Global Events and Economic Growth in India

by

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Abstract

Coupling of manufacturing sector to global trade and financial cycle is less appreciated in India until very recently. It was generally believed that due to relatively low levels of external exposure, the economy remains decoupled from external events. This paper examined possible transmission lines through which global trading and financial shocks could spill over to growth in India. It argues that the global events manifested over Indian economy systematically in terms of lost growth since the outbreak of the gulf crisis in 1990, which aggravated further with the increase in openness since mid-1990s. The impact of various crises is quickly visible over the manufacturing GDP through manufacturing export that constitutes over 65 per cent of total merchandise export in India. Rest of the GDP is relatively slow to respond as compared to the manufacturing GDP. The shocks also transmit through lower injection of foreign liquidity impacting stock prices and availability of finance from bank and non-bank sources. The empirical framework followed in the study involves examining the tentative cyclical correspondence of a number of domestic and global indicators to assess openness in India apart from giving an episode wise account of the growth around major global events since 1990. In addition, attempts are made to decompose variance of output to global shocks. The paper concludes that the foreign liquidity and trade channel is strong in India not purely from standard trade openness perspective as merchandise trade to GDP ratio is relatively low in India as compared with other emerging economies. In fact, manufacturing exports to value of production is no more than 13 per cent in India. The importance possibly derives from the fact that the country exports labour intensive merchandise by smaller manufacturing units that share around 34-39 per cent of industrial output, exports and employment. Thus, initial exports loss and lower access to credit gradually turn out to be a sizeable shock to output through employment loss and domestic demand. Monetary policy plays a limited role to counter global shock as RBI has to balance the inflationary pressure with simultaneous slowdown of capital inflows. Even an extremely accommodative monetary policy stance of the Reserve Bank of India acts slowly to bring down the real cost of finance after the crisis.

The paper has been organised as follows. Section 1 takes some literature outlining the propagation of international shock among emerging economies with special reference to India. Indian growth experience around major global events is described in Section 2. Section 3 narrates dilemmas faced by the Reserve Bank of in India (RBI) under an open economic framework to balance alternates goals of monetary policy during crisis. An analysis of cyclical correspondence between growth in India to global trading and financial cycle was undertaken in Section 4 to appreciate the level of openness. Section 5 outlines empirical framework for testing the hypothesis on transmission lines and reporting of the results. Finally, the concluding Section 6 summarises the major findings of the paper.

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Section 1

Propagation of Global Shock

It is generally believed that the globalization enhanced business cycle synchronization and contagion of crisis. Several studies tried to explore the channels of business cycle synchronisation and disturbance propagation in relation to emerging countries like India.

For instance, Lee Walker (1998) explains how trade links provide a natural channel for financial contagion. Competitive devaluation as well as squeezing international line of credit has been identified as the prime channel leading to erosion of foreign reserves. Kaminsky and Reinhart (1999) explored the 'bank channel' of disturbance transmission across countries in the light of East Asian crisis. Accordingly, deterioration in the quality of loans prompts banks to move away from disturbed countries/currencies and increase its holdings of risk free government bonds to amplify the loss of output. This can trigger large capital outflows if loan contracts are of shorter maturity and bank's rebalancing needs are significant. Kaminsky, Reinhart and Vegh (2003) attributes spillover of crisis to the trinity of unanticipated shocks, leveraging of common creditor with shorter maturities liability and sudden stop of capital inflows. Martin and Rey (2006) attribute the crises to financial globalization, while trade liberalisation observed to have reduced the probability of a crisis.

Hall and Taylor (2002) investigated investor behaviour that led to the spill over of crisis even if countries do not share close trade and financial linkages. Bikhchandani, Hershleifer and Welch (1992) extended this to informational cascades where an investor tends to follow the action of others ignoring its own information set. Calvo and Mendoza (2000) attribute this to high fixed costs of gathering country specific information, which induce investors to mimic portfolios. Beirne *et al* (2008) observed that spill over from mature markets influence the conditional variances of returns in many local and emerging stock markets besides identifying parameters change during turbulent episodes.

Another school of thought observe limited transmission of output and financial shocks from developed economies to EMEs. This decoupling school asserted that growth in Asia is driven mainly by domestic factors decoupled from the west. Growth engines in Asia (Asean +5, China and India) are thought to be insulated from the developments in the US and believed to get through the crisis without a significant recession (Nachane, 2009). Dooley and Hutchinson (2009) referred the period from February 2007 to May 2008 as the golden age of decoupling of emerging markets from industrial countries. It was characterized by sharp increase in emerging market equity prices and appreciation of their currencies vis-à-vis dollar. The author attributes this to substantial increases in reserve and reductions in net government debt, currency exposures of emerging market Governments limited to long dollar positions and strict restrictions on commercial bank's net foreign exchange borrowings.

Kose, Otrok and Prasad (2008) examines the global business cycle co-movement among 106 countries consisting of advanced and emerging market economies (EMEs) (including India and China) and developing economies, spanning over 1960-2005. The study assesses the relative importance of global factors which is common across all variables and countries along with country-group specific factors and country specific factors in explaining the macroeconomic fluctuations. The study finds that there is relative decline in the importance of global factors in accounting for business cycle fluctuations. It held that rising trade and financial linkages are not associated with global convergence of business cycles. Instead, group specific factors were found to be comparatively more important than global factors in driving cyclical fluctuations in advanced and emerging market economies. This result runs contrary to the notion that globalization induces greater business cycle synchronicity across all countries, but attributes the same to the state of the group of countries at comparable levels of economic development. In other words, there has been substantial convergence of business cycles among industrial economies and among EMEs, while decoupling of business cycles between these two groups of countries remained. Business cycles in EMEs are now more influenced by their own group-specific dynamics than in the pre-globalization period.

Kose, Prasad and Terrones (2003) examined business cycle co-movement using annual data over the period 1960-1999 for a sample of 76 countries. They find limited support for the theory that increased bilateral and multilateral trade and financial linkages between countries leads to business cycle synchronization. However, they found that increased linkages between economies enhance global spill over of macroeconomic fluctuations on occasions.

In the context of the recent sub-prime crisis, Ram Mohan (2009) took the view that the strength of US economic slowdown on the EMEs would depend upon degree of trade and financial integration as well as the severity of the slowdown. He held that EMEs may remain decoupled from the crisis through the trade channel if the US economy encounters a moderate slowdown. However, with US economy landing into serious problems, both asset price and confidence channels get activated leading to a relatively stronger impact on the EMEs. To this context, he felt that despite no direct exposure of the banking sector, India would find it difficult to escape unscathed from the sub-prime crisis due to the sheer size of the investment support it received from abroad. He estimated that the overseas finance funded nearly half of the 11 per cent rise in investment to GDP ratio in India during 2003-08. Therefore, the drying of such finance is bound to tell the fortune of Indian corporate.

Subbarao (2009) elaborates various channels of contagion operational in the transmission of sub-prime crisis to India. In terms of the financial channel, he identified market segments like equity markets, money markets, forex markets and credit markets to come under pressure. Forex market stress followed the withdrawal of capital flows as a part of global deleveraging process. With international lenders turning risk averse towards EMEs, the Indian corporate sector had to fall back on domestic financial sector for its credit needs and had to unwind their mutual fund investments extending liquidity problem beyond the banking sector. Unlike other economies, overall there was no crisis of confidence in the Indian economy.

Rakshit (2009) felt that the slowdown of Indian GDP growth in the pre-crisis period (sub-prime) was significantly less than what the precarious fall in the growth of exports and related private investments would suggests. The reason lay partly in a step-up in the public investment besides bumper crops for few years on a row. He blamed large scale opening up of Indian stock market to foreign institutional investors, which led to a significant strengthening of rupee to affect export growth in India. Overall, he held than some degree of economic slowdown was inevitable in India during 2008-09 even without any financial crisis.

A number of studies at the Indian Council for Research in International Economic Relations (2004) concluded that the liberalization of trade, particularly the reduction of tariffs has had a favourable impact on intra-industry trade, net exports, and efficiency-enhancing FDI inflow in India. In their attempt to measure the link between growth and capital inflow into India, Marwah and Klein (1998) suggest that for every one-percentage growth point, 0.351 is generated by growth of domestic and foreign capital nested together as compared to 0.569 by labor, and 0.08 by imports.

Measuring the impact of capital flows on Indian growth is not found to be very straightforward in India, although owing to a predominant recipient of portfolio capital; a strong positive correlation between capital inflows and contemporaneous stock returns is visible. As market return emerges as the prime mover of FII inflow and thus, a drop in equity return leads to withdrawals of investments with disturbing consequences over the economy (Coondoo and Mukherjee 2004). The impact of capital flows was generally observed to bring in contraction in output growth through currency appreciation as pointed out by Sikdar (2006). According to this study, however, an increase in foreign capital may lead to a rise in income if the direct plus indirect crowding in effects is strong enough to offset a fall in net exports through currency appreciation. It was also held that portfolio investment flows can contribute to growth indirectly by enhancing the liquidity and efficiency of capital markets.

Section 2

Indian Growth Experiences around Major Global Events

Notwithstanding these divergences of opinion, it can be held that adverse global events posed macro-economic risks and led to loss of growth momentum in India to a varying extent since the gulf crisis in early 1990s. Output contraction had been severer on the back of economic stabilisation measures and structural adjustment initiated in the early 1990s. The overall GDP growth collapsed from 5.6 per cent in 1990-91 to just 1.3 per cent in 1991-92 (Chart 1).

Chart 1: Components of GDP Growth
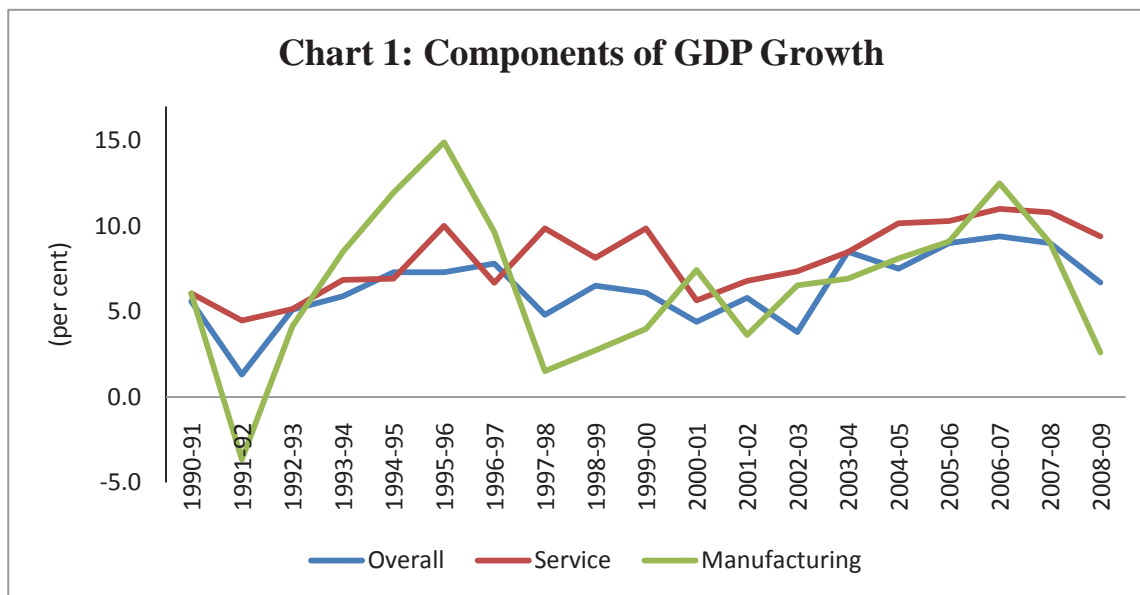
The economy gained momentum subsequently and until 1995-96, when exchange market pressure and tightening interest rates in months following the Mexico crisis (December 1994) stalled the growth momentum again. This was one of the longest phases of economic slowdown in India. The average growth fell from about 7.5 per cent during 1993-96 to 5.6 per cent during 1996-2003. The lower growth during this period is associated with a number of external disturbances like East-Asian crisis in 1997 (growth fell at the rate of 4.8 per cent in 1997-98) and Technology meltdown followed by 9/11 (growth fell at the rate of 4.7 per cent in 2000-03). Domestic factors like political instability and slowdown of economic reforms, economic sanctions related to nuclear blast in 1998, prudential norms and balance sheet cleaning of the Indian banking sector that could have affected credit growth is also often blamed for the poor economic performances during 1996-2003.

Growth eventually turns out to be unprecedentedly strong during 2004-08 in tune with the global business cycles, rising world trade volumes and India's strong integration to the upturn. This steady growth phase was finally interrupted during the second half of 2008-09. The loss of growth momentum during this period coincided with the sub-prime crisis, failure of Lehman brothers and global economic slowdown that followed. The GDP growth slowed from an average of nearly 9.0 per cent from 2004-08 to 6.7 per cent in 2008-09. The growth during the second half of 2008-09 was substantially low at 5.8 per cent, down from 7.8 per cent in the first half. Thus, the global events, more for the relatively recent period can be conceived as systematically spilling over to the Indian growth momentum.

The impact of the global events was clearly visible over industrial output, manufacturing in particular, which fell quite sharply in early 1990s as well as after the external sector crisis during 1995-96. The manufacturing output declined by 3.6 per cent in 1991-92 (gulf crisis) and grew by just 2.1 per cent in 1997-99 (East-Asian crisis) and 3.6 per cent in 2001-02 (Technology meltdown cum 9/11). The drop in

manufacturing GDP is sharp to 2.4 per cent in 2008-09 from 8.2 per cent in 2007-08 and the peak of 11.6 per cent in 2006-07.

On the other hand, it is the services sector that gives resilience to the growth momentum consistently with its growth remaining above the headline in most of the years. Even for the very recent event, the services growth slowed moderately in the second half of 2008-09 despite unprecedented nature of slowdown in the global economy. Cyclical resilience to services growth could be arising from the domestic demand component, which roughly constitute over 78.0 per cent in 2008-09, besides competitive strength India enjoys in terms of skilled manpower, who are adaptable and innovative enough to minimize the downsides.

Incidentally, the agricultural output declined around most of the external crisis prone years, say by 1.5 per cent in 1991-92, 1.0 per cent in 1995-96, 2.4 per cent in 1997-98 and 6.9 per cent in 2002-03. The agricultural output dropped by 0.8 per cent in the third quarter of 2008-09 coinciding with the peak of the current financial turmoil. However, given the primitive nature of the agriculture and limited international trade of agricultural commodities, it would be unrealistic to correlate them with global/financial factors. As the performance of agriculture in India is more likely to be associated with domestic and exogenous events like the availability of moisture, simultaneous occurrences of the disturbance would be ignored in this study.

