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India's Balance of Payments in Three Decades of Liberalization: With a Focus on Exchange Rate Dynamics and Monetary Policy[1]

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ABSTRACT

India's balance of payments (BoP) has gone through several merits and oddities over its long journey since the liberalization era. On its way forward it has faced three of the world's worst challenges from the global turmoil — i) East Asian currency and banking crisis in 1997-98,ii) global economic and financial tsunami of 2007-08 and lastly, iii) the Eurozone sovereign debt crisis of 2011-12 followed by the global recession. Another area of concern in the paradigm of India's BoP has been the inflation dynamics. It is in this context the chapter evaluates the evolution of India's BoP over the period concerned (i.e., from 1992-93 to 2021-22) in terms of structural changes, exchange rate fluctuations, and related monetary policy dynamics.

In the first part of the methodology section, the focus is on exchange rate volatility in different perspectives, i.e., from the trade balance side and from the export and import volume side. In view of this, exercises have been carried out to understand the dynamics between movements in the real effective exchange rate, trade balance, growth in export and import volume. A comparative study has been carried out on the movements of real and nominal effective exchange rates in line with the growth of exports and imports in the pre- (since independence) and the post-reform period in India. In the second part of the paper, the author tries to explore the monetary policy dynamics by examining the possible trade-off between the policy rate (we consider REPO rate) and the focus variables, which includes rate of inflation, GDP growth, real effective exchange rate and money supply by considering annual data ranging from 1992-93 to 2021-22 for India. The paper makes use of the Granger Causality approach to study the direction of causality among the interrelated policy variables. Interestingly, the results show that there is a unidirectional causality running from all the focus variables to the REPO rate. Finally, the Johansen co-integration test has been used to find out the number of cointegrating relations in the model and accordingly interpret the monetary policy dynamics in line with Taylor's rule.

The paper concludes by highlighting that care should be taken to strengthen India's external sector through a fitting real rate of growth, relatively low inflation, an optimum level of foreign exchange reserves, a low current account deficit in BoP and a falling debt-service ratio as well as a realistic real effective exchange rate supported by suitable tight monetary policy measures for boosting exports and promoting trade facilitation.

Key words: BoP, GDP growth, Impossible Trinity, Inflation targeting, Monetary policy, Real effective exchange rate, Taylor's rule

The challenges for monetary policy in general and in particular for India have been changing over time in tune with balance of payments, even though some basic issues have remained of perennial concern.

— C. Rangarajan
(Former Governor,
Reserve Bank of India)

I. INTRODUCTION

India's balance of payments (BoP) has gone through several merits and oddities over its long journey since the liberalization era. On its way forward it has faced three of the world's worst challenges from the global turmoil — i) East Asian currency and banking crisis in 1997-98,ii) global economic and financial tsunami of 2007-08 and lastly, iii) the Sovereign Euro Zone Debt crisis of 2011-12 (Karmakar, 2014). Of them, the impact of the East Asian crisis on India was minimal. But the other two crises had a tremendous impact on India's external sector. In addition to that India's BoP faced turmoil from its trade and payments policy — both internal and external. In effect, the current and the capital account of India's BoP have undergone significant structural changes during the period between 1992-93 — 2021-22.

OBJECTIVE OF THE STUDY

The objective of the paper is to find out the various structural changes and different transitions India has faced over its long journey in the path of BoP during 1992-93 to 2021-22 and to assess critically what has happened to India's BoP in the context of global changes and exchange rate fluctuations and related monetary policy dynamics over the period concerned. Primarily, the methodology used here is time series regression. The data sources have been compiled from the various economic surveys by the Government of India and the Reserve Bank of India database in the *Handbook of Statistics on Indian Economy*.

II. STRUCTURAL CHANGES IN INDIA'S BOP: AN OVERVIEW

The BoP crisis of 1990 triggered the need for India to look at things differently. Economic reforms of 1991 accompanied by simultaneous introduction of macroeconomic stabilization and structural reforms in response to the fiscal /BoP crisis in 1990-91 brought in fundamental

changes in the external sector and gradually lifted the Indian economy into the higher growth orbit.

Global Changes and India's BoP

Following the 2008 global financial and economic crisis (US Subprime crisis), trade suffered with a slump in demand for exports from the United States, the European Union, and the Middle East. The unfolding of euro zone crisis along with other crises, have adversely affected the global economy as well the Indian economy.

The Impact of Euro Zone Crisis on India's BoP on Current Account

The fallout of the euro zone crisis for the Indian economy has been a sharp deceleration in exports and a slowdown in GDP growth. India's growth declined from an average of 8.3 per cent per annum during 2004-05 to 2011-12 to an average of 4.6 per cent in 2012-13 and 2013-14. The trade deficit, as a result, increased to US$ 189.8 billion in 2011-12 which was 10.2 per cent of the GDP.

The high current account deficit (CAD) has had implications for rupee volatility and business confidence in the economy. This makes capital account vulnerable to a 'reversal' and 'sudden stop' of capital, especially in times of stress (Karmakar and Mukherjee, 2017).

India has witnessed three global effects on its BoP. With the opening of the external sector of the economy, the structure of India's balance of payments has undergone several structural changes which are mentioned below.

Ups and Downs of the Current Account of BoP (1992-93 — 2021-2022)

1. The current account of India's BoP [the sum of the balance of trade (exports minus imports of goods and services), net factor income (such as interest and dividends) and net transfer payments (such as foreign aid)] has shown sharp ups and downs following the liberalization of foreign trade and investments.

2. It is noteworthy India once in the past witnessed for the first time a surplus on the current account for three consecutive years during 2001-02 to 2003-04), but as time passed by, India recorded a current account gap of $23 billion or 2.7 per cent of the GDP in the last quarter of 2021, the largest in two years. India's current account deficit widened to $23.9 billion in the second quarter of 2022, the highest since the last quarter of 2012. The trade deficit increased sharply to $68.6 billion from $30.7 billion in 2021, as imports soar amid rising commodity prices and a strong dollar.

On the other hand, the services surplus has widened to $31.1 billion in 2021-22 from $25.8 billion in 2020-21, pushed by rising exports of computers, transportation, business, and travel services.

3. Exports have shown buoyant growth from $18.5 billion in 1990-91 to $166.1 billion in 2007-08. The share of exports in GDP also more than doubled from 6.6 percent in 1990-91 to 15.2 percent in 2008-09. It stood at 16.5 per cent in GDP in 2011-12. It was a clear indication of the Indian economy's greater participation and integration with the global economy. But the sluggish global growth not only adversely impacted merchandise exports but also caused the invisibles surplus to grow only marginally in 2014- 15 and in 2015-16. Thereafter, what has happened is that India has achieved merchandise export of $33.0 billion in August 2022, almost at similar levels of $33.38 billion in August 2021.

4. India's imports have not grown at a very fast rate. Hence, the trade deficit of $9.4 billion (3.3 percent of GNP) in 1990-91 rose consistently to high of $17.8 billion (4.4 percent of GNP) during 1999-2000. It rose sharply thereafter primarily due to rising crude oil prices and higher imports on account on higher economic growth. India's merchandise import in August 2022 was $61.68 billion, an increase of 36.78 per cent over $45.09 billion in August 2021. The RBI claims that the import surge reflects the strong demand of the domestic economy due to robust growth and strong fundamentals of the Indian economy.

Trends in Composition of Trade and Policy Implications:

The commodity composition of India's trade has undergone many changes since liberalization and has been driven by trade policy, movements in international prices, and the changing pattern of domestic demand. Since 2000, Indian trade with rest of the world has ballooned. The reforms have also given a boost to India's manufactured goods in the world market. The top ten[2] export sectors continue to dominate India's

[2]The top ten sectors in 2020-21 include, i) Petroleum products, ii) pearls, precious and semi-precious stones, iii) iron and steel, iv) drug formulations, biologicals, v) gold and other precious metal jewelry, vi) organic chemicals, vii) electric machinery and equipment, viii) aluminum products, ix) products of iron and steel, x) marine products.

export basket, accounting for nearly 40 per cent of total exports in 2020-21. While it was 46.7 per cent in 2021-22[3].

