Long run sustainability of current account balance of China and India: New evidence from combined cointegration test

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Long Run Sustainability of Current Account Balance of China and India: New Evidence from Combined Cointegration Test

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Abstract

This paper investigates the long run sustainability of current account balance (CAB) in two fast growing emerging economies of Asia, China and India, using annual data from 1980 to 2014. Sustainability of current account balance is analysed by examining the long run equilibrium relationship between exports and imports of goods and services. We use the Bayer-Hanck (2013) combined cointegration test to examine the long run relationship between exports and imports. The results indicate that while China has a sustainable current account balance, India's current account balance is not sustainable in the long run. Therefore, in terms of maintaining the growth momentum, India has to enhance the rate of growth of its exports while China has to maintain high levels of export growth, even in an era of sluggish global demand.

Key Words: Current account deficit; Sustainability; Intertemporal budget constraint

JEL Classification: F30; F32; Q56

1. Introduction

Since 2010, global sum of external imbalances has broadly remain stable with some changes in its composition. Notable changes have been in emerging Asia where India's current account deficit narrowed sharply after 2012 while the current account surplus of China declined over the recent years. Apart from the decline in trade balance, in China high investments since the global financial crisis of 2008 has brought down the current account surplus and there has been sizable appreciation of the real exchange rate which, currently is not undervalued. This fast decline in the trade surplus of China has important implications not only for its own growth but also for other emerging market economies. As regards to its own growth, an apparent secular deterioration in China's terms of trade and sustained increase in imports particularly in commodities and capital goods are linked to strong domestic demand relying on investments which raises concerns about domestic imbalances at a time when external imbalances are retreating. For China's trading partners in Asia, this rebalancing in China offers benefits which could be long lasting if they expand their access to Chinese markets. However, if the rapid growth of Chinese exports witness slowdown then the Asian trading partners might also have slower exports due to their supply linkages with China, which are basically downstream in nature. Thus countries with large trade exposure to China are vulnerable to a slowdown in China.

China's current account upsurges are in line with the oil trade balances. The non-oil current account is essentially stable as the effect of REER appreciation is offset by productivity gains and slower growth of domestic demand. This underscores the importance of oil prices in shaping external account balances of China, as current account is dominated by the impact of oil price drop which is only partly offset by related currency movements. After several years of relative stability the price of oil declined steeply in 2014. Since then oil importing economies have been enjoying the fruits of plummeting crude oil prices globally. This can help in restoring their external sector balances and moderate inflation as the prices of goods and services do not increase because of lower energy prices and transportation cost. Moreover, a reduction in the oil prices can reduce the import bills for oil importing countries, which will have a favourable impact on the trade and current account balances. Falling oil prices also can help to reduce the subsidy burden and thereby lead to cutting down the fiscal deficit, as oil is subsidised in developing economies. Thus this episode of decline in oil prices raises two important questions. First, whether the effects of falling oil prices are temporary or permanent. Second, if it is temporary, can any long term macroeconomic policy help in mitigating the cyclical effects which gets transmitted globally due to fluctuations in oil prices? This leads to an important question on the long run sustainability of the external sector balances of an economy, ensuring which, is a prerequisite for achieving stable rates of growth.

Given this background, this paper examines the sustainability of the current account balance in the two prominent emerging economies, China and India. Our motivation to examine this issue stems from the fact that China and India are fast growing economies in Asia, which is propelling global growth currently. Besides, both these countries are trading partners with voluminous bi-lateral trade between them. Though the current account of China shows surplus for a longer period of time, India's current account lies in the deficit zone for most of the years since 1980, except during 2001 to 2003. China is also considered as one of the main source of a perceived imbalance in global capital flows and as the mirror image of the persistent U.S. trade deficit (Hoffmann, 2013). On the other hand, India is continuously being affected by the increasing deficits in its current account, which raises questions about the financing of such deficits as India's current account deteriorated to 4.8 percent of its GDP in 2012-13. This was one of the major cause for the depreciation of the Indian Rupee and rapid increase in inflation. In recent years, both China and India have been prone to domestic and external shocks. China witnessed stock market crash of 8.48 percent on 24 August 2015, marking the biggest fall since 2007. Further the rates of growth of exports have also slowed down from 27.74 percent in 2010 to 3.96 percent in 2014. Therefore, fundamental questions are being raised about the sustainability of the external sector balances and growth of China.

This paper contributes to the existing literature by revisiting the current account sustainability in the case of two growing open economies by incorporating the recent 'domestic market' re-shaping policies of these economies. We apply structural break unit root test and combined cointegration test to examine time series properties and long run relationship between variables, respectively. The VECM Granger causality is applied to investigate the direction of the causal relationship between the variables. Although most empirical studies have used the univariate unit root testing procedures to investigate the sustainability hypothesis, there has been an increasing interest to test the sustainability hypothesis by examining the long run equilibrium relationship between the exports and imports of goods and services. Holmes et al. (2011) show that the existence of the long run relationship between exports and imports is a necessary condition for current account sustainability. Further, the conventional unit root testing procedures suffer from the well-known low power, when the time series under analysis is short and/or stationary and subject to non-linear behaviour (Lanzafame, 2014). Therefore, this study uses the Bayer and Hanck (2013) and the Pesaran et al. (2001) test of cointegration to examine the sustainability of the current account balances of China and India.

The rest of the paper is organised as follows. Section 2 reviews the literature. Section 3 presents the recent trends in exports, imports and current account balance for both China and India. Section 4 describes the model, data and methodology. Section 5 presents the results and discussion. Section 6 concludes.

2. Literature Review

Implications of current account imbalances and its sustainability is an important issue in international macroeconomics. An economy's current account reflects its economic performance because of which it is considered as an important barometer for assessing growth by both policy makers and investors (Baharumshah et al., 2003). Temporary current account imbalances may arise because of the reallocation of capital to the countries that gives higher possible returns to factors of production, especially higher returns to capital (Hakkio, 1995). Such differences in returns to capital might even out in the long run and hence does not create persistent imbalances for an economy. On the other hand, large and persistent deficits in current account tends to pose serious problems and may necessitate proper policy response. More specifically, in the long run, rising current account deficits tend to depreciate domestic currency and increase the domestic interest rate as compared to foreign interest rate. This results in further increase in the volume of imports and accumulation of larger external debt which indirectly imposes greater burden on the future generations.

The intertemporal approach, developed by Sachs (1981) and latter extended by Obstfeld and Rogoff (1996), has been considered as an important theoretical development to explain whether disequilibrium in an economy's current account is sustainable in the long run or not. This approach is based on the assumptions of perfect capital mobility and the consumption-smoothing behaviour. The 'sustainability hypothesis' as elucidated in intertemporal approach defines the condition under which current account imbalances are consistent with a country's intertemporal budget constraint (IBC), which can be met in the long run without any drastic corrections (Lanzafame, 2014). While non-stationary current account does not necessarily violate the IBC (Quintos, 1995; Bohn, 2007), stationarity can be considered as the sufficient condition for the sustainability of the current account.