The patches of growth moderation in India are observed to have been broadly coinciding with global events, although it would be difficult to attribute the slowdown to global factors without referring to the transmission lines. Without going to the issue of the transmission in detail at this stage, it can generally be observed that the Indian merchandise exports have over the years become intensely correlated with the global trend of merchandise business (Chart 2).

Chart 2: Quarterly Growth in World Exports and Exports from India

This is somewhat contrary to the popular perception in India until very recently. Hitherto, it was believed that due to relatively low levels of exposure to the external sector, structural and domestic demand related factors have dominated the growth cycle as the economy remaining by and large decoupled from the external events. Domestic factors such as excess capacity, infrastructural bottlenecks, low productivity, allocative inefficiencies, restricted labour laws and fluctuations of some cyclical industries such as cement, steel and automobiles was largely believed to be responsible for the inability to sustain high industrial growth, at least before 2001 (Forthcoming RBI Annual Report, 2008-09). However, over the years, Indian exports have gradually become well diversified across advanced as well as emerging economies to pick up

global slowdown.[2] In addition, effect may be arising indirectly from countries with significant trading relations with US and Euro Areas.

Thus the two major reasons behind the intensification of the global impact on Indian economy could be the growing trade and financial sector linkages it developed with the rest of the world. As per the National Accounts Statistics, the international trade to GDP which stood at 15.7 per cent in 1990-91 increased to 45.9 per cent by 2007-08. Similarly, international reserve to base money increased from 9.1 per cent in 1990-91 to 133.4 per cent by 2007-08, revealing that global sources is supplying liquidity in India to a large extent.

The impact of global merchandise slowdown appeared to have percolated into the Indian industry through a number of manufacturing export items such as 'engineering goods', 'petroleum products', 'chemicals and related products', 'textiles and textile products' and 'leather and leather products', which together account for more than 45.0 per cent of the index of industrial production (over half of the manufacturing sector) and recorded maximum slowdown within the manufacturing items with sluggish recovery (Forthcoming RBI Annual Report, 2008-09). Another channel of infection could be the capital inflows, especially the portfolio investments that had given support to the Indian equity market in a consistent manner since its inception and more prominently since 2003. The buoyant stock market proved to be crucial for raising resources by the non-financial companies particularly through equity issuance consistent with the peaking order hypotheses of corporate finance. Not only the rated and bigger corporate house in India could mobilise a sizeable amount from the markets abroad, but even smaller companies raised resources from capital market possibly at a rate cheaper than bank finance when the market is bullish. In addition, liquid financial markets enable banks to extent credit at more generous terms when capital flows are high.

Since 2003, foreign institutional investor (FII) inflows into the Indian equity market increased by leaps and bounds inspired by the growth momentum of Indian economy, improving economic fundamentals and overhauling capital market reforms encompassing trading, clearing, and settlement[3]. Because of low domestic institutional participation, the fortunes of the Indian equity market tend to be strongly associated with the net investment interest by the FII. It may be observed that as FIIs withdrew in large numbers, the benchmark 30 scrips BSE Sensex plumbed down in 1995-96, 1997-99, 2001-03, 2006-07 and 2008-09 (Chart 3).

[2]Around 38.5 per cent of the exports were directed to OECD countries (*viz.,* US, EU, North America) in 2007-08, while 42.7 per cent of the exports were directed to developing countries. The share of exports to the US declined from 23 per cent in 1999-2000 to 15 per cent in 2007-08. The share of exports to China and emerging Asian economies accounted for around 7 per cent and 25 per cent of India's total exports, respectively.
[3] SEBI undertook several reforms including introduction of new investment products such as American style stock options and trading in cash settled stock futures, protective measures such as index-based market wide circuit breaker system for scrips in rolling settlement mode, risk alleviation measures such as shortening the rolling settlement cycle from T+5 to T+3. Further, the Government of India permitted Indian companies to increase FII investment limit upto the sectoral cap/statutory ceiling as applicable. The Reserve Bank of India also took some forward looking steps such as permitting FIIs to trade in exchange traded derivative contracts.

Chart 3: FII Inflows and BSE Sensex
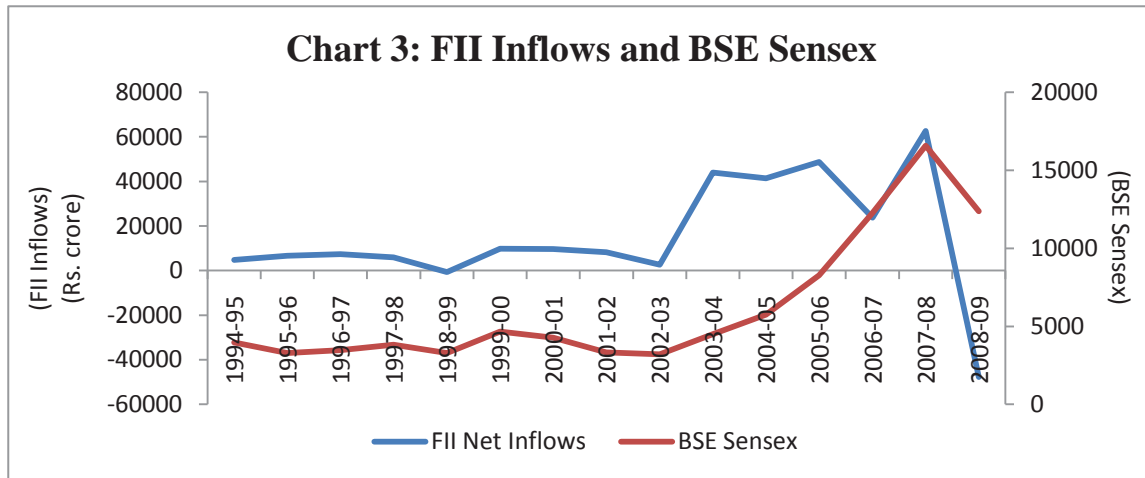
This squeezed the non-bank sources of finance for the corporate such as primary issues of debt and equity. For instance, the new primary issues that accorded considerable support to the manufacturing companies in terms of easy finance from capital market during 1992-95 had declined abruptly by 39.5 per cent in 1995-96. Such decline was associated with reduced investment support from FII to equities in India from second half of 1994-95 to the first half of 1995-96 preceded by Mexico crisis and a steady rise in Fed Fund target rate. The experience was somewhat similar during East Asian crisis in 1997-98, when capital issue had fallen by 69.9 per cent. Decline of capital issues by 2.2 per cent was observed in 2001-02 associated with dotcom bubble in 2000 and the terrorists attack on 9/11 in 2001. The decline in issue was more than 76.0 per cent in 2008-09 following sub-prime crisis and the subsequent fall in Lehman Brothers.

As portfolio investment through the stock market constitutes a major source of liquidity, drying up resources in primary market forces financial companies to access the private placement of bond issuances. The private placement grew steadily after the collapse of public issues in 1995-96; from Rs. 13,361 crore in 1995-96 to Rs. 2,12,568 crore in 2007-08. However, manufacturing companies' access to such market segment is almost negligible forcing them to take recourse of credit from the financial intermediaries like banks.

However, the bank's ability to accommodate the increased demand for credit comes down sharply as slowdown in capital inflows sets in. It may be observed that slowdown in capital inflows leads to the decline in the growth of banking liquidity like narrow money (M1), reserve money (RM) and non food credit (NFC) growth for the same period (Chart 4).

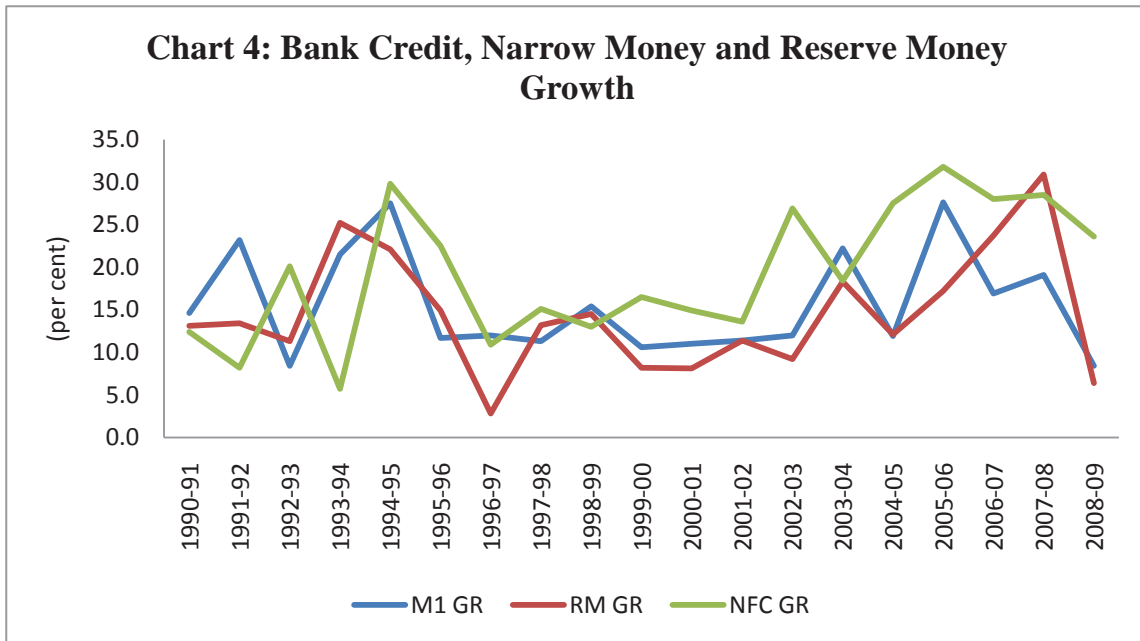**Chart 4: Bank Credit, Narrow Money and Reserve Money Growth**

Chart 4 shows sudden drops in growth of M1, RM and NFC during the crisis ridden periods like 1995-2002 and also in 2008-09 from their respective highs showing difficult phases of liquidity. In all these years, the RBI responded strongly by taking an extremely accommodative stance to off-set the slowdown. However, liquidity failed to take off partly on the relative cost consideration between bank and non-bank sources as also, domestic and foreign sources besides heightened uncertainties associated with such events. The industrial output reveals some co-movements in years around the capital flow slowdown in India (Chart 5).

**Chart 5: Quarterly Capital Flows and Growth in IIP**
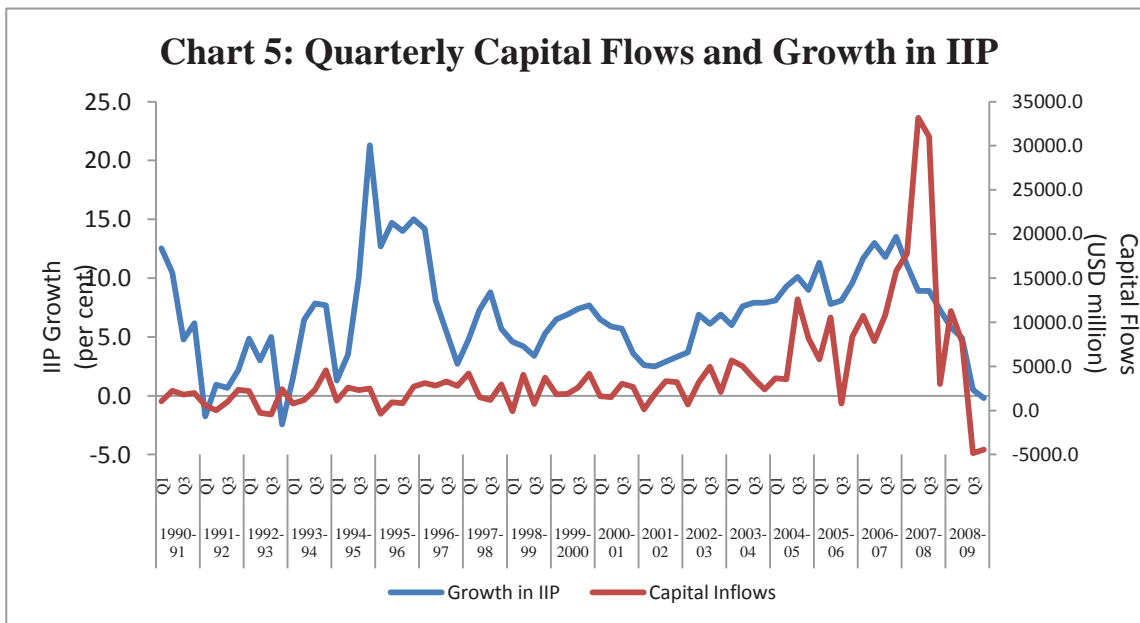
As monetary management had to adjust quickly under such circumstances, the monetary policy operation in India in general and policy stance adopted by the RBI in the face of rapid shifts in capital flows is outlined in the next section.
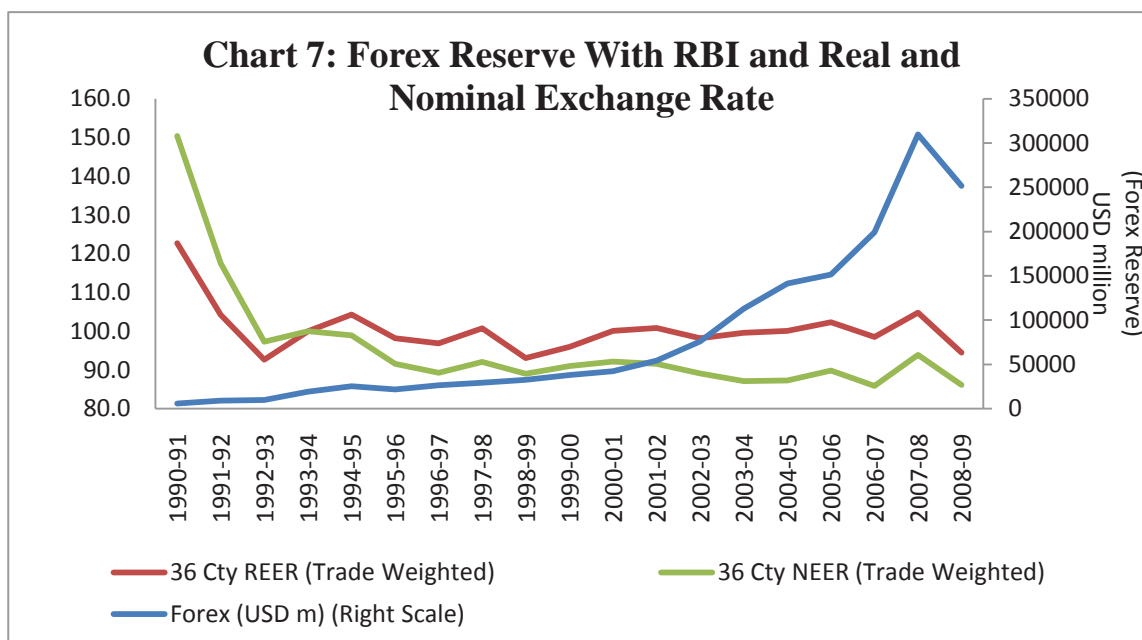
Section 3

Capital Flows and Monetary Policy in India

The structural reforms in the Indian economy since 1990s have impacted monetary policy. While price stability and ensuring adequate credit to productive sectors constitute the twin objectives of monetary policy, financial stability emerged as a key consideration in the second half of 1990s. The monetary policy has generally been successful in meeting its key objectives of price stability in terms of anchoring inflation expectations particularly since the second half of 1990s except for some intermittent disturbances relating to global commodity prices and agriculture failures (Chart 6).


