
Modeling India's External Sector: Review and Some Empirics

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Abstract

In the aftermath of global food & fuel price spikes and the recent global financial crisis, understanding of external sector behaviour has become crucial. More specifically, the transmission mechanism of external sector shocks to domestic macroeconomic variables is essential for undertaking relevant policies to mitigate adverse impact of such shocks. Here an attempt has been made to review the theoretical and empirical issues relating to India's external sector behaviour and present a suitable analytical framework for macro modeling.

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Introduction

The integration of the domestic economy through the twin channels of trade and capital flows has accelerated in the past two decades for India and other emerging market economies. Gross flows on the current account expressed as a percentage of GDP grew from 8 percent in 1990, to 31 percent in 2000 and 71 percent in 2008. Capital account integration measured by gross investment position (excluding the official reserves) rose from 30 percent of GDP in 1990 to 85 percent in 2007.

The implications of the acceleration in trade and capital flows for the economy are multifarious and mixed. While the increase in access to international capital markets has released the crucial problem of financing the balance of payments deficit for the domestic economy and allowed higher levels of imports on the one hand and contributed to reserve adequacy on the other, it has increased the economy's dependence on these flows. The volatile and uncertain nature of the capital flows not only makes the external sector balance position precarious and raises the problem of sustainability of current account deficit, it also impacts the whole of financial markets and its prices and above all the macroeconomic policy options. Also, while there is genuine growth inducing impact of capital flows, the evidence on capital inflows and growth warns of the pro-cyclical nature of these flows.

In this paper an attempt has been made to discuss the theoretical and empirical issues in external sector of India. As the policy changes in the external sector have been a continuous process since 1991, it is expected that the theoretical relationships would have undergone a sea change in terms of its determinants, direction and extent of its impacts. Further, with significant changes in the global economy notably in the international commodity prices and global financial crisis, one would expect structural shifts in empirical facts. This paper looks at these issues and draws a suitable framework relevant for current conditions. In Section II and III, we briefly explore the recent literature for the conceptualization of the external sector in theoretical literature and empirical studies, focusing on macroeconomic dimensions. Section II looks at the trade flows, while section III looks at the capital flows. The emphasis is mainly, though not exclusively, on India given the specificity of the structure of its external economy. The models surveyed lay a background to the empirical work undertaken in Section IV and V. Section VI discusses the findings and the agenda for future research.

II.1 International Trade and Economic Growth

In the era of globalization, most of the economies, especially the emerging market economies have relied on an export-led growth strategy that was considered to be the policy prescription for increasing the growth potential of the domestic economy and resulting in greater productivity spillovers on to the non-exporting sectors as well. Thirlwall (2000) discusses three main models of export-led growth, viz., the neoclassical supply side model, the virtuous cycle model and the balance of payments constrained model (pp.16-22). The neo-classical supply side model assumes that the export sector confers externalities on the non-export sector and the export sector has a higher level of productivity than the non-export sector. Therefore, the share of exports in GDP and the growth of exports have a significant bearing on output growth. Feder (1982) provided a formal model along these lines to explain the relationship between export growth and output growth. Based on Feder's model,

Prasad(1995) finds the existence of a significant relationship between export growth and economic growth, but concludes that the relationship is seen to depend on favourable world trade environment and requires higher level of development for an export promotion strategy to be effective.

The virtuous cycle model recognizes the cumulative interrelationship between exports and growth. It assumes that output growth brought about by export growth induces faster productivity growth (the so-called Verdoorn Law), which confers competitive advantages on goods, thereby inducing faster export growth, making the process 'circular' and 'cumulative' and giving rise to the possibility that once a country attains a growth advantage, it has a tendency to retain it. This forms the crux of 'center-periphery' models. (see Thirlwall, 2000).

The balance of payments constrained growth model that owes its origins to Thirlwall (1979) takes a demand-induced view of growth. Thirlwall (1979) introduced a simple analytical model to show that a country's long-run rate of economic growth will be limited by its foreign trade performance, that is, by the size of the income elasticity of its imports relative to the pace of expansion of its exports. Export growth relaxes a balance of payments constraint on demand and allows all other components of aggregate demand, viz., consumption, investment and government expenditure, to grow at a faster pace. "Exports are unique as a growth-inducing force from the demand side because it is the only component of demand that provides foreign exchange to pay for the import requirements of growth" (Thirlwall, 2000, p.21).

Driven by the spectacular economic performance of the East Asian economies particularly, China, where their success stories could be attributed to impressive export performance, many countries have attempted to follow a similar policy with varying degrees of success. The inability of many countries to join the bandwagon in emulating the rapid export-led growth of the East Asian countries raises the possibility of what has come to be known as the 'fallacy of composition', that is, an adding up constraint on the attempts of several developing countries to concomitantly export similar kinds of manufactured products to cater to the markets of the same industrialized countries (Blecker and Razmi, 2010)².

In case of India, since the era of liberalization gathered momentum in the nineties following crisis in the external account, a spate of 'export promotion' measures have been unveiled. The resultant shift in the policy stance in favour of outward- oriented trade strategies that started towards late 1970s intensified in the subsequent years as a large number of cross-country studies validated the positive relationship between export growth and output growth (Kravis, 1970; Balassa, 1978; Bhagwati, 1978; Krueger, 1978; Tyler, 1981; Feder,1982; Ram, 1985, 1987)³. However, it is to be borne in mind that the empirical evidence regarding exports-economic growth nexus throws up rather ambiguous results with

² Palley(2011) talks about the three main kinds of criticisms labeled against the whole export-led growth strategy, viz., Joan Robinson's "beggar-thy-neighbour" kind of argument, the Prebisch-Singer "deterioration of terms of trade" critique and the 'structural Keynesian' critique, whereby he says that export-led growth spurs a race to the bottom among countries in terms of declining labour and environmental standards.

³ See Dash (2009) for a summary of major empirical studies exploring the causality between export and output growth in case of India.

many empirical investigations being unable to provide conclusive evidence on the relationship between these variables, especially in the long-run (Kugler, 1991). Also, it is difficult to gauge whether export expansion has stimulated growth or merely accompanied growth in the rest of the economy, that is, the 'export-led' growth versus 'growth-driven' export debate (Kindleberger, 1962; Meier, 1976). For instance, while Kwan et al. (1996) found that China's growth story subscribed to the 'export-led growth' argument, in contrast, Boltho (1996) inferred that internal forces were the drivers of Japan's economic growth rather than foreign demand (See Bhanumurthy and Sharma, 2013).

Thus, for a country's overall economic performance to improve, it is not enough for export growth to accelerate. Export growth has to outpace import growth; otherwise the economy will run into balance of payments difficulties. The argument on the trade-off between domestic growth and balance of payments revolves around the working of the Keynesian import multiplier. Krishnamurthy, Pandit and Sharma (1989) note that higher growth implies higher imports and a sharply worsening foreign exchange situation unless accompanied by a correspondingly better export performance⁴. Further, it is often the case that a slowdown in the growth of the export markets, say, due to sudden onset of crisis and recession, causes the trade account in the exporting nation to steeply worsen. This is because import continues to grow at the rate at which the domestic economy is growing, even while export growth has slowed. Income inelasticity of import demand (like, gold imports in the current Indian scenario) often contributes to deficit in trade balance. Eventually, import growth is observed to fall, bringing down the trade deficit.

II.2 Determinants of Trade Flows

Exchange Rate and Trade Flows

One of the principal instruments that has been resorted to quite often to sustain the high export growth in most economies trying to attain high economic growth, has been the exchange rate and most policy implications have revolved around its management. This prescription draws upon the 'elasticities approach' to the balance of trade which focuses on the exchange rate as the major determinant of the trade balance, and this approach emphasizes the relative price induced substitution of domestic demand away from foreign imported goods to the domestic goods and foreign demand towards domestic exports through devaluation. The salutary effects of exchange rate changes on the trade balance are premised upon the Marshall-Lerner condition which requires that the combined elasticities of demand for both exports and imports be greater than unity, which is then considered to be the sufficient and necessary condition for depreciation or devaluation to improve the trade balance (Krugman and Obstfeld, 1997).

The efficacy of the exchange rate as a policy prescription hinges critically on the extent to which the exchange rate adjustment is transmitted to export prices denominated in foreign currency and import prices in terms of domestic currency, that is, the degree of pass-through. But it has been discussed in the literature that the increasing costs of imports as a

⁴ The issue of trade-off between economic growth and balance of payments has been considered in all macromodels on the Indian economy (see Krishnamurthy, 2002).

result of devaluation can also affect exports that have become increasingly import-dependent; and this could nullify any global cost advantage accruing from the devaluation. And in a situation where the export response is weak and the share of imports in variable costs is high, a devaluation could culminate in a domestic recession if the decline in the value of the Keynesian multiplier (brought about by distributional shifts like a fall in the real value of wages or domestically produced inputs) is greater than the increase in the value of the multiplicand ($I+X-M$), resulting from an improvement in the trade balance brought about by a devaluation (Chandrasekhar, 1995, p.115).

Sarkar (1992) argues that depreciation of the rupee during 1971-90 had no significant impact on growth in the dollar value (or volume) of India's exports and imports. Hence, he goes on to question the effectiveness of devaluation in managing exports and imports, while referring to the problem of 'fallacy of composition' that hinders the effectiveness of devaluation in export expansion⁵. In response, Krishnamurthy and Pandit (1996) posit that "since this analysis does not take into account either a structural model or a reduced form nor adjusts prices for exchange rate changes, so its results cannot be taken at their face value" (p.427).