A number of studies have attempted to examine the issue of the sustainability of the current account both at the individual country level (Karunaratne, 2010; Apergis et al., 2000; Fountas & Wu, 1999) as well as for a cross section of countries (Gnimassoun & Coulibaly, 2014; Zubaidi, Lau, & Fountas, 2013; Kim et al., 2009). Plethora of studies have argued that a stationary current account balance can be considered as sustainable (Christopoulos & León-Ledesma, 2010; Chen, 2011). This is because a stationary current account is consistent with the accumulation and sustainability of external debts (indicating that there is less probability of a country defaulting its debts) as well as an indicator of potential exchange rate realignment. Further, the stationarity of current account concurs with the implication of the modern inter-temporal model of current account, and hence supports its validity (Obstfeld and Rogoff, 1996, p. 90). However, Bohn (2007) argues that the stationarity of current account balance is sufficient but not the necessary condition for the sustainability of external debt. In this case the long run equilibrium relationship between exports and imports are nonetheless more informative. In this regard, Husted (1992) shows that under the null hypothesis that the economy satisfies its inter-temporal budget constraint, we expect that exports and imports have a cointegrating relationship with cointerating vector (1, -1), granted that they are I(1). Thus the stationarity of trade balance is a necessary condition to be satisfied for balancing an economy's intertemporal budget constraint.

Bulk of the empirical examination of the sustainability of current account have provided evidence from a comparative perspective, especially among emerging economies (Baharumshah et al., 2003). While recent empirical research has focused on the issue of sustainability of the India's current account (Shah & Patnaik, 2005; Holmes et al., 2011, Goyal, 2012; Callen & Cashin, 1999), there exists a lacunae in terms of studies comparing India with other emerging economies, especially China. In our view a comparative analysis between China and India would provide useful insights on the factors and determinants of the current accounts of two large economies.

3. Trends in exports, imports and current account balance

India and China, similar to other contemporary developing economies, adopted an inward looking import substituting industrialization strategy since 1950s. The main motive of such a policy was to enhance the pace of industrialisation and conserve the limited available foreign exchange. In 1978, China proceeded with the liberalisation of its external sector. India also followed the same in the1980s, with an initial focus on internal deregulation rather than on the external sector liberalization. In response to the severe balance of payments crisis during the early 1990s, India liberalised the external sector to a greater extent, making exports and imports of goods and services more convenient across the international borders[2].

Trends in exports, imports and the current account balance (all the variables are expressed as per cent of GDP) for China and India for the period 1980 to 2014 are presented in Figure 1. This shows that after 1994, China's exports have shown an increasing trend and it remains greater than imports. It is also evident that China's current account surplus increased sharply overtime and after the 2007-08 global financial crisis it decreased from 10.08 percent of GDP in 2007 to a 2.09 percent of GDP in 2014. The year 1994 shows a significant policy change in the China's external sector when the People's Bank of China devalued the domestic currency against the US Dollar, and the exchange rate system was officially changed to a managed float. Although the currency has been *de facto* fixed to the US Dollar since 1995, China officially has a managed floating exchange rate system (Bal and Rath, 2015).

On the other hand, in the case of India, there is an increasing trend in both the exports and imports of goods and services, and the imports remained higher than the exports for the entire period. One of the causes for rising India's imports is the increase in defense imports which is rising over time (Dash et al., 2016). Both the exports and imports registered a sharp increase since 1990s. Following the 1991 balance of payments crisis, Indian government adopted a more liberal trade and payments policy as well as devalued the domestic currency (Rupee) against all the major foreign currencies. This period shows significant changes in the country's balance of payments. Further, there has been a reduction in India's exports and imports of goods and services during 2007-08 and the current account deficit increased significantly and reached a higher level of 4.84 percent of GDP in 2012-13.

[2] There exists voluminous literature on the changes in trade and industrial policies in China and India. Hence we avoid a detailed discussion on this. See Brandt and Rawski (2008) for discussions on changes in economic policies and its implication for China and Panagariya (2008) on India. Bardhan (2012) investigates the two countries' economic reforms in a comparative perspective.

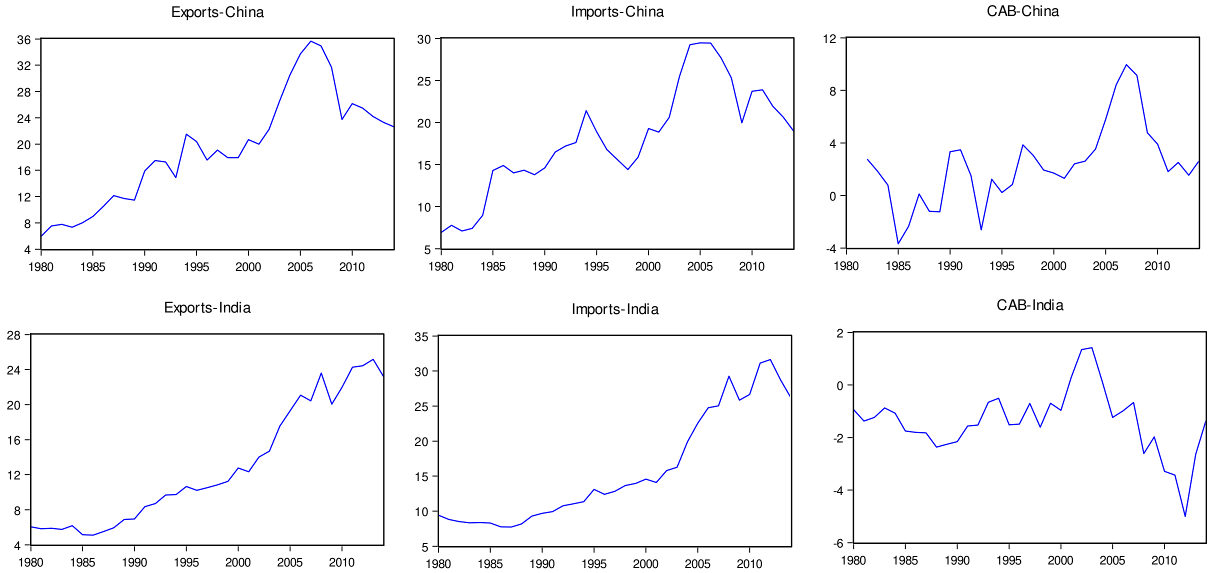


Figure 1 Trends in exports, imports and current account balance, 1980 to 2014

Source: World Development Indicators (WDI) of World Bank

Table 1 presents the share of China and India in world exports and imports and also the trend in the total foreign exchange reserves as percentage of GDP for both the countries. We notice that there has been a significant increase in the share of exports and imports of both China and India in total world trade. While exports of both countries (China and India) has increased from 2.9 percent in 1995 to 12.4 percent in 2014 and 0.6 percent in 1995 to 1.6 percent in 2014, the imports has increased from 2.5 percent in 1995 to 10.4 percent in 2014 and 0.7 percent in 1995 to 2.4 percent in 2014, respectively. The important point to note here is that China's share in exports is always higher than its imports, whereas in the case of India the share of exports is less than its imports for the entire period. The higher share of exports in the case of China and higher share of imports in the case of India to the total trade can be interpreted as the major reason for China's current account surplus and India's current account deficit for a longer period of time.