Chart 6: Average Inflation
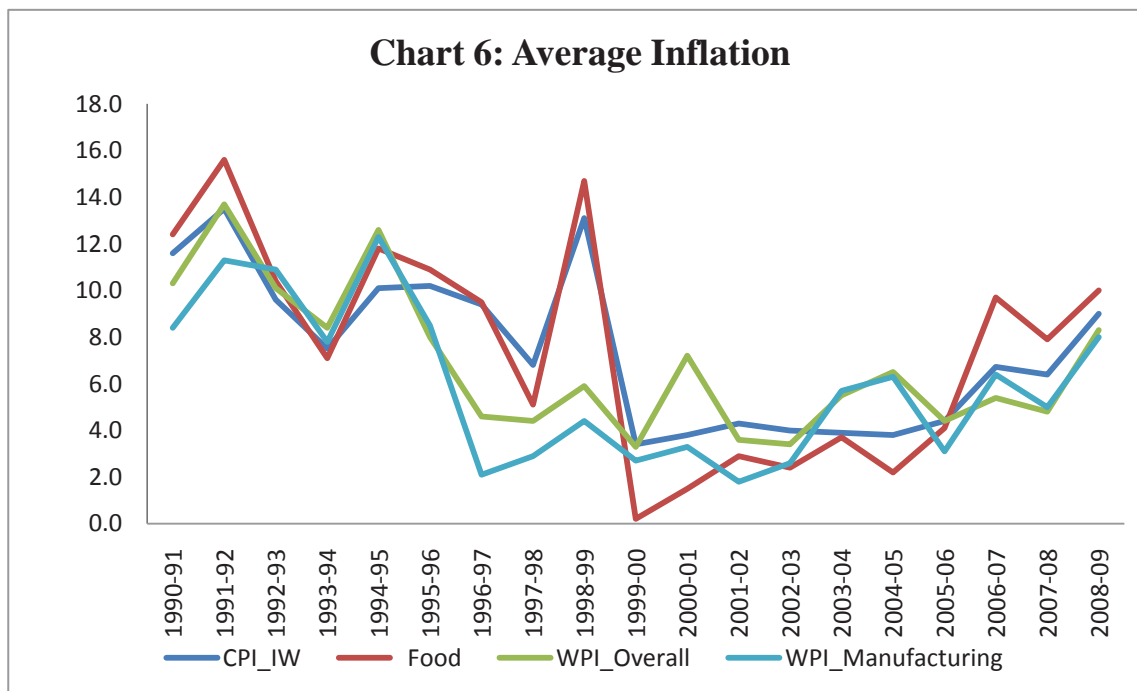
The objective of assuring credit flow to productive sectors too is met in general with added efforts from the RBI to streamline credit delivery mechanism further since 2003. In addition, great deal of efforts had undergone to address financial stability concerns through designing various prudential parameters, strengthening of the regulatory and supervisory framework, keeping a sizeable share of bank's liability in liquid assets and limiting external sector exposure of banks. The reforms in the monetary-fiscal interface during the 1990s played some role in imparting flexibility to monetary policy notwithstanding varied fiscal space accorded to it in some of the years including 2008-09 and 2009-10.

Management of the external sector remained one of the key considerations of monetary policy and exchange rate management by the RBI. The exchange rate regime has gradually tilted towards greater currency flexibility even though managing short-term disruptive volatility leading to two-way intervention in the currency market by the RBI on occasions. Intervention to ensure orderly market conditions and certain forms of capital control was prevalent, which stepped up during the crisis. Pattanaik and Mitra (2001) studied the effectiveness of monetary interventions in relieving the pressure on the exchange rate of the rupee during major episodes of disorderly correction of the exchange rate in the post-March 1993 period and concluded that the interest rate defence of the exchange rate was effective in India in containing exchange rate volatility. While forex reserve with the RBI increased from USD 9.8 billion in 1992-93 to USD 42.3 billion in 2000-01 and further to USD 309.7 billion in 2007-08, Rupee remained by and large steady in nominal as well as real effective terms after the substantial adjustments in the early 1990s (Chart 7).

Chart 7: Forex Reserve With RBI and Real and Nominal Exchange Rate

- 36 Cty REER (Trade Weighted)
- 36 Cty NEER (Trade Weighted)
- Forex (USD m) (Right Scale)

Needless to say that it is the capital flows that decided the course on monetary management, as Indian BoP is generally characterised by current account deficits (CAD) in most of the years, with net capital inflows over and above the CAD adding to BoP surpluses (Chart 8) (Trade Deficits are shown as positive numbers in the Chart 8). Real exchange rate is found to be co-integrated with the level and volatility of capital flows apart from high-powered money, current account balance and government expenditure with capital flows proved to be the most significant determinant of real exchange rate (Dua and Sen 2006).

Chart 8: Composition of Indian BOP (USD million)

- Trade Deficits
- Invisibles
- Capital Flows
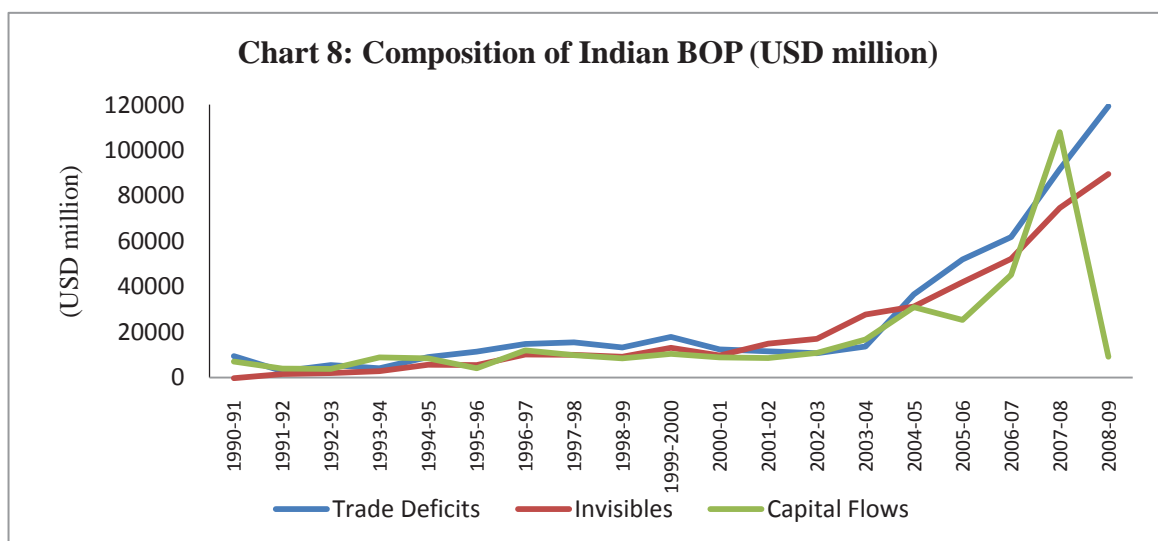
The BoP surpluses are generally accommodated in terms of rising reserve providing insurance against sudden stop of international financial flows, while a part of the rupee liquidity so generated are sterilised using a number of instruments. The liquidity emerging from the unsterilized forex inflows attracted serious policy dilemma from the viewpoint of appropriate design of the instrument mix. The sterilization cost in terms of forgoing interest earnings on reserves *vis-à-vis* the cost of servicing domestic bonds is debated frequently. Besides balancing the relative concerns for monetary policy objectives like accommodating adequate credit flow and managing inflationary expectations, apart from addressing

financial stability issues has been addressed time to time in designing the monetary policy stance. Unsterilized foreign liquidity supported real economy especially during economic recovery in a capital scare economy like India through the easing of liquidity and the credit constraints. However, too fast credit growth, rising inflationary pressure and external imbalances on occasions called for RBI interventions to stall 'overheating' (Annual Policy Statement, April 2007). Fine-tuning the domestic cycle in line with the global trade and financial cycle called for frequent adjustments of monetary policy stances particularly since 2001.

The benefits of a more flexible exchange rate in the face of high and sustained capital flows are often debated for greater flexibility of monetary policy besides discouraging speculative tendencies. However, the risk of real appreciation and the loss of competitiveness with currency floatation posed concerns for exports and trading sector profitability. In addition, there are adjustments costs associated with frequent exchange rate changes if the inflows turn out to be temporary (Kohli, 2001). Certain degree of exchange rate management was therefore considered appropriate so long as capital flows are not identified as permanent (Annual Policy Statement, April 2006).

Moderate controls over capital flows should be viewed to this context, which eased over the period. The Reserve Bank's policy stance on capital flows changed substantially after the gulf crisis in 1990 with all major forms of non-debt and longer-term capital inflows getting in preference. The foreign portfolio investment emerged as the major form of capital inflows since it is allowed in 1993-94. In addition, the foreign direct investment has been liberated through automatic and discretionary route; the automatic route being progressively enlarged to many sectors with gradually rising sectoral caps. This led to rise in direct investment and private equity interest in the recent years. The other sizeable inflows are through external commercial borrowings (ECBs), which were allowed freely up to a limit with inflows over the limit subjected to specific approvals. Besides restrictions on the end uses on ECBs, there are ceilings for most of the time on the cost of raising funds linked to international benchmark rates such as LIBOR, which varied over the period consistent with monetary policy stance.

The exchange guarantee on the non-resident Indian (NRIs) deposits was withdrawn in 1993 by introducing Foreign Currency Nonresident (Banks) (FCNR(B)), under which the foreign exchange risk was borne by banks. The interest rate differential between FCNR(B) and international rates was kept low to discourage arbitrage at the time of high capital inflows but also widened on occasions to attract foreign liquidity in some years. In respect of rupee NRI deposits, the initial policy was to retain attractiveness by freeing banks to offer deposit rates consistent with resident deposits apart from exempting the liabilities from maintenance of reserve requirements until 2001. Subsequently, rupee NRI deposits were also discouraged by imposing reserve requirement in 2001 and placing an interest rate ceilings linked to international benchmark like FCNR(B) deposits since 2003 to eliminate arbitrage or to attract foreign liquidity as the condition demands.

While fully current account convertible by 1994, the progress with capital account convertibility is gradual in India with a combination of direct and market based control in place. Short-term capital gains were taxed at a higher rate than longer-term capital gains before the latter was abolished altogether in 2005-06. Individuals, Indian companies and mutual funds are permitted to access international markets, subject to a limit and prescribed guidelines liberalized over the period. Two Committees on Capital Account Convertibility (Chairman: Shri S.S. Tarapore) in 1997 and 2006 highlighted the benefits of a more open capital account, but at the same time prescribed certain preconditions to be achieved to avoid disruptions in the financial market.

In addition, various interventions were undertaken under crisis related to global events. For instances, the period 1993-95 was characterized by strong capital inflows with remarkable stability in the Rupee-USD bilateral exchange rate and credit growth of around 25 per cent fuelled by the rally in equity prices. Initial expansion was accompanied by an accommodative monetary policy stance as it was supporting the economic recovery from the setback in early 1990s. There were large overall surpluses in the balance of payments building up during 1993-94 and the initial months of 1994-95 leading to a significant increase in foreign exchange. The Reserve Bank initially intervened in the foreign exchange market to prevent an appreciation of the rupee with a number of steps to sterilize the monetary impact. In the

subsequent months of 1994-95, the expansionary cycle started posing monetary policy / financial stability concerns in terms of fast credit growth, double digit inflation and widening current account deficit. Accordingly, the monetary policy stance was kept tight despite concerns about tightening liquidity. The market liquidity condition worsened in the subsequent months on the quick reversal of capital flows. The slowdown of capital inflows fasten from the second half of 1994-95 in the wake of the Mexican crisis, which finally broke up in to a sharp overshooting of exchange rate. The Reserve Bank intervened in the spot market by matching withdrawal of liquidity leading to a further tightening in money and foreign exchange market.

With improvement of situation, the support was restored by the RBI to bring back stability in the market in terms of easing of monetary policy well supported by the benign inflationary condition since mid-1990 partly in tune with global inflation trend. The Statutory Liquidity Ratio (SLR), which directs banks to maintain liquid investments, mainly in the form of government securities, was reduced from an all time high of 38.5 per cent in January 1993 to the then statutory minimum of 25 per cent by October 1997 and subsequently, to 24 per cent in November 2008. This enabled commercial banks ability to accommodate the rising demand for credit by offloading government securities. Cash Reserve Ratio (CRR) was also brought down from the statutory maximum of 15 per cent of net demand and time liabilities from April 1993 to 4.5 per cent in June 2003. Despite these easing, the economy lost large part of the momentum gained during 1993-96 as real lending rate (PLR of State Bank of India net of average WPI inflation) remained high at around 8 per cent during 1996-2001 as compared to around 6.5 per cent in 1993-95. The recovery was also held for a number of reasons like high government borrowings, transition in the financial sector, political uncertainty and macro-economic risks arising from slow pace of reforms in the real sector.