5. **Remittances to India**

Remittances are private flows in which individuals voluntarily send funds to their personal choice of beneficiaries. In the year 1990, recorded remittance transfers to developing countries were about $31 billion and in 2015 they are estimated to have reached $436 billion. In 2014, the largest flows were to India (over $70 billion) and China ($64 billion) (Goldin, *2016*).

Inflows of remittances to India have experienced a sharp rise. Remittances have also emerged as a more important and stable source of foreign exchange inflow compared to official development assistance, foreign direct investment, or other types of capital flows in developing countries. Remittances have some comparative advantages as they do not create any future repayment obligation and liabilities. Moreover, remittances come to the households as private aid to care about the well-being of the family back home of the migrants' members.

As per World Bank data, among countries today, the top recipient countries are India with $87 billion, followed by China ($53 billion), Mexico ($53 billion), the Philippines ($36 billion), and Egypt ($33.3 billion). India, with a vast reservoir of both highly skilled and semi-skilled and unskilled labor force, is a major contributor to the contemporary global labor flows. Available evidence indicate that migrant labor flows from India since 1990s have not only registered impressive growth, in respect of the traditional destinations like United States of America (USA), United Kingdom (UK), Canada and the Gulf countries but also have diversified and expanded to newly emerging migrant destinations in continental Europe (Germany, France and Belgium), Australasia (Australia and New Zealand), East Asia (Japan) and South-East Asia (Singapore and Malaysia). Consequently, the proportion of Indian migrants in total immigration inflows in the major receiving countries has registered considerable increase in recent years. The most beneficial impact of the increasing number of migrants from India is the growing magnitude of remittances inflow, which is now far more than the external sector aid and foreign investment

[3] The top ten sectors in 2021-22 include i) mineral fuels including oil, ii) gems, precious metals, iii) machinery including computers, iv) iron and steel, v) organic chemicals, vi) pharmaceuticals, vii) vehicles, viii) electrical machinery and equipment, ix) cereals, x) cotton.

flows and a major factor accounting for the improvements in India's balance of payments.

The inflows come from an Indian Diaspora estimated at around 25 million spread across nearly 130 countries and are both quite stable and rapidly growing with the flows all set to diversify further in the years to come (Ratha, 2009).

India is the highest remittance-receiving country in the world. With an increasing number of Non-Resident Indians (NRIs) living overseas, either for work or having settled there, flows into the country have certainly grown dramatically in the past few decades. The magnitude of the remittances can be judged by the fact that they sometimes exceed far over and above the foreign direct investment (Table 1).

Table 1: Remittances as a share of GDP

Year	Remittances Inflow (Rs Billion)	Remittances as a percentage of GDP	Net FDI Inflow as a percentage of GDP
1975-76	3.614494	0.416862998	-0.010628169
1976-77	5.7880931	0.619564246	-0.007604007
1977-78	8.1929375	0.77402856	-0.030083406
1978-79	9.5356413	0.831739278	0.01335363
1979-80	11.7393947	0.933706201	0.032176041
1980-81	21.75668	1.453915345	0.043059214
1981-82	20.0103652	1.138213657	0.048148456
1982-83	24.8890728	1.665691951	0.036397108
1983-84	26.9870898	1.178367477	0.002618983
1984-85	26.0675119	1.015837665	0.00919131
1985-86	30.563808	1.055657148	0.046244655
1986-87	28.2736879	0.872782071	0.047923052
1987-88	34.4996976	0.936954561	0.077119938
1988-89	32.2403599	0.73794636	0.031182439
1989-90	42.344118	0.843629325	0.086308037
1990-91	41.6830944	0.711058361	0.074736972
1991-92	74.737566	1.109071653	0.027593624
1992-93	75.0660576	0.969163284	0.097238944
1993-94	110.9093366	1.244277943	0.199720325
1994-95	183.695941	1.756863981	0.301406511
1995-96	201.8019968	1.645046745	0.603030361
1996-97	310.4678322	2.187506964	0.625827257
1997-98	375.3267464	2.38697646	0.871838424
1998-99	391.0939929	2.168674526	0.633739715
1999-00	478.785417	2.366557844	0.479034915
2000-01	577.2555845	2.651107459	0.77555818
2001-02	671.4053253	2.849955431	1.070660341
2002-03	763.3492051	3.009663995	1.025248066
2003-04	978.9186285	3.445073359	0.614080764
2004-05	849.8203245	2.621115186	0.775952192
2005-06	975.7125	2.641795336	0.898676912
2006-07	1283.728538	2.989095268	2.176329406
2007-08	1538.867125	3.08570153	2.100365807
2008-09	2174.244387	3.861847349	3.656950691
2009-10	2381.7147	3.676718597	2.687536065
2010-11	2445.437176	3.141573803	1.653785022
2011-12	2916.972078	3.237582777	2.002065552
2012-13	3677.62907	3.636435168	1.312934337
2013-14	4100.088066	3.610798509	1.516275965
2014-15	4295.805476	3.414846991	1.698769519
2015-16	4420.707429	3.196443895	2.105852937
2016-17	4218.117762	2.748317088	1.96389782

Source: World Bank Data 2017

Of late, Private transfer receipts, mainly representing remittances by Indians employed overseas, increased to US$ 23.7 billion in 2021-22, up by 13.4 per cent from the level it was year ago.

It is true that remittances have proved to be an important and stable source of external finance to cushion the impact of a weak merchandise trade account in India.

In respect of remittances, the most effective policy may have been to follow a realistic and competitive exchange rate policy, and to provide efficient and cheap banking services (Jalan, *2021*).

6. **Services Trade**

Leapfrogging growth of the IT (Information Technology) or software industry to meet the global demand has made the Services trade in India as a prominent sector in terms of contribution to national and states' incomes, trade flows, FDI inflows, and employment, so the World Bank did not hesitate to say that it was India's services trade revolution.

It was one of the biggest success stories in India's technology, economy, and BoP fronts. Net services receipts increased, both sequentially and on a year-on-year (y-o-y) basis, on the heel of a rise in net earnings from computer and business services (Mukherjee & Karmakar, 2020).

7. **Capital and Finance Account: From Flood to Drought**

The structure of capital account of India (the records of exports and imports of capital) that emerged with much strength and resilience in the three decades after liberalization, especially since 1993-94 has undergone significant changes in the new millennium. Net capital inflows from all sources (excluding IMF) averaged about US $8.89 billion per year over the seven years from 1993-94 to 1999-2000.

FDI, which was a mere $97 million in 1990-91, increased thereafter to $1.3 billion in 1994-95 and $2.1 billion in 1999-00. During 2014-15, there was huge surge in net foreign investment to US$73.5 billion. In 2017-18, net FDI in India also declined to $30 billion from a peak of $49 billion in 2016-17, due to high repatriation. At this level, the share of FDI in India dropped from 16 to 9.5 per cent of the total FDI into the emerging markets. Of late, there has been a dramatic transformation in the sectoral composition of both the flows and the stock of FDI. Foreign investment is no longer going into primary products or resource-based manufacturing. Today, the concentration is mainly in services and technology-intensive manufacturing. In the financial account, net foreign direct investment (FDI) in 2021-22 at US$ 13.8 billion was higher than US$ 2.7 billion in 2020-21.

Fresh inflows for **portfolio investment by** FIIs which was merely US$ 166 million in 1993-94 rose to US$ 2.14 billion in 1999-2000. In 2021-22, net foreign portfolio

investment (FPI) recorded an outflow of US$ 15.2 billion – mainly from the equity market, though its inflows helped a lot in strengthening India's external position. One important characteristic of it is that it is more volatile than FDI depending on movements in share prices. An interesting feature of it is that if the growth prospects are positive and exchange reserves are high, as is the case of India, the size of the current account deficit does not have a significant adverse impact on the size of inflows. From policy point of view, over the long run, while these flows continue without any abatement, excessive reliance on such flows for long-term investments and equity market developments should be avoided. So, the policy slogan for better prospect for Indian external sector would be: Regulate 'inflows' of portfolio capital and restrict 'outflows' of domestic capital through administrative rules.

Funds raised through **issue of ADRs/ GDRs** which was nil in 1990-91 and 1991-02 and only US$24 million in 1992-93 amounted to US$ 768 billion in 1999-00. Total foreign investment (FDI+ FPI) which was merely US$ 103 million in 1990-92 rose to US$5.181 billion in 1999-00. Subsequently, it has gone through several structural changes.

