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Imported inflation: Myth or reality?

INR has tended to depreciate sharply in 2025, even though it has regained some lost ground in the past few sessions. The depreciation pressure on INR started manifesting after the US election results were announced as US policies under the new President were deemed to be inflationary, fuelling a rally in the dollar. This exerted pressure on all major currencies, and the INR too was not immune from it. The situation further escalated after the US President announced tariffs on several of its trading partners, including Canada, Mexico and China. While the imposition of tariffs on Canada and Mexico stands postponed as of now, tariffs on China have already come into effect. This was followed by the US announcing higher tariffs on aluminium and steel imports. These announcements along with anticipation of retaliatory tariffs and fears of a full-blown global trade war kept investors on edge. Wide gyrations were seen in almost all asset classes, with global currencies also depreciating to multi-year lows. INR also remained under pressure and tested new lows in successive sessions, ultimately depreciating to a record-low of 87.58/$ on 6 Feb 2025, marking a ~4% depreciation in the exchange rate since the US elections.

Section 1. Inflation and exchange rate:

Apart from the external sector stability considerations, a sustained currency depreciation can also have implications for domestic macroeconomic stability. Traditional economic theory postulates a negative relation between inflation and exchange rate. This essentially means that a higher inflation exerts depreciation pressure on the exchange rate, and vice versa. This is based on the purchasing power parity principle. There also seems to be growing concern over the inflationary impact of a significant decline in the domestic exchange rate, also known as imported inflation. Emerging countries like India, which depend on imports either as intermediate inputs in the domestic manufacturing processes, or for direct consumption are particularly more susceptible to the risks emerging from a rapid depletion in the value of their currencies. This is because currency depreciation pushes up the price of imports, making inputs or imported goods more expensive. It is hence unsurprising that the recent bout of weakness in Rupee has led to serious concerns about its inflationary impact, especially at a time when the RBI has embarked on a long-awaited rate cut cycle, driven largely by a belief that the inflation outlook is much more comfortable.

To put this in perspective, India's headline inflation as measured by the CPI, has hovered at ~5.3% in the past 2 years, above the 4% target. This was driven largely by high food inflation which averaged about 7.5% in the same period. However, with improvement in agricultural production, the inflation trajectory has improved, with food prices showing signs of relenting. Hence, the depreciation in the exchange rate has led to a fair degree of fear and uncertainty in the domestic market, particularly as there have been growing calls for further monetary easing to support growth.

Section 2. Empirical relationship between exchange rate and inflation

For an open economy macro economy, literature suggests that exchange rate pass through to inflation broadly happens through two passages: the direct and the indirect one. 1) The direct one is through increase in the cost of imported goods both the final product and raw materials or intermediate input such as energy costs, gold prices etc. amongst others, which goes into the making of the product, as highlighted in **Section 1** and 2) The indirect one is mainly translation through change in relative prices, demand for exports, their substitutes, wage formation, profit margins, etc. India has a flexible inflation targeting framework, hence from the policy perspective, understanding the pass through to the core variable becomes crucial. However, cross-country analysis has shown that the extent of pass through is contingent upon structural parameters such as degree of competition, segmentation of the market, use of hedging instruments and import intensity of countries and in most cases the pass through gets diluted with correction in production chain.

In India's context, we have looked at the relation between inflation using WPI and CPI, GDP, NEER which is the nominal effective exchange rate weighed against 40 currency basket (2015-16 base), and imports to GDP ratio using a cross-correlation exercise. The aim is to ascertain the degree and nature of correlation between these variables. We have looked at a long-term data series from Apr'13 onwards. Based on an empirical analysis, it stands out that generally, a depreciating currency affects inflation negatively. The cross-correlation coefficient matrix is shown in **Table 1,** which shows the same. Furthermore, it can be seen that the correlation between NEER and WPI is stronger at (-) 0.20 and for CPI it is (-) 0.17. The rationale for higher correlation coefficient for WPI is that the share of intermediate imported inputs and the elasticity of fuel products to one unit change in crude prices is higher. In CPI, the share of food and beverages basket is higher at ~ 45.9% and for petrol and diesel prices the translation from base to retailers is more controlled through the OMCs margin. However, a shorter period analysis would establish a further stronger correlation coefficient between NEER and WPI compared to one with CPI. This is on account of India's openness to global economy and increased participation in global value chains.