The period 1996-2000 was also marked by episodes of heightened volatility on the back of several international and domestic factors - the Asian financial crisis and the spread of contagion to other markets such as Russia and Brazil, border tensions and sanctions imposed by US after the nuclear tests by India. Although inflation rate was by and large anchored in line with global trend, the foreign exchange market posed serious challenges to exchange rate management on several occasions leading to turmoil from August 1997 to August 1998 and sharp reversals of portfolio flows in 2000 following technology meltdown, international crude oil prices and interest rate increases in industrial countries besides sharp cross-currency movements of the US dollar *vis-à-vis* other major international currencies. RBI responded to these episodes by intervening in both the spot and forward segments of the foreign exchange market by adoption of stringent monetary measures like hike in the Bank Rate, the repo rate, cash reserve requirements, refinance to banks and administrative measures like surcharge on import finance and minimum interest rates on overdue export bills to curb destabilizing speculative activities- all leading to a contraction in primary liquidity and impact on economic growth. Suspension of fresh multilateral lending (except for certain specified sectors), downgrading of country rating by international rating agencies and reduction in investment by foreign institutional investors (FIIs) also affected capital flows and reserve money growth during this period. The success of the RIB issue to the tune of US $ 4.2 billion and IMDs to the tune of US $ 5.5 billion from the non-resident Indian backed by government guarantees helped in easing pressure in external sector at a time when global liquidity condition was easing on recessionary outlook.

The external sector and exchange rate regime after 2001 with the brief turmoil relating to 9/11 is characterized by gradually increasing inflows of capital and easing domestic liquidity on accommodative stance by RBI notwithstanding intermittent inflationary episodes related to the rise in crude oil price. The Reserve Bank undertook net forex purchase generating matching rupee resources especially since 2002 a part of which has been sterilized to neutralize its monetary impact. Even as debt creating flows ebbed in response to policy changes such as prepayment of high cost official debt and rationalization of interest rates on NRI/ECBs, non-debt flows like portfolio investments initially and then foreign direct investments surged. Efforts to moderate capital inflows have been focused on a number of measures like restrictions on equity investments. In addition, restrictions on capital outflows, like expansion of automatic route of FDI abroad, prepayment of their external commercial borrowings, liberalize the surrender requirements of foreign currency for exporters, expansion of foreign currency account facilities to residents, liberal regime

for banks to invest abroad, *etc.* were eased. Despite this, the net foreign assets of the Reserve Bank have increased sharply.

The sustained surges in capital inflows coupled with surpluses in current account until 2004-05 marks easy liquidity condition supporting strong economic recovery. Despite the appreciating trend in bilateral Rupee-USD exchange rates since 2003-04, the exports as well as overall growth remained strong during 2004-08. Domestic credit was growing by around 30.0 per cent for four years at a row to support an average 9.0 per cent GDP and 25.0 per export growth. Monetary policy during this period was accommodative with comforts drawing from a general benign inflationary environment partly supported by benign global consumer inflation and the inadequate pass-through of global commodity prices, crude oil in particular, carried by the fiscal authorities. However, fair amount of safeguards were in place in terms of active liquidity management and containing credit growth besides assuring the overall quality of the credit. Accordingly, the sterilization and monetary measures are supplemented by regulatory and prudential measures whereby calibrated deceleration in credit to sensitive sectors were brought about through changes in risk weights and provisioning norms.

In the face of unprecedented capital inflows during 2004-08, the sterilization and liquidity management has been stepped up in an innovative manner. The Reserve Bank of India Act, 1934 does not permit the monetary authority to float its own securities. Therefore, a combination of instruments, *viz.*, the LAF window, outright open market operations, market stabilisation scheme (MSS) and CRR is used for liquidity management. These instruments have helped monetary authorities in managing alternating liquidity cycles of surpluses and deficits. The task of day-to-day liquidity management is assigned to LAF, while semi-durable and durable liquidity mismatches are addressed through MSS and CRR. While sterilizing, liquidity management has been focused on a burden sharing where the costs of sterilization operation have been shared by all stakeholders, *i.e.*, the Government in case of MSS, the Reserve Bank in case of LAF reverse repos and the banking system in case of CRR.

The overall objective of monetary management was addressed more intensively as credit growth gained strength owing to high economic growth since 2004-05. In response to the changing financial landscape, financial stability threat and rising inflationary expectations, the Reserve Bank adopted several policy changes to mop up liquidity in a faster pace. As part of a broader policy package, the Reserve Bank increased the CRR effective from the fortnights beginning December 23, 2006 with incipient inflationary pressure being evident. Since then there have been successive increases in CRR up to August 30, 2008, when it was raised to 9.0 per cent. Although inflation moderated during April-December 2007, the net forex reserve with RBI increased by around USD 100 billion following the accommodative monetary policy stance adopted by OECD central banks after the sub-prime crisis in August 2008. This was adding liquidity at an enormous speed requiring mop up operation through all possible avenues.

Until the first half of 2008-09, liquidity management operations geared up primarily through CRR hikes with a view to containing inflationary pressures observed since January 2008 emanating from rising crude, metal and primary food and non-food commodity prices in the global market. Simultaneously, the foreign exchange market operations of the RBI led to absorption of domestic liquidity during April to mid-September 2008 as drying capital inflows brought a turnaround from net spot purchases up to May 2008 to net spot sales thereafter, barring August 2008. Nevertheless, the pick-up in WPI inflation during the first half of 2008 has been extraordinarily fast from around 3 per cent in December 2008 to 12 per cent by August 2009 leaving no room for the Reserve Bank to accommodate liquidity. Thus, the money market rates shot up on occasions since the second half of September 2008.

The reversal of capital inflows has been matched by commensurate operation in the currency market and substantial reversal of monetary policy stance from tightening to easing phase quickly following the full outbreak of the crisis by September 2008. As domestic money and foreign exchange markets came under pressure and inflationary pressures abated after August 2008, rupee liquidity has been augmented through reduction in the CRR and a slew of special liquidity facilities and MSS buy-back dovetailed with the Government's normal market borrowing program. The level of CRR has since been reduced by 400 basis points to 5.0 per cent in view of extraordinary circumstances. The monetary stimulus

came through a sharp reduction in the policy interest rates, reduced pre-emption of bank resources and expansion of refinance facilities for banks. The potential liquidity made available by the RBI as a result of these measures amounted to Rs.560,000 crores, nearly 9 per cent of GDP. Despite these, the real lending rate showed considerable stickiness to support the growth by the end of 2008-09 at around 10 per cent from 6 per cent during 2001-07.

Thus, from being operated almost exclusively in a closed economy context, monetary / financial policy in India had to contend with the pressures of the open economy dynamics since the early 1990s. The vicissitudes in capital flows started influencing monetary aggregates and real economy besides constraining the conduct of monetary policy. The monetary condition generally turns tight at the peak of global trade and financial cycle to anchor down the imported inflation, contain excessively fast credit growth besides restoring a balance in the external sector. However, as things turn out, it is difficult for monetary authority to fine-tune the condition and change the monetary policy stance precisely at a time when the abrupt slowing of capital inflows coincided with rising inflationary pressures. Accordingly, there were rise in money market rates and the erosion of business/lenders' confidence. Such sentimental change is not easy to reverse. Even an extremely accommodative monetary policy stance of the RBI found it difficult to offset the foreign liquidity or shape the financial market sentiments back towards more confidence. Consequently, there is a sudden and prohibitive rise in real lending rates.

In order to test the propagation of global shock, it is necessary first to pre-test the extent of openness in India. The cyclical correspondence between a number of local and global variables is thus undertaken in the next section.

Section 4

Cyclical Correspondence of Domestic and External Factors

With openness in global environment and reforms in the real and the financial sector, Indian economy was in the process of integrating itself to global factors. India's reluctance to enter into international market until early part of 1970s forced it to pay a rising bill of petroleum, oil and lubricants arising from steep rise in oil price in 1973. With gradual relaxation in foreign exchange and wage goods constraints, India had undertaken deregulation of industrial policy and import licensing combined with several concessions to exporters since the late 1970s. The strategy of financial sector development that had a development finance orientation assuring credit to wider section through state regulated banks and development financial institutions and a strong commitment to financial stability but through regulations and control gradually eased in 1980s. A much wide ranging liberalization of real and financial economy including foreign trade and capital market began since 1991 after the gulf crisis. The reforms were initiated with greater consensus towards reorienting the development strategy in favour of market forces in a cautious manner and with careful sequencing.

Openness in India is evident from the rising international trade, invisibles and overseas financial flows between 1990 and 2009. The most prominent policy changes to fasten this process was the reduction in the peak tariff rate, industrial and trade policy liberalisation, encouraging foreign investments, full current account convertibility, gradual movements towards capital account convertibility, managed float to exchange rate and the indirect monetary policy pursued through deregulation in the financial market segments.

India's integration to the multilateral trading environment and global communication revolution supporting the financial integration too helped. The reforms in the banking sector, capital market, government finance, market infrastructure, payment system as also insurance and pension system of late ensured that India responds to the fast changing global trading and financial environment relatively flexibly. The process gathered further momentum with signing of the Marrakesh Treaty which brought into

existence the World Trade Organisation (WTO) on January 1, 1995 to replace the General Agreement on Trade and Tariff (GATT).

The level of integration however has been relatively less as compared to a number of emerging economies in Latin America, East Asia and even China as planning model historically followed in India had a predominant domestic orientation as opposed to export led growth followed by these economies sometimes in early 1960s (Table 1).

Table 1: Merchandise Exports as percentage of GDP						
Year	Argentina	Chile	China	India	Malaysia	Russia
2000	9.3	25.5	20.8	9.2	104.7	40.6
2005	22.2	34.9	34.1	12.7	102.1	31.9
2008	21.6	39.2	32.5	14.6	94.4	28.1
Source: World Economic Outlook and International Financial Statistics, IMF.						

Nevertheless, a relatively open and free economy undergoing through transitional adjustments is gradually evident through a number of changes, *e.g.,* greater export intensity of output, integration of global input prices like crude, petro products, cement, steel, capital goods, food and non-food articles, *etc.,* to domestic wholesale prices, increasing trend of foreign collaboration and joint ventures with an eye to global markets, robust rise in invisibles and outsourcing business giving external account stability and increasing foreign investment.

Correspondence of domestic to global factors could have emerged at three levels of integration, *e.g.,* global price to domestic price, global exports to domestic exports and global liquidity to domestic liquidity. The level of integration is evident from the increasing foreign interest in Indian companies leading to a very close co-movement of global and domestic stock markets.

These changes make inter-temporal comparison of data difficult without referring to the openness conditions. Owing to this coupling of the real and financial sector to global forces, some cyclical correspondence of domestic to global activity is inevitable. An attempt has been made here to explore how domestic variables correspond to global trading and financial cycle, which is then followed through testing of a more structured hypothesis in the next section. Cyclical dating of variables is difficult in an emerging economy like India with transitional character. It is nevertheless essential to establish basic conditions about the level of integration before carrying out the test.

The quarterly data on a host of relevant domestic and global series from Q1:1996-97 to Q4:2008-09 has been seasonally adjusted and the resultant series is de-trended using linear filters. It may be mentioned that data on quarterly GDP series in India is not available before 1996-97. Cyclical correspondence is ascertained using statistically significant cross correlation between a pair of related variables. Use of linear filter can be an issue in a transitional economy like India. It is nevertheless considered appropriate as the period being too short (12 years) to observe any significant structural drifts. The reform process in India is gradual as compared to many emerging economies. Using ad-hoc non-linear filter in such circumstances may smoothen out important information in the data.

This simple analysis indeed yields some very powerful results. For instance, it could be ascertained that de-trended manufacturing wholesale price indices (WPI), which is one of the widely used measures on inflation in India constituting two-third of headline WPI is most powerfully coupled with the global CPI inflation rate than any other domestic variables including real money/ credit/GDP or agricultural output. The contemporaneous correlation coefficient between them is statistically significant at 0.86 higher than its best correlation coefficient with any domestic variable, the real bank credit, at 0.84 (Chart 9).

Chart 9: Correlation between Domestic and Global Inflation
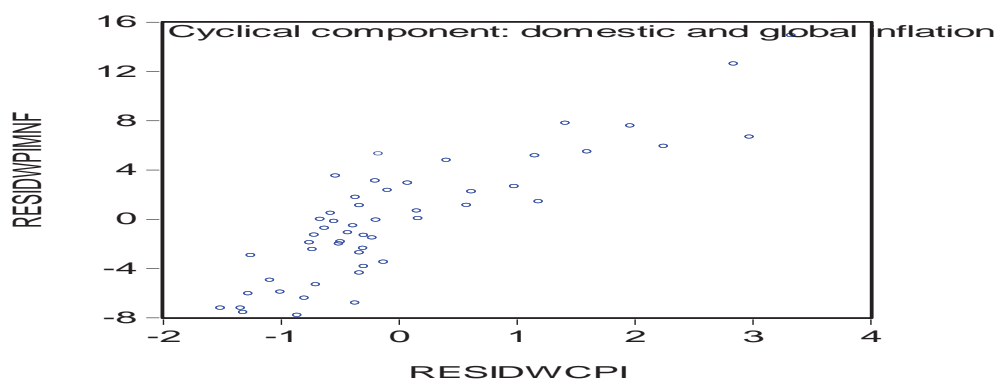
Such close price integration is unlikely to occur without domestic merchandise exports being strongly linked to global merchandise activities. In fact, the correspondence between the de-trend merchandise exports by India (USD terms) to global merchandise exports published by IMF International Financial Statistics is equally remarkable with contemporaneous correlation coefficient between them being statistically significant at 0.98. Such tight association discards the decoupling theory convincingly (Chart 10).

Chart 10: Correlation between Domestic and Global Exports
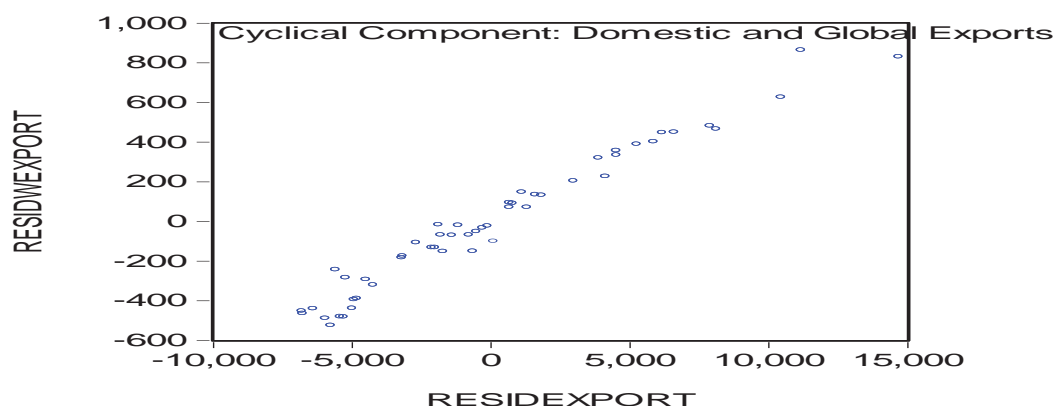
The next two charts show the correspondence of Indian merchandise exports in USD to the index of manufacturing output (MO) and MO to overall the real GDP. These two are jointly revealing the tentative transmission line expected from exports to MO and to GDP thereafter, showing their strengths in association. The contemporaneous and a significant correlation co-efficient of 0.91 between merchandise exports and MO is surprising as the value of manufacturing exports to the overall value of manufacturing output is not more than 13.0 per cent despite robust rise in Indian merchandise exports at around 25.0 per cent in USD terms during 2004-08 (Chart 11).

