship between the three indices cannot be ascertained beforehand. The selection of appropriate orders of the ARDL model is sufficient to simultaneously correct for residual serial correlation and the problem of endogenous regressors ([Pesaran & Shin, 1995, 1998](#)). Additionally, [Jailani and Masih \(2015\)](#) stated that the endogeneity problems are addressed in the ARDL technique. Furthermore, the work of [Tinoco-Zermeno, Venegas-Martínez, and Torres-Preciado \(2014\)](#) stated the cointegration analysis is possible even when independent variables are endogenous. Thus, according to studies of [Ang \(2008\)](#) and [Inder \(1993\)](#), the method of ARDL computes accurate long-run parameters and valid *t*-values; moreover, the endogeneity bias tends to be irrelevant and very small. The estimation through the ARDL approach is free from the endogeneity problem; as in the ARDL technique, the different variables have different optimal numbers of lags, whereas in Johansen-type models, this is not possible and it takes the same lag length for all variables ([Tadesse & Abafia, 2019](#)).

3.5 Data

The study has used annual time series data for different variables included in the model which have been discussed in detail in the previous section. The time span of data ranges from 1971 to 2020. The reason for selecting this specific time is that the country faced partition in 1971, so the starting point of data is 1971 to avoid controversy related to macroeconomic data and structural breaks due to the war period. Second, the availability of macroeconomic time series data from 1971 is smooth. These two reasons motivated to start analysis for data commencing from 1971 to the latest available data figures of 2020. The data of macroeconomic variables have been collected from multiple sources and figures have been cross-checked and verified to avoid any biasedness of the data source.

As far as national data sources are concerned, there are three different sources of data collection related to secondary data of macroeconomic variables in Pakistan: namely, the State Bank of Pakistan (SBP); the Pakistan Bureau of Statistics (PBS); and the Ministry of Finance (MoF) Government of Pakistan. The current study has collected the data of debt indicators, such as domestic debt, external debt and overall public debt of Pakistan from various issues of “Pakistan Economic Survey” published by the Ministry of Finance, Government of Pakistan. The statistics related to budgetary variables, such as interest payment expenses, primary budget balance and overall budget balance are taken from “Handbook of Statistics on the Economy of Pakistan” and “Annual Reports” published by the State Bank of Pakistan. The various statistics of rate of return on treasury bills (*t*-bills), rate of return on government bonds and statics related to the capital market (stock exchange) have also been collected from “Handbook of Statistics on the Economy of Pakistan.” The data of total fertility rate and old-age dependency ratio has been collected from World Development Indicators. Moreover, special care has been taken in the compilation of the dataset in a way that statistics taken from one source have been cross-verified from another source for maintaining the authenticity and reliability of data. The econometric software Eviews 10 has been used for econometric estimations and data analysis.

4. Analysis and discussion of results

The first part of the current study has computed three different indices, i.e. the FVI, the FSI and the MPI in the case of the Pakistani economy. These indices have been used in an

empirical model to analyze their impact and the overall role which they have played in the economy of Pakistan. A major benefit of constructing the said three indicators is their ability to capture various causes of volatility and instability in an economy, which have the capacity to lead toward the phases of fiscal strain and financial disorder into a single variable. A more precise illustration of the macroeconomic and financial settings is presented while capturing the effects of fiscal vulnerability and financial stress on macroeconomic policies. Hence, the current study is capable of empirical investigation of the association between fiscal vulnerability, financial stress and macroeconomic policies.

The FVI and FSI have been constructed by following the equal-variance approach, which has been proposed by different studies, which include [Cardarelli *et al.* \(2006, 2011\)](#) and [Magkonis and Tsopanakis \(2014\)](#). According to this approach, the FVI is a composite indicator, in which every variable is included with its standardized value. It means that the study deducted the mean value and divide it by the standard deviation. The measurement issues and problems have been avoided by using standardized values, while the input of every single indicator has been measured to deviations from its mean value. In the end, equal weights have been assigned to each component contributing toward an aggregate index. Though it is obvious that pertinent literature is rich about the use of various approaches in the aggregation of the index, the equal-variance method is as effectual as any other approach, in terms of the precise and correct representation of the phases of fiscal vulnerability and financial stress.

The study has presented the indices in three different graphs to verify whether our indices work well as appropriate indicators of the prevailing conditions in the financial markets and the macroeconomic situation of the country. The graphical representation of the FVI, the FSI and the MPI has been given in [Figures 1–3](#), respectively.

[Figures 1–3](#) provide the graphical representation of FVI, FSI and MPI for the economy of Pakistan. A composite index number measures the fluctuation, variation or change in the value of a composite number defined as the aggregate of a set of elementary numbers. The said indices represent the fluctuations in the level of fiscal vulnerability and the intensity of financial stress in Pakistan. Highly volatile movements of the indices throughout the examined period, i.e. 1971 to 2020 could be observed. Some variations might be identified, but overall, all the three graphs represent similar kinds of uncertain conditions for the last five decades. The 1980s, for instance in the case of the financial stress index, was a period of extremely stressful conditions in the financial market of the country which lasted until the start of the 1990s. The decade of the 1980s was the decade of martial law and dictatorship in Pakistan which caused the deterioration in economic conditions of the country. Moreover, the