Krishnamurthy, Pandit and Mahanty (2004) find that an increase in the exchange rate (Rupees per US dollar) or currency depreciation does not display immediate results. The export demand function is characterized by lagged price response, which implies higher price elasticity in the long-run compared to the short-run. The response of imports to depreciation is more prompt and a lot stronger. The authors conclude that the exchange rate can serve as an effective policy instrument in reducing the trade deficit by bringing about a compression of imports. But they suggest a word of caution against this as this might have adverse effects on domestic industrial production as curtailed volume of imports can depress output supply.

Previously, Ghosh (1990) had argued that the real exchange rate failed to play any significant role in determining export growth, which appeared to be more strongly related to real economic variables such as domestic output and world export growth. Further, by modeling in the subsequent year's nominal exchange rate as one of the independent variables in explaining impact on import values and volumes, she suggested that the continuous devaluations of the currency led to an import bulge, by inducing greater current expenditure on imports in anticipation of future devaluations, and thereby, led to a worsening of the trade balance.

More recently, Bhanumurthy and Sharma (2013) find that exchange rate depreciation does not seem to be significant driver of exports growth in India, in the post-reform period. In fact, imports seem to have a significant positive impact on exports, suggesting that imports support exports through improving domestic innovation and productivity and improving the export competitiveness.

Commenting on the pessimism displayed by studies on the role of exchange rate in the determination of exports, Rangarajan and Mishra (2013) provide some possible

⁵ As discussed by Sarkar (1992), devaluation by a country might spur competitive devaluations by other competing countries producing and exporting similar kind of products, which might result in over supplies of the commodities in the international market and lead to sharp plunges in prices. This is the 'fallacy of composition'.

explanations. "It is hard to estimate the elasticities using macro data – exports and exchange rates are highly endogenous." The authors suggest that "the imported intermediate content of exports can dampen the competitive effects of depreciations, by feeding in higher input costs. "Third, macro equations do not allow the export-exchange rate elasticity to vary depending on the position of the aggregate supply curve. If there are capacity constraints, then increased domestic demand can reduce the availability for exports" (p.58).

Role of Demand and Supply

The importance of supply conditions in affecting trade flows has been stressed by Ghosh (1990). Past year's agricultural output and changes in infrastructural output are found to play a positive and significant role in influencing exports. Supply variables like changes in infrastructural output and lagged agricultural output are also seen to exert negative influences on import values, suggesting that some proportion of imports substituted for inadequate domestic supply.

Krishnamurty and Pandit (1996) specify demand and supply functions for exports and imports separately. The world demand for exports considers both the world real GDP as well as the relative price or the real exchange rate. The supply function incorporates both domestic availability relative to demand as well as the domestic price effects. The import demand function is specified in terms of import price relative to the corresponding domestic price and real GDP, a proxy for domestic level of activity. The supply function explains the supply price of imports in domestic currency in terms of international prices denominated in dollars and the exchange rate.

Rangarajan and Mohanty (1997) put forth an empirical model, drawing upon features of both the absorption and monetary approach to external adjustments, extending over the period from 1971-72 to 1993-94. While imports are specified as being demand-induced, exports are hypothesized to be subject to twin influences of demand and supply. Demand for exports is found to be related to world income and exports price relative to world price. Export supply in turn, is expressed as a function of real income (as a proxy for domestic economic activity), and export price relative to domestic price to capture the profitability of exporting to the world market vis-à-vis selling in the domestic market. An exchange rate depreciation is postulated to bring down the export price and stimulate export demand, based on value of price elasticity of exports (degree of pass through). Domestic price change is seen to exert a two way influence on export price-through a simultaneous impact on unit value index of exports (reflecting domestic cost conditions) and exchange rate.

Sachdeva and Ghosh (2009) incorporate both demand and supply factors to provide a hybrid function for the export of goods, where domestic GDP and non-agricultural imports represent the supply side while world GDP reflects the demand for exports. This also serves to bring out the interdependency between exports and imports that go in as inputs for production and exports, which has also been discussed in Bhanumurthy and Sharma (2013).

A demand side explanation of exports is provided in Kar and Pradhan (2009). In their structural model, exports of goods and services have been postulated to be a function of the volume of world trade, proxied by world imports, and the real exchange rate. Imports are disaggregated into oil and non-oil imports. The oil imports are found to be determined by

factors that affect its relative price, that is, import price of oil, domestic prices and the exchange rate. Non-oil imports are also seen to be strongly affected by price of non-oil imports, domestic prices, the exchange rate as well as the level of output and tariff rates.

The policy debate about the key drivers of exports in India can be encapsulated in the following manner. According to one school of thought, exports are mainly supply driven and not very sensitive to relative prices. The policy option to accelerate growth of exports thereby involves improving the supply conditions (Ghosh, 1990). On the opposite side is the view that exports are mainly demand determined (Kar and Pradhan, 2009). Exports being highly sensitive to price, the price competitiveness of exports can be influenced by wielding the policy instrument of exchange rate (Krishnamurty et al., 1996; 2004). Then there is the view that both demand and supply factors play a crucial role in determining trade flows and there is a need to incorporate both demand and supply factors influencing trade flows (Virmani, 1991; Krishnamurty and Pandit, 1996; Rangarajan and Mohanty, 1997; RBI, 2004)⁶.

II.3 Determinants of Invisibles

Though there are many studies that have tried to analyse the determinants of merchandise trade flows in India, the literature on invisibles has been limited⁷. It would, therefore, be pertinent to have a look at some of the studies that have tried to model the growth and determinants of invisibles, particularly services, in case of India.

It has been argued that there is a complementarity between merchandise exports, particularly manufacturing exports, and export of services, with trade in merchandise exports spilling over to service exports. Eichengreen and Gupta (2012a) suggest that merchandise exports exert a positive influence on service exports due to network effects wherein a country with high penetration in goods market can use its networks to export in services. Similar effect is obtained even when exports of merchandise is replaced with total trade in goods (Krishnamurty, Pandit and Mahanty, 2004; Eichengreen and Gupta, 2012a).

The importance of the exchange rate in influencing the export of services has been discussed in the literature, with the effect of the real exchange rate believed to be stronger for exports of services than exports of goods. Eichengreen and Gupta (2012b) consider the importance of the real exchange rate in determining the exports of services in case of a set of countries belonging to different income levels, spanning the period from 1980 to 2009. They categorize services separately as traditional (including travel, transportation and insurance) and modern (software, other business services, financial services and communications). They find that the exports of services, particularly modern services, display greater responsiveness to changes in the real exchange rate. The authors conjecture that this might be because modern services use fewer imported inputs, these sectors have

⁶ Goldstein and Khan (1978) point out that trade flows are subject to an identification problem, that is, exports and imports are subject to both supply and demand influences. They suggest the simultaneous estimation of supply and demand functions for both exports and imports to overcome simultaneity bias and identify the separable influences of demand and supply factors on trade flows.

⁷ In fact, most macroeconomic models have treated invisibles as being exogenously or residually determined.

lower fixed costs of entry, making for a more elastic supply response, or that the demand for these exports is more price elastic (p.6).

Banga and Kumar (2011) try to examine the role played by demand side and supply side factors in growth of exports of services for the period from 1970 to 2008. Drawing from the existing literature, they expound that most studies show that conventional models of merchandise trade can also be successfully applied to trade in services. On the basis of an export demand function, the authors undertake a similar exercise for aggregate services exports as well for different kinds of services, where real exports of services of India to the world are seen to depend on real world income and real effective exchange rate. Income elasticities of India's export demand for different kinds of services as well as aggregate service exports are found to be much higher than the price elasticities of services exports, emphasizing the importance of world GDP growth on India's export growth of services.

Among the supply side variables, a host of other variables like infrastructure, technological and organizational capacity, level of economic development, etc., have also been found to influence trade in services. Eichengreen and Gupta (2012a) examine the determinants of aggregate exports of services for a sample of 60 emerging and developed economies for the period 1990-2008. They find that that among other factors, a range of variables like per capita income of the domestic economy (as a measure of economic development), infrastructure development measured by telephone connections, access to foreign technology as measured by net inflow of FDI) are found to be significant in explaining service exports of India.

The complementarity that exists between export and import of invisibles has been explored in Sachdeva and Ghosh (2009). They come up with eclectic export and import functions for invisibles, combining both demand and supply side factors. In case of exports of invisibles, while the services sector GDP and the imports of invisibles represent the supply side the world GDP represent the demand side. For imports, the demand side is represented by the service sector GDP and the exports of invisibles, while the world GDP indicates the supply side.

In the 'IEG-DSE' structural macroeconometric model for India (IEG-DSE, 1999; Krishnamurty et al., 2004) invisibles have been disaggregated into private transfers, services and investment income (including interest and service payments on foreign loans and credit), all components being determined in net terms. In case of private transfers, real gross domestic product of the Middle East in the previous period and the real exchange rate of the Rupee vis-à-vis dollar are found to have an impact. As mentioned earlier, total merchandise exports and imports are seen to have a significant impact in case of net services. Net investment income could be explained by the external debt of the government in the previous period along with the change in the exchange rate over the preceding period.

