

Unpacking Macroeconomic Performance in Pakistan: An Index Construction Approach

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Abstract

Background and Objectives: Pakistan's macroeconomic trajectory has remained highly volatile since independence, characterized by persistent fiscal deficits, elevated inflation, monetary and external imbalances, rising unemployment, and vulnerability to global shocks. In the early 1970s, post-partition debt pressures and oil shocks contributed to inflation and fiscal deficits hovering around 7–8%. Subsequent decades were marked by recurring cycles of reforms and crises. During the 1980s, relative macroeconomic stability under non-democratic regimes was followed by the liberalization challenges of the 1990s, compounded by nuclear tests and sanctions; inflation reached 12.37% in 1994. The 2008 global financial crisis further exacerbated fiscal deficits and public debt. More recently, IMF-supported programs initiated in 2019 and 2023 sought to address balance-of-payments pressures, yet inflation surged to 30.78% in 2023, unemployment remained in the 4–6% range, and external sector performance remained constrained. Existing research often focuses on one or a few indicators of macroeconomic performance, which can overlook the complex interrelationships among fiscal, monetary, and external variables. Composite indices—such as those developed by the Organisation for Economic Co-operation and Development (OECD) and the International Monetary Fund (IMF)—offer a more comprehensive representation of macroeconomic conditions. Against this backdrop, this study aims to develop a composite macroeconomic performance index (MPI) for Pakistan using annual data for 1972–2024.

Methodology: A composite MPI for Pakistan is constructed using two complementary approaches: Principal Components Analysis (PCA) and Sarma's (2008) distance-based (normative) method. The index integrates eight key indicators of macroeconomic performance: fiscal balance, public debt, inflation rate, trade openness, unemployment rate, broad money supply, interest rate, and the real exchange rate. Using both approaches allows assessment of whether alternative aggregation frameworks yield consistent signals regarding Pakistan's macroeconomic performance and its evolution over time. For the PCA-based MPI, component weights are derived from eigenvalues, and the first three principal components are retained because they capture the maximum

variance. These three components account for 54.6% of the total variation over 1972–2024 and provide the most robust summary of the underlying macroeconomic environment within the PCA framework. In contrast, the distance-based index (UNDP-style) normalizes the same eight indicators using min–max scaling and evaluates each year’s proximity to a predefined “ideal” macroeconomic stance, characterized by low inflation, a moderate increase in broad money supply and interest rates, manageable budget deficits and public debt, a stable exchange rate, and higher trade openness. Together, these methods provide a structured way to synthesize multiple macroeconomic dimensions into a single index while retaining sensitivity to both data-driven variance (PCA) and normative benchmarks (distance-based method).

Key Findings: The MPI dynamics reveal substantial shifts in Pakistan’s macroeconomic performance during 1972–2024, with alternating periods of relative stability and instability. Notable instability is observed in the early 1970s, during 2006–2012, and again from 2021 onward, whereas the 1980s, the 1990s, the early 2000s, and 2016 appear relatively more stable. Taken together, the index patterns underscore that macroeconomic performance in Pakistan has not followed a linear improvement path; instead, it has been shaped by repeated shocks and policy adjustment episodes. The use of two index construction methods is intended to provide a more robust depiction of these shifts, by examining whether the broad timing of stable versus unstable periods is consistently reflected across alternative aggregation strategies.

Policy Implications: The results highlight the fundamental role of public debt management, price stability, fiscal discipline, stable exchange rate conditions, monetary management, and trade openness in shaping macroeconomic performance in Pakistan. Importantly, improvements in individual indicators may not fully reflect overall macroeconomic conditions when other dimensions deteriorate. By offering an integrated measure of performance, the MPI developed in this study can support more holistic policy assessment and monitoring. Achieving sustainable improvements in macroeconomic performance requires strengthening structural reforms, improving domestic revenue systems, promoting export diversification beyond textiles, and reducing reliance on temporary or short-term stabilization measures.

Keywords: Macroeconomic Performance; Principal Components Analysis; Sarma’s Normative Approach

JEL Classification Codes: C38; C43; E31; E52; E62

1. Introduction

In recent years, various indices have been developed to gauge economic performance, including corporatism (Crouch, 1985) and central bank independence (Cukierman et al., 1992). Indices have also been constructed to assess economic well-being, freedom, and human development (Osberg & Sharpe, 1999; UNDP, 2000). However, such indices have received limited attention as indicators of a country’s overall macroeconomic performance. Macroeconomic performance reflects a country’s

overall health and efficiency and is typically characterized by low inflation, high and stable employment, a balanced budget, stable growth in broad money supply, stable interest and exchange rates, and a high degree of trade openness. These indicators often yield heterogeneous outcomes, leading to different implications across indicators often yield heterogeneous outcomes, leading to varying implications across economies (Hurduzeu & Lazar, 2015). Moreover, GDP growth alone does not provide a complete picture of macroeconomic health, especially when accompanied by high inflation or unemployment (Belke, 2020). Montiel and Serven (2006) and di Giovanni and Levchenko (2010) noted that developing countries are more vulnerable to macroeconomic instability because they are more exposed to shocks and have less capacity to absorb them. Many empirical studies have concluded that macroeconomic instability undermines a country's economic performance by reducing consumption, investment, and factor productivity, and by weakening the quality of macroeconomic policies (Afonso & Furceri, 2010; Loayza et al., 2007). Macroeconomic instability may improve returns on investment and growth performance only in the presence of a high-quality institutional framework, as stronger domestic institutions can mitigate the adverse effects of shocks (Fatas & Mihov, 2006; Ranciere et al., 2008). Earlier literature primarily focused on growth stability and cross-country variations (Acemoglu et al., 2003) and largely overlooked macroeconomic performance. Belke (2020) argued that to assess a country's macroeconomic performance more accurately, it is necessary to examine indicators beyond GDP. Ali and Rehman (2015) similarly noted that stable macroeconomic performance is essential for both businesses and policymakers. Kahreman (2025) suggested that a more balanced and informative assessment of macroeconomic performance should rely on several key indicators or composite indices that capture the broader and more complex structure of national economies.

Against this backdrop, this study aims to construct a composite Macroeconomic Performance Index (MPI) to assess the macroeconomic performance of Pakistan over the period 1972–2024. Pakistan provides an appropriate case due to recurring cycles of economic stability and instability (Rahman et al., 2020). During episodes of instability, Pakistan has experienced excessive and persistent fiscal deficits, a high public-debt-to-GDP ratio, a low tax-to-GDP ratio, a low investment-to-GDP ratio, substantial exchange-rate depreciation, high borrowing costs, and elevated inflation (Khan et al., 2025). These macroeconomic imbalances contribute to low and volatile capital formation and economic growth. To measure the overall stance of Pakistan's economy, this study constructs a broad-based MPI that summarizes eight core variables—public debt, budget deficit, inflation rate, trade openness, unemployment rate, changes in the real exchange rate, interest rate, and broad money supply—which collectively shape macroeconomic performance. The index serves two purposes: (i) it provides a summary measure to evaluate macroeconomic performance across decades, and (ii) it helps resolve inconsistencies that arise when a single indicator produces conflicting policy signals that may not accurately reflect the economy's overall condition. In this way, the MPI consolidates multiple facets of macroeconomic performance into a single, succinct

statistic and provides informative signals regarding improvement or deterioration in the economy.