Further, the total foreign exchange reserves as percent of GDP for both the countries shows increasing trend first and then falls significantly in the later years. Table 1 shows that recently there is a continuous larger fall in the total foreign exchange reserves in the case of China as compared to India. While the total foreign exchange reserves of China has fallen from 47.45 percent of GDP in 2010 to 40.46 percent in 2013 and 37.27 percent of GDP in 2014, in case of India it has reduced from 16.11 percent of GDP in 2010 to 14.85 percent in 2013 and further to 14.81 percent of GDP in 2014. This declined trend has raised concerns on the external sector stability and imports cover in these two economies. From the above trends it emerges that even though China is having continuous surplus in its current account for a longer period of time as compared to India, which is having deficits, the long run sustainability of current account balance in both these economies warrants closer scrutiny.

Table 1 Share of China and India in world exports and imports

Countries	Variables	1995	2000	2005	2010	2013	2014
	Exports	2.91	3.90	7.29	10.35	11.72	12.41
China	Imports	2.55	3.41	6.16	9.08	10.40	10.41
	Reserves	10.30	13.96	36.21	47.45	40.46	37.27
	Exports	0.62	0.66	0.96	1.45	1.79	1.68
India	Imports	0.71	0.80	1.31	2.28	2.49	2.44
	Reserves	4.89	7.95	15.81	16.11	14.85	14.81

Source: World Development Indicators, World Bank.
Note: Reserves shows total foreign exchange reserves as percentage of respective country's GDP.

4. Model, Data and Methodology

4.1 The Model

Assessing the sustainability of current account has been a debatable issue in literature (Holman, 2001; Mann, 2002). Widely employed tests exploit the recent developments in time series econometrics for testing the sustainability hypothesis. These tests rely on stationarity of current account which has implications for the intertemporal approach. According to the intertemporal approach current account acts as a buffer to smooth consumption implying that typically it behaves like a stationary variable. However, employing conventional unit root test have yielded non-stationarity of current account in its level (Shibata and Shintani, 1998) and the lack of power of conventional tests for stationarity is well known (Shiller and Perron, 1985). Husted (1992) proves that the mean reversion in current account can be explained by examining the cointegration properties between exports and imports, and that current account is sustainable if exports and imports are cointegrated with the cointegrating vector being (1,-1). This enables us to examine the long run relationships between the variables using the recent test of combined cointegration approach of Bayer and Hanck (2013). We follow Husted (1992) to determine the sustainability of current account in China and India. This approach uses a model of budget constraint at an individual level, which can be extended to an economy. We discuss the approach below:

The current period budget constraint for an economy can be expressed as

$$C_0 = Y_0 + B_0 - I_0 - (1+ir_0)B_{-1} \tag{1}$$

Where C_0 denotes current consumption, Y_0 current output, I_0 is investment expenditure, ir_0 is world interest rate, B_0 is international borrowing and $(1+ir_0)B_{-1}$ is external debt. As equation (1) must hold good for every time period intertemporal budget constraint (IBC) can be arrived as the summation of period by period budget constraint, which can be expressed as equation (2).

$$B_0 = \sum_{t-1}^{\infty} \delta_t TB + \lim_{n\to\infty} \delta_n B_n \tag{2}$$

Where $TB_t = X_t - M_t = Y_t - C_t - I_t$ which is the trade balance in period t, that is, income-absorption. X_t and M_t are exports and imports, respectively and δ_t is the discount factor. The last term in equation (2) implies that when limit term equals zero the amount a country borrows is equal to the present value of future trade surpluses. Assuming that the world interest rate is stationary with unconditional mean ir, equation (1) can be expressed as

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

Where $Z_t = M_t + (ir_t - ir)B_{t-1}$

Solving equation (3), Husted (1992) arrives at

$$M_t + ir_t B_{t-1} = X_t + \sum_{j=0}^{\infty} \phi^{j-1}(\Delta X_{t+j} - \Delta Z_{t+j}) + \lim_{j\to\infty} \phi^{t+j} B_{t+j} \tag{4}$$

Where $\phi = 1/(1+r)$ and Δ is the first difference operator. It can be seen from equation (4) that payments on imports as well as interests on foreign debt is represented on the left hand side. To arrive at the current account of an economy we subtract X_t from both sides of equation (4) and multiply the result by (-1). In order to convert equation (4) to a regression model we assume that the limit term is zero and a residual term is added. This yields the following equation:

$$X_t = a + bM_t^* + \mu_t \tag{5}$$

It should be noted that M_t^* measures imports of goods and services plus unilateral transfers. In order to satisfy IBC the necessary condition is the existence of a stationary error structure.

This implies that μ_t in equation (5) should be an I(0) process. The necessary and sufficient condition for IBC is the existence of a vector (a, b) such that (a, b) = (0, 1) and the process is stationary. Two intuitive implications can be arrived from equation (5). First, Failure to detect co-movements between exports and imports implies that the economy fails to satisfy its budget constraint resulting in default of its debt. Second, if exports and imports are cointegrated with a vector $\beta = (1, -1)$ then the economy satisfies IBC in the long run and the two series would never drift too far apart. We use the above framework for testing the sustainability of current account of China and India.

4.2. Data

On the basis of the availability of data for both the economies, we use annual data from 1980 to 2014 for the econometric analysis. The data from the World Development Indicators (WDI) database of the World Bank is used. Following the earlier literature[3] on testing current account sustainability, the present study uses exports of goods and services (as percent of GDP) and imports of goods and services plus interest payments on the external debt (as percentage of GDP) to test the sustainability of the current account imbalances.

The summary statistics of the variables are presented in Table 2. The average values of exports (imports) for China and India are 19.223 (18.086) and 12.854 (15.875) respectively, and the standard deviations are 8.308 (6.319) and 8.615 (7.870). Further, while the maximum value of the exports is higher for China (35.652 percent of GDP) than for India (25.163 percent of GDP), the maximum value of imports is higher in case of India (31.643 percent of GDP) than that of China (29.481 percent of GDP). The correlation results show that the correlation between exports and imports for India (0.99) is higher than that of China (0.96).

Table 2 Descriptive Statistics

Variables	Mean	Max.	Min.	S.D.	Skewness	Kurtosis	J.B. Test
China:							
Exports	19.223	35.652	5.958	8.308	0.230	2.265	1.097
Imports	18.086	29.481	6.924	6.319	0.038	2.441	0.464
				Correlation			

[3] See Kalyoncu and Ozturk (2010), Husted (1992).

	Exports	Imports					
Exports	1.000						
Imports	0.962	1.000					
India:							
Exports	12.854	25.163	5.107	6.815	0.541	1.819	3.738
Imports	15.875	31.643	7.721	7.870	0.738	2.055	4.481
				Correlation			
	Exports	Imports					
Exports	1.000						
Imports	0.991	1.000					

Note: Exports imply the exports of goods and services as percentage of GDP; Imports imply imports of goods and services plus the interest payments on the external debt as percentage of GDP. Both the variables have taken as percentage of GDP.

