ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR

Fiscal and External Imbalances in South Asia: An Empirical Test of the Twin Deficit Hypothesis Using Panel ARDL

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Abstract

This is an empirical research paper where the twin deficit hypothesis is examined in the South Asian countries through the dynamic correlation between the budget deficit and current account deficit, incorporating other significant macroeconomic variables, namely worker's remittances, terms of trade, and gross fixed capital formation. The analysis in the article uses panel data on annual data spanning from 2000 to 2023 for eight countries in South Asia. We use the Panel Autoregressive Distributed Lag (ARDL) technique in order to capture the short-term and the long-term dynamics. To investigate the long-run and short-run relationships, two estimators, the Pooled Mean Group (PMG) and the Mean Group (MG), are used in the analysis. The findings show that there is a very strong long-run correlation between the current account deficit and the budget deficit, which proves the validity and importance of the twin-deficit hypothesis in the region. The results indicate that an increase in the budget deficit by 1% is associated with an increment in the current-account-deficit measure of approximately 0.176 percent, which indicates that fiscal imbalances and the performance of the external sector are strongly related. Also, remittances and terms of trade have a negative relationship with the logged dependent variable, where a 1 percent increase in remittances is associated with a decrease of approximately 0.199 percent and a one percent increase in terms of trade is associated with a decrease of approximately 0.271 percent. Gross fixed capital formation (GFCF) has a positive and statistically significant relationship with CAD, indicating that a 1% increase in GFCF is associated with an approximately 0.638% increase in CAD ($p = 0.0052$). This paper explains how South Asia can cope with its external imbalance using fiscal discipline, remittances and favourable terms of trade. In addition, the error correction term implies that there is a 64.8 percent per annum correction rate of non-equilibrium in the long term, which shows strong long-run convergence. The error correction term (ECT) is negative, and it is statistically significant, which means that it adapts quickly to the long-run equilibrium after short-term shocks. The policy implications of these findings are that fiscal policy, increasing remittances, and increasing terms of trade can be used to alleviate current account imbalances in South Asia. This research reiterates the fact that South Asian economies must pay attention to the fiscal imbalances and export enhancement to the best of their ability to alleviate the negative impact of twin deficits on economic stability and growth. These outcomes offer valuable policy recommendations in solving the budget deficit and current account deficit in South Asia and ensuring that the region can develop its economy sustainably. The study is essential because it would lead to the interpretation of the twin deficit hypothesis and its implication, particularly for the South Asian nations.

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Introduction

Modern economic theory describes, that the twin deficits hypothesis (TDH) explains a situation where a country faces both a government budget shortfall and a deficit in its current account together. We commonly refer to a situation as a "twin deficit" when a nation's budget deficit and its current account deficit occur simultaneously. Most economists are of the view that a massive current account deficit does not stem from a high budget deficit. When the government of a country implements a policy of tax reduction, it leads to inadequate and insufficient government revenue. Such an approach, in turn, results in a budget deficit and increased consumption, leaving people with only one option to spend their surplus funds. Eventually, the upsurge in spending results in a lower saving rate in the deficit country, forcing it to rely on excessive borrowing from abroad (Lubna & Saha, 2024).

A significant improvement in the budget deficit (BD) is often related to a widening current account deficit (CAD). Both deficits pose serious risks to the economy, as they can worsen macroeconomic conditions by fueling inflation, reducing purchasing power, and increasing both domestic and foreign debt. The higher the level of debt, the higher the debt servicing burden, and foreign exchange reserves are likely to deplete. The simultaneous movement of these two imbalances is known as the twin deficits hypothesis (TDH). According to this hypothesis, variations in the fiscal balance are mirrored in the current account, implying that larger budget deficits are likely to be accompanied by greater current account deficits (Munir et al., 2025).

Researchers often discuss the critical Twin Deficit phenomenon in the context of developing nations, particularly in South Asian countries. It explains the connection between a government's fiscal imbalance and the external balance of the country. In essence, the hypothesis argues that when a government experiences and faces a budget deficit, it is likely to be coupled with a current account's imbalance as well, indicating a direct and positive association between the two.

A "twin deficit" situation arises when both of these imbalances occur at the same time. This means the government is spending more than it earns domestically while the country as a whole is also importing more goods, services, and capital than it exports. This situation reflects underlying macroeconomic pressures and structural weaknesses in the economy. Under this situation government have to face critical economic issues, such as high levels of public debt and reduced competitiveness in domestic industries.

Founded on the Keynesian absorption theory, which is also known as being identical to the twin deficit hypothesis, indicates that a government's budget deficit and its current account deficit are positively correlated. This opinion describes that a fiscal deficit occurs when the government's expenditure surpasses its tax revenue. This deficit reaches out to boost domestic consumption or spending, especially income in the economy, assuming output is held constant. The consequent increase in income is the stimulation of a higher level of importation, which means an increased trade deficit and a subsequent upsurge in the current account shortfall. The theory highlights the presence of a causation that is unidirectional, where budget deficits are the central reasons of current account deficits in the long run (Hadji & Amara, 2025).

Twin deficit hypothesis is the concept that in cases where both the current account deficit and the fiscal deficit are increasing, both of them can have a counterproductive impact on the economy. In particular, the increased spending by the government via borrowing stimulates the internal demand for products. This increase in demand has a propensity of increasing imports, thus worsening the current account deficit (Hadji & Amara, 2025).

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

The traditional Keynesian perspective and the theory of Ricardian's equivalence anchor the twin deficit hypothesis. These approaches contradict each other. The Mundell-Fleming model, the foundation of the Keynesian perspective, uses exchange and interest rate channels to support the claim that budget deficits cause to current account deficits (Fleming, 1962; Haug, 1996; Kawai, 1985; Kearney & Monadjemi, 1990; Marston, 1985). Conversely, the Ricardian's Equivalence Theorem opposes the notion that two deficits have a causal relationship (Barro, 1974, 1989; Chowdhury & Saleh, 2007; Epaphra, 2017; Olanipekun, 2012).

South Asian nations still struggle with the endemic problem of the twin deficits—fiscal and current account deficits—which have been hard to control over the years. The region is one of the most economically vulnerable in the world, with one of the highest debt-to-GDP ratios and the world's second-largest fiscal deficit. Although the economic measures brought about in the 1980s and 1990s were initially promising, especially in improving market efficiency and growth, the effect was stalled by the 1997-98 Asian Financial Crisis and the 2008 Global Financial Crisis. These global shocks have exposed structural vulnerabilities in the coordination and oversight of macroeconomic policies across the region. The last five decades have been associated with decreasing macroeconomic indicators in a significant portion of Asian countries, whereby the twin deficits have been experienced. This trend is mostly caused by heavy dependence on the use of public borrowing to close fiscal gaps and fund the high levels of development of infrastructure. The increase in public debt levels of most South Asian economies has become a formidable economic liability and poses a cause of concern to both policymakers and international observers (Rajakaruna et al., 2021).

Literature Review

This section reviews the current literature on the twin deficit hypothesis from both theoretical and empirical perspectives. It begins by outlining the key theoretical foundations of the hypothesis, followed by an examination and discussion of findings from various empirical studies.

Theoretical Framework of the Twin Deficit Hypothesis

The twin deficits hypothesis has its theoretical foundation on the national income identity of an open economy. Following Hailemareiam (2023), it is articulated as follows:

$$Y = C + S \quad (1)$$

The equation (1) asserts that income is equivalent to consumption + savings.

$$S = I \quad (2)$$

Where S denotes savings and I denotes investment. This indicates that savings are equivalent to investment. Consequently, equation (2) is reformulated as:

$$Y = C + I \quad (3)$$

Incorporating government expenditure into the aforementioned equation three yields:

$$Y = C + I + G \quad (4)$$

The above equation, number four shows the closed economy. If we add the exports and imports, then it will become an open economy, and the open economy GDP (the output produced by the economy) identity can be represented as

$$Y = C + I + G + (X - M) \quad (5)$$

This equation expresses national income (Y), or GDP, as the sum of private consumption (C), investment (I), government expenditure (G), and the net exports of goods and services, which is the difference between exports and imports, X - M.

Current Account Equation: $CA=X-M+NTP \quad (6)$

The current account (CA) equation expresses the balance of trade, accounting for exports (X), imports (M), and net transfer payments (NTP).

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ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR

For an open economy we can express national savings in the national income identity as follows

$S = I + CA$ (7)

Private savings are

$Sp = Y - T - C$ (8)

Public savings are given by

$Sg = T - G - R$ (9)

(Sg) is the difference between public receipts from taxes (T), goods and services expenditure (G), and transfers (R) refers to government payments like social security, unemployment benefits, welfare, and subsidies without the purchase of goods or services.

