"An Empirical Investigation of the Impact of Capital Inflows on Domestic Investment in India"

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Abstract

Like many emerging market economies (EMEs), India also experienced significant surge in capital inflows since the second the half of 1990s. The capital inflows as percentage of GDP increased from 7.2 per cent during 1990-91 to 25.8 per cent in 2008-09 reflecting rising contribution of financial channel in India's global integration. Notably, the investment in India also made large leaps during the same period and generated an obvious debate on the contribution of capital inflows to the incremental investment. The relationship between investment and capital inflows based on national income accounting identity remains quite ambiguous on many counts. In view of above, we have attempted to investigate empirically the direct impact of capital inflows to investment in India in this paper. We have used the Johansen (1988) and Johansen and Julious (1989) cointegration model to estimate the causality running from capital inflows to investment since data series used in the study viz., investment and capital inflows as percentage of GDP and GDP growth are of I(1) process. The estimates of the long run cointegration equation indicate that 37 per cent of the capital inflows go into higher investment. Variance decomposition analysis reveals that the contribution of KF to GDCF variation increases and reached to about 13 per cent by 10th period. We have found the short-term dynamics of the cointegration model quite robust with error correction mechanism (ECM) term negative and significant. ECM coefficient suggests that about 23 per cent of deviation in the long-run equilibrium level of investment is corrected in the next period.

JEL Classification: E22, F 34, F 36,

Keywords: Capital Inflows (KF), Gross Domestic Capital Formation (GDCF), Cointegration

I. Introduction

A large number of developing and emerging market economies (EMEs) liberalised their capital account lifting restrictions during 1990s to attract capital flows for supplementing domestic investment. The domestic investment in these economies is supposedly to be constrained by availability of capital and thus, opening up for international pool of financial

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resources provided them with large potential benefits. The international financial resources may augment the private savings and eventually lead to higher rate of capital accumulation and growth. Initially, there was a clear preference for stable long-term capital inflows such as foreign direct investment (FDI) and foreign loans, but subsequently, doors were opened for the portfolio flows. Accordingly, developing and emerging countries received large capital inflows since 1990s. India also experienced significant surge in capital inflows since the second half of 1990s. In India, capital inflows in absolute terms rose from US$ 23 billion in 1990-91 to US$ 302 billion during 2008-09, while as percentage of GDP they increased from 7.2 per cent to 25.8 per cent during this period reflecting mounting contribution of financial channel in India's global integration. Notably, the investment in India also made large leaps during the same period and generated an obvious debate on the contribution of capital inflows to the incremental investment.

The impact of capital inflows on domestic investment depends on domestic environment as well as objectives of foreign investors. If domestic rate of return is favourable, substantial capital flows would enter the country for the investment purpose strengthening the relationship between capital inflows and domestic investment[2]. In this regard, Blanchard and Giavazzi (2002) document significant surge in capital inflows to Greece and Portugal that financed increased investment and consumption subsequent to their joining the European Monetary Union (EMU). Besides external resources transfer to a country, capital inflows contribute to domestic investment in several other ways through generating direct and indirect spillovers. It is important to note that impact of capital inflows on domestic investment will also depend on the absorbing capacity on a country. In case of limited absorbing capacity, capital inflows may contribute to domestic investment but in totality their contribution may be partly nullified by capital flight with domestic investors investing in other countries in view of mounting competition from global players or with central bank building foreign exchange reserves. Thus, it will not be appropriate to draw any inference about contribution of capital inflows to domestic investment either on the basis of external resources transfer represented by

[2] In case, domestic rate of return is not that favourable, still foreign capital may enter in developing and emerging market economies for portfolio diversification purpose.

a country's current account deficit or gross capital inflows. In view of above, their contribution towards domestic investment needs to be empirically estimated with econometric techniques. Bosworth and Collins (1999)[3] find that during the period 1978-99, a dollar of capital inflows raised domestic investment by more than 50 cents in developing countries. On the other hand, Mody and Murshid (2005) in study of 60 developing countries conclude that even as liberlisation attracted new flows, foreign capital stimulated less domestic investment during 1990s than the preceding decade[4]. In this paper, we have estimated the direct impact of capital inflows on domestic investment in India using cointegration model Johansen (1988) and Johansen and Julious (1989). We find that only 37 per cent of the capital inflows go into higher domestic investment.

The structure of the study is as follows. The theoretical relationship between capital flows and domestic investment has been discussed in Section II, while some stylised facts have been given in Section III. Section IV contains cointegration analysis. The paper concludes with major findings in Section V.

