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# **Exchange Rate Pass-Through Effect on Prices and Inflation Targeting: A Comparison of Emerging Market Economies<sup>1</sup>**

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## **Abstract**

Most emerging market economies in the 1990s witnessed a wide variety of crises. Following those crises, emerging market economies have given up monetary policies using exchange rates as a nominal anchor and inflation targeting has become a new policy of such countries. The overshooting effect of exchange rates in these markets and therefore arising problems are an important cause of this political change. The aim of this paper is to evaluate exchange rate pass-through effects on prices in Asian Pacific, Latin American and Turkish economies which implemented inflation targeting, but have different dollarization and inflation episodes. Panel VAR approach was used in the analysis. Our findings show that exchange rate pass-through effect in Asian Pacific countries is lower than that of Latin America and Turkey.

**Key Words:** Pass-through Effect, Inflation Targeting, Emerging Market Economies.

**JEL Classification Numbers:** E42, E52, E58.

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## 1. INTRODUCTION

In recent years, there has been an increasing interest in exchange rate pass-through effect on prices. Two basic characteristics are remarkable when the crises in Mexico (1994), Asia (1997), Russia (1998), Brazil (1999), Turkey (2000–2001), and Argentina (2001) are considered. The first characteristic is that prior to the crises exchange rate systems were mixed regimes, either crawling peg (Mexico, Indonesia, Russia, Brazil, and Turkey) or crawling band system (Malaysia and Thailand). The second characteristic is that all these economies used to have a financial liberty with no any effective control mechanism<sup>2</sup>.

The overshooting effect of exchange rates due to financial crises caused economic and financial problems (Devereux et al., 2006; Reinhart, 2006). One of the underlying factors that may affect policy decisions implemented by emerging market economies is foreign funds that may lead to balance sheet vulnerabilities depending on possible fluctuations in domestic interest rates and floating exchange rate system. The original sin hypothesis and the problem of sudden stops highlighted by Eichengreen and Hausmann (2003), Calvo and Reinhart (2002) and Calvo (1999) are the basis of balance sheet vulnerabilities. The sensitivity of prices to a change in exchange rates is another factor that may also have an impact on policy decisions. In the studies of Calvo and Reinhart (2002) and Choudhri and Hakura (2006), following exchange rate shocks, the upward trend of prices in emerging market economies are higher than that of industrialised countries. These findings show that exchange rate pass-through effect on prices in emerging market economies is higher than that of advanced economies.

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<sup>2</sup> Frankel (1999), Fischer (2001), Calvo and Reinhart (2002), Hausmann et al. (2002), Calvo et al. (2003) and the following literature support this view.

On the other hand, the presence of dollarization causes a strong pass-through effect then increases vulnerabilities in the economy and also prevents price stability. In the case where financial systems are not deep enough and imported products have higher share in total consumption basket, pass-through effect has an indirect, undesirable impact on transmission mechanism (Bhattacharya et al., 2011; Kandil and Morsy, 2009). Assuming that there is a strong, positive correlation between dollarization, inflation and pass-through effect, the success of inflation targeting may eliminate dollarization, therefore mitigating pass-through effect (Taylor, 2000).

This paper will focus on a comparison of two sets of countries that represent emerging market economies and have different dollarization and inflation episodes. The aim of this paper is to examine pass-through effect. The remainder of the paper has been organised in the following way: Section 2 reviews the literature. Section 3 presents the model and data set whereas Section 4 shows the findings of this study. Section 5 offers some discussion of the findings. Section 6 concludes.

## **2. LITERATURE REVIEW**

The studies on pass-through effect for developing and developed countries have started in the 1990s. For instance, McCarthy (2000) was the first study that seeks the question of whether there is any correlation between a fall in inflation and a change in exchange rates.

In recent years, pass-through effect has been also studied from the perspective of “open economy macroeconomics”. McCarthy (2000), Hunt and Isard (2003), Hahn (2003), Campa and Goldberg (2006), and Ihrig et al. (2006) serve as good examples of such studies that focus on developed economies whereas studies like Mihaljek and Klau (2000), Frankel et al. (2005) and Choudhri and Hakura (2001) provide in-depth analysis of pass-through effect for developing economies.

Taylor (2000) found a strong and positive relation between inflation and pass-through effect. According to his findings, a fall in inflation may minimise pass-through effect. Honohan and Shi (2001) found a positive and strong correlation between dollarization and pass-through effect. The presence of dollarization hampers monetary transmission mechanism and therefore restraining precautions taken towards exchange rate shocks.