Previous studies have often relied on inflation as a proxy for macroeconomic instability (Mamon & Qureshi, 2020) and concluded that high inflation increases volatility in relative prices, raises investment risk, slows economic growth, and exacerbates inequality. However, Fisher (1993) and Sahay and Goyal (2006) emphasized that multiple factors—including exchange rates, interest rates, external debt, fiscal deficits, inflation, and trade deficits—can jointly undermine macroeconomic performance. In this regard, Azam (2001) suggested that an instability index combining inflation and nominal exchange-rate volatility provides a more appropriate measure than inflation alone. Similarly, Sanchez-Robles (1998) included inflation, fiscal deficits, public expenditure, and market distortions to evaluate macroeconomic performance, while Ismihan et al. (2005) incorporated inflation, exchange rates, external debt, and deficit-to-GNP ratios. More recently, Owusu-Ankamah and Sakyi (2021) developed a composite index using inflation, exchange rates, the budget deficit-to-GDP ratio, the prime interest rate, and changes in external debt, whereas Neffati and Sallam (2021) considered inflation, the budget deficit-to-GDP ratio, unemployment, changes in the terms of trade, and changes in the real exchange rate. They concluded that trade, investment, and monetary policy are key drivers of macroeconomic performance in North American countries.

In Pakistan, Shahbaz (2013) have used the inflation rate as a proxy for macroeconomic instability, while Iqbal and Zahid (1998) have used the misery index as a measure of macroeconomic instability, which consists of the inflation rate and the unemployment rate. Ramzan and Ahmad (2014) used the inflation rate, fiscal balance, and trade openness, while Ali and Rehman (2015) selected inflation rate, unemployment, trade deficit-to-GDP ratio, and budget deficit-to-GDP ratio in constructing the macroeconomic instability index. More recently, Ditta and Hayat (2017) constructed a macroeconomic policy instability index for a panel of 22 countries, including Pakistan, using the inflation rate, the external debt-to-GNP ratio, the public deficit-to-GDP ratio and the exchange rate. Unlike the above-cited studies, the present study constructs a broad-based macroeconomic performance index by including the inflation rate, the public debt-to-GDP ratio, the budget deficit-to-GDP ratio, trade openness, the unemployment rate, the money supply-to-GDP ratio, the interest rate, and changes in the real exchange rate.

Despite the growing body of research, there is no consensus on the most appropriate indicators or methodologies for measuring macroeconomic performance. Traditional studies that focus on isolated variables (Burnside & Dollar, 2000) often fail to capture its multidimensional nature. In Pakistan, fragmented fiscal, monetary, and trade policies, together with external shocks and structural weaknesses, highlight the need for a more holistic analytical framework. Composite indices such as a MPI provide a unified approach by integrating key fiscal, monetary, and external-sector indicators—such as the budget deficit, public debt, inflation, interest rate, exchange rate

depreciation, broad money growth, and trade openness—into a single measure of overall performance. This approach is consistent with macroeconomic-stability benchmarks used in policy frameworks, such as the Maastricht criteria, which emphasize inflation stability, long-term interest rates, fiscal deficits, public debt sustainability, and exchange-rate stability (Baun, 2018; Imanov et al., 2018).

Most earlier studies adopted the United Nations Development Programme (UNDP, 2000) index-construction approach—originally used to construct the Human Development Index—which is suitable for assessing levels of macroeconomic performance but less effective in capturing the influence of dynamic policy changes over time. To address this limitation, this study employs Principal Component Analysis (PCA) (Boivin & Ng, 2006) and applies Sarma’s (2008) distance-based approach for comparison. PCA provides a variance-based statistical perspective, whereas the UNDP/Sarma approach evaluates proximity to an ideal policy stance (Sarma, 2008; Sharma & Kumar, 2022). This dual-method framework enables a more robust evaluation of Pakistan’s macroeconomic performance.

This study makes three main contributions: First, it constructs a long-term MPI for Pakistan for the period 1972 to 2024. Second, it employs both PCA and the UNDP (2000) methodologies to capture both the statistical and normative aspects of macroeconomic performance. Third, it offers a replicable and data-driven framework that can be applied to other developing economies.

While PCA and Sarma’s methods have been separately applied to construct either macroeconomic policy, or to the best of our knowledge no study has constructed a long-term macroeconomic performance index for the Pakistan economy. Covering an extended historical period from 1972 to 2024, this study constructs the MPI using the public debt-to-GDP ratio, the budget deficit-to-GDP ratio, inflation, trade openness, the unemployment rate, real exchange rate volatility, the broad money supply-to-GDP ratio, and the interest rate. The proposed MPI thus offers an innovative and adaptable tool for assessing the macroeconomic performance of Pakistan and other comparable developing economies.

The remainder of the paper is organized as follows: Section 2 outlines the components of the MPI. Section 3 reviews the theoretical and empirical literature. Section 4 discusses the methodology, data, and results. Section 5 concludes the paper, and Section 6 discusses policy implications.

2. An Overview of MPI Components

A MPI, which measures the overall stance of the economy and allows for inter-temporal and cross-country comparisons, would be valuable for economic policy analysis in Pakistan. Eken et al. (2017) developed an MPI using five indicators, namely the inflation rate, economic growth, unemployment and long-term interest rates, and the exchange rate, and argued that such an index better explains the overall economic stance in emerging economies. However, we believe that, in addition to the inflation rate (INFR), unemployment rate (UR), and long-term interest rate (INTR), public debt-

to-GDP ratio (PD), budget deficit-to-GDP ratio (BD), trade openness (TO), money supply-to-GDP ratio (GM), and real exchange rate depreciation (DRER) should also be integral components of the MPI. Therefore, the MPI can be written in functional form as:

$$MPI = f(PD, BD, INF, TO, UR, GM, INTR, DRER) \quad (1)$$

These variables are used in the construction of the MPI because they are closely linked with macroeconomic performance in Pakistan. Bleaney (1996) and Ocampo (2005) argued that the malfunctioning of economy and unhealthy public and private sector balance sheets can generate macroeconomic instability, which impedes growth, consumption, investment, and factor productivity, thereby undermining the quality of macroeconomic policies (Afonso & Furceri, 2010; Loayza et al., 2007). High inflation, unemployment, external debt and fiscal imbalances increase economic vulnerabilities and consequently deteriorate macroeconomic performance. The MPI comprises various indicators that influence the macroeconomic performance of an economy. The first indicator is public debt-to-GDP ratio, which represents the government's total borrowing to finance budget deficits. Oyadeyi et al. (2024) noted that moderate levels of debt can stimulate domestic investment, support capital formation, create employment opportunities, and promote long-term economic growth. However, while debt may stimulate aggregate demand and output in the short run, excessive accumulation can discourage investment and production in the long run (Elmendorf & Mankiw, 1999; Reinhart and Rogoff, 2010). Previous studies show that high public debt constraints fiscal flexibility (Aghion & Kharroubi, 2007), discourages capital formation (Baldacci & Kumar, 2010), reduces household spending and entrepreneurship (Cumming & Hubert, 2022), and contributes to high inflation (Maitra, 2019). Together, these factors increase macroeconomic instability and weaken overall macroeconomic performance (Zeimann, 2012). Albulescu (2010) argued that higher levels of the debt-to-GDP ratio can disturb the government's balance sheet and influence future fiscal costs. Higher levels public debt may also affect macroeconomic policies designed to mitigate inflation rates.