The total receipts of NRI deposit stood at $43.1 billion in 2010-11 — highest ever in the past two decades. It forms an important segment of India's BoP and should continue to show healthy growth due to the close cultural links of the NRIs with India. But the happy mirror soon faded out. Net inflows from NRI deposits schemes have plunged to $2.6 billion in 2021-22 as against $7 billion in 2020-21.

ECBs (External commercial borrowings**),** it being a crucial determinant of the magnitude of India's external debt and its single largest component, are another item of capital/finance account and are relatively less volatile than foreign investment. Net ECBs were US$1.6 billion in 2014-15 as compared to US$11.8 billion in 2013-14. The total external commercial borrowings – i.e., loans granted by non-resident entities to eligible Indian borrowers in foreign currency, has increased by a whopping 61.45 percent year-on-year to USD 50.15 billion, as of December 2019. This happens to be a 117 percent jump from the numbers of 2017.

Overview of Balance of Payments

Despite a decline in the level of merchandise exports the India's external sector situation remained comfortable with India's BoP situation becoming benign since

2013-14, Some of the salient external sector developments were as follows: (i) lower trade deficit and modest growth in invisibles resulted in lower CAD; (ii) the increase in FDI inflows and NRI deposits continued; and (iii) there was net outflow of portfolio investment. Although there was a net outflow under portfolio investment, capital/ financial flows were in excess of CAD and their absorption by the Reserve Bank of India (RBI) led to an accretion in reserves. In fact, the improvement in the invisibles trade balance along with the net capital flows dominated by foreign investment and banking capital was more than sufficient to finance the trade deficit leading to accretion in foreign exchange reserves. But there was a reversal in almost every account, of late.

BoP during 2021-22

The current account balance recorded a deficit of 1.2 per cent of GDP in 2021-22 as against a surplus of 0.9 per cent in 2020-21 as the trade deficit widened to US$ 189.5 billion from US$ 102.2 billion a year ago.

Net invisible receipts were higher in 2021-22 due to an increase in net exports of services and net private transfer receipts, even though net income outgo was higher than a year ago.

Net FDI inflows at US$ 38.6 billion in 2021-22 were lower than US$ 44.0 billion in 2020-21.

Net FPI recorded an outflow of US$ 16.8 billion in 2021-22 as against an inflow of US$ 36.1 billion a year ago.

Net ECBs to India recorded an inflow of US$ 7.4 billion in 2021-22 as compared with US$ 0.2 billion in 2020-21.

In 2021-22, there was an accretion of US$ 47.5 billion to foreign exchange reserves (on a BoP basis), while there was a drawdown of US$ 16.0 billion in the foreign exchange reserves (on a BoP basis) in 2020-21.

Reserve Position

Because of strong capital flows, international reserves have increased substantially from less than US$ 5 billion in July 1991 to more than US$ 304.7 billion at the end of March 2013-14. The **reserves cover for imports** also increased from 2.3 months in 1991-92 to 8.9 months in 2014-15 and 12.2 months of merchandise imports at end – December 2021.

India achieved the milestones of holding the fifth largest reserves in the world in 2020 and as of end-December 2021, India was the fourth largest foreign exchange reserves holder in the world ($634 billion) after the likes of China, ($3399.9 billion), Japan ($1387.4 billion), and Switzerland ($850.8billion). Russia, with $562 billion, has fallen behind India now. A sizeable accretion in reserves in India has led to an improvement in external vulnerability indicators such as foreign exchange reserves to total external debt, short-term debt to foreign exchange reserves, etc.

External Debt Profile

An aspect of India's external economy, which has shown a very positive development and is imparting strength to its BoP, is its external debt profile. India resisted the temptation of opening a full capital account. It avoided the debt trap and kept its BoP more stable. Key external debt indicators show that India's debt-carrying capacity has to some extent strengthened. Over the years, the composition of India's external debt stock has undergone structural transformation in terms of composition, and it has remained within manageable limit. The proportion of concessional debt in total external debt came down. India's external debt rose to US$ 593.1 billion as at end-September 2021 (Economic Survey, 2021-22).

The ratio of short-term external debt to foreign exchange reserves was 24.6 per cent at end-September 2015. The ratio of concessional debt to total external debt decreased steadily. India's external debt has remained in safe limits as shown by the external debt to GDP ratio of 23.7 per cent and debt service ratio of 7.5 per cent in 2014- 15. Now in fiscal year 2021, the debt services ratio in India was about 8 percent.In a globalized economic environment, India's prudent external debt policies and management and solvency have successfully limited the rise in magnitude of external debt to a modest level. India continues to be among the less vulnerable countries.

III. MANAGING INDIA'S EXCHANGE RATE

The exchange rate is vital pipeline that links all of India to the rest of the world. It is through this that goods, services, and investments flow go in and out of the nation. The nation's growths, especially inflation, is sensitive to the exchange rate. Obviously, a realistic exchange rate is crucial to export performance.

Until the 1990s, international exchange rate policies had fixed exchange rate policies with per values or fixed but adjustable exchange rates, in response to changes in fundamentals. Floating rates, capital volatility, massive changes in technology and integration worldwide markets across different time zones are relatively recent phenomenon (Jalan, 2017). To keep abreast of these phenomenon, India's exchange rate policy in recent years has been guided by the broad principles of careful monitoring and management of exchange rates with flexibility, without a fixed target or a preannounced target or a band, while allowing the underlying demand and supply conditions to determine the exchange rate movements over a period in an orderly way. The combination of a managed flexibility and partial capital account controls has also allowed India to resolve, to a large extent, the trilemma of the famed "Impossible Trinity", which disallows the simultaneous achievement of exchange rate stability, monetary independence, and capital market integration. Any two of these goals may be attained but never all three. With the help of partial capital controls India has successfully enjoyed substantial monetary independence and a fair degree of exchange rate flexibility, thus avoiding the trap of Impossible Trinity. This has helped India to have a dramatic improvement in her BoP — improvements coming both from invisibles as well as from portfolio equity investment and misc. capital flows (Karmakar and Jana, 2015).The system has worked so well, but there are some oddities or pitfalls regarding sharp nominal and real appreciation of the rupee, which has seen the six-currency (US dollar, euro for the Euro zone, pound sterling, Japanese yen, Chinese renminbi, and Hong Kong dollar) NEER and REER index (1993/94 = 100) to rise. In particular, the REER index (1993/94 = 100) has risen.

It is to be noted that from a competitive point of view and in the medium-term perspective, the REER which should be monitored as it reflects in the external value of the currency in relation to its trading partners in real terms (*Jalan,2021*).

With the opening of the trade and the capital accounts, the currency market has grown very large. Old solutions, like buying a few billion dollars to prevent appreciation, or selling a few billions from the central bank's reserves to prevent currency depreciation may no longer work. Moreover, the Indian economy is still trying to come to terms with the adverse impact of the COVID-19 pandemic which has dealt a severe blow to economic growth. In the event of an external shock, such as the US Fed announcing a tightening of monetary policy, like the 2013 taper tantrum episode, the rupee might depreciate sharply against the dollar. If the RBI attempts to defend the currency either by tightening liquidity in the domestic financial system

or raising interest rates to discourage capital outflows, this may hamper the growth recovery process in such a situation. The RBI would need to weigh the pros and cons of a currency defense strategy especially from a medium-term perspective, before embarking on a drive to prevent the rupee from depreciating.

Recent experiences show that the Indian rupee depreciated by 4.5 per cent (y-o-y basis) against US dollar in 2020-21. Although the rupee exhibited movements in both directions against US dollar during April-December 2021, it depreciated by 3.4 per cent in December 2021 over March 2021. The depreciation of the rupee, however, was modest as compared with its emerging market peers, such as — Turkish lira, Argentine Peso, Thai baht, and Philippine peso. The rupee appreciated against euro, Japanese yen, and pound sterling by 1.8 per cent, 1.3 per cent and 0.6 per cent, respectively, in December 2021 over March 2021. One of the salient features of the external sector developments very recently has been the relatively stable rupee dollar exchange rate and much lower level of fluctuations within the year (though fluctuations do happen).

