

Assessing determinants of the current account deficit: a case study of india

Jamshed Haidery¹, Zabihullah Shokuri²

Abstract

This paper is an attempt to enrich the existing literature on the macroeconomic determinants of the current account deficit in India since 1970. Besides, the study assesses the short and long-term dynamics of current account imbalances. Based on the intertemporal models, this paper examines cointegration between the current account and selected macroeconomic variables in the long run. It adopts Error Correction Model (ECM) to explore the dynamics of the current account in the short run. Furthermore, this paper applies variance decompositions and impulse response analysis to understand the mechanism of the impact of each variable on the CAD. The results of the Johansson Cointegration test indicate a long-run equilibrium relationship between the current account deficit and selected macroeconomic variables. This study concludes that fiscal deficit (FD), trade openness (OPEN), and foreign exchange reserves (RES) are major determinants of India's current account deficit. However, there is no evidence of the long-run and short-run influence of real effective exchange rate (REER) on the level of current account deficit. The persistence of the current account deficit in India implies that policies that have been implemented in the past to improve the current account position were not successful enough and calls for change in the policy and consider fiscal consolidation, improvement in the external competitiveness, and implementation of structural reforms.

Keywords: Cointegration, Current Account Deficit, Error Correction Model, Granger Causality, Long-run

Author Affiliation: ¹Department of Economics, Kabul University, Kabul, Afghanistan.

²Department of Economics, Kabul University, Kabul, Afghanistan.

Corresponding Author: Jamshed Haidery, Department of Economics, Kabul University, Kabul, Afghanistan.

Email: jhaidery@ku.edu.af, zabihullah.shokuri@gmail.com

How to cite this article: Jamshed Haidery, Zabihullah Shokuri. Assessing Determinants of the Current Account Deficit: A case study of India, Journal of Management and Science, 11(1) 2021 23-32. Retrieved from <https://jms.eleyon.com/index.php/jms/article/view/458>

Source of support: Nil

Conflict of interest: None.

Received: 6 February 2021 **Revised:** 7 March 2021 **Accepted:** 9 March 2021

1. INTRODUCTION

Large and persistent current account imbalances can be a sign of concern, particularly when the sustainability of the current account imbalances is imposing a risk to the economic prosperity of a country. The evolution of four generations of global imbalances suggests that despite several attempts, global imbalances persist and even continued to grow both concerning the depth and the number of countries with current account surpluses and deficits.^[1] Running a significant current account (CA) imbalance is considered a major source of macroeconomic vulnerability and a constraint on economic growth.^[2-4] Running CA imbalances are considered important in the sense that it raises two significant concerns among lenders and borrowers in the capital market about the ability of a country to pay its debts and sustainability of imbalances.^[5] These issues suggest carefully tailoring external balance policies to adjust and control the overall balance of payment in a country.

The current account deficit is not necessarily harmful, mainly if the current account deficit in a period is driven by inward investment (surplus on financial account). This inward investment will increase domestic capital accumulation that will create jobs and, as a consequence, higher growth, which in turn increases the country's ability to repay its debts and generates higher confidence of lenders in the capital market. A current account deficit may indicate a strong

economy, which is increasing. It also depends on the magnitude of the CAD relative to GDP. For instance, a deficit of higher than 5% would be a signal for greater concern. Besides, it depends on how one is financing the CAD. If a country is borrowing to finance consumption, it imposes a high risk in the long run to the economy. However, if it is financing CAD through attracting long-term capital investment, this would have positive impacts.^[6]

Therefore, exploring and assessing the macroeconomic determinants of the current account imbalances is of considerable importance, which is evident from the existence of significant literature in this regard over past decades. Various empirical applications of these models have been used on the national accounting balance, which treats the CA balance as the difference between domestic saving and investment. These studies put more emphasis on the critical role of the factors that impact consumption (saving) and investment decisions in explaining current account positions.

In the early 1970s, as a result of the Rupees devaluation, followed by the world trade expansion and a series of export incentives led to the export support environment. These conducted to a surplus in the current account for several years in India. This trend was returned by the 1973 oil shock, and led to the control of imports and restraining domestic expenditure. In the 1980s current account of India gradually deteriorated as a result of the immense pressure of the 1979 oil shock on the

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balance of payment. Further, in the late 1980s, the current account deficit also increased, imports increased almost by five times between 1978-79 and 1988 while exports increased only four times, due to the widening fiscal deficit. The fiscal deficit in 1980-81 increased from 6.1% to 8.4% in 1990-91.^[7] As a result of unsustainable current account and fiscal positions, India was faced with a BOP crisis in the early 1990s. In turn, the Indian government initiated a series of policy measures for macroeconomic stabilization and liberalization of both current and capital accounts to address this issue that restructured the Indian economy to be more open and integrated with the world economy.^[8]