II. Capital Inflows and Domestic Investment: Theoretical Explanation

At the outset, capital inflows impact the domestic investment in the form of external savings to the extent of bridging the gap between investment and savings. This only represents the extent of external resources transfer, represented by current account deficit. But capital inflows impact the domestic investment beyond the gap between investment and savings. For instance, suppose a country receives capital inflows only in the form of foreign direct investment (FDI) for a new venture and that are much more than the current account deficit. In this case, almost entire capital inflows have gone into investment, which is higher than the gap between investment and savings (current account deficit). In practice, FDI does not come only for new venture but come for acquisition of existing assets also in which case no fresh

[3] Moreover, the foreign direct investment (FDI) component of capital flows had an even stronger influence on the investment in the host county.

[4] With greater financial integration, government accumulated more international reserves and domestic residents diversified by investing abroad; the surge in capital flows during 1990s was driven largely by diversification motive. However, the countries with better policies did have greater success in absorbing capital inflows.

investment is taking place. Further, capital inflows in the form of FDI, loans and deposits also pull investment from domestic investors augmenting overall investment in the economy. Thus, it will be untenable to say that capital inflows contribute to the domestic investment only to the extent of investment-saving gap. The contribution of capital inflows towards domestic investment should be gazed going beyond the national income identity.

Capital inflows directly contribute to domestic investment in several ways. Capital inflows such as foreign direct investment (FDI) contribute directly to new plant and machinery (Greenfield investment). Furthermore, these inflows may generate investment spillovers beyond directly augmenting capital stocks through linkages among firms. Another form of capital inflows i.e. foreign loans catalyse investment through facilitating imports of capital goods and making available funding at lower cost especially in developing and emerging market economies. Capital inflows in the form of FDI, loans and portfolio investment may also reduce the interest rate or increase the credit availability giving impetus to investment activities (Mileva, Elitza, 2008). For instance, Harrison *et al* (2004) find that FDI in particular eases the financing constraints of the firms in developing countries and that this effect is stronger for low income than high-income regions. Moreover, these different types of capital flows may have varying degree of impact on domestic investment. For instance, Bosworth and Collins (1999) find that aggregate foreign capital flows raise domestic investment, but the evidence on the different types of flows is more nuanced[5].

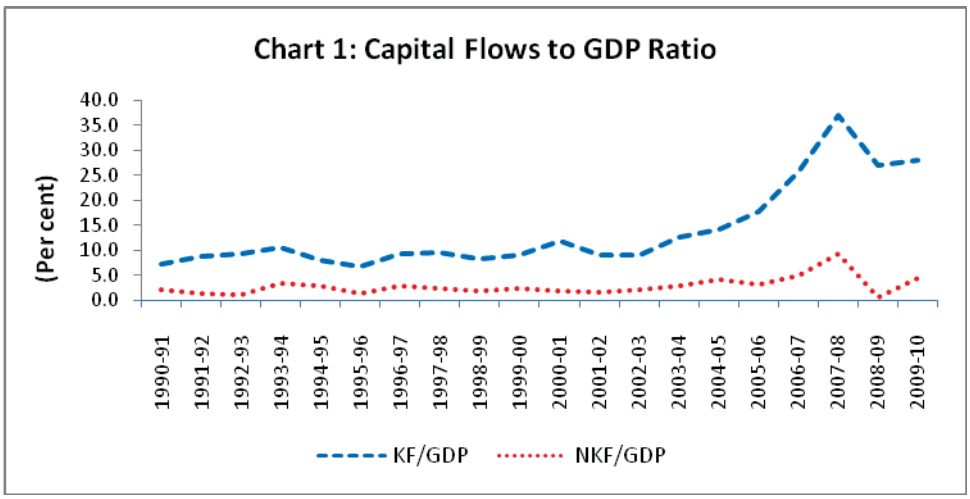
Besides direct affects, capital inflows may also catalyse investment through indirect impact. Kose, Prasad, Rogoff and Wei (2006) call the indirect impact "collateral benefits" as governments of developing countries are coerced to implement sound macroeconomic policies, develop their institutions and improve governance for attracting foreign investors. Some proponents have gone to argue that, by increasing the rewards for good policies and penalities for bad policies, the free flow of capital across national borders has the salutary effect of promoting more disciplined macroeconomic policies and reducing the frequency of policy

[5] They show that impact of a one-dollar increase of FDI is an 81-cent contemporaneous rise in domestic investment and that of foreign loans is a 50-cent rise, while no statistically significant relationship between portfolio flows and capital formation.