III.1 Capital flows, economic growth and stability

The impact of capital flows on growth varies across the different schools of open economy macroeconomic models. In the benchmark neoclassical model, capital flows from countries that have relatively high capital-to-labor ratios to countries that have relatively low

ratios. So investment would fall below savings rates in developed countries and rise above savings rate in developing countries. International capital mobility in the absence of distortions is expected to enhance welfare and promote economic convergence across nations by enabling poorer nations to achieve faster growth. However, the empirical evidence has not corroborated this logic very strongly. What is now one of the important puzzles of international economics Feldstein and Horioka observed that, for OECD countries, domestic savings rates and domestic investment rates are, instead, highly correlated, in contrast to standard economic theory (Feldstein and Horioka, 1980). Similarly, in an influential paper, Lucas (1990) noted that flows of capital from the “North” to the “South” are nowhere near the levels predicted by theory.

A second set of macro models relevant to developing economy in the context of foreign capital inflows are the two gap models. The two gap models focus on the effects of foreign capital inflows on savings and foreign exchange constraints. These models imply higher rates of growth as a result of capital flows, the exact magnitude depending on whether foreign exchange or savings constrain growth. The two gap models were employed as part of planning exercise and to assess the impact of foreign aid to developing countries. Regarding the impact of foreign aid, which was the principal vehicle of capital flows to developing countries till the 1970s, regressions of income on foreign capital inflows and sometimes other variables suggest that greater capital flows reduced the domestic savings rate. Some studies however showed that investment was positively related to aid flows which suggest that inflows raised the rate of growth of the economy (see Dutt 1995 for a review of this literature).

In the basic demand constrained models, the impact of capital flows on growth depends on how foreign capital flows affect investment, savings and import propensities. The result also crucially depends on the policy choices in regard to macroeconomic management in the domestic economy. We discuss a simple demand constraint model relevant to the recent Indian situation by Ghose (2011) in some detail.

Ghose (2011) starts by observing that for the set of medium income developing countries gross investment was only slightly above the gross domestic savings in the pre-East Asian crisis period and below it in the post crisis period (1990 to 2005 is the period studied). This suggests that the inflow of foreign capital pushed domestic investment below what could have been supported by domestic savings alone. Ghose tries to analyse the problem by extending the IS-LM model in an open economy framework, rather than the more regular Mundell-Fleming model used in textbook analysis. The main innovations used in the model are: (a) capital flows are assumed to be exogenous and beyond the control of the domestic economy, which means that the BP curve in the Mundell-Fleming model has either to be modified summarily or dispensed with. (b) alongside domestic investment, foreign investment in the domestic economy adds to aggregate demand and aggregate income. (c) foreign capital inflows add to money demand, while the money supply is now affected by the decision to sterilize forex market intervention. The model demonstrates that domestic currency appreciation, consequent on capital inflows, can only be prevented by sterilized forex market intervention, which in turn diverts the flow of domestic saving away from domestic investors to the central bank. “Thus when macroeconomic policy is focused on maintaining a fixed or depreciating real exchange rate, substantial inflow of foreign private capital tends to generate a growing surplus of domestic saving, which is accumulated by the government as foreign currency reserve. Inflow of foreign saving, because it induces outflow of domestic saving, has little impact on the overall investment rate.”

There are models that have used a supply side approach to look at the contribution of FDI and FII to growth. On the supply side, FDI's contribution to growth has been explored through capital formation and technology transfer along with accumulation of knowledge due to labour training and skill acquisitions. FDI is also associated with productivity spillovers to the host economy, resulting in higher growth. Foreign portfolio investment increases the liquidity of domestic capital markets, and can help develop market efficiency as well. As markets become more liquid, as they become deeper and broader, a wider range of investments can be financed.

There exists a large body of empirical literature on the relationship between capital flows and growth. After a systematic examination of the evidence, Prasad et al (2003) suggest that it is difficult to establish a strong causal relationship. If financial integration has a positive effect on growth, there is as yet no clear and robust empirical proof that the effect is quantitatively significant. There is some evidence of a "threshold effect" in the relationship between financial globalization and economic growth. The beneficial effects of financial globalization are more likely to be detected when the developing countries have a certain amount of absorptive capacity. In addition to sound macroeconomic policies, improved governance and institutions have an important impact on a country's ability to attract less volatile capital inflows, and on its vulnerability to crises.

With rapid capital account liberalization, procyclical international capital flows have dominated economic cycles in emerging markets. Given the herd behavior intrinsic in modern financial markets, these tend to produce a cumulative process of credit expansion, asset price bubbles and over-indebtedness, which in turn adds to spending and growth. However, as balance-sheets adopt smaller margins of safety, the system develops endogenous fragility (see Bose, 2013). With cyclical downturn in economic activity and/or increased cost of borrowing, incomes or assets acquired can no longer service the debt setting off a process of debt-deflation and deepening the contraction in economic activity, along with capital outflows and exchange rate volatility. Financial spillovers affect capital flows, asset prices and exchange rate in other economies.⁸ Kaminsky (2005) argues with evidence that countries seem to have lost access to international credit markets during recessions on a systematic basis. This evidence contrasts sharply with the prescription that international capital markets will allow countries to smooth out the effect of the business cycle.

III.2 Determinants of Capital flows

The determinants of capital flows are generally classified into pull and push factors. Push factors such as international interest rates, world GDP growth, total availability of capital flows to all emerging markets, etc. are beyond the control of national authorities.

⁸ Akyuz (2013) discusses the private capital flows and financial spillovers in the context of the recent Eurozone crisis.

In modeling the international capital flows based on pull factors, RBI (2002) classifies the pull factors as comprising of strength, vulnerability and openness variables. Real GDP growth is taken as a summary measure of the strength variable while gross fiscal deficit represents the vulnerability variable, and trade (export and import of goods) to GDP ratio is the openness indicator. Trade openness seems to be a major determinant of capital flows as it reflects both the requirement to finance imports and the capacity of the country to service external liabilities through export earnings (p. VI-24). From the positive relationship between fiscal deficit and net capital flows, the authors infer that the level of fiscal deficit has not discouraged capital flows into India. While external aid has traditionally been a source to finance the fiscal deficit, other debt creating flows improve the resource availability in the economy for private investment, facilitating financing of the deficit through domestic market borrowing. The positive relationship, therefore, essentially reflects the financing role of foreign capital. Further, when capital flows are disaggregated into debt-creating and non-debt creating flows, fiscal deficit seems to discourage inflows in case of non-debt creating flows, while it encourages greater recourse to external debt flows. Thus, while in case of non-debt inflows the fiscal deficit could be a sign of vulnerability, in case of debt-creating flows the fiscal deficit could reflect the improved availability of resources brought about by the inflows from abroad.

Fiscal Deficit and External Sector Balance

The relationship between fiscal deficit and external sector variables is a crucial one and has been modeled differently by different schools of thought. In the Swan Diagram (Swan, 1955), a higher fiscal deficit by raising domestic absorption is expected to reduce the current account surplus/ increase the current account deficit, even as growth goes up in a demand constrained economy. An expenditure switching policy becomes necessary to bring about a balance of payments correction.

The basic proposition of the monetary approach to the balance of payments is that balance of payment deficit is caused by domestic credit creation and that reduction in domestic credit creation will reduce the deficit (Polak, 1957). To the extent, fiscal deficit leads to higher domestic credit creation it is responsible for the balance of payment situation. The IMF approach, as it came to be popularly called has been used in many of the macro models on the Indian economy with some modifications. In the macro-model by Rangarajan and Mohanty (1997) fiscal deficit increases the aggregate demand level in the economy and may influence output in the absence of supply constraints. Since a part of the fiscal deficit is financed by borrowing from the RBI the stock of money evolves endogenously through the feedback from reserve money which varies with the changes in fiscal deficit. The money stock along with the output determines the price level in the economy, which in turn determines the relative prices of imports and exports. To the extent that the nominal exchange rate deviates from its full purchasing parity level, fiscal deficit financed by money creation leads to appreciation of exchange rate, leading to a loss in competitiveness for exports and deterioration in current account balance. Similarly, the macro model by Bhattacharya, Barman and Nag (1994) also exhibits the link from fiscal deficit to current account deficit through output and prices.

In a regime of substantial cross-border capital flows, the relationship between fiscal deficit and external balance is likely to be transformed. The perceptions of the private investors who may look at fiscal deficit as a sign of vulnerability has to be integrated (see RBI, 2002).

The need to disaggregate capital flows into its various components each of which might be influenced differently has been recognized in most recent studies. Singh (2009) analysed the determinants of various components of private debt flows and equity flows to India. With regard to portfolio equity flows, he found co-movement rather than causality in volatility of daily net foreign institutional investments (FII) inflows and stock returns. NRI deposits are significantly influenced by real economic activity in the host country, exchange rate movements and interest rate differential. Indian corporates' long-run demand for overseas commercial borrowings is predominantly influenced by the pace of domestic real activity, followed by interest rate differentials and the credit conditions in domestic markets. The author also found that during the normal periods the overseas borrowings are influenced by the underlying domestic demand shocks, the external credit shocks seem to be the most dominant factor during periods of financial crisis. A similar observation is made by Akyuz (2013) in the context of the recent crisis in the advanced economies. While the pre-Lehman boom was broad-based, pull factors have become important in the post-Lehman recovery with lenders and investors increasingly differentiating among developing countries. On the question of interest rate sensitivity, Verma and Prakash (2011) find that FDI and FII flows are not impacted by interest rate changes as they are primarily determined by growth prospects of the Indian economy and returns on equities, respectively. On the other hand, ECBs and NRI deposits are found to be interest rate sensitive. In terms of the push factors, the authors find that stronger growth in OECD countries actually coexists with larger capital inflows to India.