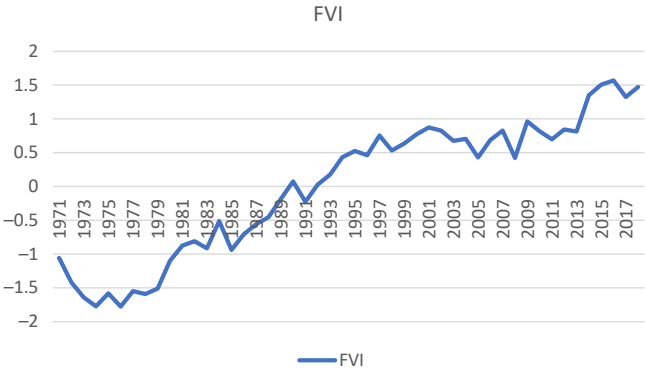


Figure 1.
Fiscal
vulnerability index

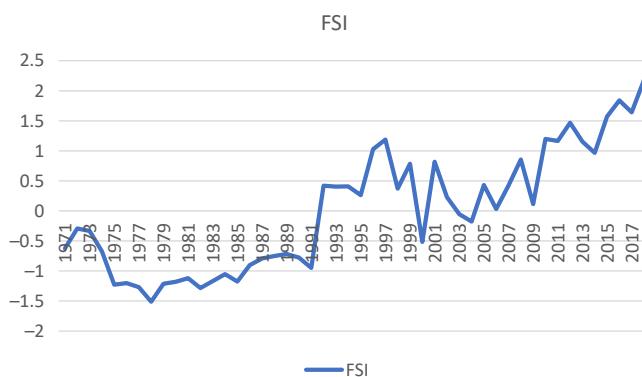


Figure 2.
Financial stress index

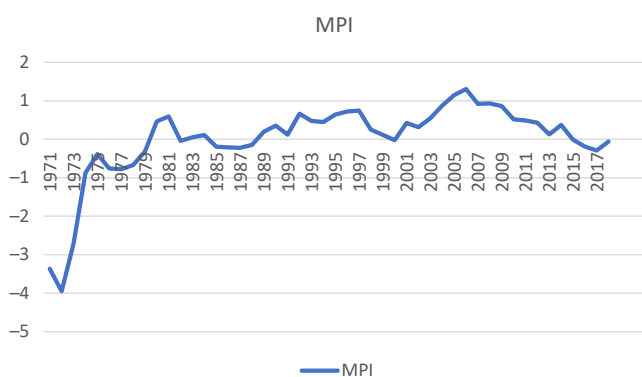


Figure 3.
Macroeconomic
policies index

effects of the Asian Financial Crisis (the late 1990s) and the global financial crisis (late 2000s) on the economy of Pakistan can be observed through Figures 1–3. Figure 4 presents the integrated graph of all three indices.

It is necessary to briefly analyze the descriptive statistics of the variables which have been employed in the empirical model of the current study before moving toward the first step of

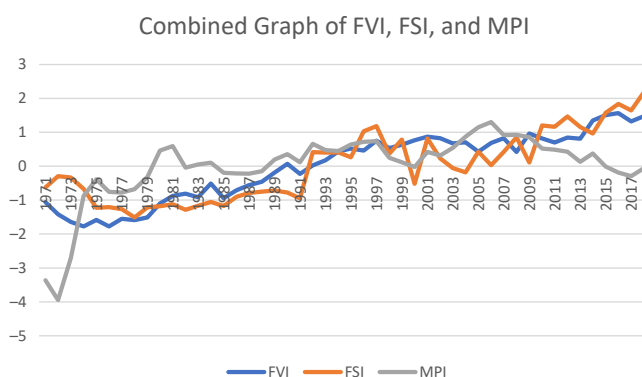


Figure 4.
FVI, FSI, and MPI

testing the stationarity of data through the ADF unit root test. Table 1 presents the descriptive statistics of different variables. The mean value of FVI is positive, while the value for FSI and MPI is negative. All the variables, except FSI, have a negative value of skewness, indicating that the distribution is skewed to the left, with more observations on the right. Table 1 provides the summary statistics for our sample. The mean value of the two variables is negative. It specifies the fact that for every variable the standard deviation value is near to the pseudo standard deviation, the Jarque–Bera test shows the normality of data. The null hypothesis for the test is that the data is normally distributed; the alternate hypothesis is that the data does not come from a normal distribution.

The first step in the process of econometric estimation is to test the stationarity properties of the time series data. For the said purpose, the Augmented Dickey–Fuller (ADF) test has been employed. The purpose of the unit root test is to confirm that any of the variables included in empirical model is not integrated at order 2, i.e. $I(2)$. The results of ADF test are shown in Table 2. The outcomes of the ADF unit root test specify that two indicators, i.e. FVI and FSI are integrated to order one with a significance level of 1%. The third variable, i.e. MPI is integrated to zero-order with a significance level of 1%. Though, none of the indicators is integrated at $I(2)$ level. The results of the unit root test indicate that the primary requisite for applying ARDL technique for the assessment of long-run association among the three indicators included in an empirical model has been fulfilled and it is satisfactory to move toward applying bound test which is the second step in econometric analysis.