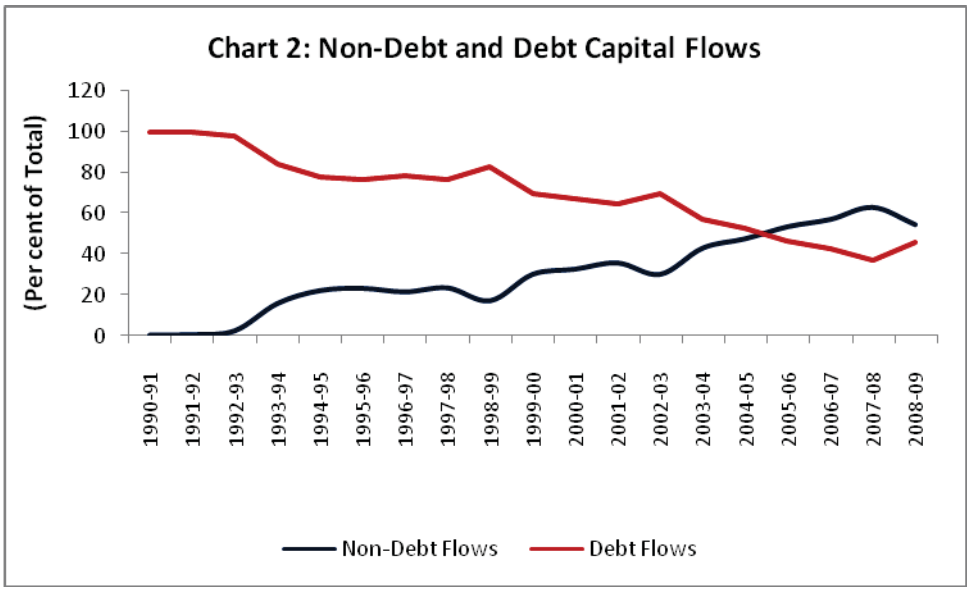
errors (Bosworth, Barry and Susan M. Collins, 1999). Another indirect impact of capital inflows on investment stems from the transfer of managerial skills and new technology infused generally by FDI. To the extent capital inflows especially foreign loans used for consumption smoothening also contribute to investment through spurring growth during sluggish periods. Capital inflows such as portfolio investment and foreign bank lending also propel the depth and breadth of financial markets and promote efficient allocation of resources and investment.

III. Some Stylised Facts

Since the introduction of the reform process in the early 1990s, India has witnessed a significant increase in cross-border capital flows, a trend that represents a clear break from the previous two decades. Net capital inflows increased from US $7.1 billion in 1990/91 to the highest of US $ 109.2 billion in 2007-08, before declining to US $ 7.2 billion during 2008-09 due to global financial crisis but again improved to US $ 53.6 billion with firm economic recovery in 2009-10. India has one of the highest net capital flows among the emerging market economies (EMEs) of Asia. Net capital inflows, which increased from 2.2 per cent of GDP in 19900-91 to around 9 per cent in 2007/08, do not, however, reflect the true magnitude of capital flows to India. Gross capital inflows, as a percentage of GDP, increased more than five times from 7.2 per cent in 1990-91 to 36.9 per cent during 2007-08 but declined to 27.9 per cent in 2009-10 (Chart 1).



As regards the composition of capital flows, the thrust of the policy reform in India in the aftermath of the balance of payments crisis was to encourage non-debt-creating flows and discourage short-term debt flows. Accordingly, the composition of capital inflows to India clearly reflects a shift towards non-debt-creating flows **(Chart 2 & Table 1)**. Although non-debt flows, particularly foreign investments, have gained in importance, there has also been a significant rise in debt-creating flows in last few years, mainly on account of a rise in external commercial borrowings by Indian corporates.



Equity flows under foreign direct investment (FDI) and foreign portfolio investments constitute the major forms of non-debt-creating capital flows to India. There has been a marked increase in the magnitude of FDI inflows to India since the early 1990s, reflecting the liberal policy regime and growing investor confidence. Inflows under FDI were particularly high during the last few years, though a large part was offset by significant outflows on account of overseas investment by Indian corporates.

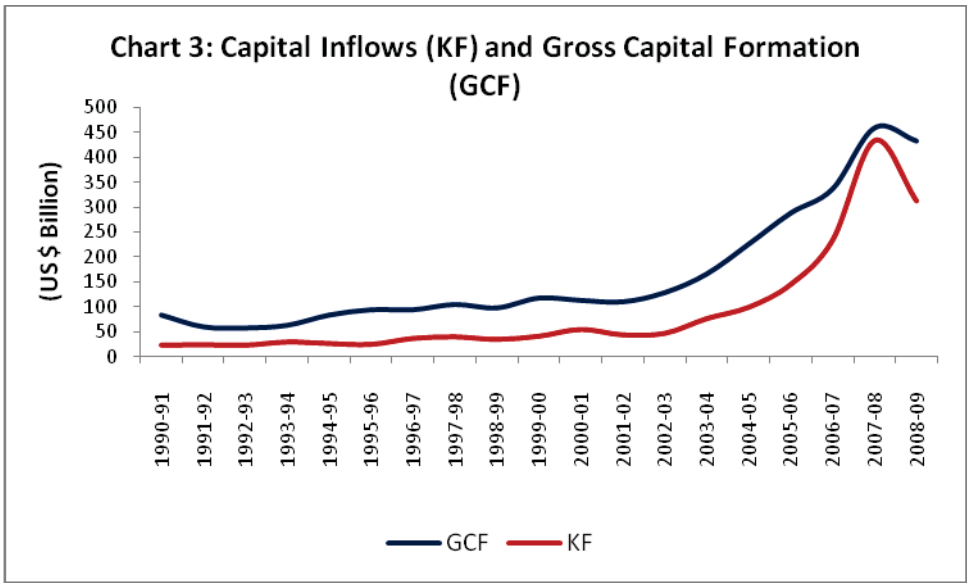
Table 1: Composition of Capital Inflows (As % to Total)				
Component	**1991-1995**	**1996-2000**	**2001-2005**	**2006-2010**
Foreign Direct Investment	2.0	8.0	9.0	9.2
Portfolio Investment	6.4	15.2	28.9	47.8
Loans	39.3	43.1	30.5	22.5
External Assistance	14.5	8.7	5.5	1.7
Commercial Borrowings	12.9	17.3	9.5	7.7
Trade Credit	12.0	17.1	15.4	13.0
Banking Capital	42.2	24.8	26.2	16.3