4.3. The Bayer-Hanck cointegration approach

For testing the sustainability hypothesis we apply the combined cointegration test developed by Bayer and Hanck (2013). There are several tests that have been developed to examine the long run relationship among variables. The residual based test of Engle and Granger (1987), the system based test of Johansen (1988) and the error correction based test of Boswijk (1994) and Banerjee et al. (1998) are the most commonly used. Engle-Granger test involves a two-step testing procedure. The major limitation of this test is that if an error arises in the first step it carries over and feeds into the second step and ultimately gives biased results. Further, the results of the long run regression may provide inefficient estimates if the residuals are not normally distributed. However, Engle and Yoo (1991) cointegration test solved the issues of Engle and Granger (1987) test by providing efficient results even if the distribution of estimators from the cointegrating vector is not normally distributed.

Johansen and Juselius (1990) developed the maximum likelihood cointegration test which can be applied to examine the cointegration between variables when the variables are non-stationary at levels but integrated of the same order. However, this is a single equation model and is not applicable when the variables are integrated of mixed order. The results are also sensitive to the incorporation of exogenous and endogenous variables in the model. While the test indicates the presence of cointegration among the variables or not, it does not give any information about the short run dynamics. Further, Pesaran et al. (2001) suggested a bounds testing cointegration approach using an autoregressive distributed lag (ARDL) model which can deal with some of the issues arising out of the Johansen and Juselius (1990) approach. This approach is applicable even if the series are $I(0)$, $I(1)$ or a mix of $I(0)/I(1)$. Unlike Johansen and Juselius (1990) cointegration test, the ARDL model shows both the short run and the long run relationship between the variables. The demerit of this method is that, it is not applicable if any of the variable is integrated of order two [$I(2)$] Pesaran et al. (2001).

As discussed above there exists various methods to test long run relationship between a set of variables. However, in practice it is possible that different methods may give different results making it difficult to conclude whether the series are cointegrated or not. In order to overcome this Bayer and Hanck (2013) developed a new dynamic cointegration technique by combining several popular tests such as Engle and Granger (1987), Johansen (1988), Boswijk (1994) and Banerjee et al. (1998) to obtain uniform and reliable results. This test gives efficient estimates by ignoring the nature of multiple testing procedure which gives robust and better results as compared to the individual t-test or the system based test.

The Bayer and Hanck (2013) cointegration test follows Fisher's (1932) critical tabulated values formula to combine the statistical significance level i.e. p-values of single cointegration test. Following Shahbaz et al. (2016), the formula is given below:

$$EG - JOH = -2[\ln(P_{EG}) + \ln(P_{JOH})] \tag{6}$$

$$EG - JOH - BO - BDM = -2[\ln(P_{EG}) + \ln(P_{JOH}) + \ln(P_{BO}) + LN(P_{BDM})] \tag{7}$$

The notations such as P_{EG}, P_{JOH}, P_{BO} and P_{BDM} represent the probability values for the individual cointegration tests such as Engle and Granger (1987), Johansen (1991), Boswijk (1994) and Banerjee et al. (1998), respectively. We follow the critical values of Fisher (1932) to decide whether there is cointegration between the variables or not by rejecting the null hypothesis of no cointegration when the calculated Fisher (1932) statistic value is greater than the critical values generated by Bayer and Hanck (2013). If we will find cointegration among the variables, in the final step, the vector error correction model (VECM) will be estimated to obtain the short run and the long run Granger causality between the variables.

4.4. The VECM Granger causality

The vector error correction model (VECM) tests for both the short and long run dynamics of the variables. It helps in testing the causal relationship between the variables in the short run as well as long run. If cointegration is found among the variables, the following VECM model can be estimated.

$$\begin{bmatrix} \Delta\text{Exports} \\ \Delta\text{Imports} \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} + \begin{bmatrix} B_{11,1}, B_{12,1} \\ B_{21,1}, B_{22,1} \end{bmatrix} \times \begin{bmatrix} \Delta\text{Exports}_{\text{t-1}} \\ \Delta\text{Imports}_{\text{t-1}} \end{bmatrix} + \\ \ldots. + \begin{bmatrix} B_{11,m}, B_{12,m} \\ B_{21,m}, B_{22,m} \end{bmatrix} \times \begin{bmatrix} \Delta\text{Exports}_{\text{t-1}} \\ \Delta\text{Imports}_{\text{t-1}} \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \end{bmatrix} \times (ECM_{t-1}) + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \end{bmatrix} \quad (8)$$

where Δ represents difference operator and ECM_{t-1} denotes the lagged error correction term. The long run causality can be obtained from the coefficient of the lagged error correction term. The joint χ^2 statistic for the first differenced lagged independent variable is used to investigate the short run causality between the variables. For example $B_{12,i} \neq 0 \forall_i$ shows that imports Granger causes exports and vice-versa if $B_{21,i} \neq 0 \forall_i$.

5. Empirical results and discussions

5.1. Unit root test results

As it is necessary to check for the stationarity properties of the variables prior to examining the cointegrating relationship among them, we test for the presence of unit roots in the levels and first differences for exports and imports. The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests, presented in Table 3, indicate that both exports and imports are integrated of order one or $I(1)$ for both China and India. To check whether our unit root test results are robust in the presence of a potential structural break, we implement the Zivot and Andrews's (1992) unit root test where the break date is endogenously determined within the model. The findings, presented in Table 4, show that the null hypothesis of a unit root in the presence of a structural break cannot be rejected for both the series at level, while it is clearly rejected at first difference. Unit root results of ADF, PP and Zivot and Andrews (1992) show that both exports and imports are stationary in their first difference implying the variables are integrated of order one or $I(1)$ for both the countries.

Table 3

Results of unit root tests

		Augmented Dickey-Fuller test results				Phillips-Perron test results			
Country	Variable	ADF without trend		ADF with trend		PP without trend		PP with trend	
		Level	1st Difference	Level	1st Difference	Level	1st Difference	Level	1st Difference
China	Exports	-1.602	-4.965*	-1.204	-5.045*	-1.618	-4.956*	-1.456	-5.047*
	Imports	-1.848	-4.332*	-1.217	-4.482*	-1.848	-4.350*	-1.217	-4.423*
India	Exports	0.612	-7.475*	-2.585	-7.629*	0.292	-7.361*	-2.585	-7.596*
	Imports	-0.198	-5.001*	-2.268	-4.898*	-0.198	-5.000*	-2.271	-4.839*

* Represents significance at 1% level.

