The Effects of Crude Oil Imports, Financial Development and Fiscal Balance on C/A Balance of India: Lessons from an Emerging Economy Perspective

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ABSTRACT

Using annual time series data for the period 1980-2014, this study explores the impact of crude oil imports on India's current account balance (CAB) with incorporation of real exchange rate, trade openness, fiscal balance, financial deepness, terms of trade and age dependency as other key important determinants in the current account model. Utilising both Bayer and Hanck's (2013) combined cointegration and Pesaran et al. (2001)'s Autoregressive Distributed Lag (ARDL) bounds testing approaches, we confirm the long-run relationship between variables in the model. Contrary to the general theoretical expectation, the findings revealed that crude oil imports significantly improve the current account balance in the long-run, although it has an adverse impact in the short-run. Furthermore, the fiscal balance and financial deepening significantly improve the current account performance of India, whereas real exchange rate, trade openness and age dependency cause deterioration in the long-run. These results have significant policy bearings for the sustainability of current account balance of the large emerging economy of India.

Keywords: Oil imports, financial deepening, Fiscal balance, Current account balance, Exchange rate, India

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1. INTRODUCTION

Current account balance is a crucial economic barometer to understand the external economic performance of a country. There are several factors which can exert pressure on this indicator such as fiscal pressure, capital inflows, openness to international trade, exchange rate, and domestic factors like population dependency, consumption, and investment and financial deepness etc. A lot of studies has focused on examining the possible linkage between fiscal deficits and current account deficits popularly known as "twin deficit" hypothesis in the literature. A greater proportion of this literature has concentrated on investigating the relationship in the context of the United States. In general, the countries where current account imbalances are large, a key policy concern is to assess what extent the fiscal remedial measures in terms of adjustments can contribute to solving the external imbalances.

Some authors have argued that the sign of the current account response to transitory income shocks depends on the share of foreign assets in a country's total assets (Kraay and Ventura, 2000). Based on certain assumptions, Kraay and Ventura (2000) have shown that the response of current account to a transitory income shock is equal to the increase in savings generated by the shock times the share of foreign assets in the country's total assets. This 'rule of thumb' implies that favorable income shocks can lead to current account deficits in the debtor countries and surpluses in the creditor countries. In contrast, some authors also have argued that if the world real interest rate were above its 'permanent' level, the current account surplus would be higher than usual for the creditor countries as agents in those countries save more to smooth into the future their unusually high incomes (Obstfeld and Rogoff, 1998). The effect would just alter for the debtor countries. There are more interesting works establishing the response of investment and current account as a consequence of the shocks to the productivity (Glick and Rogoff, 1995; Nason and Rogers, 2002). Although the

current account is likely to get influenced due to the temporary business cycle fluctuation, however, the current study attempts to explore the current account variations that are not driven purely due to cyclical influences or by shocks that would have temporary real effects (or the shocks that reflect the effects of nominal rigidities). Further, although isolating these specific events are one of the quite complex issues, nevertheless, the study tries to take care of these shocks by capturing in dummies based on the observed trends where there are larger fluctuations.

An economy's characteristics which get reflected in terms of macroeconomic policies pursued could significantly determine the current account position. For instance, the degree of openness to international trade could reflect policy choices, including tariff regimes and the extent of capital controls pursued. It could also be correlated with other characteristics that can make a country attractive to foreign capital. A country with greater openness to international trade and found performing better in terms of exports can have a greater capacity to earn more foreign exchanges and would have greater ability to service its past international liabilities than a country with less capability to earn greater foreign exchanges. The latter consequences could be due to the institutional or external sector policy rigidities. Basing on to the 'stages of development' hypothesis, it could be argued that as the countries move from a low to a higher stage of economic development, they usually engage in importing more capital and, therefore, they are likely to run large current account deficits (Roldos, 1996). However, as they reach an advanced stage of economic development, countries run current account surpluses and should be able to pay off the accumulated external liabilities and also export capital to the less advanced economies. However, this is proving contrary for the India context as the economy is most frequently or on a sustained basis experiencing deficits in its current account balances. Further, although the recent

experience shows that certain countries like China have recently been building up huge surpluses in its current account with the advanced countries like the USA, but as far as the countries in Asia as a whole are concerned, the issue is quite different as country cases differ comparing the Asian as a whole in an aggregative context. Some studies for instance, by Chin and Ito (2007) more interestingly noted that while more developed financial markets lead to smaller current account balances for countries with highly developed legal systems and open financial markets, but greater financial development is effectively resulting only in higher savings in some others. The authors substantiate this inference based on their observation that the Asian current account surpluses on an aggregate basis are driven not due to the excess of savings but on account of depressed investment conditions which characterizes the global glut at the time when the advanced economies like the USA along with some European countries are either experiencing larger current account deficits or reduced current account surpluses along with their sluggish growth performances. And certainly, India is quite far away from reaching to the economic stage of the USA or advanced countries of Europe to experience current account deficits in a similar line that of the advanced countries like the USA with China. In India, although savings are lesser than investment in absolute terms the growth of investment has been decelerating to a large extent over the years in recent times.

Taking a look at an individual emerging country perspective like India and examining how it is doing in terms of its current account performance in relation to its other economic parameters, it may rather give some interesting insights from a developing economy perspective. During the last two and half decades, despite several economic policy measures undertaken to uplift the Indian economy, the economy has frequently experienced unprecedented imbalances in its balance of payments (BoPs). This is observed in terms of increasing current account deficits (CAD), along with persistence of large fluctuations in the

international capital flows, a significant depreciation of the Indian rupee and high general government deficits. It is also observed that after the global financial crisis of 2007-08, India's current account had deteriorated sharply and reached a deficit of 4.6 percent of GDP in 2012-13. At the same time, the value of the Indian rupee remained downwardly biased. With frequent volatility in its value, it had experienced a maximum depreciation of Rs 66 per US Dollar during 2012-13 and, at the same time, the overall inflation rate also reached higher level. Thus, a high and persistent domestic inflation with the drastic depreciation of the rupee has raised serious macroeconomic challenges for the Indian economy and increased the chances of domestic and external vulnerabilities.

India has recently emerged as the 4th largest oil importer in the world followed by the USA, China, and Japan, from its 3rd position in the year 1995.[1] Recently, there is also a significant rise in the oil import demand by India because of the dramatic collapse in the international oil price coupled with a rapid growth of population and per capita incomes, urbanisation and globalisation factors, resulting in huge transportation requirements.[2] Further, if one would decompose the total imports in the current account of India, the total oil imports which were 2.83 percent of GDP in 2001, it has more than doubled to reach at 6.73 percent of GDP in 2014. On the other hand, the total non-oil imports which were 7.57 percent of GDP in 2001, it has also almost doubled up to reach at 15.12 percent of GDP in 2014 (Handbook of Statistics on the Indian Economy, RBI). This shows that India's greater and increasing dependence on the oil imports over the period. As oil imports constitute a major proportion of India's total import basket, a rise or fall in the oil prices can significantly affect India's current account balances according to the direction of the volume of India's oil imports. Following Chinn and Prasad (2003), this study tries to examine the impact of crude oil

[1] See Table1A in Appendix.
[2] See Table2A in Appendix.

imports along with other relevant variables on the current account deficit in India. For this purpose, the study uses the annual data for the period, 1980-2014 in order to provide an empirical exploration into the relationship between crude oil imports and the current account deficits in India by incorporating the real exchange rate, trade openness, fiscal deficit, financial deepness, terms of trade and dependency ratio in the current account balance function as other potential determinants.

Our study contributes to the existing literature in the following ways. First, the study investigates the impact of crude oil imports on India's current account, which is overlooked by the existing studies in the Indian context. Second, along with crude oil, the study also examines the role or impact of other potential determinants as considered to be the key in other important literature. Third, the study also contributes to the literature by considering the latest and relevant time series applications such as unit root test incorporating the structural break test (Zivot and Andrews; 1992) and the cointegration techniques as proposed by Bayer and Hanck (2013). Finally, the study suggests important policy implications for strengthening the current account position of India in the long run.

The rest of the study is structured as follows. Section 2 elaborates the historical trends in India's balance of payments and its major components. Section 3 comprehensively provides the related literature review. Section 4 explains theoretical framework, modeling strategy and data source to be used for the empirical estimation. Section 5 discusses the descriptive and empirical results. Finally, Section 6 concludes with policy prescriptions by demonstrating on the direction for future research.

2. PERFORMANCE OF INDIA'S BALANCE OF PAYMENTS

In last few decades, the Indian economy has been able to integrate with the rest of the world in an unprecedented way. This gets manifested from its increasing volume of international trade and financial transactions. Such integration has visibly benefited the Indian economy in terms of getting an accession to the competitive international commodity and service markets and accumulating remittances for financing domestic consumption and investment along with enabling Indian investor's to make outward foreign investment. The integration process at the same time has also benefited the foreigners' by enabling them to have an easy access to India's debt and equity (financial investment) markets, besides enabling them to make real investments, helping the economy to grow in size and macro activities. However, in spite of such expansionary activities, the Indian economy has also experienced a widening current account deficit in her balance of payments (BoP).[3] Its current account has deteriorated as high as to the extent of 4.8 percent of GDP in 2012-13 (Handbook of Statistics on Indian Economy, RBI). This results in imposing a rising risk on its BoP and bringing macroeconomic instability.

Following the global financial crisis of 2007-08, the total trade volume has slumped and the capital flows (inflows and outflows) have also become more volatile. The increasing fiscal deficit on the one hand and current account deficit on the other have posed risks of twin deficits.[4] In this context, it is very much vital to understand the evolution of India's BOP in a

[3]Although BoP is defined as the transaction account with the rest of the world, but it can be better understood by setting up the national income accounting identity: $GDP = C + I + G + X - M$. In other words, domestic aggregate output (GDP) is equal to sum of private consumption (C), domestic investment (I), government consumption (G), and net exports $(X - M)$. When domestic absorption $(C + I + G)$ is greater than domestic aggregate output (GDP), this reflects deficit in the current account $(X - M)$ which is normally financed by the external borrowings and/or investments (Mohanty, 2013). Such financing of the current account deficits is quite challenging more especially when the global and the economic outlook are not very favourable.

[4] This shows that rising fiscal deficit increases the domestic interest rate which attracts more capital inflows. Rising capital inflows appreciates domestic currency and thereby makes exports cheaper and the imports costlier. This leads to rising imports and falling exports and as a result, itleads to deterioration in the current account balance (Abell, 1990; Salvatore, 2006).

historical context and trace how the Indian economy has been responding to various external shocks. The Indian economy has experienced several domestic and exogenous economic shocks in its BoP. In the last 65 years from 1950-51 to 2014-15, six events had a lasting impact on India's BoP (See Figure 1). These events can be sequentially put as (i) the devaluation of currency in 1966, (ii) first and second oil crises of 1973 and 1980, (iii) external payments crisis of 1991, (iv) East Asian crisis of 1997, (v) the Y2K event of 2000, and (vi) the global financial crisis of 2007-08. These events had special significances for the Indian economy on many counts.

The aftermath of India's independence, higher imports and capital outflows led by India's partition, resulted in significant deficits in the balance of payments necessitating running down of accumulated sterling balances (Reddy, 2006). Therefore, rapid industrialization through basic and heavy industries was given predominant importance during the first (1951-56) and second (1956-61) five-year plans in order to enable the economy to be self-reliant. "Import substitution" was the major strategy followed for rapid industrialisation. During this period, due to a continuous lackluster export performance by the export-intensive sectors and excessive emphasis on inward looking policy strategy (i.e. import substitution), the external sector started underperforming significantly. This is mainly attributed to an intense focus on the development of the heavy industries; leading to a surge in import demand and therefore rising current account deficits during the second plan. The third plan (1961-66) put the emphasis on "self-sustaining" growth through "efficient substitution of imports". However, during this period, the economy confronted several internal as well as external hiccups such as strains due to Indo-China conflicts in 1962, Indo-Pakistan war of 1965 and severe drought conditions in 1965–66. These events triggered major BoP crisis during 1990-91. At the same time, India's international relation with the

developed countries came under sharp stress leading to declining in the capital inflows into the economy. In such circumstances, it is indicative of the fact that withdrawal of foreign aid by US economy and conditional resumption of aid by the Aid India Consortium led to a contraction of capital inflows into the economy (Mohanty, 2013). A low level of foreign exchange reserves combined with burgeoning trade deficit had lager consequences on its BoP. India had no other alternatives. Rather, it was forced to devalue the domestic currency to gain the momentum in the external sector stability.[5]

----Insert **Fig.1** here please----

India initiated to implement several liberalising measures along with extensive domestic currency devaluation. Thus, with devaluation, the export growth, although was modest but outpaced the import growth. In this pretext, some noted economists have argued that the effective devaluation was more for exports than for imports (Bhagwati and Srinivasan, 1975). Due to significant export growth and a sharp increase in the invisible receipts, the current account turned into a surplus in 1973-74. However, this lasted temporarily as the current account again turned out the deficit in the subsequent year, with hitting of oil crisis episode in October 1973. The oil import bill rose sharply for India due to the sharp rise in the prices of oil in the international market. Therefore, fifth plan (1974-79) gave importance on achieving "self-reliance" of the economy. The self-reliance policy resulted in the development of the tourism and shipping which were major invisible items in the BoP and that had some greater potential to improve the current account balances. Remittances from the Indian workers abroad were also used as a new source of funding to meet the growing financing needs of the economy. Moreover, the external assistances were considered as the dominant financing instrument in the BoP. As a result, the current account

[5]Rupee was devalued by 36.5 per cent in June 1966.

registered surpluses in 1976-77 and 1977-78. Furthermore, India's current balance was again severely got strained due to second oil shock in 1980. This oil shock in the early 1980s led to a rapid increase in imports bill relative to the export earnings and thereby it contributed to the deterioration of current account balance. During 1980-83, the oil import increased to about two-fifths of total imports. Hence, it necessitated export promotion policies and the import sectors also got liberalized for the exporters. In spite of these policy measures, several factors like slowdown of economic growth, deterioration in the invisible surpluses, rising external debt, and declining fiscal balances were eroding the external stability of the economy during the time.