The next phase in the estimation of ARDL model is an estimation bound test, for examining the long-run association among the indicators which are part of the empirical model. The lag length while estimating the ARDL approach has been chosen according to the Akaike Information Criterion (AIC). The outcomes of the bounds test for an estimated equation are given in Table 3. The results indicate that the estimated value of F -statistic is

Table 1.
Descriptive statistics

	FVI	FSI	MPI
Mean	5.4586E-16	–2.86808E-16	–1.28514E-16
Standard error	0.145864991	0.145864991	0.145864991
Median	0.427029497	–0.009772827	0.161888612
Standard deviation	1.010582305	1.010582305	1.010582305
Sample variance	1.021276596	1.021276596	1.021276596
Kurtosis	–1.144678059	–1.064435095	1.887728312
Skewness	–0.36643455	0.305103901	–0.417356859
Jarque–Bera	3.849151	2.278783	2.163471
Probability	0.145938	0.320014	0.339007
Range	3.345145639	3.692101854	3.253572664
Minimum	–1.777187333	–1.512365618	–3.949062032
Maximum	1.567958306	2.179736236	1.304510631
Sum	2.62013E-14	–1.37668E-14	–6.16868E-15
Observations	48	48	48

Table 2.
The ADF unit root test **Note(s):** *** indicate 1% significance level, ** indicate 5% significance level, * indicate 10% significance level

Variables	Level	1st difference
MPI	–3.825613***	–
FVI	–0.471803	–9.200337***
FSI	–0.068990	–10.80434***

larger than the upper level of critical value, which indicate the presence of long-run association in variables.

After the confirmation of the presence of the long-run association in indicators within an estimated model, the long-run and short-run coefficients for the specified model are given in Table 4.

The results given in Table 5 indicate that the coefficient of error correction term (ECT) is statistically significant with a negative magnitude. The value of ECT, i.e. -0.3877 implies that almost 38.77% adjustment takes place upcoming one period as a movement toward achieving equilibrium relationship.

The diagnostic tests include the LM test for testing serial correlation, the White test for analyzing heteroscedasticity and the Ramsey RESET test for examining any misspecification in an empirical model. The results of all the diagnostic test results have been presented in Table 6. The results of the LM test, the White test and the Ramsey RESET

	<i>F</i> -statistic	<i>K</i>	Optimal lag length	<i>I</i> (0) bound	1% <i>I</i> (1) bound	5% <i>I</i> (0) bound	<i>I</i> (1) bound
Equation (6)	13.27262	2	2, 2, 1	4.8	5.725	3.368	4.203

Table 3.
ARDL bound test results

Variable	Coefficient	Std. error	<i>t</i> -statistic	Prob
C	0.257692	0.115484	2.231416	0.0316
FVI	−0.645522	0.251867	−2.562951	0.0145
FSI	−0.448582	0.233384	−1.922080	0.0621

Table 4.
Long-run coefficients
(FVI, FSI and MPI)

Variable	Coefficient	Std. error	<i>t</i> -statistic	Prob
Δ MPI (−1)	0.360706	0.084997	4.243768	0.0001
Δ FVI	0.208413	0.159717	1.304887	0.1998
Δ FVI (−1)	−0.625389	0.160014	−3.908335	0.0004
Δ FSI	0.095158	0.073566	1.293503	0.2036
CointEq. (−1)	−0.387709	0.051227	−7.568476	0.0000

Note(s): $R^2 = 0.715$, Adj. $R^2 = 0.68$, D.W. Stat. = 1.88

Table 5.
Error correction
estimates (FVI, FSI
and MPI)

<i>Breusch-Godfrey serial correlation LM test</i>				
<i>F</i> -statistic	0.075937	Prob. <i>F</i> (2,36)		0.9270
Obs* <i>R</i> -squared	0.193246	Prob. chi-square (2)		0.9079
<i>White heteroscedasticity test</i>				
<i>F</i> -statistic	1.077116	Prob. <i>F</i> (35,10)		0.4805
Obs* <i>R</i> -squared	36.35620	Prob. chi-square (35)		0.4053
<i>Ramsey RESET test</i>				
	Value	Probability		
<i>t</i> -statistic	0.751233	0.4573		
<i>F</i> -statistic	0.564351	0.4573		

Table 6.
Diagnostic tests results
(Equation 6)

test indicate the absence of serial correlation, heteroscedasticity and misspecification in the model. The plot of the cumulative sum of recursive residual (CUSUM) and cumulative sum of the square of recursive residual (CUSUMSQ) of an estimated model indicate that there is no proof of the presence of any misspecification or instability in the structural model during the estimation period. The results of CUSUM and CUSUMSQ tests are given in Figures 5 and 6, respectively.

Table 7 shows the results of the Granger causality test and results indicate the bi-directional causality between FVI and MPI, which implies that fiscal vulnerability and macroeconomic performance, both cause and effect each other simultaneously. The phenomenon is interesting because in practice macroeconomic policies are meant to avoid the situation of fiscal vulnerability. The monetary authorities, fiscal authorities and the governments formulate monetary, fiscal and trade policies for the betterment of an economy and to save the economy from the risks of vulnerability. The causal relationship running from macroeconomic performance index toward FVI represents the failure of the governments to

