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# RELATIONSHIP BETWEEN INFLATION AND THE EXCHANGE RATE: AN INTEGRATIVE REVIEW OF LITERATURE

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## ABSTRACT

This paper provides a comprehensive review of the existing research on the relationship between inflation and exchange rates, with a particular focus on the 'exchange rate pass-through' phenomenon. The literature review also covers the pertinent factors that influence the analysis on the subject matter such as monetary policy transmission channels, inflation expectations, oil prices and asymmetry of the 'exchange rate pass-through'. Following the integrative review of the existing research, the research gaps have also been highlighted. The present study of the relationship between inflation and the exchange rate in India reveals diverse outcomes. The research on 'exchange rate pass-through' and its asymmetry is largely restricted to the investigations performed abroad. Inflation expectations have become an important variable, especially since the introduction of the inflation targeting framework in India. However, research on this aspect within the Indian context remains sparse. Research on monetary policy transmission channels and oil prices highlights certain aspects of these factors; however, additional studies are needed, especially in the context of India's current inflation-targeting regime.

## **INTRODUCTION**

The economic models lay emphasis on the operations of central banks in developed nations, vis-à-vis the operations of central banks in developing nations. Recent studies indicate that numerous factors influence the effectiveness of monetary policy in developing countries [17]. Additionally, the nominal anchor of monetary policies in developing economies like India has been a point of contention. In the past, Reserve Bank of India focused on the monetary aggregate (M3<sup>1</sup>) to fulfil the macroeconomic goals such as price stability, economic growth and exchange rate stability. However, the augmented inflationary pressures in India raised concerns regarding the monetary policy. India thus adopted inflation targeting system in 2015, taking into account the objective of reducing the inflationary pressures, and the success of other countries with the inflation targeting regime.

Some economists had expressed reservations regarding implementation of the inflation targeting regime in India. Emerging market economies similar to India, that adopted inflation targeting, have faced exchange rate volatility and output instability more than the developed market economies. Thus, the Reserve Bank of India, while planning and executing inflation targeting in India also caters to economic growth and exchange rate stability. This research paper delves into the extensive body of literature that has been published examining the relationship between exchange rates and inflation and aims to offer a comprehensive understanding of the factors that drive these economic interactions. Monetary policy transmission channels, inflation expectations and oil prices too are important topics in this context, for which the existing literature has been studied. Further, the study highlights the contrasting findings and the research gaps.

<sup>&</sup>lt;sup>1</sup> Broad money.



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The exchange rate is a crucial channel for transmitting monetary policy, as it influences the value of a domestic currency. When interest rates are raised, the domestic currency appreciates, drawing foreign capital and affecting inflation and economic activity by making imports less expensive and exports more expensive. The exchange rate affects the inflation dynamics through two mechanisms. Change in import prices is through which the first mechanism functions. The other mechanism operates via the aggregate demand. Imports are encouraged and exports are discouraged due to appreciation in the domestic currency. This leads to decline in inflation as a result of fall in demand for the goods produced domestically.

It has been observed that under the inflation targeting system, emerging market economies such as India have to face an additional challenge in the form of exchange rate stability. This is not much of a challenge in developed economies with relatively stable capital and foreign exchange flows. Exchange rate fluctuations can significantly impact domestic inflation patterns, potentially causing substantial effects on the national economy. Economists suggest that in emerging economies, the exchange rate plays a more pivotal role in shaping domestic inflation compared to its influence in developed economies. The study of India's exchange rate channel dynamics necessitates a thorough examination of how inflation has been influenced by the country's depreciation.

Understanding how exchange rate movements affect domestic price levels and 'exchange rate passthrough' is essential for monetary authorities to formulate effective strategies and policies. Inflation expectations, monetary policy transmission channels and oil prices are important factors in the context of inflation and exchange rate. Recent research studies in India and abroad have investigated these aspects. Detailed hereunder is the theoretical background and the pertinent research work undertaken in this regard.

## **Theoretical Background :**

Exchange rate fluctuations are among the key factors influencing the inflation rate. These fluctuations impact domestic inflation through both direct and indirect channels. The direct channel describes how fluctuations in the value of the foreign currency impact the prices that domestic consumers pay for imported final consumption products, which in turn impacts the aggregate demand. The indirect channel however has an effect on the aggregate supply. This channel involves the effect of exchange rate changes on the import costs of capital and intermediate goods, subsequently influencing production costs borne by producers.