Gordon and Gupta (2003) analyzed factors affecting portfolio equity flows into India. Both external and domestic factors were found to be equally important. Among external factors, an increase in external interest rate adversely affected FII flows into India, while the performance of emerging stocks positively influenced FII flows. Among domestic factors, lagged domestic stock market returns, credit rating downgrades and depreciation of the exchange rate were found to affect FII flows negatively. The existence of negative relationship between lagged domestic stock return and FII flows and positive relationship between portfolio flows and expected domestic returns has been explained by the authors in terms of FIIs being bargain hunters and "buying on the dips". Another study on FII flows by Rai and Bhanumurthy (2004) using monthly data for the period Jan 1994 to Nov 2002 obtain that FII inflows depend on stock market returns, domestic and foreign inflation rates and ex ante risks, captured by the standard deviation for the Indian economy.

Table 1 provides a sample of the variety of country specific and global factors that have been used in empirically modeling capital flows worldwide.

Table 1: Country-specific and Global Factors influencing Capital Flows: Select Studies

Studies	Country Specific Factor	Global Factors
Taylor and Sarno (1997)	Country credit rating and black market exchange rate premium.	Long-term nominal interest rate - the Treasury bill rate and the government bond yield and the level of the real U.S. industrial production.
Mody, Taylor and Kim (2001)	Consumer price index, level of domestic credit, short term debt to forex reserves ratio, level of industrial production, domestic short term interest rate, credit rating, reserves to import ratio and the level of domestic stock market index.	Strength of the US output growth, the US short-term and long-term interest rates, the Emerging Markets Bond Index (EMBI), the US swap rate and the US high-yield spread (as proxies for a measure of risk aversion).
Culha (2006)	Real rate of interest on Turkish T-Bills, Istanbul stock exchange price index, budget balance and current account balance.	Interest rate on 3-month US T-Bills and US industrial production index.

III.3 Trade Flows, Capital Flows and Exchange Rate

Till the late 1990s, most economic models have modeled exchange rate as an administered price subject to realignment through Central Bank intervention. With very little private foreign capital inflows, the benchmark for realignment would be the purchasing power parity exchange rate and/ or the current account balance. That is, a deterioration of current account balance vis-a-vis domestic output or a high inflation in domestic prices vis-a-vis the world prices that could erode export competitiveness would become the basis for exchange rate devaluation. In a typical representation, exchange rate would be a function of current account deficit to GDP ratio, change in Central Bank's reserves and a domestic price variable (see Bhattacharya, Barman and Nag, 1994, Rangarajan and Mohanty, 1997; IEG-DSE, 1999).

With rising magnitudes of capital flows and the progressive move towards assigning a greater role of the market mechanism for exchange rate determination, the relationships have undergone a change.

Chakraborty (2003) discusses the relationship between capital flows and REER for India between 1993Q2 and 2001Q1. The study uses an unrestricted VAR framework and the variables included are, net capital inflows (aggregate of FDI, portfolio investment and external commercial borrowing), and rate of growth of domestic credit and rate of inflation as proxies for monetary and fiscal policies, respectively. The paper concludes that REER depreciated in response to one standard deviation innovation to foreign capital inflows.

Critiquing these counter-intuitive findings of Chakraborty (2003) as due to weak econometric methodology, Dua and Sen (2006) re-examine the impact of changes in the levels and volatility of capital flows on the Indian exchange rates. Their theoretical model specifies a goods market, money market, domestic bond market and a foreign assets market with a wealth identity connecting the latter three. Inflation is determined by the output gap but is also impacted by the exchange rate movements. Balance of trade and factor incomes equal the capital flows in a simple BOP identity. In the estimated reduced form equation REER is a function of level and volatility of real net capital flows, real government

expenditure, real current account balance and money supply. For the period 1993Q2 to 2004Q1, Dua and Sen (2006) obtain that the REER is positively related to real net capital inflows and their volatility. Net capital flows cause the REER to appreciate. These results are corroborated by Kohli (2010).

Given the fact that the Indian currency is now subject to the movement of cross-border capital flows, Rohit (2013) has drawn attention to the need to look at both current and capital accounts together. "While the current account deficit is a structural problem facing the country, the mode of financing it is important, specifically whether the latter is non-debt creating and long-term." Drawing attention to the fall in the value of the Rupee since mid-2011, the author argues that fall in the value of the Rupee is more a reflection of the structural problem in the current and capital account of the balance of payments (rather than a fallout of announcement for quantitative easing).

Finally, the determinants of exchange rate depend crucially on the time horizon. Bhanumurthy (2006) examines the relative importance of macro vis-à-vis micro variables in determining the exchange rate movements over different time horizons with the help of primary information collected from the Indian foreign exchange dealers. The findings suggest that while speculation and central bank intervention are the major determinants of the intraday movements in the exchange rate, in the medium run and long run, economic fundamentals played a major role in determining the rate movement.

IV. Framework for Modeling External Sector

Based on the above review, in this section, we discuss the possible framework for estimating a satellite model for external block with sufficient disaggregation. Prof K Krishnamurthy, a pioneer in Indian macroeconomic model building, in his review of the models in India had recommended construction of satellite models for the major sectors of the Indian economy, including the external sector. On external sector he specifically suggested:

"...sub-model for foreign trade, BOP and exchange rate to enable more disaggregation on the goods side of trade with destination-wise focus than has been accomplished so far. It is necessary to accord more incisive treatment to invisibles particularly software exports which have grown in importance and to permit specific treatment in BOP to private capital flows-direct and portfolio. Also, it is important to allow for more exhaustive analysis of exchange rate determination, particularly, the role of private foreign inflows, foreign exchange reserves and RBI intervention in market" (Krishnamurthy, 2002, p.4306).

Broadly, following the above suggestion and also based on the conclusions of some empirical studies it is proposed to model the whole external block with a focus on the account of the balance of payments. The situation in respect to the two accounts, current and capital account of BOPs for the Indian economy is described briefly below.

Current Account of Balance of Payments

For the Indian economy, the current account balance has been deteriorating in the past five to six years. Table 2 provides the trends in India's BOP divided into three sub-

periods: (a) the initial post reform period (1990-1 to 2002-3); (b) the period of rapid export growth, comfortable current account position and high net capital inflows (2003-4 to 2007-8) and (c) the post-crisis period with volatile net capital inflows and high current account deficit (2008-9 to 2012-13).

Table 2: Summary Statement of India's Balance of Payments

Components of BOP as a percentage of GDP			
	Period Average		
	1990-91 to 2002-03	2003-04 to 2007-08	2008-9 to 2012-13
1. Capital Account Balance	2.1	4.7	3.2
2. Current Account Balance	-0.8	-0.3	-3.3
3. Overall Balance (1+2) (+: Increase/ – : Decrease)	1.3	4.3	-0.1

Source: Handbook of Statistics on Indian Economy, RBI

While the slowdown in the growth of the advanced country markets is the primary driver of the worsening current account position during the post-global financial crisis years, there are other structural factors that have had a contributory role. Gold imports have gone up significantly and also as a proportion of GDP contributing to the merchandise trade gap (See Table 3). Oil imports (net of exports) have risen to nearly 6% of GDP. These flows hence define the structure of the merchandise trade account along with other trade flows.

Table 3: Select Components of Current Account of BOP: Annual Flows
(as percent of GDP)

Year	Gold Imports/ GDP	Net Oil Imports*/ GDP	Net Services Exports#/ GDP	Remittances@/ GDP	Investment Income@/ GDP
2000	0.87	2.9	0.29	2.77	-0.98
2001	0.85	2.41	0.60	3.22	-0.78
2002	0.74	2.88	0.72	3.22	-0.68
2003	1.06	2.75	1.51	3.58	-0.61
2004	1.46	3.17	2.00	2.87	-0.57
2005	1.30	3.87	2.71	2.96	-0.64
2006	1.52	4.05	3.04	3.16	-0.71
2007	1.35	4.14	3.08	3.38	-0.36
2008	1.69	5.27	4.37	3.63	-0.55
2009	2.10	4.30	2.56	3.83	-0.53
2010	2.37	3.77	2.80	3.11	-0.96
2011	3.00	5.31	3.46	3.40	-0.88
2012	3.02	5.92	3.57	3.48	-1.21

* Net oil imports have been measured as total value of oil imports minus oil exports.

Net of imports.

@ Measured as net inflows.