Post-BOP credible reforms gave the Indian economy export competitiveness and conducted once again large surpluses in the current account in the early 2000s. The current account surplus reached its record high in 2003-04 to 2.25 percent of GDP. In the following years up to 2007-08, imbalances averaging less than one percent of GDP were moderate. The global financial crisis once again hit the current account deficit to dramatically increase and reached a recording high of 4.8 percent of GDP by the end of 2012-13.^[9] This was twice the level that was considered as a safe threshold by the Reserve Bank of India (RBI) and caused India's external sector to lead on the verge of crisis. The current account deficit eased in 2013/14 after a government crackdown on gold imports, and this process gradually continued until 2016-17. After 2016-17, the CAD is widening, which is primarily driven by a more significant increase in merchandise imports relative to exports. The CAD reached 1.8 and 2.1 percent of GDP in 2017-18 and 2018-19, respectively. The theoretical and empirical literature suggests several factors that can affect a country's CA balance, which can be categorized into two broad groups: 1) internal macroeconomic conditions and 2) external forces. In the Indian context, studies indicate that gold, electronics, and crude oil are the main drivers of India's CAD. India is one of the largest gold importers in the world, and the imports mainly take care of demand from the industry. Despite the massive import tariffs on gold, gold imports in value terms reached \$32.8 billion during 2018-19. Irrespective of the economic position, Indians are positively inclined towards the gold purchase, which is primarily driven by custom, sentiments, marriages, safety concerns, liquidity, and readability.

Besides, currency depreciation, inflation, and reduction in the credit rating of the country that has an impact on foreign investment are also considered influential on CAD.^[10] In summary, despite adopting several adjustments and controls policies, CAD impinged by different shocks and regime shifts since independence. The recent development in Saudi Arabia raises legitimate concerns about the further slowdown of the Indian economy and an increase in the fiscal and current account deficit that will be caused by a surge in oil prices. The objective of this paper is to examine the domestic macroeconomic determinants of the current account in India. The empirical analysis covers the period of 1970-71 to 2017-18. The empirical analysis will begin by assessing the current account in equilibrium (long run) perspective. Based on the intertemporal models, this paper is looking to established cointegration between the current account and selected macroeconomic variables. In the second stage, the short-run dynamics of the current account will be explored.

The rest of the paper is organized as follows: in section two, we review the theoretical and empirical literature about the current account imbalances. Section three presents the data, data sources, methods, and empirical model specifications. Section four presents empirical results, and finally, section five concludes and presents policy implications

2. Literature Review

2.1. Theoretical literature

Due to the existence of large and persistent global current account imbalances in the last two decades, researchers, economists, and policymakers have paid more attention to the issue of the current account. The behavior of the current account balance contains important information about an economy's economic performance, and also provides valuable macroeconomic policy recommendations. Several theoretical models exist in the literature that tries to explain the behavior of the current account balance. Each of them gives different predictions about the elements determining the current account balance and the sign and magnitude of the relationships between the current account fluctuations and its determinants. Therefore, undertaking an empirical analysis could help discriminate among competing theories. Understanding the elements that influence the current account balance in both the short-run and long-run can have important policy implications.^[1]

Due to the large, persistent, and growing global imbalances in recent decades, the determinants of current account deficit (CAD), researchers, economists, and policymakers paid more attention to the issue of the current account. There are several theoretical models developed that try to explain the behavior of the current account balance. Based on these theoretical models, there are three different approaches mostly used to explain the current account balance. First, the elasticity approach claims that the current account balance is solely determined by the exchange rate, domestic and foreign output. It implies that international prices and their determinants are major factors of the current account dynamics. One of the benefits of the elasticity approach is in its straightforward empirical predictions, which is often found to help examine the short-term impact of exchange rate fluctuations on CA balance, due to its partial-equilibrium nature that looks only at traded goods market and ignores the interaction of other various markets in an economy. However, the elasticity approach is not able to explain the long-term or equilibrium CA position.

The second approach is the saving, and investment or absorption approach that assumes savings and investment decisions of a country are the outcomes of CAD. The third approach is the intertemporal approach to the current account balance, this approach is based on the microeconomic analysis, and it assumes CA balance behavior solely depends on the collective behavior of economic agents. Obstfeld & Rogoff (1995) extended the intertemporal approach to the current account, which was initially proposed by Sachs (1981) and Buiters (1981) based on the permanent income hypothesis.^[11] The intertemporal approach views the current account balance as the outcome of the rational expectations of a forward-looking economic agent whose consumption choices depend on their permanent income. Changes in the CA, savings absorbs most of the impact to sustain a relatively stable long-term consumption path.

This paper stems from the intertemporal approach to the current

account. The empirical application of the model has generally followed two directions.^[12] First, several papers have tried to establish evidence to support the baseline model using different testing strategies.^[13,14] Second, several studies have attempted to examine the long-run relationship between the current account and its fundamental macroeconomic determinants by applying standard econometric techniques.^[7,9,12,15-19] This paper draws upon the second line of research and attempts to empirically test the long-run relationship of macroeconomic variables with the current account balance.