DOES REAL EFFECTIVE EXCHANGE RATE INFLUENCE TRADE BALANCE?

One of the major issues in the literature on India's BoP has been the effects of exchange rate adjustments on the country's trade balance. While some researchers have argued that the exchange rate did matter in improving our trade balance over time, some others took the opposite view. Authors like Mathew Joseph (1992), Rajiv Kumar and Mathew Joseph (1994), Joshi and Little (1994) have supported the case for exchange rate variations because India's export growth bears significant relation with her real effective exchange rate (REER), but authors like Sarkar (1992, 1997) does not seem to be convinced with this line of arguments.

We do not find unanimity amongst scholars over this important issue, although the majority seems to support the view that exchange rate does matter for India's trade balance. To access the importance between real effective exchange rate (REER) (trade-weighted) and the trade balance in the Indian context from the post-reform period *1992-93 to 2021-2022*, we have attempted Granger's causality test (Granger, 1992) between these two variables. In this connection, it is worth mentioning that the year 1991-92 was an outlier because of the severe BoP crisis and should therefore, be omitted for the purpose of discerning trade. Hence the effect of reforms should be judged starting with the economy's performance in 1992-93. For this exercise to perform, we have taken quarterly data. A four-period lag structure is assumed for

the two variables, viz, the REER and India's trade balance (B_t) according to the Akaike Information Criterion (AIC). We postulate the following relation:

Model I

A. **$REER_t = f(REER_{t-i}, B_{t-i})$;** **Unrestricted Form ……** **(1)**

B. $REER_t = f(REER_{t-i})$; **Restricted Form……..** **(2)**

Again we postulate that,

Model II

A. $B_t = g(B_{t-i}, REER_{t-i})$; **Unrestricted Form…..** **(3)**

B. $B_t = g(B_{t-i})$; **Restricted Form …….** **(4)**

It is clear that part B of the Models I and II can be obtained by dropping the second variable from the estimable forms of part A of these models. Here i =1, 2, 3, 4 stands for the quarterly lag. The estimable equations of Model I and Model II are as follows:

Model I

A. Unrestricted Form with lag: $REER_t = \theta_0 + \theta_1 REER_{t-1} + \theta_2 REER_{t-2} + \theta_3 REER_{t-3} + \theta_4 REER_{t-4} + a_1 B_{t-1} + a_2 B_{t-2} + a_3 B_{t-3} + a_4 B_{t-4} + U_t$ **… (5)**

B. Restricted Form with lag : $REER_t = \theta_0 + \theta_1 REER_{t-1} + \theta_2 REER_{t-2} + \theta_3 REER_{t\ 3} + \theta_4 REER_{t-4} + V_t$ **… (6)**

Thus,Model IB is obtained by putting the restrictions $a_i = 0 \ \forall$ i=1, 2, 3, 4 in Model IA

Model II

A. Unrestricted Form with lag:

$$B_t = \alpha_0 + \alpha_1 B_{t-1} + \alpha_2 B_{t-2} + \alpha_3 B_{t-3} + \alpha_4 B_{t-4} + \beta_1 REER_{t-1} + \beta_2 REER_{t-2} + \beta_3 REER_{t-3} + \beta_4 REER_{t-4} + U_t \quad \text{… (7)}$$

B. Restricted Form with lag:

$$B_t = \alpha_0 + \alpha_1 B_{t-1} + \alpha_2 B_{t-2} + \alpha_3 B_{t-3} + \alpha_4 B_{t-4} + V_t \quad \text{… (8)}$$

When we put $B_i = 0 \ \forall$ i = 1, 2, 3, 4,…, 22 in Model IIA, we get Model IIB. The Null Hypothesis in Model I is that B_t does not Granger cause $REER_t$ and that in Model II is that $REER_t$ does not Granger cause B_t. Granger causality is obtained when the Null-Hypothesis is rejected i.e., the calculated F-statistic exceeds the tabulated value. This test is due to Granger (1969).

Table 2: ANOVA Tablesfor Models I AND II

MODEL IA		
Residual Sum of Squares	*Degrees of Freedom*	*Adjusted R^2*
(RSS)		
92211.23	113	0.798
MODEL IB		
Residual Sum of Squares	*D.F*	*Adjusted R^2*
(RSS)		
91011.21	111	0.811
MODEL IIA		
Residual Sum ofSquares	*D.F*	*Adjusted R^2*
(RSS)		
5074968.11	113	0.701
MODEL IIB		
Residual Sum ofSquares	*D.F*	*Adjusted R^2*
(RSS)		
7526984.12	111	0.847

Source: Authors' calculations

From the ANOVA Table 2, we find that in Model I (A & B), the estimated

$$F = \frac{(RSS_B - RSS_A)/(113-111)}{RSS_A/111}$$

$= -49.93 < 3.08$ (Tabulated Value)

Here the Null Hypothesis H_0: B_t does not Granger because $REER_t$ is not rejected. Therefore, B_t does not Granger cause $REER_t$.

On the other hand, we find in that Model II (A & B), the estimated

$$F = \frac{(RSS_B - RSS_A)/(113-111)}{RSS_A/111}$$

$= 36.16 > 3.08$ (*Tabulated Value*)

(The tabulated F-statistic both at 1% and 5% levels of significance). Therefore, the Null Hypothesis H_0: $REER_t$, does not Granger because B_t, is rejected and the trade weighted real effective exchange rate ($REER_t$) does Granger cause trade balance (B_t).Thus, we find that in the Indian case, the direction of causality runs from REER to trade balance, and not the other way around. Hence, we can conclude that the real effective exchange rate matters and here the changes in the real exchange rate will influence the trade balance.

RUPEE CONVERTIBILITY, LONG-RUN EXCHANGE RATE MECHANISM AND BOP IN INDIA

The Rupee Convertibility can be well explained with the behavior of exchange rate variation and its implications in India's balance of trade (BoT) and balance of payments (BoP) situation. Rangarajan (1991) estimated the following export equation based on time series data for 1977-1990.

$$\log (\text{export volume}) = 4.28 + 0.71 \log (\text{world GDP}) - 0.66 \log (\text{REER}).$$

$$R^2 = 0.94$$

All regression coefficients are statistically significant at 5% level.

The above regression clearly points out the impact of the exchange rate on exports. A 1% reduction (depreciation) in the exchange rate promotes 0.66% increase in exports and higher is the elasticity of REER, the higher is the value of exportables. The study of Sarkar (1992) reveals that there existed no significant impact between BOT and exchange rate where BOT is measured in terms of Rs. Dollar and SDR. His regression analysis during 1971-91 confirmed that the depreciation of rupee has no favorable impact on Dollar value and volume of export.

But the above relationship is not unanimously true because there is no unique relationship between increasing growth of exportable and downward REER. In our regression analysis, it is found that in the pre-reformed period from 1976 to 1991, a 1% decrease in NEER induced increase in exports by 2.9756% and imports by 2.9166% per year. On the other hand, a 1% decrease in REER led to an increase in export by 3.192% and imports by 3.2568% per year respectively.