Given the height of BoP instability due to various internal and external shocks (Figure 1), the Indian economy has again entered the phase of bigger global shock in its BoP during 1990, when the Gulf War led to a sharp increase in prices of imported oil. This had put pressure on India's BoP, because of India's huge import bill. India's exports also partly started falling sharply on account of the slowdown in the growth of the industrialised countries.[6] Meanwhile, Kuwait war surfaced which required thousands of the Indian workers to be airlifted to India and thereby affecting the inflows of workers' remittances to India. The bulk amounts of foreign exchange reserves which were already used for financing the current account deficits (CAD) in earlier years witnessed a severe decline. The gross foreign currency assets had dipped so low as much as US$ 1.0 billion which was not sufficient enough to cover merely two weeks of imports (Mohanty, 2013). This resulted in weak confidence by creditors and investors on India. This, in turn, led to dry up of both short-term credit availability and the substantial outflow of non-resident of Indians (NRI) deposits. All these episodes resulted in the downgrading of India's credit rating below the international

[6]This implies that foreigners cannot afford our exportable commodities in the international commodity markets due to fall in their growth of income.

average. This also constrained India's access to funding from external commercial banks and trade credits. This contributed to unprecedented macroeconomic instability, and therefore, the Government of India (GoI) took bold decisions to commit all the past debt obligations without seeking any further rescheduling (Reddy, 2006). After the BoP crisis of 1991, a High-Level Committee on Balance of Payments was set up (known as Rangarajan Committee). It streamlined several effective policy measures in direction of trade, exchange rate and the industrial sectors to boost up the productivity, competitiveness, and efficiency of the economy. Apart from that, the exchange rate of Indian rupee was also adjusted downwardly to the extent of 9% and 11% in 1st and 11th July 1991 in order to minimize trade and current account deficits and to stimulate export competitiveness. Grappling with dual exchange rate system introduced in March 1992 and later unified in March 1993, the Indian economy moved to current account convertibility in August 1994 via liberalising various transactions on the merchandise trade and invisible items. Due to such numerous policy changes, the current account had improved significantly in the subsequent years. Furthermore, the Indian economy could not escape from the adverse effects of both East Asian Crisis in 1997 and the dot-com bubble in 1999-2000. However, a dramatic insulation of the Indian economy from the East Asian crisis could be possible due to the timely and proactive reforms undertaken by the Indian government along with its Central Bank, RBI.

Again faced with the challenges on account of the Y2K problem, India's software exports got stimulated. Eventually, this has resulted in increased migration of the Indian software engineers to the advanced countries. The surpluses in services exports and remittance in the BoP increased sharply which more than offset the deficit in the trade account. This can be gleaned in Table 1. The software exports rose from 2.1 percent of GDP in 2000-2007 to a peak of 3.4 per cent of GDP by 2014. Further, as revealed in Table 1, the

private remittances rose from 2.15 per cent of GDP in 1999-2000 to 3.22 percent during 2014. This in totality implies that both software exports and private remittances have emerged as vital sources of financing the current account deficit in last two and half decades.

The composition of the current account balance for India (as shown in Table 2) expressed as a percentage of GDP further indicates that the oil trade balance has deteriorated to a greater extent than the non-oil trade over the period. While the oil TB has deteriorated from -0.267 (% of GDP) in 1970s to -4.973 (% of GDP) in 2012-14, the non-oil trade balance (NTB) has deteriorated from a surplus of 0.06 (% of GDP) in the 1970s to a deficit of -3.049 (% of GDP) in 2012-14. Further, it is important to point out that while the non-oil CAB (CAB minus net oil imports) showed surpluses after the 1990s, the total CAB (includes both oil and non-oil imports) showed a deficit for all the period. This implies that oil import which constitutes a major component of total imports in the current account is pulling down India's current account into deficit. Therefore, this justifies examining the extent of the impact of oil imports on India's external sector imbalance during the period. More specifically, it attempts to understand to what extent international oil import is contributing to the current account under-performance of the Indian economy.

----Insert **Table 1** here please----

----Insert **Table 2** here please----

3. LITERATURE REVIEW

This section surveys the empirical literature on the determinants of current account balance both for the developed and developing countries. The factors determining the current account balance in applied macroeconomic literature have grappled with mixed and inconclusive evidence. Given that it becomes important for us to review the important existing studies on

the dynamics of current account balance which may help us to identify the critical factors determining the current account balances for our study. Debelle and Faruqee (1996), using a panel data for 21 industrial countries over the period of 1971-1993, found that income, government debt, and demographic factors influence the current account balance, while fiscal surplus, terms of trade, and capital control have less or no current account impacts in the long-run. By using unbalanced panel framework across 44 developing countries over the period of 1966 to 1994, Calderon et al. (2002) observed that economic growth, terms of trade and real exchange rate appreciation worsen the current account deficit. Similarly, Chinn and Prasad (2003), using a panel sample of 18 industrial and 71 developing countries over the period 1971 -1995, reported that current account balances are positively linked with government budget balances and net foreign assets in advanced countries and negatively linked with financial deepening and trade openness for the developing countries.

Using the Generalized Method of Moments (GMM) method and the quarterly data from 1973 -2010, Ang and Sek (2011) found that the consumer price index, world price, interest rate and exchange rate are leading factors of current account balance in current account deficit-driven economies, while consumer price index, trade openness and terms of trade are also found to be key determinants in current account surplus-driven economies. Yang (2011) examined the impacts of net foreign assets, trade openness, real exchange rate and economic growth on current account for eight selected emerging Asian economies with the use of quarterly data from the period of 1980 -2009. They found a significant long-run relationship between the variables and in particular they observed the current accounts of all sample economies have a self-adjusting mechanism except China.

Using annual data from 1995- 2008 for the Russian economy, Ketenci (2010) found the existence of long-run relationship between current account balance, private savings, government savings, domestic investment, real exchange rate, trade openness, the balance of trade, prices of natural gas and index of average petroleum spot prices. It is further found that the current account balance in the long-run is mostly affected by trade and financial variables rather than the prices of mineral resources. Similarly, Batdelger and Kandil (2012) found that in contrast to government saving, private savings, and budget deficit influence significantly current account balance in the United States. In a further attempt, Chinn and Prasad (2003), using panel data from 1971 - 1995 for 18 industrial and 71 developing countries, found that financial development stimulates current account balance. A similar finding has also been reported by Chinn and Ito (2007) for a panel of 19 industrialized and 70 developing countries. In contrast, Gruber and Kamin (2009) did not find any significant effect of financial development on current account balance for a sample of 84 countries within a panel framework.

Influenced due to Feldstein's (1985, 1987) proposed "twin deficits" hypothesis, Abell (1990) examined the linkage between federal budget deficits and merchandise trade deficits for the United States and observed that budget deficits influence trade deficits indirectly rather than directly. Similarly, Anoruo and Ramchander (1998) examined the existence of "twin deficits" hypothesis for five South-East Asian countries (i.e. India, Indonesia, Korea, Malaysia and the Philippines) during the period of 1957-1993 and found that fiscal deficits do not cause trade deficits; while trade deficits cause fiscal deficits. However, their findings were contradicted by Vamvoukas (1999), Baharumshah and Lau (2007). Normandin (1999) supported the "twin deficits" hypothesis for Canada and USA

economies. Trachanas and Katrakilidis (2013) also supported "twin-deficits" hypothesis for Portugal, Ireland, Greece, and Spain.

Nickel and Vansteenkiste (2008), using panel data for 22 industrialized countries, found that fiscal balance improves current account balance. A similar conclusion is also drawn by Abbas et al. (2011) for a large panel of advanced, emerging and low-income countries. Kim and Roubini (2008) empirically also observed that expansionary fiscal policy shocks improve the current account balance for the USA economy. Vamvoukas (1999) also reported the non-linear long-run relationship between budget deficit and the trade deficit for Greece and the unidirectional causality runs from fiscal deficit to trade deficit. Using the panel data from 1974 to 2009 for 21 OECD countries, Gossé and Serranito (2014) found that oil price is the key to dynamics of current account balance. In addition, they reported that the speed of current account adjustment towards the long-run is faster in the case of current account deficit countries than the current account surplus countries. In a recent study, Huntington (2015) investigated the relationship between crude oil trade and the current account balance in case of 91 developing and developed countries over the period 1984 to 2009. Most interestingly, he observed that oil exports significantly improve their current account balance in case of the net oil exporting countries, whereas the net oil imports have an insignificant effect on current account balance in case of net oil importing countries. Further, he also found that higher oil imports appear to contribute to greater current account deficits in oil importing advanced countries.

As far as the studies in the Indian context are concerned, Parikh and Rao (2006) examined the effects of fiscal deficits on the current account deficits for the period, 1970-71 to 1999-2000. Their findings revealed a unidirectional causality running from fiscal deficits

to current account deficits. Using quarterly data for the period 1998Q1 to 2011Q1, Bose and Jha (2011), found that budget deficit is not the prime cause of current account deficit. Rather, there exists a unidirectional causality from current account deficit to budget deficit. In the similar vein, Suresh and Tiwari (2014), using annual data from 1975-76 to 2011-12, found that fiscal deficit has a positive and significant impact on the current account deficit, indicating that the "twin deficits" hypothesis is supported by the Indian economy. Since fiscal deficit and economic growth were found to be positively related to their analysis, on a policy ground they further suggested that there is scope for the Indian governments to reduce the current account deficit by reducing the level of the fiscal deficit without undermining the sustained economic growth. Garg and Prabheesh (2017), using quarterly data from 1997-2012, supported the ''twin deficits'' hypothesis for the Indian case, indicating that reduction in the fiscal deficit is helpful to reduce current account deficit.

From the above comprehensive literature survey, we find that except Huntington (2015)'s study, hardly there exists any study, which examines the role of crude oil trade on the dynamics of current account deficits for as large as for 91 number of countries. Furthermore, to the best of our knowledge, there is no single study available in the Indian context which decomposes the current account into two broad components into oil imports, and non-oil imports and examines the relative contribution of these components into the aggregate current account balance along with examining the contribution of other key determinants. As shown in the Table 2, since India's oil imports constitute its major part of the total imports, therefore, the present study is motivated to make an empirical contribution in examining the impacts of both oil and non-oil imports on India's current account balance by controlling other important determinants such as fiscal balance, real exchange rate, trade

openness, terms of trade, financial development and age dependency in the current account model.

4. THEORETICAL FRAMEWORK, MODELING AND DATA SOURCE

4.1. Theoretical Framework

A country's current-account balance over any time period is the increase in residents' claims on foreign incomes or outputs, less the increase in similar foreign-owned claims on home income or output. Thus, in theory, the current account includes not only exports fewer imports (broadly defined to include all the income on and pay-outs on cross-border assets: dividends, interest payments, insurance premia, and payments, etc.), but also net capital gains on existing foreign assets. Our paper is based on an *intertemporal approach* to explaining the major determinants of the current account. The intertemporal approach views the current-account balance as the outcome of forward-looking dynamic saving and investment decisions (Buiter 1981; Obstfeld 1982; Sachs 1981; Svensson and Razin 1983). This approach had explicit precursor in areas of trade and growth (Bardhan 1967; Bruno1970; and Hamada 1969. The existing literature has tested this approach for both individual countries and across the countries mainly in two directions. While a set of studies tried to establish the evidence in favour of a baseline model using different testing strategies (Bergin and Sheffrin, 2000; Nason and Rogers, 2006), a group of studies examined the long run and short run relationship between current account and a broad set of macroeconomic determinants by applying various econometric techniques (Debelle and Faruquee, 1996; Chinn and Prasad, 2003; Gruber and Kamin, 2007). Our paper is based on the second line of research and attempts to examine some of the key implications for the current account in general and India in particular. Since the literature on the current account modeling is vast, and numerous specifications are available, we proceeded by selecting standard variables that are typically included in the

current account equations, including oil imports, which is of particular interest for India during the period under review.

The current account can be defined as the difference between an economy's total exports and total imports or gross savings minus gross investment. This implies that a rise in imports (investment) may lead to rising deficit in the current account when exports (savings) remain constant. Further, as India is one of the largest oil importers in the world, therefore we test the impact of crude oil imports on India's current account balance. Further, several studies have shown that there is a positive and significant relationship between current account deficit and fiscal deficit (Abell, 1990; Trachanas and Katrakilidis, 2013). Mundell-Fleming model suggests that a rise in fiscal deficit can increase the domestic interest rate and thereby, the capital inflows. This leads to an appreciation of the domestic currency and rising import demand and thereby it deteriorates the current account. Such a relationship between the fiscal and the current account deficit is known as the twin deficit hypothesis. On the other hand, the Ricardian equivalence theory of Barro (1974 and 1989) argued that a rise in budget deficit leads to an equal instantaneous increase in private savings with no net effect on aggregate wealth, implying that there is no link between fiscal deficits and the current account (Piersanti, 2000). In contrast, Kim (1995) and Enders and Lee (1990) empirically tested in support of the REH.

