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Abstract

The study empirically investigates the long-run sustainability of India's current account deficit and the factors that have affected its current account balance by applying Husted (1992) intertemporal budget constraint model and Keynesian national account identity, respectively. We utilize a different empirical approach and extend the data set. The Pesaran bounds testing approach and the Johansen and Juselius likelihood ratio cointegration tests results suggest that a long-run positive relationship exists between India's current account inflows and outflows. It implies that the path of India's current account deficit is sustainable. We find that there is one cointegrating vector between India's current account balance, fiscal deficit, real effective exchange rate and interest rate. India's current account balance is statistically significantly affected by fiscal deficit, real effective exchange rate and interest rate. Our finding suggests that fiscal deficit curtailing policy need to be supplemented by a real effective exchange rate devaluation policy, lowering of interest rate and increase in export promotion measures in order to manage presently mounting India's current account deficit.

Keywords: Current account deficit, India, Cointegration, Fiscal deficit, Bounds testing, Vector error correction model

JEL Classification: C22, F32

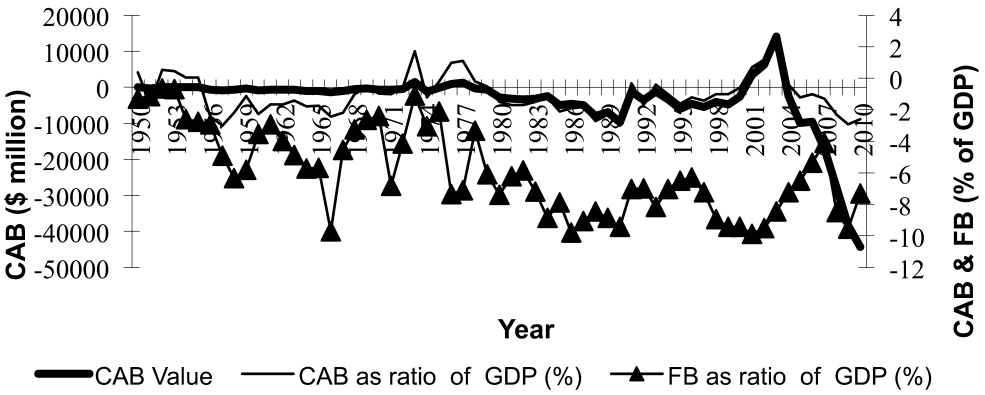
1. Introduction

The sizes of current account and fiscal balances are important indicators of the macroeconomic stability and well-being of a country. As economy grows, its demand for foreign goods and services grows simultaneously and the world trade benefits as a whole. Problem that arises is not caused by increasing imports but by a mismatch between exports and imports growth. Without a stable balance between exports and imports, current account imbalance will tend to expand. Cointegration between exports and imports implies that current account deficit (CAD) is only a temporary phenomena and current account converges toward equilibrium over the long-run. It, in turn, means that the country is not in violation of its International Budget Constraint (IBC), because its macroeconomic policies have been effective in bringing exports and imports into a long-run equilibrium.

India's current account position has historically mainly been one of a deficit which is accompanied by a substantial fiscal deficit (FD), as depicted in Figure 1. India's First and Second Five-Year Plans (1951-61) focused on rapid import-substitution industrialization with the main

aim of achieving economic self-sufficiency. The objective also manifested itself in the country foreign trade policy where imports were strictly controlled through comprehensive exchange rate control and an extremely complex system of quantitative import restrictions, which were supplemented by a composite tariff structure with high and differentiated rates across industries (Joshi and Little, 1994).

Fig. 1. India's Current Account and Fiscal Balances, 1950−2010



The extensive protection reduced competition drastically, engendered inefficiency in domestic industries and generated monopoly rent, which resulted in a distinct 'anti-export bias'. With the export performance remained poor, India's trade deficit widened and current account deficit increased to 2.4 per cent of gross domestic product (GDP) as the surplus of invisible account also narrowed in 1966-67. This situation was further aggravated by a high fiscal deficit of 9.7 per cent of GDP for the same period, as seen in Figure 1.

The pressure on external position led to a more conducive export environment, with the introduction of a number of exports promotional schemes, including the devaluation of Indian rupee in June 1966—the rupee devaluated from Rs 4.7 to Rs 7.5 per dollar. The devolution was accompanied by some liberalization of import licensing and cuts in import tariffs, and introduction of export subsidies for approximately a year. Improved export performance due to expansion of the world's total trade and export incentives led to an improvement in India's current account position during the late 1960s and early 1970s. While this moderation was temporarily reversed in the aftermath of oil prices shock of 1973, a tightening of import control, generous external assistant and fiscal conservatism quickly brought import down.