Source: Handbook of Statistics on Indian Economy, RBI

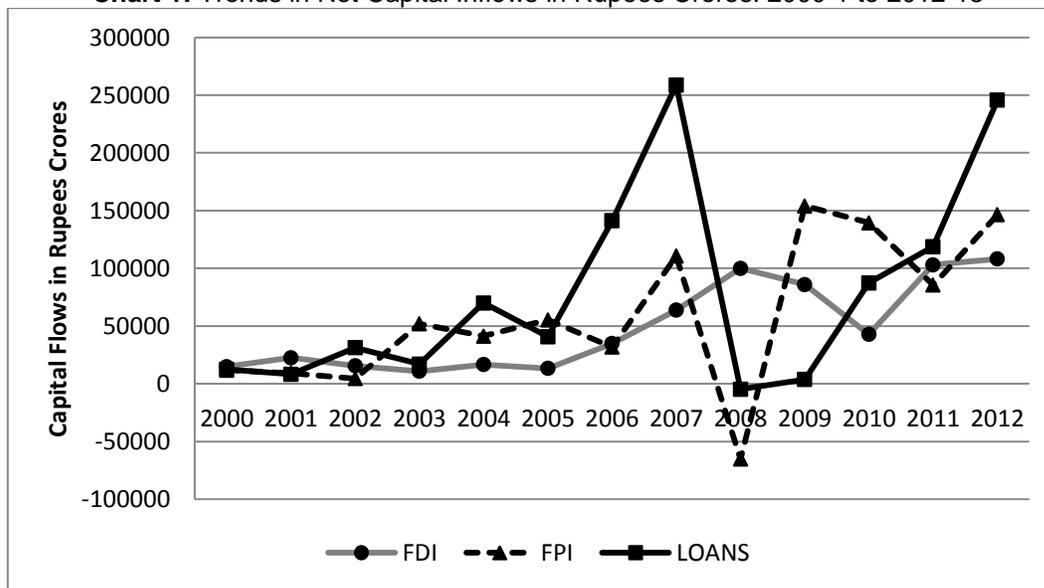
The flows on the invisible account have typically provided a cushion to the current account balances in India and can be categorized as services trade, remittances and investment income. Service exports, rising in significance for the Indian economy, are tied to the fortunes of advanced countries expansion, particularly USA. Remittances are also procyclical vis-a-vis economic performance of advanced and middle-east economies, though have shown a greater stability over the years. Net investment income has been deteriorating in the recent years. With persistently high current account deficit, great capital inflows have been required to balance the external accounts, which in turn give rise to greater outflows in investment income.

In view of the above discussed structural features and review of the literature, Flowchart 1 suggests the disaggregation of the current account of BOPs and the respective determinants.

Capital Account of Balance of Payments

The capital account is disaggregated into flows on account of foreign direct investment (FDI) , foreign portfolio investment (FPI) and loans & other flows, the latter representing the foreign debt flows into the economy. This is a standard disaggregation which recognizes the difference in variability of the FDI, FPI and loans series (see Chart 1). The recovery of the capital flows in the post crisis phase is yet not complete. Also, a large part of it is constituted by loans as against equity flows. Loans have shown a continuously rising trend since 2008.

Chart 1: Trends in Net Capital Inflows in Rupees Crores: 2000-1 to 2012-13



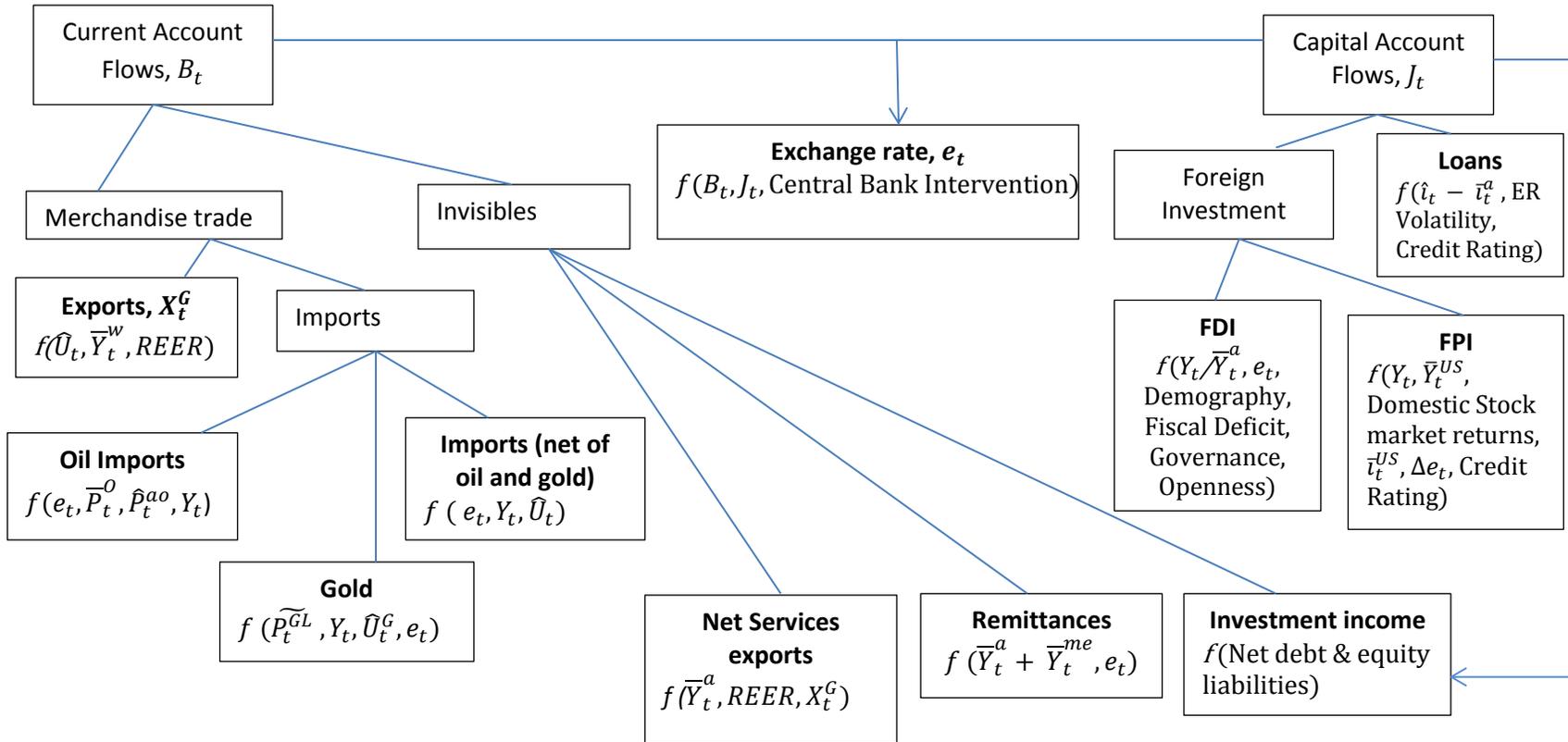
Source: Same as above

Determination of Exchange Rate

Given the structure of the current and capital account of balance of payments, the exchange rate can be hypothesized as being determined by the net flows in the two accounts. In other words, current account balance and the capital account balance together determine the net demand and supply of foreign exchange to the economy, which in turn determine the exchange rate. While imports of goods and services, outflow of capital and addition of foreign reserves with the RBI represent the demand for foreign currency, exports and inflows of capital represent the supply of foreign currency. The composition of supply of foreign currency is also expected to affect the exchange rate. A greater share of loans in overall capital inflows would have a different bearing on exchange rate compared to flows that are mainly constituted by FDI inflows.

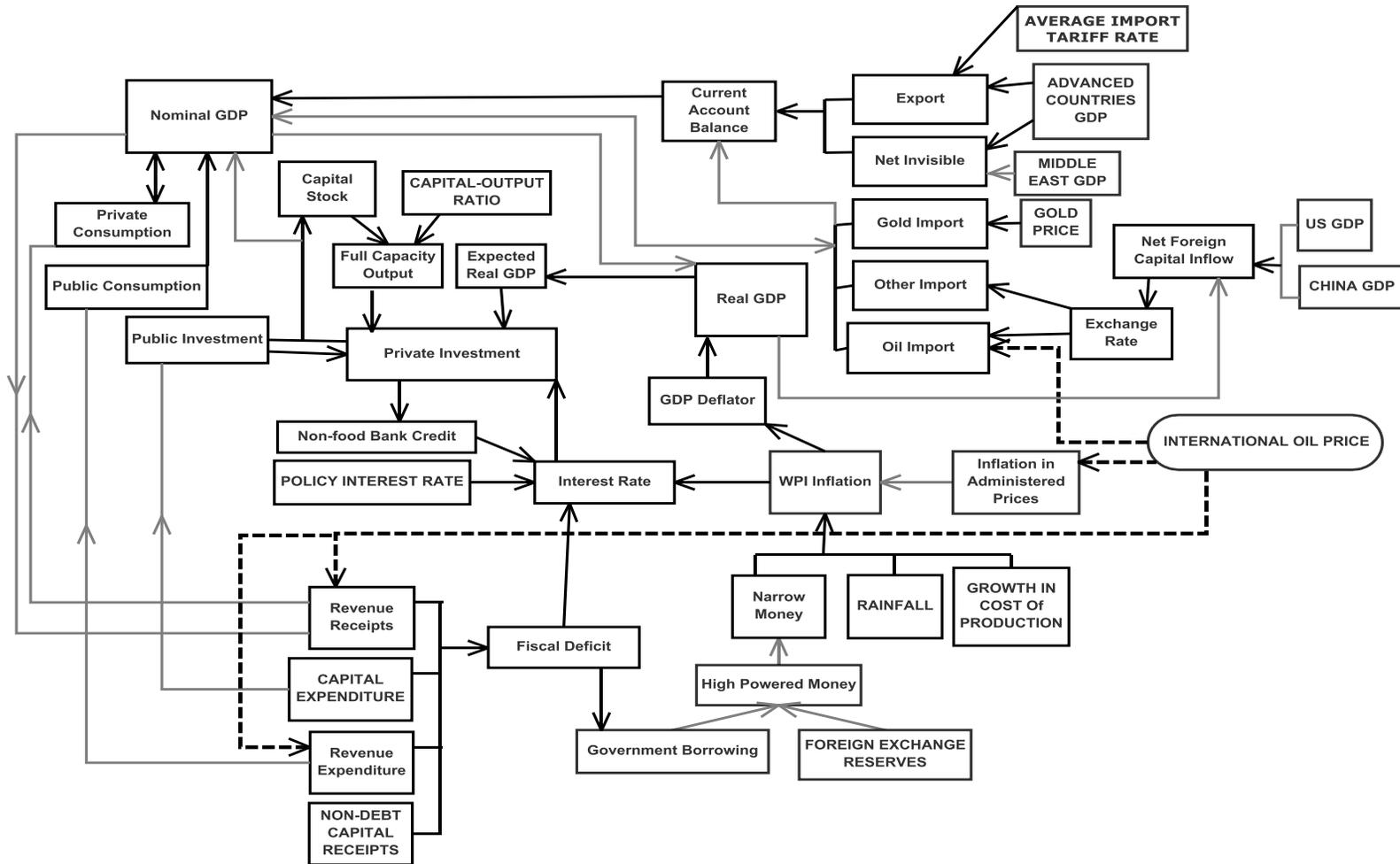
The above discussed relationships are presented in a system of equations.

