Causal Relationships between the Capital Account and the Current Account: an empirical investigation from India

Bhavesh Garg [a] and Prabheesh K. P.[b]

Corresponding author. E-mail: bhaveshgarg89@gmail.com

[a] Research Scholar, Department of Liberal Arts, Indian Institute of Technology, Hyderabad-502285.
[b] Assistant Professor of Economics, Department of Liberal Arts, Indian Institute of Technology, Hyderabad-502205.

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This article provides an empirical investigation of the causal relationship between the current account (CA) and the capital account (KA) in the case of Indian economy. The results indicate the non-existence of causal relationship between the CA and the KA. Furthermore, we examine the causal relations between the components of the KA and the CA along with exchange rate as the linking factor between them. The causal findings, in the above mentioned case, show different results. Our finding suggests that there exist a causal relationship from Non debt flows to the CA via the real effective exchange rate. This implies that decomposition of the KA helps in identifying the source of flows that drives the CA the most. The results also indicates that volatile capital flows may deteriorate the CA balance and therefore, emphasis should be laid on improving the soundness of the financial sector before moving towards the full KA convertibility.

I. Introduction

Over the last two decades, there have been significant policy measures towards the capital account (KA) liberalization, especially in the case of emerging economies. Although the KA liberalization is expected to increase savings and investment, and thereby higher economic growth[1], it could lead to deterioration of the current account (CA) in the absence of a well-established financial system (Yan, 2005, 2007). High capital inflows due to the liberalization in the KA may lead to real exchange rate appreciation of the domestic currency, loss of export competitiveness and subsequently leads to the CA deficit (Cooper, 2001; Kim *et al.*, 2004; Prasad and Rajan, 2008). Therefore, the direction of causality between the KA and the CA assumes greater policy implications. It is argued that if there is a unidirectional causality from the KA to the CA, then the country must be cautious in removing KA restriction as it leads to the deterioration of the CA balance. However, if there is a unidirectional causality from the CA to the KA or an absence of causality in either direction, then the KA liberalization process will not have any adverse effect on the CA.

The existing literature does not give adequate attention to examine the causal relationship between the KA and the CA, even the available studies show mixed results. Studies by Wong and Carranza (1999) and Ersoy (2011) found a unidirectional causality running from the KA to the CA in the case of Argentina and Mexico, and Turkey, respectively. However, Faroque and Veloce (1990) and Kim and Kim (2011) found a bidirectional causality in the case of Canada and Korea, respectively. Yan (2005) found causality running from the CA to the KA in the case of developed countries whereas in the case of emerging economies the causality runs the other way around.

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[1] Prasad *et al*. (2004) discussed the impact of KA liberalization on economic growth and other macroeconomic factors. Other studies include Wang (1990) and Klein (2003).

Some of the above studies further tried to identify the sources of the CA deficit by considering the different components of the KA. For instance, Yan (2007) found that foreign portfolio investment (FPI) causes the CA deficits in the case of Mexico while foreign direct investment (FDI) causes the CA deficits in the case of Philippines and Canada.

Given that the growing KA surplus coincides with the CA deficit in the Indian case[2], the article tries to examine the causal relationship between the KA and the CA in India. This study contributes to the literature in several respects. First, this is the first study that attempts to find the causal relationship between the CA and the KA in the Indian context. Second, the present study uses a multivariate framework to avoid the distortion of the causality inferences that could result from the omission of relevant variables. Finally, it also tries to identify the sources of the CA deficit in India by decomposing the KA into different sub-accounts such as Non-debt flows (NDF), Debt flows (DF), FPI and FDI. The remainder of this article is organized as follows. Section II deals with the methodology of the empirical tests and data. Section III presents the results. Section IV concludes.

II. Methodology of the Empirical Tests and Data

The present study analyzes the causal relationship between the KA and the CA by applying the Modified Wald (MWALD) Granger causality test proposed by Toda and Yamamoto (1995). The advantage of using this method as compared to simple unrestricted Vector Auto Regression (VAR) is that this test is applicable even if the VAR is stationary, integrated of an arbitrary order, or cointegrated of an arbitrary order (Toda and Yamamoto, 1995).