The second indicator is the budget deficit-to-GDP ratio, which arises when government spending exceeds government revenue. Large and prolonged deficits, especially in countries like Pakistan with a narrow tax base, often lead to higher inflation, rising debt, and overall instability (Alesina & Perotti, 1996). A high value of budget deficit negatively affects capital accumulation and productivity (Ramzan & Ahmad, 2014). Both the public debt-to-GDP ratio and the budget deficit-to-GDP ratio are therefore included as measure of the fiscal policy stance.

Inflation is the third indicator, which increases the general price level and reduces purchasing power. If not properly controlled, it can affect savings and investment decisions. Ramzan and Ahmad (2014) found that inflation harms economic growth by creating uncertainty and discouraging investment. Price stability is a fundamental objective of the State Bank of Pakistan because a stable price level is essential for financial stability and restoring investor's confidence. In Pakistan,

inflation often results from supply shocks, loose monetary policy, and weak fiscal management. These factors hinder poverty reduction and slow balanced growth.

The fourth indicator is trade openness, which is measured as the ratio of exports plus imports to GDP and reflects the extent to which an economy is integrated with global markets. Greater openness generally improves efficiency and promotes economic growth. However, these benefits depend on how effectively an economy manages external shocks and diversifies its exports. Fisher (1993) pointed out that inflation, fiscal deficits, and distorted foreign exchange markets reduce the gains from trade and weaken economic growth. Moreover, increased trade openness can attract higher levels of foreign investment, which positively contribute to economic growth.

The fifth indicator is real exchange rate (RER) depreciation, which is included to capture the influence of international competitiveness on macroeconomic performance. Large fluctuations in the exchange rate may signal macroeconomic instability, which can undermine financial market stability and, consequently, economic productivity. The RER is constructed as a relative-price measure of competitiveness, combining the nominal exchange rate with price levels in Pakistan and the United States; higher values indicate real depreciation. Exchange-rate misalignment and depreciation patterns can significantly affect economic growth and income distribution (Jehan & Irshad, 2020). Ribeiro et al. (2020) further conclude that, in developing countries—including Pakistan—the distributional effects of real exchange-rate movements play a significant role in shaping income distribution.

Unemployment rate is the sixth indicator, which reflects labor market imperfections that directly affect economic growth and income distribution within a country. In Pakistan, unemployment is associated with inflation and the level of money supply. Empirical evidence suggests that lower inflation is often linked to higher unemployment and vice versa (Stylianou et al., 2024). In this study, the unemployment rate is included to measure the economy's production stance (Khramov & Lee, 2013). Interest rate is the seventh indicator, influencing macroeconomic performance through its impact on investment expenditure. Higher interest rates negatively impact investment decisions through credit availability and monetary transmission mechanism (Akbar, 2021). Finally, the broad money supply-to-GDP ratio is included in the index because it reflects the liquidity conditions of an economy, which are crucial in determining inflation, consumption, and investment levels in both the short-run and the long-run (Gillani & Abdin, 2021). Therefore, the inflation rate, money supply relative to GDP, and the interest rate are included as measures of monetary policy stance (Khramov & Lee, 2013).

Figure 1 depicts the trends in the public debt-to-GDP ratio, real exchange rate, broad money supply-to-GDP ratio and trade openness. Figure 2 presents the trends in the unemployment rate, interest rate, and budget deficit-to-GDP ratio.

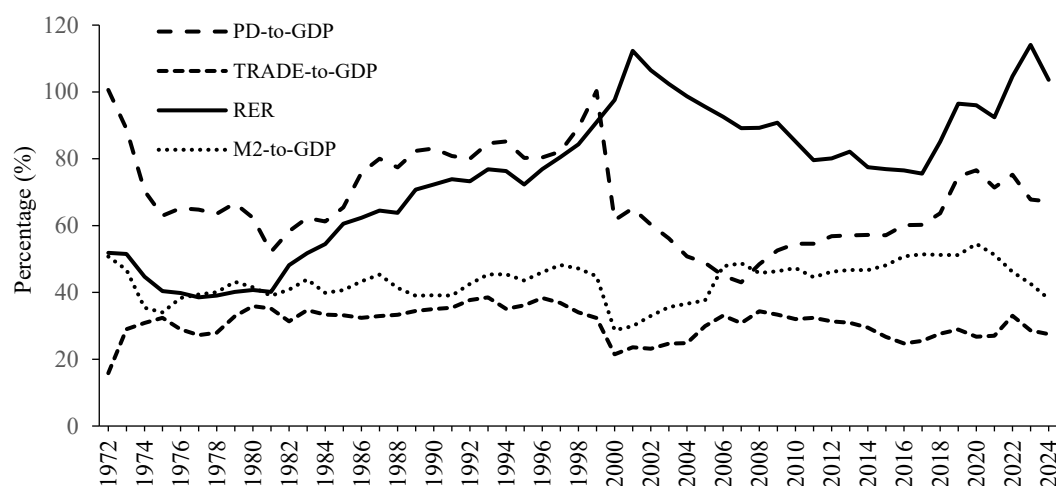


Figure 1. Public Debt, Real Exchange Rate, Broad Money, and Trade Openness, 1972–2024

Source: Authors' calculations and illustration based on Pakistan Economic Survey (various issues) and World Bank, World Development Indicators.

Note: PD-to-GDP, M2-to-GDP, RER, and TO-to-GDP denote the public debt-to-GDP ratio, broad money-to-GDP ratio, real exchange rate, and trade-to-GDP ratio, respectively.

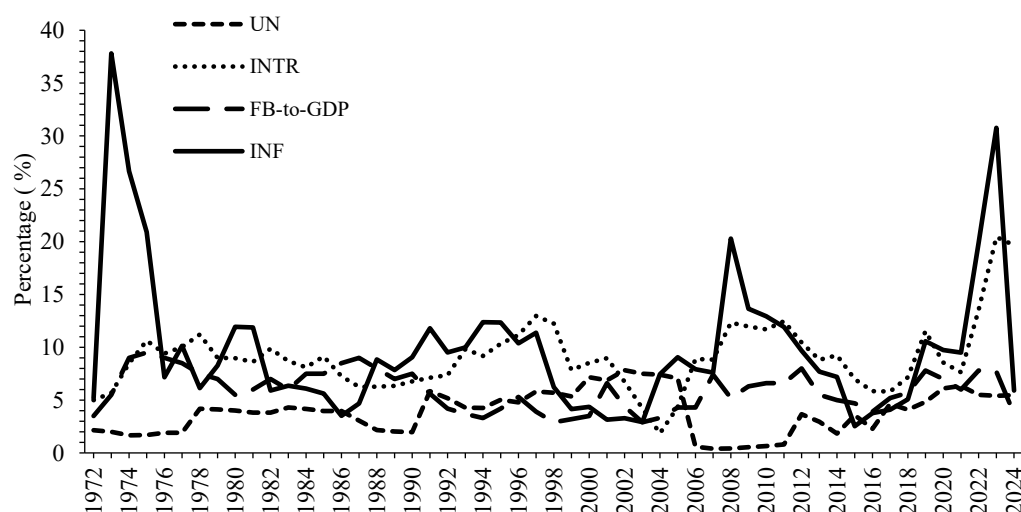


Figure 2. Unemployment Rate, Interest Rate, Budget Deficit-to-GDP Ratio and Inflation Rate

Source: Authors' calculations and illustration based on Pakistan Economic Survey (various issues).