In the late 1970s, a combination of high domestic inflation, a large fiscal deficit (i.e., 7.1 per cent of GDP in 1977), second world's oil price hike of 1979 and a pegged exchange rate generated: (a) low exports, (b) more imports, (c) a wider current account deficit (i.e., 1.1 per cent of GDP in 1977), and (d) near-exhaustion of reserves. As reserves fell critically low, India undertook an International Monetary Fund (IMF) program in 1981. However, unlike first half of the 1970s, no significant current account adjustment followed. With a large macroeconomic imbalance developing in the second half of 1980s, particularly a large fiscal deficit (e.g., 9.1 per cent of GDP in 1987), growing public debt, high external debt, and their expansionary influences on money supply and high rate of inflation, the current account deficit burgeoned—picked up to 3 per cent of GDP in 1990-91. While the trade deficit remained in 2-2.5 per cent of GDP range, the surplus on invisible account narrowed and moved into a small deficit during the same period.

The erosion of international confidence in the Indian economy not only made borrowings in international markets difficult but also led to an outflow of deposits of non-resident Indians with Indian banks. Investment income payments also raised as the structure of external financing shifted away from concessional finance toward higher-cost debt. This situation was further aggravated by indiscriminate fiscal profligacy. It resulted in a sudden drying up of India's foreign reserves (US$ 3962 million or 1.28 per cent of GDP in 1989-90). As foreign exchange reserves close to exhaust, India was brought to a brink of default with respect to external payments liability in January 1991. This was averted by resorting to borrowings from the IMF under the stand-by arrangements (in January and July 1991), mortgaging gold to the Bank of England and adoption of IMF programme.

On 4 July 1991, the Government of India undertook the major task of fundamentally altering its development paradigm by announcing a massive dose of external liberalization and other major policies aimed at reducing the fiscal deficit and the current account deficit. The trade liberalization measures include: (a) devaluation of the currency, (b) steady decline in the ceiling on custom duties—peak tariff rates brought down to maximum 50 per cent from up to 355 per cent, (c) drastically prune in the complex import licensing system, (d) removal of non-tariff barriers (NTBs) like quantitative and other restrictions from all tradable except consumer goods, (e) decontrol of foreign exchange, and (f) announcement of sector/market-specific export promotion schemes. For reduction in fiscal deficit, central bank credit for the government (which is the major source of financing the central government fiscal deficit) was reduced.

Recently, India's net current account balance has been turned from a surplus of $14.08 billion in 2003-04 to a deficit of $2.47 billion in 2004-05 which further widened to $38.44 billion or 2.9 per cent of GDP in 2009-10. The fiscal deficit has also been reached to its peak of 9.5 per cent of GDP during the same period. It is, therefore, instructive to investigate whether India's current account deficit is sustainable and what factors affect the current account deficit.

The sustainability of India's current account deficit has been investigated by a few studies, which provide mixed results. The prominent studies judging CAD sustainability include: Konya and Singh (2008), Holmes et al. (2011), and Sohrabji (2010). Konya and Singh (2008) concluded, applying unit root and cointegration approaches, that during 1949-50 to 2007-08 India's merchandise exports and imports were not cointegrated. Holmes et al. (2011) find mixed results for long-run relationship (cointegration) between India's ratios of merchandise exports and imports to GDP—a non-cointegration regime until late 1990s and cointegration thereafter. Sohrabji (2010) finds that India satisfies its inter-temporal solvency constraint during 1996–2006.

The significant studies explaining behavior of India's balance of trade are: Bahmani-Oskooee (1985), Nachane and Ranade (1998), Singh (2002), Buluswar et al. (1996), Arora et al. (2003), Mallick (2004), Virmani (2003), Basu and Datta (2005), and Anoruo and Ramchander (1998). Bahmani-Oskooee (1985) finds that the domestic income variable is insignificant while the world income plays a significant role in explaining India's balance of trade for the period 1973–1979.

Nachane and Ranade (1998) find that nominal and real exchange rates consistently emerge as important influences on the balance of trade for the period 1979–1991. Similarly, Singh (2002) shows that the devaluation based real exchange rate and domestic income play a significant, while the world income plays an insignificant role in affecting the balance of trade. In sharp contrast, Buluswar et al. (1996) show lack of cointegration between India's balance of trade and her real exchange rate. Arora et al. (2003) show that in the long-run real depreciation of the rupee against the currencies of Australia, Germany, Italy and Japan has a positive impact on India's balance of trade with each country.

Mallick (2004) uses a small macro-econometric model for examining the determinants of India's balance of trade for the period 1950–1995 and finds that the trade balance effects of tight credit policy are more enduring than that of devaluation. Virmani (2003), using data for the period 1970–1999, find a positive impact of central government fiscal deficit on CAD (both measured as a ratio to GDP). Basu and Datta (2005), on the other hand, find an absence of cointegration between India's fiscal deficit and current account deficit for the period 1985–2003. Anoruo and Ramchander (1998) show trade deficits to cause fiscal deficits in India.