2.2. Empirical literature

There is numerous empirical literature globally that examines the current account determinants in several countries. The empirical literature regarding the current account position in the context of India can be divided into three groups. The first group tries to assess either the sustainability of the current account position or find a sustainable level of India's current account deficit.^[20-22] The second group focuses on certain macroeconomic and external factors that influence the current account deficit in India.^{[9],[23-24]} The third group focuses on the long-run relationship of the macroeconomic variables with the current account deficit.^{[7],[10],[25-26]}

Holmes et al. (2008), in their investigation into the sustainability of the Indian CAD throughout 2000-2003, suggests that there are two distinct regimes are identified, which are defined by whether import and exports are cointegrated. The regime of non-cointegration runs until the late 1990s, and the second regime of cointegration is documented after that. The later regime is the cause of the liberalization of the Indian economy. Sohrabji (2010) analyzed the sustainability of India's current account position using Hakkio and Rush (1991) and Husted (1992) intertemporal solvency models. The findings of the study suggest a strong cointegration between CA inflows and outflows. The study concludes, despite the improvement in the trade patterns, India experienced a CA deficit, but it is sustainable.^[27]

Goyal (2012) estimated the sustainable level of current account deficit for India adopting Domar's model of debt sustainability. The study argues that CAD in the ranges of 2.4 and 2.8 percent of GDP is sustainable over the medium term. This will be on the assumption that GDP growth ranges between 6.0 and 8.0 percent, inflation is fluctuating around 5.0 percent, and interest rate and size of capital flow roughly follow their trends in the recent past. Most recently, Tiwari (2015) attempted to examine the cointegration between oil and non-oil exports and imports to assess the sustainability of the current account in India. The study findings suggest a strong long-term relationship between non-oil exports and imports, and for oil exports and imports, there is no evidence of long-term relationships. The study concludes that the current account is sustainable for non-oil products but not for oil products, in the Indian context.

Kaur et al. (2012) investigate the relationship between foreign direct investment and the current account in India using Granger's causality techniques and impulse response function.^[28] The study confirms the long-run cointegration between foreign direct investment and the current account. The causality is found to be unidirectional from FDI toward the current account. Besides, international trade components (imports and exports) that constitute a significant part of the current account, also support the Granger causality. The study

used the impulse response function to provide further insights into the impact of the FDI on the current account. Nday & Aneja (2015) studied the causal relationship between budget deficit and CAD during 1990-2013 using the error correction method and Granger causality.^[23] The study indicates that there is bi-directional causality between budget balance and CA balance in the long run. Besides, results show that there is no short-run relationship between the budget balance and current account balance, and also the presence of the twin deficits hypothesis in India is confirmed. Garg & Prabheesh (2017) examine the macroeconomic and external factors that influence India's CA position in the period of 1997-2012.^[9] This study adopts the intertemporal approach to CA, and their finding supports the twin deficits hypothesis implying that a decrease in the fiscal deficit can have a positive impact on the CA position.

Venkata (2014) used VECM, Variance decomposition, and cointegration techniques to outline the short and long-run determinants of CAD in India.^[25] The study results suggest a long-run equilibrium relationship between current account deficit and investment, saving, and openness of the economy in the Indian context. Besides, the study shows that openness has a very strong influence on the current account deficit as compared to other variables (savings, REER, and output gap). Fayaz and Bhatia (2016) assess trends, patterns, and determinants of the current account deficit in India for the period of 1996-2013 using VECM and cointegration methods. The results show a long-term equilibrium relationship between current account and GDP, net foreign assets, openness, REER, and wholesale price index. The study concludes that continuously increasing net foreign assets will have a positive influence on the current account, while exchange rate deterioration by more imports will hurt the current account position. However, previous studies of India's current account balance have focused mainly on solvency, sustainability, and determinants until 2015-16. These studies do not cover the most recent changes in the current account imbalances and the slowdown of the growth, and the present study examines the macroeconomic factors driving current account imbalances of India during the period 1970-71 to 2018-19. Besides, this paper attempts to predict the current account position of India as well.

3. Data and Method

3.1. Data

The current account deficit is the dependent variable and is expressed as a ratio to GDP. The relationship between the current account deficit and GDP is theoretically ambiguous. However, empirical results show a positive relationship in the long run between real GDP growth and the current account deficit.^[29] The relationship between the Real Effective Exchange Rate (REER) and the current account deficit is an empirical matter. The Mundell-Flemming model suggests that a depreciation in the REER can positively affect a country's competitiveness position, leading to an improving trade balance and, through this, an improving current account balance. Besides, the consumption smoothing hypothesis suggests that a temporary REER appreciation will lead to an improvement in the current account deficit.^[19] This hypothesis implies that in the case of shocks in the national cash flow as a result of REER depreciation, the economy would prefer to run a current account deficit rather than allowing consumption to decrease.