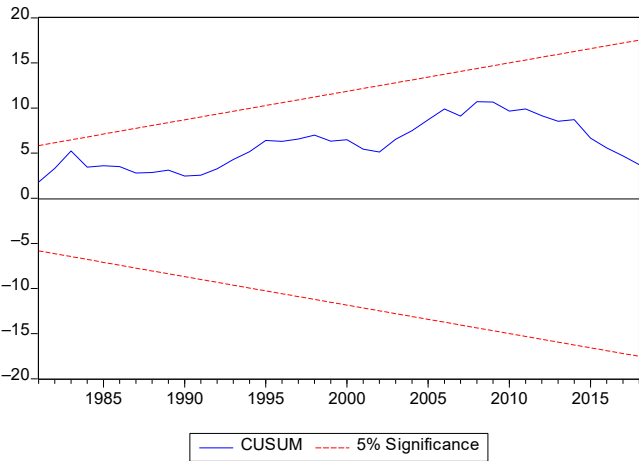


Figure 5.
Plot of cumulative sum
of recursive residuals

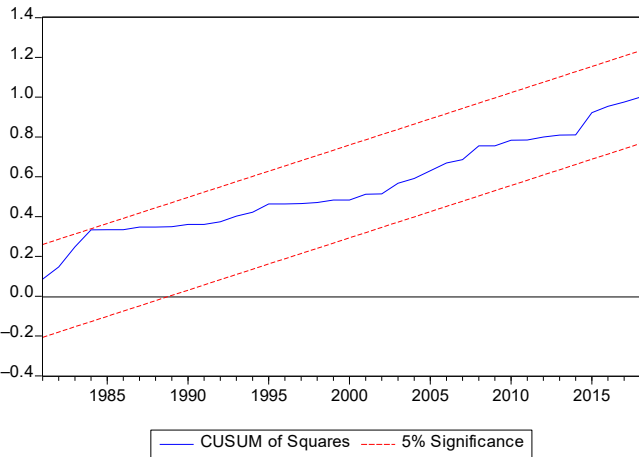


Figure 6.
Plot of recursive sum
of squares

avoid the situation of vulnerability through appropriate macroeconomic policies. The results also indicate uni-directional causality between FVI and FSI. It implies that it is the fiscal vulnerability that causes financial stress in the economy of Pakistan. The vulnerability of the fiscal sector leads toward stress episodes in the financial sector. The results of Granger causality test are unable to prove any causal relationship between FSI and macroeconomic performance index.

The economy of Pakistan has been facing large fiscal deficits and accumulation of public debt burden since 1985. These consistent deficits and debt accumulation are representative of fiscal indiscipline that ultimately results in inflation, the balance of payment crisis and deterioration of macroeconomic performance (Chaudhary, Anjum, & Ali, 1996). The consistent rise in budget deficit paved the way for international lending institutions to propose and advocate structural adjustment programs. The revenue-expenditure structure of Pakistan is stiff and has become a sin which is difficult to identify, measure and alter due to several economic, political and social reasons. The excessive growth in recurring government spending within inflexible revenue collection mechanisms has increased the fiscal deficit in Pakistan. Despite the several efforts by different governments over time, the budget deficit as a percentage of GDP has hardly ever achieved the targets. The persistent fiscal deficits have not only badly affected economic growth but also aggravated the burden of public debt. According to Eisner, “every dollar of deficit of government adds a dollar to debt.”

Furthermore, with an increase in debt burden, the budget deficits have also depreciated the exchange rate, which led to an increase the monetary indiscipline in the economy of Pakistan. In 1996, external debt was over \$30bn. Total domestic and foreign liabilities were about 88% of gross national product, which was creating challenges for debt servicing at that time. The study of Chaudhary *et al.* (1996) warned the governments and fiscal authorities of that time and emphasized taking immediate actions on the part of fiscal authorities and policymakers to avoid any severe consequences. Macroeconomic policies have their roots in political developments in Pakistan over time. The differences and variations in ideological and institutional frameworks have altered the balance between government intervention and the market mechanism, and in the relative importance of the public and private sectors. These shifts in the political economy seem to have a substantial impact on the economic development of the country, savings and investment gap, fiscal developments, the balance of payments situation and the variations in monetary framework and prices. The country has remained a mixed economy, and successive governments with diverse political beliefs/ideologies have abjured fundamental reforms of any kind.

If we shift our discussion to recent years, the economy of Pakistan has been growing at a slow pace for the past two decades. The annual growth in per capita income has averaged 2%, which is less than half of the average of different South Asian countries (World Bank, 2021). The reason for this situation is the inconsistency in macroeconomic policies and a low dependence on investment and exports to boost economic growth. The short spans of rapid consumption-fueled growth led to substantial fiscal and current account deficits, which

Null hypothesis	F-statistic	Prob	Type of causality
FVI does not Granger cause MPI	5.75197	0.0063	Bi-directional causality
MPI does not Granger cause FVI	3.14488	0.0536	
FSI does not Granger cause MPI	0.16901	0.8451	
MPI does not Granger cause FSI	2.04247	0.1427	
FSI does not Granger cause FVI	0.01824	0.9819	Uni-directional causality
FVI does not Granger cause FSI	4.64754	0.0152	

Table 7.
Granger causality test

eventually resulted in tight policies and periodic boom-bust/growth-decline cycles. In the early months of the fiscal year 2020, which spans from July 2019 to June 2020, following one such episode of imbalances/indiscipline (fiscal as well as external), the government entered a 39-month IMF-Extended Fund Facility. The accompanying adjustment measures, i.e. fiscal consolidation, contributed to a decrease of the imbalances over the year and improved macroeconomic stability which only lasted for a few months till July 2021.

According to the macro-fiscal experiences of Pakistan over time from 1971 to 2020, the current study support propositions highlighted in [Easterly \(2002\)](#) that governments of debtor economies have preferences for current consumption more than the private sector and the creditor economies. The study also states that in such economies, governments would have poor policies, plan and strategies about imposing taxes on the private sector. Hence, these are the poor macroeconomic policies that create the accumulation of public debt that in turn increases the degree of vulnerability in an economy. The negative impact of fiscal vulnerability and financial stress is the function of the macroeconomic performance of the country. Therefore, it can be justified that the healthier policies in terms of less fiscal deficit, less inflation rate and increased trade openness; the possibility that the degree of vulnerability would not be able to impact the macroeconomic performance of an economy increases. These findings suggest that the bad and varying macroeconomic policies of Pakistan are accountable for fiscal vulnerability.

