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# The Structural Relationship between Current and Capital Account Balance in India: A Time Series Analysis<sup>1</sup>

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## Abstract

The long run relationship between current account balance (CAB) and capital account balance (KAB) and the repercussions of capital account convertibility (KAC) on growth process of a country is a much debated issue. In particular, in the aftermath of the Southeast Asian crisis, the limitation of the liberal capital regime for a developing country like India is often highlighted in the literature. However, the probable impact of introducing KAC on CAB in India generally is discussed theoretically. Though some of the existing studies in India have earlier focused on this research question, they have done so by exogenously assuming the existence of a single structural break in the interrelationship between CAB and KAB. The present study intends to bridge the gap in the literature by raising two empirical questions: first, how far KAC is likely to destabilize the CAB and second, measuring the strength of the interrelationship between CAB and KAB. The current paper also contributes to the literature by incorporating multiple endogenous structural breaks in the empirical analysis. The empirical findings do not support any long term relationship between capital and current account balance and reveals that two significant structural breaks are observed in 1993-94 and 2003-04.

**Keywords:** International Capital Movements, Foreign Exchange, Current Account Adjustment

**JEL Classification:** F21, F31, F32

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## **1. Introduction**

Capital account convertibility (KAC) has been one of the most fiercely debated issues regarding progressive liberalization of the financial and external sector not only in India, but also in many other developing nations. A wide section of the literature addresses the pros and cons of KAC. In a nutshell the strongest view in favour of KAC has been that absence of capital controls in an economy boosts the confidence of the international investors on it and consequently ensures higher investment inflow. On the other hand, opposition to the concept of KAC is based on the argument that the amount of financial stability and self sufficiency which is needed to abolish any kind of control in capital flow is not present in the developing and emerging economies. So for these economies moving towards KAC may result in major shocks as a potential capital flight in case of an economic crisis simultaneously exposes the country to greater volatility. Especially after the recent global economic meltdown which even forced the most developed part of world economy to adhere to certain protectionism, the whole issue of control over capital flow should be critically examined.

The current paper is organized along the following lines. First a brief discussion on the theoretical perspective on capital controls is provided, followed by the ongoing debate in India on this issue. After that Zivot and Andrews unit root test in presence of structural break is performed, and further the long run equilibrium or co-integrated relationship between India's current account balance (CAB) and capital account balance (KAB) in presence of multiple structural breaks is examined. Finally based on the empirical findings and the current scenario, some policy conclusions are drawn, regarding whether full KAC would be a plausible and beneficial measure in the present state of economy.

## **2. Capital Controls: Theory and Evidence**

According to the mainstream open economy macroeconomic theory, if capital controls are withdrawn by a country, the resulting capital movement may affect its current account through various channels, depending on the exchange rate regimes. Wong and Carranza (1999) noted that capital inflow worsens the CAB, both under flexible and fixed exchange rate, though through different routes. On the other hand

the FDI-led growth model induced mainly by the 'Asian tigers' who mostly liberalized capital account as part of unilateral financial deregulation, buoyed by huge external surpluses (RBI, 2004), underline the importance of foreign investment in facilitating economic development (Borensztein, 1998; de Mello, 1997). Sengupta (2007) argued that KAC improves macroeconomic management, as higher degree of capital account openness generates lower inflation rates.

But on the other hand Latin American financial crisis, mainly due to liberal capital account regime, and most notably the East Asian crisis (1997) has made even the IMF and World Bank to subsequently acknowledge the importance of maintaining strict capital control regime in developing countries, at least in the short run.<sup>5</sup> It is evident that without an effective and efficient regulatory framework, capital market liberalization done in haste was the major cause of these crises (Stiglitz 2000).

However, it is also argued that KAC is neither necessary nor sufficient for a foreign exchange crisis (Agarwal, 1998); and financial stability is not guaranteed by either KAC or by capital controls (Vasudevan, 2006). Nonetheless, a number of studies indicate that easing capital inflow can significantly constrain the growth process of a country (Stiglitz, 2006; Podkaminer, 2006; Gonçalves and Teixeira, 2006) and India may not be immune to that process (Chakraborty and Guha, 2006, 2007). There have been a number of studies that imply that the positive impact of capital account liberalization process may depend on the financial structure of the country. And it has been more beneficial for the developed countries rather than the emerging economies (Klein and Olivei, 2008). The main benefits of capital account liberalization for emerging markets appear to be indirect; more related to their role in building other institutions than to the increased financing provided by capital inflows and the positive effect from uncontrolled capital flow evaporate during financial crises (Prasad and Ranjan, 2008)

Inspired mainly by the success of the Asian tigers, in late nineties a discussion on moving towards KAC was initiated in India. The Tarapore Committee appointed to

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<sup>5</sup> RBI (2004) notes that while Global Economic Prospects (World Bank, 1999) favoured a cautious approach in developing countries towards capital accounts liberalization; World Economic Outlook (IMF, 2001) opined that capital controls in the short run paves a strong platform for more fundamental reforms in the future.

facilitate that objective (May 1997) recommended introduction of KAC by 1999-2000 in a phased manner, which caused a major debate for and against KAC. This instigated a long debate and was heavily criticized (EPW, 1997; Rao, 1997). The freer capital regime in India was supported on the argument that the country “must take full advantage of the global changes in capital flows and attract not only more but also high quality investment which has strong links to the domestic economy, export orientation and advanced technology.” (Rangarajan, 2000).