The objective of our study is twofold: (i) to examine the sustainability of India's current account deficit, and (ii) to investigate the factors explaining the behaviour of India's current account balance. The study is justified by five concerns. First, consistent with the theoretical framework, exports include exports of goods and services, while imports are defined to cover goods and services plus net transfer payments and net interest payments (Husted, 1992). Secondly, data on level (in terms of US$) are used instead of a ratio to GDP as in Holmes et al. (2011), Sohrabji (2010) and Virmani (2003)—the ratio of imports or exports to GDP may not give an accurate picture of the trend (or pattern) in imports or exports since any increase in GDP may decrease the trend in these ratios. Thirdly, it is widely known that without testing for stationary status time-series data can give spurious results (e.g., Bahmani-Oskooee 1985; Virmani 2003). Fourthly, we use a robust technique of cointegration, i.e., Pesaran et al. (2001) autoregressive distributed lag (ARDL) bounds testing approach. Finally, the study uses data for enough long periods—1950–2009 for the examination of the sustainability of CAD, and 1970–2009 for investigating the factors affecting CAD (due to non-availability of readily data in the required form).

The rest of the study is organized as follows. Section 2 specifies the theoretical models to support the existence of a long-run relationship between exports and imports and macroeconomic variables explaining CAD. The empirical methodology used for investigating the sustainability of current account deficit and its determinants is presented in Section 3. Section 4 reports and discusses the empirical results. Final Section summarizes the main findings and draws their policy implications to preserve India's current account sustainability.

2. Model Specification

2.1 The Intertemporal Budget Constraint Model

Based on Hakkio and Rush (1991), Husted (1992), Kalyoncu and Ozturk (2010) and Greenidge et al. (2011), we first examine the IBC to test the sustainability of India's CAD. Husted (1992) developed a theoretical framework to test for sustainability based on Hakkio and Rush's (1991) procedure. Husted's approach began by noting that an open economy individual faces the following budget constraint for each period t:

$$C_0 = Y_0 + B_0 - I_0 - (1+r_0)\, B_{-1} \tag{1}$$

where C_0, I_0, Y_0, B_0 and r_0 represent current consumption, investment, output, international borrowing, and one-period world interest rate, respectively; and $(1+r_0)\, B_{-1}$ is the initial debt size which could be positive or negative.

Eq. 1 must hold for every time period, so budget constraints can be formed of the economy's intertemporal budget constraint, which can be expressed as:

$$B_0 = \sum_{t=1}^{\infty} \mu_t TA_t + \lim_{n \to \infty} \mu_n B_n \tag{2}$$

where $TA_t = X_t - M_t (= Y_t - C_t - I_t)$ is the trade balance in period t, X_t is exports, M_t is imports, $\lambda_0 = 1/(1+r_0)$, μ_t is the discount factor defined as the product of the first t values of λ, and t is time period. In case the last term of Eq. 2 equals to zero, then the debt of the country in international markets is equal to the present value of the future trade surplus (deficit). If B_0 is positive or negative (and the limit is not equal to zero), then the country is 'bubble-financing' its external debt or decisions of the country are Pareto-inferior: welfare could be raised by lending less, respectively.

We can derive a testable model by rewriting Eq. 1. First, assuming that the world's interest rate is stationary with unconditional mean r, (1) may be expressed as:

$$Z_t + (1+r)B_{t-1} = X_t + B_t \tag{3}$$

where $Z_t = M_t + (r_t - r)B_{t-1}$.

Following Hakkio and Rush (1991), Husted (1992) suggests Eq. 3 can be explained as:

$$M_t + r_t B_{t-1} = X_t \sum_{j=0}^{\infty} \lambda^{j-1} [\Delta X_{t+j} - \Delta Z_{t+j}] + \lim_{j \to \infty} \lambda^{t+j} B_{t+j} \tag{4}$$

where $\lambda = 1/(1+r)$ and Δ is the first difference operator. The left hand side of Eq. 4 represents the value of imports plus interest payments (receipts) of the country external debt (assets). If X_t is taken away from the both sides of Eq. 4 and each is multiplied by minus one, then left side become country's current account.

Assume that X and Z are both non-stationary processes, at level form and each of them are integrated of order one (denoted $I(1)$, then Eq. 4 can be expressed as:

$$X_t = \alpha + MM_t - \lim_{j \to \infty} \lambda^{t+j} B_{t+j} + \varepsilon_t \tag{5}$$

where $MM_t = M_t + r_t B_{t-1}, \alpha = [(1+r)^2 / r](\alpha_1 - \alpha_2)$. Assuming the limit term in Eq. 5 equal to zero, Eq. 5 can be transformed into a standard regression equation:

$$X_t = a + \delta MM_t + e_t \tag{6}$$

where X is exports of goods and services (current account inflows), *MM is* imports of goods and services plus net transfer payments and interest payments (current account outflows), δ is the parameter to be estimated, a is intercept and e is an error term. The empirical results may allow establishing several conclusions concerning the sustainability of the current account: (a) when there is no cointegration between current account inflows and outflows, the current account deficit is not sustainable, (b) when there is cointegration between current account inflows and outflows with $\delta = 1$, the current account deficit is sustainable, and (c) when there is cointegration between current account inflows and outflows, with $\delta < 1$, economy's inflows grow faster than economy's outflows, and the deficit may not be sustainable.

As Hakkio and Rush (1991) demonstrate in the context of government finance also, if X and MM are non-stationary variables in level, the condition $0 < \delta < 1$ is a sufficient condition for the budget constraint to be obeyed, implying current account deficit sustainability.