Given that the composition of national savings is Sp + Sg, we can express equation (7) as

$S = Sp + Sg = Y - T - C + (T - G - R) = I + CA$ (10)

Where R stands for other government revenues (non-tax revenues such as fees, royalties, or profits from state-owned enterprises).

We can rewrite equation (10) as

$I + CA = Sp + (T - G - R)$ (11)

By further simplifying equation (11) we get

$CA = Sp - I + (T - G - R)$ (12),

where Current Account Balance = Excess Private Savings Over Investments + Budget Balance.

Equation (12) represents a twin association between a current account deficit and a fiscal deficit of a country. It demonstrates that the current account is exaggerated by the budget deficit as well as the difference between the savings and investment by the private (Sp-I) popularly known as the savings gap. Supposing that this difference (Sp-I) is constant over time, variations in the budget balance (T-G-R) can give rise to similar alterations in the current account (CA). Consequently, any fiscal balance movements can be connected to the variations in the current account balance, though the direction and strength of this correlation can be defined finally by the empirical analysis. This conditional connection is referred to as the twin deficits hypothesis (Hailemareiam, 2023).

There are basically two main arguments reinforcing the twin deficit hypothesis. The first one relies on the Keynesian proposition, which advocates for twin convergence, which states that the current account's deficit is the output of the happening of the government's budget deficit, while the Ricardian equivalence hypothesis is the second one, which advocates for twin divergence, in which both deficits have no link at all and are treated as unrelated. In the situation when a nation is preferring to function depending on an open economy's system with a flexible exchange rate that finances its obligations through domestic borrowing, the Keynesian proposition—later incorporated into the Mundell–Fleming framework—is dependent on the concept that a country's budget shortfall leads to an improvement in domestic interest rates (which, in turn, encourages foreign investors in such a way that they consider it beneficial and preferable to invest in the home country). Greater demand for financial assets in a particular country leads to the local currency's higher demand, which will ultimately be conducive to the exchange rate's appreciation and massive capital inflows (Sakyi & Osei Opoku, 2016). Due to this happening, exports fall while imports rise, leaving the nation with an inequity in the country's current account. Actually, the "Twin Deficit Hypothesis" describes that whenever a promotion in the budget deficit occurs, it surely brings the current account's deficit enhancement. By stating that consumption and output will not be suffered if the fiscal policy is of an expansionary nature, the Ricardian equivalence hypothesis refutes the twin deficit theory. Tax cuts diminish government revenues, resulting

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ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
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in a budget deficit if government spending remains constant. Households that prudently preserve the extra income they generate as a precautionary measure in case government policies tighten in the future (such as raising taxes). In this case, an expansionary monetary policy will be proved the main cause of large private savings and low government savings, having no and nearly passive influence on the real interest rate, currency rate, or current account balance (Abbas et al., 2011; El-Khishin & El-Saeed, 2021). The domestic investment will diminish, or there will be an enhancement in the current account's deficit (or both) if private and governmental savings do not equalize (Helmy & Zaki 2017).

Empirical Review

Husain et al. (2025) investigated the presence of short- and long-term correlations between the fiscal deficit (FD) and the current account deficit (CAD), considering the framework of the twin deficit hypothesis in the context of the Indian economy. They analysed data for the period from 1980 to 2021. They also considered the influence of additional independent variables such as inflation and exchange rates on the current account deficit. The first results were in terms of the ARDL bounds test, where no association between the variables was identified in the long run. Nevertheless, when the endogenous structural break was used, as in the Gregory-Hansen co-integration technique, a strong long-run relationship was found, and a structural break was observed in 2005. The long-run findings show that the fiscal deficit contributes to the current account deficit because of a positive link, as demonstrated by study findings; hence, they succeeded in confirming through their findings that India's economy is facing the critical issue of the twin deficits. Therefore, it has been established that India's current account deficit is being positively and significantly exaggerated by the inflation in the long run, implying that an upsurge in price levels results in an imbalance in the external accounts. Granger causality outcomes also indicate the occurrence of two-way causality between the two deficits, which verifies the existence of twin deficits in India.

Based on yearly data from 1977 to 2022, Kumar (2025) inspected the link between fiscal deficit and trade deficit in India. To inspect and detect asymmetric short- and long-run belongings, the study practises the Nonlinear Autoregressive Distributed Lag (NARDL) model, whereas the Zivot-Andre test for unit root is used to determine possible structural breaks in the data. The findings showed an asymmetric cointegration among the fiscal and trade deficits, thus showing that when there is a positive and a negative shock, there are different influences on them. Short-run and long-run outcomes indicate that the dynamics of the fiscal shortfall are strongly influenced by instabilities in the trade deficit and, hence, the validity of external imbalances in shaping fiscal outcomes. It was also established that the two deficits' relationship was stronger and more long-term stable, thus leading to the need to manage the trade imbalances effectively so as to achieve fiscal sustainability in India.

Hussain et al. (2024) inspected about the existence of the twin deficit hypothesis considering Pakistan's developing economy with the changing aggregate demand and the growth of fiscal and external imbalances. The study utilized annual time-series data and the ARDL framework and methods recommended by McNown et al. (2018) and Sam et al. (2019) to eliminate the problem of degeneracy. There were two models estimated and two dependent variables, namely the current account balance and trade balance. The long-run implications strongly support the traditional twin deficit theory, demonstrating a causal connection between the fiscal deficit and the trade balance. The results also show that a growth in the nominal effective exchange rate enhances current account and trade balances, and this is a benefit of the elasticity approach in the long run. It was observed that trade openness worsens the current account balance, and it positively but insignificantly impacts the balance of trade.

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The research was able to reach the conclusion that cuts in fiscal shortfalls along with proper economic policy are the key to dealing with the long-term external imbalances in Pakistan.

Waheed and Akram (2023) have investigated the association between the budget deficit and the current account deficit by analyzing the data that covers the period from 1980 to 2021 while taking Pakistan's developing economy into consideration. The cointegration test of Johansen provided evidence about the occurrence of a long-term integration between two variables, and the positive bearing of the fiscal deficit was noted on the current account deficit, demonstrating a direct link in the two deficits. Based on a Vector Error Correction Model (VECM), it was observed that high government expenditure, which is usually financed by way of borrowing, in turn increased the imports and thus was conducive to the deteriorating of the trade balance, and ultimately the current account deficit took place. The study placed an emphasis on good fiscal policy by having better taxation and export competitiveness so as to deal with these imbalances. It further endorsed the Keynesian interpretation of the twin deficit hypothesis but discarded the Ricardian equivalence hypothesis through the evidence that fiscal deficits play a major role in establishing external balances.

Riaz et al. (2022) investigated how fiscal policy shock distresses the current account balance in South Asian countries while they adopted the Panel Structural Vector Autoregressive (PSVAR) model, and in this regard, they analyzed the data on the years between 1984 and 2019. The study examined the channels of transmission of said policy shocks to current account dynamics and took the relative relevance of output shocks and government expenditure shocks in correcting current account deficits into account. The study adds to the literature in terms of fiscal-external sector interactions by looking at South Asia, a region of emerging markets with long-term external imbalances and macroeconomic instabilities. The empirical results indicated that when the government adopts the strategy of expansionary fiscal policy, then its shocks have the effect of lowering current account deficits, which indicated that the conventional twin deficit proposition was not deviated from.

Abbas et al (2022) examined the three-gap phenomenon in Pakistan and presented their results in terms of the trend of the trade deficit, fiscal deficit, and saving-investment gap based on time-series data in the period 1976-2020. This paper has explored the interdependences between these three deficits and how they have transmission mechanisms of interdependence and how they are hard to deal with individually. Through the application of the ARDL and cointegration methods of causality analysis, the study made contributions toward the causality relationships between these balances and derived conclusions about the economy in the context of twin deficit and saving investment gap. The findings showed that there are short-run relations and bidirectional causality among the external debt, current account, and fiscal balances/deficits, as well as showed that such deficits are significantly related to the macroeconomic variables.

The article by Rajakaruna and Suardi (2021) analyzed the problem of the twin deficit in South Asia, where a budget and current account deficit has been one of the primary strategy issues over decades. The study reached beyond the conventional assumption of a unidirection relationship in using a panel vector autoregression model of five countries in South Asia. The outcomes presented that there was a two-way cause between fiscal and external deficits. Analysis of impulse response also indicated that the budget balance is positively affected by a shock in the current account balance and vice versa. It was also observed during the study that the increasing fiscal debt may act as a barrier to economic growth and have detrimental effects on the fiscal balance. The authors concluded based on these findings that the fiscal

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ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
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policy in itself is not adequate and that the region needs a wider policy mix in order to deal with twin deficits.