The study attempts to examine the impact of real exchange rate, trade openness, financial development, terms of trade and age dependency on India's current account deficit as these variables are found to be significant in impacting the current account deficit (Chinn and Prasad 2003; Debelle and Galati 2007). An appreciation of the exchange rate makes the imports relatively cheaper and exports dearer, which results in increasing imports and

declining exports and thereby deteriorates the current account. Further, improvement in trade openness may positively contribute to the current account performance of an economy by raising the exports more than the imports (Huntington, 2015). Some literature also argued that the rising trade openness may increase the imports more than the exports and thereby can deteriorate instead of improving a country's current account balance (Chinn and Prasad, 2003).

Edwards (1995) also proposed financial development, which is usually measured as a domestic credit to private sector (as percent of GDP) or as ratio of M2 to GDP as one of the key determinants of current account balance. The traditional interpretation of this variable as a measure of the depth and sophistication of the financial system suggests that financial development could induce more saving and thereby improves the current account of an economy. At the same time, financial development could also be viewed as a proxy for borrowing constraints faced by individual agents and could, therefore, actually be associated with lower levels of private savings and thereby deteriorate the current account balance. Further, either an improvement or deterioration of terms of trade in an economy also can significantly affect its current account balance. It is proposed that a surplus in the current account emerges in response to a temporary fall in the price of a country's initial exports if and only if the economy attains higher monetary utility on every date as a result of the price-path change (Lahiri, 1994; Obstfeild, 1996). Further, the age dependency is also considered as one of the major determinants of the current account, as an increase in the proportion of the dependent population may lead to rising consumption and fall in the domestic saving and thereby causing the fall in the current account surplus (Huntington, 2015; Sun, 2011). Therefore, this study examines the impact of crude oil imports, real exchange rate, trade

openness, fiscal balance, financial development, terms of trade and age dependency on the current account balance of India.

4.2. Modeling Strategy and Data Source

One of the exponents in this literature, Alexander (1952) proposed both the elasticity and absorption approaches as fundamental mechanisms in analyzing the current account balance. This approach underlies improving a country's balance of payments through depreciation of domestic currency.[7] It highlights the dual role of national income in the dynamics of current account balance conditional to the marginal propensity to absorb. It proposes that if the marginal propensity to absorb is less than unity, the income level would improve the performance of the current account balance and if the marginal propensity is greater than one, the vice-versa would hold true. Subsequently, Sachs (1981, 1982) and Obstfeld and Rogoff (1996) theoretically advocated the intertemporal current account balance model which recognizes the vital role of capital inflows in financing the gap between national savings and investments. The current account function also acts as a "buffer stock" via capital inflows to smooth the intertemporal consumption and investment disequilibrium of an economy. For instance, foreign capital inflows not only finance the current account imbalances but also stimulate domestic investment because of the host country's greater investment opportunity, higher economic growth and wealth creation from the "New Economy". This establishes the point that the current account can lead to foreign capital inflows into the host country (Yan and Yang, 2012).

Another central issue has been the role of government imbalances on the dynamics of current account imbalances (Feldstein, 1985, 1987). This issue has attracted a considerable

[7]This comes under the Marshall Learner Condition which states that if the sum of the elasticity of exports and imports is greater than unity, then a real depreciation of the exchange rate would yield improvement in the trade balance and the current account by making domestic exports less expensive (Krugman and Obstfeld, 1997).

attention of policy makers and governments mainly in developing countries. Bernheim (1988) had a thoughtful discussion on the ‘‘twin-deficits hypothesis’’ linking the trade deficits with government budget deficits. Huntington (2015) recently viewed twin-deficits hypothesis. Many scholars also have considered this twin-deficits hypothesis by relating the net total public and private savings with the current trade account. A rise in government budget deficits requires to be financed from private and public sector domestic savings. If both the domestic private and public sector savings are inadequate to finance domestic profitable investments and increasing fiscal deficits, under that circumstance, the inflows of foreign capital investment would greatly aid the developing economies in order to mitigate the scarcity of resources and domestic demand for goods.[8] The foreign inflows offset the imbalances between public and private savings and total investment in the economy. The rising fiscal deficits in net oil importing countries show that the countries dependent on oil continue to pay expensive oil import bills and thereby stimulating the fiscal spending. In this context, Kilian et al. (2009) and Lee and Chang (2013) argued that higher oil prices are not only responsible for bulging of fiscal deficits but also transmit the price of imported goods and services to the domestic economy and thereby fuel domestic inflation in net oil importing countries. In such circumstances, monetary authorities of net oil importing countries try to maintain the inflation rate at a moderate level by pushing up the domestic interest rate. A prevalence of relatively higher domestic interest rate in the net oil importing countries comparing other countries would attract foreign investment capital or foreign financial loans to support investment in the domestic economy. But sometimes if the loan is channeled into unproductive directions that may adversely affect the economic growth. As a further consequence, the net oil importing countries will find it more expensive to produce output with a rise in interest rate. With lower productive capacity, the economy will allocate few

[8]According to Huntington (2015), net oil importing countries are understood when net oil export balance is negative (-oil trade balance).

inputs for exports and at the same time, it would discourage exports of goods and services. Both the oil and non-oil imports would decline as the economy contracts and thereby create imbalances for both government and trade accounts (Huntington, 2015). This can be viewed from an intertemporal approach which serves as a theoretical framework for the present study.

Given the above theoretical strands from the literature, the current account balance function can be specified as follows:

$$CAB_t = f(CRUDE_t, EXR_t, OPEN_t, FB_t, FD_t, TOT_t, AGE_t) \quad (1)$$

The above can be written in terms of the following estimable equation as in (2) in the following.

$$CAB_t = \beta_1 + \beta_2 CRUDE_t + \beta_3 EXR_t + \beta_4 OPEN_t + \beta_5 FB_t + \beta_6 FD_t + \beta_7 TOT_t + \beta_8 AGE_t + \mu_t \quad (2)$$

where CAB_t in Eq. (2) refers to current account balances as a % of Gross Domestic Product (GDP), $CRUDE_t$ is the crude oil imports (as % of GDP), EXR_t is the real effective exchange rate, $OPEN_t$ is trade openness (exports plus imports as % of GDP), FB_t is the government fiscal balance (as % of GDP), FD_t is financial development, TOT_t is the terms of trade, AGE_t is the proportion of dependency ratio and μ_t is residual term which is assumed to follow a normal distribution.

The present study uses the Indian data for the period 1980-2014 considering the fact that the globalisation period started in the early 1980s. All the variables are taken as a percentage of GDP, except real exchange rate, age dependency ratio.[9] All the data, except the crude oil imports, are drawn from the World Development Indicators (2015) of the World Bank and the database on the Indian economy as provided by the Reserve Bank of India (RBI). The crude oil data is drawn from the U.S. Energy Information Administration, 2015.

----Insert **Fig.2** here please----

Figure 2 presents the trends of key macro variables for India during the period of 1980 to 2014. It shows that CAB deteriorated sharply after the year 2003 and during 2012-13 it reached a deficit level of 4.8 percent of GDP from a surplus of 1.42 percent of GDP in 2003. It can also be found from the figure that, after 2012-13, CAB has improved significantly. The trend in the crude oil imports shows a decreasing trend during the initial periods of 1980 and an increasing trend in the later periods. There is a sharp depreciation in the exchange rate till 1991 and after that, on an average, the exchange rate started improving though in the later period it further depreciated. Trade openness and financial development have improved over the period, while age dependency shows a declining trend which implies that the number of dependent population is decreasing and the number of working population is increasing over the years. The fiscal balance series shows that during the 1980s the fiscal deficit and after that, it improved slowly. Fiscal deficit reduced from 8.13 percent of GDP in 1986 to 2.54 percent in 2007. After the global financial crisis of 2007-08, the fiscal deficit

[9]The prime reason for the choice of sample size used in the current study is that the use of a long dataset not only increases the total number of observation but also enables the empirical estimation to have higher degrees of freedom. To some extent, it reduces noise coming from the individual time series co-integrated regressions and also establishes the long-run relationships between the series.

further started increasing. The terms of trade series show that there is a significant improvement in the terms of trade since 1995 and after that, it started deteriorating. This is mainly because of the liberalisation, privatisation and globalisations policies adopted by the government of India in its external sector, which brings drastic changes in the behaviour of exports and imports of India with the rest of the world.

----Insert **Table 3** here please----

4.3. The Bayer-Hanck Cointegration Approach

This study utilizes the combined cointegration test as developed by Bayer and Hanck (2013) to verify the presence of a long-run relationship between the variables of our interest. Engle and Granger (1987) had devised a residual based cointegration test, but it suffers from limitations in providing unbiased estimates. Apart from being known to be a single equation two step based cointegration procedure, the major problem with the Engle and Granger (1987) cointegration test is that long-run regression results may be inefficient if the residuals are not normally distributed. Under such situation, it becomes difficult to derive any sensible decision on cointegration relationship between the variables in the long run. To overcome such issues, we have gone in for estimating the Engle and Yoo (1991) cointegration test which provides more efficient empirical results due to its power and size. This test can be applied if the distribution of estimators from the cointegrating vector is non-normal. Subsequently, the cointegration test proposed by Philips and Hansen (1990) was also employed by econometricians to overcome the biases of ordinary least squares (OLS) estimates. Inder (1993), however, criticized the Philips and Hansen (1990) test and applied FMOLS for long run estimates in comparison to the estimates obtained from an unrestricted error correction model (UECM). Finally, Stock and Watson (1993) developed dynamic OLS

(DOLS) to test for the cointegration. DOLS is a parametric approach which uses leads and lags of variables in an OLS regression, while FMOLS is a non-parametric approach.

Before such advancement in time series econometrics, econometricians also heavily recoursed to applying the Johansen and Juselius (1990) maximum likelihood cointegration approach. That can examine the cointegration between the variables under a unique order of condition in the system of equations. Although this procedure was based on the system of equation, its estimation becomes invalid if any of the variables are integrated of I(0) in the system or happens to belong to a mixed order of integration. The Johansen and Juselius (1990) maximum likelihood cointegration results are also sensitive to incorporating the exogenous and endogenous variables in the model. This test indicates only the presence of cointegration between the variables for the long run but provides no information about short run dynamics. As a further development, Pesaran et al. (2001) suggested the ARDL bounds testing approach to cointegration to scrutinize the long run cointegrating relationships, along with accommodating the structural break(s) arising in the series. This cointegration approach can be used irrespective of the series whether integrated of either I(1) or I(0). The bounds testing approach also simultaneously provides empirical long run and short run relationships among the variables. However, the testing approach at the same time also suffers from some inherent limitations. Although it provides efficient and reliable estimates the consistency of the estimated parameters are subject to the condition that there must be cointegration relationship between the variables in the corresponding single cointegration equation under consideration. Otherwise, the results derived from it will be misleading. If this feeds into policy, that may misguide the policy from a normative path. Further, this approach will also not produce conclusive results if some variables are found to be integrated of order I(2).

Although there are a number of cointegration testing approaches available in the time series econometric literature, but in reality, one would come up with different inconclusive results when estimated with various approaches at a time. In such setting, it becomes most often difficult to get uniform results because of the fact that one cointegration test while rejecting the null hypothesis, the other tests may not be able to reject the null hypothesis. In applied econometrics literature, a variety of cointegration tests have been employed to test the presence of cointegration between the variables (e.g. Engle-Granger's (1987) residual-based test, Johansen's (1991) system based test, Boswijk (1994) and Banerjee et al. (1998) lagged error correction based approaches to cointegration). It is again suggested by Pesavento (2004) that the power of cointegration tests may be sensitive to the presence of nuisance parameters. To resolve these issues, Bayer and Hanck (2013) subsequently proposed a new dynamic cointegration technique by uniquely combining almost all the cointegrating testing approaches to provide a uniform and efficient cointegration test results. Thus, the efficient cointegration test results are possible by ignoring the nature of multiple testing procedures. This implies that the application of combined cointegration tests would not only be capable of providing efficient results but also could help to infer robust inferences in comparison to individual t-test or system based cointegration test. An insight emerging by applying the Bayer and Hanck (2013) combined cointegration test is that it eliminates the common problem of inconsistent findings which are associated with the other traditional cointegration techniques used in applied economics. In doing so, it is evident that both the efficient and conclusive results are guaranteed by employing the Bayer and Hanck (2013) combined cointegration approach, which was not the case earlier by using other traditional cointegration models in econometrics.

Therefore, the efficient and conclusive result emerging from using the Bayer and Hanck (2013) technique is supposed to provide a new potential insight for policy making in order to prescribe sound economic policies relating to the current account balance and various determinants of it in an emerging economy context. Moreover, the Bayer and Hanck (2013) cointegration test follows the critical tabulated values of Fisher's (1932) in order to combine the statistical significance level (i.e. p-values of single cointegration test and formula) which is presented as follows:

$$EG-JOH=-2[\ln(P_{EG})+\ln(P_{JOH})] \tag{3}$$

$$EG-JOH-BO-BDM=-2[\ln(P_{EG})+\ln(P_{JOH})+\ln(P_{BO})+\ln(P_{BDM})] \tag{4}$$

The probability values of different individual cointegration tests including Engle-Granger (1987); Johansen (1991); Boswijk (1994) and Banerjee et al. (1998) are reported by P_{EG}, P_{JOH}, P_{BO} and P_{BDM}, respectively. We also follow Fisher (1932) critical statistical values to confirm the presence of cointegration between the variables in our model. One can confirm the presence of cointegration by rejecting the null hypothesis of no cointegration when the critical values of Bayer and Hanck (2013) are found to be less than the calculated statistical values of Fisher (1932). Otherwise, the reverse would hold true.