According to Mishkin (2008), determining the period and magnitude of pass-through effect should be required for estimating inflation and timely performing monetary policy actions taken towards exchange rate shocks. Hunt and Isard (2003) emphasise that in the economies with high pass-through effect due to fact that the extent of pass-through effect is indefinite models that anticipate inflation should be restructured. Central Banks should pay more attention to exchange rate shocks and exchange rate volatility in those economies.

Bhattacharya et al. (2011) study the relationship between pass-through effect and monetary transmission mechanism. According to the findings of their study, pass-through effect has an undesirable effect on monetary transmission mechanism. The findings also support the view saying that pass-through effect is falling in the economies where inflation is lower.

There have been also several studies that focus on the pass-through effect in Turkey such as: Kara and Ögünç (2005), Özçiçek (2007), Aldemir (2007), and Peker and Görmüş (2008). For instance, according to the findings of Peker and Görmüş (2008), the effect of crude oil price on inflation is not strong and the effect of exchange rates on inflation is much higher than monetary policy and demand shocks. They also highlight that to a large extent exchange rates may account for inflation.

### **3. MODEL AND DATA SET**

In this paper, we apply the model studied by Leigh and Rossi (2002). In the model that serves for analysing exchange rate pass-through effect on domestic prices, “Panel VAR” approach

was used. Our study includes two sets of countries as noted earlier. The first set of countries is four Latin American countries, such as: Brazil, Mexico, Chile, Peru, and Turkey (Group 1) whereas the second set consist of four Asian Pacific countries, namely, South Korea, Indonesia, Thailand and Philippines (Group 2). The reason why we chose those countries is that all countries which are both in Group 1 and Group 2 implemented a flexible exchange rate system. Due to the different performance of inflation in Asian Pacific and Latin American countries and Turkey, we have done a comparison of them.

The analysis was implemented for the period 2002-2010. We used the data obtained from IMF, International Financial Statistics (IFS) and Moody's dataset. The series which are consistent with the studies in the literature (such as: McCarthy, 2000; Leigh and Rossi, 2002) are as follows: Moody's Commodity Price Index (MCI), real Gross National Product (GNP), nominal exchange rate (prices in US dollar), producer price index and consumer price index.

Using Cholesky decomposition, structural shocks in the model are obtained from VAR residuals. It is important to emphasise that supply shock, demand shock and exchange rate shock are obtained by MCI, real GNP, and nominal exchange rate, respectively. The model can be defined as follows (Leigh and Rossi, 2002, pp. 5-6):

$$cp_t = \alpha_1 cp_{t-1} + \varepsilon_t^{cp} \quad (1),$$

$$\Delta y_t = \beta_1 \Delta y_{t-1} + \beta_2 \varepsilon_t^{cp} + \varepsilon_t^{\Delta y} \quad (2),$$

$$\Delta e_t = \gamma_1 \Delta e_{t-1} + \gamma_2 \varepsilon_t^{cp} + \gamma_3 \varepsilon_t^{\Delta y} + \varepsilon_t^{\Delta e} \quad (3),$$

$$\pi_t^{wpi} = \delta_1 \pi_{t-1}^{wpi} + \delta_2 \varepsilon_t^{cp} + \delta_3 \varepsilon_t^{\Delta y} + \delta_4 \varepsilon_t^{\Delta e} + \varepsilon_t^{\pi^{wpi}} \quad (4),$$

$$\pi_t^{cpi} = \theta_1 \pi_{t-1}^{cpi} + \theta_2 \varepsilon_t^{cp} + \theta_3 \varepsilon_t^{\Delta y} + \theta_4 \varepsilon_t^{\Delta e} + \theta_5 \varepsilon_t^{\pi^{wpi}} + \varepsilon_t^{\pi^{cpi}} \quad (5).$$

where  $cp$ , Moody's commodity price index;  $\Delta y$ , the first order difference of the logarithm of real income;  $\Delta e$ , the first order difference of the logarithm of nominal exchange rate,  $\pi^{wpi}$  and  $\pi^{cpi}$ , producer price index and consumer price index, respectively.