Flowchart-1: Modeling External Block



Here, B_t is current account flows in period t ; J_t is capital account flows in period t ; e_t is the exchange rate (Rs/\$) in period t ; X_t^G is the value of merchandise exports in period t ; \hat{U}_t is the import weighted average tariff in period t ; \bar{Y}_t^w is the world GDP in period t , an exogenous variable; REER is the real effective exchange rate; \bar{P}_t^O is the dollar price of petroleum and oil imports in period t , an exogenous variable; \hat{P}_t^{ao} is the administered price of oil in period t ; Y_t is the domestic GDP in period, t ; \bar{P}_t^{GL} is the expected price of gold in period, t ; \hat{U}_t^G is the import tariff on gold in period t ; \bar{Y}_t^a is the advanced country GDP in period t , an exogenous variable; \bar{Y}_t^{me} is the GDP of the middle east in period t , an exogenous variable; \hat{i}_t is the interest rate in India in period t , a policy determined variable; \bar{i}_t^a is the interest rate in advanced nations in period t , an exogenous variable; \bar{i}_t^{US} is the U.S interest rate in period t , an exogenous variable; \bar{Y}_t^{US} is the US GDP in period t , an exogenous variable; and Δe_t denotes the exchange rate movements.

Flowchart 2: Schematic Diagram of the Model



V. Model Estimation and Simulation

Ideally, the theoretical specifications in the external block should have been estimated with the help of high frequency data particularly in the capital account. However, as this sub-block needs to be integrated with the other macro variables, for which the robust data is available only at annual level, all the specifications are estimated at annual level. The ultimate aim is to integrate the external block with the core NIPFP macroeconomic model⁹ for policy simulations purpose¹⁰.

The estimation results of the model outlined in Flowchart 1 are presented below. The database for the estimations is from 1991-92 as the substantial changes in the policies relating the external sector is largely relevant in the post-reform period.

Current Account of the Balance of Payments

- 1) The first difference of exports(net of oil exports) in rupee terms (EXGOODS) has been hypothesized to be dependent on the first difference of the nominal exchange rate (ER), the first difference of the GDP of the world(WORLDGDP) and on the competitiveness of Indian products measured by the import weighted average tariff rate (DUTY)as a proxy.¹¹

Sample size = 22 (1991-92 to 2012-13)

$$D(\text{EXGOODS}) = 44097.91 + 391.30 \cdot D(\text{ER}) + 955.38 \cdot D(\text{WORLDGDP}) - 2176.37 \cdot \text{DUTY} + 104062.87 \cdot \text{DUMEXGOODS}$$

(4.26) (0.50) (7.11) (-13.50)

(18.62)

Adjusted R² = 0.985

DW Stat= 1.837

- 2) The first difference of import of gold valued in rupee terms (IMGOLD) has been postulated to be function of the international gold price (GOLDPRICE) and the import tariff on gold (DUTYGOLD)¹².

Sample Size: 19 (1994-95 to 2012-13)

$$D(\text{IMGOLD}) = -13417.75 + 3.47 \cdot \text{GOLDPRICE} - 7836.24 \cdot \text{DUTYGOLD} + 21245.44 \cdot \text{DUMIMGOLD}$$

(-6.90) (16.23) 5.12) (9.39)

Adjusted R² = 0.967

DW Stat = 2.178

⁹ See Bhanumurthy et al (2012) for details

¹⁰ Flowchart-2 presents the overall framework within which the satellite model has to operate.

¹¹ Virmani et al .(2004) include import tariff as one of the explanatory variables in the specification of the export function in the Indian manufacturing sector. The rationale behind this is that reduction in tariffs would "generate pro-competitive efficiency enhancing effects and hence, improve the competitiveness of Indian products" (p.15). Lowering of tariff is also likely to promote better market access for exports and increase the relative profitability of export sales vis-à-vis domestic sales.

¹² The series starts from 1994-95 due to unavailability of figures for import of gold for the previous years.

- 3) The value of import of oil and petroleum products net of oil exports in Indian rupees (IMOILNET) has been hypothesized to be depending on the exchange rate (ER), price of Indian basket of oil imports in US\$ (OILPRUSD), domestic GDP at market price (YMP) and the domestic price index of oil (OILPRWPI).

Sample size: 20 (1991-92 to 2012-13)

$$\text{IMOILNET} = -110280.88 + 1845.05 \cdot \text{ER} - 1115.82 \cdot \text{OILPRWPI} + 443.56 \cdot \text{OILPRUSD} + 0.04 \cdot \text{YMP} + 90744.59 \cdot \text{DUMIMOILNET}$$

(-4.56)
(2.52)
(-4.73)
(9.53)
(11.88)

90744.59*DUMIMOILNET
(13.13)

Adjusted R² = 0.998

DW Stat= 1.284

- 4) The value of domestic price index of oil in the WPI basket (OILPRWPI) is hypothesized to be dependent on the oil price ratio, defined as the ratio of the domestic oil price index to the index of international oil price, both denominated in rupee terms, (OILPRRATIO), price of Indian basket of oil imports in US \$ (OILPRUSD) and its own value in the previous period (OILPRWPI (-1)). These specifications have been further elaborated in the context of oil price shock and domestic oil price policy reforms in Bhanumurthy et al. (2012).

Sample size: 22 (1991-92 to 2012-13)

$$\text{OILPRWPI} = -25.61 + 27.12 \cdot \text{OILPRRATIO} + 0.09 \cdot \text{OILPRUSD} + 0.77 \cdot \text{OILPRWPI}(-1)$$

(-1.70)
(1.92)
(2.76)
(6.59)

Adjusted R² = 0.985

DW Stat= 1.962

- 5) The value of non-oil, non-gold merchandise imports in rupees (IMOTH) has been hypothesized to be dependent on the domestic income, given by GDP at market prices (YMP) and on the exchange rate (ER).

Sample size= 23 (1990-91 to 2012-13)

$$\text{IMOTH} = 143406.72 - 7661.38 \cdot \text{ER} + 0.18 \cdot \text{YMP} + 76864.42 \cdot \text{DUMIMOTH}$$

(6.39)
(-11.85)
(85.71)
(9.20)

Adjusted R²= 0.998

DW Stat= 2.307

- 6) The net export of services in rupee terms (EXSERVNET) has been hypothesized to be a function of the GDP of the U.S.A (USGDP), which accounts for the bulk of Indian net service exports and export of merchandise (EXGOODS)¹³. Export of goods has been included as an explanatory variable in order to capture the

¹³ Some cost related variables and productivity related variables (like unit labour cost ratio) were tried but didn't yield any significant results. Investment in physical infrastructure as a proportion of GDP (a supply side variable) seemed to have a positive impact on net service exports but was dropped due to unavailability of a comparable back series prior to 1999 (India Infrastructure Report).

complementarity between different classes of exports and network effects, based on the rationale that networks in goods market could be used for export of services as well (See Eichengreen and Gupta, 2012).

Sample size: 17 (1996-97 to 2012-13)

$$\begin{aligned} \text{EXSERVNET} = & -266986.17 + 1140.81 \cdot \text{USGDP} + 0.21 \cdot \text{EXGOODS} - 46171.94 \cdot \text{DUMCRISIS} \\ & (-1.63) \quad (1.87) \quad (5.74) \quad (-5.53) \\ & + 22421.32 \cdot \text{DUMCRISISLAG} + 0.83 \cdot \text{AR} (1) \\ & (2.45) \quad (6.06) \end{aligned}$$

Adjusted R² = 0.994

DW Stat = 2.438

- 7) The net flow of remittances in Indian rupees (REMIT) has been hypothesized to be a function of the first difference of the combined GDP of the advanced countries (ADVGDGP) and the Middle East (MEGDGP), these being the two major sources of remittances, and the exchange rate (ER).