2.2 The Current Account and Fiscal Balance in National Accounts

The current account and fiscal deficits have coexisted in the Indian economy. So, to explore the determinants of India's CAD, we use "twin deficit" view, popularized by Feldstein (1985). This conventional (Keynesian) view argues that higher budget deficit is the main cause of higher trade deficit. Following Baharumshah et al. (2006), we use the following national account identity to analyse the relationship between budget and current account deficits:

$$CAD \equiv S_p - I - (G + T_r - T) \equiv S_p - I - BD \tag{7}$$

where S_p = private saving; I = real investment; G = government expenditure on final goods and services; T_r = transfer payment; T = taxes; BD = budget deficit.

We can re-write Eq. (7), given the dependence of private savings and investment on the interest rate (IR) and the exchange rate (ER), as:

$$CAD \equiv S_p(IR, ER) - I(IR, ER) - BD. \tag{8}$$

If the variables of interest, viz. CAD, BD, ER and IR are cointegrated, their causal relationship can be examined within a vector error-correction Granger causality representation.

It is clear from Eq. 8 that increase in budget deficit can cause an increase in current account deficit.[1] The Mundell–Fleming's model suggests that a fiscal expansion will worsen the CAD through an increase in domestic interest rate, capital inflows and an appreciation of the exchange rate. A further theoretical justification for the two balances moving together is the absorption approach. Here, a fiscal expansion also leads to a worsening of the CAD, but through domestic absorption and import expansion. A bi-directional causal relationship between the two deficits may also exist, i.e., budget deficit Granger causes a current account deficit and vice-versa. In this case, the authorities cannot simply rely on curtailing the budget deficit to manage the current accounts. The real solution to the problem would lie with a coherent package consisting of both fiscal and monetary policies.

3. Methodology

The cointegration between variables of interest is investigated using *Auto Regressive Distributed Lagged (ARDL)* bounds testing approach developed by Pesaran et al. (2001). The procedure is adopted because it enjoys the following main advantages over conventional type of cointegration techniques. *First*, this producer does not require the pre-testing of the variables under study for unit roots unlike other techniques such as Johansen and Juselius (1990) approach. It is applicable irrespective whether the regressors in the model are integrated of order zero, i.e., I(0) or fractionally cointegrated. The ARDL bounds testing procedure, however, crash in the presence of $I(2)$ series. *Secondly*, this technique generally provides unbiased estimates of the long-run model and valid t-statistic even when some of the regressors are endogenous. In view of above advantages, ARDL-ECM used for estimating cointegration between current account inflows and outflows is specified as:

[1] Note that contradict view, i.e., Ricardian Equivalence Hypothesis claims that budget and current account deficits are neutral, not twins.

$$\Delta InX_t = \beta_0 + \sum_{i=1}^{p} \delta_1 \Delta InX_{t-i} + \sum_{i=0}^{p} \delta_2 \Delta InM_{t-i} + \beta_1 InX_{t-1} + \beta_2 InM_{t-1} + \varepsilon_t \quad (9)$$

where Δ is the first-difference operator; X and M are the export and import, respectively; ln represents natural logarithm transformation; β_0 is an intercept; t represents the time, p is optimal lag length and ε_t is a white-noise error term.

3.1 Bounds Testing Producer

The first step in the ARDL bounds testing approach is to estimate Eq. (9) by ordinary least squares (OLS) in order to test for the existence of a long-run relationship among the variables by conducting an F-test for the joint signifiance of the coefficients of the lagged levels of the variables, H_0: $\beta_1 = \beta_2 = 0$ against the alternative H_1: $\beta_1 \neq \beta_2 \neq 0$. We denote the test which normalizes on X by $F_X(X|M)$. Two sets of the critical value are generated by Pesaran et al. (2001). If the computed value of F-statistic is above the upper bound, the null hypothesis of no cointegration is rejected. If it is below the lower bound, the null hypothesis of no cointegration can't be rejected. Nevertheless, if the calculated value of F-statistic lies between the bounds, the test is inconclusive. The appropriate critical values are computed by stochastic simulations using 20000 replications.

In the second step, once cointegration is established, the conditional ARDL long-run model for X_t can be estimated as (for details, see Pesaran et al., 2001):

$$InX_t = \beta_0 + \sum_{i=1}^{p} \beta_1 InX_{t-i} + \sum_{i=0}^{p} \beta_2 \Delta InM_{t-1} + \varepsilon_t \quad (10)$$

where all the variables are previously defined. It requires the selection of order of the ARDL (p, q) model using Schwarz Information Criteria (SIC). For estimating the long-run relationship between InX/M, FD, ER and IR, the bivariate model is extending to multivariate ones:

$$InX/M_t = \beta_0 + \sum_{i=1}^{p} \beta_1 InX/M_{t-i} + \sum_{i=0}^{p} \beta_2 \Delta InFD_{t-i} + \sum_{i=0}^{p} \beta_3 \Delta InER_{t-i} + \sum_{i=0}^{p} \beta_4 \Delta InIR_{t-i} + \varepsilon_t \quad (11)$$