Chart 11: Correlation between Manufacturing Output and Exports
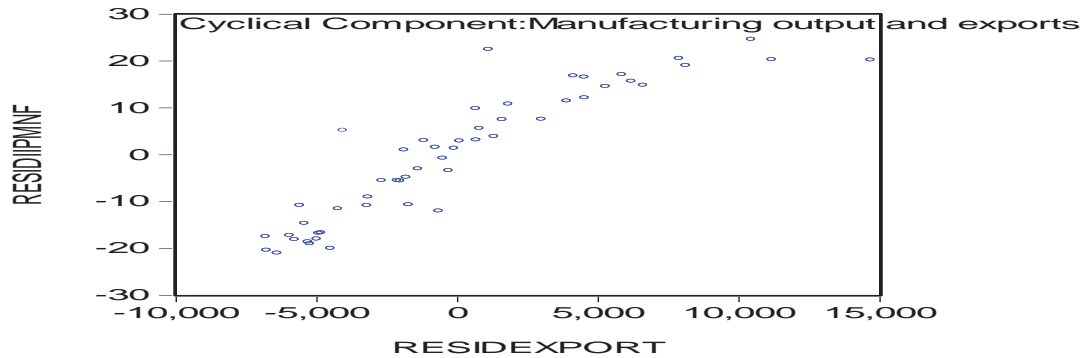
The correlation co-efficient at 0.93 between MO and GDPR too is surprising given the fact that the manufacturing share in GDP in India is low at around 15 per cent (Chart 12).

Chart 12: Correlation between Manufacturing Output and GDP

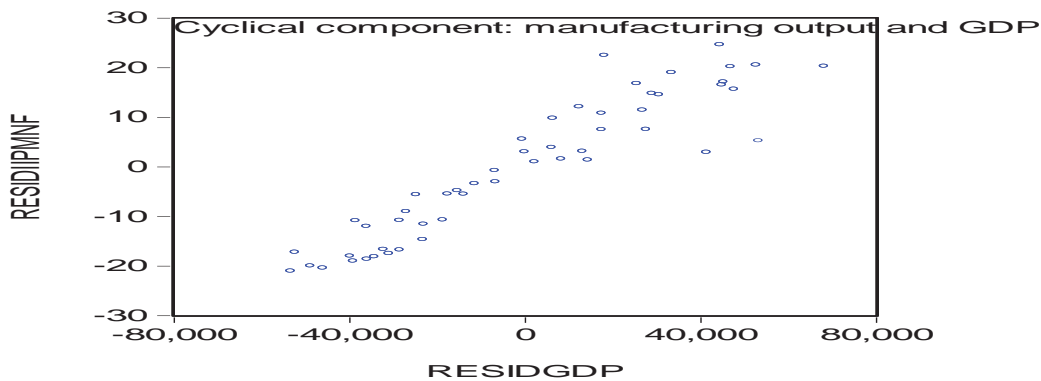Therefore, the impact of Indian merchandise exports through global trade cycle is expected to be strong on manufacturing and overall GDP despite low MO share to merchandise exports and manufacturing share to overall GDP. Such association is possible given the labour-intensive nature of India's manufacturing exports largely through Micro, Small and Medium Enterprises (MSME). A lower export easily converts to lower domestic demand through unemployment and cutback in spending by the household and the MSME amplifying the shock.

In fact, there is a high and statistically significant correlation coefficient between consumer output and MO at 0.89 and capital goods and MO at 0.93. Although, sector wise employment data particularly for the informal economy is not readily available, two surveys undertaken by the Government of India after the fallout of sub-prime crisis suggests a huge drop in employment in the export oriented units during Q4:2008, which only mark a negligible recovery in Q1:2009 despite a number of countercyclical fiscal stimulus measures. During Q4: 2008 quarter, about half a million workers were assessed to have lost their jobs, which are estimated to have increased by about a quarter million in Q1: 2009, lower than prevailing employment in September 2008 at 16.2 million.

As per the latest available information too, the Indian MSME sector accounted for around 39.0 per cent of total industrial production, 34.0 per cent of the exports in the industrial sector and around 35.0 per cent of employment (MSME Annual Report, 2006-07). MSME sector registered a robust annual average growth in value of output, exports and employment at 16.8 per cent, 20.0 per cent and 4.4 per cent, respectively during the expansionary cycle of 2003-07. While it somewhat sustained output growth backed by commensurate growth of merchandise exports, the employment growth had already fallen to 2.9 per cent by 2007-08, as industry was showing incipient signs of slowdown. Therefore, the spill over of exports growth to domestic demand through cutback in manufacturing employment and investment is likely to be stronger in India. Further, the MSME sector is also affected by the financial channel. An internal RBI Staff Study observed that production growth in smaller industries (comprising around 36.1 per cent of index of industrial production) come under pressure around peak of the recent growth cycle that forces them to take recourse of higher bank finance on drying down of the internal resource generation. Therefore, tightening of credit terms was observed to affect output growth of small industries further in 2008-09 (Manna, Forthcoming).

In line with the real economy, the preliminary evidence on the integration of domestic and global liquidity is evident despite managed float of exchange rate and active monetary management by the RBI to sterilise bulk of its net purchase of foreign exchange. The association between trend adjusted capital flows and reserve money is statistically significant and contemporaneously co-related at 0.91 (Chart 13).

Chart 13: Correlation between Domestic and Global Liquidity
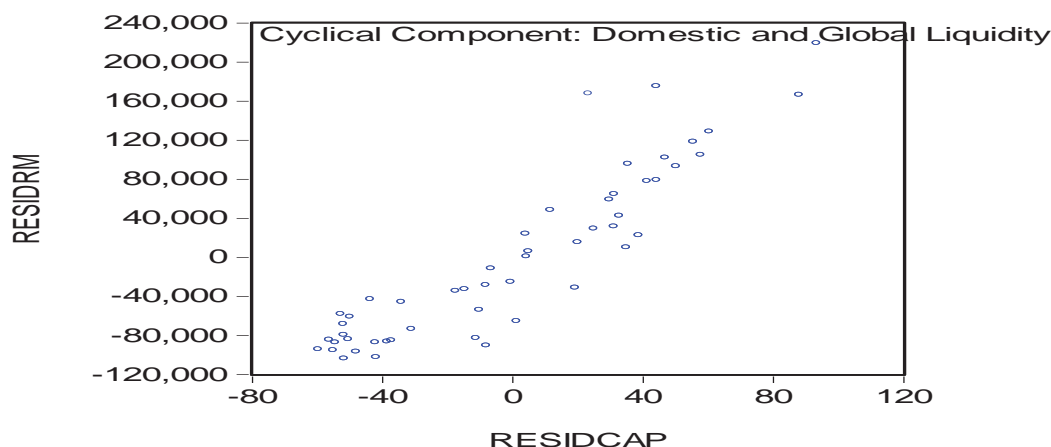
The other component of domestic liquidity considered in this study is the stock prices, a rise in which enabled non-financial firms to raise funds with relative ease, is also influenced strongly by the capital flows to India owing to a substantial volume of foreign investment flows through direct, portfolio and private equity route during 1993-95 and 2004-08. On the other hand, uncertainty marks the net capital flows and stock market during 1995-2003. Although two are contemporaneously related and statistically significant at 0.75, the maximum association between them at 0.86 arrives with a lag of one quarter (Chart 14).

Chart 14: Correlation between Stock Price and Net capital Flows
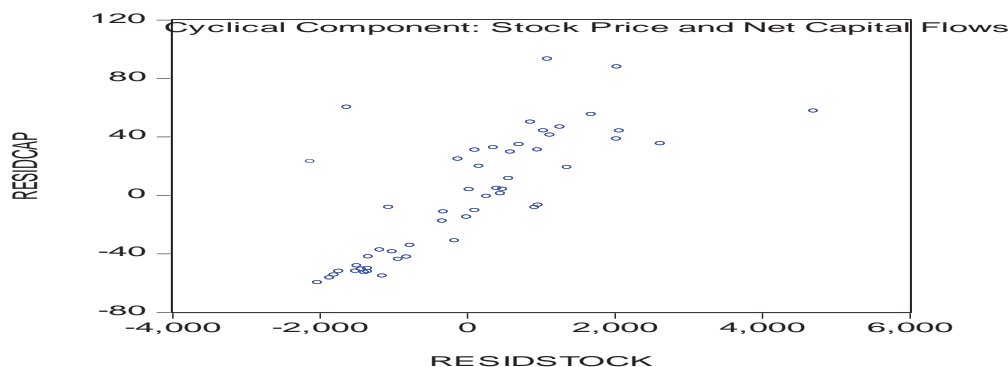
With the above evidences, it is now clear that global trading and financial cycle had a tendency to spill over to the domestic growth momentum in India with the gradual opening up of the economy. The stylised pattern associated with external disturbances would now be tested in the next section. The objective is to explore the openness linkages in India to see if the merchandise exports and foreign liquidity constraint amplifies the risks to macro-economy.

Section 5

Testing of the Transmission Channels

With preliminary evidences established in the previous section, it would now be easy to set the key hypothesis regarding transmission lines for testing. The available evidence suggests that global events had systematically transmitted to the Indian growth trajectory mainly through two channels-merchandise exports and liquidity channels- which need to be explored separately. For that purpose, the related variables are segregated in two blocks, *i.e*., real and financial.

In real block, the test required is the transmission line of exports to the real GDP, manufacturing in particular. Specifically, the impact of the shock in global merchandise exports (WEXPORT) and India's merchandise exports (EXPORT) in USD to the manufacturing (MNFR) and the overall GDP (GDPR) is the key test for interest in the real channel. Similarly, for financial block, the test is to check if shocks in net flow in the external capital account (CAPAC) and reserve money (RM) affect MNFR and EXPORT in a sizeable manner- separately as well as jointly. Besides direct liquidity channel through RM, the impact through stock prices (BSE100) supporting easy availability of credit to non-financial firms too is incorporated. Similarly in the real channel, impact of external demand shocks on prices- wholesale prices, manufacturing (WPIMNF) as well as the overall headline (WPIALL) - in addition to output is also assessed, the shock being essentially a demand shock.

There are various ways of undertaking the tests. We preferred the Vector Error Correction Mechanisms (VECM) to explore these channels separately as relations are expected to follow a short-term dynamics but around a possible stable long-term equilibrium path. Although the long-term relations are not of interest in this study, the short-term dynamics would not be specified correctly without imposing the restrictions. VECM framework is preferred as it imposes minimum identification restrictions. The specifications could be tested by changing the recursive order to ensure that system is not sensitive to any particular ordering.

Data used in the tests needs some clarification. WEXPORT data is sourced from International Financial Statistics, IMF and EXPORT is sourced from Directorate General of Commercial Intelligence and Statistics, Government of India (GoI). GDPR and MNFR are sourced from the National Account Statistics published by Central Statistical Organisation (CSO), GoI. Overall wholesale price index (WPIALL) and the same for the manufacturing sector (WPIMNF) are too sourced from the CSO, GOI. It may be indicated that WPI inflation is more widely used in India even for the monetary policy assessment in addition to price data on various consumer price index (CPI). The remaining data used are RM and CAPAC taken from the data compiled and published by the Reserve Bank of India. For stock price indicators, 100 scrip BSE100 index is used that is published by the Stock Exchange, Mumbai. All variables are used at quarterly intervals from Q1:1996-97 to Q4:2008-09 in the VECMs.

There are three steps which are involved in testing: (i) assessing for co-integration between sets of variables; (ii) testing the validity of restrictions imposed on the error correction (EC) representation among the co-integrating variables and (iii) observing the impulse response and variance decomposition to the Cholesky shock of the related variables.

In Step 1, the Maximum likelihood approach to test for co-integration proposed by Johanssen necessitates that the variables be integrated of the same order. Hence, the first step in conducting co-integration test is to pre-test each variable to determine their order of integration. In this respect, we use the Augmented Dickey Fuller and Phillips-Perron unit root tests to identify the integration properties of the variables (Table 2).

Table 2: Unit root tests

Variables	ADF –test		Phillips-Perron	
	Levels	First Difference	Levels	First Difference
GDPR	1.41 (0.99)	-3.64 (0.00)	-0.52 (0.99)	-11.79 (0.00)
MNFR	-2.58 (0.11)	-3.38 (0.00)	1.31 (0.99)	-10.50 (0.00)
EXPORT	1.80 (0.99)	-3.96 (0.00)	-0.37 (0.91)	-6.77 (0.00)
WEXPORT	-0.07 (0.99)	-5.26 (0.00)	-0.06(0.95)	-5.28 (0.00)
WPIALL	2.07 (0.99)	-5.85 (0.00)	1.07(0.99)	-7.98 (0.00)
WPIMNF	2.88 (1.0)	-5.21 (0.00)	1.93(1.0)	-4.69 (0.00)
CAPAC	-2.73 (0.13)	-7.11 (0.00)	-2.81(0.13)	-8.84 (0.00)
RM	3.54 (1.00)	-3.60 (0.00)	5.60(1.00)	-7.66 (0.00)
BSE100	-1.14 (0.69)	-6.77 (0.00)	-1.27(0.64)	-6.80 (0.00)

Note: Figures in parentheses are p-values.

The test statistics for testing the null hypothesis that the individual series has a unit root against the alternative that the series has a stationary process is compared against the critical values. The results indicate that the null is rejected at 1% significance level for all the variables under consideration in first differences while it is accepted in levels. This confirms that the variables in levels are non-stationary while they are stationary in first differences; suggesting that they could be integrated of first order.

The next step is to examine the co-integration properties of the set of variables for modelling them in VECM framework. The test statistics (λ_{TRACE} and λ_{MAX}) for testing null hypothesis that the number of co-integrating vectors $r = i$ against the alternative hypothesis that $r \leq 1 + i$ are presented in the Table 3 and, separately for the real and financial channels.

