Bulletin of Business and Economics, 13(1), 193-201
https://bbejournal.com
https://doi.org/10.61506/01.00188

Macroeconomics Determinants of Fiscal Sustainability in the Asian Countries

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Abstract
The present study is designed to investigate how macroeconomic determinants of the South Asian region have affected the fiscal sustainability from 1980 to 2021. This study has used Newey and West (1987) robust standard errors approach to overcome the problem of autocorrelation and heteroscedasticity in panel data. The results of the statistical model confirmed the existence of fiscal sustainability in selective Asian countries. The significant contribution of the study is to obtain robust standard errors that rectify the issues of violation of simple regression analysis, which is the solution to all problems relevant to OLS regression. Furthermore, the results also confirmed that using macroeconomic determinants significantly improves fiscal sustainability. The results confirmed that macroeconomic factors contribute to fiscal sustainability. The study concluded that South Asian countries should use macro indicators as sources to achieve a higher fiscal sustainability rate.
Keywords: financial sustainability, budget deficits, public debt, inflation

1. Introduction

The macroeconomic landscape encompasses multifaceted challenges, where issues like budget deficits, public debt, and inflation demand governments' strategic interventions. This complexity underscores the significance of achieving fiscal sustainability, a concept crucial for establishing enduring solutions. Fiscal sustainability is the enduring equilibrium between government spending and various economic indicators. This long-term approach seeks to enhance the current government's fiscal position, addressing budget deficits and escalating public debt (Yared, 2019).

Managing fiscal sustainability involves steering government finances to meet current obligations while preserving the capacity to address future demands. A sound fiscal management approach ensures a resilient and stable budget over time. Maintaining a balance between revenue and expenditure allows governments to sustainably deliver public services, invest in infrastructure, and foster economic growth without burdening the nation with excessive debt.

Asian economies prioritize fiscal sustainability due to its crucial role in long-term prosperity, budget surplus maintenance, and sustained development. A comprehensive review of macroeconomic factors influencing fiscal sustainability in Asian countries is imperative (Holtfrerich et al., 2016; Ali & Rehman, 2015; Ali & Audi, 2018).

The effectiveness of fiscal policy tools in ensuring public finance stability is reflected in macroeconomic determinants of fiscal sustainability. These indicators assess a country's fiscal policy's long-term viability, ensuring it meets financial obligations without jeopardizing the economy's health or future administrations' funding capacity (Ali, 2015; Chugunov & Makohon, 2019).

Economic expansion and innovative revenue streams are central to financial viability and directly impacted by economic growth. Economic growth positively influences tax revenues, diminishes budget deficits, and fosters fiscal stability. Economic growth and budgetary sustainability are correlated in countries like China and India, where expanding economies exhibit favorable fiscal outcomes (Baharumshah, Soon, & Lau, 2017).

Public debt dynamics are crucial in fostering fiscal and monetary sustainability by managing total debt buildup. Lowering governmental debt enhances fiscal sustainability, while an increase in debt has adverse effects. Countries like Oman serve as examples, emphasizing the intricate connection between public debt dynamics and fiscal sustainability (Baharumshah et al., 2017). Models of fiscal policy prioritizing restraint, efficient public spending, and reliable tax collection are pivotal. As observed in countries like Singapore and South Korea, successful implementation of sound fiscal policies contributes to economic stability and security (Caselli et al., 2022; Audi & Ali, 2023).

Global economic trends, international trade, and capital movement significantly impact government budgets in Asia. The economies of Malaysia and Indonesia serve as case studies, highlighting the importance of understanding foreign variables affecting fiscal sustainability. A holistic strategy considering current and future financial responsibilities and macroeconomic concerns is crucial for achieving fiscal sustainability (Melina, Yang, & Zanna, 2016; Audi et al., 2022).

For fiscal sustainability, Asia's economic development, responsible fiscal policies, and prudent public debt management are vital. The macroeconomic dynamics, including economic growth, income generation, and debt management, are integral to maintaining fiscal health. Evidence-based policymaking, backed by research and analysis, emphasizes the need for fiscal discipline, efficient public spending, and stable revenue management (Caselli et al., 2022).

External forces' influence on fiscal viability should be considered. The fiscal health of Asian economies is susceptible to global economic trends, international commerce, and capital flows. Countries like Malaysia and Indonesia face challenges due to external factors, emphasizing the importance of understanding these impacts for long-term fiscal strategies (Melina et al., 2016).

Fiscal sustainability is a dynamic and intricate concept requiring continual attention and adaptation. Policymakers in Asian countries must navigate complex dynamics, adopting evidence-based strategies and drawing insights from domestic and foreign experiences. This approach ensures meeting changing population demands while ensuring long-term economic health (D'Erasmo, Mendoza, & Zhang, 2016).

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Fiscal sustainability requires a sophisticated analysis of factors influencing the economy, including economic growth, tax elasticity, fiscal multipliers, financial market swings, and political considerations. Policymakers must navigate complex dynamics for long-term viability, mitigating risks through responsible fiscal management and policy adjustments (Battistini, Callegari, & Zavalloni, 2019).

Macroeconomic factors provide insights into a government's fiscal health, supporting the development of policies for long-term sustainability. Achieving the right balance between economic growth, tax policy, fiscal stimulants, and political considerations is crucial for fiscal stability in the global economic environment (Bailey, 2015).

Asian economists must comprehend macroeconomic dynamics for sustainable budgets. Improving fiscal sustainability hinges on nonlinear aspects like economic growth, public debt dynamics, fiscal policy frameworks, demographic factors, and externalities. Proposing policy measures to address nonlinear effects is essential for managing debt dynamics and promoting economic growth (Krueger, Uhlig, & Xie, 2022).