Table 3: Comparison of Results of Pre-reform Period (1975-76 to 1990-91) and Post-reform Period (1991-92 to 2021-22)

Pre-reform period (1975-76 to 1990-91)	**Post-reform period (1991-92 to 2021-22)**
Log (export) = 22.4392 – 2.9756 log (NEER)	Log (export) = 6.739 + 0.922 log (NEER)
(-8.7977)* (14.220)*	(1.622) * (0.991)
R^2=0.763, DW = 0.35, F = 77.40*	R^2=0.061, DW = 0.112, F = 0.983*
Log (export) = 23.6147 – 3.9120 log (REER)	Log (export) = 7.088 + 0.783 log (REER)
(16.276)*(-10.370)*	(1.871) * (0.947)*
R^2=0.817, DW = 0.853, F = 107.721*	R^2=0.056, DW = 1.907, F = 0.896*
Log (import) = 22.517 – 2.9166 log (NEER)	Log (import) = 638969 + 0.964 log (NEER)
(10.262)*(-6.2017)*	(1.505)*(0.944)*
R^2=0.615, DW = 0.261, F = 38.46*	R^2=0.056, DW = 0.137, F = 0.891*
Log (import) = 24.2732 – 3.2568 log (REER)	Log (import) = 7.384 + 0.829 log (REER)
(12.254)*(-7.456)*	(1.577)*(0.817)
R^2=0.714, DW = 0.639, F = 60.162*	R^2=0.043, DW = 0.121, F = 0.667*
Log (export) = 7.1764 + 0.1035t	Log (export) = 9.672 + 0.132t
(109.53)*(24.396)*	(115.79)*(16.126)*
R^2=0.926	R^2=0.945
Log (NEER) = 5.0817-0.02738t	Log (NEER) = 4.381 + 0.009t
(134.058)*(-11.156)*	(47.116)*(1.040)
R^2=0.838	R^2=0.067
For NEER	**For NEER**
Co-efficient of variation = 26.187%	Co-efficient of variation = 14.456%
Skewness = 1.576; Kurtosis = 6.353	Skewness = 1.3162; Kurtosis = 3.2109
For REER	**For REER**
Co-efficient of variation = 23.856%	Co-efficient of variation = 6.1294%
Skewness = 0.837; Kurtosis = 3.4044	Skewness = 0.1732; Kurtosis = 3.1032

Source: Authors' calculations

But during the post-reform period from 1991-92 to 2014-15, one percent increase in NEER led to an increase in exports by 2.0821% and one decrease in NEER led to increase in import by 2.5827% per year. The relation between NEER and export is found insignificant. Again, one per cent increase in REER led to an increase in import by 2.5788% per year and was found insignificant. And one percent decrease in REER led to 2.7549% increase in export per year and was found significant (Table 3**)**. It is interesting to note that the volatility of NEER and REER affect the behavior of export and imports but the volatility of both the NEER and REER are higher in the pre-reform period than the post-reform period. For example, the coefficient of variation of NEER is 26.187% in the pre-reform period and 12.765% in the post-reform period.

Again, the coefficient of variation of REER is 23.8566% in the pre-reform period and 6.2994% in the post-reform period. Not only that, downward trends of NEER and REER are not confirmed in all the periods, such as, REER shows an increasing trend in the post-reform period, which is verified by the semi-log linear model. This may be corrected through prudent exchange rate management.

IMPORTANCE OF EXCHANGE RATE IN EXPORT GROWTH

In addition to the above exercise, the importance of exchange rate in export growth is brought about through econometric exercises. The volume of aggregate exports (QEX) here has been regressed against real effective exchange rate (REER), global real income (WY), real capital formation (KF), real domestic absorption (HA). Table 4 below shows the results obtained from the estimation. The results obtained from the general equation shows that all the variables are significant in explaining QEX. The data considered is from 1992-93 to 2021-22. Given the time period considered, the result is very much relevant. Final equations (1) reveal the importance of real effective exchange rate (REER), and real world income in India's export growth. Final equation (2) indicates the importance of real fixed capital stock (KF). The results of the models are good enough to justify the inclusion of the factors, already mentioned, in explaining India's export performance. The message that is emerging from the above empirical study on India is loud and clear: exchange rate is a crucible variable for India's export performance.

Table 4: Regression Results for Volume of Aggregate Exports
(Sample Period 1992-93 to 2021-22)

General Equation	
ln QEX = 20.1 – 0.55* ln REER – 0.31* ln WY – 0.98* ln KF + 0.73* ln HA	
*Denotes 5 per cent level of significance	
1. Final Specification	
ln QEX = 4.22 – 0.71* ln REER – 0.27* ln WY	
*Denotes 5 per cent level of significance	
Adjusted R^2 = 0.88	
2. Final Specification	
ln QEX = 17.9 – 0.59* ln REER + 0.41*ln KF	
*Denotes 5 per cent level of significance	
Adjusted R^2 = 0.91	

Source: Authors' calculations

SUMMING UP

It appears from the foregoing analysis that there are many issues and challenges on the BoP front that remain unaddressed. These issues and the most challenges warranting priority attention should be addressed properly for having *to the path of strength and resilience* on BoP front in the upcoming years. At present, India's salient external sector sustainability indicators are strong (but with odds and oddities, to some extent) and much improved as compared to what they were during the global financial crisis or taper episode of 2013. India has improved its BoP position anchored by capital flows bouncing back through FDI, FPI and ECBs, receipt of robust remittances and contraction of current account deficit to GDP ratio, along with external debt remaining low. Hence, the rise in the foreign exchange reserves of the RBI has largely been due to the current account surplus which, in turn, is largely due to the contraction in imports rather than an increase in competitiveness of exports. This has allowed the RBI to keep accumulating foreign exchange reserves (they stood at US$ 634 billion on 31st December 2021). This is equivalent to 13.2 months of merchandise imports and is higher than the country's external debt. The combination/ continuation of high foreign exchange reserves, robust capital flows, particularly, FDI and FII, and rising export earnings through innovative policy initiatives will not go a long way for India in the upcoming future if it does not take care of the odds and oddities that may frequently come and of the appropriate policies relating to forex markets, entwined with flexible exchange rates and the ability to intervene or manage exchange rates — to some degree — if movements are believed to destabilize in the short run and at least with sufficient reserve to take care of fluctuations in capital flows and 'liquidity art

risk,' keeping in mind that full capital account convertibility for all investment and business-related transactions is not the too-distant future.

Our foregoing empirical analysis shows that as in Indian case, the direction of causality runs from exchange rate to trade balance and not the other way around. And the exchange rate of the Rupee in improving trade balance and balance of payments is one of the essential elements in external balance for the Indian economy. That is why care should be taken to pursue domestic macro-economic policies – with the prudent policy of exchange rate management along with management of capital account since in Indian case net capital flows are increasing and trade deficits have been high and increasing. Balance of payments and trade balance of a country are essentially macroeconomic phenomena and therefore policies to improve them must also be integrated macroeconomic in nature with some comprehensive approach. In this regard, the monetary policy dynamics in a full-blown model follows.

IV. MONETARY POLICY DILEMMAS AND EXCHANGE RATE

MONETARY POLICY IN INDIA: A BRIEF RECAPITULATION

The monetary policy framework, overall, largely depends on the underlying relationships between the relevant economic variables. The mechanism through which the monetary policy operates affects output and inflation, the final objectives of monetary policy. In the existing literature, four sets of transmission channels have been identified — first, the quantum channel, relating to money supply and credit; second, the interest rate channel; third, the exchange rate channel and finally through the asset price channel. How each of these channel's function in each economy depends on the stage of development of the economy and the underlying financial structure (Reddy, 2007). There can be considerable feedback and interactions among the various transmission channels which must be carefully assessed. In the design of monetary policy, another important consideration is the identification of the basic relationship between money, output, and prices. Together with this, targeting the exchange rate as an intermediate target with anchoring the level of inflation takes center stage.

In the initial days, the bank rate was a major tool but with the increase in inflationary pressure, the RBI successively kept increasing the bank rate until 1965 when it reached 6 per

cent, before lowering it to 5 per cent in March 1968. During the days of the second five-year plan, inflation steadily began to rise on account of an ambitious outlay on the investment front. RBI then started following the path of 'controlled expansion' coupled with moral persuasion to restrain lending but at the same time selectively ease out credit during the period prior to the nationalization of banks. After independence, RBI did not engage itself in the buying of government securities. But then the focus shifted with deficit financing becoming an intermediate target. This happened in line with the targets of the five-year plans. The late 1960s and the beginning of 1970s saw a noisy period — collapse of the Bretton Woods system brought an end to the pegged exchange rate regime, however, India continued with the pegged exchange rate. In 1975, to diversify the associated currency risk, the basket of currencies against which exchange rate was pegged got expanded. In the backdrop of rising inflation during 1980-81, the bank rate was raised to 10 per cent in July'1981. This was followed up with the Reserve Bank of India using the cash reserve ratio (CRR) for limiting commercial bank's capacity to expand credit, during 1980s. To mop up the excess credit available, CRR from 7 per cent in 1983 went up to 15 per cent in the year 1989. Similarly, the Statutory Liquidity Ratio (SLR) moved up from 35.5 per cent in 1984 to 38.5 per cent in 1989. With the 1991 crisis began the process of economic liberalization of the economy and the RBI accordingly shifted its approach from open market operations (OMOs) to monetary targeting with checking the annual growth in money supply (M_3), gradual deregulation of interest rates, abandoning the policy of relying on CRR and SLR to combat inflation in line with the Narasimham Committee recommendations.