Table 1: Description of Variables

Variable	Description	Units
CA	Current Account Balance	Ratio to GDP
GDP	Gross Domestic Product	Real GDP at a constant price (Base year 2004-05)
REER	Real Effective Exchange Rate: Trade based (36 countries)	Index number (Base year 2004-05)
OPEN	Trade Openness: Sum of exports and imports	Ratio to GDP
FD	Fiscal Deficit	Ratio to GDP
LRES	Foreign Exchange Reserves	Ratio to GDP

Source: Author

The openness variable is measured as the sum of export and import to GDP, and it measures the degree of India's openness to international trade. Trade openness shows the degree of trade liberalization, openness to technology transfer, and services external debt through export earnings. Hence, the degree of openness has a positive relationship with foreign capital inflow to a country.^[17] Therefore, a negative relationship between openness and the current account deficit is expected. There is two opposing theoretical explanation that establishes a relationship between fiscal deficit and the current account deficit. According to the Mundell–Fleming model, an increase in fiscal deficit under a flexible exchange rate regime increases disposable income, and higher disposable income leads to higher demand for imports. Similarly, the increase in domestic demand will increase domestic prices, which will appreciate the real exchange rate and reduce exports and, as a result, will lead to an increase in the current account deficit. In the contrast, Ricardian Equivalence Hypothesis (REH), assumes that an expansionary fiscal policy will not have an impact on the current account balance, as the increase in disposable incomes resulting from the reduction in government savings “the increase in budget deficit” will not be interpreted as an increase in aggregate demand. Because rational households will save it as their consumption will be based on the life cycle hypothesis because they expect to pay taxes in the future, the increase in private savings is equivalent to the reduction in government savings. Therefore, that might be the reason the government will not affect real interest rates and current account deficit.

$$CAD=f(GDP,FD,OPEN,REER,RES) \quad (1)$$

The primary model identified consists of eight different variables which hypothesize current account (CAD) as a function of Gross Domestic Product (GDP), fiscal deficit (FD), trade openness (OPEN), Real Effective Exchange Rate (REER), and foreign exchange reserves (RES).

$$CAD=f(GDP,FD,OPEN,REER,RES) \quad (1)$$

The order of integration and autoregressive determine the

functional form of the equation (1).

The result of the VAR using the SIC criterion illustrated in Table 2 shows that apart from GDP for all other variables, the optimal augmenting lags are one. Given this, equation (1) can be specified as follows:

$$CAD_t = \beta_0 + \beta_1 CAD_{(t-1)} + \beta_2 LGDP_t + \beta_3 LGDP_{(t-1)} + \beta_4 LGDP_{(t-2)} + \beta_5 FD_t + \beta_6 FD_{(t-1)} + \beta_7 OPEN_t + \beta_8 OPEN_{(t-1)} + \beta_9 OPEN_{(t-2)} + \beta_{10} SAV_t + \beta_{11} SAV_{(t-1)} + \beta_{12} INV_t + \beta_{13} INV_{(t-1)} + \beta_{14} REER_t + \beta_{15} REER_{(t-1)} + \beta_{16} RES_t + \beta_{17} RES_{(t-1)} + \varepsilon_t \quad (2)$$

4. Results and Discussion

To avoid the heteroskedasticity issue that would arise by using nominal variables, we normalized current account deficit, fiscal deficit, net saving, net investment, and foreign exchange reserve with nominal GDP. The temporal properties of all variables are examined using Augmented Dickey-Fuller (ADF), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), Phillip Peron (FP), and Dickey-Fuller Generalized (AD-GLS) unit root tests. The number of optimal lags is determined by adopting Schwartz Information Criterion (SIC). The results in Table 3 show that all variables are non-stationary at the level at the 5% significant level. However, non-stationarity in the current account time series suggests that the deficit has been persistent, and has continued to drift away from its previous level without showing signs of returning to a constant mean. Figure 1 shows that India's current account overall has a moderately declining trend that signals for the existence of unit root. Hence, the results of Table 4 show that all variables are stationary in the first difference, indicating that variables are integrated of order one, I(1). Besides, the first difference in India's current account deficit is illustrated in Figure 1 that indicates a stationary time series process.

4.1. Cointegration

Estimating models with non-stationary times series data imposes the risk of having very significant but spurious regression results. However, the presence of a long-run relationship allows us to estimate stable long-run relationships, but also through using Error Correction Mechanism (ECM), we can further examine the short-run dynamics and adjustment mechanism to the equilibrium as well. To check for the presence of a long-run equilibrium relationship between the current account and its determinants, we used the Johnson Cointegration test with intercept and no trend. The result of the Johnson Cointegration is reported in Table 5

Based on both Trace statistic and Maximum Eigen statistic, there are two integrated equations. The results of Table 5 and 6 indicates that we have at least two cointegrated equations in the system at the one percent level of significance. This implies that REER, GDP, OPEN, RES, and FD have a long-run relationship with the current account of India. This means that variables tend to move together in their steady-state path in the long run. The cointegrating equation for the current account obtained as:

Table 2: Optimal Lag Structure of Variables using Schwartz Information Criterion (SIC)

Variables	CA	REER	INV	SAV	FD	LGDP	OPEN	RES
Optimal Lags	1	1	1	1	1	2	1	1

Source: Author's Estimation

Table 3: Unit Root Test (At level) with intercept and trend at the 5% using Schwarz Information Criteria for Optimal Lags