To see the robustness of the empirical results, we use two further tests, namely Trace test and Maximum eigenvalue test—devised by Johansen and Juselius (JJ) (1990). However, the ARDL bounds testing approach is based upon the assumption that the variables are not $I(2)$, and that is ensured applying Dickey-Fuller generalized least squares (DF-GLS) (Elliott et al., 1996) unit root test. The conclusions of DF-GLS test are confirmed by Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) and Phillips-Perron (PP) (1988) unit root tests. Once cointegration has been established, the ARDL model is used to estimate the long-run parameters. The reliability of parameters estimated is tested by applying usual diagnostic tests, viz. (a) Lagrange multiplier test of residual serial correlation, (b) Ramsey's RESET test using the square of the fitted values for correct functional form, (c) Normality test based on skewness and kurtosis of residuals, and (d) Heteroscedasticity test based on the regression of squared residuals on squared fitted values. The long-run stability of parameters is tested applying the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests. The Microfit 5 is used to perform the ARDL model and the diagnostic tests.

3.2 Granger Causality Test

To investigate the nature of the casual links between variables under investigation, the Granger causality test via Vector Error-Correction Modeling (VECM) has been used (see, e.g.: Engle and Granger 1987). An appropriate formulation of the cointegrated error-correction Granger causality test for current account inflows (X) and outflows (M) is:

$$\Delta ln(X)_t = \alpha_1 + \sum_{i=1}^{n} b_i \Delta ln(X)_{t-i} + \sum_{j=1}^{m} d_i \Delta ln(M)_{t-j} + r_i(EC_1)_{t-1} + e_t \quad (12)$$

$$\Delta ln(M)_t = \alpha_2 + \sum_{i=1}^{n} c_i \Delta ln(M)_{t-i} + \sum_{j=1}^{m} g_i \Delta ln(X)_{t-j} + l_i(EC_2)_{t-1} + u_t \quad (13)$$

where Δ is the first-difference operator, X and M are the current account inflows and outflows, respectively, u_t and e_t are white-noise error terms where $E[e_t\ e_s] = 0$, $E[u_t\ u_s] = 0$, $E[e_t\ u_t] = 0$ for all $t \neq s$, n and m are the numbers of lag lengths chosen by the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) and EC_{1t-1} and EC_{2t-1} are the error-correction terms which represent the lagged residuals from the cointegration equations. The OLS technique is applied for the estimation of the parameters and the t-test for testing the significance of each term. The F-test is used for testing the joint significance of the lagged independent variables in the VECM equations. The E-Views 7 is used to perform VECM and diagnostic tests.

3.3 Data Sources

The data on exports and imports of goods and services, net external transfer payments, net interest payments on international borrowings, and short-term interest rate are obtained from the Reserve Bank of India's (RBI) *Handbook of Statistics on Indian Economy*. The data on combined fiscal deficit of center and states governments are taken from *Indian Public Finance Statistics,* Ministry of Finance, Government of India (GoI), New Delhi. Data on real effective exchange rate, ER*,* (36-country bilateral trade weights based) are taken form *RBI Bulletin*. Note that the ER series is so constructed that a decrease indicates depreciation. Data on GDP are taken from *Economic Survey,* Ministry of Finance, GoI, New Delhi. Data used in the study are annual. Exports, imports and fiscal deficit series are measured in US$ and expressed in natural logarithms (ln). Since India's current account balance generally takes negative values, it is not possible to take its logarithm transformation. Following the trade literature (e.g., Bahmani-Oskooee, 1995), a proxy of current account deficit (CAD) is measured in terms of ratio of export (X) to import (M): CAD = X/M. Fiscal deficit is estimated as a gap between government expenditure and revenue.

4. Empirical Results and Discussion

4.1 Sustainability of India's Current Account Deficit

Prior to the testing of cointegration, we first test the stationarity status of current account inflows and outflows series to determine their order of integration. Even though the ARDL framework does not require pre-testing of variables to be done, the unit root tests are used to ensure that the variables are not $I(2)$ stationary so as to avoid spurious results.[2] Table 1 contains the results of the DF-GLS, ADF and PP unit root tests for both variables, namely: InX and InM in level and first difference forms (Δ) with and without trend.

[2] The features of the distribution of both series, namely lnX and lnM have been examined in terms of descriptive statistics. The results suggested that there was not any unusual feature in any series. The standard deviation was low, skeweness was approximately zero and kurtosis was less than 3 for both series. Furthermore, the Jarque-Bera statistic cannot reject the null hypothesis of normal distribution at any conventional significance level.