After the 2008-2009 economic crisis, discussions on maintaining stable government finances gained prominence. The relationship between government spending and tax receipts' dependability is vital for macroeconomic viability and economic stability. Asian countries must decide whether addressing fiscal inefficiencies akin to OECD countries or implementing economic reforms is more crucial to prevent bankruptcy and default (Weiss, 2018).

Bohn's 2007 study challenges prior fiscal policy analyses, emphasizing the validity of transversality criteria for sustainability through stationarity tests. Assessing whether a state's primary balance positively influences debt and understanding government debt's uniqueness through various perspectives are crucial for determining sustainability (Naciti, 2019).

Various methods for assessing a company's sustainability over time have been explored. Evaluating government debt's uniqueness, assessing fiscal reaction functions for Ricardian consistency, and testing theoretical limits shed light on fiscal policy concerns. Long-term collaborations through the intertemporal government budget constraint lens underscore the need for sustainable spending and borrowing decisions over the long run (Giannakis & Papadopoulos, 2016).

The intertemporal government budget constraint argues that no government can indefinitely spend more than it collects in taxes and can never have a negative net worth. This concept emphasizes present decisions' interconnectedness and potential future effects, highlighting the necessity for checks and balances to preserve long-term economic stability (Muller, 2021).

Research findings guide visualizing long-term financial stability, especially pertinent in current circumstances. Fiscal response functions provide crucial data for implementing fiscal and monetary policies to protect the economy over the long run. However, sustainability without government involvement may have unintended consequences, emphasizing the role and extent of government engagement (Ahmed, Cary, Shahbaz, & Vo, 2021).

Understanding the findings of these studies is crucial for attaining and sustaining budgetary stability. Fiscal response functions guide policymakers, ensuring fiscal policy aligns with the proper monetary stance for long-term economic health. Evaluating long-term equilibrium relationships sheds light on the intensity of these effects, emphasizing the level and breadth of government engagement (Battiston, Dafermos, & Monasterolo, 2021).

The primary aim of undertaking the research is the estimation of the impact of macroeconomic indicators on fiscal sustainability from 1980 to 2021 and to deeply examine the issue of maintenance of fiscal as well as monetary sustainability and derive policy recommendations relevant to fiscal sustainability in a panel study of 22 Asian countries from 1980-2021. The research estimates the influence of public debt dynamics on fiscal sustainability in Asian countries. It is necessary to analyze how increasing public debt burdens can influence a government's potential to handle its revenues and expenditures to adjust long-term requirements, whether positively or negatively impacting the primary balance to sustain fiscal stability.

2. Literature Review

This study thoroughly examines microeconomic and macroeconomic factors influencing long-term fiscal sustainability, focusing on revenue, spending, GDP deflator, and interest rates. The research explores the nexus between economic growth, prosperity, and governmental fiscal practices, drawing on robust scholarly literature. Specific attention is given to the impact of small-scale interventions, such as tax cuts or a combination of tax and spending adjustments, on the overarching sustainability of budgets over extended periods.

The study employs a nuanced approach by assessing the responsiveness of consumption choices to tax cuts, positing that fiscal sustainability improves when this responsiveness exceeds one. The synergistic effect of tax cuts and spending reductions is investigated, demonstrating potential enhancements to economic sustainability when both measures are implemented simultaneously. The research extends to explore the broader implications of augmented budgetary sustainability on societal and economic well-being, drawing from insights provided by (Luporini, 2015).

A universally embraced tax reduction strategy is explored, postulating a multiplicative effect on tax collections. The hypothesis suggests that, despite an initial revenue decrease, the growth in the tax base may compensate for short-term declines, increasing the discounted value of future tax collections. Verification of the claim that reducing income tax rates can stimulate economic growth and fortify long-term fiscal balance is conducted through rigorous analysis, mirroring Barro's seminal work in 1989. The study underscores the evolving landscape of public finances, emphasizing the increasing importance of intertemporal solvency for governments to maintain fiscal stability, as highlighted by Kim, Wang, Park, and Petalcorin (2021).

An in-depth exploration into the revenue-increasing argument is undertaken, scrutinizing the circumstances under which it contributes to sustained long-term fiscal equilibrium. Utilizing a basic endogenous growth model developed by Turnovsky (2000), the research navigates the tradeoff between immediate and long-term impacts of fiscal policy changes. The study investigates conditions aligned with Laffer (1979) conclusions, delving into public consumption dynamics and manufacturing costs. Furthermore, an alternative approach involving an artificially increased intertemporal elasticity of substitution in income tax reduction is

considered, challenging the conventional Laffer argument that assumes a constant behavioral elasticity, as proposed by van Oudheusden (2016).

A comprehensive exploration of the deficit problem, government debts, and deficit impact is conducted, emphasizing the critical link between a one-unit increase in the primary deficit and a ten-unit increase in long-term interest rates based on a comprehensive panel survey of 16 developed countries. The study aligns with Lane (2015) VAR methodology, revealing similar findings indicating a significant rise in interest rates over a decade. Nonlinearity in the relationship between debt and interest rates, especially for countries surpassing a certain debt threshold, is highlighted. The study anticipates the increasing global relevance of fiscal policy as the world economy transcends national boundaries, acknowledging the local impact of global debts and deficits buildup.

The study underscores the far-reaching consequences of fiscal mismanagement, including the growth of national debt, reduced investment in crucial industries, and the development of long-term economic inefficiencies. The adverse impact harms domestic and international investment and reduces economic competitiveness. Ineffective fiscal policies divert funds from critical areas such as infrastructure, education, and research, further compounding economic challenges. The study advocates sound fiscal management to mitigate rising debt, declining competitiveness, inflationary pressures, and diminishing investor confidence. It calls for governments to prioritize growth-promoting and long-term fiscal measures, emphasizing the necessity of fiscal discipline, economic sustainability, and transparent budgeting practices in alignment with Tötterman (2017).