Generally, the results of the current part emphasize the significance of fiscal vulnerability and financial stress in the developing country, i.e. Pakistan. More specifically, the negative impact of the said indicators on the macroeconomic performance create/highlight another significant motive to emphasize strategies and policies with a capacity to comprehend their effect. The inefficiency of fiscal authorities and the government in Pakistan to formulate appropriate macro-fiscal plans and possible execution of fiscal rules indicate that they have not realized the presence of the intricate dynamic association among the fiscal sectors, financial sector and macroeconomic policies. Such developments highlight the need for high carefulness and corrections on fiscal stance. This would lead toward a safe fiscal position that would be helpful in controlling the fiscal deficit, inflation and reduction of public debt. Additionally, it would offer room for betterment in poor macroeconomic phases when fiscal policy expansions are necessary to avoid the impact of a financial market failure for sustainable economic activity.

5. Conclusion

The current study has examined the interaction between macroeconomic policies, fiscal vulnerability and financial stress in the case of Pakistan from 1971 to 2020. The current macroeconomic conditions across the globe after the global credit crisis show that the solitary examination of the fiscal and financial conditions is not adequate for a comprehensive analysis of the episodes/phases of global crisis and their effects on individual economies'. For evaluating the impact of fiscal and financial sector shocks on macroeconomic policies, the study has developed a fiscal vulnerability indicator, financial stress indicator and a macroeconomic policy indicator for the economy of Pakistan. In this way, one can analyze and examine the level, and the progress of the usual circumstances of fiscal and financial sectors. The indexes accomplish the desired objective in a good manner, as these successfully capture previous and current crisis phases/episodes.

The salient feature of the current study is that it has analyzed the impact of the vulnerability of an economy and stress in the financial sector on the state of macroeconomic policy in Pakistan through a fiscal vulnerability index, financial stress index and an MPI. In the empirical literature on the said issue, several studies have tried to develop financial stress indices on an individual as well as geographical levels. However, there is barely any literature

that has concentrated on the impact of fiscal vulnerability and financial stress on the outcomes of macroeconomic policy. The current study has examined the relationship among fiscal vulnerability, financial stress and macroeconomic policies for the economy of Pakistan. The current study is fresh in the body of knowledge, as it has studied the relationship of among fiscal vulnerability, financial stress and macroeconomic policies from 1971 to 2020.

The analysis consists of four different econometric approaches, which have been used to estimate the relationship among three composite indicators. As an initial step, the ADF unit root test has been employed to verify the presence of unit root in three variables, i.e. the FVI, the FSI and the MPI. The results of the ADF unit root test show the existence of unit root in the FVI and the FSI, at the level $I(0)$; however, the MPI was stationary at $I(0)$. The data was stationary at the first difference, and two indices become stationary at level $I(1)$. The estimations of the bound test of ARDL indicate the presence of a long-run equilibrium relationship between the FVI, the FSI and the MPI. Furthermore, the study used error correction estimates for measuring the short-run behavior of the three composite indices. Error correction model measures the short-run performance of long-run association without losing the long-run association. The estimations show the correction of variables in upcoming years because of disequilibrium in the previous period. It implies that adjustments are significant, and the composite indicators adjust to sustain their relationship.

The study has also applied the Granger Causality test to investigate the direction of causality between the three indicators, i.e. the FVI, the FSI and the MPI in Pakistan from 1971 to 2020. The test results indicate that there exists bi-directional causality between the FVI and the MPI, as p -values and F -statistic are significant at 1% level, which means that both cause and affect each other. There exists a unidirectional causality between the FVI and the FSI and causality runs from the FVI toward the FSI. It implies that it is the vulnerability of the economy that poses the stress on the financial sector in the case of Pakistan. Moreover, the study indicates the uni-directional causality running from the MPI toward the FSI. However, the causal relationship is very weak between the MPI and FSI.

The current discussion highlights that fiscal vulnerability, financial stress and macroeconomic policies have a strong equilibrium relationship in the economy of Pakistan. It can be concluded that an increase or decrease in fiscal vulnerability significantly affect macroeconomic policies in a long run in the context of Pakistan and vice-versa. On the other hand, fiscal vulnerability creates pressure on the performance of the financial sector, which ultimately results in a stressed financial sector in Pakistan. Though the macroeconomic policies have been showing a friendly attitude toward the financial sector of Pakistan since 1990s. The government of Pakistan initiated policies related to the liberalization of the financial sector especially banks and financial markets in 1990 and put an end to the fixed exchange rate regime in the late 1980s. The vulnerable economic condition of the country is a dilemma for the politicians, policy makers, academicians and common people of Pakistan. The ultimate sufferers are the poor and common people of Pakistan, who face high inflation, rise in interest rates and increase in taxes due to budget deficit, current account deficit and accumulated debt burden.

The current study has comprehensively accommodated the macroeconomic policies, fiscal structure and financial sector dynamics of Pakistan; however, there is a need to link these issues with social challenges, i.e. social security framework, problems in bureaucratic structure and other institutional issues. The current study could be helpful in initiating the research on the potential reforms which could be possibly helpful for overhauling the macroeconomic ills and fiscal structure of the economy, which could solve the problems of the common people of Pakistan. Though there is an abundance of empirical research (Chandia *et al.*, 2018a, b; Chandia *et al.*, 2019) suggesting the need for reforms in the fiscal structure of the economy, the actual frameworks and experimental results are missing which could be helpful in generating real-time results at macro-level.