In an attempt to test if the level of series is stationary, Augmented Dickey-Fuller (ADF) test was used. As can be seen from the findings in Table 1, there is no unit root for both groups (Group 1 and Group 2). In order to account for the effect of a change in exchange rates on domestic prices, impulse-response analysis is a powerful tool. ADF test requires that the first order differences of the series should be used in estimating VAR models. In attempting to determine lag length for the model estimation, AIC (Akaike Information Criterion) was chosen. Based on the results obtained, the first order differences were taken for each country in Group 1 and 2, and lag length was set equal to 5.

#### 4. FINDINGS OF THE STUDY

The main purpose of our study is to analyse the effect of exchange rate shocks on prices for the countries noted earlier. In the study, pass-through coefficients are obtained by dividing the response of each price index at the end of  $j$  months to exchange rate shocks into the response of exchange rate at the end of  $j$  months to exchange rate shocks. This expression can be summarised as follows (Leigh and Rossi, 2002):

$$PT_{t,t+j} = P_{t,t+j} / E_{t,t+j} \quad (6).$$

where  $P_{t,t+j}$ , cumulative change in prices between  $t$  and  $t + j$  months;  $E_{t,t+j}$  cumulative change in nominal exchange rate between  $t$  and  $t + j$  months.

Exchange rate pass-through coefficients in Group 1 and 2 countries are shown in Table 2 below (Pass-through coefficients in the table have been estimated through impulse-response functions). In estimating pass-through coefficients, the responses of producer (*wpi*) and consumer (*cpi*) price indexes to shocks have been assessed for one-year period (the first four quarters). According to pass-through coefficients shown in Table 2, the level of pass-through coefficients peculiar to producer prices for both groups is slightly higher than those of consumer prices. These findings are consistent with the results for Turkey in Leigh and Rossi (2002).

On the other hand, pass-through coefficients in Group 1 countries, namely Latin America countries and Turkey, with high inflation are higher than those of Group 2 countries with relatively less inflation. These findings are consistent with the studies in the literature such as: Leigh and Rossi (2002), Kara and Öğünç (2005), and Honohan and Shi (2001). Moreover, the findings are also consistent with the study of Taylor (2000) that found a positive correlation between a fall in inflation and the magnitude of pass-through effect.

To determine the explanatory power of exchange rate shocks on changes in both producer price index and consumer price index, variance decomposition analysis has been used. For this purpose, the first 24-month observations (the first eight quarters) have been done; the results can be seen from Tables 3a-b and 4a-b.

According to the findings which are consistent with the pass-through coefficients in Table 2, the explanatory power of exchange rate shocks for fluctuations in consumer price index in the period of the first 8 quarters in Group 1 countries is lower than its explanatory power for fluctuations in producer price index over the same time period. However, in Group 2 countries, the explanatory power of exchange rate shocks for fluctuations in both consumer price index and producer price index over the same period is lower in comparison to Group 1

countries, again which are consistent with the findings in Table 2. Like Group 1 countries, consumer price index-based shocks have the highest explanatory power for fluctuations in consumer price index.

For both groups, the effect of commodity prices on producer price index is more significant than other variables. By and large, the effect of commodity price shocks on producer price index may have increased for each group. On the other hand, the effect of commodity prices on producer price index in Group 1 countries is higher than Group 2 countries.

## **5. DISCUSSION OF THE FINDINGS**

Our study analyses whether or not inflation targeting can mitigate pass-through effect in emerging market economies that implemented inflation targeting. Following the 1990s, the studies that have focused on emerging market economies have emphasised the phenomenon of dollarization which affected those countries in two ways: Firstly, it hampers the efficiency of monetary transmission mechanism, therefore restraining monetary policy to operate. Secondly, in economies with high devaluation it leads costs to increase and therefore affects inflation further. It is possible to say that one of the leading factors that may foster dollarization is the credibility of Central Banks. Central Banks that have low credibility cannot maintain their price stability and lead inflation to persist over time (Mishkin, 2004; Reinhart et al., 2003; Eichengreen et al., 2003).

There is a feedback effect between dollarization and inflation. The failure of inflation targeting increases dollarization that results in higher pass-through coefficient, therefore leading to an increase in exchange rates or devaluation to have a higher impact on inflation. According to Taylor (2000), the success of inflation targeting helps dollarization lower, therefore facilitating price stability through an increase in the efficiency of monetary policy.