However, unlike FDI flows, which have exhibited a more or less steady upward trend over the years, portfolio flows are more volatile, moving in tandem with domestic and international market sentiments. Accordingly, a sharp rise in portfolio investment into India in the recent period reflects both global and domestic factors. The search for yield in view of very low real long-term rates in advanced economies has been an important factor driving portfolio flows to EMEs as a group, and India also has attracted such flows. Domestic factors, such as strong macroeconomic fundamentals, a resilient financial sector, a deep and liquid capital market, the improved financial performance of the corporate sector and attractive valuations also attracted large portfolio flows. Consistent with the principle of the hierarchy of capital flows, India has been making efforts towards encouraging more inflows through FDI and enhancing the quality of portfolio flows by strict adherence to the "know your investor" principle (Reddy (2005)).

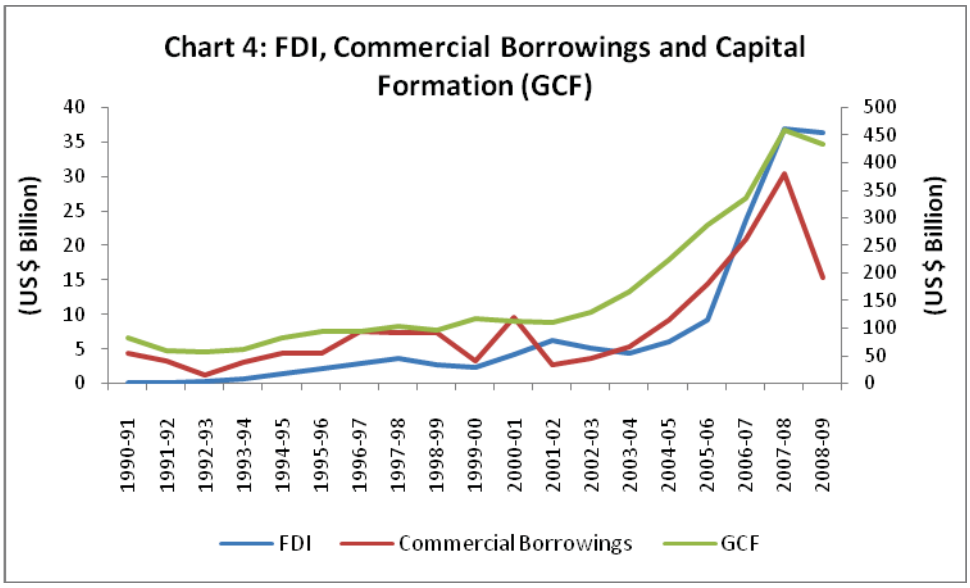
Post reforms period ushered an easing of recourse to international financial markets by Indian corporates and accordingly, debt inflows increased significantly during 1990s and 2000s. ECBs rose significantly in the latter half of the 1990s, responding to the strong

domestic investment demand, favourable global liquidity conditions, the upgrade of India's sovereign credit rating, lower risk premia on emerging market bonds, and an upward phase of the capital flow cycle to the EMEs. During this period, ECBs constituted about 30% of the net capital flows to India. In the late 1990s and the early 2000s, the inflows under ECBs remained subdued due to a host of factors such as the global economic slowdown, the downturn in capital flows to developing countries and lower domestic investment demand. The period beginning 2003-04 marked the resumption of ECBs and other debt flows, which was the combined outcome of the higher interest rate differential emanating from ample global liquidity and the robust growth expectations and low risk perception towards the emerging markets. Inflows under ECBs increased from US $ 5.2 billion in 2003-04 to US $ 30.4 billion in 2007-08 but declined to US $ 15.4 billion during 2008-09. Higher ECB withdrawals during the past few years reflect sustained domestic investment demand, import demand, the hardening of domestic interest rates and also the greater risk appetite of global investors for emerging market bonds. Similarly, inflows under trade credit augmented from US $ 11.1 billion in 2003-04 to US $ 48.9 billion during 2007-08 before declining to US $ 39.7 billion in 2008-09. NRI deposits were a generally stable source of support to India's balance of payments through the 1990s, although the external payment difficulties of 1990/91 demonstrated the vulnerability that can be associated with these deposits in times of difficulty and drastic changes in perceptions. NRI deposits inflows improved to US $ 37.1 billion during 2008-09 from US $ 7.1 billion in 1990-91.