4.4. ARDL Bounds Testing Approach to Cointegration for Level Relationship

The study employs the ARDL bounds testing approach as proposed by Pesaran et al. (2001) in order to establish both the long-run and short-run relationships among the variables in the current account balance model. The ARDL bounds testing approach to cointegration is used in this study because of its several advantages over the traditional co-integration procedures. Firstly, the ARDL bounds testing approach overcomes the problem of endogeneity among the

variables in the estimated model which is normally a problem encountered with the Engle-Granger cointegration (Pesaran and Shin, 1996; Pesaran et al., 1996; Pesaran et al., 2001; AI-Mulai et al., 2015). Secondly, this method does not require any pre-testing of the variable so as to know their order of integration and later use them in the ARDL model (Pesaran and Pesaran, 1997; Pesaran et al., 2001). This is because the model can be estimated irrespective of the mixed order of integration of regressors (e.g. I(1)/I(0)). Thirdly, it enables us to understand simultaneous analysis of both the short-run and long-run effects of the independent variables on the dependent variable. Finally, it also produces superior results even with small sample size which is a common feature with most time series observations. Given these advantages, ARDL bounds testing approach has gained wide popularity among the researchers and economists in the field of applied economics and therefore our study utilizes this method for our empirical estimation.

The ARDL bounds testing approach takes the following form as represented in Eq. (2) in order to examine the long-run relationship between the variables:

$$\begin{aligned}\Delta CAB_t = {} & \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta CAB_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta CRUDE_{t-i} + \\ & \sum_{i=0}^{m} \alpha_{3i} \Delta EXR_{t-i} + \sum_{i=0}^{m} \alpha_{4i} \Delta OPEN_{t-i} + \sum_{i=0}^{m} \alpha_{5i} \Delta FB_{t-i} + \sum_{i=0}^{m} \alpha_{6i} \Delta FD_{t-i} + \\ & \sum_{i=0}^{m} \alpha_{7i} \Delta TOT_{t-i} + \sum_{i=0}^{m} \alpha_{8i} \Delta AGE_{t-i} + \alpha_9 CAD_{t-1} + \alpha_{10} CRUDE_{t-1} + \\ & \alpha_{11} EXR_{t-1} + \alpha_{12} OPEN_{t-1} + \alpha_{13} FB_{t-1} + \alpha_{14} FD_{t-1} + \alpha_{15} TOT_{t-1} + \alpha_{16} AGE_{t-1} + \mu_t\end{aligned} \tag{5}$$

where m is the optimal lag length and Δ is a the first difference of the concerned variables. α_0 is intercept. Moreover, μ_t is the error term of both the model. First and second parts of Eq. (5) represent error correction dynamics and the long-run relationship among the

series, respectively. To test the existence of the long-run relationship, F-test is employed. The null-hypothesis of the bounds test assuming no cointegration among variables is $H_0 : \alpha_9 = \alpha_{10} = \alpha_{11} = \alpha_{12} = \alpha_{13} = \alpha_{14} = \alpha_{15} = \alpha_{16} = 0$ and the alternative hypothesis is $H_1 : \alpha_9 \neq \alpha_{10} \neq \alpha_{11} \neq \alpha_{12} \neq \alpha_{13} \neq \alpha_{14} \neq \alpha_{15} \neq \alpha_{16} \neq 0$. Finally, the computed *F-statistics* are compared with the modified critical values provided by Narayan (2005). This is because the lower and upper bound critical values of Narayan (2005) are most appropriate to be used for drawing inferences on cointegration when sample sizes are smaller than when sample sizes are larger. A decision can be inferred about the co-integration relationship without knowing integration order of the regressors if the computed F-statistic falls outside the upper and lower bounds. For instance, if the calculated F-statistic is higher than the upper bound critical value I(1) for the number of explanatory variables, then the null hypothesis of no cointegration is rejected. If the computed F-statistic is lower than the lower bound critical value I(0), then the null hypothesis of no cointegration is not rejected (Narayan and Narayan, 2004). If the calculated F-statistic is between lower and upper critical values, no exact conclusion can be made (Ertugrul and Mangir, 2015; Seker et al., 2015). The optimal lag order of the model relating to Eq. (5) is selected on the basis of Akaike Information Criterion (AIC). The minimum value of AIC from the model is considered to form the optimal lag length.

4.5. The VECM Granger Causality

Once the long-run equilibrium relationship is defined, it is also necessary to have a vector error correction model (VECM) because the latter constitute a part of the long-run model. More specifically, VECM is an econometric model that combines both the short-run and long-run dynamics of an estimated equation. The VECM is also useful for testing Granger causality between the variables. Once the cointegration between the variables is statistically established or confirmed, then VECM can be represented as follows:

$$\begin{bmatrix}\Delta CAB_t\\ \Delta CRUDE_t\\ \Delta EXR_t\\ \Delta OPEN_t\\ \Delta FB_t\\ \Delta FD_t\\ \Delta TOT_t\\ \Delta AGE_t\end{bmatrix}=\begin{bmatrix}b_1\\ b_2\\ b_3\\ b_4\\ b_5\\ b_6\\ b_7\\ b_8\end{bmatrix}+\begin{bmatrix}B_{11,1}\ B_{12,1}\ B_{13,1}\ B_{14,1}\ B_{15,1}\ B_{16,1}\ B_{17,1}\ B_{18,1}\\ B_{21,1}\ B_{22,1}\ B_{23,1}\ B_{24,1}\ B_{25,1}\ B_{26,1}\ B_{27,1}\ B_{28,1}\\ B_{31,1}\ B_{32,1}\ B_{33,1}\ B_{34,1}\ B_{35,1}\ B_{36,1}\ B_{37,1}\ B_{38,1}\\ B_{41,1}\ B_{42,1}\ B_{43,1}\ B_{44,1}\ B_{45,1}\ B_{46,1}\ B_{47,1}\ B_{48,1}\\ B_{51,1}\ B_{52,1}\ B_{53,1}\ B_{54,1}\ B_{55,1}\ B_{56,1}\ B_{57,1}\ B_{58,1}\\ B_{61,1}\ B_{62,1}\ B_{63,1}\ B_{64,1}\ B_{65,1}\ B_{66,1}\ B_{67,1}\ B_{68,1}\\ B_{71,1}\ B_{72,1}\ B_{73,1}\ B_{74,1}\ B_{75,1}\ B_{76,1}\ B_{77,1}\ B_{78,1}\\ B_{81,1}\ B_{82,1}\ B_{83,1}\ B_{84,1}\ B_{85,1}\ B_{86,1}\ B_{87,1}\ B_{88,1}\end{bmatrix}\times\begin{bmatrix}\Delta CAB_{t-1}\\ \Delta CRUDE_{t-1}\\ \Delta EXR_{t-1}\\ \Delta OPEN_{t-1}\\ \Delta FB_{t-1}\\ \Delta FD_{t-1}\\ \Delta TOT_{t-1}\\ \Delta AGE_{t-1}\end{bmatrix}+\ldots$$

$$+\begin{bmatrix}B_{11,m}\ B_{12,m}\ B_{13,m}\ B_{14,m}\ B_{15,m}\ B_{16,m}\ B_{17,m}\ B_{18,m}\\ B_{21,m}\ B_{22,m}\ B_{23,m}\ B_{24,m}\ B_{25,m}\ B_{26,m}\ B_{27,m}\ B_{28,m}\\ B_{31,m}\ B_{32,m}\ B_{33,m}\ B_{34,m}\ B_{35,m}\ B_{36,m}\ B_{37,m}\ B_{38,m}\\ B_{41,m}\ B_{42,m}\ B_{43,m}\ B_{44,m}\ B_{45,m}\ B_{46,m}\ B_{47,m}\ B_{48,m}\\ B_{51,m}\ B_{52,m}\ B_{53,m}\ B_{54,m}\ B_{55,m}\ B_{56,m}\ B_{57,m}\ B_{58,m}\\ B_{61,m}\ B_{62,m}\ B_{63,m}\ B_{64,m}\ B_{65,m}\ B_{66,m}\ B_{67,m}\ B_{68,m}\\ B_{71,m}\ B_{72,m}\ B_{73,m}\ B_{74,m}\ B_{75,m}\ B_{76,m}\ B_{77,m}\ B_{78,m}\\ B_{81,m}\ B_{82,m}\ B_{83,m}\ B_{84,m}\ B_{85,m}\ B_{86,m}\ B_{87,m}\ B_{88,m}\end{bmatrix}\times\begin{bmatrix}\Delta CAB_{t-1}\\ \Delta CRUDE_{t-1}\\ \Delta EXR_{t-1}\\ \Delta OPEN_{t-1}\\ \Delta FB_{t-1}\\ \Delta FD_{t-1}\\ \Delta TOT_{t-1}\\ \Delta AGE_{t-1}\end{bmatrix}+\begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\\ \zeta_6\\ \zeta_7\\ \zeta_8\end{bmatrix}\times(ECM_{t-1})+\begin{bmatrix}\mu_{1t}\\ \mu_{2t}\\ \mu_{3t}\\ \mu_{4t}\\ \mu_{5t}\\ \mu_{6t}\\ \mu_{7t}\\ \mu_{8t}\end{bmatrix} \quad (6)$$

where Δ represents difference operator and ECM_{t-1} denotes the lagged error correction term which is found from the long-run cointegration equation. The long run causality can also be obtained from the VECM model by looking at the significance of the estimated coefficient on the lagged error correction term. The joint χ^2 statistic for the first-differenced lagged independent variables is used to investigate the direction of short-run causality between the variables. For example, $B_{12,i} \neq 0 \forall_i$ shows that crude oil import Granger causes current account balances and vice-versa if $B_{21,i} \neq 0 \forall_i$.

5. EMPIRICAL RESULTS AND DISCUSSION

5.1. Unit root results and its discussion

Conventionally, testing of the stationarity of the variables is a necessary condition before doing the cointegration testing among the variables. The study applies a battery of unit root tests including Augmented Dickey-Fuller (ADF, 1979) and Phillips-Perron (PP, 1988) and Ng and Perron (2001). An application of the conventional unit roots testing procedures (i.e. ADF & PP), shows that all the variables, such as CAB, CRUDE, TOIL, EXR, OPEN, FB, FD, TOT, and AGE are found to be non-stationary at their levels. However, all are found to be stationary at their first difference.[10] Therefore, the results reported in Table 4shows that all the variables are integrated of first order i.e. I(1).

----Insert **Table 4** here please----

From the applied econometrics literature, it is known that the conventional unit root tests, such as ADF (1979), PP (1988) and Ng and Perron (2001) unit root tests may yield biased results in presence of structural break(s). This is because if these unit root tests do not accommodate the information about the unknown structural break dates stemming from the level of time series variables, then it has the possibility of biases in the decision of unit root testing procedures. In order to overcome this problem, the study applies the Zivot and Andrews (1992) unit root test as it accommodates the information about a single unknown structural break present in the series.[11] The results reported in Table 5 reveal that all of the

[10]The conventional unit root test results are not reported here and can be available upon request to the authors.

[11] We use Zivot and Andrews (1992, hereafter ZA) single structural break test to check the existence of structural break in the level series. The reason for using structural break test is because the time series variables often used in the empirical testing are sensitive to several random shocks (e.g. economic policy related to financial sector, oil shocks, global economic financial crisis, and other external policies). This will enable us to know in which period there is a structural change has occurred in the Indian economy. Since the economy might have experienced more than one structural break(s) over the time, we have also employed a second structural break(s) unit root test as proposed by Clemente et al. (1998). An application of Clemente et al. (1998) test, suggests that there is a double structural break occurring for some variables in the Indian content. In presence of double structural breaks we have also applied in correspondence a double structural regime shifting residual-based cointegration test as developed by Hatemi-Ji (2008) and found that there exists long-run co-integration among the variables. However, after confirming that our results are robust, the estimated results on double

variables have unit root problem in their levels in the presence of single structural break. The results further indicate that all of the variables are found to be stationary in presence of single structural break once all the variables are taken in their first differences, suggesting that these variables can fit well to testing of cointegration relationship among them.

----Insert **Table 5** here please----

The use of ZA unit root test suggest that the structural breaks in the series of current account balance, crude oil imports, total oil imports, real exchange rate, trade openness, fiscal balance, financial development, terms of trade and age dependency occurred around the period 2008, 1987, 1987, 1986, 1986, 2008, 2004,1997 and 1987 respectively. The breaks mainly happened during these periods because of major policy changes in the Indian economy. It is noted that the current account balance and fiscal balance have structural breaks around the same year i.e. 2008. This break is associated with the period of global financial crisis during 2007-08 which affected the majority of the economies in the world, including India. After the global financial crisis, both current account deficit (CAD) and fiscal deficit (FD) of India increased significantly. India's CAD significantly increased from 0.99 percent of GDP in the fourth quarter of 2007 to 6.47 percent of GDP in the third quarter of 2012. Similarly, the FD also increased significantly from 1.18 percent of GDP in the fourth quarter of 2007 to 3.45 percent of GDP in the first quarter of 2013. There was a larger depreciation of the Indian Rupee and a sharp rise in the domestic inflation coincided with this low performance of current account and fiscal balance of India. Furthermore, the structural break occurring in period 1997 was associated with the Asian financial crisis that raised fears of a world economic meltdown due to the financial contagion. The crisis affected the export

structural breaks are not reported here for conserving space. However, those results can be made available from the authors on request.

and import activities of India with the rest of the world and thereby affected India's terms of trade. Thus, mostly all the variables, particularly oil imports, had structural breaks either in the period 1986 or in 1987. In 1986, there was a larger collapse in the international oil prices as a result of falling demand for oil following the 1970s energy crisis and the decision taken by Saudi Arabia and some of its neighbours to increase their share of the oil market (Gately, 1986). However, this is to note that all the variables were of first difference stationary.