The MWALD test estimates the $(m+d_{max})$th-order VAR model while simultaneously imposing restrictions on the first m coefficient matrices ignoring the last d_{max} lagged vectors in the model.

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[2] India's CA has been persistently in deficits for most of the period since 1990s, while on the other hand the KA has been in surplus during this period.

The inference of the null hypothesis follows a χ^2 distribution and uses m degrees of freedom, instead of $m+d_{max}$.

Following Yan (2005, 2007) and Kim and Kim (2011) we include real effective exchange rate along with the CA and the KA to estimate the following system of equations.

$$CA_t = \alpha_1 + \sum_{i=1}^{m+d_{max}} \beta_{1i} KA_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{1i} CA_{t-i} + \sum_{i=1}^{m+d_{max}} \delta_{1i} REER_{t-i} + \varepsilon_{1t} \qquad (1)$$

$$KA_t = \alpha_2 + \sum_{i=1}^{m+d_{max}} \beta_{2i} KA_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{2i} CA_{t-i} + \sum_{i=1}^{m+d_{max}} \delta_{2i} REER_{t-i} + \varepsilon_{2t} \qquad (2)$$

$$REER_t = \alpha_3 + \sum_{i=1}^{m+d_{max}} \beta_{3i} KA_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{3i} CA_{t-i} + \sum_{i=1}^{m+d_{max}} \delta_{3i} REER_{t-i} + \varepsilon_{3t} \qquad (3)$$

where CA, KA and REER are the current account, the capital account and the real effective exchange rate, respectively; ε the serially uncorrelated random errors; m the optimal lag length and d_{max} the maximum order of integration. The present study estimates three sets of system of equations. First, we estimate the above broad system of equations, that is, equations 1—3. Second, we estimate the above equations by decomposing the KA into DF and NDF. Third, we further decompose NDF into FPI and FDI based on the findings from second estimation.

We utilize quarterly data covering from 1990Q1 to 2011Q4. Data have been drawn from the *Database on Indian Economy* of the Reserve Bank of India. All variables are measured in real terms and scaled down by the Gross Domestic Product (GDP). The real effective exchange rate (REER) is proxied by the monthly average index of the Indian rupee (36-currency trade based weights).

III. Empirical Results and Discussion

Table 1 shows the stationary properties of the variables based on Philips-Perron (PP) unit root test. The results suggest that the CA and the KA are stationary at level, whereas the REER is stationary at first difference. Thus, the results indicate that the maximum order of integration is 1, $I(1)$. Hence, in the subsequent analysis the maximum order of integration is treated as 1 (i.e. $d_{max} = 1$).

Table 1. Results of Unit Root Test

Variables	At Level	At First Difference
CA	-3.96*	-19.49*
KA	-3.10*	-22.38*
REER	-0.36	-8.32*

Note: * denote rejection of a unit root at 1% level.

Causal relationship between CA, KA and REER

Once the maximum order of integration is identified, we need to select appropriate lag lengths for the VAR model. The log-likelihood ratio (LR) test suggests the optimal lag as 4, where VAR is found to be stable and no autocorrelation is detected among residuals. Hence, we choose $m = 4$ and $d_{max} = 1$ in order to apply MWALD test. The results of the Granger causality test are reported in Table 2 and it show that the null hypothesis of KA Granger-causes CA and vice-versa cannot be rejected, implying no causal relation between them. This also implies that the information contained in the lagged values of the KA does not improve the predictability of the CA and vice-versa. However, there is evidence of a unidirectional causality running from the REER to the KA.

Table 2. Granger Causality Test on CA, KA and REER

Lagged Variables	Dependent Variables		
	CA	KA	REER
CA		4.06(0.39)	0.43(0.98)
KA	2.06(0.72)		6.16(0.18)
REER	6.10(0.19)	10.04(0.03)**	

Notes: CA is current account, KA is capital account and REER is real effective exchange rate. The test results are based on $m = 4$ and $d_{max} = 1$. The numbers in the parentheses beside the MWALD test statistics are the *p*-values. *, ** and *** represents the 5% significance level.