In real channel, first two co-integrating relations involve three variables, while the next two relations involve four variables with WEXPORT being introduced in the existing relations. The co-

movement of external demand, *i.e.,* EXPORT is first tested separately both on manufacturing and overall price and output. In other words, the co-integration relation among EXPORTS, WPIMNF, MNFR and EXPORTS, WPIALL, GDPR is tested separately first. Then, WEXPORT is being added in the next two co-integrating equations as the fourth variable.

Similarly, for financial channel, the first two co-integrating relations involving three variables have been extended to four variables by introducing CAPAC. The impact of reserve money (RM) and stock prices (BSE100) is tested separately on MNFR and EXPORT. Therefore, the first two co-integrating relations involves RM, BSE100, MNFR and RM, BSE100, EXPORT has been extended to four-variable co-integration by adding CAPAC (Table 3).

Table 3: Co-integration between Real Channel Variables

Variables	Hypothesis	Eigenvalue	λ_{TRACE}	λ_{MAX}
EXPORT, GDPR & WPIALL	r = 0	0.86	108.14*	29.79
	r ≤ 1	0.14	8.39	15.49
	r ≤ 2	0.01	0.65	3.84
EXPORT, MNFR & WPIMNF	r = 0	0.52	46.30*	29.79
	r ≤ 1	0.12	9.60	15.49
	r ≤ 2	0.06	3.19	3.84
WEXPORT, EXPORT, GDPR & WPIALL	r = 0	0.91	137.43*	47.86
	r ≤ 1	0.28	20.17	29.80
	r ≤ 2	0.07	4.01	15.49
	r ≤ 3	0.01	0.61	3.84
WEXPORT, EXPORT, MNFR & WPIMNF	r = 0	0.63	69.49*	47.86
	r ≤ 1	0.29	20.42	29.80
	r ≤ 2	0.06	3.43	15.49
	r ≤ 3	0.004	0.18	3.84

* indicate significance level at 5 %.

The results of Table indicate that there is one co-integrating relationship in all the relations at 5% significance level in real channels. Relation in financial channel suggests that variables could be related in different ways as suggested by the presence of more than one relation in some equations (Table 4).

Table 4: Co-integration between Financial Channel Variables

Variables	Hypothesis	Eigenvalue	λ_{TRACE}	λ_{MAX}
RM,BSE100 & MNFR	r = 0	0.51	51.97*	29.8
	r ≤ 1	0.28	16.56*	15.49
	r ≤ 2	0.001	0.07	3.84
RM,BSE100 & EXPORT	r = 0	0.43	42.2*	29.80
	r ≤ 1	0.25	14.33	15.49
	r ≤ 2	0.0009	0.004	3.84
CAPAC, RM,BSE100 & MNFR	r = 0	0.61	88.32*	47.86
	r ≤ 1	0.35	41.73*	29.80
	r ≤ 2	0.34	15.43	15.49
	r ≤ 3	0.0003	0.01	3.84
CAPAC, RM,BSE100 & EXPORT	r = 0	0.47	67.20*	47.86
	r ≤ 1	0.39	35.53*	29.80
	r ≤ 2	0.20	10.91	15.49
	r ≤ 3	0.0006	0.03	3.84

* indicate significance level at 5 %.

In next step, we used a parsimonious Vector Error Correction Model (VECM) for an $m \times 1$ vector of I(1) variables, z_t

$$\Delta z_t = -\Pi z_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta z_{t-i} + d + \epsilon_t \, ,$$
$$t = 1, 2, \ldots, T,$$

where k is the number of lags in the unrestricted VAR representation of z_t, and d is an m vector of deterministic terms. The equilibrium properties of the above equation are characterized by the rank of Π. If the elements of z_t are I(1) and co-integrated Π can be decomposed into two $m \times r$ full column rank matrices α and β, where $\Pi = \alpha\beta'$, this implies that there exist $r < m$ stationary linear combinations of z_t, such that $\xi_t = \beta' z_t$ distributed as $I(0)$. The matrix of adjustment coefficients, α, measures how strongly deviations from the long-run equilibrium, ξ_t, feed back into the system.

At least four types of restrictions are relevant in such relation: restrictions on the rank of the long-run matrix, Π; restrictions on the long-run co-integrating vectors, β; restrictions on the short-run dynamic coefficients, Γ_i; and restrictions on the loading parameters α. There are various ways to impose these restrictions; although it is almost impossible to implement all of them in a limited sample size like this as the interaction of dynamic and long-run parameters has an enormous effect on the size and power of the tests. Therefore, we used a normalization procedure that identifies all co-integrating relations and expresses the first r variables in the VEC as functions of the remaining $k - r$ variables, where r is the number of co-integrating relations and k is the number of endogenous variables. The causality structure of the model is thus established by eliminating co-integrating vectors with insignificant loading parameters.

The coefficient of the co-integrating equations so obtained is furnished in Table 5. The real channel co-integration result shows WEXPORT is strongly coupled with EXPORT, which in turn is expansionary in respect to both for manufacturing and overall GDP. However, external demand failed to reveal impact on domestic price in the long-run. This could be due to openness influencing domestic prices converging to global levels so evident in India, while output and export growth rising in response to greater access to global market.

In financial channel block among the three variables, the impact of reserve money (RM) is clear on both manufacturing and exports, which however disappears in the long-run once CAPAC is introduced. It is possible that the exchange rate impact of capital inflows in the long-run offset the liquidity impact consistent with some of the literature in Section   1. No clear relation emerges after the incorporation of CAPAC although co-integration among variables gets confirmed.

The issues relating to longer term impact of trade on prices as compared to output or simultaneous longer-term impact of exchange rate on manufacturing or exports are beyond the scope of the paper. However, to the extent longer-term co-integrating relation is established, we impose the restrictions as it is (Table 5).

In fact, it is the short-term convergence properties that are of interest as fallout of global events and associated disturbances, which would be evident from error correction (EC) terms. The EC coefficients of difference equation VARs and the speed of adjustments of EC terms associated with them are presented in Table 6 to 9. In all cases, the lag length in VAR is chosen based at two. Coefficients of lagged EC term are statistically significant at 1% level. Any disequilibrium shock in the system was found at least some of the variables to get back to their long-run stable relation suggesting the desired convergence properties.

Table 5: Speed of EC term in difference equation VARs

Real Channel		Financial Channel	
Variables	Normalised Coefficients	Variables	Normalised Coefficients
(EXPORT	[1	(RM	[1
WPIMNF	379.04 (1.97*)	BSE100	-92.32 (-3.68*)
MNFR)	-0.97 (-4.63*)]	MNFR)	-11.80 (-4.46*)]
(EXPORT	[1	(RM	[1
WPIALL	527.44 (8.40*)	BSE100	-77.24 (-0.76)
GDPR)	-0.19 (-13.08*)]	EXPORT)	-40.36 (2.10*)]
(WEXPORT	[1	(CAPAC	[1
EXPORT	-0.10 (-12.37*)	RM	-0.05 (-0.42)
WPIMNF	10.72 (2.15*)	BSE100	-0.11 (-0.23)
MNFR)	-0.03 (-3.44*)]	MNFR)	0.02 (0.22)]
(WEXPORT	[1	(CAPAC	[1
EXPORT	-0.40 (-4.17*)	RM	-0.02 (-0.73)
WPIALL	33.66 (4.39*)	BSE100	-0.42 (-1.29)
GDPR)	-0.01 (-4.59*)]	EXPORT)	0.63 (1.28)]

Figures in parenthesis are t statistics. *: Significant at 5% levels.

Table 6: Adjustment of EC Terms (3 variables) in Difference Equations: Real Channel VECM

Diagnostics / Equations	Relating to Overall GDP			Relating to MNFR		
	D(EXPORT)	D(WPIALL)	D(GDPR)	D(WEXPORT)	D(WPIMNF)	D(MNFR)
EC adjustments speed	-0.60 (-4.57)	-0.0005 (-3.38)	0.53 (5.01)	-0.58 (-3.29)	-0.0002 (-1.71)	-0.53 (-2.04)
R Bar Square	0.46	0.60	0.91	0.24	0.41	0.33
F-Stat	6.95	11.38	71.94	3.16	5.72	4.46

Figure in parenthesis are t-statistics; D before variables stands for first difference

Table 7: Adjustment of EC Terms (4 variables) in Difference Equations: Real Channel VECM

Diagnostics / Equations	Relating to GDPR				Relating to MNFR			
	D(WEXPORT)	D(EXPORT)	D(WPIALL)	D(GDPR)	D(WEXPORT)	D(EXPORT)	D(WPIMNF)	D(MNFR)
EC adjustments speed	-0.50 (-2.51)	-0.56 (-1.75)	-0.0008 (-2.37)	0.74 (2.96)	0.73 (3.91)	12.59 (5.05)	0.003 (0.99)	11.01 (3.32)
R Bar Square	0.54	0.55	0.60	0.93	0.57	0.72	0.44	0.80
F-Stat	7.02	7.29	8.90	71.39	8.01	14.60	5.16	21.92

Figure in parenthesis are t-statistics; D before variables stands for first difference

Table 8: Adjustment of EC Terms (3 variables) in Difference Equations: Financial Channel VECM

Diagnostics / Equations	Relating to EXPORT			Relating to MNFR		
	D(RM)	D(BSE100)	D(EXPORT)	D(RM)	D(BSE100)	D(MNFR)
EC adjustments speed	-0.04 (-3.03)	0.0004 (1.20)	0.001 (0.96)	0.09 (4.12)	-0.002 (-1.97)	0.01 (4.77)
R Bar Square	0.34	-0.11	0.28	0.57	0.04	0.57
F-Stat	4.48	0.33	3.19	9.99	1.27	10.02

Figure in parenthesis are t-statistics; D before variables stands for first difference

Table 9: Adjustment of EC Terms (4 variables) in Difference Equations: Financial Channel VECM

Diagnostics / Equations	Relating to Overall EXPORT				Relating to MNFR			
	D(CAPAC)	D(RM)	D(BSE100)	D(EXPORT)	D(CAPAC)	D(RM)	D(BSE100)	D(MNFR)
EC adjustments speed	-0.48 (-2.11)	3.25 (3.54)	0.003 (0.10)	0.04 (0.51)	-0.51 (-1.66)	6.34 (7.75)	0.01 (0.35)	0.65 (4.21)
R Bar Square	0.09	0.40	0.00	0.29	0.12	0.75	0.03	0.52
F-Stat	1.50	4.57	0.89	3.19	1.70	17.12	1.17	6.78

Figure in parenthesis are t-statistics; D before variables stands for first difference

The remaining step three of the exercise involves examining the sign and pattern of impulse responses of the variables of interest in the system in response to the one SD Cholesky shock of other relevant variables. The overall variance was then decomposed in order to identify the impact of the global shocks. Major results of the same are reported in the Annex (Panel A to H). Given that the major interest of the study confine to this step, the results are analysed at length in the subsequent paragraphs separately for the real and financial channel.

Three variables VECM for real channel on manufacturing output and price (i.e., EXPORT, WPIMNF & MNFR) shows that the impact of external demand (EXPORT) on manufacturing price (WPIMNF) and output (MNFR) has been strongly positive. Shock in EXPORT explained 55 per cent of the MNFR variations in the same quarter. External demand also put pressure on price but gradually. The shock in EXPORT explained maximum WPIMNF variations of 50 per cent by the third quarter (Panel A).

Some difference arises as regards the impact of merchandise exports on overall GDP. As opposed to quick transmission on manufacturing output, the impact of external demand on overall GDP is slow, although little more sizeable over the entire period. The shock in EXPORT explains only 7 per cent of GDPR variations in the same quarter but the maximum GDPR variation of 59 per cent by the end of sixth quarter. This implies that merchandise export does not have any impact on GDP outside the manufacturing sector immediately. The 7 per cent of GDP variation explained by the same quarter is quite consistent with the 15 per cent share of manufacturing to the overall GDP (i.e., 15 per cent of the 55 per cent manufacturing variance explained by EXPORT shock in the same quarter or 7.75 per cent). This possibly indicates that immediate impact of MNFR gradually turn out to be sizeable on overall GDP relatively slowly as domestic demand started adjusting to the manufacturing slowdown. As regards price, the overall impact on WPIALL is broadly similar to WPIMNF with positive impact of external demand; although effect is relatively higher as manufacturing price has a weight of over two-third on overall WPI. The peak effect of exports is showing late on WPIALL between third and fifth quarters (Panel B).

Notably, the long-term impact of international trade on wholesale prices is of easing nature and therefore, is quite different than the effect arising from an external demand shock. These are consistent with experiences in India prior to the growth slowdown as observed in the first half of 2008, when international trade cycle put pressure on global commodity prices with wholesale inflation in India too shooting up. This however is contrary to the longest spell of low global inflation observed during 1996-2007, which benefitted India too.

The condition changes dramatically when the world merchandise exports (WEXPORT) is introduced as the fourth variable in the two sets of real channel VECMs. First, the WEXPORT started explaining nearly 73-78 per cent of domestic exports within 1-2 quarters in both the VECMs with manufacturing and overall GDP. On the other hand, the impact of EXPORT on domestic price and output, although showing across manufacturing and overall GDP, drops drastically and explains just 12-19 per cent of manufacturing output and price. The impact on EXPORT on overall GDP and price virtually disappeared. On the contrary, it is the WEXPORT that explains 68 per cent and 82 per cent of WPIMNF and WPIALL by fourth quarter. As regards transmission over output, the delay over GDPR vis-a-vis MNFR holds. While WEXPORT explains the peak of MNFR variations of 36-43 per cent between second and fourth quarter, the peak GDPR variation by WEXPORT at 63 per cent is reached by seventh quarter. This confirms two facts. First, Indian merchandise exports has been very fast to catch a sizeable momentum of the global trade cycle. Second, the initial manufacturing slowdown does not spill over to other segment of GDP immediately but advance slowly in the next five quarters possibly through domestic demand component with falling global and Indian exports (Panel E & F).

As regards the financial channel VECMs, short-term dynamics are insightful too. Financial channel VECMs restricts itself to explain the overall manufacturing output (MNFR) and merchandise exports (EXPORT), as we have seen and believed that the global trade transmit to overall GDP through merchandise trade and manufacturing. Therefore, understanding the liquidity impact over Indian exports and manufacturing is crucial than on GDP as a whole.