Various factors including economic output growth, import prices, the credibility of the monetary authority, and the persistence of inflation affect the extent of 'exchange rate pass-through'. Due to increased credibility, economies implementing inflation targeting have experienced reduced 'exchange rate pass-through'. This suggests that lower inflation rates contribute to decreased 'exchange rate pass-through', thereby aiding in maintaining low inflation. Recent studies suggest asymmetric 'exchange rate pass-through' into prices, with varying impacts observed during exchange rate appreciations and depreciations. Therefore, it can be inferred that a lower inflation. Concerning the asymmetry of the pass-through, recent observations indicate that the 'exchange rate pass-through' to prices varies between currency appreciations and depreciations. This differs from the assumption often made that the pass-though is symmetric.

Monetary policy adjustments influence multiple sectors such as interest rates, credit, exchange rates, and asset prices, thereby affecting borrowing and lending, trade balance, inflation, export and import competitiveness, as well as wealth and consumption patterns. Adjustments in monetary policy impact



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inflation and exchange rates through these channels. For example, adjustments to the policy repo rate impact consumption and investment, thereby influencing aggregate demand and inflation through the interest rate channel. Moreover, fluctuations in interest rates can influence foreign investment flows and currency movements, impacting the domestic currency's value in the foreign exchange market and thereby affecting inflation through the exchange rate channel.

Inflation expectations is an important determinant of inflation in the economy. High inflation expectations lead to workers demanding wage increases. This leads to businesses raising their prices, resulting in higher levels of inflation. Managing the inflation expectations is vital for the monetary authorities. Actual inflation, exchange rates, policy communications, and international oil prices significantly influence inflation expectations.

In India, oil is a major import item. Depreciation of the Indian Rupee raises the price of essential import items such as oil. This increase in prices of imports transitions into increase in domestic costs of production, and affects the headline inflation in a significant manner.

## Literature Review :

Detailed below is the examination of the relevant studies along with their significant findings.

## **Exchange rate Dynamics and Inflation :**

From the first quarter of 1996–1997 to the fourth quarter of 2013–2014, there was an investigation into the factors influencing inflation in India, focusing particularly on structural and monetary influences [1]. Utilizing a vector autoregression model, the study identified causal relationships and dynamics of inflation linked to variations in money growth, exchange rate, output gap, and interest rate. The research indicates that in India like fluctuations in the exchange rate, interest rate, and money growth play a less significant role in determining inflation in India compared to the output gap. The research however also concluded that depreciation of exchange rate does trigger inflation in India. A detailed examination of exchange rate shocks on domestic inflation over the period from April 1994 to February 2018 revealed significant short-term and long-term impacts on domestic inflation [5]. Consumer Price Index (average household's cost of services and goods consumed) and Indian Rupee /U.S. Dollar bilateral exchange rate (monthly average) were used.

Research was conducted to find the efficacy of the monetary policy regarding inflation control in India before and after the 2007-2008 financial crisis<sup>2</sup> [10]. From the exchange rate perspective, the cointegration results indicate that foreign exchange rate, output gap and money supply have a notable impact on the inflation gap. The study highlights that in the post-crisis period, the influence of money supply on the inflation gap has diminished. However, there has been no alteration in the significance of the exchange rate and output gap in determining the inflation gap, both before and after the crisis. Therefore, based on its findings, the research underscores how the exchange rate exerts a substantial influence on the inflation gap. It highlights how crucial it is for economists and policymakers to comprehend this link in order to control inflation and create monetary policies that respond to changes in exchange rates.

The macroeconomic variables affecting inflation in India since the 1980s were examined [11]. Fiscal variable and trade openness factor are also considered in the research. The research paper indicates that there is considerable impact of real effective exchange rate (along with money growth, real interest

<sup>&</sup>lt;sup>2</sup> Global financial crisis.



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rate and the output gap) on the inflationary pressures in India. Important macroeconomic factors determining inflation in India were studied, incorporating data from 1996–1997 (Q1) to 2016-2017 (Q1) [6]. The research paper employs the cointegration approach, specifically the autoregressive distributed lag model, to establish conclusions regarding the long-term relationship between inflation rates, exchange rates, output gaps, and crude oil prices. According to the paper, a significant role is played by exchange rate and crude oil prices in determining the prices in the domestic economy. However, there is lack of robust association between inflation and output.