Mukhtar et al. (2021) evaluated the twin deficit hypothesis in Pakistan on the basis of annual data, covering 1980-2018. The model used in the study was the NARDL model, which was used to obtain asymmetric effects between fiscal balance and current account balance. The findings suggested that both short- and long-term effects were highly asymmetric, implying that fiscal expansions and contractions have different effects on external balances. This questions the symmetry of the conventional linear models and the adaptability and responsiveness of macroeconomic policies in Pakistan.

El-Khishin and El-Saeed (2021) looked at the correlation between fiscal balance and external balance in oil-exporting and non-oil economies of the MENA within the twin deficit framework. In order to assess the effects of the dynamics of oil prices and geopolitical situations in the region on the vulnerability of these balances, the analysis used a generalised method of moments along with panel vector autoregression analysis sustained by the Granger causality and impulse response analysis. The findings showed that there is a higher tendency of twin deficits in oil-rich MENA countries than in non-oil economies. The results also indicated that the oil dependence increases fiscal vulnerability to geopolitical shocks, and the fiscal shocks can be transmitted to the exterior balance. On the contrary, non-oil MENA economies were discovered to be more vulnerable to structural factors that influence both fiscal and current account results.

Awan et al. (2020) analysed and worked on the time-series data which covers the period between 1974 and 2018 in order to empirically study the dynamics of the twin deficit hypothesis in Pakistan. The research estimated the link between fiscal deficit and current account deficit with the concurrent equation model made up of two stochastic equations in which either of the two variables can be considered a government endogenous variable. To test formally the endogeneity in the system, a simultaneous Hausman test was used, and to test the stationarity position of the series, the Ng-Perron unit root test was used. Since simultaneity and possible correlation existed among error terms, the authors estimated the system with the help of the three-stage least squares (3SLS) estimation method. The empirical results showed a statistically significant positive bivariate association between a budget shortfall and a current account shortfall. Taking into consideration this fact, the paper found out that the long-term fiscal imbalances are directly linked to external sector imbalances in Pakistan and that a concerted, disciplined, and wise fiscal and monetary policy intervention is necessary to address the growing twin deficits.

Jackson and Jabbie (2020) researched the twin deficit hypothesis's validity by empirically assessing the data, which covers the 1980–2018 period in Sierra Leone. They preferred to adopt the Fully Modified Ordinary Least Squares (FMOS) methodology for the accomplishment of the study and to arrive at a meaningful conclusion. They were successful in demonstrating that the government's fiscal deficit is partially to blame for Sierra Leone's current account deficit. They also reasoned that the economy of Sierra Leone being a small open system is limited by poor governance systems especially in areas that add little to productivity, high cost of borrowing that restricts the involvement of the private sector.

Devadas and Loayza (2018) identified the negative connotations of current account deficits by differentiating between sustainable and unsustainable episodes of deficits. The paper described that the deficit can be considered sustainable in the case when it is caused by some reversible factors which do not cause significant disturbance in the situation, but an unsustainable deficit has a deeper macroeconomic imbalance which has to be corrected with painful adjustment. Their review showed that deficits, both large and persistent and brought

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
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about mainly by consumption and not investment, and deficits that are caused by high domestic credit creation, high exchange rates or untamed fiscal deficits have a higher likelihood of creating undesirable macroeconomic effects.

Epaphra (2017) examined data spanning from 1966 to 2015 to explore the association between Tanzania's budget deficit and its current account deficit. The study aimed to test the twin deficits hypothesis, which suggests that these two variables are positively correlated. He adopted a Vector Error Correction Model (VECM) to obtain the empirical evidence about the proposition, which states that the enhancement of budget deficits contributes to worsening current account deficits. The findings show that there was a relatively high rate of equilibrium adjustment, as is expected in a small open economy. He points out that this relationship implies significant policy implications: in order to alleviate the burden of fiscal deficit on the external balance, governments ought to engage in reducing non-development expenditures, increasing domestic revenue collection, fighting corruption and tax evasion and ensuring that the export-orientated and import-substitution industries are promoted through some favourable business environment. Such results should be viewed within the context of the overall discussion of the twin deficits hypothesis and prove that fiscal discipline is an important factor to ensure external stability in a developing economy such as Tanzania.

Rehman and Sumaira Saeed (2017) conducted research to examine and evaluate the economic significance of the twin deficits issue in Pakistan. They collaborated with and analyzed data from 1972 to 2015 to conduct their study. They used three well-known and distinct econometric approaches to trace the connection and coordination between the budget and current account deficits. Their findings depict and explain that both deficits have a coincidental relationship, thereby supporting the presence of the twin deficits theorem in relation to Pakistan's economy. In addition, based on findings from the econometric approach, they also succeeded in discovering the path of causality and reported that there exists unidirectional or one-way causation between the two deficits.

Sakyi and Opoku (2016) empirically investigated whether a long-run association between fiscal and current account deficits in Ghana is confirmed. They analyzed the data which covers the period from 1960 to 2012 to obtain reliable and authentic results, while preferring to adopt cointegration techniques for their study analysis. Their results surprisingly showed that the budget deficit contributes to an enhancement in the current account balance, thereby supporting the assertion of the twin divergence hypothesis. Therefore, their this finding reduces the popularity of the twin deficits' theorem by inviting attention to this aspect that this situation may also takes place.

In a study that focused on 16 industrialised countries in the post-1975 era, Boileau and Normandin (2012) observed the effects of tax shocks on the budget deficit and the external deficit. Through a structural small open-economy model, the study demonstrates that a tax reduction initially creates a budget deficit, which in turn spreads to the external deficit in the two primary vehicles, namely a demographic vehicle, founded on the structure of overlapping generations, and a forecasting vehicle, created by the dynamic expectations that are captured by the model. Their empirical findings have shown that tax shocks can cause large positive comovements between fiscal and external deficits, and thus they show that taxation cuts have a tendency to increase both of these imbalances. Further, the discussion reveals that the demographic and the forecasting engines are also instrumental in the explanation of the observed comovements that offer strong evidence of the interrelationship between the fiscal policy and the external sector performance of the developed economies.

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ISSN P: 3006-1458
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Holmes (2011) offers a strict empirical study of the twin deficit assumption considering the United States by using a threshold cointegration technique as proposed by Hansen and Seo (2002) on annual data over 1947-2009. This paper proves a positive cointegrating connection between the budget deficit and the current account deficit in the long run, thus providing strong evidence of the Keynesian view that fiscal imbalances cause external deficits in the long run. Together with the long-run equilibrium, Holmes discusses the short-run processes, employing a threshold vector error correction model, where the adjustment speed and direction are determined by the current economic regime and either internal fiscal balance or external current account is the dominant factor behind error correction. This conditional behaviour also explains why domestic fiscal policy and external sector stability interact in a complex way, where the success of the fiscal measures in correcting current account imbalances is conditional depending on the macroeconomic and structural circumstances. Combining both long-run cointegration and short-run threshold dynamics, this study does not only confirm the hypothesis of twin deficits theory in a key advanced economy but also sheds light on the policy processes in which fiscal policy can be used to manipulate external balances, which supports the theoretical as well as practical significance of keeping fiscal management when it comes to external sustainability.

In another research, which was conducted by Rauf and Khan (2011), it was noticed that the basic factor and main determinant that generates the budget deficit is the deficit in the trade's balance, and they further described that the causality was running from trade deficit to budget deficit. They presented this statement in the light of their findings, which they got by empirically working on the data, which covers the 1980 to 2009 period, and through the application of the famous OLS (ordinary least square) regression methodology.

Zamanzadeh and Mehrara (2011) were other researchers who succeeded in tracing the association between the non-oil current account's balance deficit and the Iranian state's budget shortfall regarding the Iranian economy. They conducted research, which is basically of an empirical nature, by assessing and analyzing the data of the 1959 to 2007 period through the adoption of cointegration techniques. Their findings produced evidence of the twin deficits' hypothesis validity as far as Iran's economy is concerned. Their results depict and report bidirectional causation between the variables under review and analysis.

Hakro (2009) analyzed the data, which consists of a sufficient number of observations of the 1946-2005-time period to detect and know any possible coordination and expected link between the two deficits with regard to Pakistan's economy. His outcomes proved the causal connection between two deficits and other variables he took for study in Pakistan's case. The autoregressive vector model's estimates indicate that causality is observed to flow from the budget deficit to inflation to the interest rate to the exchange rate to the capital's flow and ultimately to the trade deficit. In the context of his results, he listed the presence of thin capital markets in developing nations. He, with the help of the study's findings, also noted the association between the deficit in the budget and the exchange rates. Furthermore, the study describes how flows of capital inevitably affect exchange rates.