Note: UN, INTR, FB-to-GDP, and INF denote the unemployment rate, interest rate, budget deficit-to-GDP ratio, and inflation rate, respectively.

Figures 1 and 2 illustrate the changes in Pakistan's macroeconomic indicators from 1972 to 2024. It is evident from Figure 2 that inflation has been highly unstable over the period. It reached about 38% in 1973 during the global oil crisis and then

remained relatively moderate throughout the 1980s. Inflation rose again in 2008 to over 20% and has remained relatively high in recent years. Trade openness increased gradually over time. It was around 15% of GDP in 1972 and exceeded 30% by the 1990s and 2000s, reflecting the gradual liberalization of the trade sector, though with some fluctuations and occasional reversals. The budget deficit rarely fell below 3–4% of GDP and often exceeded 6–7% during the 1990s and 2000s, indicating persistent fiscal imbalance. Similarly, public debt was approximately 100% of GDP in 1972, declined to around 60–70% during the 1980s and 1990s, but has increased again in recent years.

Regarding the real exchange rate, the major spike was observed in 2001 when index reached 112.3, indicating a high level of volatility and external sector imbalance. Similarly, the graph also shows the varying behaviour of broad money supply and the interest rate. Both indicators, depict a highly unstable macroeconomic environment during the early 1970s. During 1996–1997, both indicators show an upward trend, possibly due to external pressures. However, broad money supply declined in 2000 (28.69% of GDP) and 2001 (29.88% of GDP), while the interest rate remained at a moderate level during the structural adjustment period. Interest rate remained above 10% during the global financial crises, while broad money supply stayed at moderate level (more than 45% of GDP). Severe volatility was observed in both the variable in 2023 and 2024, reflecting the strongest contractionary monetary phase in Pakistan's macroeconomic trajectory. The unemployment rate was recorded above 7% during the period 2000–2005, indicating rising unemployment in Pakistan. However, unemployment averaged 3.91% over the period 1972–2024. These trends reflect long-term fiscal stress, instability in the monetary and real sectors, and uneven growth in the trade sector.

3. Literature Review

The pursuit of stable and sustained macroeconomic performance has long been central to development strategies in countries such as Pakistan, where persistent instability calls for a multidimensional analytical approach. Evidence from Fischer (1993) shows that sound macroeconomic policy maintains low inflation, manageable fiscal deficits, sustainable debt levels, and openness to trade. Burnside and Dollar (2000) highlight that each policy area affects the economy through distinct channels. Monetary policy manages inflation and liquidity, fiscal policy influences spending and debt dynamics, and trade policy shapes competitiveness and market access. These policies are interdependent, and their coherence is crucial for achieving sustainable and stable macroeconomic performance.

In Pakistan, macroeconomic management has often been hindered by large fiscal deficits, volatile inflation, rising public debt, and inconsistent trade liberalization. Alesina and Perotti (1996) and Easterly and Fischer (2001) noted that countries with narrow tax base, weak monetary autonomy, and fiscal and price instability tend to reduce private investment and purchasing power. Conversely, trade openness can

promote economic growth, and attract capital inflows, but only when supported by strong institutions and resilient economic structures.

It is worth noting that measuring macroeconomic performance based on a single indicator, such as the inflation rate, budget deficit-to-GDP ratio or debt-to-GDP ratio, is insufficient to capture overall economic stance of a country. Composite indices overcome this limitation by combining multiple indicators, thereby enabling both historical and cross-country comparisons. Burnside and Dollar (2000) argued that macroeconomic performance depends on policy coherence rather than isolated indicators; they constructed a macroeconomic policy index by combining the inflation rate, trade openness, and budget surplus. Lovell et al. (1995) developed a macroeconomic performance index using per capita real GDP, inflation, unemployment rate, and trade balance for 19 OECD countries. Ahangari and Saki (2012) computed a macroeconomic instability index for Iran, including the inflation rate, budget deficit, foreign debt, and exchange rate ratios. Sirimaneetham and Temple (2009) developed a macroeconomic stability index by combining several indicators, namely central government budget surplus as a share of GDP, inflation, black market premium, exchange rate variability, and an index of currency overvaluation. They concluded that unsatisfactory macroeconomic outcomes may result from deeper institutional weaknesses, exposure to external shocks, and political instability. Furthermore, they found that strong institutions alone do not guarantee economic growth unless macroeconomic stability is in place. Mlachila et al. (2014) developed the Quality of Growth Index (QGI) and concluded that political stability, financial development, and institutional quality are the key drivers of economic growth. Most of these studies used the PCA approach to construct their indices, as this method reduces multicollinearity and over-parameterization issues. Jolliffe (2002) demonstrated that PCA reduces dimensionality by capturing the maximum variance in fewer components, thereby simplifying index construction.

On the other hand, Sarma's (2008) Euclidean distance-based method, measures how close a set of observe policy outcomes are to an ideal target point. Few studies used Sarma's (2008) approach in the construction of macroeconomic (in)stability index. For example, based on the approach of the United Nations Human Development Index, Hutton et al. (1998) developed national economic performance by developing a composite national economic performance index for the United Kingdom, the United States, West Germany and Japan. They included unemployment, GDP growth rate, inflation, trade balance, government debt, collective burden, and GNP per head as a key indicator of economic performance. The weighting scheme of this index was based on traditional macroeconomic theories, such as Monetarist, Utilitarian, Keynesian, and Neomercantilist approaches. They concluded that the relative economic performance varied across countries for the 1970s and 1980s. Amoo et al. (2017) constructed a macroeconomic policy instability index by considering inflation rate, fiscal balance, exchange rates, and terms of trade as key indicators. Likewise, Owusu-Ankamah and Sakyi (2021) constructed macroeconomic instability index for Ghana using inflation

rate, exchange rates, budget deficit to GDP ratio, prime rate and changes in external debt and concluded that these factors are the key drivers of macroeconomic instability. Sirimaneetham and Temple (2009) argued that these approaches allow more comprehensive evaluation of macroeconomic performance.

In the context of Pakistan, only a few studies have developed a MPI using PCA and Early Warning System (EWS) procedure. For example, Javid and Qayyum (2011) applied PCA to construct a MPI for Pakistan and found that policy coherence enhances growth. Similarly, Ditta and Hayat (2017), Ali and Bibi (2017), Ali and Rehman (2015) and developed macroeconomic (in)stability indices using the EWS approach proposed by Kaminsky et al. (1998). They concluded that inflation, exchange rate, external debt-to-GNP ratio, and public deficit-to-GNP ratio play a significant role in determining macroeconomic (in)stability. However, these studies used equal weighting scheme for the construction of indices.