For a small open economy comprising of two sectors, the coordination of exchange rate and monetary policy was investigated [15]. The research concluded that inflation targeting is significantly more effective when the exchange rate is scrupulously managed. In a system with flexible exchange rates, inflation targeting carries significant risks of uncertainty. Additionally, small inflation shocks may snowball into considerably bigger inflationary scenarios. However, if the central bank closely monitors and manages the nominal exchange rate, such precarious economic conditions can be avoided. Similar opinion is expressed in another research paper. Numerous research studies highlight the concerns of monetary authorities in transitioning to the inflation targeting regime, as it is accompanied with floating exchange rate [16]. However, to keep financial conditions and currency rates stable, central banks intervene in the financial markets. These actions might take the form of interest rate changes, currency purchases or sales, or regulatory changes. In order to maintain economic stability and encourage sustainable growth, it is intended to reduce excessive volatility and speculative movements. It takes these calculated actions to keep the economy stable.

According to the World Bank, for the EMDEs (Emerging Market and Developing Economies), the correlation between inflation and the exchange rate varies considerably over a period of time (appendix Figure 1) [12]. The influence of changes in the currency on inflation may get affected by economic shocks and the macroeconomic landscape of the country. Pass-throughs for the period 1998-2017 are exhibited for EMDEs (appendix Figure 2). The pass through (average) declined in the EMDEs to slightly below +0.1 and in developed nations to near zero, in the last two decades. However, the differences among the countries were significant.

A study on ASEAN-5 countries (those employing inflation targeting and those not using inflation targeting) analysed the relationship between inflation and various macroeconomic determinants, including the real exchange rate, economic growth, and money supply [4]. The data analysed in this regard is for the period 2000 (Quarter 1) to 2019 (Quarter 4). The study examined the correlation between inflation and exchange rates in various countries, comparing the degree of pass-through in countries with targeting policies versus those without. The research used the non-linear auto-regressive distributed lag model. The nonlinear approach was selected because of the impact of fluctuations in currency rates on inflation. The study's vital empirical finding indicates that exchange rate shocks do affect inflation significantly. Additionally, the research provides initial evidence of asymmetric impacts of exchange rate shocks in countries that target inflation and those that do not. Over time, the actual exchange rate had an asymmetric impact on just Singapore and Indonesia.

## **Monetary Policy Transmission Channels:**

The efficacy of India's monetary transmission system and exchange rate variations were examined in the study [8]. Important results show that India's exchange rate channel is comparatively weak and may be impacted by Reserve Bank of India actions meant to stabilize the exchange rate between the Indian Rupee and the US dollar. This finding has significant implications for the Indian economic



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context. Additionally, the study observed minimal impact on bank lending rates resulting from changes in the policy repo rate, and underscored the relatively small scale of financial markets in India.

A study examined the influence of monetary policy on overall, sector-specific, and disaggregated inflation rates in India from 1997 to 2017 [25]. The results reveal that the contractionary monetary policy has become more effective over the years in taming inflation. Stronger transmission across the credit and asset price channels is attributed to the enhanced efficacy of the monetary policy.

The study examined the relationship between inflation and the exchange rate in Vietnam from 2001 to 2015 and analysed the effectiveness of monetary transmission mechanism [2]. The empirical findings do not support the existence of an inflation-exchange rate link. Vietnam does not follow a liberalized system of foreign exchange and capital flows, thus changes in exchange rate are not reflected adequately as a result of monetary policy shocks. The central bank absorbs or releases the necessary currency in the foreign exchange market to mitigate the impact of adverse capital flows resulting from differential interest rates. The exchange rate<sup>3</sup> is managed and kept stable in order to prevent sharp decline in the local currency. Therefore, as per the research study, the monetary transmission mechanism in the Vietnamese economy has weakened the exchange rate channel, attributable to the implementation of a managed exchange rate regime to strengthen the resilience of the exchange rate channel. Further, results from the research performed include, credit growth is the prime factor for high inflation in Vietnam.

## The Role of Expectations:

Determinants of inflation in India were found, analysing data for the years 1996 to 2017 [22]. There is long-term association between inflation and variables such as expected inflation, exchange rate and international oil prices, as per the study's empirical findings. Among all the factors that influence inflation, expected inflation is the main one. The study also reveals that high level of inflation in fuel and food, via the inflation expectations, influences the headline inflation. This stems from persistent fuel and food inflation, which has a lasting impact on household inflation expectations and consequently on overall inflation in the economy.