The Chart 3 clearly show that capital inflows and gross capital formation (investment), which have been moving in tandem over the years, increased massively during the last few years. This phenomenon supports the hypothesis that the contribution of capital towards domestic investment in India has become significant.



At a disaggregated level, some of the capital inflows such as foreign direct investment (FDI) and commercial borrowings by Indian corporates are supposed to contribute to investment/ capital formation directly. It could be seen from **Chart 4** that movements in FDI and commercial borrowings have remained highly in tandem with movements in capital formation in India, their although scale varies widely.



The synchronization of capital inflows at disaggregated level with gross capital formation, measured through correlation coefficient, have been found quite elevated **(Table 2)**. The high level of synchronisation between capital inflows and gross capital formation indicate high level

of positive association among their movements. However, the associated movements do not tell anything about the cause and effect relationship among them.

Table 2: Capital Inflows Synchronisation with Gross Capital Formation		
Sr. No	**Component**	**Correlation Coefficient**
1	Capital Inflows	0.97
2	FDI	0.95
3	Portfolio Investment	0.95
4	External Assistance	0.69
5	Commercial Borrowings	0.90
6	Trade credit	0.98
7	NRI Deposits	0.92

The causal relationship running from capital inflows to gross capital formation/ investment need further probe through appropriate econometric technique. Hence, in the next section, we apply Cointegration Analysis to quantify the causality running from capital inflows to investment.

IV. Cointegration Analysis

The quarterly data on GDP growth (GDPG) and gross domestic capital formation (GDCF) and capital flows (KF) as percentage of GDP used in this study from the 1996:2 to 2010:1. The GDPG in the specification has been taken to represent demand side impact on GDCF, while KF impact GCF from supply side. Before searching for the Cointegration relationship, we have examined the unit root properties of the time series pertaining to chosen variables.

A battery of unit root tests are available to test whether the series are stationary or not. Testing of unit root property of the variables considered in the study is the first step in econometric estimation procedure especially when dealing with time series data. In the present study, unit root tests, viz., Augmented Dickey Fuller (ADF), and Phillips-Perron have been

used. First, ADF test has been applied to test the stationarity of variables. This test investigates the presence of unit root in time series data. Strong negative numbers of unit root reject the null hypothesis of unit root at some level of confidence. ADF framework to check the stationarity of time series has been given in following equation:

$$\Delta x_t = \beta_1 + \beta_2 t + \theta x_{t-1} + \alpha_i \sum_i^n \Delta x_{t-1} + \varepsilon_t \qquad (1)$$

Where ε_t is white noise error term.

Basically, this test determines whether the estimates of θ are equal to zero or not. Fuller (1976) provided cumulative distribution of the ADF statistics by showing that if the calculate-ratio (value) of the coefficient is less than critical value from Fuller table, then x is said to be stationary. However, this test is not reliable for small sample data set due to its size and power properties (Dejong et al, 1992 and Harris, 2003). For small sample data set, these tests seem to over-reject the null hypotheses when it is true and accept it when it is false. Therefore, the findings of ADF test have been corroborated with other unit root tests discussed above.

The Phillips-Perron (PP) unit root tests differ from ADF test mainly in how they deal with serial correlation and heteroskedasticity in errors. Particularly, where the ADF tests use a parametric autoregression to approximate the ARMA structure of the errors in the test regression, the PP test ignores any serial correlation. The test regression for the PP test is:

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + \epsilon_t \qquad (2)$$

Where ϵ_t is I(0) and may be heteroskedastic. The PP test correct for any serial correlation and heteroskedasticity in the errors ϵ_t of the test regression directly modifying the test statistics.

The result of the ADF unit root test in **Table 3** demonstrate that null hypothesis of unit root for GDPG is rejected at 10 per cent level of significance and accepted for both GCF and KF. This

reveals that GDPG is weakly stationary while both GCF and KY are non-stationary. However, the null hypothesis of unit root in their first difference is rejected at 1 per cent significance level for GDPG, GCF and KF. The results of ADF unit root test confirm that all three variables GDPG, GCF and KF are stationary in their first difference and thus, they are of I(1) unit root process.