Overall, composite indices like the MPI provide an insightful overview of the macroeconomic trajectory by combining fiscal, monetary, and trade dimension, help policymakers assess macroeconomic performance more accurately. For instance, rating agencies use macroeconomic performance indicators to evaluate and compare different economies, while foreign investors may rely on such indices when planning cross-border investments. Therefore, this study addresses the existing literature gap by developing a long-term MPI for Pakistan covering the period 1972 to 2024. The dual-method approach—PCA and Sarma's technique—enables comparison Pakistan's economic performance from both statistical and normative perspectives and offering deeper insights into the country's macroeconomic evolution.

4. Empirical Methodology and Results

This study uses two methods to construct the MPI: PCA and Sarma's (2008) distance-based method. PCA is a data-driven technique that identifies key patterns and captures the maximum variation among selected indicators. It is widely used in empirical research for developing composite indices, it is less restrictive than the conventional econometric methods (Owoundi, et al., 2021). The main advantage of PCA is that it minimizes problems of multicollinearity and over-parameterization in the context of a multifaceted measure such as MPI.

PCA is multivariate method that reduces the dimensionality of the original dataset and constructs a set of uncorrelated new variables, called principal components (PCs), which are linear combinations of the original variables (Dumicic, 2010). The correlation matrix was employed to run PCA, and weights were computed from the corresponding eigenvectors. The PCs are orthogonal and capture the largest variance, thereby reducing correlations within the dataset (Owoundi, et al., 2021). The most relevant PCs capture fractions of the total variance in decreasing order of PC number. The Kaiser-Guttman criteria (i.e. the selection of PC with eigenvalue greater than one) is commonly used to determine the number of PCs to retain. In this study, the composite MPI consists of eight key indicators, as given by equation (2):

$$MPI = \sum_{i=1}^8 a_i X_i \quad (2)$$

where X_i is the matrix of the selected indicators included in Equation (1), and a_i is the corresponding weight assigned to that indicator. The factor loadings (or component loadings) reflect each indicator's contribution to the overall index.

In contrast, Sarma's (2008) approach provides a normative assessment by comparing actual outcomes with an ideal benchmark (see Appendix A). Since Sarma (2008) method relies on a subjective weighting scheme (e.g., equal or arbitrary weights), the selection of components and their weights are crucial for index construction. Composite indices are sensitive to subjective weighting, and even small changes in weights can substantially alter the resulting values (Nizam et al., 2020). On the other hand, PCA derives weights endogenously, thereby eliminating potential bias, multicollinearity, and over-parameterization issues. Therefore, this study employs the PCA approach to track changes in Pakistan's macroeconomic performance over time, while Sarma's method serves as a robustness check.

4.1. Data and Variables

To develop the MPI for Pakistan, annual data for the period 1972 to 2024 were used for eight indicators: public debt-to-GDP ratio, budget deficits-to-GDP ratio, inflation rate, trade openness, unemployment rate, money supply-to-GDP ratio, interest rate, and changes in the real exchange rate. Public debt-to-GDP is measured as the sum of domestic and external debt as a percent of nominal GDP. Budget deficit-to-GDP ratio is defined as the difference between consolidated government revenue and consolidated government expenditure as percent of GDP. The unemployment rate is calculated as one minus the ratio of employed labour force to total labour force (in percent). Inflation rate is measured as the annual percentage change in the consumer price index, while broad money supply is measured by the M2 definition of money as a percent of nominal GDP. The real exchange rate is defined as the nominal bilateral exchange rate multiplied by the ratio of the foreign price index to the domestic price index, with the foreign price index proxied by the United States consumer price index. Data for all variables were obtained from the *Pakistan Economic Survey*, Annual Reports of the *State Bank of Pakistan*, and the World Bank's *World Development Indicators*.

4.2. Construction of the Macroeconomic Performance Index

This paper uses the PCA approach to combine the eight indicators, namely, the public debt-to-GDP ratio, fiscal deficit-to-GDP ratio, inflation rate, trade openness, the unemployment rate, money supply-to-GDP ratio, interest rate and changes in real exchange rate into a single index measuring macroeconomic performance. PCA minimizes multicollinearity and over-parameterization issues, while also quantifying the contribution of each variable to overall economic performance (Brave & Butters, 2011).

Each indicator's weight depends on its historical variation, with those more closely correlated with other variables receiving higher weights. Consequently, a small change in a highly weighted indicator can have a greater effect on the index than a large change in a less influential variable.

It is important to note that PCA is sensitive to the scale of the data; therefore, all variables were normalized prior to estimation. Following Le et al. (2019), we applied min–max normalization to rescale each indicator to the [0, 1] interval, where 0 denotes the weakest and 1 the best performance observed in the sample. We initially considered z-score standardization; however, because it can be sensitive to outliers and high dispersion (Mlachila et al., 2014), we opted for min–max scaling. The PCA then generated eigenvalues and eigenvectors describing the underlying covariance structure. The first three principal components, which together explain 54.6% of the total variation, were retained to construct the MPI. Tables 1a and 1b report the eigenvalues and factor loadings.

Table 1a. Macroeconomic Performance Index (MPI): Principal Component Analysis

Component	Eigenvalue	Difference	Proportion	Cumulative variance
1	1.796	0.440	0.225	0.225
2	1.356	0.136	0.170	0.394
3	1.219	0.263	0.152	0.546
4	0.956	0.069	0.120	0.666
5	0.888	0.099	0.111	0.777
6	0.789	0.193	0.099	0.876
7	0.596	0.195	0.074	0.950
8	0.400	—	0.050	1.000

Source: Authors' calculations.

Note: Principal components are extracted from the correlation matrix. Following the Kaiser criterion, components with eigenvalues ≥ 1 are retained (PC1–PC3). Weights for the retained components are computed as each component's share of the total variance explained by the retained components: $w_j = \text{Proportion}_j / \sum_{k=1}^3 \text{Proportion}_k$. Accordingly, $w_{PC1} = 0.225/0.546 = 0.4121$ (41.21%), $w_{PC2} = 0.170/0.546 = 0.3114$ (31.14%), and $w_{PC3} = 0.152/0.546 = 0.2784$ (27.84%).

Table 1b. Indicator Loadings and Weights for PC1–PC3 in the Macroeconomic Performance Index (MPI)

Variable	PC1 Loading	Weight (%)	PC2 Loading	Weight (%)	PC3 Loading	Weight (%)	Combined weight (%)
PD	0.420	17.64	0.425	18.06	0.233	5.43	14.41
BD	0.214	4.58	-0.438	19.18	0.354	12.53	11.35
INF	0.444	19.71	-0.481	23.14	-0.072	0.52	15.47

Variable	PC1 Loading	Weight (%)	PC2 Loading	Weight (%)	PC3 Loading	Weight (%)	Combined weight (%)
TO	0.532	28.30	0.177	3.13	-0.213	4.54	13.90
ΔUN	-0.053	0.28	-0.024	0.06	0.691	47.75	13.45
M_2	0.278	7.73	0.255	6.50	-0.354	12.53	8.70
INTR	0.423	17.89	-0.302	9.12	0.062	0.38	10.32
ΔRER	0.198	3.92	0.455	20.70	0.405	16.40	12.63

Source: Authors' calculations.