Table 4

Zivot-Andrews unit root test

Countries	Variable	Level			1st difference		
		T-statistic	Time break	Decision	T-statistic	Time break	Decision
China	Exports	-3.129 (0)	2007	Unit root	-5.478* (0)	2005	Stationary
	Imports	-3.220 (1)	2007	Unit root	-4.735** (0)	2004	Stationary
India	Exports	-2.457 (1)	1986	Unit root	-8.760* (0)	2006	Stationary
	Imports	-2.265 (0)	1987	Unit root	-6.354* (0)	2009	Stationary

Lag order is shown in parenthesis.
* Represents significance at 1% level
** Represents significance at 5% level

5.2. Cointegration test results

As the unit root tests show that the variables are integrated of the same order, that is, $I(1)$, the combined cointegration test of Bayer and Hanck (2013) can be a suitable method to investigate whether the variables (exports and imports) are cointegrated in the long run. Table 5 presents the results of the Bayer-Hanck cointegration test including the EG-JOH, and EG-JOH-BO-BDM. The results show that, in case of China, the Fisher statistics for EG-JOH and EG-JOH-BO-BDM exceeds the critical values at 5% levels of significance implying both exports and imports are having long run equilibrium relationship. On the other hand, in case of India we cannot reject the null hypothesis of no cointegration between exports and imports since the Fisher statistics for EG-JOH and EG-JOH-BO-BDM found to be less than the critical values at 5% significance level. The results confirm that the presence of cointegration in case of China and no cointegration for India. Thus, we can conclude that there is a long run relationship between the exports and imports in case of China, hence China's current account is sustainable in the long run. On the other hand, we did not find any long run relationship between the exports and imports for India, hence India does not have a sustainable current account balance in the long run.

Table 5

The results of Bayer and Hanck (2013) cointegration analysis, 1980-2014.

Country	Estimated Models	EG-JOH	EG-JOH-BO-BDM	Lag order	Cointegration
China	Exports=f(imports)	14.400**	37.442**	1	Yes
	Imports=f(exports)	16.808**	34.214**	1	Yes
India	Exports=f(imports)	4.902	7.142	5	No
	Imports=f(exports)	5.607	9.579	5	No

Critical values at 5% level are 11.229 (EG-JOH) and 21.931 (EG-JOH-BO-BDM), respectively. Lag length is based on minimum value of AIC.
** Represents significance at 5% level.

Though the Bayer and Hanck (2013) combined cointegration approach gives efficient results, it fails to accommodate for the structural breaks in the series. So we use the ARDL bounds testing approach as a robust method proposed by Pesaran et al. (2001) to overcome this problem in the presence of structural breaks in the data series. Since ARDL bounds testing procedure is known to be sensitive to the lag length in the model, we used the AIC criteria to select the lag length which are given in the column-3 of Table 6. The critical bounds statistics of Narayan (2005) is used to determine the cointegration between the variables. The results show that the calculated F-statistic is found to be greater than the upper bound critical value of Narayan (2005) in case of China showing the exports and imports of China are cointegrated. On the other hand, in case of India the calculated F-statistic values found to be smaller than the lower bound critical value showing that there is no cointegration. This shows that the ARDL bounds test confirms the long run relationship among the variables same as shown by the Bayer-Hanck cointegration results given in Table 5. This implies that while China's exports and imports are cointegrated in the long run, no long run relationship found among both these variables in case of India for the period 1980-2014. Finally, the stability of our models are checked by the CUSUM and CUSUMSQ tests which are given by Figure 2 to 9.

Table 6

The results of ARDL cointegration test

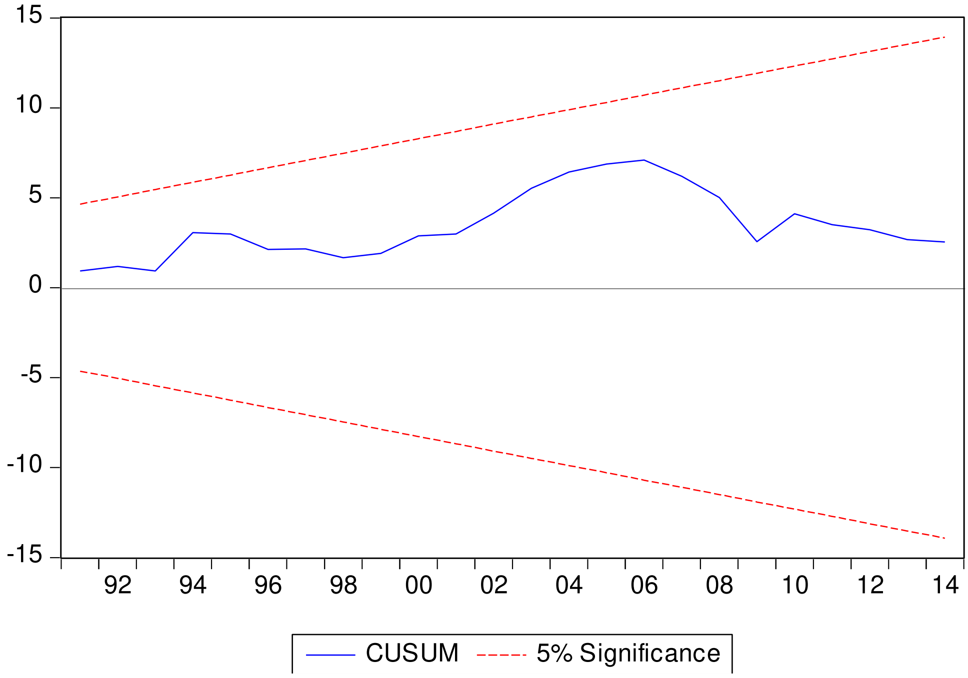
Bound testing approach to cointegration					Diagnostic tests			
1	2	3	4	5	6	7	8	9
Country	Estimated Models	Optimal lag length	Structural break	F-statistics	χ^2_{Normal}	χ^2_{ARCH}	χ^2_{RESET}	χ^2_{SERIAL}
China	Ex = f(Im)	(1,3)	2007	8.79*	2.55	0.25	0.80	1.81
	Im=f(Ex)	(2,2)	2007	6.25**	3.05	0.78	0.24	0.84
India	Ex = f(Im)	(4,4)	1986	2.38	0.72	0.44	0.97	0.50
	Im=f(Ex)	(1,2)	1987	2.40	0.07	0.03	0.78	1.75

Critical values (T = 35)[a]	
Lower bound I(0)	Upper bound I(1)
7.870	8.960
5.290	6.175
4.225	5.050

The optimal lag length is determined by AIC. T is the total number of observations used in the empirical analysis.
* and ** denote significance at 1% and 5% levels, respectively.
[a] Critical lower and upper bounds values are collected from Narayan (2005) including unrestricted intercept and no trend.
Further, Ex and Im represent exports (as % of GDP) and imports (as % of GDP), respectively.