It has been argued that provided the preconditions recommended by the Tarapore Committee are met, India could gradually move towards full convertibility (Jadhav, 2003; Anderson, 2003; RBI, 2004) and equity outflows are not likely to pose any major problems for the economy (Virmani, 2001). The effectiveness of linking liberal capital regime at home with other concern areas (e.g. - labour mobility) as a bargaining tool at the WTO forums has also been explored (Nunnenkamp and Pant, 2003; Hoekman and Saggi, 2000), although the practicability of such a step has been questioned on the ground of India’s limited resource and technology base (Das, 2003). Other studies have expressed reservation against such strategy citing problems of imperfect information, uncertainty and instability associated with KAC (Gupta and Sathye, 2004; Dutt, 2006; Sen, 2006). Moreover Williamson (2006) has pointed out that while India has fulfilled two of the preconditions named by Tarapore Committee; the third one on fiscal discipline is yet to be achieved.<sup>6</sup>

The objective of the present study is two fold. First, it intends to analyze how far KAC in India might affect CAB, given the theoretical relationship between the two, described earlier. Second, it examines the strength of the interrelationship between CAC and KAC in the long run with the presence of multiple endogenous structural breaks.

The current study proposes to contribute to the existing literature in two ways. Firstly most of the existing literature in the above mentioned areas deal with the theoretical aspect of the relation between KAB and CAB, whereas the current paper

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<sup>6</sup> Though fiscal deficit as a percentage of GDP declined in India from 4.5 percent in 2003-04 to 2.6 percent in 2007-08, the same in the aftermath of the global recession has increased to 5.9 percent in 2008-09 and further to 6.5 percent in 2009-10 respectively. Economic Survey (2009-10).

examines it empirically with annual data points from 1970-71 to 2008-09. The logic behind the selection the time frame is to capture both national and internal transitory phases and different economic downturns, starting from oil price shock in early Nineties, debt crisis in Latin America, East Asian Crisis in late Nineties, India's economic liberalization in 1991, 9-11 crisis in 2001 and the latest financial meltdown. As India went for financial sector liberalization in the early 1990's, the recent international financial turmoil is bound to affect Indian economy.

Secondly, the existing empirical works (Chakraborty and Guha, 2006, 2007) examine the interrelationship and the structural break, but do so by considering the break point exogenously through the Chow test. On the contrary, the current paper incorporates the possibility of multiple endogenous structural breaks, estimated through the Bai-Perron test. A simple case with only mean shifts in a linear regression between the current and capital account is considered, where maximum 5 breaks and a trimming value of 0.15 is allowed. With this framework the multiple structural breaks in the cointegrated relation has been examined.

### **3. Changing Policy Environment in India<sup>7</sup>**

After independence in 1947, the mixed economic model provided the building block of a strong indigenous industrial base in the 1950s and 1960s. However this import substitution and licensing approach also resulted in a massive loss of efficiency. The oil price shocks of 1970s and 1980s prompted the government towards some reform measures, which led to a higher growth trajectory in the short run but in the long run created certain macroeconomic imbalances like high fiscal deficit, high current account deficit, high external debt etc. This coupled with the gulf crisis led to a major BOP crisis in 1991 which triggered a long term liberalization of trade policy and the subsequent opening up of the economy.

In the aftermath of the gulf crisis, a new liberalized policy regarding foreign trade, exchange rate etc was introduced. Starting with the July 1991 Budget, there was a clear switch in favour of a move toward outward-oriented, market-based economy. The July 1991 reforms abolished import licensing on most of the items barring certain

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<sup>7</sup> A detailed external sector reform profile of India is provided in Appendix 1.

exceptions.<sup>8</sup> India had one of the most stringent tariff regimes during 1980s. One of the major policy shift after 1991 was the subsequent reduction in tariff rates, which facilitated imports and contributed in worsening CAB.

Since 1991, India has also carried out a substantial liberalization of trade in services. Traditionally, services sectors have been subject to heavy government intervention. As a result service exports from India increased considerably, which contributed in improving CAB. On December 7, 1999, the Insurance Regulatory and Development Authority (IRDA) Bill was passed which established an Insurance Regulatory and Development Authority and opened the door to private entry including foreign investors. Moreover under the 1997 WTO Financial Services Agreement, India committed to permitting 12 foreign bank branches annually. Gradually almost all sectors have been opened up for foreign investment. At present FDI up to 100% is allowed, under the automatic route, in most sectors/ activities. FDI under the automatic route does not require prior approval either by the Government of India or the Reserve Bank of India (RBI). The resultant capital inflow contributed in improving KAB and overall BOP.

Coming to exchange rate regime, Indian exchange rate system over the last few decades has shifted from a par value system to a basket-peg and further to a managed float exchange rate system. The Foreign Exchange Regulation Act (initially enacted in 1947) was placed on a permanent basis in 1957. In terms of the provisions of the Act, the Reserve Bank, and in certain cases, the Central Government controlled and regulated the dealings in foreign exchange payments outside India, export and import of currency notes and bullion, transfers of securities between residents and non-residents, acquisition of foreign securities, etc. The Act was later replaced by a more comprehensive legislation, *i.e.*, the Foreign Exchange Regulation Act (1973), and subsequently by Foreign Exchange Management Act (FEMA) in 2000.