The macroeconomic variables that affect the inflation expectations in India were observed [23]. Inflation expectations provide vital indications regarding the economy to the policy makers. The variables analysed include exchange rate, inflation rate, international oil prices, output, international financial volatility, monetary policy and economic policy uncertainty. The study concludes that both exchange rates and international oil prices significantly impact inflation expectations. It researched the variables influencing inflation expectations among Indian households [24]. Data for the years 2008 to 2019 was collected and interpreted in this regard. The research study concludes that in the short run, policy communications significantly influence inflation expectations among households in India. It shows that, as suggested by impulsive reactions, an increase in the policy rate elevates inflation expectations. Moreover, the study suggests that policy communications have a greater impact on expectations compared to policy rates themselves.

The study examined how 'exchange rate pass-through' affects inflation expectations in a small open economy that adopts inflation targeting [20]. The research focused on the Czech Republic, the first emerging economy to adopt inflation targeting. Data was analysed for the period from May 1999 to

<sup>&</sup>lt;sup>3</sup> Vietnamese Dong/ U.S. Dollar.



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December 2018. The results indicate that 'exchange rate pass-through' has significant implications for inflation expectations. Evidence of adaptive expectations is shown by the significant impact of previous inflation expectations and actual inflation on current inflation expectations.

# **Exchange rate pass-through:**

The 'exchange rate pass-through' dynamics of nineteen countries were examined both before and after the inflation targeting mechanism was implemented [3]. The results were also compared between highincome and middle-income countries. High-income countries included Australia, Canada, and New Zealand, while middle-income countries comprised the Philippines, India, and South Africa among others. The study utilized the autoregressive distributed lag (ARDL) model to estimate the 'exchange rate pass-through' coefficient for each nation. The findings revealed that inflation targeting played a significant role in reducing exchange rate volatility. This effect was observed both in high- and middleincome countries. However, compared to high-income countries, the long-term average exchange rate pass through of middle-income countries after the introduction of inflation targeting was considerably lower. Countries such as Indonesia and Thailand experienced a decline in exchange rates after the introduction of inflation targeting.

The pass-through effect of exchange rates to domestic prices was calculated for certain countries in Latin America and Asia [7]. The nations that are covered in the research have varied history regarding the domestic inflation dynamics but have adopted the inflation targeting system. The study included two groups of countries. The first group includes four Latin American countries and Turkey<sup>4</sup>. Four countries in Asia formed the second group<sup>5</sup>. According to the findings, Turkey and Latin American economies have a higher pass-through effect as compared to the economies in Asia. BRICS<sup>6</sup> economies were considered to conduct research regarding movement and dynamics of the exchange rate for the period January 2005 to December 2019 [9]. The empirical investigation presented in the research paper is on the basis of the autoregressive distributed lag model. The study suggests that though the 'exchange rate pass-through' exists, but the magnitude of this pass-through has declined over the years. Further, in case of a short run shock, the rate of adjustment towards long-run equilibrium has been observed to be slow, for both domestic prices and the exchange rate.

Since the global financial crisis, researchers have investigated the magnitude of 'exchange rate passthrough' to inflation rates [13]. The research paper presents the following main results. First, after the financial crisis, 'exchange rate pass-through' has been relatively low and stable in advanced nations, whereas it has declined for emerging nations. Second, the connection between decreasing inflation and decreasing pass-through in the emerging markets was established. There have been concerns regarding the exchange rate depreciation in Ghana and its impact on domestic inflation and the overall economy.

The study examined the threshold effect of 'exchange rate pass-through' on inflation from 2002 to 2018 [14]. Employing the threshold autoregressive method, it highlighted the importance of a specific threshold level, indicating that exchange rate depreciation exceeding 0.70% significantly contributed to inflation. Therefore, vigilant monitoring of the exchange rate to prevent depreciation beyond this threshold can effectively mitigate its pass-through impact on inflation rates.

## The Asymmetry of Exchange rate pass-through:

<sup>&</sup>lt;sup>4</sup> Chile, Brazil, Peru, Mexico and Turkey.

<sup>&</sup>lt;sup>5</sup> Philippines, Indonesia, Thailand and South Korea.