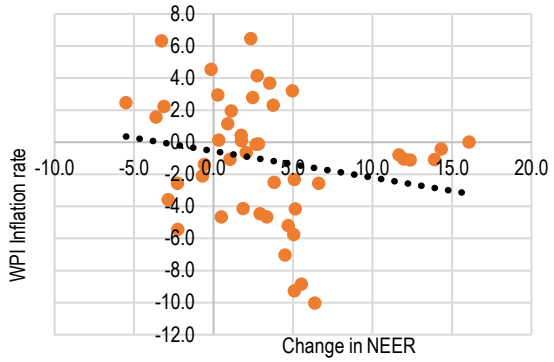
Table 1: Cross correlation matrix evaluated using data from Apr-2013 onwards*

Coefficient	CPI	GDP	IMP_GDP	NEER	WPI
CPI	-	-0.08	0.23	**-0.17**	0.24
GDP	-	-	0.32	**0.20**	0.27
Import/GDP	-	-	-	-0.06	0.55
NEER	-	-	-	-	**-0.20**
WPI	-	-	-	-	-

Bank of Baroda Research | Note:* Apr-2013 is chosen as WPI data of the 2011-12 is available during that time onwards, Note: GDP: growth rate, CPI,WPI: Inflation rate, NEER(Nominal Effective Exchange Rate): YoY change, IMP_GDP': Import to GDP ratio

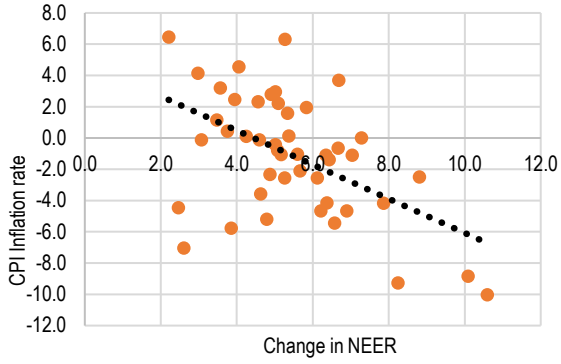
The scatter plot below shows the relationship between inflation and NEER since Apr-13 onwards. Here NEER should be read as % change. So, a higher NEER implies appreciating currency and otherwise. The scatter plot clearly establishes a negative relationship between NEER and inflation, i.e. a depreciating currency raises inflation and otherwise. The trendline for CPI is comparatively steeper, however, for shorter time periods, the trendline for WPI comes in stronger.

Figure 1: Movement of NEER and WPI inflation



Source: CEIC, Bloomberg, Bank of Baroda Research

Figure 2: Movement of NEER and CPI inflation



Source: CEIC, Bloomberg, Bank of Baroda Research

Section 3. Methodology for calculating pass through of inflaiton:

In this exercise, two approaches are used to calculate the passthrough of exchange rate to inflation. 1) We use a partial equilibrium analysis where the import intensity of the inflation basket has been calculated commodity wise and industry wise, using the corporate results. The same ratios have been juxtaposed to the WPI and CPI basket to arrive at the change in index assuming a 10% depreciation of USD/INR.

2) Second is an econometric exercise where auto regressive distributed lag model (ARDL) has been used to arrive at the pass through. A refined way would be to use VAR to determine the simultaneity of relationships, but we limit our result to ARDL analysis.

Partial Equilibrium analysis:

In this section, we attempt to estimate the impact of currency depreciation on domestic inflation at both the wholesale as well as retail level. For this, we have relied on a partial equilibrium analysis. We have assumed a 10% depreciation in the exchange rate along with the assumption that there has not been any change in commodity prices. Commodities which are likely to have a higher import dependence, have been identified in both the WPI as well as CPI basket. To ascertain the degree of imported inflation, we have looked at two main parameters: ratio of imported raw materials to total raw materials and ratio of raw materials to total sales. While the former is a proxy of import intensity, the latter can serve as a proxy for the pass-through of higher input costs to selling prices. For calculating these ratios, we have relied on corporate results database at a granular industry/sector wise level. Industries/Sectors have been mapped with the WPI and CPI basket, as closely as possible. The weight of the commodity is then used to arrive at the new index. For base, we have used WPI/CPI index value as of 2023-24, from which the change has been calculated.

WPI inflation:

Based on our analysis, we estimate that a 10% depreciation in INR can push up WPI inflation by ~1-1.3%. This is because WPI basket consists of many imported inputs and hence, the pass through is higher. In this, the largest impact of currency depreciation can be attributed to the fuel and power basket, due to higher pass through to the mineral oil basket. Within primary articles, the value of crude and petroleum is expected to increase by 10%, as the value of crude imports is likely to go up by 10% under 10% depreciation in INR. Within manufactured products, the largest impact is likely to be felt in the food products category, particularly led by the edible oil category. India imports as much as 60%

of its domestic consumption of edible oils, and hence the price is likely to go up. Inflation in other categories such as electronics, chemicals and metals are also likely to be higher, due to higher dependence on imports.

CPI inflation:

For CPI, we estimate that a 10% depreciation in INR, will increase CPI by 30-35bps. The impact is limited due to higher share of domestic food basket in the index. Among sub-indices, major impact will be felt on edible oil components. Apart from this, pulses inflation will also go up due to higher import intensity of few pulses. The fuel and light as well as transport and communication are partly insulated compared to the WPI basket because it is more controlled and share of import intensive commodities and pass through are borne by OMCs.