Table 1 Unit Root Tests Results for India's Current Account Inflows and Outflows

Variable	Dickey-Fuller Generalised Least Square Test Statistic		Augmented Dickey-Fuller Test Statistic		Phillips-Perron Test Statistic	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend
InX	0.54 (3)	−0.90 (0)	2.12 (0)	−1.66 (0)	1.99 (3)	−1.72 (3)
InM	1.37 (2)	−1.79 (2)	1.45 (0)	−1.92(2)	1.45 (0)	−1.42 (2)
ΔInX	−6.23 (0)*	−6.54 (0)*	−6.70 (0)*	−7.53 (0)*	−6.88 (4)*	−7.56 (3)*
ΔInM	−2.75 (1)*	−3.52 (1)**	−4.28 (1)*	−7.55 (0)*	−7.60 (2)*	−7.55 (0)*

Notes: Figures in parenthesis in Columns 2–5 are the optimal lag length chosen using the Akaike information criterion and in Columns 6 and 7 the optimal Newey West Bandwidth chosen using the Bartlett Kernel criterion. The critical values for DF-GLS, ADF and PP tests with intercept and intercept and trend at 1% significance level are: −2.60, −3.54, −3.54 and −3.73, −4.12, −3.54, respectively. * indicates rejection of the null hypothesis of unit root at the 1% significance level.

It is evident from Table 1 that in level form of both exports and imports series the calculated values of DF-GLS, ADF and PP statistic are less than their critical values in all cases, suggesting that these variables are not level stationary. The null hypothesis of a unit root cannot be rejected for the both exports and imports series in level form. Since for the first difference form, the unit root hypothesis can be rejected, it is concluded that India's imports and exports are integrated of order one—*I*(1). This result is consistent with Greenidge et al. (2011) who have provided the same evidence for Barbados.

The null hypothesis of no cointegration ($r = 0$) is tested and the results are presented in Table 2. The table shows that the computed *F*-statistic (*F*-statistic = 3.53) for the ARDL (1, 1) model is greater than the upper bound critical value of 3.33 at 10 per cent significance level. Hence the null hypothesis of no cointegration is rejected.

Table 2 Results of Tests for Cointegration between Exports and Imports and Long-Run Elasticity

Cointegration Tests F_X (X|M)				Long-Run Elasticity F_X (X|M)	
ARDL (1,1)	Johansen and Juselius (JJ) Maximum Likelihood			ARDL (1,1)	JJ Maximum Likelihood
F-test Statistic	Hypothesis	Trace Test Statistic	Maximum Eigenvalue Test Statistic		
3.53	H_0: r = 0	32.19 (0.00)*	26.18(0.00)*	1.08 (0.00)	0.96 (0.02)
	H_0: r ≤ 1	6.01 (0.18)	6.01 (0.18)		

Notes: The lower and upper bounds critical values at the 10% significance level for the *F*-test are: 2.42 and 3.33 respectively. *r* stands for the number of cointegrating vectors. * indicates rejection of the null hypothesis of cointegration of rank *r* at the 5% significance level. The critical values for the Trace test and Maximum eigenvalue test are: 20.26, 9.16 and 15.89, 9.16, respectively. The figures in parentheses are the probability values for statistical significance of parameters estimated.

This model passes all the usual diagnostic tests including the CUSUM and CUSUMQ tests for structural stability (not reported here but available on request). The estimated value of Trace test statistic is 32.19 and Maximum eigenvalue test statistic is 26.18, for null hypothesis of no cointegrating vector, which are greater than critical values of these tests (20.26 and 15.89) at 5 per cent level of significance. Hence, we reject the null hypothesis of $r = 0$, in favour of the alternative hypothesis $r = 1$. However, in case of null hypothesis of $r \leq 1$ the estimated values of these tests are less than their critical values at 5 per cent significance level.

Consequently, we conclude that there is only one cointegrating relationship between lnX and lnM. This is an evidence of a long-run relationship between India's current account inflows and

outflows. This result is again consistent with Greenidge et al. (2011) who have provided the same evidence for Barbados.

A look at Column 5 of Table 2 reveals that the long-run elasticity coefficient is 1.08 which is statistically significant at 1 per cent level.[3] The empirical finding suggests that India's current account deficit is sustainable in the long-run. This result is in line with Kalyoncu and Ozturk (2010) who find the same evidence for Peru. This result is confirmed by JJ maximum likelihood test (0.96) reported in Column 6 of Table 2. Our results differ from those of Konya and Singh (2008) that India's exports and imports are not cointegrated. This may partially be attributable to selection of data, period under study and method of analysis.

Since India's current account inflows and outflows are cointegrated, the causal relationship between these variables is examined using Granger causality test through vector error correction approach. The results are presented in Table 3.

Table 3 Vector Error Correction Granger Causality Test Results

Independent Variable	**Dependent Variable**	
	$\Delta\ln(X)_t$	**$\Delta\ln(M)_t$**
EC	0.473 (2.877)*	0.634 (3.53)*
$\Delta\ln(X)_{t-1}$	0.050 (0.181)	0.213(0.703)
$\Delta\ln(X)_{t-2}$	−0.093 (−0.369)	−0.067 (−0.244)
$\Delta\ln(M)_{t-1}$	−0.087 (−0.390)	−0.083(−0.337)
$\Delta\ln(M)_{t-2}$	0.187(0.998)	0.195(0.945)
R^2	0.234	0.360
F-statistic	3.119*	5.746*

Notes: Figures in parenthesis in first six rows are t-statistic. The optimal lag length is determined using the Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC).* indicates rejection of the null hypothesis at the 1% significance level.