Lau, Baharumshah, and Ismail (2009), in their seminal contribution, empirically revisit the existence of the twin deficits hypothesis (TDH) taking into consideration the five ASEAN economies, namely, Malaysia, Thailand, the Philippines, Indonesia, and Singapore, by clearly introducing the contribution made by investment and capital mobility as the nexus of the fiscal and external balance. After analysing causal interrelationships between budget deficits, current account deficits, and investment using time-series techniques, the authors offer subtle evidence that the TDH is not always generalizable throughout emerging budget deficit economies in Southeast Asia. In particular, the theory is strongly lawful for the situation of

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

Malaysia, Thailand and the Philippines, where fiscal imbalances have a statistically significant and positive effect on current account deficits, thus supporting the traditional Keynesian transmission process in which expansionary fiscal policy boosts domestic absorption, increases imports, and worsens the external balance. In addition to this direct fiscal medium, the paper also provides additional information that the government spending will push out enterprise investment and further supports the neoclassical argument that fiscal stimulus may limit domestic investment by increasing interest rates or misallocating resources. Furthermore, investment itself is observed to have a noteworthy bearing on current account dynamics, which highlights the pivotal role of the savings-investment gap in the explanation of external imbalance. Notably, the authors disclose that a significant share of internal investment in these economies is funded by international capital flows, indicating a fairly high mobility in capital flows as well as a reduced significance of the Feldstein-Horioka puzzle empirically in the ASEAN 5 setting. Taken together, their results bring the wider macroeconomic literature on open economies closer to the fiscal external imbalance relationship in the emerging markets by showing that investment behaviour and international capital flows mediate the relationship, thus illustrating structural heterogeneity in the applicability of the twin deficits model.

Arize and Malindretos (2008) inspected the long-run and short-run link between budget deficits and trade deficits in ten African countries between the quarterly period 1973: Q2 and 2005: Q4. The authors give solid econometric results of a steady and positive long-run stability association between fiscal and external imbalances by using several cointegration methods such as the Harris-Inder, Shin, Geweke-Porter-Hudak, and Sowell approaches, and as such, the authors give solid support to the traditional Keynesian explanation of the twin deficits proposition. Their outcomes display the existence of a two-way long-run Granger causality, meaning that fiscal deficits and trade deficits have a joint endogenous and mutually reinforcing relationship over time. But the dynamics in the short run are somewhat different: causality can be seen to be less compelling and more unidirectional, with the budget deficit having a causal effect on the trade deficit, and bidirectional feedback effects seem to be largely insignificant in the short run. Notably, the research defines fiscal adjustment as the main process that leads to convergence to long-run equilibrium, proving that budget deficits are quicker to respond to restore macroeconomic equilibrium after the shocks than the trade deficits. This imbalance suggests that the fiscal policy is dominant in rectifying external imbalances in African economies. The paper contributes greatly to the empirical discussion on fiscal-external interdependence with the short-run adjustment dynamics, and this paper highlights the central role of fiscal discipline in ensuring that external sustainability.

Mukhtar et al. (2007) tested the twin deficits hypothesis for Pakistan's economy empirically. They focused on data that covers 1975:1 to 2005:4 durations. For their study, they employed the co-integration's methodology along with the error correction model. Keeping in view their outcomes, they reported the occurrence of the cointegration between the budget's deficit and the current balance's deficit in Pakistan's context. Furthermore, a bi-directional causality was also confirmed by them between those variables took for the analysis. With respect to nine SEACEN economies, Lau and Baharumshah (2006) worked on annual data for the period between 1980 and 2001 to empirically test the degree of association between two deficits. OLS, panel VAR, and Granger's Causality checking and empirical estimation techniques were adapted. They were able to confirm that there is a bidirectional causal connection between the two deficits.

Samadi (2006) tested the twin deficits hypothesis in MENA countries by working on the 1971–2000 data and applying the cointegration techniques, including ECM and Granger's

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causality test, and discovered the mixed proof of Ricardian's equivalence and Keynesian's proposition. Regarding the nine SEACEN economies, Lau and Baharumshah (2006) empirically evaluated the degree and extent of the association between the two deficits. They considered and assessed the annual data comprising the period between 1980 and 2001. They adopted OLS, panel VAR, and Granger Causality tests and techniques for their empirical estimation to arrive at solid and accurate conclusions. They, therefore, succeeded in confirming that a casual bidirectional relationship is being taken place between the two deficits. Akbostanci and Tunc (2001) analyzed quarterly data from 1987 to 2001 with the primary objective of confirming whether the twin deficits theorem holds for Turkey. They applied the cointegration approach and ECM methodology for their investigation. Their findings confirm that the theory of twin deficits applies to Turkey's economy both in the long and short term.

Saleh et al. (2005) conducted a study with the main goal to trace the coordination between budget deficit and current account deficit with regard to Sri Lanka by analyzing the data consisting of the 1970-2003 period. The modern autoregressive distributed lag (ARDL), which is the famous and frequently used technique, was adopted to get reliable and concrete results for the study, which was founded on empirical research work. His findings support the sound and positive link between two deficits. The test that helps and facilitates in finding the causation, which was introduced by Granger, was also implemented with the prime goal to know the causality's direction. The test confirms the evidence of the unidirectional causation that flows from the budget's deficit to the current account's deficit.

Pattichis (2004) empirically examines the twin deficit theory within the Lebanese context, that is, between the years of 1982 and 1997, when the country was picking up following decades of raging civil war. The study achieves the validation of the Keynesian proposition of twin deficits by examining how the budget deficit of the state can be directly related to the trade deficit, showing that fiscal imbalances are contributing factors to the external deficits. The findings also show that any decline in the budget deficit would equally impact positively on the elimination of the trade deficit and thus the dependence between domestic financial management and foreign economic stability. This observation is especially remarkable in post-conflict economies such as Lebanon, where fiscal contraction and external balance repair are of importance in the sustainable economic recovery. According to the analysis of Pattichis, careful fiscal measures to curtail the domestic spending or enhance revenue collection can be effective mechanisms not only for domestic stabilisation but also to deal with continuous trade imbalances, which supports the general theoretical assumption that fiscal discipline is a decisive factor in foreign sustainability in emerging and transitional economies.

Leachman and Francis (2002) have conducted extensive research on the critical issue of twin deficits using cointegration methodology. They examined two distinct periods following the Second World War: the first period was pre-Bretton Woods (1948 to 1973), and the second period was post-Bretton Woods (1974 to 1992). Considering the study's findings, they established that the twin deficits hypothesis does not hold for the period before Bretton Woods, while it was found to be valid after that time. Thus, they further added that the deficit in the government's budget is the main factor owing to which the current account's balance is being exacerbated. Therefore, by following the guidelines of their research findings, we can easily conclude that the phenomenon of two deficits began in the early 1970s.

Kulkarni and Erickson (2001) re-analysed the concept of twin deficits hypothesis by testing the theoretical and empirical connection between deficits in government budget and external trade deficits in reference to India, Pakistan and Mexico. Based on the national income

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accounting identity, the paper has highlighted that fiscal imbalances can be transferred to external imbalances as the growth in aggregate demand through higher government expenditure or decreased taxation surpasses the local production capacity. According to this structure, budget deficits may be related to trade deficits through increased absorption, imports and compulsions on interest rates and exchange rates. The authors framed their analysis in the context of the existing open-economy macroeconomic literature, which forms the basis of the absorption approach and the IS-LM-BP model to describe the welfare of the transmission mechanism between fiscal policy and balance-of-payments performance. This view holds that through expansionary fiscal policy it is possible to upsurge domestic interest rates, promote capital inflows, appreciate domestic currency, and decrease competitiveness of exports, thus deteriorating the trade balance. Nevertheless, the study also admitted that this relationship is not automatic and country-specific because the institutional structures, policy regime and macroeconomic conditions mediate the relationship. They emphasized that the relationships between the twin deficits might not be the same as in developed economies by concentrating on the developing and emerging economies. Their analysis has brought to the fore the applicability of country specific variables such as fiscal discipline, exchange rate management and capital mobility in establishing the interaction between fiscal deficits and external balances. On the whole, the research made a contribution to the literature by showing the applicability of the twin deficit debate but with the warning that the generalizations cannot be made especially in the world of diverse developing economies.

Akbostanci and Tunç (2001) have conducted a comprehensive empirical analysis of the hypothesis of twin deficits, analysing the theory on the basis of quarterly data between 1987 and 2001 in the Turkish economy. The authors employ a cointegration and error correction model with which they explore the short- and long-run associations between the government deficit in the budget and the trade deficit. The results of the long run indicate that the equilibrium relationship is significant statistically, and it indicates that the fiscal imbalances and external trade deficit in Turkey are highly related, therefore establishing the Keynesian twin deficit theory. The short-run error correction model depicts that the worse the budget balance is, the worse the trade balance is, and that is why the fiscal shocks should be conducted to foreign accounts immediately. In addition, the outcomes are not supportive of the Ricardian equivalence theory, in which the fiscal policy is known to possess a real effect on the trade deficit and that it is not counterbalanced by the behaviour of the Turkish private sector. The paper is applicable to the general body of fiscal-external relationships literature since it shows that government budget deficits can be both short- and long-term strains on external balances in emerging economies with developing capital markets and insufficient compensating institutions, and that good fiscal policy is essential to ensuring external sustainability.