Variables	ADF		KPSS		PP		DF-GLS		Remarks
	T-stat.	Critical	LM-stat	Critical	Adj. T-stat.	Critical	T-stat.	Critical	
CA	-3.305	-3.530	0.071	0.146	-3.320	-3.506	-3.351	-3.190	Non-Stationary
REER	-2.379	-3.506	0.216	0.146	-2.341	-3.506	-1.578	-3.190	Non-Stationary
INV	-2.983	-3.533	0.072	0.146	-3.007	-3.509	-3.028	-3.190	Non-Stationary
SAV	-2.262	-3.509	0.096	0.146	-2.262	-3.509	-2.362	-3.190	Non-Stationary
FD	-2.626	-3.533	0.166	0.146	-2.563	-3.506	-2.668	-3.190	Non-Stationary
LGDP	-2.434	-3.509	0.086	0.146	-2.190	-3.506	-2.579	-3.190	Non-Stationary
OPEN	-1.508	-3.506	0.793	0.146	-1.903	-3.506	-1.550	-3.190	Non-Stationary
RES	-2.498	-3.509	0.187	0.146	-1.906	-3.506	-2.613	-3.190	Non-Stationary

Source: Author's Estimation

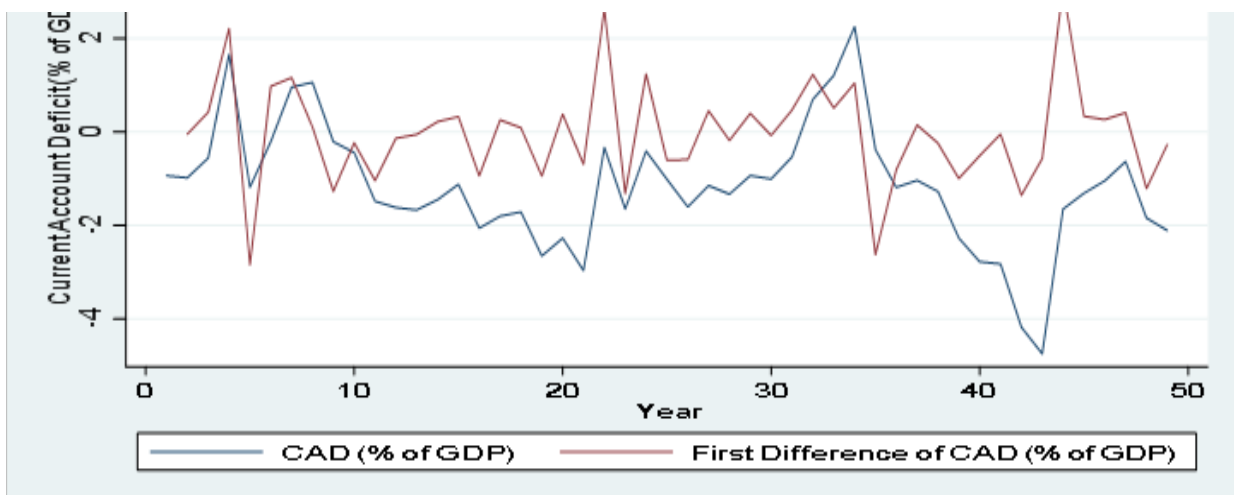


Figure 1: Line Chart of Current Account Deficit of India During 1970-71 to 2017-18

Variables	ADF		KPSS		PP		DF-GLS		Remarks
	T-stat.	Critical	LM-stat	Critical	Adj. T-stat.	Critical	T-stat.	Critical	
ACA	-8.416	-3.509	0.054	0.146	-8.555	-3.509	-8.601	-3.190	Stationary
AREER	-6.421	-3.511	0.081	0.146	-7.010	-3.509	-6.080	-3.190	Stationary
AINV	-7.782	-3.511	0.113	0.146	-8.243	-3.511	-7.947	-3.190	Stationary
ASAV	-7.453	-3.511	0.088	0.146	-7.492	-3.511	-7.613	-3.190	Stationary
AFD	-7.008	-3.511	0.041	0.146	-8.041	-3.509	-6.872	-3.190	Stationary
ALGDP	-4.653	-3.509	0.086	0.146	-4.634	-3.509	-4.070	-3.190	Stationary
AOPEN	-5.392	-3.509	0.099	0.146	-5.402	-3.509	-5.471	-3.190	Stationary
ARES	-4.239	-3.509	0.076	0.146	-4.239	-3.509	-4.328	-3.190	Stationary

Source: Author's Estimation

Table 4: Unit Root Test (At first difference) with intercept and trend at the 5% using Schwarz Information Criteria for Optimal Lags

$$ECT_{(t-1)} = 1 \times CAD - 0.274944 \times FD - 0.0012 \times REER - 0.124398 \times OPEN + 0.17207 \times RES - 0.172169 \times LGDP \quad (3)$$

The results of the cointegrating equation and Engle-Granger results are qualitatively similar, with statistically significant coefficients and similar signs. The results suggest that fiscal deficit, trade openness, foreign exchange reserves, and two dummy variables that account for structure breaks of India's current account balance in 2003 and 2012 determine the current account imbalances in Indian.