With the breakdown of the Bretton Woods System in 1971 and the floating of major currencies, the rupee was linked to the pound sterling in December 1971. In

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<sup>8</sup> After a series of complaints in the Dispute Settlement Body of the World Trade Organization (WTO), (e.g. - DS 90, DS 149) remaining categories were exempted from the requirement import licensing. Quantitative restrictions on imports of manufactured consumer goods and agricultural products were removed after 2001.

order to overcome the weaknesses associated with a single currency peg and to ensure stability of the exchange rate, the rupee, with effect from September 1975, was pegged to a basket of currencies. The foreign exchange market in India till the early 1990s, however, remained highly regulated with restrictions on external transactions, barriers to entry, low liquidity and high transaction costs. As a stabilisation measure, a two step downward exchange rate adjustment by 9 percent and 11 percent between July 1 and 3, 1991 was resorted to in order to counter the massive drawdown in the foreign exchange reserves, to instil confidence among investors and to improve domestic competitiveness.

A two-step adjustment of exchange rate in July 1991 effectively brought to close the regime of a pegged exchange rate. After the Gulf crisis in 1990-91, the broad framework for reforms in the external sector was laid out in the Report of the High Level Committee on Balance of Payments (under the Chairmanship of Dr. C. Rangarajan). Following the recommendations of the Committee to move towards the market-determined exchange rate, the Liberalised Exchange Rate Management System (LERMS) was put in place in March 1992 initially involving a dual exchange rate system. The LERMS was essentially a transitional mechanism and a downward adjustment in the official exchange rate took place in early December 1992 and ultimate convergence of the dual rates was made effective from March 1, 1993, leading to the introduction of a market-determined exchange rate regime. The dual exchange rate system was replaced by a unified exchange rate system in March 1993, whereby all foreign exchange receipts could be converted at market determined exchange rates. On unification of the exchange rates, the nominal exchange rate of the rupee against both the US dollar as also against a basket of currencies got adjusted downwards, which almost nullified the impact of the previous inflation differential. The restrictions on a number of other current account transactions were also relaxed.

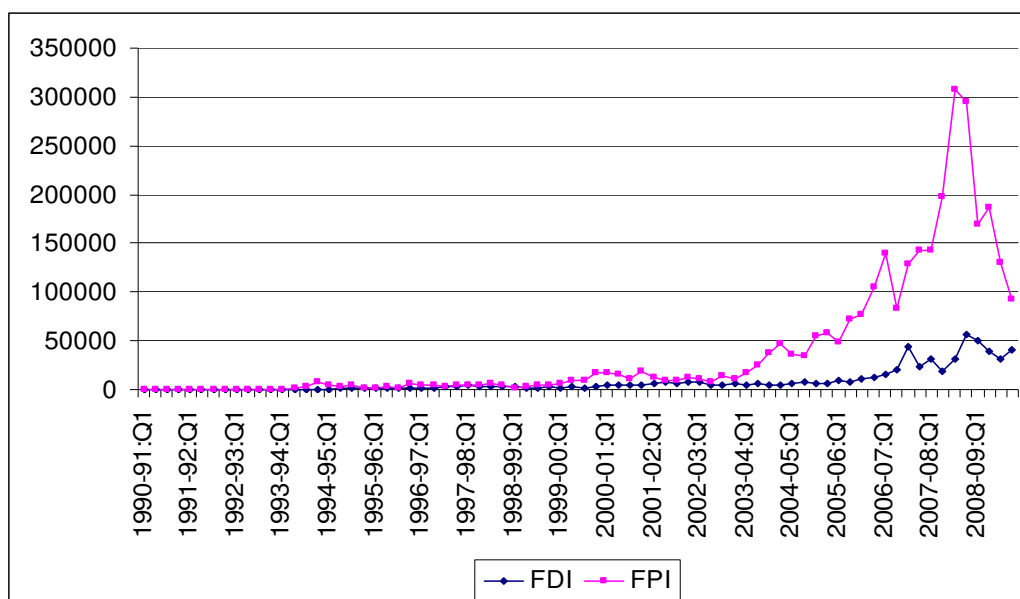
Perhaps motivated by the success of the Asian tigers and buoyed by the positive export response in the aftermath of the devaluation, in late nineties a discussion on moving towards KAC was subsequently initiated in India. The Tarapore Committee appointed to facilitate that objective (May 1997) recommended introduction of KAC by 1999-2000 in a phased manner, after strengthening macroeconomic scenario through fulfilment of three conditions: (1) fiscal consolidation, (2) achieving a mandated inflation target and (3) ensuring a



strengthened financial sector.<sup>9</sup> However, perhaps the Asian crisis and the lack of WTO reform prompted India to move cautiously in this regard (Chakraborty and Guha, 2007).

The evolving macroeconomic framework in India is explained in the following with Figures 1-3. Figure 1 shows the quarterly foreign direct and foreign portfolio investment inflow in India. It is interesting to note that during the recent financial meltdown both FDI and FPI showed a sharp decreasing trend, but the decline in case of portfolio investment is much prominent. Figure 2 shows the foreign institutional is also showing a downward trend since the final quarter of 2007-08. Figures 1 and 2 together indicate the higher investment inflow in India as a result of the liberalized policy framework. Similarly, Figure 3 depicts India's current and capital account balance. While the capital account balance has generally been positive, current account balance remained negative, barring exceptions during 2002-03 and 2003-04. It is apparent from Figure 1 and 3 that there has been a break in the macro relationship during 2003-04, which has been analyzed in details in the next section.