Three variables VECM trying to explain MNFR (i.e., RM, BSE100 & MNFR) shows that the financial channel works through RM immediately by influencing liquidity and through equity price (BSE100) gradually possibly through finance availability to the non-financial business from non-bank sources. Shock in RM could explain maximum MNFR variations by 30 per cent in the same quarter, while shock in BSE100 explains the same by 41 per cent by the next quarter (Panel C). The lagged impact of equity price on output is fully consistent with finance availability channel as some time is due from the actual planning to the execution of an issue in the primary market.

Three variables VECM to explain EXPORT (i.e., RM, BSE100 & EXPORT) gives a qualitatively same but a more powerful results showing that merchandise exports in India could be financial constraint more than the overall manufacturing purely as the exporters in India might have higher access to finance than general manufacturing business. Accordingly, a RM shock explains a sizeable 56 per cent of EXPORT variations in the same quarter. In addition, credit constraint also apparent from non-bank segment as a

shock in stock prices (BSE100) shows a gradual but sizeable impact on EXPORT by explaining 60 per cent of its variation by 5-6 quarter (Panel D).

Interesting observations could be made as net capital account position (CAPAC) is introduced in the VECMs under panel C & D. On one hand, the CAPAC shocks explaining nearly 84 per cent of RM variations by four quarter and 65 per cent of BSE100 variations by second quarter indicating two relatively known issues that unsterilized capital flows acted as the major sources of primary liquidity besides highlighting the investment support accorded by CAPAC to the stock market in India. CAPAC shock now explaining nearly 40 per cent of MNFR variation by the fourth quarter. While the impact of RM is commensurate, BSE100 now fails to explain any sizeable variations to MNFR. This possibly indicates the importance of bank finance to the overall credit flow to the manufacturing companies as compared to non bank sources (Panel G). Accordingly, domestic and foreign liquidity crunch affects them indirectly though delay in receiving payments or tighter credit terms from buyers / creditors, but not directly through reduced access to non-bank finance.

The VECM involving CAPAC, RM, BSE100 and EXPORT is stronger in the sense that the variance decomposition of EXPORT receives additional explanatory power of equity price (BSE100) beyond that is explained by the RM and CAPAC. Of the overall variation of EXPORT, the shock in RM explain 40 per cent in the same quarter, CAPAC explains 38 per cent by the fourth quarter and BSE100 explains 35-36 per cent by the 3-4 quarter. Thus, it may be conjectured that merchandise exporters have access to finance from both the bank and non-bank sources domestically and trade finance from abroad. Therefore, cutback of finance from any of the sources would impact exports (Panel H).

On the basis of the above set of results, a number of implications of external shocks can be outlined now. First, with increasing integration of the real and the financial sector, the impact of global trade over merchandise exports and dependence on foreign liquidity on the availability of finance got pronounced in India. Second, initial shock in external demand is quickly picked up by the manufacturing sectors, which gradually manifest over the domestic demand slowdown and magnified further with financial constraint. Third, the trade channel is perhaps too strong in India not from the viewpoint of standard trade openness perspective but from the fact that the country usually exports labour intensive manufacturing and therefore, the exports loss implies a sizeable shock to output through consumption and investment demand. Fourth, the financial flow from external sources shaped domestic liquidity and stock price with sizeable impact on the availability of finance from the bank as well as non-bank sources.

Thus, global trade slowdown and absence of liquidity from foreign sources makes business condition tighter even for the best rated borrowers. The reduced access to capital market prompts corporate to access banking system by reducing availability of finance to household / SMEs borrowers. Consequently, the household and the SMEs producing manufacturing exportable faces tightening credit terms apart from lower demand. This could have impacted domestic growth and exports in a big ways through cut-back in manufacturing activities.

Section 6

Concluding Observations

Indian growth experience around major global crisis prone years has been examined in this paper. It is observed that manufacturing sector quickly picks up the slack in global trade as manufacturing exports constitute around 63.5 per cent of the overall merchandise exports in India. Overall GDP is relatively slow to respond to the export slowdown perhaps reflecting the gradual slowdown in domestic demand associated with loss of employment and cutback in associated domestic spending. This is difficult to rule out as the MSMEs in India accounts for a sizeable 34-39 per cent of industrial output and exports as well as employment. There are evidences of pressure on employment and credit terms during current industrial slowdown phase.

Another channel of infection could be the capital inflows, especially the portfolio investments since 1993 that had given support to the equity market besides easing banking and non-banking liquidity in a consistent manner. With slowdown in capital flows around the crisis prone years, liquidity off-take in the financial market shrinks despite an easing monetary policy pursued by the Reserve Bank of India. The financial slowdown from foreign sources makes business condition tighter even for the best rated borrowers, who started accessing banking system reducing availability of finance to household / SMEs borrowers. This could have impacted domestic growth and exports through cut-back in manufacturing activities.

Monetary policy plays a limited role to counter global shock in crisis prone years to balance the inflationary pressure with an almost simultaneous slowdown of capital inflows. At the peak of the global trade and financial cycle, surge in global commodity price imposes pressure on RBI to anchor inflationary expectations. Simultaneous slowdown of foreign capital made the fine-tuning job difficult for RBI with pressures evident in the money market. Even an extremely accommodative monetary policy stance of RBI acts slowly to bring down the real cost of finance after the crisis.

The empirical framework followed in the study involves examining the tentative cyclical correspondence of a number of domestic and global variables to assess openness and decomposing the overall variance of output to global shocks. As evident from the first exercise, openness is far more evident than what is usually believed in India in terms of contemporaneous correlations among de-trended variables at three levels, e.g., global price to domestic price, global exports to domestic exports and global liquidity to domestic liquidity.

As regard variance decomposition, it is observed that the shock in Indian merchandise exports impacted manufacturing variations immediately to the extent of 55 per cent in the same quarter, which spill over to the overall GDP slowly by explaining 59 per cent of its variation but at the end of sixth quarter. It is also evident that Indian exports picked up the global trends very fast as the explanatory power of Indian exports to explain output variations drops drastically with the inclusion of global trade. On the other hand, global trade starts explaining nearly 73-78 per cent of domestic export variations in the next 1-2 quarters besides indicated the overall external demand pressure on output and price.

The financial channel works through reserve money immediately by influencing liquidity as also through equity price gradually through affecting finance from the non-bank sources. Shock in RM could explain maximum manufacturing and export variations by 30 per cent and 56 per cent in the same quarter, while shock in BSE100 explains the same by 41 per cent and 60 per cent gradually as raising non-bank finance from capital market requires some time. After the introduction of capital flows in the existing relation, the importance of liquidity and bank finance only shows over to the manufacturing sector but not the equity price as manufacturing units under MSME possibly have lesser access to non bank finance, while lack of liquidity affect them though delay in receiving payments or tighter credit terms from buyers / creditors. The high dependence of exports to external flows, domestic liquidity and stock prices possibly reveals the fact that firms producing exportable in India has higher access to finance from multiple source and thus, shock in the same during global turmoil affects them in a sizeable manner through financial channel.

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Annex

Response to Cholesky One S.D. Innovations of
EXPORTS on WPIMNF & MNFR

Response of WPIMNF to EXPORT

Response of MNFR to EXPORT
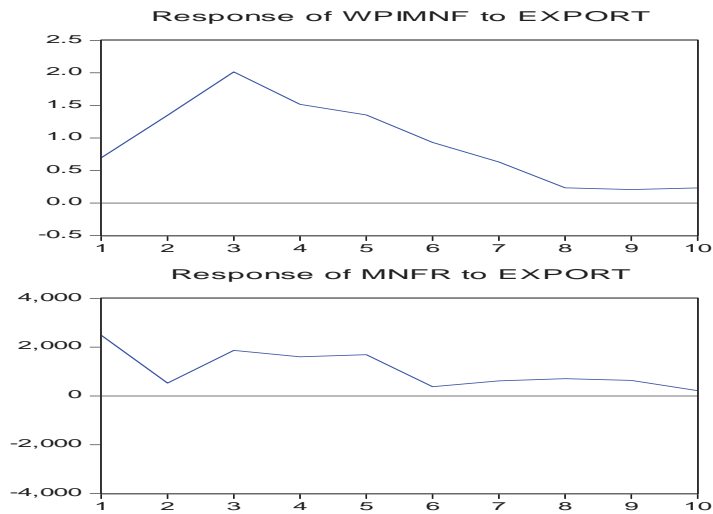
Panel A: Variance Decomposition of 3 Variables Real Channel VECM: EXPORT, WPIMNF, MNFR

	Variance Decomposition of EXPORT:		
Period	EXPORT	WPIMNF	MNFR
1	100.0000	0.000000	0.000000
2	91.09599	5.336558	3.567450
3	78.61463	11.81982	9.565551
4	63.34714	19.97528	16.67758
5	53.22766	24.71510	22.05723
6	44.41611	28.37342	27.21048

	Variance Decomposition of WPIMNF:		
Period	EXPORT	WPIMNF	MNFR
1	17.44249	82.55751	0.000000
2	34.38671	63.99931	1.613986
3	50.50638	39.47055	10.02308
4	50.39983	29.42432	20.17585
5	48.66410	23.65521	27.68069
6	43.48985	19.52806	36.98209

	Variance Decomposition of MNFR:		
Period	EXPORT	WPIMNF	MNFR
1	55.73819	4.604915	39.65689
2	34.07027	16.80653	49.12320
3	42.05567	14.61722	43.32711
4	42.05492	13.78279	44.16229
5	33.67097	16.95385	49.37518
6	26.44114	20.87933	52.67952

Response to Cholesky One S.D. Innovations
of EXPORT on WPIALL & GDPR
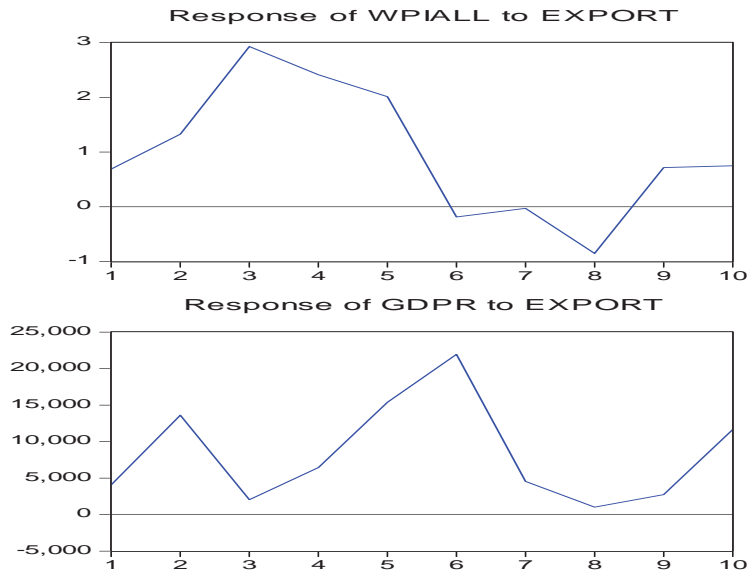
Panel B: Variance Decomposition Of 3 Variables Real Channel VECM: EXPORT, WPIALL, GDPR

	Variance Decomposition of EXPORT:		
Period	EXPORT	WPIALL	GDPR
1	100.0000	0.000000	0.000000
2	88.84578	1.802131	9.352084
3	87.79559	1.444805	10.75960
4	78.25197	4.950611	16.79742
5	75.42651	5.484985	19.08851
6	71.49945	8.756211	19.74434

	Variance Decomposition of WPIALL:		
Period	EXPORT	WPIALL	GDPR
1	12.21698	87.78302	0.000000
2	31.19832	66.04552	2.756164
3	52.74875	37.90940	9.341846
4	54.26404	26.74339	18.99257
5	53.91538	24.57517	21.50944
6	50.72147	23.66190	25.61663

	Variance Decomposition of GDPR:		
Period	EXPORT	WPIALL	GDPR
1	7.142814	2.382544	90.47464
2	44.81358	2.560359	52.62606
3	43.54868	2.437501	54.01382
4	44.38461	9.724930	45.89046
5	47.20633	5.419063	47.37460
6	59.11613	3.528931	37.35494

Response to Cholesky One S.D. Innovations
of RM and BSE100 on MNFR

Response of MNFR to RM

Response of MNFR to BSE100
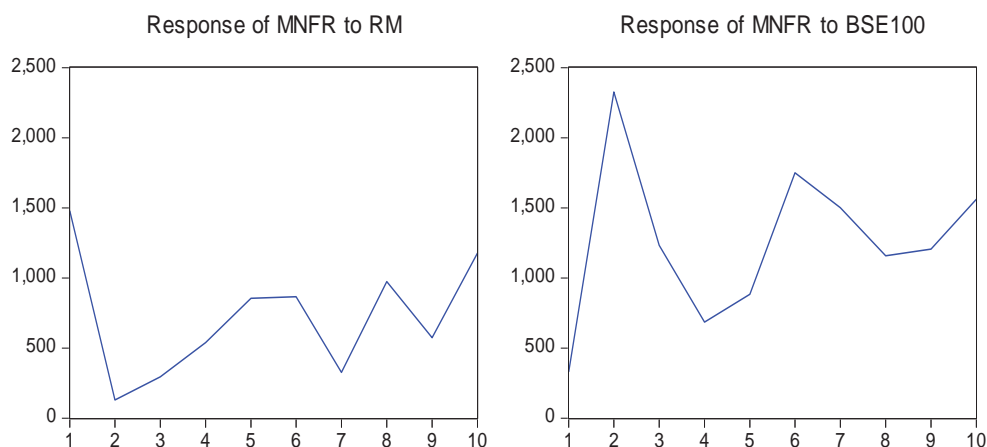
Panel C: Variance Decomposition Of 3 Variables Financial Channel VECM: RM, BSE100 & MNFR

Period	RM	BSE100	MNFR
	Variance Decomposition of RM:		
1	100.0000	0.000000	0.000000
2	70.33129	21.65353	8.015176
3	66.59152	30.04696	3.361514
4	59.06829	38.36559	2.566124
5	65.37812	32.94654	1.675335
6	60.61054	37.86140	1.528062

Period	RM	BSE100	MNFR
	Variance Decomposition of BSE100:		
1	21.50540	78.49460	0.000000
2	25.13265	73.70215	1.165194
3	27.27280	71.84167	0.885529
4	30.37038	68.97410	0.655521
5	28.94767	70.47748	0.574849
6	29.03221	70.45674	0.511049

Period	RM	BSE100	MNFR
	Variance Decomposition of MNFR:		
1	30.40513	1.503089	68.09178
2	16.37106	41.02604	42.60290
3	14.81977	45.56312	39.61711
4	15.84576	46.12583	38.02841
5	16.69701	41.82092	41.48207
6	16.61908	46.48490	36.89602