In this study, we compare Latin American countries and Turkey, all of which failed to manage the risk of inflation and dollarization and Asian Pacific countries that maintained price stability and had no significant level of dollarization. This paper enables us to account for the extent to which inflation targeting may have affected pass-through effect in those countries. According to the findings of the study, in Asian Pacific countries that were more successful in inflation, inflation targeting may have had a substantial impact on pass-through effect. These findings suggest that the countries that were exposed to inflation in the past may implement inflation targeting better.

On the other hand, precautions taken by FED and Central Banks in developed countries towards the financial crisis caused abundant global liquidity. Practices that Central Banks implemented also induced volatility in global capital flows. The abundant global liquidity had an undesirable impact on developing economies in the following way: it first led to revaluation of a currency, therefore expanding current account deficit (which is also caused by an increase in domestic aggregate demand). An increase in exchange rates and domestic aggregate demand resulted in the failure of estimating inflation. It is therefore possible to say that capital flows adversely affected inflation cost and competitive capacity (IMF, 2011; Ostry et al., 2011; Claessens and Köse, 2013).

It has been suggested that increase in abundant global liquidity and its impact on emerging market economies have heightened the need for managing capital flows and led to a renewed interest in macro-prudential framework. So a new policy framework that considers price stability together with financial stability has been adopted, rather than orthodox monetary policies that are only price stability-oriented (Hahm et al., 2012; Ünsal, 2011).

However, emerging market economies that have attempted to maintain their price and financial stability have become more dependent on foreign assets during the period global

liquidity has been abundant therefore increasing aggregate demand and leading those countries to run a current account deficit and to remain fragile. In other words, those countries that have focused on financial stability but have not successfully implemented inflation targeting, following expansionary monetary policy FED announced in May 2013, have faced the risk of economic crisis.

As a result, countries that have remained fragile due to abundant global liquidity have faced the risk of soaring inflation and dollarization. IMF (2013) suggests that those countries should re-implement Orthodox monetary policies that are designed only for price stability. In addition, according to Ostry et al. (2012), those countries that implement inflation targeting and adopt a flexible exchange rate system should consider exchange rate stability as well as price stability in case volatility in exchange rates may adversely affect balance sheets. They conclude that Central Banks should directly intervene in foreign exchange market which can be also regarded as a policy tool, as well as a policy interest rate. It can be thus suggested that a managed floating exchange rate system may be a good tool for those countries, rather than a flexible exchange rate system.

## **6. CONCLUDING REMARKS**

In this study, we analysed a comparison of exchange rate pass-through effects on prices between two groups of countries in emerging market economies. The results of this study indicate that the pass-through effect in Group 2 countries (Asian Pacific countries) is lower than Group 1 countries (Latin America countries and Turkey). These findings suggest that both exchange rate and commodity price shocks may have had a bigger impact on the inflation rates of Group 1 countries.

A possible explanation for the fact that Group 2 countries have the lower pass-through effect might be that historical inflation and dollarization have been lower when compared to Group

1 countries. This result is consistent with the literature following the study of Taylor (2000) who found a positive correlation between inflation and pass-through effect, as mentioned earlier. Based on the findings of the study, inflationist expectations have been the most underlying factor in explaining fluctuations in both consumer price index and producer price index in emerging market economies despite the fact that inflation targeting may have helped pass-through effect slow down. Last but not least, it is possible to hypothesise that commodity price shocks for each group has an undesirable impact on inflation.

## TABLES

**Table 1: Unit Root Analysis**

Group 1 (Latin American Countries and Turkey)					
Method	$\Delta cp$	$\Delta y$	$\Delta e$	$\Delta wpi$	$\Delta cpi$
ADF - Fisher Chi-square	44.35***	88.82***	78.98***	74.74**	47.14***
ADF - Choi Z-stat	-5.05***	-7.77***	-7.49***	-7.26***	-5.23***
Group 2 (Asian Pacific Countries)					
ADF - Fisher Chi-square	35.44***	87.22***	44.13***	51.20***	40.21***
ADF - Choi Z-stat	-4.52***	-8.13***	-5.15***	-5.68***	-4.94***

Note: \*\*\* indicates the 1 % level of significance.

Source: Authors' calculations.

**Table 2. Pass-Through Coefficients for Group 1 and 2**

	Group 1 (L. America and Turkey)	Group 2 (Asian Pacific)
<i>cpi</i>	19.67	10.69
<i>wpi</i>	25.87	19.31

Source: Authors' calculations.