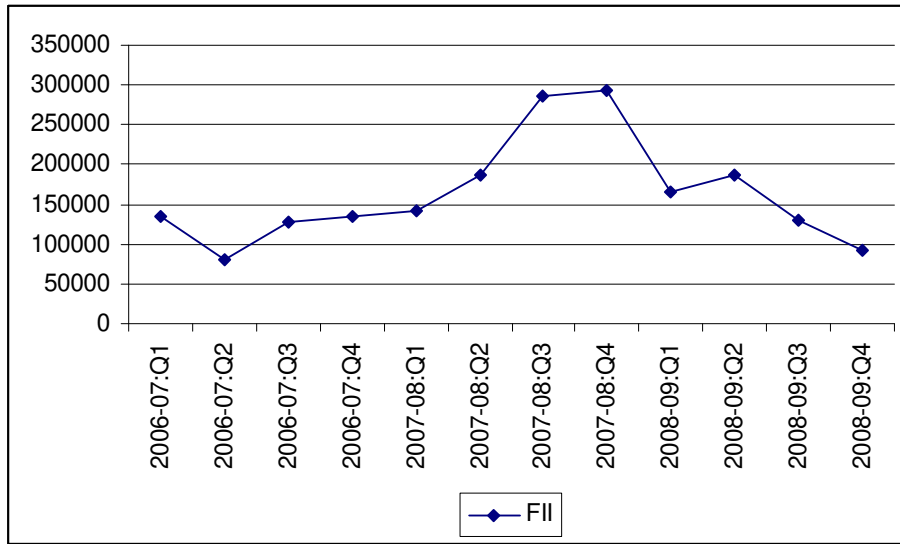
**Figure 1: Quarterly Figures of Foreign Direct Investment and Foreign Portfolio Investment in India - 1990-91 to 2008-09 (Rs Crore)**



Source: Handbook of statistics of Indian Economy, RBI (2009)

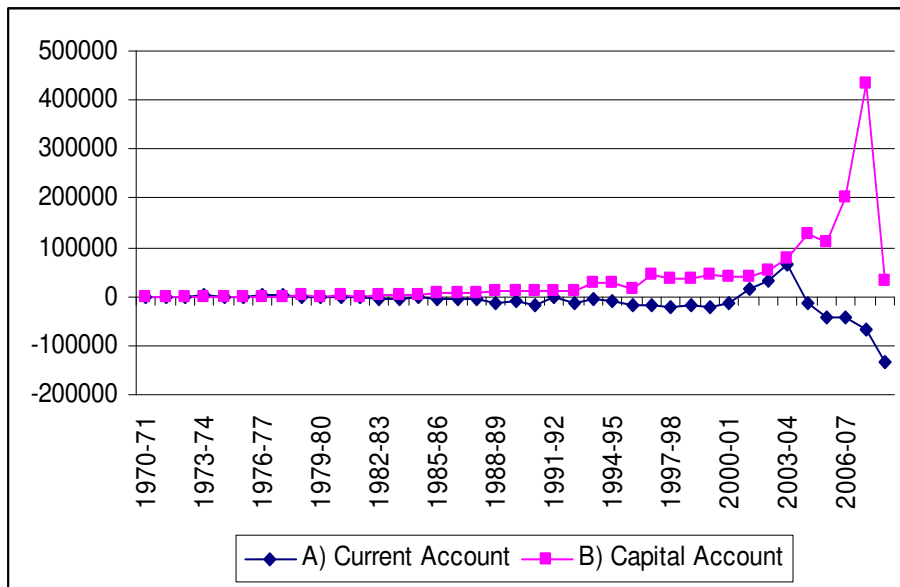
<sup>9</sup> The question of liberalization of capital account has been perceived by India as a continuous process rather than a single event (RBI, 2004).

**Figure 2: Quarterly Figures of Foreign Institutional Investment in India<sup>10</sup>  
(Rs Crore)**



Source: Handbook of statistics of Indian Economy, RBI (2009)

**Figure 3: India's Current and Capital account Balance from 1970-71 to 2008-09  
(Rs Crore)**



Source: Handbook of statistics of Indian Economy, RBI (2001, 2009)

With this background the empirical analysis is conducted in the following section, where the long term relationship between current and capital account balance has been examined.

<sup>10</sup> Due to discrepancy in data FII figures are taken from 2006-07 first quarter only.

#### 4. Methodology and Empirical Analysis

##### *Data*

Annual data over the period 1970-71 to 2008-09 are used to examine the long run equilibrium or cointegrated relationship between current account (CA) and capital account (KA) for the Indian economy. The data has been compiled from Handbook of Statistics on Indian Economy (2008-09), published by Reserve Bank of India. All the variables are calculated in home currency price (Rupees Crores).

##### *Unit Root Test*

The main motivation behind the unit root test lies on whether the time series are affected by temporary or permanent shocks. Traditionally, the stationary properties of variables are examined by using Augmented Dickey Fuller (ADF) (1979) unit root test. This test involves estimating the following equation:

$$\Delta y_t = (\phi - 1)y_{t-1} + \sum_{j=1}^k \delta_j \Delta y_{t-j} + \varepsilon_t \quad (1)$$

where  $\varepsilon_t \sim \text{WN}(0, \sigma^2)$  and then testing for the significance of  $(\phi - 1)$ .

Sometimes many series contain a drift parameter and a linear trend, and then testing methodology has to be extended in following way. Here we test for the significance of the coefficient  $(\phi - 1)$  associated with  $y_{t-1}$  in the following regression:

$$\Delta y_t = \beta_0 + \beta_1 t + (\phi - 1)y_{t-1} + \sum_{j=1}^k \delta_j \Delta y_{t-j} + \varepsilon_t \quad (2)$$

where,  $\beta_0$  is the drift parameter.