Table 3: Augmented Dicky Fuller (ADF) Unit Root Test

Statistics	**GDPG**		**GDCF**		**KF**	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
t-Statistics	-2.88*	-5.72***	-0.64	-5.09***	-1.31	-8.37***
Prob.	0.055	0.00	0.85	0.00	0.62	0.00
Critical Values						
1% Level	-3.57	-3.56	-3.59	-3.59	-3.57	-3.58
5% Level	-2.93	-2.93	-2.93	-2.93	-2.92	-2.93
10% Level	-2.60	-2.60	-2.60	-2.60	-2.60	-2.60

***, **, * indicates statistical significance at 1% level, 5% level, 10 % level, respectively.

The results of the Phillips-Perron unit root test, furnished in **Table 4** below, are in conformity with aforementioned results of the ADF unit root test. The Phillips-Perron unit root test also reveal that GDPG is weakly stationary and GCF and KF are non-stationary. The unit root hypothesis in the first difference of the series viz., GDPG, GCF and KF is rejected at any convenient level of significance. Thus, as per Phillips-Perron test also, all the series contain I(1) unit root process and are stationary in their first difference.

Table 4: Phillips-Perron Unit Root Test

Statistics	**GDPG**		**GDCF**		**KF**	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
t-Statistics	-2.90*	-8.76***	-2.93	-19.76***	-1.18	-8.37***
Prob.	0.055	0.00	0.25	0.00	0.67	0.00
Critical Values						
1% Level	-3.57	-3.58	-3.57	-3.58	-3.57	-3.58
5% Level	-2.92	-2.93	-2.92	-2.93	-2.92	-2.93
10% Level	-2.60	-2.60	-2.60	-2.60	-2.60	-2.60

***, **, * indicates statistical significance at 1% level, 5% level, 10 % level, respectively.

After establishing that all the series are of I(1) integration process, next step is to test for the co-integration. We employ the Johansen cointegration method (Johansen (1988), Johansen and Juselius (1990)) to determine whether the data series used in this study are cointegrated. First, describing the Johansen cointegration procedure, a ρ-dimensional vector autoregressive (VAR) process of k-th order can be written as follows:

$$\Delta X_t = \theta_1 \Delta X_{t-1} + \ldots . + \theta_{k-1} \Delta X_{t-k+1} + \prod X_{t-k} + \varepsilon_t \qquad (3)$$

Where Δ is the first difference lag operator, X_t is a (ρ×1) random vector of time-series variables with order of integration of at most one denoted by *I(1)*, ε_t is a sequence of zero-mean ρ-dimensional white noise vectors, Θ_i are (p×p) matrices of parameters, and Π is a (p×p) matrix of parameters the rank of which contains information about long-run relationship among the variables in the VAR.

Equation (3) above refers to as the vector error correction model (VECM). If Π has full rank *p*, all time series in X_t are stationary and if the rank of Π is zero, the model reduces to a VAR in first difference. The interesting case occurs when 0< r < p, which suggests the existence of r cointegrating relationships. To test the hypothesis that the number of cointegrating vectors is at most r, the trace statistics is calculated as under:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} (1 - \hat{\lambda}) \qquad (4)$$

Where $\hat{\lambda}$ are the estimated values of the characteristic roots (also called Eigen Values) obtained from the estimated π matrix, and T the number of observations.

When the appropriate values of *r* are clear, these statistics are simply referred to as λ_{trace}.

The null hypothesis of no cointegration among variables (r=0) against the alternative hypothesis of one or more cointegrating vectors (r>0), we calculate the λ_{trace} statistics estimating equation (4). The results in **Table 5** confirm 1 rank of π matrix, meaning thereby that there exists one cointegrating relationship normalizing the cointegrating vector on GCF.

Table 5: Johansen Cointegration Test					
Hypothesized No. of CE(s)		Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**
Null	Alternative				
r = 0	r ≥ 1	0.36*	32.94	29.80	0.02
r ≤ 1	r ≥ 2	0.22	12.25	15.49	0.15
r ≤ 2	r ≥ 3	0.02	0.81	3.84	0.37
Trace test indicates 1 cointegrating equation at the 0.05 level.* denotes rejection of the hypothesis at the 0.05 level.					

Next, after finding one cointegrating vector while normalizing on GCF, VECM has been estimated using Johansen's Maximum Likelihood procedure to examine long-run and short-run dynamics between GCF and GDPG and KF. The lag has been selected two applying Hannan-Quinn (HQ) Information Criterion. The estimate of cointegration equation given in **Table 6** show that coefficient of KF is 0.37 and statistically significant. This could be interpreted as one percentage point increase in KF (capital inflows) lead to 0.37 percentage point increase in GDCF (investment) in the long-run. The coefficient of KF at 0.51 estimated through ordinary least square (OLS) appears to be overestimated on account of non-stationary properties of the data series. The signs of all parameters of the long-run cointegration relations are as expected and their size are reasonable.