Table 6 results show exciting insights from the long-run estimation procedure. First, the estimated coefficient of the fiscal deficit, FD, is negative and statistically significant. This finding implies that the current account deficit narrows with an increase in the fiscal deficit. This means an increase in the fiscal deficit leads to higher savings and lower consumption. Thus, the evidence points against the complete Keynesian hypothesis at the 0.05 significance level 95% level and does not support the twin deficit hypothesis. Second, as expected, the estimated coefficient of the real effective exchange rate, REER, is negative, but the coefficient is economically small and statistically insignificant. This means that the real depreciation of the Indian rupee does not have a significant impact on the current account balance. The findings of other researchers also indicated no long-run relationship between the real exchange rate and the current account balance of India.^{[9], [30-32]} Third, the estimated coefficient of trade openness, OPEN, is negative and statistically significant at the 0.01 significance level. It means the current account deficit narrows with an increase in the degree of openness. The results are in line with a priori expectations that current account liberalization policies are expected to reduce the current account deficit. The result is consistent with other empirical studies that also suggest a negative relationship between openness and current account.^{[1], [7], [17]}

Forth, the estimated coefficient of foreign exchange reserves, RES, is positive and statistically very significant, as expected. This implies that a higher current account deficit requires more foreign exchange reserves to pay for imports. Fifth, the estimated coefficient of the GDP is negative but statistically insignificant. This means that GDP does not have a long-run influence on the current account balance of India. Finally, both dummy variables capturing structural breaks in the current account time series are found to be statistically significant at the 0.05 and 0.1 levels, respectively. Strong growth during the 2002-2004 period was accompanied by a narrowing of the current account deficit, and conversely, the growth slowdown of 2009-2013 met with deficit widening afterward.

4.2. Long-run dynamics (ECM)

Estimated results for long-run dynamics from the error correction model are presented in Table 7. The direction of the impact of the variables is mostly consistent with theoretical predictions. The statistical significance of the variables is similar to the long-run model, where fiscal deficit, trade openness, and foreign exchange reserves show statistically significant contemporaneous influence on the current account balance. In contrast, the real exchange rate and GDP are insignificant.

The estimated coefficient of the error correction term, $ect_{(t-1)}$, as expected, is negative and statistically significant. It confirms the presence of a long-run relationship among the variables. The estimated coefficient of $ect_{(t-1)}$ is -0.968, indicates the speed of convergence of the current account towards its long-run equilibrium. It means that 96.8% of the deviation from the equilibrium is eliminated within one year.

4.3. Model Diagnostic

Several diagnostic tests were conducted to check the reliability of findings and models. For the error terms, normality, autocorrelation, and heteroskedasticity tests are performed, while for the model, stability and accuracy tests were conducted. The result of the autocorrelation test indicates no autocorrelation in the error term. The error terms in the model pass the Jarque-Bera normality and Breusch-Pagan-Godfrey heteroskedasticity tests, indicating that the errors are normally distributed with no heteroscedasticity. It means that it is reasonable to claim that the model behaved well. Moreover, Figure 3 plotted the cumulative sum of squares (CUSUMQ) based on the recursive residuals do not show any evidence of instability in the coefficient estimates across the sample periods.

4.4. Impulse Response Function

We extended further our dynamic analysis using impulse response analysis. According to the Granger causality results in Table 7, the following order of variables is assumed: Real effective exchange rate (REER), fiscal deficit (FD), foreign exchange reserves (RES), trade openness (OPEN), GDP, and current account deficit (CAD). The current account was found to be Granger caused by most variables and thus ordered last. It is important to note that alternative orderings might lead to different results for impulse response analysis and variance decomposition analysis.

The results of the response analysis are presented in Figure 4. Figure 4, which shows the response of the current account deficit to a one standard deviation shock (innovation) in each of the variables. The time path coefficient of all variables converges to zero. This implies a positive shock to the current account deficit brings about an immediate significant increase in the current account deficit itself and that the effects on current account deficit of a unitary shock in the fiscal deficit, real exchange rate, GDP, foreign reserves, openness dies over time. Furthermore, the responses to innovation converge to zero, indicating that the whole system is stable. An exogenous increase in the real exchange rate (overvaluation) has an immediate and moderate impact in the initial year but converges to zero in the third year. An exogenous positive shock in the foreign exchange reserves and GDP does not have an immediate impact but gradually increases the current account deficit up to the eighth and third year, respectively.

An exogenous positive shock to openness illustrates no immediate impact on the current account deficit; however after the second year significantly increases the current account deficit while after the fourth year, the trend is reversed.

Innovation in fiscal deficit also does not have an immediate impact on the current account deficit but starts worsening the current account deficit until the third year and beyond that decreases the current account deficit.