However, as suggested by Perron (1989), the standard unit root tests are biased towards the non-rejection of null hypothesis in the presence of structural breaks. ‘Most macroeconomic time series are not characterized by the presence of a unit root. Fluctuations are indeed stationary around a deterministic trend function. The only ‘shocks’ which have had persistent effects are the 1929 crash and the 1973 oil price shock’ (Perron, 1989, p.1361). This is an important finding, especially because the span of time series in any empirical work is usually long enough to have had structural breaks. Given the strong likelihood that the series under consideration are

subject to structural breaks, the standard unit root tests for stationarity are likely to yield misleading conclusions. Perron's (1989) procedure is characterized by a single exogenous (i.e., known) break in accordance with the underlying asymptotic distribution theory.

Given a known structural break that is assumed to be given exogenously, Perron has proposed a modified ADF test for a unit root in the noise function with three different types of deterministic trend function. The time of a structural change is referred to as  $T_B$  ( $1 < T_B < T$ ). First, the *crash* model, Model A, allows for a one-time change in the intercept of the trend function.

$$\Delta y_t = \mu^A + \theta^A DU_t + \beta^A t + \alpha^A D(TB)_t + (\phi^A - 1)y_{t-1} + \sum_{j=1}^k \delta_j \Delta y_{t-j} + a_t \quad (3)$$

$$\text{where } DU_t = 1 \text{ if } t > T_B \\ = 0 \text{ otherwise;}$$

$$D(TB)_t = 1 \text{ if } t = T_B + 1 \\ = 0 \text{ otherwise,}$$

$$\text{and } a_t \sim \text{iid}(0, \sigma^2).$$

The *changing growth* model, Model B, allows for a change in the slope of the trend function without any sudden change in the level at the time of the break.

$$\Delta y_t = \mu^B + \theta^B DU_t + \beta^B t + \gamma^B D(TS)_t + (\phi^B - 1)y_{t-1} + \sum_{j=1}^k \delta_j \Delta y_{t-j} + a_t \quad (4)$$

$$\text{where } D(TS)_t = t - T_B \text{ if } t > T_B \\ = 0 \text{ otherwise.}$$

And both effects are allowed in the Model C.

$$\Delta y_t = \mu^C + \theta^C DU_t + \beta^C t + \gamma^C DT_t + \alpha^C D(TB)_t + (\phi^C - 1)y_{t-1} + \sum_{j=1}^k \delta_j \Delta y_{t-j} + a_t \quad (5)$$

$$\text{where } DT_t = t \text{ if } t > T_B \\ = 0 \text{ otherwise.}$$

The null hypothesis of a unit root is different, since the deterministic trend function includes dummy variables. The alternative hypothesis is a broken-trend stationary system, which also incorporates the same dummy variables.

Perron's (1989) method of exogenous break point treatment has been criticized by Christiano (1992) and later by Zivot and Andrews (1992) on the ground that the choice of break point is based on pretest examination of the data and hence is subject to the problem of "data-mining". Using prior information to set the break point on the series has the important consequence of overstating the likelihood of the trend-break alternative hypothesis. Unit root test against a single-break stationary alternative was proposed by Zivot and Andrews (1992). Their test on endogenous structural break is a sequential test that uses a different dummy variable for each possible break date. They viewed the determination of the break point  $\lambda = T_B/T$  as the outcome of an estimation procedure designed to fit  $y_t$  to an alternative hypothesis, which stipulates that  $y_t$  can be represented by a trend stationary process with a single break in trend occurring at an unknown point of time. Their approach is to choose that  $\lambda$  which minimizes the unit root test statistic computed from the regressions given in (3) through (5). The lag length  $k$  is selected by employing the BIC lag selection criteria. The critical values in Zivot and Andrews (1992) are different to the critical values in Perron (1989).

## **5. Results**

### *Unit Root Test*

Tables 1 and 2 contain the results for the Zivot-Andrews test with one endogenous structural break. The results suggest that the null hypothesis of a unit root can be rejected for current account in levels. In other words, the series current account is stationary in the presence of endogenous structural break at 5% level of significance. However, if we take the first differences, the unit root null for capital account can also be rejected at 1% level; suggesting thereby that this series is integrated of order 1, i.e., I(1). A careful observation on both the series reveals that the estimated breakpoint happens to be during 2002-03, which may be due to the delayed effect of the major financial crisis which happened in 2001-02, and the subsequent policy measures adopted by Government of India and RBI to stabilize the system.

**Table 1: Zivot-Andrews (1992) Unit Root Tests for Model C [At Levels]**

Series	Break Point	Test Statistic	Critical Values at 1%	Critical Values at 5%	Result
CA	2002	-5.35301*	-5.57000	-5.08000	Stationary
KA	2003	-1.18839	-5.57000	-5.08000	Unit Root

Note: \* indicates significance at 5% level

**Table 2: Zivot-Andrews (1992) Unit Root Tests for Model C [At First Difference]**

Series	Break Point	Test Statistic	Critical Values at 1%	Critical Values at 5%	Result
KA	2002	-7.85609**	-5.57000	-5.08000	I(1)

Note: \*\* indicates significance at 1% level

### *Cointegration Test*

After determining the order of integration of each variable, cointegration is tested to find out whether any long-run relationship exists among the variables and if so; the nature of the relationship. Standard cointegration techniques are biased towards accepting the null of no cointegration, if there is a structural break in the relationship and may produce ‘spurious cointegration results’ (Kunitomo, 1996). Therefore Gregory and Hansen (1996) cointegration procedure that allows for an endogenously determined structural break is applied in the current analysis. The test presents three models, whereby the shifts can be in either the intercept alone (C):

$$y_{1t} = \mu_1 + \mu_2 \varphi_{1t} + \alpha^T y_{2t} + e_t, \quad t = 1, \dots, n \quad (6)$$

in both trend and level shift (C/T):

$$y_{1t} = \mu_1 + \mu_2 \varphi_{1t} + \beta t + \alpha^T y_{2t} + e_t, \quad t = 1, \dots, n \quad (7)$$

and a full break or the regime shift model (C/S):

$$y_{1t} = \mu_1 + \mu_2 \varphi_{1t} + \alpha_1^T y_{2t} + \alpha_2^T y_{2t} \varphi_{1t} + e_t, \quad t = 1, \dots, n \quad (8)$$