Table 6: Restricted Estimates of Cointegrating Equation		
Variable	**Cointegrating Eq.** (Normalised on GDCF)	**OLS**
GDCF	1.0	
GDPG	2.48 (5.47)	0.71 (2.73)
KF	0.37 (3.81)	0.51 (8.27)
C	7.09	16.75
R-squared	0.50	0.74
F-Statistics	5.43	65.13
Figures in parenthesis are t-statistics.		

Variance decomposition analysis of the response to one standard deviation (SD) innovation reveal that past value of GDCF explains its largest variation but declines with passage of time and amount to around 75 per cent by 10^{th} period. However, the contribution of KF to GDCF variation increases and reached to about 13 per cent by 10^{th} period **(Appendix Table 1)**.

The short-run dynamics reveals that error correction mechanism (ECM) is working in the cointegrating equation. This means that deviation in the long-run equilibrium value of GCF is corrected by the correction mechanism. The estimates of the adjustment coefficients, which show speed of adjustment in the deviation from long-run equilibrium value, are given in **Table 7** below.

Table 7: Estimates of Error Correction Model (ECM)

Adjustment Coefficient	**ΔGDCF**	**ΔGDPG**	**ΔKF**
α	-0.23 (-1.81)	0.27 (3.86)	-0.04 (-0.17)
Figures in parenthesis are t-statistics.			

The sign of the adjustment coefficient of **ΔGDCF** is negative and statistically significant, which implies that 23 per cent of the deviation following exogenous shock in the long-run equilibrium value of the GDCF is corrected in the next period by its own value. The adjustment coefficient of ΔKF is also negative but it is statistically insignificant.

V. Conclusion

National income accounting identity provides that net external resources transfer equals the gap between investment and savings. The relationship between investment and capital inflows based on this identity, however, remains quite ambiguous on many counts. Firstly, to the extent these capital inflows are directed towards investment and consumption is not known. Further, capital inflows directly contribute to investment in several ways. Capital inflows such

as foreign direct investment (FDI) contribute directly to new plant and machinery (Greenfield investment). Furthermore, these inflows may generate investment spillovers beyond directly augmenting capital stocks through linkages among firms. Another form of capital inflows i.e. foreign loans catalyse investment through facilitating imports of capital goods and making available funding at lower cost especially in developing and emerging market economies. Capital inflows in the form of FDI, loans and portfolio investment may also reduce the interest rate or increase the credit availability giving impetus to investment activities. Besides direct affects, capital inflows may also catalyse investment through indirect impact such as coercing governments to implement sound macroeconomic policies, develop their institutions and improve governance for attracting foreign investors. Another indirect impact of capital inflows on investment stems from the transfer of managerial skills and new technology infused generally by FDI. To the extent capital inflows especially foreign loans used for consumption smoothening also contribute to investment through spurring growth during sluggish periods. Capital inflows such as portfolio investment and foreign bank lending propel the depth and breadth of financial markets and promote efficient allocation of resources and investment.

Like many emerging market economies (EMEs), India also experienced significant surge in capital inflows since the second the half of 1990s. Capital inflows to India rose from US$ 23 billion in 1990-91 to US$ 302 billion during 2008-09. The capital inflows as percentage of GDP increased from 7.2 per cent during 1990-91 to 25.8 per cent in 2008-09 reflecting rising contribution of financial channel in India's global integration. Notably, the investment in India also made large leaps during the same period and generated an obvious debate on the contribution of capital inflows to the incremental investment. In view of above, we have attempted to investigate empirically the direct impact of capital inflows to investment in India in this paper. We have used the Johansen (1988) and Johansen and Julious (1989) cointegration model to estimate the causality running from capital inflows (KF) to investment (GDCF) since data series used in the study have been found having I(1) process of unit root. Before testing for cointegration, lag was selected 2 using Hanna-Quinn (HQ) information criterion. The rank of cointegration has been found one, as indicated by trace statistics,

suggesting that KF and GCF are cointegrated. The estimates of cointegration equation find coefficient of KF at 0.37 indicating that one percentage point increase in KF (capital inflows) lead to 0.37 percentage point increase in GDCF in the long-run. The signs of all parameters of the long-run cointegration relations are as expected and their size are reasonable. Variance decomposition analysis reveals that the contribution of KF to GDCF variation increases and reached to about 13 per cent by 10^{th} period. We have found the short-term dynamics of the cointegration model quite robust with error correction mechanism (ECM) term negative and significant. ECM coefficient suggests that about 23 per cent of deviation in the long-run equilibrium level of GDCF is corrected in the next period. On an average basis, gross capital inflows were about 19 per cent of GDP during 2000s and going by the above results, they contributed an average of 7 percentage points of the GDCF. Thus, the contribution of capital inflows towards GDCF remains much higher than reflected in the national income identity through current account deficit.