Mendoza and Ostry (2008) definition of intertemporal solvency as having sufficient future income and resources to service debt is incorporated, asserting that sustainable central government debt is vital for establishing fiscal solvency in both developed and emerging countries. The study delves into the significance of maintaining primary surpluses, where government income exceeds expenditures (excluding interest payments), as a prerequisite for intertemporal solvency. Manageable debt levels are posited when primary surpluses are sustained at sustainable levels, aligning with research by Mustapha and Prizzon (2015).

The research introduces the concept of "model-based sustainability" (MBS), evaluating a government's principal balance through a comparative analysis of primary surplus-to-income and debt-to-income ratios. The study applies methodological rigor, utilizing the Newey-White Test, robust standard errors, and accounting for potential nonlinearities, short-term effects, price increases, budget shortfalls, fixed effects, autocorrelation, and heteroscedasticity in panel data, as outlined by O'Toole and Slaymaker (2021).

The research expands its scope to encompass national and regional levels of fiscal sustainability, recognizing the centrality of fiscal stability for maintaining public services and infrastructure. The study identifies three key constraints affecting regional fiscal stability: seasonal influences, changes in developmental infrastructure, and demands from other states, aligning with Springmann et al. (2018). The author contends that adjustments must be made to revenue generation and spending to avoid challenges facing national and regional budgets, concluding with recommendations for future actions and acknowledging the complexity of changing public opinion.

Sustainability, defined as the ability to provide for current needs while safeguarding those of future generations, is posited as a guiding principle for businesses. Public sector fiscal sustainability is critical for fostering economic growth, experimentation with fiscal policies, and increasing collective income for future prosperity. The research explores domestic fiscal stability, emphasizing the government's capacity to meet financial obligations on time and in full each year. It suggests that for every 10-unit increase in revenue in the American economy, domestic public spending has the potential to expand by 6-8 units, highlighting the importance of addressing revenue and expenditure behavior fluctuations (Hall & Reis, 2015).

In a comparative empirical analysis by Alam and Taib (2013) within the Asia-Pacific region, two sets of developing nations were contrasted: the six "Debt Trap Countries" and the eight "Non-Debt Trap Countries." Central government debt positively correlated with fiscal deficit, current account deficit, and exchange rate depreciation. However, the strength of this correlation varied between countries facing a debt trap and those that were not. High coefficients for public debt, budget deficit, and exchange rate depreciation in debt-trap countries indicated increased borrowing, higher debt issuance, and greater utilization of foreign exchange reserves. Conversely, lower values for these factors in non-debt trap countries suggested reduced borrowing, diminished debt obligations, and less consumption of foreign reserves. Non-debt trap countries with significant current account deficit coefficients implied that borrowed funds were ineffective for the current account adjustments.

In contrast, a reduction in the current account deficit coefficient in debt-trap countries indicated a shift from current account deficit corrections to loans. The size of public debt was strongly correlated with the budget deficit or surplus and was heavily influenced by the personal agendas of officials. Governments swayed by special interests were prone to adopting expansionary fiscal policies, resulting in increased borrowing and a growing national debt, especially in developing countries facing budget shortfalls. The primary budget deficit and depreciating currency rate were key factors facilitating debt adjustment.

Considering the complex relationship between monetary and fiscal policies, Cavalcanti, Vereda, Doctors, Lima, and Maynard (2018) employed a Dynamic Stochastic General Equilibrium (DSGE) model to analyze macroeconomic consequences. They explored how fiscal policy adjustments, in response to monetary policy shocks, affected variables like output, inflation, consumption, investment, and employment. Their findings emphasized the intricate connections between government spending, borrowing, and the economy. Using wavelet analysis,Magazzino and Mutascu (2022) analyze the relationship between public spending and revenues in Italy. The findings reveal specific frequency wavelengths' significance in understanding the dynamics between public spending and revenues, offering policy implications.

The research contributes by introducing a composite financial stability index for GCC countries and exploring whether monetary authorities prioritize financial stability. Short and long-term responses of monetary authorities to financial stability shocks are analyzed for each GCC nation. The study covers vital events impacting GCC economies (Yousaf, Beljid, Chaibi, & Ajlouni, 2022). The paper adds to the literature by measuring stabilization for specific federal budget items and in the context of the global economy. It analyzes the effectiveness of revenue and expenditure items in stabilizing the economy, focusing on the federal unemployment

insurance system. A well-designed budget can maximize stabilization by bridging the gap between capital and labor mobility (McKay & Reis, 2016).

From the previous studies, it is proved that various research has been undertaken by many economists who have explored and investigated the positive association between economic development and fiscal sustainability, fiscal sustainability, and macroeconomic determinants concerning macroeconomic concerns through different approaches in the case of Pakistan. Unlike previous studies, this research takes a comprehensive approach to understanding how fiscal sustainability impacts macroeconomic determinants and overall economic development. By employing a range of statistical tools and economic approaches, we rigorously examine the economic reasoning behind the ratios and proxies used in our research, ensuring the validity and reliability of our findings.

Our research study goes beyond surface-level analysis, delving into the total impact of macroeconomic determinants on fiscal sustainability. We explore these impacts on the economy's overall fiscal and monetary health, both directly and indirectly. This understanding is further enhanced through ratios (Such as the tax-to-GDP ratio) and proxies (such as the GDP Deflator used as a proxy for inflation), providing a comprehensive economic landscape.

3. Material and Methods

This research empirically investigates fiscal sustainability and global liquidity across 22 Asian nations from 1980 to 2021, using a panel data set. The analysis focuses on central public debt sustainability, taxation revenues, and monetary policy effectiveness, measured by inflation, interest rates, and broad money, with STATA 13 employed for analysis.