In terms of the present model,  $y_{1t}$  and  $y_{2t}$  are the (log) of exports and imports respectively;  $\mu_1, \beta_1$  and  $\alpha_1$  are the intercept, trend coefficients and slope coefficients respectively before the regime shift and  $\mu_2, \beta_2$  and  $\alpha_2$  are the corresponding changes after the break. The dummy variable  $\varphi_{t\tau}$  is defined as:

$$\varphi_{t\tau} = \begin{cases} 0, & \text{if } t \leq [\eta\tau] \\ 1, & \text{if } t > [\eta\tau] \end{cases} \quad (9)$$

where the unknown parameter  $\tau \in (0,1)$  denotes the (relative) timing of the change point, and  $[\ ]$  denotes the integer part.

Following the procedure suggested by Herzer and Felicitas (2006), the models represented by equations 6 – 8 are estimated for each possible break date in the data set (for each  $\tau$ ). Then we perform a unit root test on the estimated residuals  $\hat{e}_{t\tau}$  and the smallest value of the unit root test statistics are used for testing the null hypothesis of no cointegration between current account and capital account, against the alternative hypothesis of cointegration in the presence of an endogenous structural break. The asymptotic critical values are tabulated in Gregory and Hansen (1996). The result and the critical values are reported in Table 3.

**Table 3: Gregory and Hansen (1996) Cointegration Tests with Structural Break**

Model	Break Point	Test Statistic	Critical Value (5%)	Result*
C <sup>11</sup>	2003	-1.79673	-4.61	Do not reject the null hypothesis
C/T <sup>12</sup>	2003	-1.65625	-4.99	Do not reject the null hypothesis
C/S <sup>13</sup>	1997	-1.80769	-4.95	Do not reject the null hypothesis

\*The null hypothesis being no Cointegration between current account and capital account

The result fails to reject the null hypothesis of no cointegration at 5% level of significance. The break regime shifts during 2003 in Table 3, as established by the Gregory and Hansen (1996) procedure correspond with the widening current account surplus in 2003 followed by a continued phase of current account deficit and

<sup>11</sup> C = CONSTANT that includes an intercept and a level shift dummy.

<sup>12</sup> C/T = TREND that includes an intercept, trend and a level shift dummy.

<sup>13</sup> C/S = FULLBREAK that includes no trend, but dummies for the intercept and the slopes.

increasing capital account surplus. The current account surplus may be attributed to the comparatively lower fiscal deficit among other measures.

One limitation of this test is that it assumes that the number of breaks in the cointegrating relationship is endogenous but strictly one. Yet, other break dates may be possible for the current account – capital account cointegration relationship: for instance the balance-of-payment crisis during 1990-91, the impact of East Asian currency crisis during 1997-98, the 9/11 attacks in United States and an unprecedented appreciation in rupee during 2007-08. The test that allows multiple endogenous structural breaks was proposed by Bai and Perron (1998, 2003). The existence of multiple structural breaks is important particularly in long run time series relationship where different factors might affect the behaviour of the cointegrating relationship in different time periods.

In order to capture that aspect in our analysis, the following multiple regressions with  $m$  breaks ( $m + 1$ ) regimes is considered:

$$y_t = x_t' \beta + z_t' \delta_j + u_t, \quad t = T_{j-1} + 1, \dots, T_j, \quad (10)$$

for  $j=1, \dots, m+1$ . In this model,  $y_t$  is the observed dependent variable at time  $t$ ; both  $x_t$  ( $p \times 1$ ) and  $z_t$  ( $q \times 1$ ) are vectors of covariates and  $\beta$  and  $\delta_j$  ( $j=1, \dots, m+1$ ) are the corresponding coefficient vectors;  $u_t$  is the error term at time  $t$ ;  $T$  is the number of observations and  $T_0 = 0$  and  $T_{m+1} = T$  by convention. The break points ( $T_1, \dots, T_m$ ) are explicitly treated as unknown. The purpose is to estimate the unknown regression coefficients together with the break points when  $T$  observations on  $(y_t, x_t, z_t)$  are available. Here the optimal number of breaks and their timings are computed using the dynamic programming search algorithm as proposed by Bai and Perron (2003).

Given the number of breakpoints, the algorithm involves finding a global minimizer of the residual sum of squares (RSS) or Bayesian Information criteria (BIC) over all possible combinations of upto  $m^*$ . As observed by Bai and Perron (2003), “When no serial correlation is present in the errors but a lagged dependent variable is present, the BIC performs badly when the coefficient on the lagged dependent variable is large. In such cases, the LWZ performs better under the null of



no break but underestimate the number of breaks when some are present. The method suggested by BP is based on the sequential application of the  $\sup F_T (l+1|l)$  test using the sequential estimates of the breaks.....” (Bai and Perron, 2003, p. 15).