Abbreviations

FVI	Fiscal Vulnerability Index
FSI	Financial Stress Index
MPI	Macroeconomic Policies Index
ADF Test	Augmented Dickey Fuller Test
ECT	Error Correction Term
SAP	Structural Adjustment Program
GNP	Gross National Product
GDP	Gross Domestic Product
OECD	Organization of Economic Co-operation and Development
UK	United Kingdom

References

- Adrian, T., Estrella, A., & Shin, H. S. (2010). *Monetary cycles, financial cycles and the business cycle*. FRB of New York Staff Report, (421).
- Afonso, A., Baxa, J., & Slavík, M. (2018). Fiscal developments and financial stress: A threshold VAR analysis. *Empirical Economics*, 54(2), 395–423.
- Ait-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S., & Tamirisa, N. (2012). Market response to policy initiatives during the global financial crisis. *Journal of International Economics*, 87(1), 162–177.
- Ang, J. B. (2008). *Financial Development and Economic Growth in Malaysia*. New York: Routledge.
- Balakrishnan, R., Danninger, S., Elekdag, S., & Tytell, I. (2011). The transmission of financial stress from advanced to emerging economies. *Emerging Markets Finance and Trade*, 47(Suppl. 2), 40–68.
- Baldacci, E., McHugh, J., & Petrova, I. (2011). *Measuring fiscal vulnerability and fiscal stress: A proposed set of indicators*. IMF Working Paper, (94).
- Baldacci, E., Petrova, I. K., Belhocine, N., Dobrescu, G., & Mazraani, S. (2011). *Assessing fiscal stress*. IMF Working Paper, (100).
- Bartolini, L., & Cottarelli, C. (1994). Government Ponzi games and the sustainability of public deficits under uncertainty. *Ricerche Economiche*, 48(1), 1–22.
- Basurto, M. A. S., Caceres, C., & Guzzo, V. (2010). *Sovereign spreads: Global risk aversion, contagion or fundamentals?* (No. 10–120). International Monetary Fund.
- Berti, K., Salto, M., & Lequien, M. (2012). An early-detection index of fiscal stress for EU countries (No. 475). Directorate General Economic and Financial Affairs (DG ECFIN). European Commission.
- Borio, C. (2017). Macroeconomics and the financial cycle: Hamlet without the Prince? *Executive Board*, 73.
- Bornhorst, F., Dobrescu, G., Fedelino, A., Gottschalk, J., & Nakata, T. (2011). When and how to adjust beyond the business cycle? A guide to structural fiscal balances. *IMF Technical Notes and Manuals*, 11(2).
- Burnside, C., & Dollar, D. (1997). *Aid, policies, and growth*. World Bank Policy Research Working Paper No. 569252. World Bank.
- Burnside, C., & Dollar, D. (2000). Aid, policies, and growth. *American Economic Review*, 90(4), 847–868.
- Burnside, C., & Dollar, D. (2004). *Aid, policies, and growth: Revisiting the evidence*. The World Bank.
- Campolongo, F., Marchesi, M., & De Lisa, R. (2012). The potential impact of banking crises on public finances: An assessment of selected EU countries using symbol. *OECD Journal: Financial Market Trends*, 2011(2), 73–84.

- Caner, M., Grennes, T., & Koehler-Geib, F. (2010). Finding the tipping point: When sovereign debt turns bad. *Sovereign Debt and Financial Crisis*, 64–75.
- Cardarelli, R., Levine, I. T. R. and Kapetanios, G., (2006). How do financial systems affect economic cycles? *World Economic Outlook*, 105-138.
- Cardarelli, R., Elekdag, S., & Lall, S. (2011). Financial stress and economic contractions. *Journal of Financial Stability*, 7, 78–97.
- Cevik, E. I., Dibooglu, S., & Kenc, T. (2016). Financial stress and economic activity in some emerging Asian economies. *Research in International Business and Finance*, 36, 127–139.
- Chandia, K. E., Gul, I., Aziz, S., Sarwar, B., & Zulfikar, S. (2018a). An analysis of the association among carbon dioxide emissions, energy consumption and economic performance: An econometric model. *Carbon Management*, 1–15.
- Chandia, K. E., Iqbal, M. B., Aziz, S., Gul, I., & Sarwar, B. (2018b). An analysis of the management of fiscal deficit of Pakistan: An econometric study of auto-regressive distributive lags (ARDL) approach. *The Singapore Economic Review*, 1–30.
- Chandia, K. E., Riaz, S., Javid, A. Y., Iqbal, M. B., Azam, M., & Gul, I. (2019). Assessment of public and external debt sustainability using debt dynamics equation approach: A comparative study of Pakistan and India. *Millennial Asia*, 10(1), 25–55.
- Chatterjee, S., Gibson, J., & Rioja, F. (2017). Optimal public debt redux. *Journal of Economic Dynamics and Control*, 83, 162–174.
- Chaudhary, M. A., Anjum, S. W., & Ali, S. (1996). Macroeconomic policies and management of debt, deficit, and inflation in Pakistan [with comments]. *The Pakistan Development Review*, 773–786.
- Chen, X., Kontonikas, A., & Montagnoli, A. (2012). Asset prices, credit and the business cycle. *Economics Letters*, 117(3), 857–861.
- Claessens, S., Kose, M. A., & Terrones, M. E. (2012). How do business and financial cycles interact? *Journal of International Economics*, 87(1), 178–190.
- Cottarelli, C. (2011). The risk octagon: A comprehensive framework for assessing sovereign risks. *Presentation at the Sapienza University in Rome on January, 25, 2011*.
- Dabla-Norris, E., & Gündüz, Y. B. (2014). Exogenous shocks and growth crises in low-income countries: A vulnerability index. *World Development*, 59, 360–378.
- Dufrénot, G., Gente, K., & Monsia, F. (2016). Macroeconomic imbalances, financial stress and fiscal vulnerability in the euro area before the debt crises: A market view. *Journal of International Money and Finance*, 67, 123–146.
- Easterly, W. (2002). How did heavily indebted poor countries become heavily indebted? Reviewing two decades of debt relief. *World Development*, 30(10), 1677–1696.
- Estrella, A., & Schich, S. (2012). Sovereign and banking sector debt: Interconnections through guarantees. *OECD Journal: Financial Market Trends*, 2011(2), 21–45.
- Gilchrist, S., & Zakrajsek, E. (2008). Linkages between the financial and real sectors: An overview. In *Academic Consultants Meeting*, Federal Reserve Board (Vol. 3), October.
- Grimaldi, M. B. (2010). *Detecting and Interpreting Financial Stress in the Euro Area (No. 1214)*. ECB Working Paper.
- Hakkio, C. S., & Keeton, W. R. (2009). Financial stress: What is it, how can it be measured, and why does it matter? *Economic Review*, 94(2), 5–50.
- Hatzius, J., Hooper, P., Mishkin, F. S., Schoenholtz, K. L., & Watson, M. W. (2010). *Financial Conditions Indexes: A Fresh Look After the Financial Crisis (No. w16150)*. National Bureau of Economic Research.
- Hemming, R., & Petrie, M. (2000). *A Framework for Assessing Fiscal Vulnerability*. International Monetary Fund Working Paper 52.