Given the state of the economy coupled with the movement of the major policy rates, the CRR was lowered from 11 per cent in April'1997 to 9 per cent in October'1997. To increase the liquidity support to banks, over a period, it got reduced to 5.75 per cent in April'2010. Similar has been the case with SLR. In the present monetary policy framework, there is less reliance on direct policy instruments and more liquidity management being carried out. The Liquidity Adjustment Facility (LAF) is carried out in the form of outright open market purchase and sale of government securities under daily repo and reverse repo operations. The objective of the LAF is to primarily adjust the short-term liquidity under varied financial market conditions, including large capital inflows from abroad. Through this scheme, RBI has the option of controlling the CRR of banks without unnecessarily constraining the liquidity position. With RBI resorting to continuous sterilization measures, the limited stock of government securities got depleted which constrained the ability of the government to make

similar interventions. So, in April 2004, under this scheme, the Government of India (GoI) started borrowing from the RBI (in addition to its normal borrowing) and issued Treasury-Bills that are utilized for absorbing excess liquidity from the market. However, amendments to the MoU had to be made following the global financial crisis of 2008 where it allowed the Government to switch a part of the MSS funds into normal government borrowing for financing its stimulus expenditure requirements. Financial stability had emerged as an important objective of monetary policy. RBI, in this regard, had to play a dual role — monetary policy authority, and regulator of banking and non-banking systems. While India escaped the impact of the 2008 global financial crisis because of the restrictions, long in place, on foreign investment by banks, the rise in non-performing assets (NPAs) in the banking system has been a concern since 2010.

Before 2014 and since the economic reforms of 1991, the focus has been on inflation and growth with multiple intermediate targets. The RBI had used a series of direct (CRR, SLR) and indirect instruments (repo and reverse repo rates operations under LAF and OMOs) to achieve its target. However, with Raghuram Rajan taking charge, RBI set out on its path of directly targeting inflation. Under Urjit Patel, the RBI has been following the continued to focus on its objective of inflation targeting. The current target is of 4 per cent with a (+) or (–) 2 per cent tolerance level. Under inflation targeting to ensure price stability, rates are set in response to the current inflation and the prevailing 'output gap' (i.e., the difference between the likely output and the actual level of output). With two major external shocks in this unsettling global environment, the Indian economy continues to be resilient in the last two and a half years. The country has withstood the shocks from COVID-19 and the conflict in Ukraine. The financial system has remained stable[4], as pointed out by the current RBI Governor, Shaktikanta Das.

Though the market was expecting a repo rate hike by June 2022, the RBI has increased the policy repo rate by 40 bps from 4 to 4.40 per cent on 4 May 2022, thus providing space for further repo rate hike by June'2022. Interestingly, the repo rate was 4 per cent for the first time on 22 May 2020 and after that remained same until 4 May 2022 (Wednesday). Interestingly, earlier since 7 Feb 2019, the RBI was on rate cut mood; on this date it was 6.25 per cent, on 4

[4]https://www.zeebiz.com/economy-infra/news-rbi-monetary-policy-governor-shaktikanta-das-speech-today-2022-monetary-policy-full-text-201225

April 2019, it was reduced to 6.0 per cent, on 6 June 2019 it was 5.75 per cent, on 7 August 2019 it was 5.40 per cent, on 4 October 2019 it was 5.15 per cent, it remained same on 5 December 2019 as well as on 6 February 2020. On 27 March 2020, it was further reduced to 4.40 per cent, before settling at 4 per cent on 22 May 2020. Since then, it remained status quo (no up, no down) until 4 May 2022. Interestingly, a similar reverse happened on 4 May 2022 in line what had happened between 27March 2020 to 22 May 2020.

Further, the February 2022 monetary policy stated by the Monetary Policy Committee (MPC) that "The MPC notes that inflation is likely to moderate in H1:2022-23 and move closer to the target rate, thereafter, providing room to remain accommodative. Though it acknowledged, "The potential pick up of input costs is a contingent risk, especially if international crude oil prices remain elevated." It is in this context that the MPC has taken steps to keep the policy repo rate unchanged at 4 per cent. And this is to continue with an accommodative stance as long as necessary to have sustained growth after recovery on a durable basis and also continue to subside the impact of COVID-19 on the economy, while ensuring that inflation remains within the target going forward"; this has changed in the April 2022 monetary policy as "Concerns over protracted supply disruptions have rattled global commodity and financial markets, given the significant share of the two economies engaged in war in global production and exports of key commodities like oil and natural gas; wheat and corn; palladium, aluminum and nickel; edible oils; and fertilizers."

On 4 May 2022 monetary policy, another notable point was the increase of the Cash Reserve Ratio (CRR) by 50 bps to4.50 per cent, which is likely to withdraw liquidity of the order of ₹87,000 crore. The hike has indicated RBI's intention to control liquidity at a much sharper pace, in fact RBI's introduction of SDF and previous policy tone is also in line with the intent of absorbing huge surplus liquidity. As highlighted in the Governor's statement - average surplus liquidity in the banking system (which is reflected in total absorption through Standing Deposit Facility (SDF) and variable rate reverse repo (VRRR) auctions) amounted to ₹7.5 lakh crore during April 8-29, 2022. In fact, the operating target, i.e., the weighted average call money rate (WACR) remained below SDF due to the large liquidity overhang in the form of daily surplus funds parked under the SDF [4.15 per cent vis-à-vis3.65 per cent]. Ten-year G-Sec is up 27 bps at 7.39 per cent after the announcement. The policy action is attempted towards aimed at lowering inflation anchoring inflation expectations. Post-rate hike today, market anticipates further rate hike on average towards 5.15 per cent by end-year.

The Monetary Policy Committee (MPC) met on 28th, 29th and 30th September 2022. Based on an assessment of the macroeconomic situation and its outlook, the MPC decided by a majority of five members out of six to increase the policy repo rate by 50 basis points to 5.9 per cent, with immediate effect. Consequently, the standing deposit facility (SDF) rate stands adjusted to 5.65 per cent; and the marginal standing facility (MSF) rate and the Bank Rate to 6.15 per cent[5]. The MPC also decided by a majority of 5 out of 6 members to remain focused on withdrawal of accommodation to ensure that inflation remains within the target going forward, while supporting growth. The RBI's MPC on December 7 2022 hiked the repo rate by 35 basis points (bps) to 6.25 per cent. The RBI's GDP growth forecast for the current financial year (FY23) is seen at 6.8 per cent. The growth has been reduced from RBI's previous estimate of 7 per cent.

It is interesting to note that the period since the 1990s has witnessed some convergence in the conduct of monetary policy worldwide and there are striking similarities in the tools that monetary authorities across the countries employ to assess macroeconomic development and the formation of expectations, be it through systemic risk management or macro prudential approach to regulation and supervision or applying both (Karmakar and Jana, 2019). Currently, in its monetary operations, RBI uses a convex combination of multiple instruments to ensure that appropriate liquidity is maintained in the system so that all legitimate requirements of credit are met, consistent with the objective of price stability. Towards this end, the bank pursues a policy of active demand management of liquidity through OMOs along with LAF, MSS, CRR, SLR and MSF at its disposal flexibly as and when the situation warrants.

In an environment of increasing capital flows and narrowing of interest rate differentials, exchange rate movements have become crucial. It poses the challenge of an integrated view on interest rates and exchange rate developments for monetary management. Taylor's rule, at present, is not followed on account of the severe criticisms across the globe (Orphanides, 2003). But this paper introduces a modified form of Taylor's rule, and then goes on to compare the results in a setting with exchange rate adjustments and without exchange rate adjustments.