The results of Bai and Perron (2003) test of multiple break points is reported in Table 4 in the following. A simple case with only mean shifts in a linear regression between the current and capital account is considered, where maximum 5 breaks and a trimming value of 0.15 is allowed. With the assistance of information criteria BIC, it may be concluded that two break points are preferred in the cointegrating relationship during 2003 and 1994. It may be noted here that while there are possibilities of the existence of multiple breaks in the cointegrating relationship as is evident from Table 4, only two break points have emerged as statistically significant.

**Table 4: Bai and Perron (2003) Test of Multiple Break Points**

No. of Breaks	RSS	Break Point	BIC	LWZ <sup>14</sup>
0	26507987648.222332	N/A	20.43	20.48*
1	24745297104.093025	2003	20.46	20.56
2	19012630622.487408	2003, 1994	20.38*	20.58
3	18790374206.649902	2003, 1994, 1999	20.56	20.86
4	8753474504.158287	2003, 1994, 1999, 1990	20.74	21.16
5	18749061976.663944	2003, 1994, 1999, 1990, 1979	20.93	21.46

Note: Optimum break point selected on information criteria is shown with a \*

## 6. Interpretation of the Empirical Findings

The two most notable observations obtained from the empirical section have been the absence of long term relationship between CAB and KAB and the presence of a significant structural break during 1993-94 and 2003-04.

The presence of the structural break in 1993-94 is expected, as rupee was allowed to float in that year and exchange rate started to get determined by the demand and supply of foreign exchange in the domestic market.

<sup>14</sup> LWZ denotes Liu et.al. (1997) modified Schwarz criterion.

The reporting of a structural break in 2003-04 may however seem counter-intuitive on the face value, but a closer analysis of the macroeconomic events, in India and abroad, since 2001 provides a logical explanation. The post September 11 financial crisis, the consequent increase in government expenditure in the US economy and the declining fiscal deficit in Indian economy may be cited as some contributory forces behind this observed structural break. On the other hand the year 2003-04, though characterised by major policy changes in exchange rate mechanism, is a year with comparatively lower fiscal deficit with respect to the previous years, and a substantial positive current account balance. This reinforces the working of the twin deficit phenomenon in Indian yearly data.<sup>15</sup>

On the other hand the absence of any long term relationship between CAB and KAB implies that, the capital account liberalization which is often argued to generate enough surplus to finance the trade deficit may not work accordingly in the Indian context. There are two major possible routes through which uncontrolled capital flow can cause a shock in the Indian market.

Firstly, if huge amount of capital inflow in the country causes excess supply of the foreign exchange, money would appreciate at a level which can be detrimental for the exporters, which precisely happened in mid 2007. On the other hand if RBI intervenes in the FOREX market and absorbs the excess supply of foreign exchange, after a point it might pose a threat. An increase in FOREX asset implies an increase in liabilities, as foreign exchange reserves are nothing else but IOUs of other countries. Excessive reserve accumulation is a problem also because of its negative balance of payments implications. Investors bringing in the capital earn minimum returns of around 7 percent. The maximum would be many multiples of that, especially from capital gains associated with investments in the stock market. These returns have to be paid out in foreign exchange. On the other hand, when the dollar flowing into the country are acquired by the RBI and invested through central and commercial banks, the returns are much lower.

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<sup>15</sup> It should also be noted that a bivariate model is considered in the present study. Role of excluded variables like fiscal deficit, interest rate differential etc. has not been considered. In a multivariate model allowing for multiple structural breaks, the working of the twin deficit phenomenon might turn out to be explicit. The potential interrelationship of the KAB series with fiscal deficit or interest rate differential in the Indian scenario has earlier been reported (Chakraborty and Guha, 2007)

Conversely if in a certain point capital starts to flow out of the country, (as witnessed during 2008-09, which reported a negative FII figure), the absence of capital control can lead to a major crisis (similar to East Asian crisis mechanism). Though Indian economy has fared extremely well despite the grim global financial condition in recent past, one plausible reason may be the low share of export in GDP. Thus it is not the openness of the economy rather the lower dependence on export and FII, which was negative for four consecutive quarters in 2008-09 contributed towards the comparatively high growth rate in the turbulent era.

The policy conclusions of the paper can therefore be summarized as follows. Firstly, though there is no evident long run relation obtained between CAB and KAB, but that can not be furthered as an argument in favour of following a path of KAC. If capital account is liberalized today, the dependence on foreign capital may increase alarmingly, and hence any external shock may cause a magnified effect on Indian economy. Secondly, Indian financial institutions are still not ready for full capital account convertibility, which underlines the need to follow a cautious approach in this regard. Thirdly, from 2000-01 to 2008-09 the share of foreign portfolio investment has increased from 25.09 percent to 42.10 percent of total capital balance (credit side). In that comparison the FDI inflow performance is much weaker, with the corresponding figures of 7.44 percent and 11.60 percent. Clearly, the volatile nature of capital inflow presents an alarming trend and if this trend continues, liberalizing capital control may lead to huge dependence on foreign portfolio capital.

A multivariate analysis considering fiscal deficit, interest rate differentials, and others factors of openness as endogenous variables can be proposed as an area of future research, which can give more holistic views and understanding regarding the long term effect of KAC on Indian economy.