- Hemming, R., Kell, M., & Schimmelpfennig, A. (2003). *Fiscal Vulnerability and Financial Crises in Emerging Market Economies* (Vol. 218). Washington, DC: International Monetary Fund.
- Hernández de Cos, P., Koester, G. B., Moral-Benito, E., & Nickel, C. (2014). *Signalling Fiscal Stress in the Euro Area-a Country-Specific Early Warning System* (No. 1712). ECB Working Paper.
- Inder, B. (1993). Estimating long-run relationships in economics: A comparison of different approaches. *Journal of Econometrics*, 57(1–3), 53–68.
- Jailani, M. Z., & Masih, M. (2015). *Determining the Relationship Between Financial Development and Economic Growth: An Application of ARDL Technique to Singapore*.
- Jalil, A., & Ma, Y. (2008). Financial development and economic growth: Time series evidence from Pakistan and China. *Journal of Economic Cooperation*, 29(2), 29–68.
- Karfakis, C. (2013). Credit and business cycles in Greece: Is there any relationship? *Economic Modelling*, 32, 23–29.
- Kastrop, C., Ciaglia, S., Ebert, W., Stoßberg, S., & Wolff-Hamacher, S. (2014). Fiscal, economic and financial vulnerabilities: Implications for euro area surveillance. *Applied Economics*, 46(6), 603–615.
- Khan, M. A., Qayyum, A., Sheikh, S. A., & Siddique, O. (2005). Financial development and economic growth: The case of Pakistan [with comments]. *The Pakistan Development Review*, 819–837.
- Korliras, P. G., & Monogios, Y. A. (2010). Asymmetric fiscal dynamics and the significance of fiscal rules for EMU public finances. *The Journal of Economic Asymmetries*, 7(2), 139–169.
- Magkonis, G., & Tsopanakis, A. (2014). Exploring the effects of financial and fiscal vulnerabilities on G7 economies: Evidence from SVAR analysis. *Journal of International Financial Markets, Institutions and Money*, 32, 343–367.
- Magkonis, G., & Tsopanakis, A. (2016). The financial and fiscal stress interconnectedness: The case of G5 economies. *International Review of Financial Analysis*, 46, 62–69.
- Mallick, S. K., & Sousa, R. M. (2013). The real effects of financial stress in the Eurozone. *International Review of Financial Analysis*, 30, 1–17.
- Matheson, T. D. (2012). Financial conditions indexes for the United States and Euro area. *Economics Letters*, 115(3), 441–446.
- Ötler, M. I., Downes, M. P., & Marston, M. D. (1999). *Mapping Financial Sector Vulnerability in a Non-Crisis Country*. International Monetary Fund.
- Park, C. Y., & Mercado, R. V. Jr (2014). Determinants of financial stress in emerging market economies. *Journal of Banking & Finance*, 45, 199–224.
- Pesaran, M. H. and Shin, Y., (1995). *An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis*.
- Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed-lag modelling approach to cointegration analysis. *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium* (Vol. 31, pp. 371–413). doi: [10.1017/CCOL0521633230.011](https://doi.org/10.1017/CCOL0521633230.011).
- Pesaran, M. H., & Shin, Y. (1999). *An Autoregressive Distributed Lag Modeling Approach to cointegration Analysis*. Cambridge University Press.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326.
- Popova, S., Karlova, N., Ponomarenko, A., & Deryugina, E. (2017). Analysis of the debt burden in Russian economy sectors. *Russian Journal of Economics*, 3(4), 379–410.
- Schaechter, A., Alper, C. E., Arbatli, E., Caceres, C., Callegari, G., Gerard, M., Jonas, J., Kinda, T., Shabunina, A., & Weber, A. (2014). A toolkit to assess fiscal vulnerabilities and risks in advanced economies. *Applied Economics*, 46(6), 650–660.
- Stock, J. H., & Watson, M. W. (1999). Business cycle fluctuations in US macroeconomic time series. *Handbook of Macroeconomics*, 1, 3–64.