3.1 Model Specification

The study aims to understand the dynamic link between government debt and primary fiscal balance to assess fiscal sustainability. The model includes major macroeconomic drivers such as GDP deflator, real interest rate, and broad money. The model is represented as:

$$SURPit = \alpha it + DEBTit + DFLit + INTExitit + INTRevit + TAXit + REVit + REALIntit + GOVTExpit + BROADMit + fi + \varepsilon it$$

Where:

- *SURPit* is the government's primary surplus as a percentage of GDP.
- *DEBTit* is central government debt as a percentage of GDP.
- *DFLit* is the GDP Deflator as a percentage of GDP.
- *INTExitit* is interest payments as an expense.
- *INTRevit* is interest payments as revenue.
- *TAXit* is tax revenue as a percentage of GDP.
- *REVit* is revenue excluding grants as a percentage of GDP.
- *REALIntit* is the real interest rate as a percentage of GDP.
- *GOVTExpit* is primary government expenditures as a percentage of GDP.
- *BROADMit* is broad money as a percentage of GDP.
- *fi* represents country fixed effects.
- εit is the white noise error term.

3.2 Variables Description

Central Government Debt (DEBTit): Represents overall debt accumulation, expressed as a percentage of GDP.

GDP Deflator (DFLit): Measures inflation by comparing current goods and services prices to a base year.

Interest Payments (INTExit and INTRevit): Represents expenses and revenues related to interest payments on government debt.

Tax Revenue (TAXit): Amount of money collected by the state through various taxes, expressed as a percentage of GDP.

Revenue excluding Grants (REVit): Overall income earned by the state, excluding foreign grants, as a percentage of GDP.

Real Interest Rate (REALIntit): The nominal interest rate is adjusted for inflation and expressed as a percentage of GDP.

Primary Government Expenditures (GOVTExpit): Aggregate primary expenditures, excluding interest payments, as a percentage of GDP.

Broad Money (BROADMit): Indicates the broad money supply within the economy, expressed as a percentage of GDP.

3.3 Model Selection

The study uses the Hausman test to choose between Fixed Effects Model (FEM) and Random Effects Model (REM). The results favor the Fixed Effects Model, indicating its efficiency for this investigation.

The fixed-effects model incorporates a distinct intercept term for each variable, remaining constant over time. Robustness tests include panel data serial correlation and heteroscedasticity tests. The Newey and West robust standard error method addresses issues of unequal variance and serially correlated disturbances.

Pesaran CD and Pesaran Scaled LMS tests are employed to detect cross-sectional dependence. This research employs a comprehensive model to analyze fiscal sustainability and global liquidity across Asian nations, utilizing robust econometric methods to ensure the reliability of results.

In the context of fiscal evaluation and economic growth, several key indicators play crucial roles in shaping policy recommendations. Interest Payments as Revenue (INTRevit) signifies the state's earnings derived from interest payments from various sources like loans or government investments. Tax Revenue as a Percentage of GDP (TAXit) represents the comprehensive sum collected through diverse taxes, including income, sales, corporation, and property taxes, calculated as a percentage of the country's GDP.

Revenue excluding Grants as a Percentage of GDP (REVit) gauges the overall income, excluding foreign grants, encompassing revenues from taxes, fees, fines, and other internal sources, expressed as a percentage of GDP.
Real Interest Rate as a Percentage of GDP (REALIntit) reflects the actual borrowing cost by adjusting the nominal interest rate for inflation. This indicator, presented as a percentage of GDP, helps assess the affordability and sustainability of public debt. Primary Government Expenditures as a Percentage of GDP (GOVTExpit) portrays the collective primary spending by the state, excluding interest payments. It covers healthcare, education, infrastructure, defense, and social welfare and is presented as a percentage of GDP. Broad Money as a Percentage of GDP (BROADMit) illustrates the economy's liquidity, including physical currency, deposits, and liquid assets, as a percentage of GDP.
These metrics are pivotal in evaluating a nation's fiscal health and economic trajectory and formulating recommendations for fiscal management, monetary policy, and overall economic development. In the econometric methodology, traditional panel data analysis explores fixed effects (FEM), random effects (REM), and the common constant model. The Hausman specification test aids in selecting the optimal model, ensuring robust analysis and meaningful policy insights.
Hausman (1978) proposed an approach to determine the most suitable model between Fixed Effects Model (FEM) and Random Effects Model (REM) for consistent and efficient results. The null hypothesis (H0) assumes REM's consistency and efficiency, while the alternative hypothesis (Ha) proposes FEM's consistency and efficiency. A significant level of 0.05 is employed, with a p-value comparison guiding the decision. Rejecting H0 (p-value < 0.05) favors FEM, while not rejecting it (p-value > 0.05) suggests REM is more suitable. The research, employing the Hausman test, concludes that FEM is more efficient (Agung & Siswantoro, 2015).
To ensure result reliability, econometricians implement robustness tests, scrutinizing Ordinary Least Squares (OLS) assumptions. A panel data serial correlation test, introduced by Drukker (2003) and enhanced by Semykina and Wooldridge (2010), assesses autocorrelation presence. A heteroscedasticity test investigates unequal variance, with both tests rejecting their null hypotheses due to p-values below the 5% significance level. The study addresses unequal variance and serial correlation using the Newey and West (1987) robust standard error method for more dependable statistical inference.
Cross-sectional dependence (CD) examines the correlation among different cross-sections in panel data. Detecting CD's presence is crucial, leading to employing Pesaran CD and Pesaran Scaled LMS tests. The null hypothesis for these tests assumes no cross-sectional dependence (Jadoon et al., 2022).
After confirming CD, the study delves into unit root tests, selecting methods based on CD presence. If the CD is absent, first-generation tests (Levin, Lin, and Chu, IPS Pesaran) are used. Second-generation tests (CIPS, Fisher-type ADF) are more appropriate if a CD is present. The CIPS test null hypothesis assumes a unit root's presence (Rashdan, Faisal, Tursoy, & Pervaiz, 2021). This multi-step methodology ensures thorough econometric analysis, enhancing the robustness and reliability of research outcomes.