5.2. Bayer-Hanck and ARDL Cointegration Results on CAB Model

Given the above unit root test results, in such circumstances, the combined cointegration test developed by Bayer and Hanck (2013) is found to be a suitable empirical strategy to investigate whether there exists cointegration among the variables. Table 6 presents the combined cointegration test results including the EG-JOH and EG-JOH-BO-BDM. We found that computed Fisher-statistics on EG-JOH and EG-JOH-BO-BDM tests exceed the critical values at 5% level of significance when we estimate our current account balance equation. This rejects the null hypothesis of no cointegration among the variables against the alternative hypothesis.[12] Thus, we can conclude that there is a long-run equilibrium relationship between all the variables in our model.

----Insert **Table 6** here please----

However, given the fact that Bayer and Hanck (2013) combined cointegration approach is known to provide efficient parameter estimates but fails to accommodate the structural break in the series, this issue is overcome by applying the ARDL bounds testing

[12]When we alternatively replaced the current account balance with all other explanatory variables, we also observed the computed Fischer's statistics exceeding the critical values at 5% level, implying that there exists cointegration among the variables in our model.

approach to cointegration of Pesaran et al. (2001)[13]. Since the ARDL bounds test procedure is known to be sensitive to lag selection in the model, we have used AIC criteria to select the appropriate lag order as it is known that the dynamic link between the series can be well captured with an appropriate selection of lag length (Lütkepohl, 2006). The optimal lag length results are reported in column-2 of Table 7. We have used the critical bounds statistics from Narayan (2005) to determine the existence of cointegration in different models. The results show that the calculated F-statistic is found to be greater than the upper bounds critical values for all the models, even we replace the current account balance with all other explanatory variables as dependent variables in a sequential way. This also confirms the long run relationship among the variables in all possible single equation ARDL models.

----Insert **Table 7** here please----

5.3. Long-run and short-run ARDL results on CAB model

The long run results reported in Table 8 show that there exists surprisingly a statistically significant positive relationship between oil imports and current account balance in both the models (model-1 with the crude oil imports and model-2 with total oil imports). It is further noted that a 1% rise in oil imports leads to a 0.138-0.497% rise in the current account surplus. This implies that contrary to the general belief, the current account balance is leading to improvement in CA performances, which is due to increasing oil imports in India. This finding can be explained mainly due to two reasons. *Firstly*, no doubt that India is one of the largest oil importers in the world but from Fig. 1A in the Appendix, it can be clearly seen that

[13] There are several advantages behind using the ARDL bounds testing approach over the alternative traditional models viz. Engle and Granger (1987) and Johansen and Juselius (1990) which justify using ARDL approach to cointegration model of Pesaran et al (2001). The ARDL model produces robust results for small sample sizes. Narayan (2005) presented the tables with critical F-values for small sample sizes ranging from 30 to 80. As our sample size falls in this range, we use the critical bounds values provided by Narayan (2005). Apart that it also solves the issue of endogeneity in the model with inclusion of appropriate lags in the model.

India is not only importing oil from the international market, but it is also exporting a significant proportion of oil to the rest of the world. Most often India engages in importing raw petroleum products and processes and refines those in order to make them exportable to other countries of the world. The later might be contributing to improving its current account balance. *Secondly,* oil is also used as one of the key energy inputs in the production sectors and sometimes used in the exporting sectors. For instance, oil is largely used in the manufacturing and services sectors of India which helps to expand the production and export activities and thereby leading to improve the current account balance. This result contradicts to the findings of Huntington (2015) as he observed that for the oil-importing developing countries, crude oil imports do not significantly affect their current account deficits but for the oil importing developed countries, high oil imports significantly deteriorate their current account balances. India is one the highest oil importing developing countries and its position being the fourth largest oil importers in the world (U.S. Energy Information Administration, 2014), our study confirms that oil import is having significant positive impact on its current account balances. This finding although seems to be contradictory to the general theoretical belief but quite startling for the policy. However, at the same time, this result is found to be strongly supporting some recent studies carried out in India where they observed energy consumption playing an important role in the production and high growth of India (Shahbaz et al. 2012; Mallick and Mahalik 2014).

However, while suggesting more energy consumption is good for improving the current account balance and higher growth of India, at the same time, since environmental protection is a major concern for every economy around the globe, then India should put more emphasis on the use of alternative cleaner forms of renewable and non-renewable energies such as solar energy, wind energy, electricity etc. rather than using more non-

renewable energies such as oil, and coal which are more polluting in nature. Further, the total stock of the oil is limited and the demand for it is increasing day by day due to a sharp increase in the population and thereby their rising consumption demand. Therefore, with the limited stock of oil in the global market, a continuous rise in the oil demand may lead to sharp increase in its prices in the near future. And the continuous increase in the global oil price may reduce its imports by the oil depending developing economies like India, and thereby can affect its production, exports, and growth potentials. As far as the positive relationship between the oil imports and current account balance is concerned, our study in terms of the policy suggests that the government of India needs to adopt a very cautious energy policy strategy for targeting a reduction in the usage of non-renewable energy inputs, particularly oil, to avoid any serious impending crisis in its external sector balances due to significant fluctuations in the international oil prices. On the other hand, by shifting from the use of the non-renewable sources energy like oil to the renewable energy sources like solar energy and wind energy, we can dramatically improve the environmental quality.

In terms of looking at the impact of real exchange rate on the current account balance of India, the results of our study reveal that real exchange rate impacts the current account balance significantly and negatively. If all else remain the same, a 1% appreciation in the domestic exchange rate reduces the current account surplus by 0.026-0.054%. This highlights the adverse implication of exchange rate movements on the current account balance of India. Intuitively, it suggests that an appreciation of the domestic exchange rate makes the imports cheaper and the exports costlier in the international market. As a result of the quantity of imports increases, while the quantity of export decreases and thereby causes deterioration in the current account balance. This result supports the findings of Lee and

Chinn (2006) and Gervais et al. (2016) who observed that exchange rate appreciation causes deterioration of the current account surplus by increasing imports and reducing exports.

In examining the impact of trade openness on the current account balance, it is found that a rise in trade openness is significantly and negatively linked with the current account balance in India. A 1% increase in trade openness leads to a 0.601-0.805% decline in the current account surplus in India. This result supports the findings of Chinn and Prasad (2003) and Yang (2011) who found that trade openness deteriorates the current account balance. Further, according to the literature, countries that are more open to international trade tend to attract more foreign capital to finance expenditure relative to income, contributing to the current account deficit. Therefore, the degree of openness to international trade may have important long-run implications for overall current account positions of the economy. It does not suggest complete closure of the economy to the rest of the world. However, it gives cautions there is an extent to which the economy will be resilient to openness and after that, it may trade off with the economic performance of a developing economy like India. It is true that India was very cautious about openness and therefore it was taking gradual steps in liberalizing the economy but now it has almost liberalized it's all sectors of the economy with greater intensity.

In examining the impact of fiscal balance on current account balance, it is found that an improvement in the fiscal balance is significantly and positively linked to the current account balance of India. A 1% increase in the fiscal balance leads to a 0.894-0.937% increase in the current account balance in India. This result supports the validity of twin deficit hypothesis for India, which implies that a rise in the fiscal deficit leads to a rise in the

current account deficit.[14] This result supports the findings of Parikh and Rao (2006) and Suresh and Tiwari (2014) for India, Baharumshah and Lau (2007) for Thailand, and Vamvoukas (2010) for Greece, in which the authors show that an increase in the fiscal deficit leads to an increase in the current account deficit in these countries. However, at the same time, our result contradicts the results of Kim and Kim (2006) for Korea, and Bose and Jha (2011) for India, who found that it is not the fiscal deficit which affects current account deficit, rather it is the current account deficit which significantly and positively affects the fiscal deficit.

Further, looking at the impact of financial development on current account balance, we found that financial development has a positive and significant impact on the current account balance in India. A 1% increase in the financial development leads to a 0.243-0.330% increase in the current account balance (surplus). This supports the findings of Chinn and Prasad (2003) and Chinn and Ito (2007), who show that rising financial development leads to rising domestic savings and thereby improves the current account balance. Further, in examining the impact of terms of trade on the current account balance, our results do not find any significant impact. Thus, our result is consistent with Chinn and Prasad (2003) and Chinn and Ito (2007) who observed no significant impact of terms of trade on the current account balance.

While examining the impact of age dependency on current account balance, our results show that age dependency is significantly and negatively affect the current account balance in India. A 1% increase in the age dependency leads to a 0.569-0.990% fall in the current account surpluses. Our result is again consistent with the results of Chinn and Prasad

[14] The twin deficit hypothesis suggests that when a government increases its budget deficit (BD) by cutting taxes or increasing government expenditure results in increasing consumers' income, and part of that increase will be spent on foreign goods and services (Ravinthirakumaran et al., 2016).

(2003) and Huntington (2015), who found that an increase in the proportion of dependent population deteriorates countries' current account position. The literature argues that an economy having more children and elderly population tend to consume more and save less from their income than the working age group. Therefore, age dependency should decrease the current account surplus. Lastly, we have incorporated a dummy variable to account for the impact of the global financial crisis (2007-08). The result shows that the global financial crisis has no significant impact on India's current account balance.

Although the study emphasizes the importance of the long run estimates for the policy implications, nevertheless, the short run results reported in the lower segment of Table 7 show that the crude oil import is significantly and negatively related to the current account balance. On the other hand, the total oil import is positively and significantly related to the current account balance of India. Exchange rate, trade openness and age dependency significantly deteriorate the current account balance in the short run. Further, the results show that fiscal balance, financial development, and trade openness do not significantly affect the current account balance of India in the short run. The short-run deviations from the long-run equilibrium are corrected by 75 to 78 percentages in each year. However, the dummy variable (global financial crisis, 2007-08) turned out to be the insignificant impact on the current account balance in the short run. The diagnostic tests suggest that the resulting residuals from the ARDL equations for both the models are normally distributed; and free from autocorrelation, heteroscedasticity, and ARCH problems. The Ramsey reset test further confirms that the functional forms are well specified.

----Insert **Table 8** here please----

5.4. Stability analysis

While exploring the impact of oil imports on current account balance in a time series framework, there is a possibility to experience the instability of the model. The instability of the model could be due to the instability of the parameters estimated through ARDL models. As a result, this can induce misleading results when such model parameters are used for drawing inference or forecasting (Lee and Chang, 2013). Hence the model stability is quite important and therefore, we investigated by employing the cumulative sum of recursive residuals (CUSUM) and the CUSUM square (CUSUMSQ) as suggested by Brown et al. (1975). The test results suggest the consistency of parameters. Furthermore, Brown et al. (1975) pointed out that these tests help in testing the dynamics of parameters. Hence, the expected value of the recursive residuals is zero leading to a non-rejection of the null hypothesis of parameter constancy. The plots for both CUSUM and CUSUMSQ showed in Figures 3-6 indicate that plots for both the tests are falling within the critical bounds of 5% levels of significance. This leads us to confirm that our estimated models are stable and robust.

----Insert **Fig.3** here please----

----Insert **Fig.4** here please----

----Insert **Fig.5** here please----

----Insert **Fig.6** here please----

5.5. The VECM Granger causality analysis

After examining the long-run relationship among the variables, we examined the short-run relationships among the variables in the VECM framework with the inclusion of both crude oil imports as percentage of GDP (CRUDE) and total oil imports as percentage of GDP

(TOIL) in the current account equation along with the incorporation of the a dummy variable to capture the structural breaks in the series.[15] The VECM results enable us to trace the direction of causality among the variables in the model.

Table 9 reports the results for the direction of causality in the short run along with incorporating the long run relationships which get reflected from the significant and negative sign of ECM coefficients. It is noted that in contrast to the long run results, in the short run, the study also almost observes similar positive impacts of both crude oil imports and total oil imports along with the negative effects of openness measure on the current account balance. However, unlike the impact of other variables in the long run, in the short run, similar variables such as exchange rate, dependency ratio, fiscal deficits, and terms of trade do not exert any significant impacts on the current account balance of India.

----Insert **Table 9** here please----

6. CONCLUSIONS AND POLICY PRESCRIPTIONS

Following the seminal contribution of Feldstein (1985, 1987) to the analysis of ‘‘twin-deficits hypothesis’’, it has produced so much literature that the issue looks like every time it is fresh and it is like the old liquor but in a new bottle (Gossé and Serranito, 2014). The issue addressed in the literature is not only restricted to examining fiscal policy and current account performance but also ranges to important dimensions viz. whether current account imbalances are ‘‘excessive’’ and how they should be adjusted over the long-run (Lane and Milesi-Ferretti, 2011). Therefore, identifying the causes of current account imbalances is a crucial policy issue for the oil-dependent developing economies like India. Several literatures

[15]These breaks are based on ZA unit root test with single unknown structural break in the series.

have examined the issue in different developing and developed countries' context (Chinn and Prasad, 2003; Gruber and Kamin, 2007, 2009; Killian et al., 2009; Lee and Chang, 2013; Huntington, 2015).In light of this, our study is specifically motivated to explore and analyze the long-run determinants of the current account performance of India by incorporating the key variables such as oil imports, the real exchange rate, terms of trade, fiscal balance, financial development, and age dependency ratio for the period, 1980-2014. For this purpose, it employs Bayer and Hanck's (2013) cointegration approach to investigate the long-run relationship between the variables in the current account balance equation. And this initial result on cointegration is also subsequently verified using Pesaran's et al. (2001) ARDL bounds testing cointegration procedure which confirmed the long-run relationship between the variables of our interest. Later, the long-run relationships from estimated parameters are derived estimating the ARDL model. We found that the oil import is positively linked with the current account balance along with the positive impact of financial development and fiscal deficits in India. However, the results suggest that the exchange rate, trade openness and age dependency ratio have significant adverse impact on the current account balance. The Granger causality showed a feedback relationship between oil imports and the current account balance, suggesting that the oil imports Granger cause the current account balance and vice-versa. This implies that a fall in oil imports, either due to rising international oil prices or global instability, can cause further deterioration in the current account balance of India.