For the fulfilment of the objective of research and to detect that whether or not there is any possible interaction between the deficit in the government's budget and Saudi Arabia’s trade deficit, Alkswani (2000) used cointegration’s regression and error correction model. Time-series data were taken which basically covers the 1970-1999-time period. To know the correlation between the study’s variables, he also applied the popular Johansen’s cointegration techniques. His results describe that a long-term link between the two deficits exists. Furthermore, the outcomes revealed that the causality’s direction comes from the trade deficit to the state’s budget deficit.

By taking into investigation the economy of Brazil and the data from 1973:1 through 1991:4 Islam (1998) conducted a research to inspect the twin deficit’s hypothesis. In order to define

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the path of causality, he followed the causality test introduced by Granger and his outcome also confirmed the bi-directional relationship of causality between the deficit in the state's budget and the trade's balance deficit. The coordination and the expected link which can take place between the budget deficit and the deficit in the current account's balance of five Southeast Asian countries was empirically analyzed by Anoruo and Ramchander (1998). For the intent of the inquiry, they followed the VAR model by working and analyzing the facts and figures relating to a specific duration of 1957 to 1993. In Malaysia's case, they found a bidirectional relationship between the variables under analysis. While their result showed that in the situation of the rest four countries the trade balance's deficit triggered the deficit in the government's budget. In light of their observations, they pointed out and described that the fiscal and trade deficits were influenced by various macroeconomic determinants.

Darrat (1988) gives the historic data on the interactive relationship involving the government budget deficit and the trade balance in the United States in the floating exchange rate era. The study uses the method of Granger causality to find out the existence of two-way causal link between the two deficits and that fiscal and external imbalances are reinforcing each other. This observation would suggest that it is not only budget deficits that augment the deterioration of trade deficits, but also policymakers have likely augmented government spending in reaction to internal economic sufferings brought about by external imbalances. This bi-directional causality, as pointed out by Darrat, highlights the sophistication of the fiscal-external linkages and why policymakers need to take into account the feedback mechanism when making fiscal and trade policies. The study also gives contributions to the theoretical knowledge of the twin deficits phenomenon, as the conventional one-way Keynesian interpretation cannot always represent the reciprocal interactions that can arise with an open economy with floating exchange rates.

Bernheim (1988) wrote about the correlation between the budget deficits and the balance of trade in the United States during a time when federal budget deficits started to rise and the balance of trade began to deteriorate. The paper highlighted that national income accounting identities enforce the fact that the budget deficit has either to be shown as a difference between the private saving and investments or as an increase in imports over exports. The argument made in the analysis was that the borrowing by the government lowers the amount of domestic funds that could be invested in new capital formation by the domestic people, which could be augmented by the inflow of foreign capital. This process, in its turn, can be connected to the decline in the balance of trade, which connects fiscal deficits to the external imbalances.

Data and Methodology

The paper investigates the validity of the twin deficits hypothesis in eight South Asian countries by analyzing the data spanning from 2000 to 2023 presented in the form of a balanced panel dataset. Taking into consideration the aims of the study, the secondary data, which was collected from reliable and publicly available sources, including the World Bank's World Development Indicators (WDI), the Asian Development Bank (ADB), and official national economic surveys and reports of the particular countries, is analyzed. Using the Pooled Mean Group (PMG) and Mean Group (MG) estimators created by Pesaran et al. (1999), this study uses the panel Autoregressive Distributed Lag (ARDL) methodology to investigate the stated hypothesis. The ARDL framework can be used for analysing the short run and long run dynamics between countries and time. ARDL method and approach provides stable and consistent results (Shafique et al.,2021). While, the choice between the PMG and MG estimators will depend on the results of the Hausman specification test.

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3.1 Model Specification and Econometric Framework

This empirical study, which is unique in its methodology, adopts dynamic panel data and, with the help of an econometric framework, investigates the twin-deficit theory in South Asian economies. The choice of modelling formats and strategy adheres to the methodology of Nguyen and Lee (2021), with the strategy being appropriately modified to correspond with the goals and data available to capture the effects of cross-country heterogeneity and the dynamic adjustments made over time, allowing for the formats and structure of the current research. The panel data methods are employed to capture the effects of cross-country heterogeneity and the dynamic adjustments made over time, which allows for a more accurate analysis of the twin-deficit theory across different South Asian economies. Annual panel data of the eight South Asian countries are used to conduct the empirical analysis over a period T = 24 years, and hence a balanced panel structure is achieved, which is appropriate to conduct dynamic panel estimation. Considering study's chief target, an econometric model is formulated and stated to find the validity of the twin-deficit hypothesis in South Asian countries.

CAD =f (BD, WREM, TOT, GFCF)

where:

CAD denotes the current account deficit (% of GDP),
BD represents the budget deficit (% of GDP),
WREM refers to workers' remittances (% of GDP),
TOT denotes terms of trade, and
GFCF stands for gross fixed capital formation (% of GDP).

In this model, the current account deficit (CAD) is the dependent variable, while budget deficit (BD), workers' remittances (WREM), terms of trade (TOT), and gross fixed capital formation (GFCF) are the independent variables.

3.2.2 Linear and Log-Linear Specifications

The linear form of the model is expressed as:

$$CAD = \beta_0 + \beta_1(BD) + \beta_2(WREM) + \beta_3(TOT) + \beta_4(GFCF) + \varepsilon \quad (1)$$

The model's anticipated signs include $\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 < 0$, and $\beta_4 > 0$. The coefficients to be estimated are β_1 to β_4, while the error term is ε.

Logarithmic transformation is widely used to reduce skewness and normalize highly skewed data (Benoit, 2011; Feng et al., 2014)). To reduce skewness and improve the distributional properties of the data, the model is transformed into a log-linear specification:

$$\ln CAD = \beta_0 + \beta_1(\ln BD) + \beta_2(\ln WREM) + \beta_3(\ln TOT) + \beta_4(\ln GFCF) + \varepsilon \quad (2)$$

The model was then transformed into a panel data model by adding the subscripts "it," where "i" refers to the cross-section (countries), and "t" refers to the time dimension. The model is specified as follows:

$$\ln CAD_{it} = \beta_0 + \beta_1(\ln BD_{it}) + \beta_2(\ln WREM_{it}) + \beta_3(\ln TOT_{it}) + \beta_4(\ln GFCF_{it}) + \varepsilon_{it} \quad (3)$$

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Finally, the model was converted into a panel ARDL model to capture both the long-run and short-run dynamics between the current account deficit and its determinants. The general panel ARDL (p, q, q, q, q)form is expressed as:

$$lCAD_{it} = \sum_{j=1}^{p} \lambda_{ij}\, lCAD_{i,t-j} + \sum_{j=0}^{q-1} \delta_{1ij} lBD_{i,t-j} + \sum_{j=0}^{q-1} \delta_{2ij} lWREM_{i,t-j} + \sum_{j=0}^{q-1} \delta_{3ij} lTOT_{i,t-j} + \sum_{j=0}^{q-1} \delta_{4ij} lGFCF_{i,t-j} + \varepsilon_{it}$$

(4)

Here, CAD_{it}denotes the current account deficit for country *i* at time *t*, while BD_{it}, $WREM_{it}$, TOT_{it}, and $GFCF_{it}$represent the explanatory variables. The parameters *p* and *q* represent the optimal lag lengths for the dependent and independent variables, respectively. The coefficients $\lambda_j$measure the effects of lagged dependent variables, and δ_{kij}(for $k = 1,2,3,4$) denote the coefficients of the lagged explanatory variables. The stochastic error term is represented by ε_{it}.

The parameterized form of the panel ARDL model is presented as:

The parameterized form of the panel ARDL model is presented as follows:

$$\Delta lCAD_{it} = \phi_i lCAD_{i,t-1} + \beta_{1i} lBD_{i,t-1} + \beta_{2i} lWREM_{i,t-1} + \beta_{3i} lTOT_{i,t-1} + \beta_{4i} lGFCF_{i,t-1} + \sum_{j=1}^{p-1} \lambda^*_{ij} \Delta lCAD_{i,t-j} + \sum_{j=0}^{q-1} \delta^*_{1ij} \Delta lBD_{i,t-j} + \sum_{j=0}^{q-1} \delta^*_{2ij} \Delta lWREM_{i,t-j} + \sum_{j=0}^{q-1} \delta^*_{3ij} \Delta lTOT_{i,t-j} + \sum_{j=0}^{q-1} \delta^*_{4ij} \Delta lGFCF_{i,t-j} + \varepsilon_{it}$$

(5)

The first difference operator is denoted by Δ, cross-section is represented by *i* and time period is represented by t.