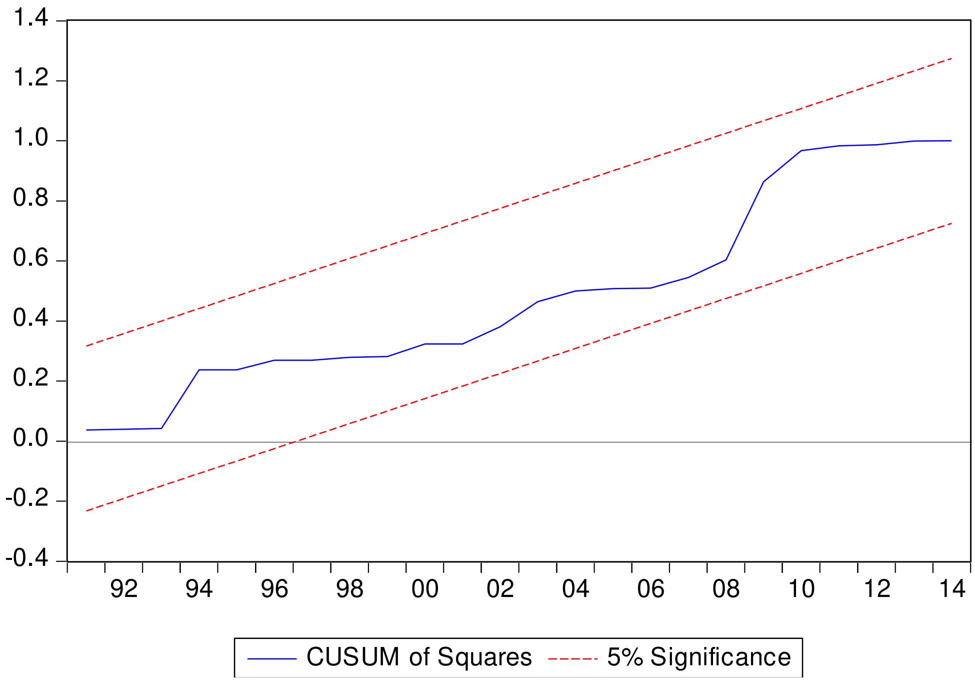
Stability test- China

Model 1: Ex=f(Im)



Note: Straight lines represent critical bounds at 5% significance level

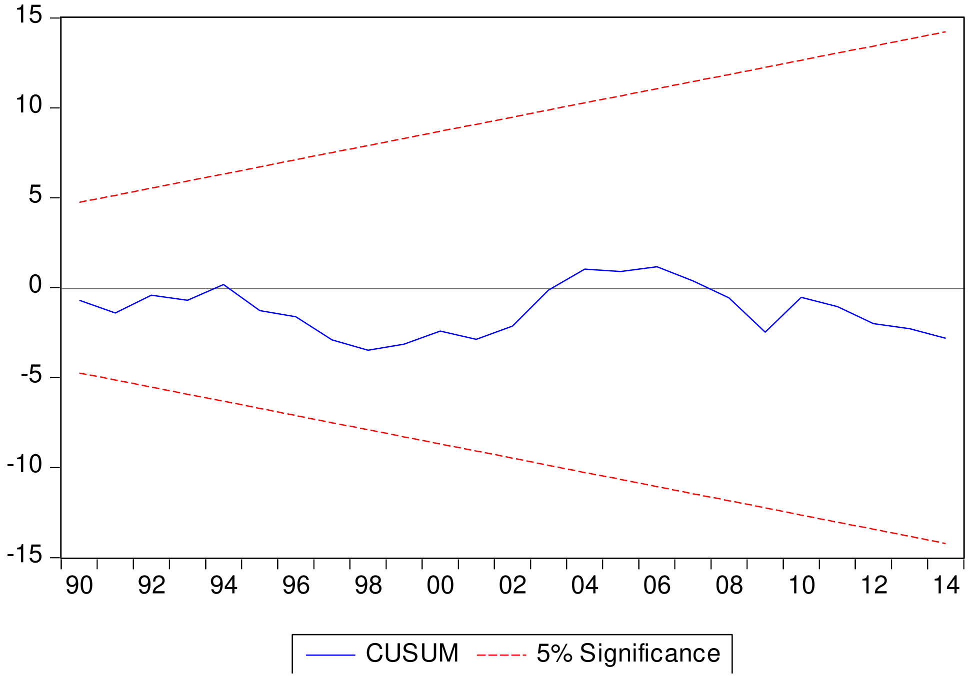
Figure 2 Plot of cumulative sum of recursive residuals.



Note: Straight lines represent critical bounds at 5% significance level

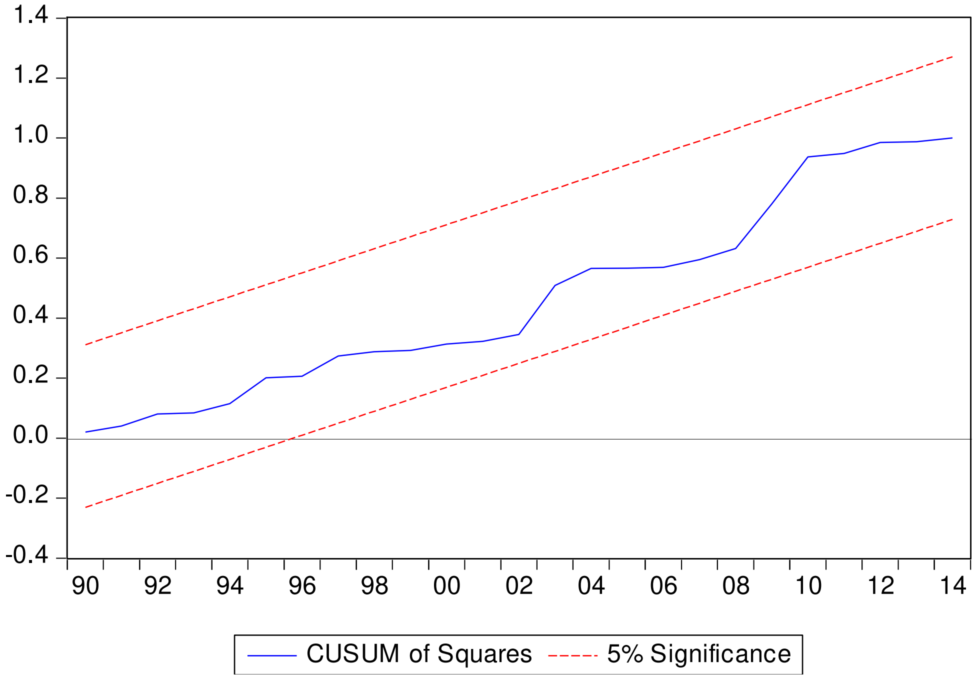
Figure 3 Plot of cumulative sum of squares of recursive residuals.

Model 2: Im=f(Ex)



Note: Straight lines represent critical bounds at 5% significance level

Figure 4 Plot of cumulative sum of recursive residuals.