A glance at Row 3 of Table 3 illustrates that coefficients of the error correction terms (r_i in Eq. 12 and l_i in Eq. 13) are statistically significant in both equations. It suggests that there exists a bi-directional causality between India's current account inflows and outflows in the long-run. In other words, one reinforces the other. This finding is in line with Mukhtar and Rasheed (2010) who have provided the same evidence for Pakistan. The Block Exogeneity Wald Test results suggested that there was no short-run Granger causality in India's current account inflows and outflows in any direction.

The econometric results presented above receive further corroboration from the evidence presented in Table 4. It is clearly evident from Table 4 that the annual average compound growth rates of both India's exports and imports show acceleration during the 1990s which further picked up during the 2000s. It suggests a positive correlation between growth rates of India's exports and imports. The policy implication of this finding is that import restriction is not an appropriate measure to manage presently widening India's current account deficit.

[3] Following Tang's (2006) suggestion for Husted's (1992) standard regression equation that (a, δ) = (0,1), Eq. 6 can be expressed as: $e_t = X_t - MM_t \equiv TB_t$; TB_t = trade balance. The stationarity status of TB_t has been tested. The empirical results suggested the stationarity of TB_t with the rejection of null hypothesis of a unit root. In the Engle–Granger sense it shows empirical evidence of cointegration relationships between India's exports and imports.

Table 4 Annual Average Compound Growth Rates of India's Exports and Imports (In %)

Variable	1950-2009	1950-1989	1990-2000	2001-09
Exports (X)	9.83	8.17	12.24	22.30
Imports (M)	9.60	8.22	12.37	24.83

4.2 Determinants of India's Current Account Deficit

In order to develop the policy options for preserving India's current account sustainability, we now turn to uncover the macroeconomic variables explaining its behaviour. As in the case of current account inflows and outflows analysis, prior to the modeling of India's CAD, we first evaluate the orders of integration of the variables under investigation. The results of DF-GLS, ADF and PP unit root tests for variables of interest, viz. X/M, FD, ER and IR in level and first difference form are presented in Table 5.

Table 5 Unit Root Tests Results

Variable	Dickey-Fuller Generalised Least Square Test Statistic		Augmented Dickey-Fuller Test Statistic		Phillips-Perron Test Statistic	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend
InX/M	−1.86(2)**	−2.03(2)	−2.09(2)	−3.47(0)**	−3.61(3)*	−3.51(3)**
InFD	−1.08(2)	−2.38(0)	−1.90(0)	−2.23(1)	−1.90(3)	−3.92(0)**
InER	0.06(0)	−1.68(0)	−1.54(0)	−1.69(0)	−1.54(1)	−1.81(2)
InIR	−2.23(0)***	−2.62(0)	−2.23(0)	−2.54(0)	−2.15(3)	−2.22(6)
ΔInX/M	−9.04(0)*	−9.16(0)*	−8.93(0)*	−8.93(0)*	−9.54(3)*	−9.51(3)*
ΔInFD	−1.08(0)	−4.20(0)*	−5.40(1)*	−5.22(1)*	−6.85(3)*	−6.59(3)*
ΔInER	−3.09(1)*	−5.56(0)*	−6.06(0)*	−6.05(0)*	−6.06(2)*	−6.04(0)*
ΔInIR	−5.34(0)*	−6.22(0)*	−4.46(2)*	−8.93(0)*	−6.56 (15)*	−14.53(37)*

Note: Same as in Table 1.

A perusal of Table 5 makes it clear that current account deficit and interest rate series are level stationary, while fiscal deficit and exchange rate series are integrated of order one [$I(1)$]. This finding suggests for the application of ARDL bounds testing approach to cointegration.

Next, we explore the existence of any significant long-run relationships among the variables in our model. If CAD is cointegrated with FD, ER and IR, then this will provide statistical evidence for the existence of a long-run relationship. The results of ARDL bounds testing approach to cointegration are presented in Table 6. A cursory look at Column 3 of Table 6 makes it clear that the four variables (X/M, FD, IR, ER) have only one cointegration relationship. The calculated value of F-statistic for ARDL bounds testing approach, 6.15, is higher than the upper bound critical value at 5 per cent significance level, 4.79. It suggests the presence of significant long-run relationship between India's current account balance and its determinants.

The model passed all usual diagnostic tests including CUSUM and CUSUMQ tests for parameters stability over time—in the plots of results of these tests the cumulative sum of residuals and the cumulative sum of squares were within the critical lines.

Table 6 F-Statistic for Cointegration Relationship

Model	*F*- statistic	Outcome
$F_{X/M}$ (X/M,|FD, IR, ER)	6.15*	Cointegration
F_{FD} (FD|X/M, IR, ER)	1.89	No cointegration
F_{IR} (IR|X/M, FD, ER)	2.89	No cointegration
F_{ER} (ER|X/M, FD, IR)	2.82	No cointegration

Notes: The upper and lower bounds critical values at the 5 and 10% significance level for the *F*-test are: 3.56 and 4.79, and 2.91, 4.04, respectively. * indicates the statistical significance at the 5% level.