4.5. Variance Decomposition

In the VAR, impulse response analysis shows the effects of innovation of one endogenous variable on the other variables. Still, the variance decomposition splits the variation in an endogenous variable into the component shocks to the VAR. Hence, variance decomposition shows the relative importance of each shock in affecting the variables in the VAR. The relative contribution of the other variables in explaining variation over time in the current account deficit is presented in Table 8. Besides, Table 8 results show forecast error variance, which means that how much of the forecast variation in the current account departs from the actual value due to variations in the current and future values of the innovations in the other variables.

The estimated results confirm the significant effect of the variables on the current account imbalances. Importantly, even from the beginning, more than two-thirds of the current variations are explained by innovations of the other variables. It is important to note that the current account seems to be quite unresponsive to the real exchange rate as only after eight years, only 2.1 percent variation is explained by the innovation in the real exchange rate. Furthermore, the current account deficits seem to be increasingly responsive to foreign exchange reserves, trade openness, and fiscal deficit while reversely to Gross Domestic Products innovations over time.

5. Conclusion

The objective of the paper was to examine the long-run and short-run macroeconomic determinants of the current account deficit in India. Annual data from 1970-71 to 2018-19 was used. The analysis was based on the intertemporal models that define the factors that influence the current account in the long run. Therefore, this study adopted cointegration analysis, Error Correction Model (ECM), Granger Causality, impulse response analysis, and variance decomposition to explore the short and long-run dynamics of the current account deficits. The results of the cointegration test suggest the presence of a long-run equilibrium relationship between the current account and FD, OEN, GDP, REER, and RES, implying that India's current account is influenced by these factors. Thus, the Granger causality analysis illustrated the impact of the interested variable on the current account deficit. Furthermore, the results of the ECM test validated the existence of a long-run equilibrium relationship, as its error term is negative and statistically significant. The results of the impulse response analysis and variance decomposition revealed the relative importance of variables in explaining a significant variation in the current through exogenous innovation in the other variable over time. The overall results of the study about the impact of the macroeconomic variables on the current account imbalances are coherent with theoretical and empirical findings. The persistence of the current account deficit in India implies that policies that have been implemented in the past to improve the current account position were not successful enough and calls for change in the policy and consider fiscal consolidation, improvement in the external competitiveness, and implementation of structural reforms.

Table 5: Results of Johnson Cointegration Test (Max Eigen Statistic)

No. of Cointegrated Equations		Eigen Value	Max-Eigen Statistic	Critical Value at 5% level	Prob.**
Ho	Ha				
$r = 0^*$	$r \geq 0$	0.7848	70.6737	40.0776	0.0000
$r \leq 1^*$	$r \geq 1$	0.5944	41.5134	33.8769	0.0051
$r \leq 2$	$r \geq 2$	0.3892	22.6796	27.5843	0.1876
$r \leq 3$	$r \geq 3$	0.2287	11.9461	21.1316	0.5530
$r \leq 4$	$r \geq 4$	0.1046	5.0808	14.2646	0.7316
$r \leq 5$	$r \geq 5$	0.0442	2.0810	3.8415	0.1491

Source: Author's estimation Note: '*' indicates rejection of the Null hypothesis at the 5% level, and '**' indicates MacKinnon-Haug-Michelis (1999) p-values.

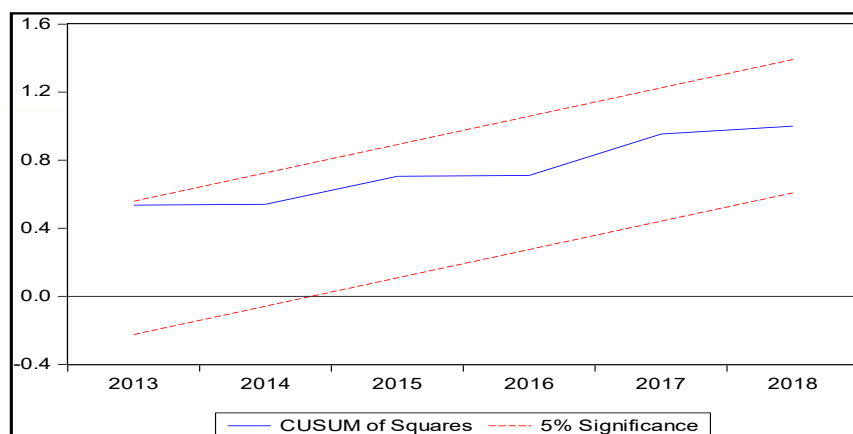
Table 6: Results of the Long-Run Engle-Granger Equation (Dependent Variable: CAD)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.186876	3.259422	1.591348	0.1192
FD	-0.322512	15.63956	-2.062153	0.0456
REER	-0.015715	0.011222	-1.400388	0.1689
OPEN	-0.189260	0.040271	-4.699690	0.0000
RES	0.364541	6.778828	5.377645	0.0000
LGDP	-0.257095	0.300135	-0.856599	0.3966
D1	-1.743702	0.826250	-2.110381	0.0410
D2	1.263780	0.718685	1.758461	0.0861
R-squared	0.639224			
Durbin-Watson stat	1.820979			
Prob(F-statistic)	0.000000			