Sample size = 22 (1991-92 to 2012-13)

$$\begin{aligned} \text{REMIT} = & -99105.28 + 1168.09 \cdot \text{D}(\text{ADVGDGP} + \text{MEGDGP}) + 2699.50 \cdot \text{ER} + 38137.97 \cdot \text{DUMREMIT} - \\ & (-7.80) \quad (25.01) \quad (7.83) \quad (9.18) \\ & 53660.63 \cdot \text{DUMCRISISLAG} \\ & (-7.13) \end{aligned}$$

Adjusted R² = 0.991

DW Stat = 2.086

- 8) The net flow of investment income in rupee terms (INVESTINCOME) is assumed to be dependent on the net flow of foreign capital to India (CAPFLOWS) and the nominal exchange rate (ER).¹⁴

Sample size: 22 (1991-92 to 2012-13)

$$\begin{aligned} \text{INVESTINCOME} = & 157557.85 - 0.05 \cdot \text{CAPFLOWS} - 4008.66 \cdot \text{ER} + 30410.15 \cdot \text{DUMINVESTINCOME} \\ & (4.83) \quad (-3.43) \quad (-6.19) \quad (5.85) \\ & + 0.77 \cdot \text{AR}(1) \\ & (13.17) \end{aligned}$$

Adjusted R² = 0.926

DW Stat = 1.208

- 9) The current account balance is the sum of commodity trade balance (export of goods (net of oil) minus net oil imports, gold imports and import of non-oil, non-gold goods), service trade balance (net export of services) and balance on income account (broadly grouped as remittances and investment income).

¹⁴ Investment income may also be modeled as a function of the net international investment position of the country, which gives the difference between the external assets and liabilities of a country.

$$\text{CAB} \equiv (\text{EXGOODS} - \text{IMOILNET} - \text{IMGOLD} - \text{IMOTH}) + (\text{EXSERVNET}) + (\text{REMIT} + \text{INVESTINCOME})$$

Capital Account of the Balance of Payments

- 10) Net foreign direct investment (FDI) has been assumed to be a function of the relative GDP of India at market prices to that of advanced countries (YMP/ADVGDGP) and the credit rating of India (CREDITRATING). Credit rating of a country is based on its institutional and governance effectiveness, economic structure and growth prospects, external liquidity and international investment position, fiscal performance and monetary flexibility. Credit rating captures the attractiveness of the domestic economy for the international investor vis-à-vis other investment destinations. Several other variables including openness, demographic dividend, and fiscal deficit indicators were tried but turned out to be statistically insignificant. A host of cost and efficiency related variables were tried but were not statistically significant in explaining the trend.

Sample Size: 17 (1996-97 to 2012-13)

$$\text{FDI} = -34343.90 + 3.47 \cdot \text{YMP/ADVGDGP} + 5413.09 \cdot \text{CREDITRATING} + 20332.34 \cdot \text{DUMFDI}$$

(-10.92)
(25.44)
(2.98)
(12.55)

Adjusted R² = 0.983

DW Stat= 2.335

- 11) The net foreign portfolio investment (FPI) in rupee terms has been hypothesized to be a function of stock returns (STOCKRETURNS) and the GDP of India at market price (YMP).¹⁵ Fiscal deficit to GDP which is considered as an index of vulnerability of the economy doesn't appear to be a significant determinant of FPI over the sample period. Push factors like growth in advanced economies and US interest rates which play a crucial role in international capital flows were not statistically significant. DUMFPI captures the spillover effects from crisis in any part of the world to FPI flows.

Sample Size: 20 (1993-94 to 2012-13)

$$\text{FPI} = 1864.61 + 416.07 \cdot \text{STOCKRETURNS} + 0.01 \cdot \text{YMP} + 91484.12 \cdot \text{DUMFPI}$$

(0.39)
(3.80)
(4.72)
(13.16)

Adjusted R² = 0.964

DW Stat = 2.036

- 12) The net foreign loans to India in the capital account of the balance of payments in rupee terms (LOANS) is hypothesized to be dependent on the GDP of India at market price (YMP), credit rating of the country (CREDITRATING) and on the volatilities in the monthly exchange rate (ERVOLATILITY). ER volatility has been considered as exogenous. Interest rate differential between India and US was found to be insignificant in explaining the loan flows.

¹⁵ Stock returns is measured as the growth in BSE SENSEX, which is assumed to be positively dependent on non-agricultural GDP. Non-agricultural GDP is expressed as a function of the domestic GDP at market price.

Sample size= 17 (1996-97 to 2012-13)

$$\text{LOANS} = -1940.45 + 0.03 \cdot \text{YMP} + 19406.54 \cdot \text{CREDITRATING} - 48056.98 \cdot \text{ERVOLATILITY} + 114632.85 \cdot \text{DUMLOANS}$$

(-0.16) (11.13) (2.03) (-5.81)
(6.96)

Adjusted R² = 0.903

DW Stat =2.762

13) The capital account balance is given by the sum of foreign direct investment, foreign portfolio investment and foreign loans.

$$\text{CAPFLOWS} = \text{FDI} + \text{FPI} + \text{LOANS}$$

14) The balance of payments identity is given by the sum of current account balance, the capital account balance and the monetary movements.

$$\text{CAB} + \text{CAPFLOWS} + \text{MONETARYMOV} \equiv 0$$

15) The rupee-dollar exchange rate (ER) has been hypothesized to be dependent on the current account balance (CAB) and the net capital flows in the sense of inflows minus outflows of foreign capital (CAPFLOWS). Central bank intervention in the foreign exchange market was found to be statistically insignificant. Loans as a proportion of capital flows, which indicates the amount of dependence on debt-flows, were found to be statistically insignificant though had the correct sign in exchange rate estimation.

Sample size = 22 (1991-92 to 2012-13)

$$\text{ER} = 46.65 - 1.57\text{e-}05 \cdot \text{CAB} - 1.13\text{e-}05 \cdot \text{CAPFLOWS} + 3.53 \cdot \text{DUMER} + 0.78 \cdot \text{AR}(1)$$

(22.05) (-2.91) (-3.99) (5.96) (19.73)

Adjusted R² = 0.966

DW Stat = 1.093

POLICY SIMULATIONS

Baseline Scenario is computed using the following assumptions about the various exogenous variables in the model:

The base case assumes that the GDP of the world, the advanced countries, the Middle East and the USA will grow at the rates forecast by the IMF, in the World Economic Outlook, October 2013. The import weighted tariff rate is assumed to remain at the existing level in the forthcoming years. The import duty on gold is assumed to remain at the 2012-13 level for the future period. The price of gold as prevailing in the year 2012-13 is assumed to hold in the future years as well. The price of the Indian basket of oil imports in US \$/tonne in the year 2012-13, the latest available year for which data is available, is assumed to continue in the future years. The oil price ratio is assumed to remain constant at the level it was in 2012-13. The outlook of India's local currency rating, based on the assessment by Standard and Poor's is assumed to continue to remain negative in 2013-14 but 2014-15 onwards, it is assumed to become stable. The volatility in the exchange rate observed during 2008-2012 is assumed to be replicated for the future years. The real GDP at factor cost (at 2004-05 prices) of India is assumed to

grow at the rates projected for the 12th Plan period based on the NIPFP macro-econometric model.

Based on the estimated equations and with above assumptions on exogenous variables, the whole model has been solved from 2009-10 upto to the end of 12th plan period (2016-17) as a baseline scenario. Here the analysis focuses largely on two important indicators in the external sector: current account deficit and the exchange rate. In the base case, in the 12th Plan period, with an assumption of an average GDP growth of 6.7%, the average current account deficit as percentage of GDP is estimated at 4.7% with an exchange rate of 61.2. However, as these forecasts are conditional upon the assumptions on exogenous variables, more useful exercise could be to understand the partial effects of some of the exogenous as well as policy changes on the outcome variables such as current account deficit. Such exercises could also useful in testing the robustness of the model. For this purpose, six scenarios have been attempted and examined its impact through the deviation from the baseline outcomes. Six scenarios that are attempted here are: 10 percent annual increase in the international oil prices, 10 percent annual decline in the international prices, 10 percent annual increase in the international prices with an increase in domestic oil price pass-through, 1 percent higher GDP in the advanced countries, US GDP and the World GDP, 1 percent lower GDP in the advanced countries, US GDP and the World GDP and finally 1 percent higher GDP growth in the Indian economy. The simulation results are presented in Tables 4 and 5 below and are discussed in the next sections.

Table 4: Simulation Results on Effect of Change in International Prices and Domestic Pass-through (Change from Baseline Scenario)

Variable	Scenario 1	Scenario 2	Scenario 3
Current Account Balance to GDP (Percentage)	-0.45	0.37	-0.35
Exchange Rate (Rupees/ USD)	0.97	-0.78	0.75

Scenario 1: 10% annual increase in OILPRUSD every year

Scenario 2: 10% annual decrease in OILPRUSD every year

Scenario 3: 10% increase in OILPRUSD every year and successive increase in OILPRRATIO

Table 5: Simulation Results on Effect of change in World Growth Outlook and Domestic Growth Outlook (change from baseline scenario)

Variable	Scenario 4	Scenario 5	Scenario 6
Current Account Balance to GDP (Percentage)	0.38	-0.43	-0.06
Exchange Rate (Rupees/ USD)	-0.79	0.90	0.16

Scenario 4: 1% higher growth in US GDP, Advanced country GDP and World GDP

Scenario 5: 1% lower growth in US GDP, Advanced country GDP and World GDP

Scenario 6: 1% higher growth in real GDP of India

VI. Findings

The simulation results suggest that India's external sector is indeed vulnerable to external shocks such as output shocks and oil price shocks. As demand plays an important role in the determination of trade flows, both for imports and exports of goods and services, any decline in the external demand indeed worsens the current account. It may be noted in the case of scenario 5 where a 1% decline in the advanced country GDP growth, which we assume translates to a similar reduction in world GDP growth, could result in worsening of current account balance by 0.43 per cent of GDP. This is through reduction in demand for services export as well as expected decline in inflow of remittances as both are significantly determined by the advanced country GDP. The commodity trade is affected as a result of the decline in world GDP.