Note: Indicator weights within each retained principal component (PC1–PC3) are computed as the squared loading of each indicator divided by the sum of squared loadings in that component, expressed as percentages. The combined weight is calculated by multiplying each component-specific weight by the corresponding principal-component weight (from Table 1a) and summing across PC1–PC3. PCA is conducted in EViews 12. PD, BD, INF, TO, ΔUN , M_2 , INTR, and ΔRER denote the transformed public debt-to-GDP ratio, budget deficit-to-GDP ratio, inflation rate, trade openness, change in the unemployment rate, broad money supply-to-GDP ratio, interest rate, and change in the real exchange rate, respectively.

Using the Kaiser-Gitman criterion, the first three components (PC1, PC2 and PC3) were retained, accounts for 54.6% of the cumulative variations in the eight indicators. We then scaled the contributions of PC1 (0.225), PC2 (0.170) and PC3 (0.152) in Table 1a relative to the combined contributions of these components, which was 0.546. This adjustment allows us to calculate the index weights for each component, which are approximately 41.21%, 31.14% and 27.84% for PC1, PC2 and PC3, respectively. PC1 is primarily driven by trade openness (0.532), inflation (0.444), interest rate (0.423) and public debt (0.420). PC2 loads heavily on change in the real exchange rate (0.455), public debt (0.425), and money supply (0.255). PC3 loads most strongly on changes in the unemployment rate (0.691), followed by changes in the real exchange rate (0.405) and budget deficit (0.354). These results suggest that inflation rate, public debt, trade openness, changes in the real exchange rate, interest rate, and budget deficit are the main factors shaping Pakistan's macroeconomic performance. Finally, based on the PCA's linear aggregation, the MPI was computed as given in Equation (3).

$$MPI = \omega_1 * PC1 + \omega_2 * PC2 + \omega_3 * PC3 \quad (3)$$

$$MPI = 0.4121 * PC1 + 0.3114 * PC2 + 0.2784 * PC3 \quad (3a)$$

Higher values of the MPI indicate unstable macroeconomic performance, while lower or negative values reflect greater stability. We expect that trade openness and that money supply-to-GDP ratio to have a positive effect on the overall stance, whereas public debt-to-GDP ratio, budget deficit-to-GDP ratio, inflation rate, changes in the unemployment rate, interest rate, and changes in the real exchange rate are expected to

have negative effect on macroeconomic performance, and consequently on the MPI. Figure 3 displays the trend of the PCA-based MPI.

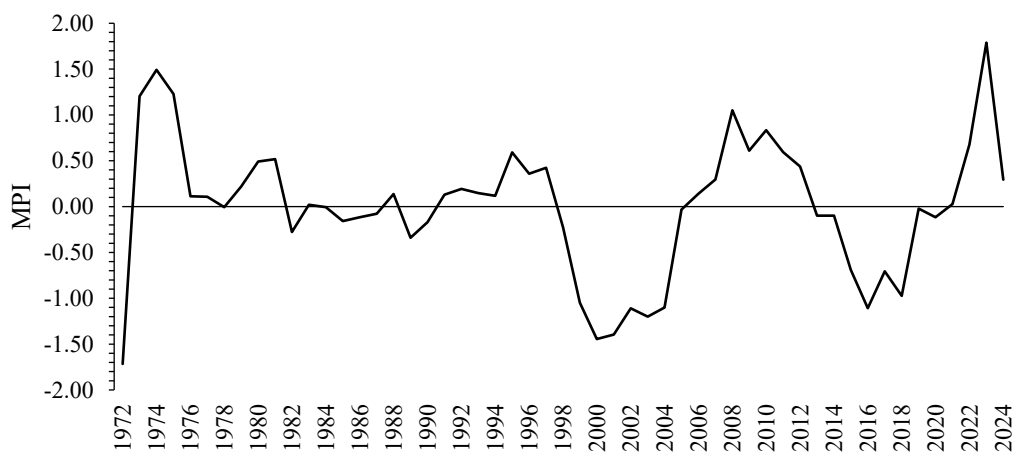


Figure 3. Macroeconomic Performance Index (MPI) for Pakistan, 1972–2024

Source: Authors' calculations based on PCA results.

Figure 3 shows clear chronological variations in the MPI, with positive values are generally associated with unstable macroeconomic performance, driven by high inflation, elevated public debt-to-GDP, large budget deficits, high unemployment, higher interest rate and exchange rate volatility, and low levels of trade openness. In contrast, negative values of the MPI reflect more stable macroeconomic performance, attributed to prudent and well-managed macroeconomic policies, including low inflation, low public debt-to-GDP and budget deficit-to-GDP ratios, increasing trade openness, low unemployment, stable exchange rates, and low interest rates. From Figure 3, Pakistan's economy experienced four major shocks in 1974, 1995, 2008 and 2023, corresponding to various economic and political developments. The first shock coincides with the oil price hike of 1974. The second shock, observed in 1995, occurred during the period of large budget deficits, high inflation and interest rates, volatile exchange rates, a high trade deficit, and political instability, all of which deteriorated macroeconomic performance. The third shock in 2008 was likely due to the global financial crisis and surges in global commodity prices. The final shock in 2023 when Pakistan's economy was on the verge of default. Overall, the MPI clearly reveals the episodic behaviour of Pakistan's macroeconomic environment over the period 1972–2024. Table 2 summarizes the episodes of Pakistan's macroeconomic performance during the period 1972–2024.

Table 2. Episodes of Pakistan's Macroeconomic Performance, 1972–2024

Episodic years	Events	Average value of Macroeconomic Indicator	Macroeconomic outcome
1972–1976	- The post-war period.	- Public debt = 80.18	Instability

Episodic years	Events	Average value of Macroeconomic Indicator	Macroeconomic outcome
1977–1997	- Nationalization of major industries. - Fiscal borrowing increased significantly to support the rebuilding of infrastructure and social services. - Policy focused primarily on domestic incentives rather than export-led growth. - The government tolerated high fiscal debt and deficits, and elevated inflation in the hope of achieving rapid reconstruction and economic recovery.	- Budget deficit = 6.88 - Inflation = 22.65% - Trade openness = 27.25 - Exchange rate = 47.10 - Broad money = 41.97 - Interest rate = 7.93 % - Unemployment rate = 1.88 % - Economic growth = 4.34% - MPI = 0.46	Moderate instability
	- A phase of stabilization-oriented policy measures, largely driven by external debt pressures and conditionalities attached to the International Monetary Fund (IMF) program. - During this period, under the guidance of the IMF and the World Bank, Pakistan launched a series of financial and trade liberalization reforms. - Politically motivated subsidies, low tax revenue collection, and high non-development expenditures led to chronic budget imbalances.	- Public debt = 74.55 - Budget deficit = 6.87 - Inflation = 9.07% - Trade openness = 34.78 - Exchange rate = 65.02 - Broad money = 42.47 - Interest rate = 9.07 % - Unemployment rate = 3.88% - Economic growth = 5.5% - MPI = 0.30	
1998–2005	- Public finance and structural reforms were initiated in late 2001 as part of IMF's Poverty Reduction and Growth Facility (PRGF). - Trade and payments were liberalized. - To stabilize the general price level and attract foreign remittances, the	- Public debt = 67.64 - Budget deficit = 4.04 - Inflation = 7.41% - Trade openness = 28.49 - Exchange rate = 92.28 - Broad money = 41.64 - Interest rate = 8.14% - Unemployment rate = 6.04% - Economic growth = 3.82%	High stability