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## Appendix 1: Major External Sector Policy Changes by India

Year	Policy
1991-92	<ul style="list-style-type: none"> <li>• July-Aug 1991 witnessed a major change in trade policy, towards diluting import licensing.</li> <li>• A new BOP adjustment strategy was put in place which included <b>exchange rate management</b>, fiscal correction and structural reform in industrial policy.</li> <li>• Exchange rate was adjusted downwards of about 18% of the external value of rupee, in two steps.</li> <li>• Foreign investment policy was liberalized to permit automatic approval up to 51% in 34 countries.</li> </ul>
1992-93	<ul style="list-style-type: none"> <li>• A new system of exchange rate, namely <b>Liberalized Exchange Rate Management System (LERMS)</b> was introduced, as a transitional arrangement towards a unified exchange rate with current account convertibility.</li> <li>• <b>LERMS was a dual exchange rate system</b></li> <li>• Receipts and payments under capital account continued to be subject to controls.</li> <li>• FIIs including pension fund, mutual funds etc were allowed under the condition that they should register with SEBI, and obtain RBI approval under FERA.</li> <li>• FERA has been liberalized, as a result of which companies with more than 40% foreign equity were treated on par with fully Indian-owned companies.</li> </ul>
1993-94	<ul style="list-style-type: none"> <li>• <b>Rupee was allowed to float.</b></li> <li>• Banks were permitted to deploy funds held in foreign currency accounts of their customers in certain kinds of overseas investment.</li> </ul>
1994-95	<ul style="list-style-type: none"> <li>• The Foreign Currency Non Resident Account (FCNRA) for which the RBI and the government has been bearing the exchange rate risk was abolished in August 1994.</li> <li>• 1994-95 budgets moved further towards current account convertibility, and accordingly RBI announced relaxation in payment restrictions in the cases of a number of invisible transaction.</li> </ul>
1996-97	<ul style="list-style-type: none"> <li>• <b>In January 1997 RBI announced some major relaxation in exchange control. The monetary ceilings prescribed for remittance of foreign exchange for a wide range of purpose was abolished.</b></li> </ul>
1997-98	<ul style="list-style-type: none"> <li>• The process of current account liberalization was carried forward further in 1997-98. The measures include:</li> <li>• greater flexibility in the Exchange Earner Foreign Currency (EEFC) accounts held by exporters,</li> <li>• more liberal indicative</li> <li>• modification in the exchange control regulations governing remittances by exporters and importers in respect of advance payments against exports, refund of export proceeds, etc</li> <li>• greater flexibility for remittances for purchases of foreign services by residents.</li> </ul>
1998-99	<ul style="list-style-type: none"> <li>• <b>‘The Committee on Capital Account Convertibility’ recommended that the implementation of capital account convertibility should be spread over 1997-98 to 1999-2000.</b></li> <li>• Major shift in FDI and FII policies took place in 1998-99. Among other measures “Credit Card Business” and “Money Changing Business” are included in FDI permissible under Non-Banking Financial Services. FII</li> </ul>

	from NRI investors were given special consideration and a change in external commercial borrowing guideline took place.
1999-2000	<ul style="list-style-type: none"> <li>• <b>Foreign Exchange Management Act, 1999 was passed to replace FERA.</b> Its provisions are in conformity with a liberalized market for foreign exchange.</li> <li>• Foreign equity limit for FDI through automatic route for drugs and pharmaceuticals rose to 74 per cent (from 51%).</li> </ul>
2001-02	<ul style="list-style-type: none"> <li>• The world economy experienced one of the worst shocks in the aftermath of September 11, 2001 events in the United States.</li> <li>• In order to stabilize domestic financial markets, the RBI announced some measures during the period September 15-25, 2001.</li> </ul>
2003-04	<ul style="list-style-type: none"> <li>• The exchange rate management policy continues its focus on smoothing excessive volatility in the exchange rate with no fixed rate target, while allowing the underlying demand and supply conditions to determine the exchange rate movements over a period in an orderly way.</li> <li>• <b>The Union Budget 2003-04 announced further measures towards capital account convertibility.</b></li> <li>• <b>Non resident schemes were made fully convertible. Foreign exchange allowance to individuals was increased up to US\$ 10,000. Capital controls were liberalized with a view to introduce greater flexibility in capital account transactions.</b></li> <li>• Policy initiatives were taken to further liberalize cross border capital flows in the area of foreign investment and external commercial borrowing and current account transactions.</li> </ul>
2005-06	<ul style="list-style-type: none"> <li>• <b>The Tarapore Committee submitted its report on July 31st, 2006.</b> It detailed a five year time frame for movement towards fuller convertibility in three phases</li> </ul>
2006-07	<ul style="list-style-type: none"> <li>• <b>To liberalize capital flow further both inflow and outflow policies were undertaken regarding increase in the overseas investment limits, higher portfolio investment limits for Indian companies as well as for domestic mutual funds, higher ceiling for FIIs in Government securities and enhanced repayment limits for the external commercial borrowings.</b></li> </ul>
2008-09	<ul style="list-style-type: none"> <li>• During 2008-09 despite the global financial meltdown, RBI carried on with the measures to liberalize capital account in accordance with the Tarapore Committee recommendations. Especially measures were taken to strengthen inflows under equity route.</li> <li>• The ECB policy which was tighten in 2007 was relaxed due to the drying up of capital inflow.</li> <li>• Measures such as raising the interest rate ceilings on FCNR(B) and NR(E)RA deposits, allowing Indian banks to borrow more funds from their overseas branches and corresponding banks were taken to cope up with the liquidity crunch in the domestic market.</li> </ul>
2009-10	<ul style="list-style-type: none"> <li>• The broad ECB policy stance towards liberalization continued during the first half of 2009-10. However, it has been decided to roll back some of the policy measures which were introduced against the backdrop of tightness in financial markets during the period of financial crisis. These policy measures have become effective from January 1, 2010.</li> </ul>

Source: Various issues of Economic Survey (Ministry of Finance, Government of India)