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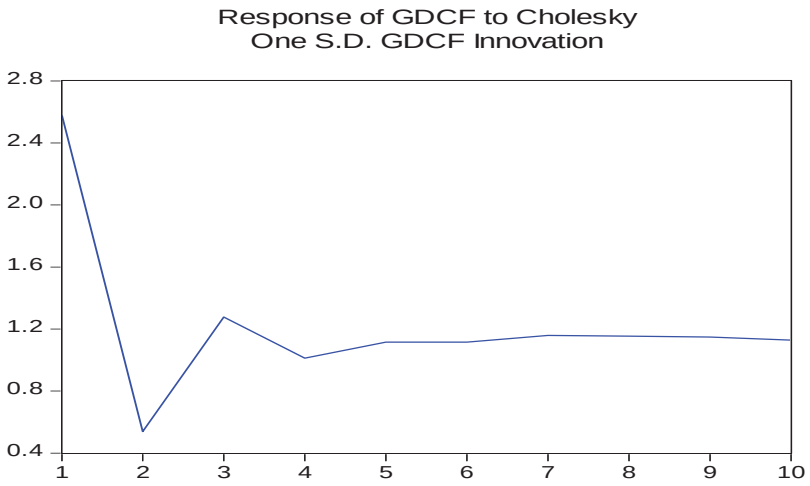
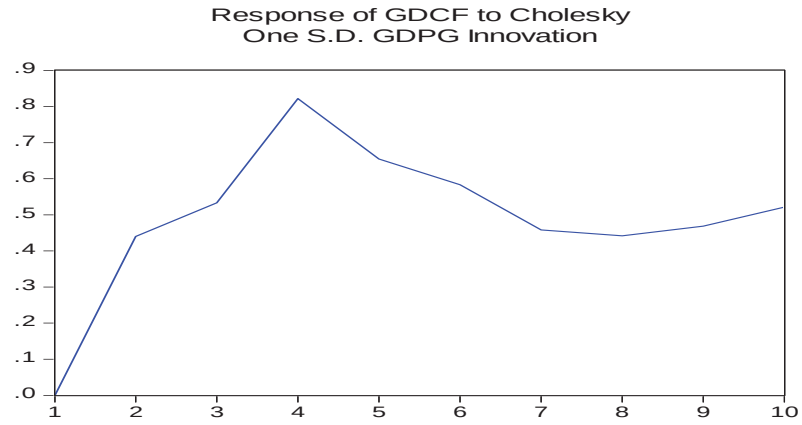
Appendix Table 1: Variance Decomposition of GDCF to Cholesky One S.D. Innovations

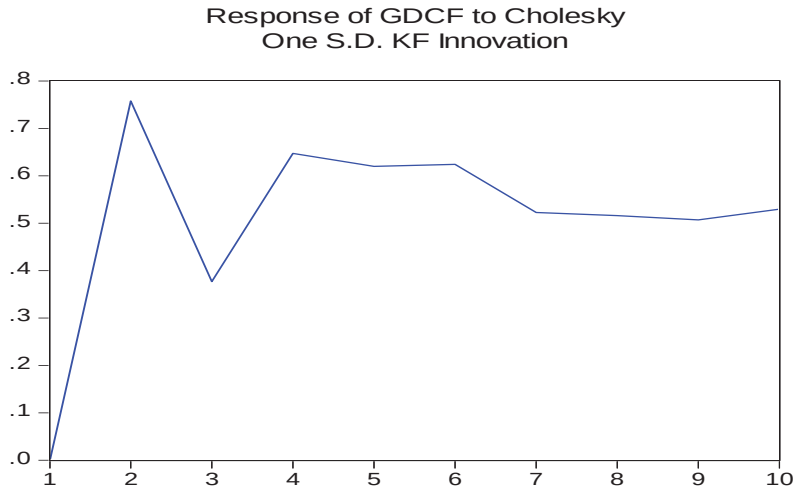
(Per cent)

Period	GCFY	GDPGC	KFY
1	100.0000	0.000000	0.000000
2	90.03483	2.516414	7.448753
3	87.76873	4.900534	7.330736
4	80.73881	9.715067	9.546127
5	77.75259	11.35526	10.89215
6	75.92491	12.08646	11.98863
7	75.68094	12.02610	12.29296
8	75.55145	11.92139	12.52717
9	75.37401	11.94774	12.67825
10	74.92938	12.18067	12.88995
11	74.37836	12.49444	13.12720
12	73.85090	12.77932	13.36979
13	73.45979	12.96843	13.57178
14	73.19520	13.07655	13.72825
15	73.00886	13.14365	13.84749
16	72.84525	13.20701	13.94774
17	72.67659	13.28229	14.04112
18	72.50012	13.36724	14.13264
19	72.32831	13.45090	14.22079
20	72.17327	13.52435	14.30238

Appendix Chart 1: Impulse Response of GDCF






Response of GDCF to Cholesky
One S.D. KF Innovation
.8
.7
.6
.5
.4
.3
.2
.1
.0
1
2
3
4
5
6
7
8
9
10