4. Result and Discussion

The cross-sectional dependence (CD) test on panel data examines if there is cross-sectional dependence among the model's error terms and cross-sectional units, especially countries. This dependence, where error terms of different cross-sectional units are correlated, violates the assumption of cross-sectional independence crucial for standard panel data analysis. Diagnosing and addressing this dependence is vital for credible panel data analysis, ensuring reliable results. The CD test allows well-defined decisions on modeling techniques and necessary modifications to handle correlated error terms across cross-sectional units. The CD test results, shown in the Table 1.

Table 1: Cross-Sectional Dependence Test Results

Variables	CD Test	P value
Primary balance	-1.98	0.048
Central debt	5.37	0.000
GDP deflator	9.66	0.000
Interest expenses	0.23	0.817
Interest revenues	-1.04	0.296
Tax revenue GDP	2.25	0.025
Rev ex grants	-1.69	0.091
Real interest rate	1.85	0.065
Prim govt. expenditure	2.76	0.006
Broad money	39.82	0.000

The p-value signifies the statistical significance of the CD test, indicating the probability of observing the test statistic under the assumption that the null hypothesis is true. For this test, the null hypothesis is no cross-sectional dependence, and the alternative hypothesis is cross-sectional dependence.
In this case, p-values for primary balance, central debt, GDP deflator, tax revenues, primary expenditures, and broad money are all less than 0.05. Consequently, the null hypothesis is rejected, indicating cross-sectional dependence. Once detected, the study uses the second-generation test, CIPS (Cross-Sectional Augmented IPS).
The second-generation panel unit root test's CIPS test addresses first-generation tests' limitations when handling cross-sectional dependence and heterogeneity in the panel dataset. The test results are presented in Table 2.

Table 2: Cross-Sectional Augmented IPS Test Results

Variables	Level	First Difference
Primary balance	-0.2395 [0.4045]	-12.7329 [0.000]***
Central public debt	3.2619 [0.9994]	-9.3579 [0.000]***
GDP deflator	-5.8624 [0.000]***	
Interest payments of expenses	-0.7234 [0.2347]	-12.2743 [0.000]***
Interest payments of revenue	0.3998 [0.6554]	-11.5096 [0.000]***
Tax revenue	-1.6280 [0.0518]**	-14.6263 [0.000]***
Revenue excluding grants	-0.3920 [0.3475]	-15.7091 [0.000]***
Real interest rate	-2.1940 [0.0141]**	-19.3740 [0.000]***
Primary government expenditures	-1.2518 [0.1053]*	-16.1129 [0.000]***
Broad money	1.3144 [0.9056]	-9.0889 [0.000]***

The p-values help determine whether the variables contain a unit root at the level or are stationary at the first difference. For instance, the p-value for primary balance at the level is above 5%, accepting the null hypothesis that it contains a unit root. However, at the first difference, the p-value is below 5%, rejecting the null hypothesis and concluding that it is stationary. This process is repeated for each variable, providing a comprehensive understanding of the stationarity status of the panel dataset. The regression analysis examines the relationship between the dependent variable, Primary Balance, and various independent variables. Table 3 presents the results, providing coefficients, standard errors, t-statistics, and p-values for each variable.

Table 3: Simple OLS Regression Results

Variable	Coefficient	Std. Err.	T-stat	P-value
Central government debt	0.0503177	0.0299134	1.68	0.093
GDP deflator	-0.5458564	0.2075755	-2.63	0.009
Interest payments of expense	-1.847628	0.2836886	-6.51	0.000
Interest payments of revenue	2.063267	0.2553773	8.08	0.000
Tax revenue	3.422684	0.1828846	18.71	0.000
Revenue excluding grants	-1.4572	0.0755199	-19.30	0.000
Real interest rate	-0.7951014	0.2295247	-3.46	0.001
Primary government expenditures	0.0803423	0.0460016	1.75	0.081
Broad money	0.309096	0.0481198	6.42	0.000
Constant	8.439565	6.434595	1.31	0.190

The coefficient 0.0503177 suggests a 1% increase in central government debt is associated with a 0.0503177 increase in Primary Balance. However, the relationship is not statistically significant (p-value = 0.093), indicating potential unreliability. GDP Deflator of GDP 2 years: The coefficient -0.5458564 indicates that a 1% increase in GDP Deflator is associated with a decrease of 0.5458564 in Primary Balance. This relationship is statistically significant (p-value = 0.009), implying a meaningful association. Interest payments of expense: The coefficient -1.847628 suggests that a 1% increase in interest payments of expense leads to a decrease of 1.847628 in the Primary Balance. This coefficient is highly statistically significant (p-value < 0.001), indicating a strong negative relationship. The coefficient 2.063267 indicates that a 1% increase in interest payments of revenue results in a 2.063267 increase in Primary Balance. This coefficient is highly statistically significant (p-value < 0.001), suggesting a strong positive relationship. Tax revenue of GDP: The coefficient 3.422684 implies that a 1% increase in tax revenue leads to a 3.422684 increase in Primary Balance. This coefficient is highly statistically significant (p-value < 0.001), indicating a strong positive relationship. The coefficient -1.4572 suggests that a 1% increase in revenue excluding grants is associated with a decrease of 1.4572 in Primary Balance. This coefficient is highly statistically significant (p-value < 0.001), indicating a strong negative relationship. Real interest rate: The coefficient -0.7951014 implies that a 1% increase in the real interest rate is associated with a decrease of 0.7951014 in the Primary Balance. This coefficient is statistically significant (p-value = 0.001), indicating a significant relationship. The coefficient 0.0803423 suggests that a 1% increase in primary government expenditures leads to a 0.0803423 increase in Primary Balance. However, this coefficient is marginally statistically significant (p-value = 0.081), indicating a weak relationship. Broad money of GDP: The coefficient 0.309096 indicates that a 1% increase in broad money is associated with a 0.309096 increase in Primary Balance. This coefficient is highly statistically significant (p-value < 0.001), suggesting a strong positive relationship. The model's R-squared value of 0.5083 indicates that the independent variables explain 50.83% of the variation in Primary Balance. The model's F-statistic is highly significant (p-value < 0.001), indicating the overall model's statistical significance. The regression analysis examines the relationship between the dependent variable Primary Balance and a set of independent variables, including Central government debt total, GDP deflator, Interest payments of expense, Interest payments of revenue, Tax revenue of GDP, Revenue excluding grants, Real interest rate, Primary government expenditures, and Broad money of GDP. The heteroskedasticity tests assess the presence of unequal variances in the regression model, while the autocorrelation tests examine the existence of correlation in the dependent variable over time. The fixed-effects model accounts for individual-specific effects, providing more robust estimates than simple OLS regression.