[5]https://rbidocs.rbi.org.in/rdocs/PressRelease/PDFs/PR966FD38CBC02DDF496C9C9389C2521656F0.PDF

THE MODEL

Historically, the Federal Reserve's Open Market Committee (FOMC) has set monetary policy by targeting the federal funds rate, i.e., the interest rate at which commercial banks give out loans to each other. The Taylor (1993) rule is a numerical formula that relates the FOMC's target for the federal funds rate to the current state of the economy. It takes the following form,

$$r = r^* + \lambda_1(Y - Y^*) + \lambda_2(\pi - \pi^*)$$

where, r = nominal rate of interest; r^* = assumed real rate of interest; Y = level of actual output (GDP); Y^* = level of trend output; π = actual inflation rate; π^* = target inflation rate. According to Taylor's original version, as presented here, the nominal interest rate gets expressed as a divergence of actual inflation rate from the *target* inflation rate and of the actual GDP from the *potential* GDP. Criticisms regarding rate of interest not being a cure for economic growth got validated for many countries in different settings (see Svensson, 2003; Schularick & Taylor, 2012). The paper does not aim to fit the Taylor's (1993) rule to the Indian data but rather tries to use the form of the Taylor's rule in predicting the causal relation between the focus variables of the model, if any. However, ever since the Taylor principle came into existence, there is more debate regarding the entry of other terms into the rule like, exchange rates, growth rates and not just level of output, etc. Also, to take care of the financial conditions, terms like stock prices and housing market prices also influence the magnitude of interest rate targeting. Keeping these arguments in mind, the modified version that this paper makes use of in the Indian context, goes as follows,

$$r = r^* + \lambda_1(y - y^*) + \lambda_2(\pi - \pi^*) + \lambda_3(M_3 - M_3{}^*) + \lambda_4(REER - REER^*)$$

where, r = nominal rate of interest (here this paper considers the REPO rate); r^* = real rate of interest (REPO rate –CPI inflation); y = growth rate of GDP; y^* = trend growth rate (in our case, geometric mean of GDP growths over the time horizon); π = actual inflation rate; π^* = target inflation rate (geometric mean of inflation rates over the time horizon); M_3 = level of money supply; $M_3{}^*$ = trend level of money supply (i.e. geometric mean of money supply level over the time horizon); $REER$ = real effective exchange rate; $REER^*$ = geometric mean of REER levels over the time horizon; This model has been estimated in a VAR set-up once in the presence of exchange rate adjustments (REER adjusted) followed by the causality and the cointegration tests.

The data under consideration in this section has been collected and compiled from various issues of *Handbook of Statistics on Indian Economy*, RBI and *www.indexmundi.com*. The component of money supply used in the study is Broad Money (M_3), which consists of,

M_3 = (Narrow money i.e., currency with the public) + (other deposits with RBI) + (the demand deposits of banks) + (time deposits with the banking system).

or $M_3 = M_1$ + (time deposits with the banking system).

In the present study, the direction of causation between the rate of growth of money supply, economic growth and rate of inflation has been analyzed contrary to what most studies have done till now. Inflation Rates in India are mostly reported by the Ministry of Statistics and Program Implementation (MOSPI, GoI). The standard definitions applicable are —

1. Inflation Rate:

The percentage change in Wholesale Price Index (WPI) from the previous period.

$$Inflation\ Rate = \frac{Price\ Level_t - Price\ Level_{t-1}}{Price\ Level_{t-1}} * 100$$

2.Economic Growth: Typically, GDP or GNP is taken as a measure of economic growth. In notational terms, GDP growth rate, $g_t$is

$$g_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}} \times 100$$

where, *t* indicates the particular time point; The data available on Wholesale Price Index for different periods had different base years. It needs to be pointed out that the author has applied the process of "Splicing''. Splicing is the technique of combining two or more overlapping series of index numbers having different base periods to obtain a single continuous series of index numbers with a common base period. In effect, this is equivalent to shifting the bases of the different series to some fixed base period. Here, 2004-05 is considered as the base period. The result of the analysis follows.

RESULTS AND DISCUSSIONS THEREOF

At the outset, to check for stationarity, we go for the unit root tests for each individual series by applying Augmented Dickey Fuller test (see Table 5), applying Akaike Information Criterion, with trend and intercept for knowing the stationarity status of the series. The main objective is to reject the null hypothesis so that the series becomes stationary.

Table 5: Unit Root results and Pairwise Granger Causality results

Unit Root Tests			
Variables	**Test statistic**	**Probability value**	**Order of Integration**
r	-6.98	0.00*	I(2)
y	- 5.40	0.00*	I(2)
π	- 6.33	0.00*	I(2)
M_3	-5.21	0.00*	I(2)
$REER$	-5.75	0.00*	I(2)
Pairwise Granger Causality			
Null Hypothesis		**W-bar statistic**	**Probability**
$(r - r^*)$ does not Granger Cause$(y - y^*)$		0.93	0.99
$(y - y^*)$does not Granger Cause $(r - r^*)$		2.76	0.00*
Null Hypothesis		**W-bar statistic**	**Probability**
$(r - r^*)$ does not Granger Cause$(\pi - \pi^*)$		1.01	0.60
$(\pi - \pi^*)$does not Granger Cause $(r - r^*)$		3.97	0.00*
Null Hypothesis		**W-bar statistic**	**Probability**
$(r - r^*)$ does not Granger Cause$(M_3 - {M_3}^*)$		0.98	0.99
$(M_3 - {M_3}^*)$ does not Granger Cause $(r - r^*)$		1.99	0.00*
Null Hypothesis		**W-bar statistic**	**Probability**
$(r - r^*)$ does not Granger Cause$(REER - REER^*)$		1.02	0.60
$(REER - REER^*)$does not Granger Cause $(r - r^*)$		2.88	0.00*

Source: * implies significance at 95 per cent level; Results as obtained by the authors in EViews 7.1

After conducting the ADF (Augmented Dickey Fuller) test we see that all our attain stationarity at the second difference i.e., at the second difference unit root is absent. At their basic level if

these focus variables are integrated of order 2, given the Taylor rule, taking difference from an average value (i.e., geometric mean over the time horizon) will yield stationarity of the first order. Since the different series of the concerned focus are integrated of the same order, the series may be tested for the existence of a long run cointegrated relationship between them. A lag of 1 is optimum for our model given the minimum value of AIC (Akaike Information Criteria). Before moving on to the estimation of the long-run cointegration equation, it is desirable to check the direction of causality among the focus variable. Interestingly, the results in Table 5 point out the fact that the specification of Taylor's rule that the paper makes use of is correct. There is a unidirectional causality running from $(y - y^*)$, $(\pi - \pi^*)$, $(M_3 - {M_3}^*)$ and $(REER - REER^*)$ to $(r - r^*)$.

In this section, this paper reports only the causality results pertaining to the estimation of the model as in Table 5 and not all the possible pairwise causality results across the variables of the model. It also needs to be noted that the direction of causality does not change with the definition of money considered, i.e., the direction of causality remains the same if instead of M_3, M_1 is used.

For the co-integration analysis we have the Null hypothesis: there is no co-integration. From Table 6, the p value at '*none*' is 0.0114 < 0.05. So, the null hypothesis is rejected and the p value at '*at most*' 1 cointegrating equation is 0.3462 > 0.05.

Therefore, results obtained from the Johansen cointegration test confirm that,

i. Trace test indicates 1 cointegrating equation(s) at the 0.05 level.

ii. Max-eigenvalue test1 cointegrating equation(s) at the 0.05 level.

Thus, in the long run the focus variables are cointegrated.

The estimated cointegration equation of the Taylor rule equation takes the form for the period under consideration,

$$(r - r^*) = 0.36(y - y^*) + 0.06(\pi - \pi^*) + 0.34(M_3 - {M_3}^*) + 0.21(REER - REER^*)$$

In this modified version of the Taylor's model, the author presents a simple analytical extension by incorporating the growth gap and the exchange rate fluctuations to make this model more realistic in the Indian context, which remained unexplored till date. The coefficients related to the growth gap, inflation gap, money supply gap and the exchange rate fluctuations imply that with 1 unit change in these components how would the REPO rate change in the Indian context. Given the amplified risks to inflation rates and volatility in the rupee in the past few months,

necessitates a rise in the interest rates (read the story of SBI hiking bulk deposit rates on account of given expectations of rise in interest rates at (https://economictimes.indiatimes.com /wealth/ personal-finance-news/sbi-hikes-fd-rates-ahead-of-rbi-monetarypolicy/articleshow/65202289.cm s)), RBI being an inflation-targeting central bank, committed to the medium-term inflation target of 4 per cent and the recent rise may not be the last one any time soon in the coming months.