Episodic years	Events	Average value of Macroeconomic Indicator	Macroeconomic outcome
	- SBP implemented a contractionary monetary policy. - Major industries were privatized. - The General Sales Tax (GST) was introduced and implemented, which reduced the fiscal deficit.	- MPI = -0.94	
2006–2012	- The global financial crisis. - A rise in global commodity prices. - An energy crisis. - Uncertainty and low investment due to political transition and the judicial crisis. - In 2010-2011, floods disrupted supply chains. - Fiscal expansion and moderate global integration.	- Public debt = 52.56 - Budget deficit = 5.66 - Inflation = 10.93% - Trade openness = 31.56 - Exchange rate = 86.44 - Broad money = 46.73 - Interest rate = 9.02% - Unemployment rate = 2.36% - Economic growth = 4.55% - MPI = 0.57	Instability
2013–2020	- FDI increased due to CPEC initiatives. - Phase of macroeconomic stabilization, though it was not necessarily growth-enhancing. - Fiscal sustainability was restored with the help of the IMF Extended Fund Facility. - Inflation declined in response to falling global oil prices. - To stimulate private sector growth, the SBP reduced the interest rate. - Increasing reliance on domestic demand and reduced integration with global markets due to the rising exchange rate. - Performance of the agriculture, trade, services, and manufacturing sectors deteriorated in response to the COVID-19 pandemic	- Public debt = 65.23 - Budget deficit = 5.35% - Inflation = 8.79% - Trade openness = 27.74 - Exchange rate = 92.79 - Broad money = 49.41 - Interest rate = 8.96% - Unemployment rate = 4.59% - Economic growth = 3.57% - MPI = -0.48	High stability
2021–2024	- Large depreciation in exchange rates resulted in cost-push inflation.	- Public debt = 70.90 - Budget deficit = 6.23 - Inflation = 16.51%	High instability

Episodic years	Events	Average value of Macroeconomic Indicator	Macroeconomic outcome
	- Substantial government borrowing crowded- out private investment.	- Trade openness = 29.90 - Exchange rate =103.95	
	- Political uncertainty, external financing constraints, and high interest rates hindered investment and capital formation.	- Broad money = 44.51 - Interest rate = 12.82% - Unemployment rate = 5.68% - Economic growth = 3.56%	
	- The Russian-Ukrainian war increased global oil prices; consequently, Pakistan’s import bill worsened.	- MPI = 0.70	

Source: Authors’ compilation based on the cited literature.

Note: Public debt, budget deficit, trade openness, and broad money are expressed as percentages of GDP. Inflation, interest rate, unemployment rate, and economic growth are expressed in percent. The exchange rate refers to the (real) exchange rate index/level as defined in the study. MPI denotes the Macroeconomic Performance Index.

In a nutshell, Pakistan’s macroeconomic environment has experienced episodes of spurts and reversals. The empirical evidence shows that the periods 1998–2005 and 2013–2020 were characterized by relatively stable macroeconomic conditions, whereas higher instability was observed during 1972–1997, 2006–2012, and 2021–2024.

5. Conclusions

This study develops a composite Macroeconomic Performance Index (MPI) for Pakistan using annual data over 1972–2024 to capture the country’s evolving macroeconomic conditions in a unified measure. Two complementary approaches are applied: Principal Components Analysis (PCA), which summarizes information from eight key indicators through data-driven component weights, and Sarma’s (2008) distance-based (UNDP-style) method, which evaluates proximity to an “ideal” macroeconomic stance based on normalized indicators. By integrating fiscal balance, public debt, inflation, trade openness, unemployment, broad money supply, interest rate, and the real exchange rate, the MPI provides a broader depiction of macroeconomic performance than analyses that rely on single indicators.

The MPI dynamics reveal clear alternations between relative stability and instability across Pakistan’s macroeconomic history. Periods of heightened instability are particularly evident in the early 1970s, during 2006–2012, and from 2021 onward, whereas the 1980s, 1990s, early 2000s, and around 2016 reflect comparatively more stable macroeconomic conditions. Overall, the results underscore that improvements in a single macroeconomic indicator may not translate into an improved overall macroeconomic environment when vulnerabilities persist through other channels. The constructed MPI therefore serves as a practical tool for tracking macroeconomic

performance over time, identifying episodes of stress, and supporting more holistic policy evaluation.

6. Policy Implications

From a policy perspective, the proposed MPI provides a concise and systematic signal of Pakistan's macroeconomic conditions that can support planning and decision-making by multiple stakeholders. For policymakers, the index offers an integrated benchmark for assessing whether policy packages improve overall macroeconomic performance rather than only selected indicators. For foreign investors and credit rating agencies, the MPI can serve as a transparent summary measure of macroeconomic stability that complements conventional dashboards of inflation, fiscal balances, and external-sector indicators. In this sense, the MPI strengthens macroeconomic surveillance by translating complex, multi-dimensional information into an interpretable metric that can be tracked consistently over time.

The findings also imply that improving macroeconomic performance requires coordinated and sustained policy actions across fiscal, monetary, and external-sector domains. Structural reforms remain essential, particularly those that strengthen revenue systems, enhance expenditure efficiency, and support prudent public debt management to reduce repeated cycles of stabilization and crisis. At the same time, maintaining price stability and credible monetary conditions requires policy consistency and stronger financial regulation to mitigate spillovers from fiscal pressures and external shocks. On the external side, improving trade performance through export diversification—beyond a narrow set of traditional products such as textiles—can strengthen resilience and reduce vulnerability to adverse global conditions. Importantly, the results caution against over-reliance on short-term or temporary measures that may ease immediate pressures but fail to improve the fundamentals captured by the MPI.

Finally, the study highlights that prolonged macroeconomic instability can undermine not only short-run macroeconomic performance but also the broader development process. Accordingly, the MPI is useful not only as a diagnostic tool for retrospective policy evaluation but also as an early warning signal that can help detect deteriorating conditions and guide timely adjustments to policy strategy, thereby supporting more sustainable macroeconomic performance over the longer term.

7. Ethics Statement

This study used secondary data from publicly available sources and did not involve human participants, personal identifiable information, or primary data collection. Therefore, ethics committee approval was not required.

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9. Appendix

A.1 Construction of Macroeconomic Performance Index Using Sarma's Methodology

To test the robustness of the MPI constructed using the PCA approach, we employed the Sarma's (2008) method to develop an alternative MPI for Pakistan. This method begins by normalizing key macroeconomic indicators and assessing their proximity to an ideal policy configuration, characterized by low inflation, budget deficits, controlled nominal liabilities, strong trade openness, low unemployment, stable interest rates and exchange rate, and stable growth of broad money. This index ranges from 0 to 1, where values closer to 0 indicate more stable macroeconomic performance. Unlike PCA, this method evaluates policy performance relative to an optimal benchmark rather than focusing solely on statistical variation. As a result, it highlights periods of strong macroeconomic performance and instances where macroeconomic outcomes fell short of expectations.