The heteroskedasticity tests yield varied results. For the fitted values of Primary Balance, the test fails to reject the null hypothesis of constant variance, suggesting no significant evidence of heteroskedasticity. However, the tests reject the null hypothesis for individual independent variables and the entire model, indicating evidence of heteroskedasticity in the relationship between these variables and Primary Balance. The autocorrelation tests reveal first-order autocorrelation in the dependent variable Primary Balance. This suggests a correlation in Primary Balance over time, impacting the reliability of the regression results. The Wooldridge test rejects the null hypothesis for both Primary Balance alone and when considering all independent variables. For instance, an increase in Central government debt total is associated with a decrease in Primary Balance, suggesting that higher government debt levels may lead to lower primary budget balances. On the other hand, an increase in GDP tax revenue corresponds to an increase in primary balance, indicating that higher tax revenues as a percentage of GDP are associated with higher primary budget balances. The overall model has a low R-squared value, indicating that the independent variables explain only a tiny portion of the variation in Primary Balance. The F-test for the fixed-effects model suggests a statistically significant effect of the group variable (Code) on Primary Balance. Differences in signs between fixed-effects regression and simple OLS results are attributed to including individual-specific fixed effects in the fixed-effects model. These effects account for time-invariant features specific to each group, addressing issues of omitted variable bias and capturing within-group variation over time. The presented panel data set faces issues of heteroscedasticity and autocorrelation among the considered variables, requiring appropriate resolution. The Newey and White Test of Heteroscedasticity is employed as part of the diagnostics check to address these problems. Robust standard errors are crucial in regression analysis, significantly when assumptions of ordinary least squares (OLS) regression are compromised. These errors offer more dependable measures of uncertainty associated with coefficient estimates.
Interpreting the robust regression results:

Table 4: Robust Standard Errors Regression Results

Variable	Coefficient	Robust Std. Error	T-stat	P-value
Central government debt	0.0503177	0.0396981	1.27	0.205
GDP deflator	-0.5458564	0.2172441	-2.51	0.012
Interest payments of expense	-1.847628	0.2403905	-7.69	0.000
Interest payments of revenue	2.063267	0.2575192	8.01	0.000
Tax revenue	3.422684	0.2291799	14.93	0.000
Revenue excluding grants	-1.4572	0.0963954	-15.12	0.000
Real interest rate	-0.7951014	0.2328064	-3.42	0.001
Primary government expenditures	0.0803423	0.0471765	1.70	0.089
Broad money	0.309096	0.0957374	3.23	0.001
Constant	8.439565	10.3268	0.82	0.414

Central government debt total (p-value = 0.205): The coefficient of 0.0503 indicates that a 1% increase in the Central government debt total leads to a 0.0503 percent increase in the Primary Balance. However, the p-value is greater than 0.05, suggesting that the relationship may not be statistically significant. GDPDeflatorofGDP2yea (p-value = 0.012): The coefficient of -0.5459 implies that a 1% increase in GDPDeflatorofGDP2yea results in a 0.5459 percent decrease in the Primary Balance. The p-value is less than 0.05, indicating a statistically significant relationship. Interest payments of expense (p-value < 0.001): The coefficient of -1.8476 signifies that a 1% increase in Interest payments of expense results in a 1.8476 percent decrease in the Primary Balance. The p-value is less than 0.05, indicating a statistically significant relationship. Interest payments of Revenue (p-value < 0.001): The coefficient of 2.0633 implies that a 1% increase in Interest payments of Revenue leads to a 2.0633 percent increase in the Primary Balance. The p-value is less than 0.05, indicating a statistically significant relationship. Tax revenue of GDP (p-value < 0.001): The coefficient of 3.4227 suggests that a 1% increase in GDP tax revenue results in a 3.4227 percent increase in the primary balance. The p-value is less than 0.05, indicating a statistically significant relationship. Revenue excluding grants of (p-value < 0.001): The coefficient of -1.4572 indicates that a 1% increase in Revenue excluding grants of results in a 1.4572 percent decrease in the Primary Balance. The p-value is less than 0.05, indicating a statistically significant relationship. Real interest rate (p-value = 0.001): The coefficient of -0.7951 implies that a 1% increase in real interest rate results in a 0.7951 percent decrease in the Primary Balance. The p-value is less than 0.05, indicating a statistically significant relationship. Primary government expenditures (p-value = 0.089): The coefficient of 0.0803 suggests that a 1% increase in Primary government expenditures results in a 0.0803 percent increase in the primary balance. However, the p-value is greater than 0.05, suggesting the relationship is statistically insignificant. Broad money of GDP (p-value = 0.001): The coefficient of 0.3091 suggests that a 1% increase in GDP results in a 0.3091 percent increase in the Primary Balance. The p-value is less than 0.05, indicating a statistically significant relationship. Additionally, the constant term provides the anticipated value of the Primary Balance when all independent variables are zero, which is 8.4396. The R-squared value of 0.5083 signifies that the model explains 50.83% of the variation in the dependent variable. At the same time, the F-test with a probability of 0.0000 indicates the overall statistical significance of the model.