Several policy implications can be drawn out based on our long-run results. The long-run results imply that an increase in oil imports improves the current account balance of India. This finding is contradictory with Huntington (2015)'s study which found that oil imports do not affect the current account performances of the net oil-importing developing

countries. This observed positive relationship between oil imports and current account balance for the Indian economy although contrary to the general belief but it is not quite surprising as a finding. This suggests that oil imports are beneficial for the Indian economy as it improves the current account balance in the long-run.

Firstly, this contradictory result could be explained because of the fact that although India imports a large volume of crude oil imports at the same time it is found to be one of the major oil refiners in the world enabling her to export a significant amount of refined oil to the global market.[16]This could imply that India's position has been changing from a major oil dependent to an oil exporting country. Perhaps, India is reducing the oil trade deficits by becoming less oil-dependent. Nevertheless, one has to see how much it is adding the value over its value of the imports or the volume of exports over the volume of imports. By becoming less oil-dependent, it would further help the Indian economy to increase its refinery-based oil revenues by selling oil at higher prices in the international energy market. Moreover, increasing oil-based revenues may also help the Indian economy to reduce too much dependency on foreign loans to carry out fiscal adjustments as these refineries in India are mainly under the control of public sector undertakings. However, generation of revenues from oil refineries is likely to come down as more countries participate in this activity. In addition, the high dependency of an economy solely on refined oil revenues to finance fiscal spending is not a suitable long-term fiscal strategy as it increases the vulnerability of the fiscal position of the government and the generation of revenues may have an adverse response to the oil price fluctuations in the international energy market. However, since there are no quick solutions to get away from the problem of high dependency on oil where a large number of countries are importers of oil and natural gas unless nations achieve major

[16] See Table3A in Appendix which also confirms our empirical result.

breakthroughs in terms of exploring and extracting low expensive renewable and non-renewable sources of energies. Therefore, it is advisable for the Indian government to carry out fiscal adjustments or improve on its fiscal consolidation by ensuring long-term stability of its finances. From a policy perspective, this result urges the governments of developing economies in general and the Indian economy, in particular, to exploit non-oil based revenues, such as direct and indirect taxes to complement its financing of fiscal spending (Lee and Chang, 2013).

Secondly, a huge amount of oil when used in different export-oriented sectors like manufacturing and services sectors etc., it must be resulting in more outputs in the economy for leveling up the exports. Overall, it leads us to conclude that imported oil not only helps to increase the refinery export oil-based revenues but also augments production process of an emerging economy like India along with financing its fiscal deficits in the long-run. Similar to Malaysia, which happens to be an oil refinery-based export economy, the Indian government should follow the energy-efficient policy and carry out an efficient utilization of refinery oil-based revenues to generate more productive investment and exports to other countries. Hence, the policy makers in India should emphasise on the refined oil production and use of the alternative renewable sources of energy like solar energy, wind energy, and water energy etc. in order to sustain the rising production and export growth in the future more especially to safeguard from the risk of large oil price movements in the upward direction. Along with exporting the refined oil to the rest of the world for generation of more export revenues, if India can preserve the refined oil for its future use like the similar strategies adopted by other developed countries like the US, it can help the Indian economy to overcome any short-term vulnerabilities on account of the rise in the oil price or shortage of oil supply in the international market in the future.

We also find the favourable effect of financial development on current account balance in India. This finding is consistent with the studies of Chinn and Prasad (2003) and Chinn and Ito (2007) who reported that financial development positively influences current account balance for the industrial and developing countries. However, it contradicts the findings of Gruber and Kamin (2009) for 84 countries who reported that financial development has no significant effect on the current account balance. A candid explanation of the positive effect of financial development on current account balance is that the Indian economy has inefficient financial systems that encourage saving and discourage investment and thereby enabling to run a surplus in current account balances. In such case, financial capital will flow out from India to rich countries characterized by matured and developed financial system. From a policy scenario, it can be suggested that policymakers should not undermine the increasing role of financial development on the improvement of the current account balance in India while designing policy framework towards containing current account balance.

The study also traced a long run positive impact of fiscal balance on current account balance in India. This finding is also consistent with the study of Nickel and Vansteenkiste (2008) who reported for medium-to-high debt countries, the fiscal deficit could have a positive impact on current account deficit. It is also consistent with the recent finding of Abbas et al. (2011) for advanced, emerging and low-income countries who reported a positive and significant association between fiscal balance and current account balance. Thus, our finding further strengthens the twin-deficits hypothesis for the Indian context. In this line, it is suggested that the Indian governments should reduce the fiscal deficit so as to improve the current account balance in the long-run. In research front, policy makers while relating fiscal policy with current account balance, they should add fiscal deficit in the current

account function to evaluate the role and efficacy of fiscal policy on current account performances.

Since exchange rate, trade openness and age dependency ratio have significant adverse impacts on the current account balances, macro policy should focus on better exchange rate policies, efficient regulation of the external sector and increasing productivity of the human capital. This not only provides the support for twin deficit hypothesis holding true for India but also at the same time, it suggests the financial sector development plays an important role in generating saving in the domestic economy and thereby helps the exporting industries to raise their production and exports by minimizing the financing constraints of those industries. Overall, the study shows that an efficient use of imported oil, reduction of fiscal deficit, improvement in financial development, efficient exchange rate policies, increasing productivity of human capital, and efficient regulation of the external sector can help India to improve and achieve sustainable current account balance over the long-run. In light of these above empirical findings and with added rich policy implications following from the study, an urgent area for future research is to look at the impact of oil price shocks and non-oil imports on current account balance for India and similar developing countries. In doing so, it would enrich the policy perspective towards designing policies for the improvement and sustainable current account balance for an emerging economy like India.

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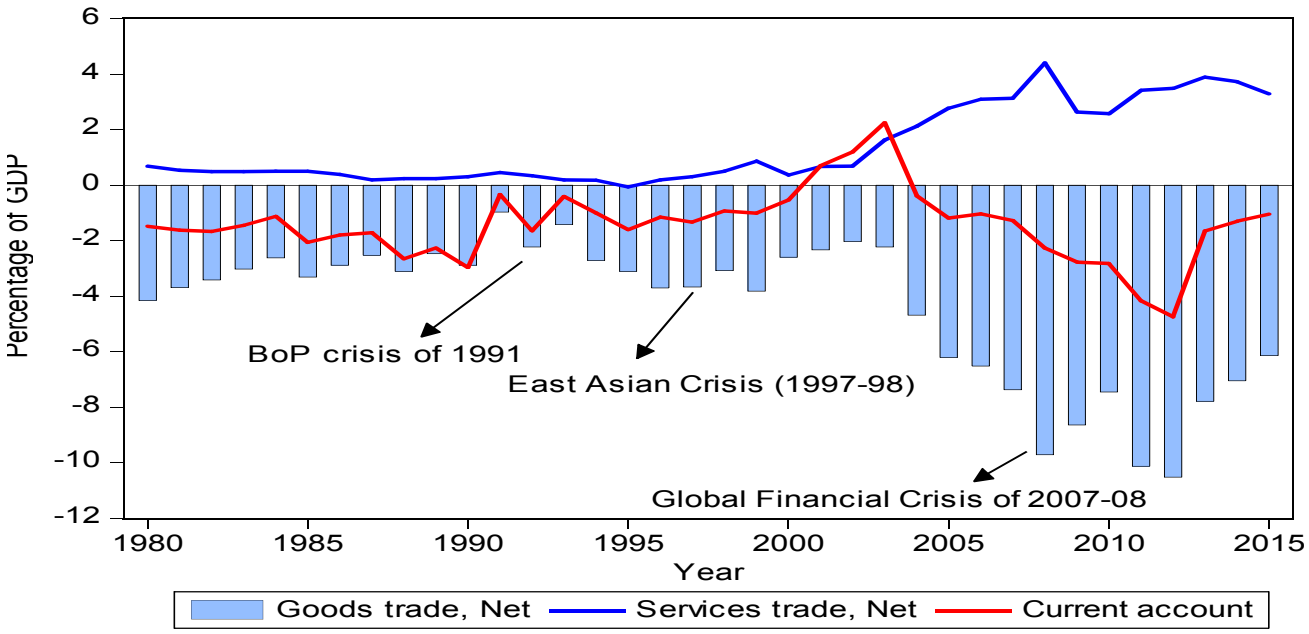
APPENDIX

----Insert **Table 1A** here please----

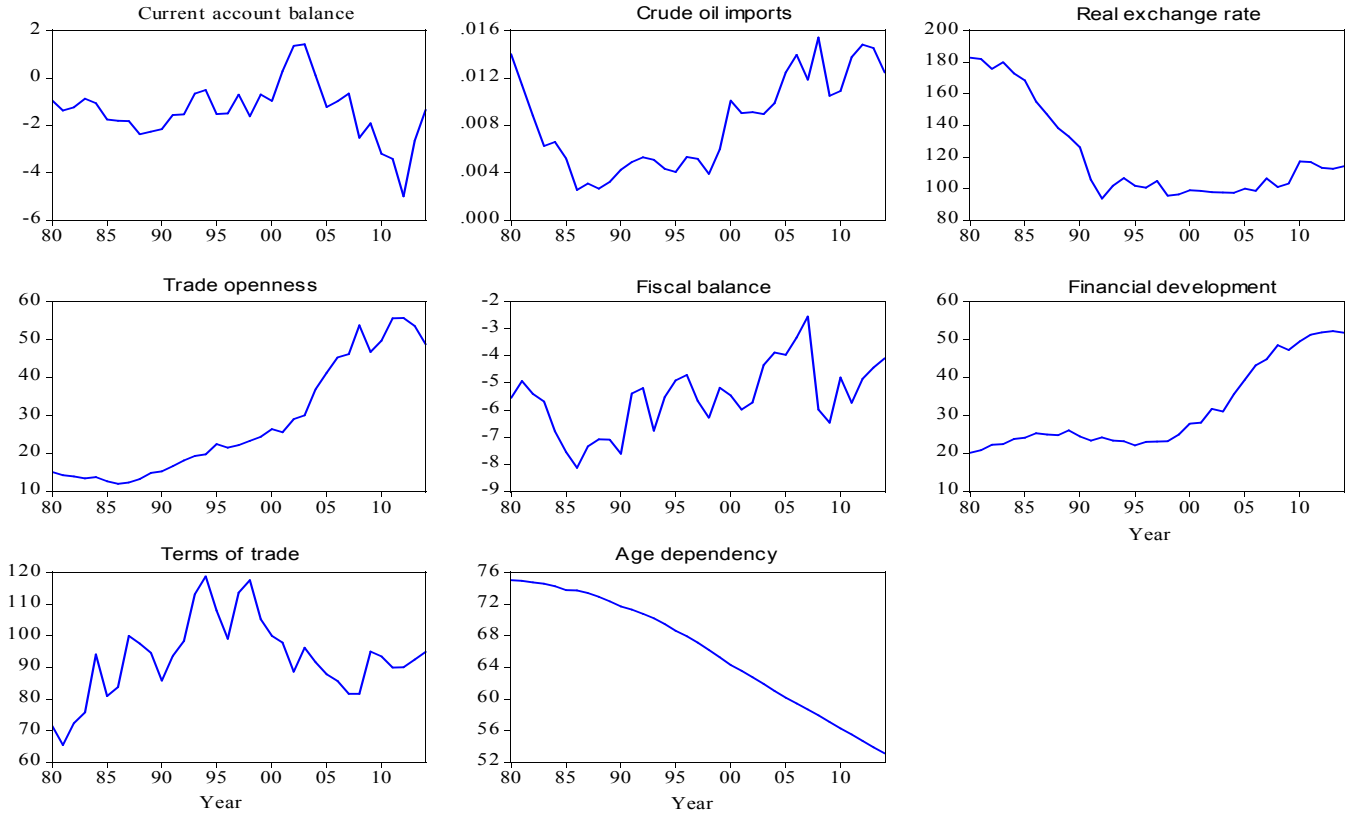
----Insert **Table 2A** here please----

----Insert **Table 3A** here please----



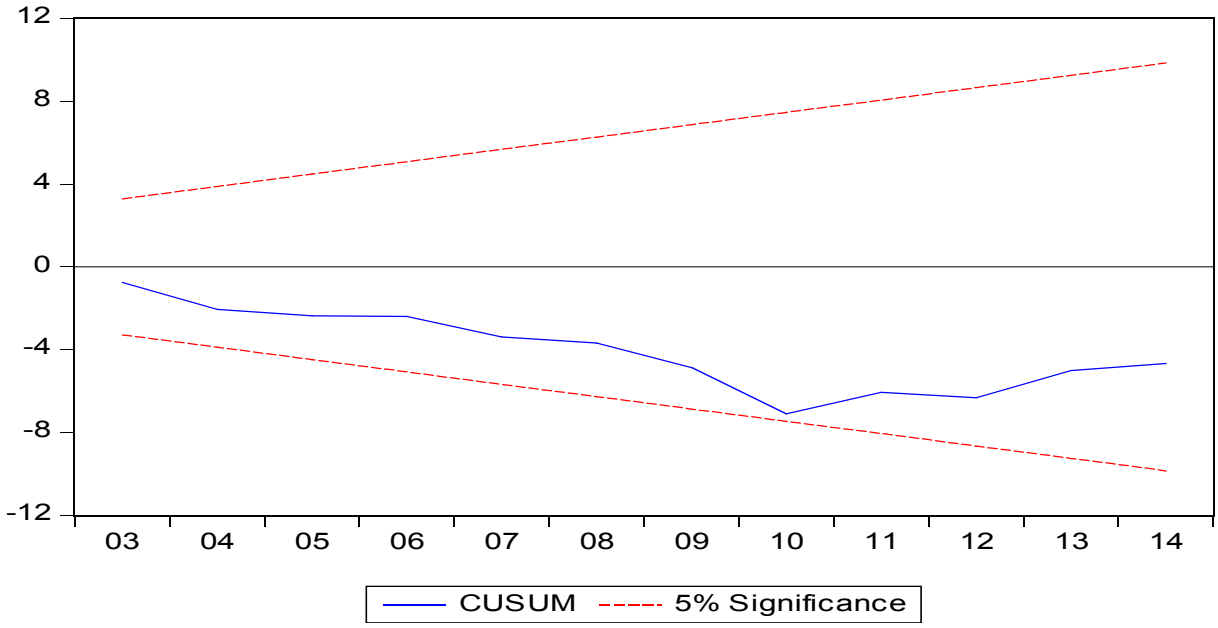
Data Source: Handbook of Statistics on Indian Economy, Reserve Bank of India (RBI)

Fig. 1. Trend in Merchandise, Services and Current Account for India.