When we look at the impact of decline in external GDP growth on the components of the current account, we find that as much as 63 percent of the decline in the current account is accounted by the deterioration of commodity trade balance, while service trade balance and balance on the income account (remittances and investment income) account for 30 percent and 7 percent of the decline, respectively. The transmission of external shocks through commodity trade channel is fairly strong.

Our model also suggests that there is second round impact through depreciation of exchange rate following worsening current account balance. On the other hand, a 1 per cent rise in advanced country GDP improves the current account balance by 0.38 per cent (scenario 4).

As shown in table 5, higher domestic demand also would worsen current account balance. A 1 per cent higher growth of the Indian economy, *ceteris paribus*, would cause a widening of current account imbalance by 0.06 per cent of domestic GDP (scenario 6). This happens through rise in demand for intermediate imports (oil plus other imports) following higher GDP growth target. From this relation, one may conclude that if India targets higher GDP growth, then it might have to deal with slightly higher current account deficit. However, the magnitude of expansion in current account deficit depends on the factors that lead to higher GDP growth. Elsewhere, we have argued that if higher GDP growth accompanied by higher capital expenditure, then such expansion is marginal¹⁶. However, if the growth is accompanied by current expenditure, the expansion in current account deficit would be larger as higher expenditure may lead to leakage in the external account.

The other external shock that is analysed here is the oil price shock. As outlined in our analytical framework, oil price shock would have an impact on current account balance through rise in oil import bill and also on the domestic inflation depending on the

¹⁶ A note submitted to the Planning Commission that looked at trade-off between growth and current account balance.

oil price pass-through decision of the Government. Simulation results for a 10 per cent hike in international oil price is seen to widen the current account deficit by 0.45 per cent of GDP though the effect might be somewhat tempered through a policy choice on pass-through (scenario 1 and 3). While higher pass-through could dampen-down the oil import demand and marginally improve the current account, its impact on overall inflation could be higher.

Gold imports, which have been rising in the recent years and have contributed to current account imbalances, have responded to import tariff on gold. Higher gold duty has dampened-down the import of gold. Increase in international gold prices may still be a risk for India's external balance.

There is feedback effect from exchange rate to current account flows, with differences across flow types. Whereas import bill for oil rises with depreciation of the domestic currency, the non-oil non-gold import basket for India is seen to respond negatively with Rupee depreciation. The net investment income is negatively related to the exchange rate indicating that a lower value of Rupee implies greater repayment liabilities and therefore strain on the current account of the BOP.

All the three capital flows are found to be pro-cyclical *vis-à-vis* the level of economic activity of the destination country. Besides the present growth scenario of the destination country, loans and foreign direct investment flows are influenced by the future prospects of the country as captured by the Credit rating. Foreign portfolio investments is a function of stock returns which over the long run is determined by growth of the non-agricultural sector. Given the structure of the model, we have not looked at the reverse relationship, i.e., how capital flows affect economic activity. A priori, one would expect a bi-directional causality.

Capital flows in India were not found to be dependent on interest rate differentials and relative costs. This supports the exogenous nature of these flows atleast in the long run as has been discussed in the theoretical literature and empirical models. Empirical studies that have found a significant relationship have only found these factors determining short duration movements.

The exchange rate was found to be determined by the net flows in the two balance of payments accounts. Imports of goods and services, outflow of capital represent the demand for foreign currency, exports and inflows of capital represent the supply of foreign currency. Together these flows determine the exchange rate. Current account balance and the method of financing it are the main determinants of the exchange rate.

VII. Conclusions

In this paper, an attempt has been made to understand and review the behavioural issues within the external sector. Based on a critical review of the existing

studies on various aspects of the external sector behaviour, the paper provides an analytical framework for modeling the external block by disaggregating the block into current and capital sub-blocks and applying it to the Indian data. The estimated model has been used to understand the role of external shocks as well as domestic policy changes on the current account deficit, which is an important indicator to assess the strength of the economy for long term investment purposes.

The estimated model broadly captures the transmission mechanism of external shocks and domestic policy changes. While external demand plays a major role in determining the exports (both goods and services), in the case of imports it is largely determined by the domestic demand and the exchange rate. In the case of capital flows, short term capital flows are largely determined by the extent of returns in the domestic financial markets while the long term foreign flows are determined by the growth differentials as well as the decisions of the credit rating agencies. Exchange rate is determined by the net flows both on the capital and current accounts. Central Bank intervention did not appear to be a significant determinant in long term.

Preliminary results from various scenarios suggest that the model is robust. The results show that external sector is indeed sensitive to changes in the external environment such as international oil and commodity price changes, change in external demand, decisions of the Credit Rating agencies and to the domestic policies such as changes in import duty, changes in price pass-through policies, and some growth/investment policies. More than the domestic policies, the external environment plays a predominant role in the behavior and performance of the external sector, a finding that is broadly in tune with the literature. To get the feedback impact of changes in the external sector on overall real economy, this estimated external sector block needs to be integrated with the core model. The future research will focus on this issue.

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Data Sources

ADVGDGP is the index number of GDP of advanced G-7 countries taken together (1990-91=100). Data from the *World Economic Outlook*, October 2013, IMF.

BSESENSEX is the annual average of the BSE Sensex. Data from *Handbook of Statistics on the Indian Economy*, RBI.

CAB is the current account balance denominated in rupees. Data from *Handbook of Statistics on the Indian Economy*, RBI.

CAPFLOWS is the net foreign capital flows to India denominated in rupees, which is sum of net foreign direct investment, net foreign portfolio investment and net foreign loans, where flows relate to inflows minus outflows. Data from *Handbook of Statistics on the Indian Economy*, RBI.

CREDITRATING is the outlook on local currency rating of India. Data from the website of Standard and Poor's.

DUTY is the import weighted average tariff rate. Data from the Planning Commission of India, *Databook for DCH*, 2nd April, 2013.

DUTYGOLD is the duty levied on gold imports. Data from *Annual Report, 2012-13*, RBI.

ER is the nominal exchange rate (Indian rupee per US\$). Data from the *Handbook of Statistics on Indian Economy*, RBI.

ERVOLATILITY is the standard deviation of the month end exchange rate. Data from the *Handbook of Statistics on Indian Economy*, RBI.

EXGOODS is the rupee value of exports of merchandise less exports of petroleum products. Data from the *Handbook of Statistics on Indian Economy*, RBI.

EXSERVNET is the rupee value of exports of services net of imports. Data from the *Handbook of Statistics on Indian Economy*, RBI.

FDI is the net foreign direct investment (inflows minus outflows) denominated in Indian rupees. Data from the *Handbook of Statistics on Indian Economy*, RBI.

FPI is the net foreign portfolio investment (inflows minus outflows) denominated in Indian rupees. Data from the *Handbook of Statistics on Indian Economy*, RBI.

GOLDPRICE is the average price of gold in Mumbai (rupees per 10 grams). This has been used as a proxy for international gold price. Data from the *Handbook of Statistics on Indian Economy*, RBI.

IMGOLD is the rupee value of gold imports to India. Data from the *Handbook of Statistics on Indian Economy*, RBI.

IMOILNET is rupee value of net oil imports, that is, oil imports net of oil exports. Data from *Handbook of Statistics on Indian Economy*, RBI.

IMOTH is the rupee value of merchandise imports less oil and gold imports. Data from *Handbook of Statistics on Indian Economy*, RBI.

INVESTINCOME is the net investment income denominated in rupees. Data from the *Handbook of Statistics on Indian Economy*, RBI.

LOANS is the net foreign loans denominated in rupees, including net figures of loans (external assistance, commercial borrowings and short-term credit to India), banking capital, rupee debt service and other capital as well as errors and omissions. Data from the *Handbook of Statistics on Indian Economy*, RBI.

MEGDP is the index number of GDP of Middle East countries taken together (1990-91=100). Data from the *World Economic Outlook*, October 2013, IMF.

MONETARYMOV is the net monetary movements (including net changes in forex reserves with the RBI, etc.), denominated in Indian rupees. Data from the *Handbook of Statistics on Indian Economy*, RBI.

OILPRRATIO is the oil price ratio, defined as the ratio of domestic oil price index divided by the international oil price index, both denominated in rupees.

OILPRUSD is the price of Indian basket of oil imports in US dollars per tonne. Data from *Handbook of Statistics on Indian Economy*, RBI.

OILPRWPI is the domestic price index of mineral oil in WPI Basket 2004-5=100. Data from the website of *Office of Economic Advisor*, Ministry of Commerce and Industry, GOI.
REMIT is the net flow of remittances, that is, net private transfers plus net official transfers, denominated in rupees. Data from *Handbook of Statistics on Indian Economy*, RBI.

STOCKRETURNS is the year on year growth of the BSE SENSEX. Data from *Handbook of Statistics on Indian Economy*, RBI.

USGDP is the index number of GDP of USA (1990-91=100). Data from the *World Economic Outlook*, October 2013, IMF.

WORLDGDP is the index number of GDP of the world (1990-91=100). Data from the *World Economic Outlook*, October 2013, IMF.

YMP is the GDP of India at current market prices. Data from *National Accounts Statistics*, CSO, GOI.