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φ_i is the error correction coefficient or speed of adjustment parameter, which measures the rate at which the dependent variable (CAD) returns to its long-run equilibrium after experiencing short-run shocks. The predicted value of φ_i is statistically negative, and this shows that it converges to the equilibrium. A negative figure implies a quicker adjustment process after any kind of disequilibrium caused by changes in budget deficit (BD), worker remittance (WREM), terms of trade (TOT), or gross fixed capital formation (GFCF).

The β coefficients β_{1i} to β_{4i} are the long-run elasticities of the corresponding explanatory variables, and the dynamic adjustments in the model in the short run are represented by λ_{ij}* and δ_{ij}*.
Lastly, ε_{it} represents the error term.

Error Correction Representation of the Panel ARDL Model

The error correction representation of the above panel ARDL model can be written as:

$$\Delta lCAD_{it} = a_i + \sum_{j=1}^{p-1} \lambda_{ij}^{*}\ \Delta lCAD_{i,t-j} + \sum_{j=0}^{q-1} \delta_{1ij}^{*}\ \Delta lBD_{i,t-j} + \sum_{j=0}^{q-1} \delta_{2ij}^{*}\ \Delta lWREM_{i,t-j} + \sum_{j=0}^{q-1} \delta_{3ij}^{*}\ \Delta lTOT_{i,t-j} + \sum_{j=0}^{q-1} \delta_{4ij}^{*}\ \Delta lGFCF_{i,t-j} + \varphi_i\, ECM_{i,t-1} + \varepsilon_{it} \quad (6)$$

Where $ECM_{i,t-1}$ is the error correction term obtained from the estimated long-run relationship:

$$ECM_{i,t-1} = CAD_{i,t-1} - \beta_{1i}\, BD_{i,t-1} - \beta_{2i}\, WREM_{i,t-1} - \beta_{3i}\, TOT_{i,t-1} - \beta_{4i}\, GFCF_{i,t-1} \quad (7)$$

The coefficient φ_i measures the speed of adjustment towards the long-run equilibrium.
It will tend to be negative and statistically significant, which will prove that any short-run deviation along the long-run equilibrium will be rectified with time. A negative statistically significant φ_i will offer support and evidence of cointegration among variables, thus confirming the twin deficit hypothesis and long-run link between the current account deficit and its macroeconomic determinants, and in particular, the budget deficit.

Table 1: Descriptive Statistics of Logged Variables

Statistic	LCAD	LBD	LWREM	LTOT	LGFCF
Mean	1.385	1.365	0.972	3.699	3.313
Median	1.310	1.592	1.251	4.050	3.337
Maximum	7.323	3.235	3.348	5.306	4.258
Minimum	−2.386	−2.323	−2.631	1.778	2.300

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Std. Dev.	1.410	1.025	1.529	0.762	0.431
Skewness	0.253	−1.126	−0.780	−0.891	−0.028
Kurtosis	3.599	4.502	2.782	2.660	2.698
Jarque–Bera	4.922	58.634	19.863	26.334	0.756
Probability	0.085	0.000	0.000	0.000	0.685
Observations	192	192	192	192	192

Source: Author's Calculations

Descriptive Statistics Discussion

The results of the descriptive statistics for the logarithmically transformed variables of the model are presented in Table 1. As evident from the table, the mean and median values of most variables are relatively close, indicating stable central tendencies across countries and over time. Such proximity and closeness of the mean and the median is an indicator that there are no severe distortions in the data, whereas the values of the standard deviation show that there is the reasonable variability of the series.

Specifically, LCAD and LWREM have relatively higher dispersion, which is the manifestation of more volatility in the current account balances and remittances of workers. This variance is not surprising since these macroeconomic variables are external and cyclical in nature, particularly during the exploration of the Twin Deficit Hypothesis. On the contrary, LGFCF has a comparatively smaller variation, suggesting more uniform patterns of investment over the sample period.

The skewness figures and statistics indicate that there is weak asymmetry in the variables. LBD, LWREM, and LTOT have negative skew, i.e., most of their values have been skewed to the high end with relatively longer tails on the low end. LCAD and LGFCF, on the other hand, seem to be more or less equal in that the observations of LCAD and LGFCF are well distributed around the mean. The majority of the variables are near a kurtosis value of three, which means that their distributions do not deviate radically from a normal distribution, but LBD has a rather high kurtosis.

According to the values and statistics of Jarque-Bra test, the null hypothesis of normality in LBD, LWREM, and LTOT is not accepted at the standard level of significance, LCAD is weakly non-normal, and LGFCF is normally distributed. These distributional properties tend to be common in macroeconomic panel data and do not compromise and undermine the validity of other subsequent econometric estimations. On the whole, descriptive statistics indicate sufficient variability and appropriate data that can be investigated to estimate the connection between budget deficits and current account deficits under the twin deficit hypothesis.

Multicollinearity Diagnostics

To verify the soundness and validity of the estimated regression outcomes, this study investigates the possibility of the existence of multicollinearity among the explanatory variables through pairwise correlation analysis and through the Variance Inflation Factor (VIF) test. Such diagnostic methods find extensive application in empirical econometric research to identify linear dependencies among regressors that can otherwise give biased estimates and false statistical inference (Cooper and Schindler, 2014).

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Table 2: Pairwise Correlation Matrix of Log-Transformed Variables

Variables	ln_CAD	ln_BD	ln_WREM	ln_TOT	ln_GFCF
ln_CAD	1.000				
ln_BD	0.139	1.000			
ln_WREM	−0.488	−0.405	1.000		
ln_TOT	−0.358	0.261	0.189	1.000	
ln_GFCF	0.120	0.425	−0.214	0.119	1.000

Source: Author's Calculations

Note: The table is a report of Pearson correlation coefficients between log-transformed variables. All the correlation coefficients are below the traditional level of 0.80, meaning they do not imply severe multicollinearity.

Table 3: Variance Inflation Factor (VIF) Results (Model Two)

Variable	VIF	1 / VIF
ln_BD	1.58	0.632
ln_WREM	1.35	0.740
ln_GFCF	1.22	0.817
ln_TOT	1.21	0.827
Mean VIF	**1.34**	

Source: Author's Calculations

Note: The values of all VIFs are significantly less than the critical value of 10 (and a less critical value of 5), which proves that the issue of multicollinearity is not a serious issue in the model.

The correlation analysis in table 2 depicts that all of the explanatory variables have no pairwise correlation. The correlation coefficients between the log-transformed variables are relatively low to moderate in value, and they are within acceptable ranges. This means that the model is able to pass through the multicollinearity diagnostic test in terms of correlation analysis.

Despite the fact that there are certain medium correlations, like the negative association between the workers' remittances and current account deficit, the correlations are economically significant and do not show statistical redundancy among the regressors. With great multicollinearity, the regression estimates would have given an unstable coefficient, broader confidence intervals, and unreliable hypothesis tests, as Cooper and Schindler (2014) stress.

The VIF results in table 3 also support the results of the correlation matrix. VIF values are between 1.21 and 1.58, and the mean of VIF is 1.34. The VIF values are all significantly less than the generally accepted value of 5, which makes it clear that none of the explanatory variables is being unnecessarily explained by the rest and that the estimated coefficients are not being inflated by multicollinearity.

As our result depicts, there is no issue of multicollinearity, which is favorable for us because, according to Cooper and Schindler (2014), the absence of problematic multicollinearity

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ensures that the regression results are not spurious and that the estimated coefficients, test statistics, and overall model fit are reliable for meaningful economic interpretation.

Cross-Sectional Dependence Test

Before conducting panel unit root and cointegration tests, it is important to determine whether the cross-sectional dependence is present or not. This study, therefore, uses Pesaran's (2004) CD test and the Breusch–Pagan (1980) LM test for the purpose, both commonly applied in macro-panel analysis. It is relevant to consider cross-country dependence, since common shocks and spillovers may affect countries; otherwise, biased or inefficient estimates may be obtained, leading to incorrect conclusions about the relationships being studied.

Table 4: Residual Cross-Sectional Dependence Test Results

Model	Specification	BP LM (p-value)	Scaled LM (p-value)	Bias-Corrected LM (p-value)	Pesaran CD (p-value)	Decision
Model	lCAD = f(lBD, lWREM, lTOT, lGFCF)	16.73 (0.954)	−1.51 (0.132)	−1.68 (0.093)	−0.69 (0.491)	No CSD

Source: Author's Calculations

Note: BP LM is simply the Breusch-Pagan Lagrange Multiplier test; Scaled LM is simply the Pesaran scaled Lagrange Multiplier test; Bias-Corrected LM is simply the Pesaran scaled Lagrange Multiplier test, and Pesaran CD is simply the test of cross-sectional dependence proposed by Pesaran (2004).