-
- Tadesse, T., & Abafia, J. (2019). The causality between financial development and economic growth in Ethiopia: Supply leading vs demand following hypothesis. *Journal of Economics and Financial Analysis*, 3(1), 87–115.
- Tagkalakis, A. (2013). The effects of financial crisis on fiscal positions. *European Journal of Political Economy*, 29, 197–213.
- Tinoco-Zermeno, M. A., Venegas-Martínez, F., & Torres-Preciado, V. H. (2014). Growth, bank credit, and inflation in Mexico: Evidence from an ARDL-bounds testing approach. *Latin American Economic Review*, 23(1), 1–22.
- Tran, N. (2018). Debt threshold for fiscal sustainability assessment in emerging economies. *Journal of Policy Modeling*, 40(2), 375–394.
- van Roye, B. (2014). Financial stress and economic activity in Germany. *Empirica*, 41(1), 101–126.
- World bank (1998). *Public Expenditure Management Handbook*. Washington: The World Bank.
- World Bank (2021). Overview. Available at: <https://www.worldbank.org/en/country/pakistan/overview>.
- Zhan, Z., & York, R. C. (2009). *Fiscal Vulnerability and Sustainability in Oil-producing Sub-Saharan African Countries* (No. 9–174). International Monetary Fund.

Further reading

- Bernanke, B. S., & Gertler, M. (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives*, 9(4), 27–48.
- Bernanke, B. S., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of Macroeconomics*, 1, 1341–1393.
- Rajan, R. & Zingales, L. (2003). Banks and markets: the changing character of European finance. In Gaspar, V., Hartmann, P., & Sleijpen, O. (Eds.), *The Transformation of the European Financial System*. Frankfurt: European Central Bank. Available at: https://www.ecb.europa.eu/events/pdf/conferences/zingales_comp.pdf.

Table A1.
Estimations of FVI, FSI
and MPI

Appendix			
Years	FVI	FSI	MPI
1971	-1.05839982202274	-0.623509059417333	-3.36222369817378
1972	-1.41835425072227	-0.294017562738222	-3.94906203244513
1973	-1.64255478484088	-0.332001785738789	-2.7109789952796
1974	-1.77469523025623	-0.670945698959827	-0.87375108088082
1975	-1.58333578865901	-1.22857623896253	-0.383875529627743
1976	-1.77718733281335	-1.20322337845488	-0.758614169195745
1977	-1.54873034239031	-1.26833197421402	-0.777206472935462
1978	-1.59210271078349	-1.51236561770138	-0.674661366507405
1979	-1.51279932751113	-1.21485781851646	-0.319650762083528
1980	-1.10173506663017	-1.17822239835661	0.462504454960629
1981	-0.877498702214863	-1.12144514040926	0.595164352819265
1982	-0.809874436512105	-1.28412956856568	-0.041143482943756
1983	-0.914321526952566	-1.16681986916579	0.0503351745667072
1984	-0.509911616993583	-1.05315786089395	0.107472048833627
1985	-0.939991724957216	-1.17580227831429	-0.195043380468332
1986	-0.706273862541226	-0.903822160773113	-0.211199374676665
1987	-0.556352386851282	-0.79138990414409	-0.22088023672961
1988	-0.455564641740721	-0.749754880844237	-0.144672102333943
1989	-0.185972783446013	-0.718169981226227	0.195901699300224
1990	0.0736123640492781	-0.775651151487199	0.355850634487604
1991	-0.227010481331787	-0.947453423373389	0.120054560502441
1992	0.0276420356394477	0.418293914120651	0.66278342100523
1993	0.174702337876226	0.404834473390033	0.476807486715339
1994	0.433506958277711	0.409237520480806	0.44631854081612
1995	0.524149986113361	0.264010649923984	0.63847558645831
1996	0.461140827447843	1.02905564963577	0.720383113990935
1997	0.752856297759923	1.1865864361965	0.7418169264993
1998	0.53288918392421	0.371038752140059	0.247624754326501
1999	0.634958922381509	0.783669649434416	0.117940980780331
2000	0.769306557048651	-0.51759593025018	-0.0235313084556934
2001	0.873977276651786	0.816929819508168	0.422456108095741
2002	0.828603680215816	0.228223386588543	0.315047891139474
2003	0.673495894412739	-0.0520405386648037	0.544568131557517
2004	0.705488236100664	-0.177835565376076	0.873940565947648
2005	0.431152491755557	0.431474259277198	1.14764645021569
2006	0.686944298234402	0.0324948840230765	1.3045106311671
2007	0.826908385041642	0.4227189479224	0.916974785446271
2008	0.422906501593256	0.854794957120647	0.928694157442482
2009	0.963436397024297	0.114411526107318	0.859331132937373
2010	0.818342905533568	1.20040568120893	0.51993989217886
2011	0.697234505163175	1.16650053842363	0.48703759463395
2012	0.844397500508474	1.46888256172926	0.428312225862151
2013	0.81344318710703	1.15425435905352	0.127875523905764
2014	1.34954146366309	0.965940517746688	0.372831673468318
2015	1.50628163855967	1.57295316602113	-0.00457003770381125
2016	1.56795830613135	1.84076030034974	-0.186092998307984
2017	1.32523508335038	1.64391160003912	-0.293301752829578
2018	1.47255359860592	2.17973623610674	-0.0581417142339652

Corresponding author
Khurram Ejaz Chandia can be contacted at: chandia@mail.ustc.edu.cn

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgroupublishing.com/licensing/reprints.htm
Or contact us for further details: permissions@emeraldinsight.com