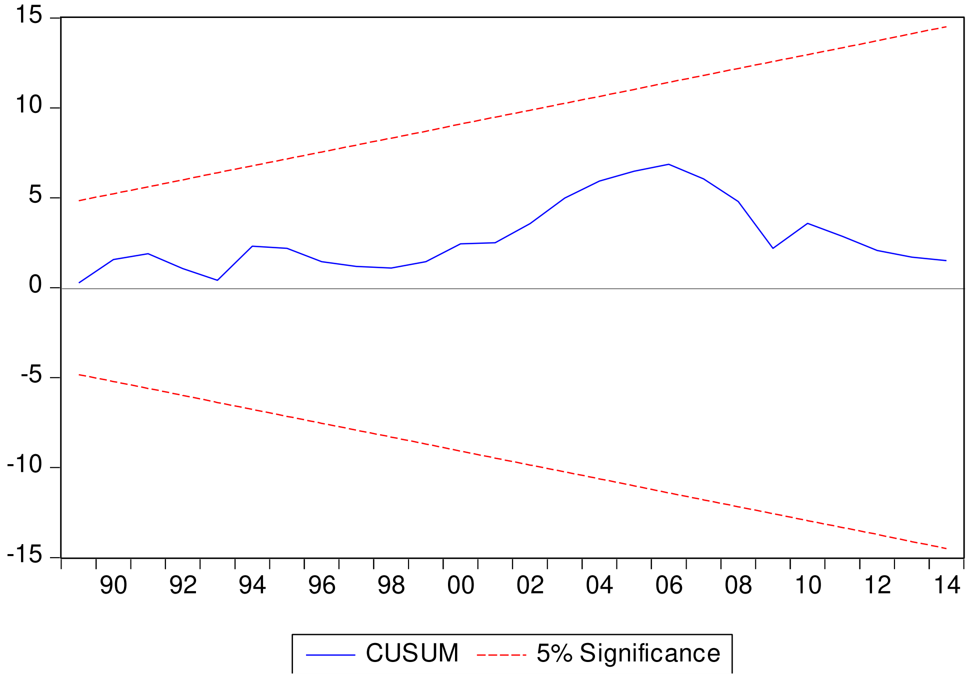


Note: Straight lines represent critical bounds at 5% significance level

Figure 5 Plot of cumulative sum of squares of recursive residuals.

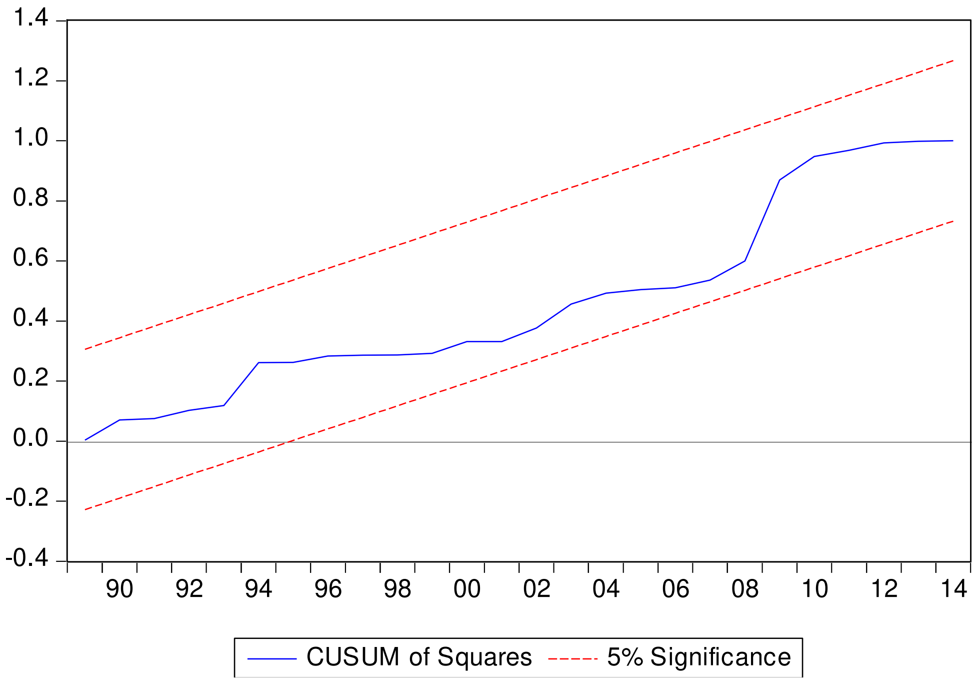
Stability test- India

Model 1: Ex=f(Im)



Note: Straight lines represent critical bounds at 5% significance level

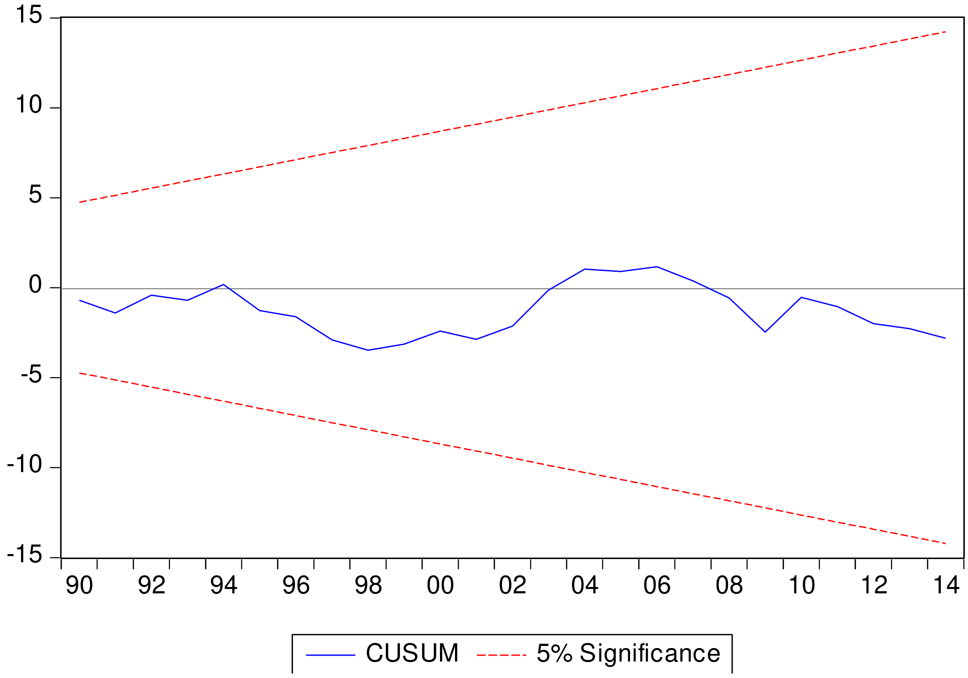
Figure 6 Plot of cumulative sum of recursive residuals.