<sup>&</sup>lt;sup>6</sup> India, Brazil, China, Russia and South Africa.



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The study analysed 'exchange rate pass-through' in India from 1993 to 2021 [26]. In recent years, developing countries have exhibited an asymmetric relationship between exchange rates and prices. The effect of depreciation on price has been observed to be considerable, whereas the impact of appreciation on price has been observed to be insignificant. The difference in results of the pass-through was investigated with regard to India in this research. The findings reveal that in the long-term, prices are not much impacted by the exchange rate shocks. Thus, this conclusion indicates that price stability is not much influenced by depreciation, and that the pass-through should not be a major concern for the monetary authorities.

The research explored the nonlinear dynamics of 'exchange rate pass-through' to both consumer and import prices, analysing how these effects varied under different inflation expectation regimes during the period from 1993 to 2021. The study aimed to provide a deeper understanding of how fluctuations in inflation expectations influence the relationship between exchange rates and price levels over time [21]. The study included inflation-targeting countries such as Canada, Sweden, the UK, New Zealand, and Australia, as well as non-targeting regions like Switzerland, the Euro-Area, and the US. The nonlinear model demonstrated a significant increase in the transmission of changes to consumer and import prices. Additionally, this effect was notably stronger in situations where consumers and markets were expecting higher future inflation rates. Thus, lowering the inflation expectations might help lower the exchange rate pass through. Further, it seems that in nations that target inflation, inflation expectations have a greater impact on the pass-through.

Research on ASEAN-5 countries provided initial evidence of asymmetric impacts of exchange rate shocks in nations such as Indonesia, the Philippines, and Singapore [4]. Singapore and Indonesia experienced asymmetric impact of the real exchange rate over the long term.

## The Impact of Oil Prices:

The study examined several factors influencing inflation in India, including fluctuations in exchange rates and oil prices [11]. Decline in value of the Indian Rupee raises the prices of essential import items such as oil. This increase in prices of imports (oil being a major import item in countries such as India) transitions into increase in domestic costs of production, with far and wide effect on inflation. The influence of crude oil prices on India's domestic inflation, short-term and long-term, was studied [5]. Given that the economy of the nation is heavily dependent on energy, the results demonstrate that any attempt to reduce fuel subsidies will sharply increase cost-push inflation. Therefore, policymakers should negate the repercussions from such shocks by implementing appropriate policy measures.

According to another study, crude oil prices play a significant role in determining prices in the domestic economy [6]. Through theoretical frameworks and empirical investigations, the link between oil prices and exchange rates has been examined. Theoretical transmission channels suggest a bidirectional causality, but empirical evidence varies depending on the sample, economy, and methodologies. Over the long term, a robust correlation exists between oil prices and exchange rates, with either being effective predictors in the short term. Oil shocks tend to induce greater currency depreciation in oil-exporting nations, and the correlation between oil shocks and exchange rates has intensified since the 2007-2008 global financial crisis.

The analysis undertaken above elucidates the existing knowledge base on the subject, on the basis of which the research gaps are identified hereunder.

## **Research Gap:**



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While numerous research studies have explored the link between inflation levels and exchange rates, there is limited literature available that specifically addresses the contradictions inherent in such studies.

In the Indian context, certain research studies question the relationship between exchange rates and inflation. The results suggest that variables such as the output gap exert a more significant influence on inflation rates than monetary factors, including fluctuations in exchange rates [1]. However, the study also concludes that depreciation of the exchange rate does indeed trigger inflation in India. Another research study reveals that the exchange rate channel is relatively weak in India, potentially influenced by interventions from the Reserve Bank of India aimed at stabilizing the Indian Rupee/US Dollar exchange rate [8]. Similar results have also been observed in countries like Vietnam [2]. The empirical conclusions do not indicate the presence of relationship<sup>7</sup> between exchange rate and inflation. Vietnam does not follow a liberalized system of foreign exchange and capital flows, thus changes in exchange rate are not reflected adequately as a result of monetary policy shocks. The World Bank reports that between 1995 and 2018, there was significant variation in the relationship between inflation and the nominal effective exchange rate [12].