Response to Cholesky One S.D. Innovations of RM and BSE100 on EXPORT

Response of EXPORT to RM

Response of EXPORT to BSE100
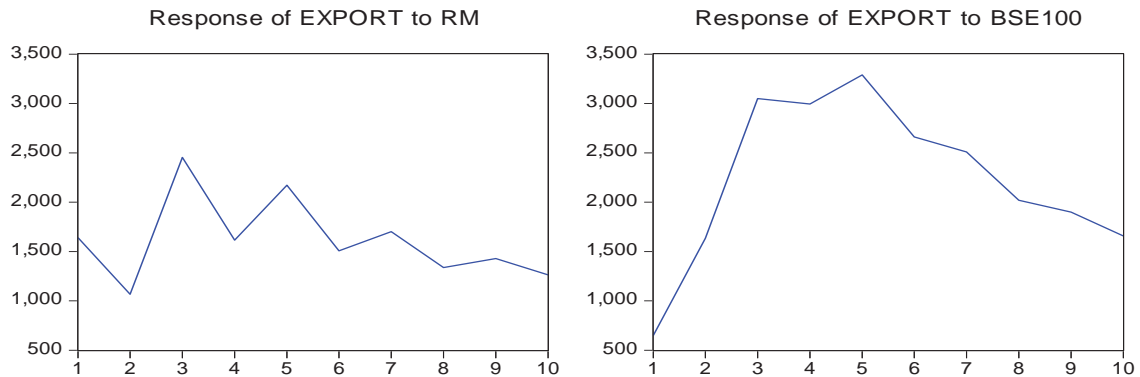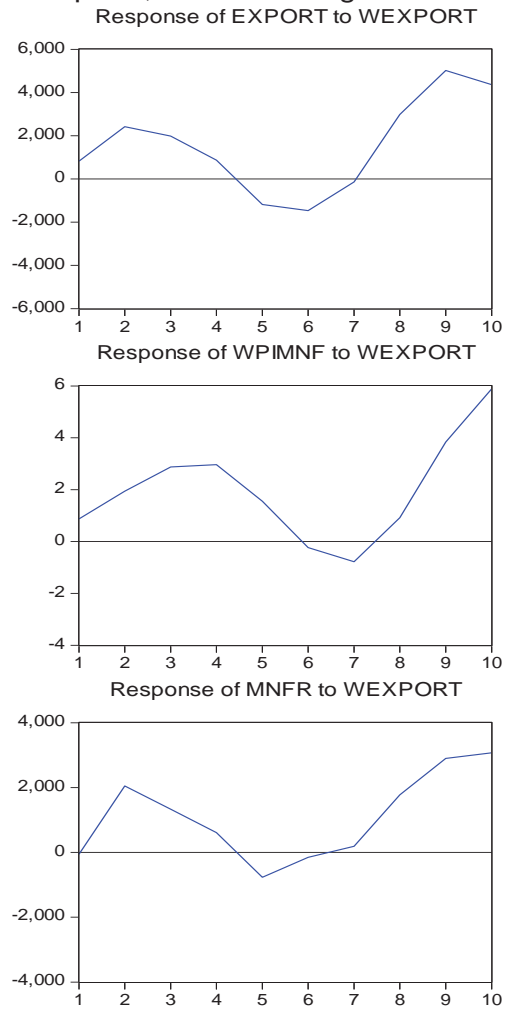
Panel D: Variance Decomposition Of 3 Variables Financial Channel VECM: RM, BSE100 & EXPORT

	Variance Decomposition of RM:		
Period	RM	BSE100	EXPORT
1	100.0000	0.000000	0.000000
2	82.62269	17.11156	0.265754
3	69.23939	30.53999	0.220619
4	63.12942	36.57809	0.292493
5	57.95285	41.81164	0.235513
6	54.40082	45.40347	0.195717

	Variance Decomposition of BSE100:		
Period	RM	BSE100	EXPORT
1	1.210951	98.78905	0.000000
2	2.398165	97.28637	0.315464
3	2.182977	97.03993	0.777098
4	1.906308	96.77938	1.314316
5	1.666224	96.51459	1.819182
6	1.486291	96.25171	2.262003

	Variance Decomposition of EXPORT:		
Period	RM	BSE100	EXPORT
1	55.70607	8.765670	35.52826
2	39.52841	32.00304	28.46855
3	37.28118	46.92765	15.79117
4	32.22109	55.24360	12.53531
5	31.34938	58.73966	9.910962
6	30.15594	60.89160	8.952463

Response to Cholesky One S.D. Innovations of World Exports on Indian Exports, Manufacturing Price and Output

Response of EXPORT to WEXPORT

Response of WPIMNF to WEXPORT

Response of MNFR to WEXPORT

Panel E: Variance Decomposition Of 4 Variables Real Channel VECM: WEXPORT, EXPORT, WPIMNF, MNFR

Period	WEXPORT	EXPORT	WPIMNF	MNFR
	Variance Decomposition of WEXPORT:			
1	100.0000	0.000000	0.000000	0.000000
2	91.99406	7.147385	0.848857	0.009693
3	95.06883	3.728813	0.609726	0.592628
4	82.25297	12.92640	2.180977	2.639653
	Variance Decomposition of EXPORT:			
1	35.65689	64.34311	0.000000	0.000000
2	73.12390	24.45258	0.004969	2.418547
3	78.04672	17.84295	0.211796	3.898538
4	60.88742	29.50445	4.219134	5.389000
	Variance Decomposition of WPIMNF:			
1	29.73709	6.268999	63.99391	0.000000
2	46.87405	11.95865	41.13081	0.036494
3	59.79733	12.07662	26.65163	1.474414
4	68.05007	8.188044	20.38930	3.372591
	Variance Decomposition of MNFR:			
1	0.099237	17.16318	0.115028	82.62255
2	35.82068	7.810947	2.510602	53.85777
3	42.93911	7.310160	2.119694	47.63103
4	35.92296	19.33476	2.984714	41.75757

Response to Cholesky One S.D. Innovations of WEXPORT on
EXPORT, WPIALL & GDPR

Response of EXPORT to WEXPORT

Response of WPIALL to WEXPORT

Response of GDPR to WEXPORT
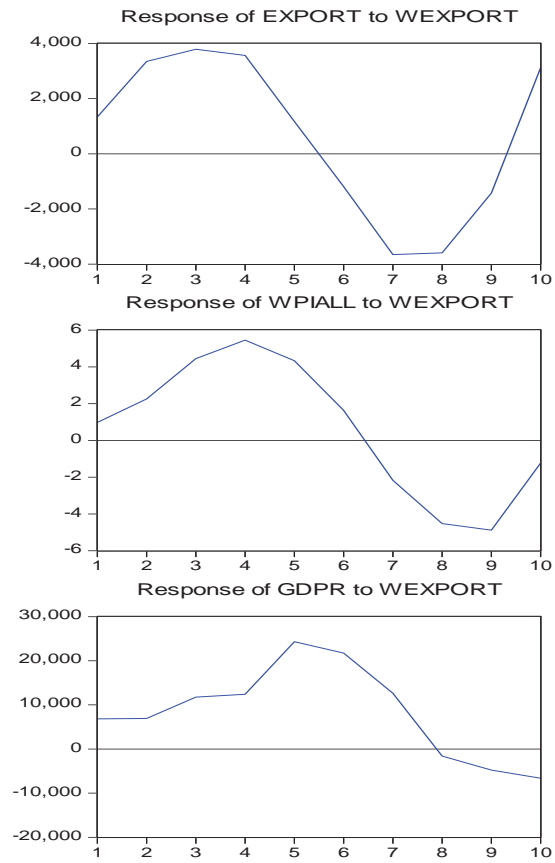
Panel F: Variance Decomposition Of 4 Variables Real Channel VECM: WEXPORT, EXPORT, WPIALL, GDPR

	Variance Decomposition of WEXPORT:			
Period	WEXPORT	EXPORT	WPIALL	GDPR
1	100.0000	0.000000	0.000000	0.000000
2	89.50118	8.502277	1.826182	0.170356
3	89.62208	6.287132	2.568527	1.522257
4	82.92927	6.040575	7.496722	3.533429

	Variance Decomposition of EXPORT:			
Period	WEXPORT	EXPORT	WPIALL	GDPR
1	57.46782	42.53218	0.000000	0.000000
2	78.07179	20.49065	0.782296	0.655264
3	74.77435	20.54032	3.206301	1.479027
4	74.38827	16.70186	5.982901	2.926967

	Variance Decomposition of WPIALL:			
Period	WEXPORT	EXPORT	WPIALL	GDPR
1	24.40988	1.207931	74.38219	0.000000
2	59.30242	1.532339	38.61192	0.553323
3	76.87683	4.975927	15.16203	2.985211
4	82.63143	4.654741	7.722965	4.990861

	Variance Decomposition of GDPR:			
Period	WEXPORT	EXPORT	WPIALL	GDPR
1	25.14201	0.112272	0.335018	74.41070
2	29.19506	5.549867	12.56976	52.68531
3	46.62732	3.965839	8.754493	40.65235
4	56.24503	7.697255	6.535879	29.52183

Response to Cholesky One S.D. Innovations of CAPC to RM, BSE100 & MNFR

Response of RM to CAPAC

Response of BSE100 to CAPAC

Response of MNFR to CAPAC
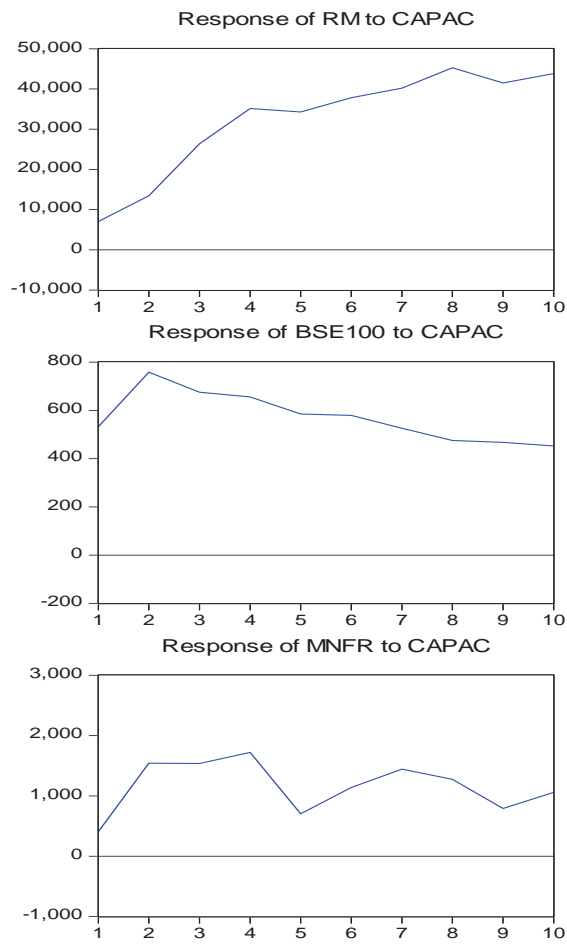
Panel G: Variance Decomposition of 4 Variables Financial Channel VECM: CAPAC, RM, BSE100 & EXPORT

Period	CAPAC	RM	BSE100	MNFR
	Variance Decomposition of CAPAC:			
1	100.0000	0.000000	0.000000	0.000000
2	98.20666	0.503790	0.107979	1.181568
3	96.64958	0.529831	0.586429	2.234162
4	96.52878	0.486348	0.946670	2.038200
	Variance Decomposition of RM:			
1	22.14531	77.85469	0.000000	0.000000
2	42.96258	33.15820	0.115274	23.76395
3	70.31685	18.93813	0.941790	9.803223
4	84.37920	9.749691	0.778664	5.092449
	Variance Decomposition of BSE100:			
1	51.83347	0.031026	48.13550	0.000000
2	65.01681	0.433752	33.13723	1.412207
3	62.18527	0.371807	36.16317	1.279760
4	61.40818	0.297272	36.94151	1.353040
	Variance Decomposition of MNFR:			
1	2.067699	23.77141	0.049720	74.11117
2	18.91545	18.12654	1.879376	61.07863
3	30.33392	15.07956	2.415563	52.17096
4	39.71104	12.42795	2.493886	45.36712

Response to EXPORT by Cholesky One S.D. Innovations
in CAPAC & BSE100

Response of EXPORT to CAPAC

Response of EXPORT to BSE100
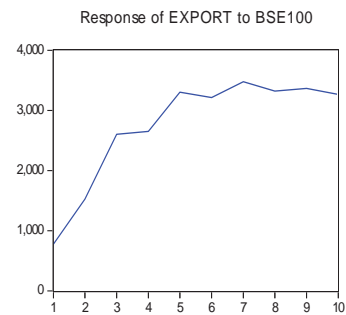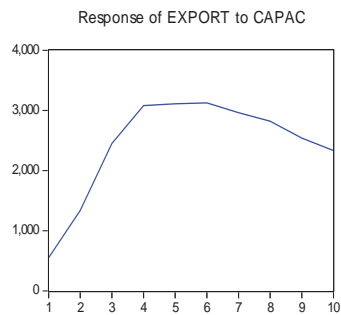
Panel H: Variance Decomposition Of 4 Variables Financial Channel VECM: CAPAC, RM, BSE100 & EXPORT

Period	CAPAC	RM	BSE100	EXPORT
	Variance Decomposition of CAPAC:			
1	100.0000	0.000000	0.000000	0.000000
2	97.06761	2.501993	0.061912	0.368484
3	95.56681	2.717830	1.080198	0.635167
4	94.90552	2.817901	1.080320	1.196261

Period	CAPAC	RM	BSE100	EXPORT
	Variance Decomposition of RM:			
1	4.601948	95.39805	0.000000	0.000000
2	18.16930	74.40362	6.044889	1.382191
3	39.62773	54.39896	5.177071	0.796235
4	57.52484	38.45483	3.550492	0.469837

Period	CAPAC	RM	BSE100	EXPORT
	Variance Decomposition of BSE100:			
1	52.53413	0.203320	47.26255	0.000000
2	66.94013	0.626242	32.35311	0.080523
3	64.69408	0.414543	34.83954	0.051843
4	63.46253	0.452788	35.99405	0.090633

Period	CAPAC	RM	BSE100	EXPORT
	Variance Decomposition of EXPORT:			
1	6.377870	39.57959	12.67162	41.37092
2	19.89236	19.04757	27.94016	33.11992
3	29.53052	12.45644	35.45526	22.55779
4	37.66321	7.701277	35.85913	18.77638