Note: Straight lines represent critical bounds at 5% significance level

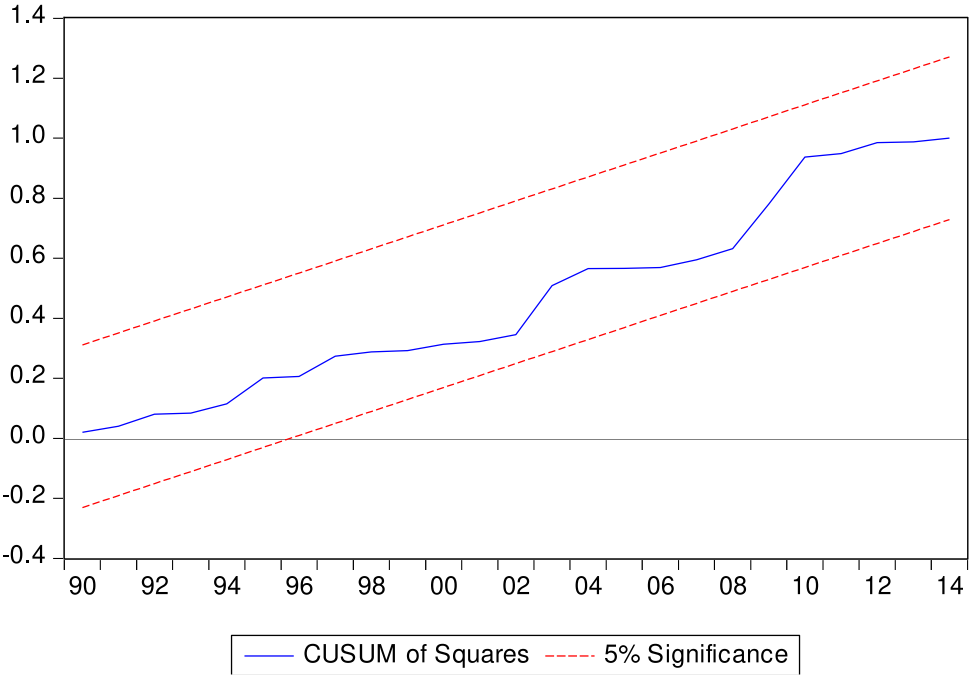
Figure 7 Plot of cumulative sum of squares of recursive residuals.

Model 2: Im=f(Ex)



Note: Straight lines represent critical bounds at 5% significance level

Figure 8 Plot of cumulative sum of recursive residuals.



Note: Straight lines represent critical bounds at 5% significance level

Figure 9 Plot of cumulative sum of squares of recursive residuals.

5.3. VECM causality results

In the presence of cointegration between variables we can apply the VECM Granger causality test to examine the short run and long run causal relationship among them. Since only in the case of China exports and imports are cointegrated, we estimated equation (8) to find out the existence of any causal relationship among the variables both in short run and long run. The VECM Granger causality results for China is presented in Table 7.

Table 7

The VECM Granger causality analysis for China, 1980-2014.

Dependent Variable	Direction of causality		
	Short run		Long run
	ΔEXP_{t-1}	ΔIMP_{t-1}	ECT_{t-1}
ΔEXP_t	–	$0.266(0.413)$	$-0.409^{***}(0.062)$
ΔIMP_t	$-0.534^{**}(0.028)$	–	$-0.209(0.436)$

** and *** represent significance at 5% and 10% levels, respectively.

The results show that in the case of China, exports Granger cause imports in the short run and not vice versa. On the other hand, in the long run there exist only unidirectional causality from imports to exports for China. This implies that in order to increase exports, importing more is required. This can be explained by the fact that during the initial phase China's rapid growth was based on domestic market, particularly household consumption and government consumption (Zhu and Kotz, 2011). However, since 2001 exports along with the higher rates of fixed investment have been driving the growth of China. Further, China is considered as the second largest oil importer after the US. This may be a plausible reason for the direction of causal relationship in our estimates.

The error correction model indicates the speed of adjustment towards long run equilibrium after a short run shock. The lagged ECM term (-0.68) in the ECM model shows the negative and significant relationship, shows 68% of disequilibrium in the previous year is corrected in the current year. The error correction term (ECT_{t-1}) which gives the long run causality between the exports and imports, shows that there is unidirectional causality from imports to exports in the long run. This implies that a rise or fall in the imports cause a rise or fall in the exports for China in the long run and not vice versa. This can be explained by the idea of intertemporal approach (discussed in Section 4.1), indicating that China is emphasizing on increasing its exports in the long run to raise the stock of forex reserves which can help in smoothening the import demand in future. In other words, in order to smoothen the future consumption in the long run, China is emphasizing the expansionary export policies in the present period.

5.4. Granger causality results

Since the exports and imports are not cointegrated in Indian case, we apply the Granger causality test to investigate the short run causality among the variables by using the following equations.

$$\Delta Exports_t = \alpha_0 + \alpha_{1i}\sum_{i=1}^{m}\Delta Exports_{t-i} + \alpha_{2j}\sum_{j=1}^{n}\Delta \mathrm{Im}\, ports_{t-j} + \varepsilon_t \quad (9)$$

$$\Delta \mathrm{Im}\, ports_t = \beta_0 + \beta_{1i}\sum_{i=1}^{p}\Delta \mathrm{Im}\, ports_{t-i} + \beta_{2j}\sum_{j=1}^{q}\Delta Exports_{t-j} + \nu_t \quad (10)$$

Where ε_t and ν_t are serially uncorrelated white noise error terms; and m, n, p and q are lag lengths for each variable in the above equations. The Granger causality results are presented in Table 8.

Table 8

The Granger causality results for India, 1980-2014

Null hypothesis :	F−Statistic	Probability Value
IMPORTS does not Granger Cause EXPORTS	0.354	0.556
EXPORTS does not Granger Cause IMPORTS	3.866***	0.058

*** Represents significant at 10% level.

The result shows that, like China, there is unidirectional causality from exports to imports in the India. This implies that India's imports are not only increasing because of the domestic consumption demand, but also a significant imports is being made for the requirement of the export based industries.

6. Concluding remarks

Long run sustainability of the current account of the two emerging Asian economies, China and India, using annual data from 1980 to 2014 is examined in this paper. The sustainability of the current account is examined by testing the long run equilibrium relationship between the countries' exports of goods and services and imports of goods and services plus interest payments. We employed the recent Bayer and Hanck (2013) combined cointegration approach to examine the long run relationship between the variables. The Zivot and Andrews (1992) test, which accommodates a single unknown structural break stemming from the series, is used to test the integrating properties of the variables. Further, the ARDL bound testing approach developed by Pesaran et al. (2001) is applied to test the robustness of our long run estimates. The cointegration results, obtained from both Bayer and Hanck (2013) and Pesaran et al. (2001), confirm that in case of China both exports and the imports are cointegrated implying the long run sustainability of its current account. On the other hand, in case of India, the cointegration results suggest that the country's current account is not sustainable in the long run.

In terms of the debate on the current account sustainability, our results show that while China is having sustainable current account, in the case of India current account is not sustainable in the long run. Our result which shows that India is having unsustainable current account in the long run is consistent with Sahoo et al. (2016). Further, we infer from the initial trend analysis of exports and imports that, for China, the exports are greater than imports for most of the period. On the other hand, in case of India, imports always outweigh exports and the gap has increased during the recent years. This widening of the trade deficit despite growing services exports has been a cause of unsustainability of India's current account, which is contrary to the results of Holmes et al. (2011). While the decline in oil prices might temporarily help in reducing the current account deficit of India, there exists an imperative to increase the exports of goods and services through raising the productivity and gaining competitive advantage. In the long run this can be helpful to bridge the gap between the exports and the imports and will push India's current account towards sustainable region. Overall, our evidence conveys important policy pointers for maintaining the growth momentum of the two economies which play a vital role in sustaining global growth.

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