**Table 3a. Variance Decomposition Results for Group 1 (Latin America and Turkey)**

Period	Variance Decomposition for <i>cpi</i>				
	Consumer Price Index ( <i>cpi</i> )	Commodity Price ( <i>cp</i> )	Growth ( $\Delta y$ )	Exchange Rate ( $\Delta e$ )	Producer Price Index ( <i>wpi</i> )
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	91.10294	2.625818	3.690531	1.425455	1.155257
3	85.84765	2.973101	4.711803	2.169361	4.298088
4	75.79928	5.770567	5.238055	3.694319	9.497783
5	71.63756	5.206003	5.134088	3.276672	14.74567
6	64.80993	9.767161	5.290881	4.203951	15.92808
7	63.76976	9.523643	5.643451	5.087836	15.97531
8	62.59582	9.492859	5.561077	6.579231	15.77101
9	61.39680	9.355746	5.455394	8.125130	15.66693
10	60.66852	9.199338	5.513132	9.083661	15.53535
11	59.66687	10.53827	5.496182	9.014971	15.28370
12	58.42668	12.08914	5.583912	8.925337	14.97493

Source: Authors' calculations.

**Table 3b. Variance Decomposition Results for Group 1 (Latin America and Turkey)**

Period	Variance Decomposition for <i>wpi</i>			
	<i>Producer Price Index ( wpi )</i>	<i>Commodity Price ( cp )</i>	<i>Growth( Δy )</i>	<i>Exchange Rate ( Δe )</i>
1	100.0000	0.000000	0.000000	0.000000
2	73.83765	19.67336	4.786291	1.702703
3	64.49868	29.98343	4.068853	1.449031
4	61.38842	26.94649	4.445400	7.219693
5	60.82901	26.63461	4.722864	7.813514
6	60.56270	26.30483	5.199372	7.933098
7	61.09213	25.14984	4.968635	8.789400
8	61.73449	24.53614	5.046964	8.682409
9	61.38322	24.52678	5.034253	9.055750
10	60.86264	24.39066	5.447795	9.298901
11	60.68222	24.37367	5.505612	9.438491
12	60.68552	24.36774	5.509730	9.437009

**Source:** Authors' calculations.

**Table 4a. Variance Decomposition Results for Group 2 (Asian Pacific)**

Period	Variance Decomposition for <i>cpi</i>				
	<i>Consumer Price Index ( cpi )</i>	<i>Commodity Price ( cp )</i>	<i>Growth( Δy )</i>	<i>Exchange Rate ( Δe )</i>	<i>Producer Price Index ( wpi )</i>
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	99.02449	0.440481	0.019852	0.513721	0.001455
3	96.79832	0.743707	1.422412	0.500040	0.535519
4	92.33495	3.117424	3.175705	0.501490	0.870437
5	90.19424	5.033511	2.796082	0.353392	1.622771
6	88.93513	4.985038	3.010312	0.611152	2.458366
7	82.95639	6.976886	3.365444	2.709038	3.992239
8	77.46868	9.276299	6.211655	2.739411	4.303952
9	73.73280	10.88316	8.593540	2.653250	4.137256
10	73.01963	11.07382	8.822314	2.699168	4.385069
11	71.31267	11.56729	8.640758	3.680795	4.798483
12	70.81409	11.11434	9.316818	3.604775	5.149975

**Source:** Authors' calculations.

**Table 4b. Variance Decomposition Results for Group 2 (Asian Pacific)**

Period	Variance Decomposition for $wpi$			
	<i>Producer Price Index (wpi)</i>	<i>Commodity Price (cp)</i>	<i>Growth(Δy)</i>	<i>Exchange Rate (Δe)</i>
1	100.0000	0.000000	0.000000	0.000000
2	91.64454	8.103874	3.88E-05	0.251552
3	91.06051	8.303783	0.256437	0.379270
4	82.71036	11.52061	5.406377	0.362651
5	81.80468	12.25445	5.519645	0.421225
6	80.73532	12.34800	5.722017	1.194662
7	76.76159	16.61603	5.489565	1.132821
8	74.54004	18.87719	5.481234	1.101537
9	75.11185	18.35907	5.285195	1.243885
10	72.83897	19.93147	5.558405	1.671153
11	71.94539	19.87288	5.642746	2.538987
12	71.46687	19.55936	6.043855	2.929913

**Source:** Authors' calculations.

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