5. Conclusion

The research investigates the influence of macroeconomic determinants on fiscal sustainability through a thorough and detailed procedure. The study delves into the impact of various macroeconomic factors on fiscal stability, analyzing fiscal policy variables like tax revenues, public expenditures, and primary surplus and monetary policy variables such as the GDP deflator, interest rates,

and money supply. This comprehensive approach aims to provide insights into fiscal long-term stability and overall economic sustainability by incorporating monetary policy tools. The panel data spans from 1980 to 2021, covering 22 Asian countries, with exclusions due to data unavailability for other nations. The fixed effects estimation methodology is employed, and results are validated using the Hausman Specification Test, which compares fixed and random effects results to determine the most optimal approach for reliable estimations. Findings indicate that government debt, interest payments, tax revenues, and primary government expenditures significantly impact the primary budget balance. The random-effects GLS model is chosen for a detailed understanding, considering both within-group and between-group variations. However, the interpretation must consider specific dataset characteristics, model assumptions, and economic reasoning. The Hausman specification test suggests that the fixed effects approach is more appropriate. For robustness, the Newey White Test is applied to address heteroscedasticity and autocorrelation issues in the panel dataset, utilizing robust standard errors for optimal and valid results. Results highlight positive responses to indicators like central public debt, interest payments of revenues, tax revenues of GDP, primary government expenditures, and broad money to fiscal sustainability. Conversely, GDP deflator, interest payments of expense, revenue excluding grants, and real interest rate negatively impact the primary surplus balance. Robust standard errors are a statistical tool in regression analysis, estimating standard errors of coefficient estimates when OLS assumptions are violated. These errors offer more reliable measures of uncertainty associated with coefficient estimates. LLC (Levin, Lin, and Chu) and Pesaran (IPS) tests are applied to check for cross-sectional dependence. Results indicate that, except for the real interest rate and GDP Deflator, all variables are stationary at the first difference, emphasizing the importance of considering unit root tests for robust analysis. First-generation panel unit root tests, like IPS and LLC, address cross-sectional dependence and heterogeneity. These tests assess the unit root hypothesis against stationarity, assuming a common unit root process across panel individuals. Understanding the stationary nature of variables is crucial for reliable panel data analysis, with p-values guiding the acceptance or rejection of unit root hypotheses.

5.1 Future Work

Future research on fiscal sustainability and macroeconomic determinants can advance by diversifying indicators and adopting sophisticated methodologies beyond simple OLS. In-depth PhD research and articles could benefit from exploring advanced estimation techniques, such as structural models, dynamic panel models, or instrumental variable approaches. This would enhance the precision and robustness of findings, providing a more nuanced understanding of the intricate relationships between fiscal policies and macroeconomic variables. By incorporating innovative methodologies, researchers can contribute to a more comprehensive and improved analysis, offering valuable insights for policymakers and economists striving to navigate the complexities of fiscal sustainability in a rapidly evolving global economic landscape.

References

Agung, I. G. N., & Siswantoro, D. (2015). Heterogeneous Regressions, Fixed Effects Or Random Effects Models: Is Your Accounting Model Appropriately Presented? *Statistics, Mathematics, Teaching, and Research*, 27.

Ahmed, Z., Cary, M., Shahbaz, M., & Vo, X. V. (2021). Asymmetric nexus between economic policy uncertainty, renewable energy technology budgets, and environmental sustainability: Evidence from the United States. *Journal of Cleaner Production, 313*, 127723.

Alam, N., & Taib, F. M. (2013). An investigation of the relationship of external public debt with budget deficit, current account deficit, and exchange rate depreciation in debt trap and non-debt trap countries. *European Scientific Journal, 9*(22).

Ali, A. (2015). *The impact of macroeconomic instability on social progress: an empirical analysis of Pakistan*. (Doctoral dissertation, National College of Business Administration & Economics Lahore).

Ali, A., & Audi, M. (2018). Macroeconomic Environment and Taxes Revenues in Pakistan: An Application of ARDL Approach. *Bulletin of Business and Economics* (BBE), 7(1), 30-39.

Ali, A., & Rehman, H. U. (2015). Macroeconomic instability and its impact on the gross domestic product: an empirical analysis of Pakistan. *Pakistan Economic and Social Review*, 285-316.

Audi, M., & Ali, A. (2023). Public Policy and Economic Misery Nexus: A Comparative Analysis of Developed and Developing World. *International Journal of Economics and Financial Issues*, *13*(3), 56.

Audi, M., Ali, A., & Hamadeh, H. F. (2022). Nexus Among Innovations, Financial Development and Economic Growth in Developing Countries. *Journal of Applied Economic Sciences*, *17*(4).

Baharumshah, A. Z., Soon, S.-V., & Lau, E. (2017). Fiscal sustainability in an emerging market economy: When does public debt turn bad? *Journal of Policy Modeling, 39*(1), 99-113.

Bailey, D. (2015). The environmental paradox of the welfare state: The dynamics of sustainability. *New political economy, 20*(6), 793-811.

Battistini, N., Callegari, G., & Zavalloni, L. (2019). Dynamic fiscal limits and monetary-fiscal policy interactions.

Battiston, S., Dafermos, Y., & Monasterolo, I. (2021). Climate risks and financial stability (Vol. 54, pp. 100867): Elsevier.

Caselli, F., Davoodi, M. H. R., Goncalves, C., Hong, M. G. H., Lagerborg, A., Medas, M. P. A., . . . Yoo, J. (2022). *The return to fiscal rules*: International Monetary Fund.