Results Discussion

Table 4 depicts that all of the diagnostic tests of the current study, namely, the Breusch-Pagan LM, Pesaran scaled LM, bias-corrected LM, and Pesaran CD, accepted the null hypothesis of cross-sectional independence. This indicates that cross-sectional dependence is not present, and there is no concern for further analysis. As a result, the panel units can be treated as independent, and here the use of the first-generation panel unit root test is appropriate. Therefore, here it will be appropriate to proceed first with LLC, IPS, and Fisher-type ADF and PP tests and then to estimate the panel ARDL-PMG model.

Unit Root Test

Unit root testing is also crucial in macroeconomic analysis to determine the stationarity position of variables and save us from spurious regressions, bogus and false inferences. Since macroeconomic time series are generally non-stationary (Mukhtar, 2010; Nelson and Plosser, 1982). We, therefore, prefer to conduct the unit root test for panel data for this purpose.

Rationale of the Panel Unit Root Test.

The panel nature of the data implies that panel unit root tests will be applied because they are more powerful and can also allow analysing cross-sectional heterogeneity when analysing multi-country data. The types of tests that are employed in this study are the Levin, Lin, and Chu (LLC), Im, Pesaran, and Shin (IPS), and Fisher-type Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests: LLC is based on the common unit root process, whereas IPS and Fisher tests can be used with heterogeneity. The null hypothesis is always a unit root in any case, and when it is rejected, the result implies that it is stationary.

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Table 5: Panel Unit Root Test Results for CAD, BD, WREM, TOT, GFCF

(Balanced panel: 8 cross-sections, 2000–2023; lag = 1; individual effects; p-values in parentheses)

Variable	LLC (Level)	IPS (Level)	ADF–Fisher (Level)	PP–Fisher (Level)	LLC (First Diff.)	IPS (First Diff.)	ADF–Fisher (First Diff.)	PP–Fisher (First Diff.)	Order of Integration
CAD	−512.71 (0.000)	−182.40 (0.000)	299.21 (0.000)	68.680 (0.000)	—	—	—	—	I(0)
BD	−3.785 (0.000)	−2.863 (0.002)	36.801 (0.002)	47.004 (0.000)	—	—	—	—	I(0)
WREM	−0.647 (0.258)	−0.893 (0.185)	28.618 (0.026)	42.618 (0.000)	−7.372 (0.000)	−7.428 (0.000)	82.470 (0.000)	368.00 (0.000)	I(1)
TOT	−3.394 (0.000)	−2.211 (0.013)	28.500 (0.027)	19.661 (0.235)	−6.341 (0.000)	−7.187 (0.000)	78.822 (0.000)	118.87 (0.000)	I(1)
GFCF	−2.035 (0.020)	−1.993 (0.023)	28.012 (0.031)	16.249 (0.435)	−4.217 (0.000)	−5.152 (0.000)	55.921 (0.000)	99.937 (0.000)	I(1)

Source: Author's Calculations

The panel unit root outcomes shown in Table 5 demonstrate that CAD and BD are found to be stationary at the level I(0), meaning they adjust quickly to short-term shocks. In contrast, WREM, TOT, and GFCF are noted to be non-stationary at the level but have become stationary when their first difference was taken and thus are I(1). As a matter of fact, none of the variables have the integration order two I(2); the assumptions required for the Panel ARDL–PMG approach are satisfied, making it suitable for estimating both long-run and short-run dynamics under mixed integration.

Panel Cointegration Analysis

To conduct an accurate analysis study, it is preferred to know about the presence of a long-run link if it exists among the variables. This study applies two residual-based panel cointegration tests: Pedroni (1999, 2004) and Kao (1999). The Pedroni test also takes into consideration cross-sectional heterogeneity, whereas the Kao test is a homogeneous cointegrating vector that offers complementary evidence. It is estimated based on annual panel data for eight cross-sectional units from 2000 to 2023, and the trend is not considered deterministic.

Table 6: Pedroni and Kao Panel Cointegration Tests

Panel A: Pedroni Residual Cointegration Test

Dimension	Test	Statistic	p-value
Between-dimension (Group statistics)	Panel PP-Statistic	−6.786	.000
	Panel ADF-Statistic	−5.878	.000
Within-dimension (Panel statistics)	Panel PP-Statistic	−6.454	.000
	Panel ADF-Statistic	−7.697	.000

Panel B: Kao Residual Cointegration Test		
Test	**Statistic**	**p-value**
ADF-Statistic	−2.575	.005

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Source: Author's Calculations

Note. The Pedroni and Kao tests start with the assumption that there exists no cointegration. However, since the findings are significant at the 5% level, this assumption is rejected, indicating the existence of a long-run association among the variables.

Table 6 results approve a strong long-run connection among the variables. The Pedroni test and the Kao test both reject the null hypothesis of no cointegration at the 5% level, indicating that the variables move together over time. Cointegration is supported by Pedroni statistics (panel and group PP and ADF) and the large value of Kao ADF (−2.575). It advocates that, notwithstanding short-run variations, a steady long-run equilibrium exists. Based on these results, the ARDL-PMG model will be suitable because it will capture long-run associations but allow short-run disparities among nations.

Selection of Lag Length of the ARDL Model.

To evaluate the ARDL model, first the study tries to use an appropriate lag structure to eliminate biased estimates and obtain accurate short and long-run estimates. Lag length is determined using AIC, BIC, and HQ criteria, with AIC chosen as it provides the lowest value. The selected lag order (Table 7) is then used to estimate the PMG-ARDL model.

Table- 7 Model Selection Criteria

Model Selection Criteria					
Dependent Variable: LCAD					
Sample: 2000 2023					
Included observations: 192					
Model	LogL	AIC*	BIC	HQ	Specification
4	-82.587638	1.983950	3.641249	2.656142	ARDL(2, 2, 2, 2, 2)
2	-93.359930	2.015454	3.528639	2.629194	ARDL(1, 2, 2, 2, 2)
3	-122.246207	2.070980	3.151826	2.509366	ARDL(2, 1, 1, 1, 1)
1	-131.178580	2.081575	3.018309	2.461509	ARDL(1, 1, 1, 1, 1)

Source: Author's Calculations

The optimal lag structure for the first model, where LCAD is the dependent variable, is presented in Table 7 and was selected using the Akaike Information Criterion (AIC). The ARDL (2,2,2,2,2) specification has the lowest AIC value among the competing specifications, which implies that it has outstanding explanatory power without compromising model efficiency. This finding supports the fact that the number of lags on the dependent variable and each explanatory variable should be two as the desired sample size to capture the dynamic nature and behavior of the LCAD for the period from 2000 to 2023.

The chosen lag structure implies that LCAD does not react only to its previous values but also to the lagged effects of the explanatory variables, and such effects can last up to two periods. This underscores the prevalence of short-run adjustment mechanisms and delay in transmission effects in the model. The suitableness and adequacy of this specification in explaining the variation in LCAD can also be supported by the relatively high value of the log-likelihood.

On the whole, the ARDL (2,2,2,2,2) model is a viable model that can be adopted to investigate and detect both short-run dynamics and long-run associations; thus, it is appropriate to do further bounds testing and estimate coefficients over the long run.

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Table 8. Findings of the Pooled Mean Group (PMG) and Mean Group (MG)

Pooled Mean Group Estimates					Mean Group Estimates			
Long-run estimates								
Variables	**Coefficient**	**Std. error**	**t-statistic**	**Prob**	**Coefficient**	**Std. error**	**t-statistic**	**Prob**
LBD	0.176172	0.062389	2.823794	0.0053	0.044663	0.500971	0.089154	0.9291
LWREM	−0.198930	0.046411	−4.286310	0.0000	1.071299	1.095329	0.978062	0.3294
LTOT	−0.271211	0.060887	−4.454345	0.0000	−1.505760	1.907946	−0.789205	0.4311
LGFCF	0.637766	0.225269	2.831125	0.0052	2.163347	1.983381	1.090737	0.2769
C	0.058742	0.880483	0.066715	0.9469	0.498284	12.63606	0.039433	0.9686
Short-run estimates								
ΔLCAD(−1)	0.006864	0.136888	0.050143	0.9601	0.326737	0.135893	2.404364	0.0173
ΔLBD	−0.248702	0.186201	−1.335664	0.1835	−0.561678	0.363966	−1.543219	0.1247
ΔLBD(−1)	−0.172290	0.251037	−0.686313	0.4935	−0.340191	0.359898	−0.945243	0.3459
ΔLWREM	0.245014	0.772381	0.317220	0.7515	0.497587	0.491144	1.013119	0.3125
ΔLWREM(−1)	0.573282	0.859389	0.667081	0.5056	0.845599	1.011471	0.836009	0.4044
ΔLTOT	−1.246847	0.984322	−1.266706	0.2070	−0.858817	1.362531	−0.630310	0.5294
ΔLTOT(−1)	0.431830	0.811075	0.532417	0.5951	1.587772	1.496512	1.060982	0.2902
ΔLGFCF	0.263912	1.706520	0.154649	0.8773	−0.205292	1.495448	−0.137278	0.8910
ΔLGFCF(−1)	0.166918	1.337340	0.124814	0.9008	−2.458943	2.818853	−0.872321	0.3843
Error Correction Term								
ECT (COINTEQ)	−0.648228	0.277501	−2.335948	0.0207	−1.345777	0.261636	−5.143705	0.0000

Source: Author's Calculations

Hausman Test

The Hausman specification test was applied to determine the most suitable estimator between the Pooled Mean Group (PMG) and Mean Group (MG) approaches.