Sarma's (2008) method begins with calculating the dimension index, using equation (3.1A), where each dimension d_i is assigned weight w_i , bounded between 0 and 1, to exhibit the relative significance of that dimension.

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i} \quad (3.1A)$$

Where,

w_i = Weight attached to the dimension i , $0 \leq w_i \leq 1$,

A_i = Actual value of dimension i ,

m_i = Minimum value of dimension i ,

M_i = Maximum value of dimension i ,

Equation (3.1A) assures that each dimension index, d_i , lies within the interval $[0, w_i]$, $0 \leq d_i \leq w_i$. If n dimensions of macroeconomic performance indicators are considered, their joint configuration is likely to be captured by point $X = (d_1, d_2, d_3, \dots, d_n)$ within an n -dimensional space. We have two important factors, the ideal point w and the worst point 0. The MPI is computed as the simple average of the normalized Euclidian distance between X and 0 (denoted by X_1 , as indicated by equation (3.2A)), and the normalized inverse Euclidian distance between X and w (denoted X_2 , shown in equation (3.3A)).

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + d_3^2 + \dots + d_n^2}}{\sqrt{(w_1^2 + w_2^2 + w_3^2 + \dots + w_n^2)}} \quad (3.2A)$$

$$X_2 = \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + \dots + (w_n - d_n)^2}}{\sqrt{(w_1^2 + w_2^2 + \dots + w_n^2)}} \quad (3.3A)$$

$$MPI = \frac{1}{2} (X_1 + X_2) \quad (3.4A)$$

Following Sarma (2015), all dimensions are assigned equal weight, such that, $w = 1$ for all i . Hence, the ideal point is $w = (1, 1, 1, \dots, 1)$, and the MPI formula takes the following form:

$$MPI = \frac{1}{2} \left[\sqrt{\frac{d_1^2 + d_2^2 + \dots + d_n^2}{n}} + 1 - \left(\sqrt{\frac{(1-d_1)^2 + (1-d_2)^2 + \dots + (1-d_n)^2}{n}} \right) \right] \quad (3.5A)$$

Depending on the value of the MPI, the period under investigation has been characterized following Goel and Sharama (2017):

1. $0 \leq MPI < 0.4$; indicates highly stable macroeconomic performance.
2. $0.4 < MPI \leq 0.6$; indicates moderate macroeconomic performance, and
3. $0.6 < MPI \leq 1$; indicates highly unstable macroeconomic performance.

Figure 5 illustrates the evolution of MPI based on Sarma's (2008) methodology.

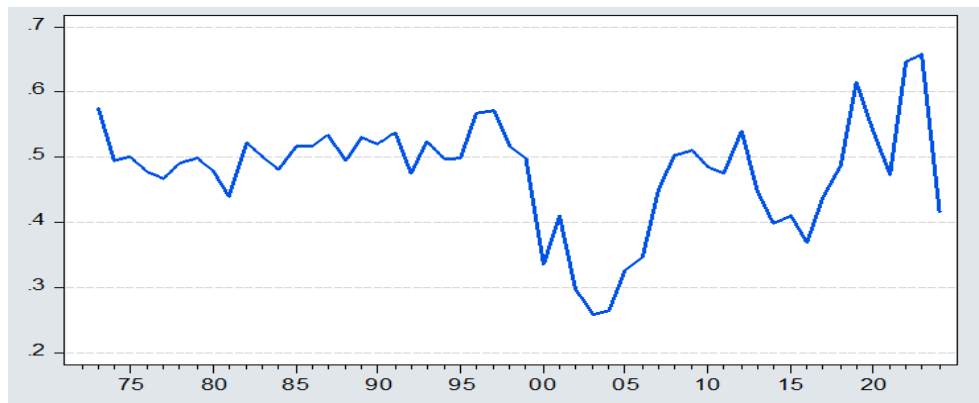


Figure 4. Macroeconomic Policy Index based on Sarma Methodology

Source: Authors' calculations.

Figure 5 shows that the value of the MPI, constructed using Sarma's (2008) distance-based method, ranges from 0 to 1, and provides a bounded measure of Pakistan's macroeconomic performance over time. Values closer to 0 indicate a stable macroeconomic performance, characterized by low public debt, moderate inflation, a controlled budget deficit, high trade openness, stable interest rates and exchange rates, and low levels of monetary growth. In contrast, values approaching 1 reflect unstable macroeconomic performance. Figure 6 presents average score of MPI for various phases.

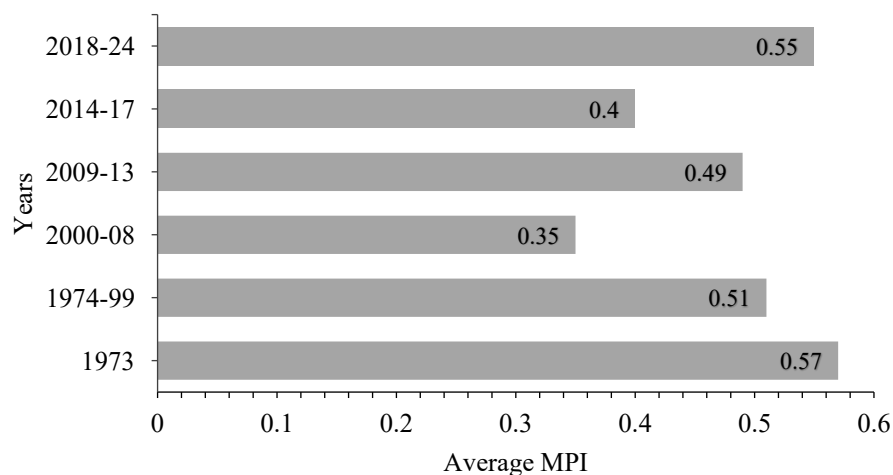


Figure 5. Average Score of MPI based on Sarma Method

Source: Authors' calculations using MPI values generated using Sarma (2008).

It is evident from Figure 6 that the average score of MPI was greater than 0.40 during the periods 1973–99, 2009–2013, and 2018–24, which confirms relatively unstable macroeconomic performance. The main reasons of this instability include a high level of public debt, large budget deficits, excessive monetary expansion, high inflation, exchange rate depreciate, economic sanctions, the adverse effects of global financial crises, discontinuities in macroeconomic policies, and political uncertainty.

These factors hinder macroeconomic performance and, consequently, economic growth in Pakistan. On the other hand, the average score of MPI was less than 0.40 during the periods 2002–08 and 2014–17, which indicates relatively stable macroeconomic performance.

The key advantage of Sarma's distance-based method is that it is flexible, unit-free and satisfies key intuitive for the development of an index, including monotonicity, boundedness, and homogeneity. It offers a clear comparative measure over time, illustrating how far the country is from its desired macroeconomic goals. The index is particularly useful for assessing the level of a country's macroeconomic performance. However, this method overlooks the dynamic patterns of MPI. Furthermore, the index assumes an equal weighting scheme, which may not be appropriate for index construction, as the contribution of various indicators are not homogenous.