ARDL (auto regressive distributed lag) approach to gauge pass through:

Historically, economists have used ARDL model to show the passthrough of exchange rate to inflation. Here a similar exercise has been conducted as partial equilibrium analysis above is not in itself sufficient. It turns out that the result of the econometric exercise also complements the results of the partial equilibrium analysis. For the ADRL model, the dependent variable has been taken as inflation, and it is regressed upon NEER and import to GDP ratio. Here, the import to GDP ratio has been used as a proxy for import intensity. We have used quarterly data from Jun-2013 onwards. Thus, the total number of observations is 46. For NEER the YoY change in the index has been accounted for. The YoY series has been used as it reflects a smoother series, thus reducing chances of heteroscedasticity.

1. The usual tests of stationarity have been conducted. For the ARDL model, the variables should be integrated either of order 1 or 0. The following are the results of integration. It shows that apart from WPI, every other variable is not stationary in their level form. However, they become stationary after their first difference. For exchange rate, the p value is insignificant at 5% level of significance.

Table 1. Results of ADF tests

Variables	Order of integration	p values of t stat in level*
CPI	I(1)	0.39
WPI	I(0)	0.01
NEER	I(1)	0.06
Import/GDP	I(1)	0.46

*at 5% level of significance

2. The usual ARDL Long Run Form and Bounds Test have been conducted and firstly the F statistic is looked at to check whether there is any cointegrating relationship between the variables or not. For WPI and CPI, the exercises have been conducted separately. For WPI, the value of F statistic at 13.53, is higher than the upper bound which is 5, thus proving that there is cointegrating relationship between the variables.

Table 2. Results of long run form and bound tests

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	13.53	10.0%	2.63	3.35
k	2	5.0%	3.1	3.87
		2.5%	3.55	4.38
		1.0%	4.13	5.00

3. The **Table 3** shows the long run coefficient. The p value of t statistic of exchange rate turns out to be statistically significant and directionally as well validates a negative relationship between exchange rate and inflation. The EC (Error Correction term) is also provided. From this table what can be deciphered is that exchange rate has a long-term effect on inflation.

Table 3. Results of long run form and bound tests

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IMP_GDP	-0.20	0.17	-1.15	0.26
NEER	**-0.38**	0.15	**-2.50**	**0.02**
C	44.31	18.07	2.45	0.02
EC = WPI - (-0.20*IMP_GDP -0.3772*NEER + 44.31)				

4. Next the Error correction form has been conducted to check the long run adjustment. The coefficient of cointegrating equation is less than 1 which shows that the model will adjust monotonically. The lag structure is selected using Akaike and Schwarz information criterion. The lag length chosen here is 4.

Table 4. Results of Error correction form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(WPI (-1))	-0.09	0.11	-0.84	0.41
D(WPI (-2))	**0.21**	0.11	2.01	0.05
D(WPI (-3))	**0.24**	0.11	2.13	0.04
D(IMP_GDP)	0.66	0.10	6.52	0.00
D(IMP_GDP (-1))	0.54	0.13	4.00	0.00
D(IMP_GDP (-2))	0.47	0.12	3.80	0.00
D(IMP_GDP (-3))	0.40	0.13	3.14	0.00
CointEq(-1)*	**-0.58**	**0.08**	**-7.71**	**0.00**

What can we say about the passthrough of WPI to exchange rate through these equations?

The short run coefficients interestingly point out that by the next two periods on an average the pass through of exchange rate to WPI will be around 12%. The long run equation in **Table 3**. on the other hand, shows pass through of 38%. As per a research report of World Bank, pass through depends on the "flexible exchange rate regimes and also credible inflation targets".

Whether cointegrating relationship holds for CPI?

The same exercise is repeated taking CPI as the dependent variable. However, the results of the long run form and bound tests indicate no cointegration between the variables. The value of statistic at 1.79 is less than the lower bound. Hence, we limit our exercise to WPI.

Table 5. Results of long run form and bound tests with CPI as the dependent variable

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	**1.79**	10.0%	2.63	3.35
k	2.00	5.0%	3.10	3.87
		2.5%	3.55	4.38
		1.0%	4.13	5.00

Key takeaways:

1. INR depreciation has raised queries on quantum of passthrough to domestic inflation due to increased share of foreign trade.
2. Partial equilibrium analysis using import intensity of companies reflect that India is partly insulated due to major reliance on domestic production, especially in the food basket.
3. The effect on WPI though will be higher due to its fuel and products components which bears the significant pass through of increase in crude oil prices due to depreciation of USD/INR.
4. Based on the partial equilibrium analysis, we estimate that a 10% depreciation in INR can push up WPI inflation by ~1-1.3% and CPI by ~0.3-0.4%.
5. The ARDL model on the other hand shows that passthrough of currency depreciation of 12% happens in the short-run and 38% in the long-run.
6. Combining both ARDL and partial equilibrium analysis, the extent of pass through to inflation seems realistic and bit toned down. For the short run, since ARDL model calculates only 12% pass through to WPI, thus juxtaposing the same in our partial equilibrium analysis we arrive at ~0.12-0.16% increase in WPI in the short run due to 10% depreciation in USD/INR. For the long run, this number translated to 0.38%-0.49% increase in WPI, bringing forth the same 38% pass through calculated from the ARDL model in the long run.

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