Table 9: Hausman Test Results for Model 1 (MG vs PMG Estimators)

Test Component	Value
Chi-square Statistic	10.2551
P-value	0.0683

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Significance Level	0.05
Decision	Fail to reject H_0
Model Selection	PMG Estimator Preferred

Source: Author's Calculations

The Hausman test results in Table 9 demonstrate a chi-square value of 10.2551 with a p-value of 0.0683 ($p > 0.05$), which depicts that the null hypothesis cannot be rejected. This suggests employing the PMG estimator, indicating no significant differences in long-run dynamics across South Asian countries. Therefore, PMG is the more efficient and appropriate method for analyzing the long-run effects of budget deficits, workers' remittances, terms of trade, and gross fixed capital formation on the current account deficit.

The results of the Hausman test suggest that the null hypothesis cannot be rejected, implying that the PMG estimator is more suitable for this analysis. Accordingly, the discussion that follows is based on the PMG results, while the MG estimates are presented only for comparison purposes.

Long-Run Results (PMG Estimates)

The PMG findings reported in Table 8 support the twin deficit hypothesis in South Asia. The budget deficit has a positive and statistically significant effect ($p < 0.01$), indicating that a 1% increase in the budget deficit is associated with a 0.176% increase in the current-account-deficit measure. This finding is consistent with Munir et al. (2025), Hussain et al. (2024), Shastri (2019), and Rajakaruna and Suardi (2021). Workers' remittances have a negative and statistically significant effect ($p < 0.01$), suggesting that a 1% increase in remittances is associated with a 0.199% decrease in the current account deficit. This result is consistent with Čakajac et al. (2023), Safdar (2022), Bousnina and Gabsi (2022), Hassan and Holmes (2015), Iqbal and Sattar (2010), and Lartey (2018). Similarly, terms of trade have a negative and statistically significant effect ($p < 0.01$), indicating that a 1% increase in the terms-of-trade measure is associated with a 0.271% decrease in the dependent variable, consistent with Seyoum (2020). Conversely, gross fixed capital formation has a positive and strong impact ($p < 0.05$), which means that a 1 percent increase in gross fixed capital formation is associated with an approximately 0.638 percent increase in the current account deficit. We find similar results to Al Haq et al. (2023).

Table 10. Wooldridge test for autocorrelation in panel data

H_0: no first-order autocorrelation

Test Statistics	Value
F(1,7)	0.704
Prob > F	0.4291

Source: Author's Calculations

Autocorrelation Test Results

The Wooldridge test is depicted in Table 10; it is used to test the first-order autocorrelation in panel data. Under this test, the null hypothesis assumes that there is no serial correlation. Since the outcome is not statistically significant ($F = 0.704$, $p = 0.429$), the null hypothesis is not rejected, indicating that there is no sign of autocorrelation in the residuals. On the whole, the outcomes of the Wooldridge tests show that there is no cause for concern with respect to autocorrelation in the model. Thus, the error terms are independent over time, and the

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estimates of the coefficients do not influence the regression findings, supporting the statistical conclusion from the regression analysis.

Table 11. Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Test component	Value
Test Statistic (χ^2)	3.22
Degrees of Freedom	1
Prob > χ^2	0.0726
Null Hypothesis (H_0)	Constant Variance
Decision	Fail to reject H_0

Source: Author's Calculations

For the sake of the reliable findings, the study conducts the Breusch-Pagan/Cook-Weisberg test shown in Table 11 to assess the presence of heteroskedasticity. The null hypothesis assumes that the error terms have constant variance. Since the result is not statistically significant (χ^2 = 3.22, p = 0.0726), the null hypothesis is not rejected at the 5% level, suggesting no evidence of heteroskedasticity. Consequently, the model meets the assumption of constant variance, and the estimates can be considered dependable.

Conclusion

The paper provides empirical results on the validity of the twin-deficit hypothesis in South Asian nations, indicating the notable links between fiscal deficits (budget deficits), current account deficits, and the most important macroeconomic variables, including remittances made by workers, terms of trade, and gross fixed capital formation. One of the methods used in the current research is the panel ARDL that emphasizes dynamic changes in the short run and the long run of the budget deficit and current account deficit, which shows that fiscal and external imbalances are interconnected in the region.

The analysis findings reveal that budget deficits are positively associated with the current-account-deficit measure, where a 1 percent growth in the budget deficit is associated with a 0.176 percent increase in the current account deficit. Moreover, workers' remittances as well as terms of trade are found to have negative relationships with the dependent variable. Precisely, a one percent increment in remittances is associated with a corresponding decrease of approximately 0.199 percent in the current account deficit; similarly, a 1 percent increase in the terms-of-trade measure is associated with a decrease of approximately 0.271 percent in the current account deficit. Gross fixed capital formation, however, has a positive and statistically significant relationship with the dependent variable ($p < 0.01$), indicating that a 1 percent increase in capital formation is associated with an approximately 0.638 percent increase in the current-account-deficit measure.

The error correction term (ECT) implies that deviations out of long-term equilibrium are amended at a rate of 64.8% per year, which points out the capability of the region to stabilize to a balanced equilibrium despite short-term shocks in the region. The Pedroni and Kao tests of cointegration of the variables show that there is a long-run association among the variables, which makes the results robust.

In general, the paper explains that fiscal discipline, increased remittance inflows, and favourable trade terms play a significant role in minimizing external imbalances and ensuring sustained economic stability. The findings of this study offer great information about the

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structural imbalances that afflict South Asian economies and give viable policy suggestions to solve the problems.

Policy Implications

1. Fiscal Policy Reform: Due to the high positive association between budget deficits and current account deficits, the policymakers should focus on ensuring fiscal discipline to limit the use of borrowings and fiscal expansions. To curb the opposing and Harmful influence on the current account balance of budget deficits, it is important to have fiscal sustainability in terms of efficient public expenditure and revenue collection.
2. Remittances Promotion: The negative association between remittances made by workers and the current account deficit obviously confirms that workers' remittances have a positive contribution to mitigate the current account deficit and reminds us of the need to encourage and absorb remittance flows. Policymakers ought to identify ways of enhancing the process of remittance transfer, providing more attractive incentives to migrants, and reducing the expenses of sending money in order to increase the foreign exchange inflows.
3. Enhancement in Terms of Trade: The research indicates that enhancement in the terms of trade will considerably decrease the current account deficit. The countries in South Asia also need to emphasize the competitiveness of their exports through diversifying their export products, improving the quality of goods, and getting favorable trade agreements. It should also be aimed at mitigating the reliance on imports, especially of basic commodities.
4. Capital Formation Management: The gross fixed capital formation leads to the growth of an economy, but it also acts as a cause of the current account deficit since it is an import-based activity. They should concentrate on increasing domestic savings, and capital formation should not be over dependent on imports by the policymakers. This may include building local industries, encouraging innovation, and promoting investment in technology and infrastructure that will cut the level of imported goods.
5. Promotion of Export-Oriented Investment: To neutralize the detrimental impact of capital formation on the current account, the South Asian countries should focus on export-oriented investment. This would assist in curbing the reliance on imports in investment activities and achieve a good balance.
6. Long-Term Structural Reforms: The research proposes that the current account deficit is fixed in the long term. Thus, the South Asian economies need to embark on long-term structural changes that will help to increase productivity, industrial output, and economic diversity. These will help to minimize the exposure to external imbalances in the long run.
7. Regional Cooperation: Since South Asian economies are interrelated, regional cooperation in the policies of trade, investment, and remittances can bring synergies to counter current account deficits. The regional cooperation in solving fiscal and external imbalances will improve the economic stability and growth in the region.

Overall, the findings of the given study represent a strong guideline for the policymaker to comprehend the dynamics of the twin-deficit hypothesis in South Asia and inform future economic policies that would allow the countries to attain fiscal sustainability and external balance. The South Asian economies can be further able to deal with external imbalances and achieve sustainable economic growth by concentrating on fiscal adjustments, facilitation of remittances, enhancement of trade, and sound investment policies.

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