Cavalcanti, M. A., Vereda, L., Doctors, R. d. B., Lima, F. C., & Maynard, L. (2018). The macroeconomic effects of monetary policy shocks under fiscal rules constrained by public debt sustainability. *Economic Modelling, 71*, 184-201.

Chugunov, I., & Makohon, V. (2019). Fiscal strategy as an instrument of economic growth. *Baltic Journal of Economic Studies, 5*(3), 213-217.

D'Erasmo, P., Mendoza, E. G., & Zhang, J. (2016). What is a sustainable public debt? *Handbook of macroeconomics* (Vol. 2, pp. 2493-2597): Elsevier.

Giannakis, M., & Papadopoulos, T. (2016). Supply chain sustainability: A risk management approach. *International journal of production economics, 171*, 455-470.

Hall, R. E., & Reis, R. (2015). Maintaining central-bank financial stability under new-style central banking: National Bureau of Economic Research.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the econometric society*, 1251-1271.

Holtfrerich, C.-L., Feld, L. P., Heun, W., Illing, G., Kirchgässner, G., Kocka, J., . . . Walter, S. (2016). Government debt: causes, effects and limits. *Berlin-Brandenburg Academy of Sciences and Humanities. Berlin, 76*.

Jadoon, A. K., Sarwar, A., Qasim, H. M., Javaid, M. F., Liaqat, S., & Ahmed, M. (2022). Some methodological considerations for the relationship between environmental degradation, economic growth and energy consumption for South Asian countries. *International Journal of Energy Economics and Policy, 12*(1), 365-372.

Kim, J., Wang, M., Park, D., & Petalcorin, C. C. (2021). Fiscal policy and economic growth: some evidence from China. *Review of World Economics, 157*(3), 555-582.

Krueger, D., Uhlig, H., & Xie, T. (2022). Macroeconomic dynamics and reallocation in an epidemic: evaluating the 'Swedish solution'. *Economic Policy, 37*(110), 341-398.

Laffer, A. B. (1979). Statement prepared for the joint economic committee. *The economics of the tax revolt: a reader. New York: Hardcourt Brace Jovanovich*.

Lane, P. R. (2015). International financial flows and the Eurozone crisis. *The Eurozone Crisis, 129*, 129-133.

Luporini, V. (2015). Sustainability of Brazilian fiscal policy, once again: corrective policy response over time. *Estudos Econômicos (São Paulo), 45*, 437-458.

Magazzino, C., & Mutascu, M. I. (2022). The Italian fiscal sustainability in a long-run perspective. *The Journal of Economic Asymmetries, 26*, e00254.

McKay, A., & Reis, R. (2016). The role of automatic stabilizers in the US business cycle. *Econometrica, 84*(1), 141-194.

Melina, G., Yang, S.-C. S., & Zanna, L.-F. (2016). Debt sustainability, public investment, and natural resources in developing countries: The DIGNAR model. *Economic Modelling, 52*, 630-649.

Mendoza, E. G., & Ostry, J. D. (2008). International evidence on fiscal solvency: Is fiscal policy "responsible"? *Journal of Monetary Economics, 55*(6), 1081-1093.

Muller, S. M. (2021). The dangers of performative scientism as the alternative to anti-scientific policymaking: a critical, preliminary assessment of South Africa's Covid-19 response and its consequences. *World Development, 140*, 105290.

Mustapha, S., & Prizzon, A. (2015). Debt sustainability and debt management in developing Countries. *Economic and Private Sector Professional Evidence and Applied Knowledge Service Topic Guide. London: Overseas Development Institute*.

Naciti, V. (2019). Corporate governance and board of directors: The effect of a board composition on firm sustainability performance. *Journal of Cleaner Production, 237*, 117727.

Newey, W. K., & West, K. D. (1987). Hypothesis testing with efficient method of moments estimation. *International Economic Review*, 777-787.

O'Toole, C., & Slaymaker, R. (2021). Repayment capacity, debt service ratios and mortgage default: An exploration in crisis and non-crisis periods. *Journal of Banking & Finance, 133*, 106271.

Rashdan, M. O. J., Faisal, F., Tursoy, T., & Pervaiz, R. (2021). Investigating the N-shape EKC using capture fisheries as a biodiversity indicator: empirical evidence from selected 14 emerging countries. *Environmental Science and Pollution Research, 28*(27), 36344-36353.

Semykina, A., & Wooldridge, J. M. (2010). Estimating panel data models in the presence of endogeneity and selection. *Journal of Econometrics, 157*(2), 375-380.

Springmann, M., Wiebe, K., Mason-D'Croz, D., Sulser, T. B., Rayner, M., & Scarborough, P. (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. *The Lancet Planetary Health, 2*(10), e451-e461.

Tötterman, K. (2017). *The effects of fiscal policy on long-term interest rates: evidence from 29 OECD countries.*

Turnovsky, S. J. (2000). Fiscal policy, elastic labor supply, and endogenous growth. *Journal of Monetary Economics, 45*(1), 185-210.

van Oudheusden, P. (2016). Fiscal policy reforms and dynamic Laffer effects. *International Tax and Public Finance, 23*, 490-521.

Weiss, M. A. (2018). Asian Infrastructure Investment Bank (AIIB). *Current Politics and Economics of South, Southeastern, and Central Asia, 27*(1/2), 1-29.

Yared, P. (2019). Rising government debt: Causes and solutions for a decades-old trend. *Journal of Economic Perspectives, 33*(2), 115-140.

Yousaf, I., Beljid, M., Chaibi, A., & Ajlouni, A. A. (2022). Do volatility spillover and hedging among GCC stock markets and global factors vary from normal to turbulent periods? Evidence from the global financial crisis and Covid-19 pandemic crisis. *Pacific-Basin Finance Journal, 73*, 101764.