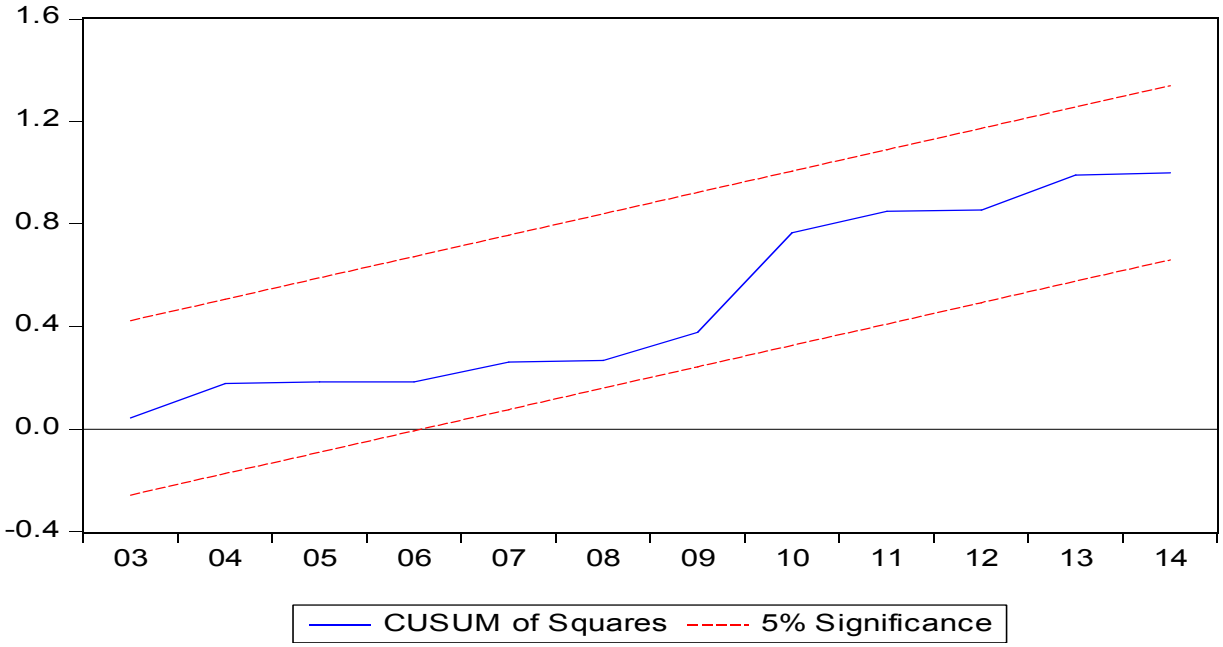
Source: Database on Indian Economy, RBI; World Development Indicators (WDI) and U.S. Energy Information Administration, 2015

Fig. 2: Trends of key macro variables used in our model.



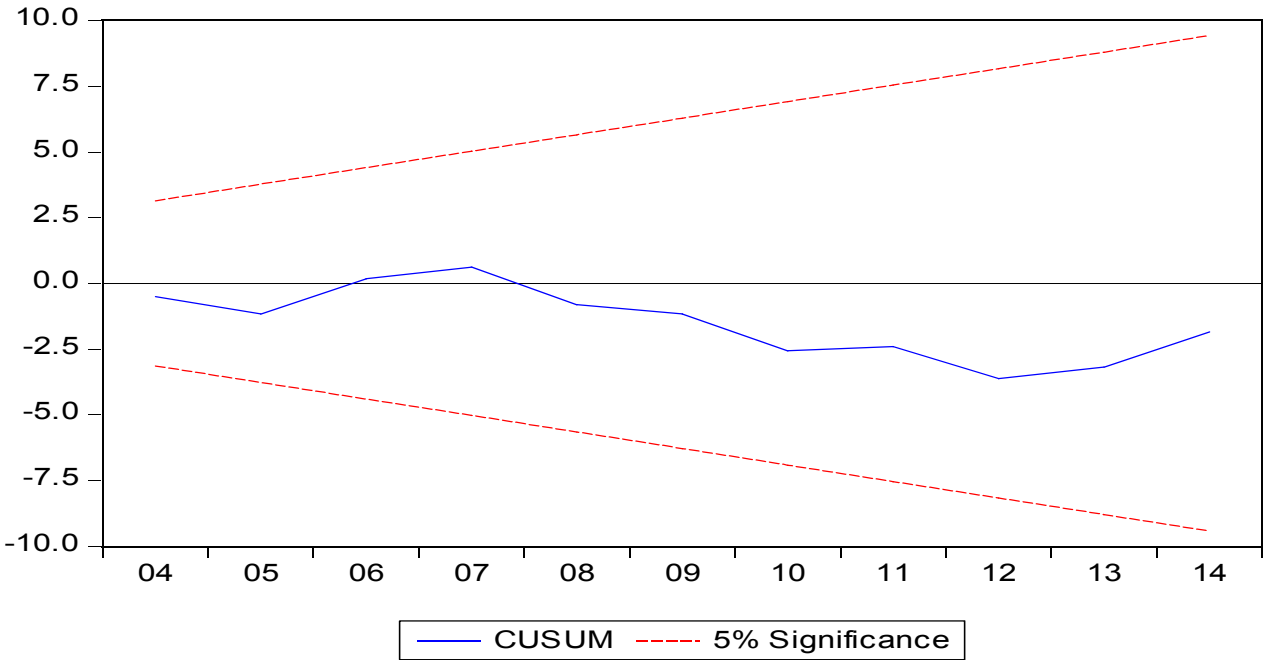
Note: straight lines represent critical bounds at 5% significance level

Fig. 3. Plot of cumulative sum of recursive residuals for crude oil imports on Current account balance.



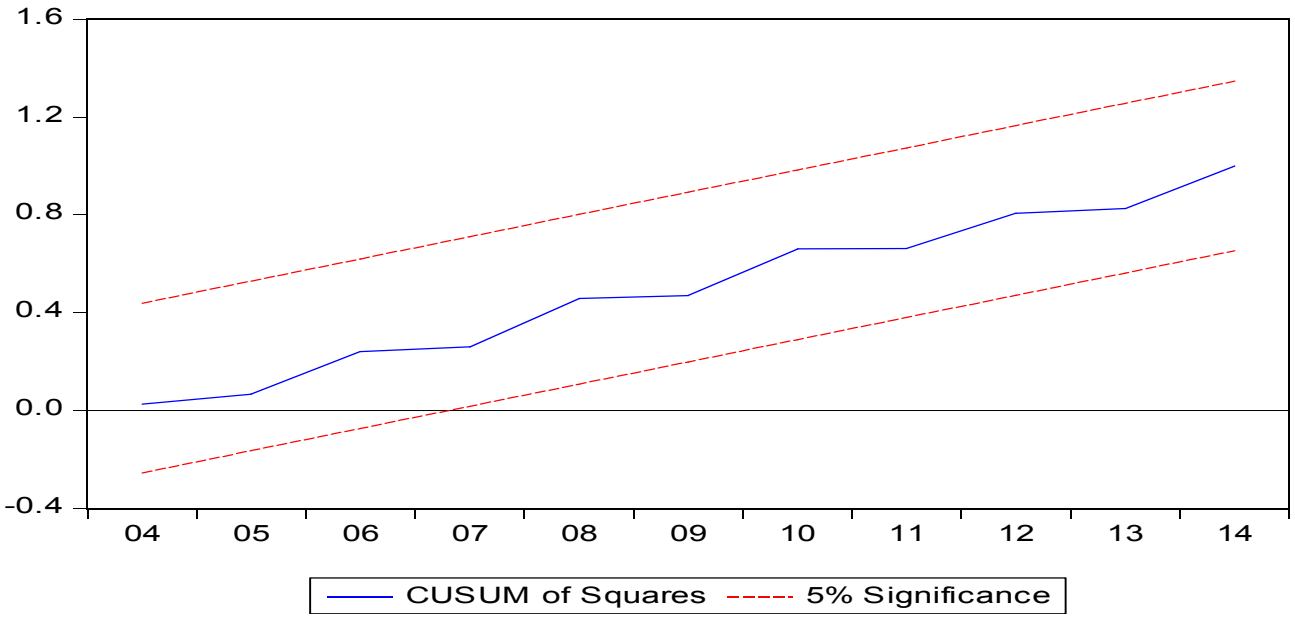
Note: straight lines represent critical bounds at 5% significance level

Fig. 4. Plot of cumulative sum of recursive residuals for crude oil imports on Current account balance.



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

Fig. 5. Plot of cumulative sum of squares of recursive residuals for Total oil imports on current account.



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

Fig. 6. Plot of cumulative sum of recursive residuals for Total oil imports on current account.

Table 1
Trend in Net Invisibles.

	(Percent of GDP)				
Period	1990-2000	2000-2007	2007-2012	2013	2014
1.Services (Net)	0.333	1.812	2.848	3.900	3.731
2.Software (Net)		2.166	2.869	3.571	3.430
3. Private Transfers (Net)	2.155	3.087	3.017	3.487	3.228
4. Total Invisibles (Net)	1.573	4.220	5.247	6.144	5.756

Source: Adapted from the study of Mohanty (2013) and Handbook of Statistics on Indian Economy, RBI

Table 2
Composition of Current Account Balance.

	(Percent of GDP)					
Period	1970s	1980s	1990s	2000-07	2007-12	2012-14
1.Oil TB	-0.267	-3.501	-1.685	-3.269	-4.717	-4.973
2. Non-Oil TB	0.060	-0.401	-0.129	-0.427	-3.877	-3.049
3. Non-Oil CAB	-0.667	2.023	-1.277	3.239	2.337	3.665
4. CAB	-0.934	-1.480	-2.963	-0.030	-2.380	-1.307

Note: TB: Trade Balance, CAB: Current Account Balance, (-): Deficit

Source: Adapted from the study of Mohanty (2013) and Handbook of Statistics on Indian Economy, RBI

Table 3
Data source and variable descriptions.

Variable	Description	Source
CAB[1]	Current account balance (% of GDP)	Database on Indian Economy, RBI
CRUDEOIL	Crude oil imports (% of GDP)	World Development Indicators (WDI)
OIL	Total oil imports (% of GDP)	Database on Indian Economy, RBI
REER	Real effective exchange rate (36-currency trade based index)	Database on Indian Economy, RBI
OPEN	Trade openness (measured by trade as % of GDP)	World Development Indicators (WDI)
FB[2]	Gross fiscal balance (% of GDP)	Database on Indian Economy, RBI
FINDEV	Financial development (measured as domestic credit to private sector (% of GDP))	World Development Indicators (WDI)
TOT	Terms of trade (measured as the ratio of an index of a country's export prices to an index of its import prices)	UNCTAD
AGE	Age dependency ratio (% of working-age population)	World Development Indicators (WDI)

[1] Since India has been experiencing current account deficits in most of the years, therefore we have taken negative values of this variable as current account balance for the empirical analysis of this study.
[2] Since Indian economy has been experiencing fiscal deficits throughout the years, hence we have taken negative values of this variable as fiscal balance for the empirical analysis of this study.

Table 4
Unit root analysis.