Table 6: Cointegration Results

Lags interval (in first difference): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.473820	30.74204	25.87211	0.0114
At most 1	0.172009	6.983881	12.51798	0.3462
Trace Test indicates 1 cointegratingeqn(s) at the 0.05 level *denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis(1999) p-values Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.473820	23.75816	19.38704	0.0108
At most 1	0.172009	6.983881	12.51798	0.3462
Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level *denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis(1999) p-values				

Source: Estimation done by the author using EViews 7.1

However, in this paper, the target inflation rate that has been estimated as the geometric mean of the inflation rates (CPI) over the time horizon stands at 6.45 per cent. Also, from the estimated cointegrated equation, if we put the 2022 figures of the concerned variables in their respective places keeping target inflation level at 4 per cent as prescribed by the RBI in the model then a nominal interest rate of 7.1 per cent is estimated but it was 6.25 per cent in

December 2022. The RBI may hike the policy repo rate to 6.75 per cent this year due to core inflation still being elevated – there is a possibility that the REPO rate can come close to the rate predicted using the Taylor's rule in 2023.Therefore, the relevancy of the Taylor rule is not entirely irrelevant as per our predictions. To be honest, India never adopted the monetary policy to be consistent with any rule to be honest but at least the rates are consistent with the predictions of the Taylor's rule. Now, the challenge is, to stabilize the tensions within the Impossible Trinity given the constraints. Keeping a risk adjusted target inflation of 4 per cent, coupled with, essentially, a market-determined exchange rate; it remains an open question as to whether this intervention will ensure the sustainability of India's growth prospects in the long run.

SUMMING UP

Over the years, the results show that India uses no pre-determined strategy to change money supply, at the most the policy makers keep in mind that excessive inflation is unacceptable and money supply is moderated when expected inflation is seen to be going out of the specified bounds and correspondingly the interest rates are monitored consistent with the exchange rate adjustments. But there is a twist in the tale.

Before Raghuram Rajan (the former RBI Governor) came to the RBI, policy rates were way below Taylor rule estimates. Caution must be exercised while trying to draw too many inferences about the previous years, because inflation targeting was adopted only in March 2015 based on retail inflation. To understand how efficient Taylor's rule was during Dr. Rajan's time, let us analyze some facts during that period. In January 2015, RBI lowered the benchmark interest rate to 7.75 per cent followed by a cut of 0.25 percentage point in March 2015 which eventually went down to 6.5 per cent by April 2016. The question is, was the cut in interest rate based on lower-than-expected inflation which dropped to 5 per cent in December'14? The answer is yes and a prudent application of Taylor's rule by Dr. Rajan. This period from January'15 to April'16 saw inflation hovering between the range 4-5 per cent, REPO rates mostly remained between 6-6.5 per cent with minor fluctuations therein and as per this model the estimate is 6.60 per cent — a negligible deviation of 0.1 percentage point. While Rajan did keep rates above Taylor rule-prescribed values for a brief while, but with the inflation rates coming down, the way REPO rates were changed consistent with change in inflation levels. Thus, this vindicates Dr. Rajan's cautious behavior at that point in time.

The rates were not exactly set according to Taylor's rule, but it was consistent with what the rule predicted. Going by what the RBI has been doing at present given the threshold level of inflation and exchange rate fluctuations, the interest rates must be pushed up further as per the predictions of the estimated model. To sum up, although the applicability of this rule is questionable but there are instances in the past two-three years which show that Taylor rule consistent interest rates were set. The prediction that RBI will hike the REPO by 50 bps makes our predictions more interesting[6]. Since India's monetary policy is conducted in a discretionary manner and with less transparency, this study will provide insights to the policymaker for conducting the future policy. And, we believe, still, there is a scope for the application of Taylor's rule after amending the model as proposed here.

The inflation scenario that has been initiated by the pandemic related disruptions, has been further complicated after the Russian invasion in Ukraine. The rise in global commodity prices was largely instigated by energy, natural gas, and coal prices. Global crude oil prices remain volatile. The current inflation mess can be explained largely by factors emanating from supply-side issues, or the so-called "cost-push" inflation, albeit a part may be due to easy liquidity pumped during pandemic catastrophe. Though, the role of monetary policy in the context of inflation driven up by supply shocks is engaging attention in India but it is primarily fiscal policy driven. In India, recent excise duty cut on fuel is a welcome move, though containing many inflation-contributing factors would be exciting. The school of thought which relies on fighting inflation with monetary policy regardless of the sources of inflationary pressures (i.e., regardless of whether it is coming from the demand side or the supply side) is happy with RBI's rate hikes. Many noted economists and fund managers, however, feel that a shock treatment to the economy through a hike in the repo rate is not required in a situation when demand-side constraints hitting inflation are not clearly visible which might in turn dampen growth prospects. Thus, the question is whether RBI's decision to go for a rate hike in a situation of a so-called cost-push inflation is a wise one. As we have demonstrated in this article, the solution to this dilemma depends on a number of variables, including the type of shock, the state of the economy's aggregate demand, the credibility of the monetary policy, and the role other market agents play in responding to supply.

[6] Read at https://economictimes.indiatimes.com/news/economy/policy/reserve-bank-of-india-may-hike-repo-rate-to-6-75-in-2023-says-idbi-banks-arun-bansal/articleshow/96397303.cms

https://economictimes.indiatimes.com/industry/banking/finance/banking/rbi-may-hike-rates-in-2023-but-bank-deposit-rates-have-peaked-say-experts/articleshow/96832238.cms?from=mdr

However, if the RBI faces a situation in the future where US monetary policy changes, there would be no way out. India's foreign exchange reserves are not a result of a buildup of trade surpluses, unlike China and several other Asian nations. Due to its structural current account deficit, India need capital inflows to cover it. Its foreign exchange reserves have grown because of a global financial cycle that was sparked by the Fed and sent a flood of capital into developing economies in search of higher yields. This was made possible by the Fed's sustained expansion of its balance sheet, which allowed it to keep US interest rates at zero bound for an extended period. If this cycle turns, India could bleed foreign exchange reserves and the central bank would be constrained to raise rates to maintain macroeconomic stability. A further rise in fuel prices would aggravate the situation. Based on comparative existing macroeconomic indicators, the experience of the 'taper tantrum'[7] indicates that India could be among the worst-affected emerging markets. In such a situation, RBI might be forced to act.

The current account deficit to GDP ratio may go up to 3 per cent in the 2023 fiscal[8] if oil prices remain at $100/bbl. RBI should continue its wait and watch policy and remain accommodative, cautious about the supply shocks driving inflation. Only time will tell how things span out.

V. CONCLUSION

Sometimes, there may be lags in the adjustment in the BoP and its accounts in response to monetary disequilibria. This is important from the viewpoint of monetary, credit and BoP policy. It is closely linked with the control of money and future course of external borrowing in line with the different policy options as well as with the prediction of changes in international reserves. In certain conditions, the Central Bank (RBI) can attain the desired stock of international reserves through the changes in the amount of credit injected into the system.

[7]The investor's immediate reaction after the Federal Reserve announced it would reduce its asset purchases in 2013 is known as the taper tantrum. When a central bank reports that its asset-buying program will be diluted in the future, investor reactions cause bond rates to drop, known as a "taper tantrum." Even if the central bank doesn't stop buying bonds immediately, investors can offload their holdings, which could increase yields.

[8]https://economictimes.indiatimes.com/news/economy/indicators/indias-current-account-deficit-for-fy23-likely-to-be-at-3-says-sbi-report/articleshow/95429575.cms?from=mdr

Moreover, for India's external sector to be strengthened – a satisfactory real rate of growth, relatively low inflation, an optimum level of foreign exchange reserves, a low current account deficit in BoP and a falling debt-service ratio as well as a realistic exchange rate buttressed by appropriate monetary policy measures that will prevent undue volatility, and effective utilization of New Foreign Trade Policy 2015-20, for boosting exports and trade facilitation, is highly warranted. Moreover, an orderly well -sequenced liberalization of the capital account must be pursued after fulfilling the prerequisites on its onward march towards capital account convertibility, as it is essential to reap the benefits of globalization. Isolating an economy and living in a protective cocoon are hardly an optimal solution.

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