Table 7: Results of Long-run Dynamic Model from Error Correction Model (ECM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FD)	-0.362150	0.139294	-2.599900	0.0128
D(REER)	-0.016001	0.013278	-1.205144	0.2349
D(OPEN)	-0.177037	0.052265	-3.387277	0.0015
D(LGDP)	-0.557093	0.869769	-0.640507	0.5253
D(RES2)	0.394928	0.080931	4.879803	0.0000
ECT(-1)	-0.968667	0.152277	-6.361205	0.0000
R-squared	0.602222			
Adjusted R-squared	0.554868			
Durbin-Watson stat	1.778785			

Figure 1: Estimated Model Stability Tests



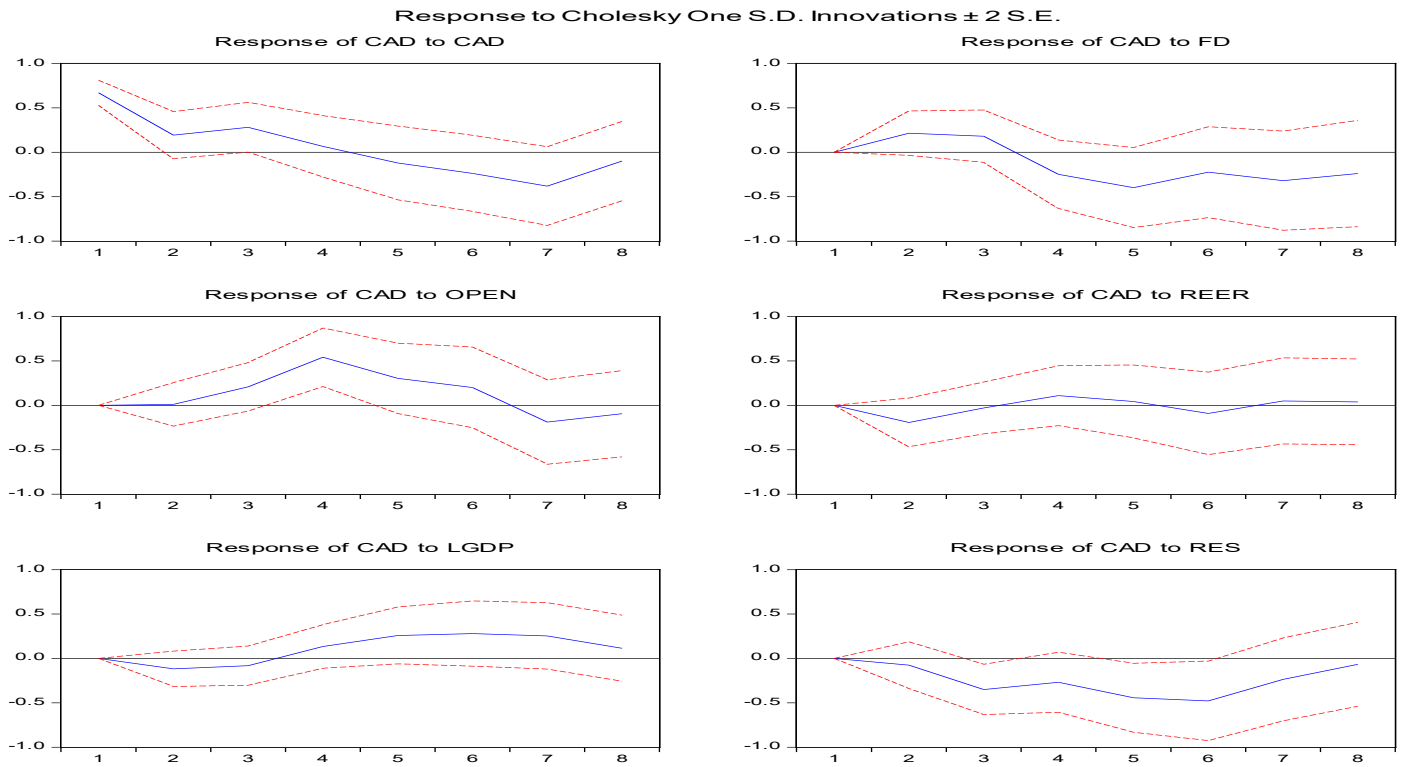


Table 8: Variance Decomposition of the Current Account Deficit

Period	S.E.	CAB	FD	OPEN	REER	LGDP	RES
1	0.67	34.0	11.9	5.6	1.5	16.2	30.9
2	0.77	27.2	14.2	6.4	5.2	21.0	25.9
3	0.94	23.5	10.0	12.6	3.6	32.2	18.1
4	1.16	16.0	13.5	24.5	4.0	21.1	21.0
5	1.37	12.0	16.0	19.3	2.9	15.1	34.6
6	1.53	10.2	13.4	15.9	2.5	12.2	45.9
7	1.65	8.7	12.3	17.4	2.2	11.7	47.7
8	1.68	8.4	13.1	17.6	2.1	11.7	47.1

Cholesky Ordering: REER FD RES OPEN LGDP CAB

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