The estimated long-run relationship from the ARDL approach may be presented as:

$$\text{InX/M} = 4.95 - 0.221\text{InFD} - 0.198\text{InIR} - 0.598\text{InER} \quad (14)$$
$$(3.71) \quad (-3.72) \quad (-2.75) \quad (-3.35)$$

The values in parentheses in Eq. 14 are t-ratio for the significance of the parameters estimated. The value of R^2 is 55.22 and *F*-test (4, 34) is 10.17, which is significant at 1 per cent level. Serial Correlation χ^2 (Lagrange multiplier test of residual serial correlation) = 1.8551(0.173), Functional Form χ^2 (Ramsey's RESET test using the square of the fitted values) = 2.0545(0.152), Normality χ^2 (Based on a test of skewness and kurtosis of residuals) = 1.7154(0.424), and Heteroscedasticity χ^2 (Based on the regression of squared residuals on squared fitted values) = 1.0003(0.317). The figures in parentheses are 'P-value'.

The results presented in Eq. 14 show a positive and significant relationship between FD and CAD.[4] This is an important result especially in regard to the debate on the "twin deficits" hypothesis. According to this finding, a rise in India's fiscal deficit would also be followed by an increase in current account deficit. This result is consistent with an earlier study in Indian context, i.e., Virmani (2003). The obvious policy implication is that measures aimed at reducing the budget deficit may also lead to a reduction in India's current account deficit. Both interest rate and exchange rate coefficients are statistically significant and carry the expected signs. The response of CAD to changes in real effective exchange rate is found to be larger than interest rate. The sign of real effective exchange rate coefficient, which suggests that devaluation in term of real effective exchange rate reduces current account deficit, is consistent with an earlier study in Indian context, i.e., Singh (2002). The sign of interest rate coefficient is in line with Mundell–Fleming model which suggests that an increase in domestic interest rate worsens the current account balance. This finding suggests a need for monitoring real effective exchange rate and interest rate policy to manage presently mounting India's current account deficit.

The results of short-run dynamic coefficients associated with the long-run relationships obtained from the error correction representation for selected ARDL models are given in Table 7.

Table 7 Error Correction Representation for the Selected ARDL Model

ARDL(1,0,1,0) selected based on SIC, $F_{X/M}$ (X/M|FD,IR,ER)				
Independent Variable	**Coefficient**	**Standard Error**	**T-ratio**	**P-value**
ΔInFD	−0.339	0.087	−3.875	0.000
ΔInIR	−0.137	0.050	−2.763	0.009
ΔInER	−0.414	0.122	−3.391	0.002
EC(-1)	−0.693	0.129	−5.371	0.000
R^2 = 0.55, $\bar{R}^2$ = 0.48, *F*-statistic (4,34) = 10.174[0.000], *AIC* = 32.82 , S*BC* = 27.83				

[4] Note that the higher value of lnX/M indicates higher current account surplus.

All the coefficients have expected signs and are statistically significant at the 1 per cent level. The signs of short-run dynamic impacts are maintained to the long-run. The VECM results suggest that variations in CAD are caused by fiscal deficit, real effective exchange rate and interest rate in the short-run as well. The equilibrium correction (EC) coefficient, estimated -0.693 is highly significant, has the correct sign and implies a fairly high speed of adjustment to equilibrium towards a shock. Approximately, 70 per cent of disequilibria from the previous year's shocks converge back to the long-run equilibrium in the current year.

5. Conclusions and Policy Implications

In the study, we have empirically investigated the sustainability of India's current account deficit and factors affecting current account balance by applying Husted (1992) intertemporal budget constraint model and Keynesian national account identity, respectively. Both the Pesaran bounds test approach and the Johansen and Juselius cointegration tests results suggest the existence of a long-run equilibrium relationship between exports and imports in India, implying that India's intertemporal budget constraint is satisfied. Our finding seems to confirm the Husted (1992) theoretical approach that exports and imports converge to a long-run equilibrium. The export and import series are integrated of order one and are cointegrated. The path of India's current account imbalances over the last six decades has been consistent with inter-temporal solvency. Vector Error Correction Granger causality test results suggest that there exists a bi-directional causality between India's exports and imports in the long-run. The policy implication of this finding is that imports restriction is not an appropriate measure to manage presently widening current account deficit.

The current account deficit series is found to be level stationary, i.e., it has no unit root. We find that the current account deficit is cointegrated with fiscal deficit, interest rate, and exchange rate. Presently, the Government of India is attempting to cut public spending to reduce the fiscal deficit. Our results suggest that fiscal deficit, real effective exchange rate and interest rate play a significant role in affecting India's current account deficit in the long-run as well as short-run. These findings suggest that in order to manage presently mounting India's current account deficit, fiscal deficit curtailing policy need to be supplemented by the real effective exchange rate devaluation policy, lowering of interest rate and increase in export promotion policies.

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