Variables	MZa	MZt	MSB	MPT
CAB	-8.13735	-2.01194	0.24725	11.2131
CRUDE	-4.10812	-1.42010	0.34568	22.0344
TOIL	-3.92933	-1.39741	0.35564	23.1358
EXR	-8.18219	-1.91340	0.23385	11.4469
OPEN	-3.90956	-1.39569	0.35699	23.2760
FB	-11.8029	-2.42140	0.20515	7.76184
FD	-1.21035	-0.70045	0.57872	63.7044
TOT	-11.5864	-2.22712	0.19222	2.78839
AGE	-0.53675	-0.34603	0.64467	83.5451
ΔCAB	-16.4625***	-2.81349	0.17090	5.86259
ΔCRUDE	-16.1258***	-2.74800	0.17041	6.18511
ΔTOIL	-15.8705***	-2.45656	0.15479	7.73730
ΔEXR	-23.9110*	-3.45767	0.14461	3.81104
ΔOPEN	-16.3794***	-2.68419	0.16388	6.58677
ΔFB	-36.0772*	-4.24572	0.11768	2.53381
ΔFD	-16.4077***	-2.81026	0.17128	5.87185
ΔTOT	-16.1792***	-2.83969	0.17551	1.53110
ΔAGE	-23.4538**	-3.36771	0.14359	4.22017

Note: The lag length is shown in parentheses. For details of these notations including MZa, MZt, MSB, and MPT, please see the study of Ng and Perron (2001).
*, ** and *** represent significance at 1%, 5% and 10% levels, respectively.

Table 5
ZA unit root test.

Variables	Level		1st Difference		Decision
	T-Stat.	Time Break	T-Stat.	Time Break	
CAB	-3.753 (0)	2008	-6.545*(1)	2004	I(1)
CRUDE	-4.146 (0)	1987	-6.868*(0)	1991	I(1)
TOIL	-4.413 (0)	1987	-7.786* (0)	1985	I(1)
EXR	-2.774 (0)	1986	-5.742* (1)	1993	I(1)
OPEN	-2.327 (0)	1986	-7.289* (0)	2009	I(1)
FB	-3.850 (0)	2008	-6.890* (1)	2008	I(1)
FD	-2.831 (1)	2004	-4.801** (0)	2009	I(1)
TOT	-3.093 (0)	1997	-6.948* (0)	1992	I(1)
AGE	-4.288 (1)	1987	-5.562* (0)	2000	I(1)

Note: Lag order is shown in parenthesis.
*, ** Represent significance at 1% and 5% levels, respectively.
The values -5.34 and -4.93 are the tabulated t-statistic values at 1% and 5% for ZA test, respectively.

Table 6
The results of Bayer and Hanck (2013) cointegration analysis.

Estimated models	EG-JOH	EG-JOH-BO-BDM	Lag order	Cointegration
Model1: CAB=F (CRUDE, EXR, OPEN, FB, FD, TOT, AGE)	55.873**	166.397**	2	Yes
Model2: CAB=F(TOIL, EXR, OPEN, FB, FD, TOT, AGE)	55.496**	166.020**	2	Yes

Note: Critical values at 5% level are 10.419 (EG-JOH) and 19.888 (EG-JOH-BO-BDM), respectively.
Lag length is based on the minimum value of Akaike Information Criterion (AIC).
** Represents significance at 5% level.

Table 7
Results of ARDL cointegration analysis.

Estimated model	Optimal lag	Break year	F-statistic
Model 1: CAB=F (CRUDE, EXR, OPEN, FB, FD, TOT, AGE)	(2,2,0,1,2,1,0,0)	2008	5.274*
Model2: CAB=F(TOIL, EXR, OPEN, FB, FD, TOT, AGE)	(2,0,2,1,2,1,0,2)	2008	4.108**

Table 8
Long run and short run results on CAB model.

	Model 1: With CRUDE Oil Imports	Model 2: With Total Oil (TOIL) imports
Long run analysis		
Variables	Coefficient	Coefficient
Constant	45.775** (2.772)	88.243* (4.757)
CRUDE	0.497** (2.674)	
TOIL		0.138* (3.117)
EXR	-0.026*** (-1.814)	-0.054* (-3.103)
OPEN	-0.601** (-2.907)	-0.805* (-4.376)
FB	0.894** (2.50)	0.937** (3.014)
FD	0.243*** (1.863)	0.330** (2.688)
TOT	0.026 (1.035)	0.017 (1.039)
AGE	-0.569* (-3.074)	-0.990* (-4.831)
Dt	-1.117 (-0.731)	0.165 (0.157)

Short run analysis		
ΔCAB (-1)	-0.312*** (-1.777)	-0.393** (-2.317)
ΔCRUDE	-0.187*** (-1.935)	
ΔTOIL		0.109** (2.897)
ΔEXR	-0.020*** (-1.952)	-0.022 (-0.976)
ΔOPEN	-0.210** (-2.608)	-0.364* (-3.936)
ΔFB	0.208 (1.465)	0.189 (1.421)
ΔFD	-0.074 (-0.616)	0.075 (0.656)
ΔTOT	0.020 (1.105)	0.014 (0.940)
ΔAGE	-0.432* (-3.167)	0.888 (0.880)
Dt	-0.848 (-0.720)	0.130 (0.158)
ECM_{t-1}	-0.759* (-4.443)	-0.786* (-4.626)
Diagnostic tests		
Test	F-statistic	F-statistic
$\chi^2 SERIAL$	3.002	1.979
$\chi^2 NORMAL$	0.659	0.659
$\chi^2 ARCH$	0.003	0.560
$\chi^2 RESET$	0.106	0.026

Note: Values in the parenthesis reflects the T-statistic values of respective coefficients.

Table 9
VECM Granger causality results.

Dependent variable	Type of causality									
	Short run estimate									Long run
	$\sum\Delta CAB_{t-1}$	$\sum\Delta CRUDE_{t-1}$	$\sum\Delta EXR_{t-1}$	$\sum\Delta OPEN_{t-1}$	$\sum\Delta FB_{t-1}$	$\sum\Delta FD_{t-1}$	$\sum\Delta TOT_{t-1}$	$\sum\Delta AGE_{t-1}$	Break year	ECM_{t-1}
ΔCAB_t	…	0.2591** [0.044]	-0.040 [0.161]	-0.254** [0.024]	-0.067 [0.716]	0.0520 [0.723]	-0.026 [0.225]	-0.038 [0.964]	2008	-0.759* [-4.443]
$\Delta CRUDE_t$	-0.273 [-0.598]	…	0.053 [0.827]	0.223 [1.019]	0.6850*** [1.835]	-0.204 [-0.591]	-0.013 [-0.282]	-1.027 [-0.371]	1987	-0.886* [-6.629]
ΔEXR_t	-0.948 [0.520]	-0.648 [0.432]	…	-0.751 [0.295]	-1.622 [0.207]	2.251** [0.026]	0.189 [0.193]	-3.339 [0.743]	1986	-0.195*** [-1.894]
$\Delta OPEN_t$	-0.860 [0.132]	-0.592*** [0.0577]	0.199** [0.012]	…	0.665 [0.173]	-0.224 [0.535]	0.089 [0.116]	2.527 [0.386]	1986	-0.429** [-2.705]
ΔFB_t	0.149 [0.382]	-0.136 [0.182]	-0.041*** [0.090]	0.054 [0.533]	…	-0.383* [0.004]	-0.004 [0.811]	-1.575** [0.029]	2008	-0.892* [-5.938]
ΔFD_t	-0.329 [0.424]	-0.338 [0.134]	0.034 [0.528]	0.0505 [0.784]	0.241 [0.495]	…	-0.001 [0.985]	-0.601 [0.778]	2004	-0.315* [-4.163]
ΔTOT_t	-0.300 [0.868]	1.373 [0.209]	0.425 [0.117]	-0.211 [0.811]	-4.967* [0.007]	-0.998 [0.495]	…	41.754* [0.003]	1997	-0.316** [-2.732]
ΔAGE_t	-0.035 [0.168]	0.016 [0.259]	0.001 [0.804]	-0.006 [0.627]	-0.016 [0.473]	-0.026 [0.133]	-0.007 [0.010]	…	1987	-0.403*** [-1.910]
	$\sum\Delta CAB_{t-1}$	$\sum\Delta CRUDE_{t-1}$	$\sum\Delta EXR_{t-1}$	$\sum\Delta OPEN_{t-1}$	$\sum\Delta FB_{t-1}$	$\sum\Delta FD_{t-1}$	$\sum\Delta TOT_{t-1}$	$\sum\Delta AGE_{t-1}$	Break year	ECM_{t-1}
ΔCAB_t	…	0.345** [0.031]	-0.042 [0.153]	-0.244** [0.040]	-0.030 [0.853]	0.043 [0.804]	0.016 [0.390]	0.1889 [0.834]	2008	-0.786* [-4.626]
$\Delta TOIL_t$	-0.305 [0.742]	…	-0.168 [0.194]	0.109 [0.822]	1.360 [0.249]	0.152 [0.828]	-0.024 [0.760]	-9.618*** [0.065]	1987	-0.413***

										[-1.801]
ΔEXR_t	-0.948 [0.563]	0.670 [0.198]	…	-1.305*** [0.056]	0.672 [0.578]	2.650** [0.012]	0.202 [0.158]	9.290 [0.472]	1986	-0.289** [-2.251]
$\Delta OPEN_t$	-0.298 [0.647]	0.167 [0.335]	0.161*** [0.054]	…	1.004 [0.178]	-0.316 [0.504]	0.077 [0.123]	2.202 [0.430]	1986	-0.711* [-5.484]
ΔFB_t	0.115 [0.584]	0.037 [0.513]	-0.050*** [0.072]	-0.174*** [0.078]	…	-0.121 [0.345]	-0.007 [0.684]	-2.121** [0.018]	2008	-0.295* [-5.083]
ΔFD_t	-0.128 [0.755]	0.058 [0.590]	0.026 [0.608]	-0.062 [0.751]	0.527 [0.259]	…	0.048 [0.129]	-0.467 [0.789]	2004	-0.641* [-5.002]
ΔTOT_t	2.687 [0.344]	0.487 [0.534]	-0.522 [0.153]	-1.637 [0.290]	2.821 [0.388]	2.027 [0.366]	…	-22.417 [0.279]	1997	-0.731* [-3.845]
ΔAGE_t	-0.017 [0.509]	-0.002 [0.725]	-0.004 [0.274]	-0.011 [0.297]	0.006 [0.748]	-0.001 [0.978]	-0.007* [0.009]	…	1987	-0.320* [-3.244]

Note: P values reported in parenthesis for short run test and t statistics reported in parenthesis for long run tests.
*Denotes the significance at the 1% level.
** Denotes the significance at the 5% level.
***Denotes the significance at the 10% level.

Table 1A

Crude oil imports by countries (1000 bbl/day).

Country Rank (2014)	Countries/ Year	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013	2014
1	United States	8459	6755	9633	11165	13879	15620	13705	13236	12003	11493	10342
2	China	-349	-620	-478	373	1564.9	3161.9	5109.9	5769.3	6445.4	6919.8	7344.7
3	Japan	4950	4425	5282	5648	5473	5291.4	4323	4340	4625	4499.3	4262.2
4	India	461	275	508	872	1481	1847	2554	2679	2839	2884	2968
5	Korea, South	537	552	1048	2008	2135	2191	2269	2259	2322	2328	2348
6	Germany	--	--	--	2823	2703	2557	2418	2341	2338	2383	2326
7	France	2230	1703	1766	1865	1972	1969	1804	1761	1723	1698	1677
8	Spain	957	814	994	1174	1428.2	1603.9	1438.4	1382.8	1298	1200.7	1193.8
9	Italy	1896	1660	1781	1849	1764	1666	1448	1395	1269	1158	1160
10	Netherlands	767	534	664	701	826	977	1010	1003	977	969	962
11	United Kingdom	103	-913	-44	-673	-510	170	393	556	647	726	733

Source: U.S. Energy Information Administration.
Link: http://www.eia.gov/petroleum/data.cfm

Table 2A

Trend in crude oil imports, current account and trade balance of India, 1980-2014.

Year	Crude oil imports (% of GDP)	Current Account (% of GDP)	Trade Balance (% of GDP)	Real oil price (Crude oil, Brent, $/bbl, real 2010$)
1980	0.01	-0.94	-3.89	58.09435
1985	0.01	-1.75	-3.03	45.787
1990	0.00	-2.96	-1.81	28.64722
1995	0.00	-1.61	-1.33	18.56596
2000	0.01	-0.56	-1.25	35.53676
2005	0.01	-1.19	-5.52	62.0655
2010	0.01	-2.90	-7.16	79.63563
2011	0.01	-4.29	-10.06	101.8351
2012	0.02	-4.82	-10.41	104.0621
2013	0.02	-1.73	-7.29	102.6389
2014	0.01	-1.32	-6.74	93.44457

Source: U.S. Energy Information Administration, and Handbook of Statistics of RBI.
Crude oil imports (% of GDP)
Source: U.S. Energy Information Administration, link: http://www.eia.gov/petroleum/data.cfm
Current account (% of GDP)& trade balance (% of GDP), Source: Handbook of Statistics of RBI, Link: https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications

Table 3A

Share of India's oil exports to its total oil imports.

Year	Oil Exports (Rupees Billion)	Oil Imports (Rupees Billion)	Oil Exports as percentage of Oil Imports
1970-71	0.086	1.359	6.328
1975-76	0.189	12.257	1.542
1980-81	0.249	52.635	0.473
1985-86	6.447	49.894	12.921
1990-91	9.378	108.161	8.670
1995-96	15.178	251.736	6.029
2000-01	85.417	714.965	11.947
2005-06	515.328	1946.400	26.476
2010-11	1887.790	4822.817	39.143
2014-15	3460.825	8428.745	41.060
2015-16	1985.759	5400.688	36.769

Source: Handbook of Statistics on Indian Economy, RBI