On the contrary, there exists literature wherein exchange rate movements are indicated as important determinant of inflation in India. It is concluded that exchange rate shocks significantly influence domestic inflation in India [5] & [6]. Further, it is indicated that inflation gap is notably affected by the foreign exchange rate [10]. There is no change in the prominence of exchange rate in determining inflation gap, before and after the 2007-2008 crisis. In their research paper, Maitra and Hossain opine that the inflationary pressures in India are considerably affected by the real effective exchange rate [11]. For ASEAN-5 countries too, results revealed that exchange rate shocks affect inflation significantly [4]. Another research paper states that inflation targeting is significantly more effective when the exchange rate is scrupulously managed, as the risks of uncertainty are considerably less [15].

Existing research also highlights the 'exchange rate pass-through', though most studies focus on foreign countries. These countries have observed a decrease in 'exchange rate pass-through' following the implementation of an inflation targeting framework [3]. However, this decline in the 'exchange rate pass-through' (average) was considerable in countries with middle level income, compared to countries with high income. Another research on the topic concluded that the pass-through effect in the Asian region is lower than that in Latin America and Turkey [7 A study on BRICS nations reveals 'exchange rate pass-through', where changes in exchange rates affect domestic inflation. However, the impact of exchange rate fluctuations has diminished over time, suggesting other factors or policies may be moderating the direct transmission of exchange rate pass-through' declined in developing nations, while it has remained relatively low and stable in developed nations [13]. In countries like Ghana, research has identified a threshold concerning exchange rate depreciation in relation to 'exchange rate pass-through' [14].

The research on 'exchange rate pass-through', and its asymmetry, is largely restricted to the econometric analysis performed abroad. Thus, research is warranted in the Indian context with regards to the magnitude and asymmetry of the 'exchange rate pass-through'. Analysis of the 'exchange rate pass-through' is critical, and will provide the monetary authorities with valuable data and information to plan and formulate the policy.

<sup>&</sup>lt;sup>7</sup> Long term or short term.



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Inflation expectations play a crucial role, especially in the inflation targeting regime. Comprehending the efficacy of the inflation targeting mechanism in reducing inflation projections in India since its implementation is crucial. Research on the relationship between inflation expectations, actual inflation, policy repo rate, and exchange rate is limited, leaving unanswered questions about their interaction within the economic context. Understanding these dynamics is crucial for policymakers to manage inflation and formulate monetary policies.

## **Conclusion:**

Many research studies investigating the above aspects have been conducted in the developed economies. There is a dearth of similar studies in India and the other emerging market economies. Over the last decade, some interesting research papers have surfaced, however, the studies conducted vary in terms of the data frequency, time periods, econometric modelling adopted and the conclusions drawn. It is evident from the analysis above that there is consensus among some research studies regarding the weakness of the link between inflation and the exchange rate. In contrast, certain other research studies demonstrate exchange rate as a key factor in determining the rate of inflation. There is no clear-cut consensus that has yet emerged from the studies. Moreover, the research on 'exchange rate pass-through' (and its asymmetry) is largely restricted to the econometric analysis performed abroad. With the introduction of India's inflation targeting system, inflation expectations have emerged as a significant variable in terms of inflation and exchange rates. However, the research on this aspect is scanty in the Indian context. The existing studies regarding the weakness/ robustness of these components, nonetheless, further research is warranted on these aspects in the era of the inflation targeting regime in India.

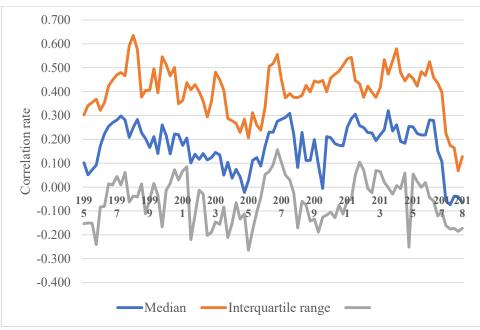
## Appendix 1

# Figure 1 – EMDEs: Correlations between the inflation rate and changes in the nominal effective exchange rate



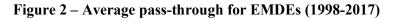
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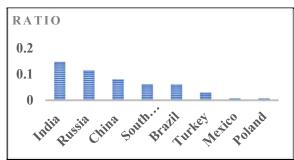
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Note: Adapted from "Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies" World Bank Publications Eds. by Ha et al (2019), p-283

Appendix 2 – EMDEs: Average pass-through, 1998-2017





Note: Adapted from "Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies" World Bank Publications Eds. by Ha et al (2019), p-295

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