Causal relationship between CA, REER, NDF and DF

Since we cannot establish a causal relationship between the KA and the CA, we further investigate the possibility of causality between the CA and the two major components of the KA, that is, DF and NDF[3]. Hence, a VAR model with CA, NDF, DF and REER is estimated and the results are reported in Table 3.

Table 3. Granger Causality Test on CA, NDF, DF and REER

Lagged Variables	Dependent Variables			
	CA	NDF	DF	REER
CA		3.75(0.44)	4.09(0.39)	0.92(0.92)
NDF	9.92(0.04)**		4.45(0.35)	10.99(0.02)**
DF	4.14(0.38)	3.43(0.48)		3.58(0.47)
REER	9.60(0.04)**	7.92(0.09)***	2.30(0.68)	

Notes: CA is current account, NDF is non-debt flows, DF is debt-flows and REER is real effective exchange rate. The test results are based on $m = 4$ and $d_{max} = 1$. The numbers in the parentheses beside the MWALD test statistics are the *p*-values. ** and *** represent the 5% and 10% significance levels, respectively.

The results show that NDF Granger-causes the CA and the REER. Similarly the REER Granger-causes the CA and NDF. These findings establish a unidirectional causality running from NDF to

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[3] Unit root test results suggest that both DF and NDF are stationary at levels at 1% significance level.

the CA via the REER. This implies that an increase in non-debt inflow causes the rupee to appreciate and this appreciation leads to the deterioration of the CA balance.

Causal relationship between CA, FDI and FPI, DF and REER

Since we find a causality running from NDF to the CA in the previous estimation, we further decompose NDF into FDI and FPI and follow the same estimation procedure[4]. The results are reported in Table 4.

Table 4. Granger Causality Test on CA, FDI, FPI, DF and REER

Lagged Variables	Dependent Variables				
	CA	FDI	FPI	DF	REER
CA		2.36(0.67)	4.28(0.37)	4.38(0.36)	1.11(0.89)
FDI	0.86(0.93)		17.46(0.00)*	2.02(0.73)	7.90(0.09)***
FPI	8.67(0.06)***	9.85(0.04)**		3.61(0.46)	9.37(0.05)***
DF	3.75(0.44)	6.51(0.16)	1.67(0.79)		2.92(0.57)
REER	8.16(0.08)***	4.12(0.38)	8.37(0.07)***	2.45(0.65)	

Notes: CA is current account, FDI is foreign direct investment, FPI is foreign portfolio investment, DF is debt-flows and REER is real effective exchange rate. The test results are based on $m = 4$ and $d_{max} = 1$. The numbers in the parentheses beside the MWALD test statistics are the *p*-values. *, ** and *** represent the 1%, 5% and 10% significance levels, respectively.

The results show that FPI Granger-causes the CA and the REER. Similarly the REER Granger-causes the CA and FPI. This implies that an increase in FPI leads to the rupee appreciation and hence the deterioration of the CA balance. The results also show a bidirectional causality between FPI and FDI, and a unidirectional causality from FDI to REER.

To sum up, our overall empirical findings show that separating the KA into different components helps to find a significant causality from the KA to the CA in the Indian context. The results suggest that NDF especially, FPI Granger-causes the CA via the REER. This implies that

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[4] Unit root test results suggest that both FDI and FPI are stationary at levels at 1% significance level.

the lagged values of NDF, or more specifically FPI, improves the predictability of the CA, while the aggregate KA cannot. As Yan (2007) pointed out, each component of the KA might be a substitute or a complement to one or the other variables and hence the aggregate KA might weaken or enhance the causal relationship between the KA and the CA due to the cancelling-out or the adding-up effect. Almost similar results are reported by Lau and Fu (2011) and Yan (2007).

IV.   Conclusions

This article examines the causal relationship between the KA and the CA in the Indian context. Our empirical findings suggest that there is a unidirectional causality running from NDF, especially FPI, to the CA. These findings suggest that the volatile components of capital flows deteriorate the CA balance of the country. Therefore, emphasis should be laid on improving the soundness of the financial sector before moving towards the full KA liberalization, especially in the case of portfolio flows.

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