

Does Inflation Targeting Reduce Pass-Through Effect?

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Abstract

There is a common academic opinion that the dollarization caused by the increasing inflation rates, particularly in the emerging market economies since 1990s also increases the pass-through effects in such countries. Yet another opinion suggests that the decrease in the inflation rates thanks to inflation targeting causes a reversal in the dollarization and a decrease in the pass-through effect. The aim of this study is to evaluate both opinions for the selected emerging market economies. Six different emerging market economies have been tested via Panel VAR approach. The findings of the study seem to support the latter.

Keywords: *Inflation Targeting, Pass-Through Effects, Exchange rates, Prices*

JEL Classification: G14, G15, G18.

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Introduction

When the crises in Mexico (1994), Asia (1997), Russia (1998), Brazil (1999), Turkey (2000–2001), and Argentina (2001) are evaluated, two fundamental aspects of these countries attract attention. First one is the exchange rate systems in these countries before the crisis were either crawling peg in general (Mexico, Indonesia, Russia, Brazil, and Turkey) or crawling band (in Malaysia and Thailand) – which were interim regimes. And the second one is that, these economies had a financial freedom which lack auditing⁴.

One of the most important problems of the countries which have exchange rate peg system is “dollarization”, because the ever increasing inflation rates despite the exchange rate anchors discredit both the Central Bank and the currency of that country. Immediately after the financial crises, because of the over shooting effect of the foreign exchange rate and the problems caused by it, most of these countries have abandoned the policies which assume the foreign exchange rate as the nominal anchor and adopted inflation targeting (Reinhart, 2006; Dornbusch, 1976).

At this point, it is necessary to mention the importance of the dollarization for the emerging market economies. The presence of a strong dollarization also causes a strong pass-through effect and increases the fragilities in the economy and hinders to achieve economic price stability. In reality, not only the dollarization but also the pass-through effect in economies, where the fiscal systems are not sufficiently profound and imports have the major part in the social consumption, has an adverse effect on the transmission mechanism in an indirect manner. That is because, in either case, the central bank has to take the immediate changes in the exchange rate into account while determining the policy interest rates (Bhattacharya et al, 2011; Kandil and Morsy, 2009).

According to the literature opinion which accepts that there is a strong and positive connection between the dollarization (or pass-through effect) and the inflation⁵, the success regarding the inflation rates also may cause a decrease in the dollarization, and thus, a decrease in the level of pass-through effect (Taylor, 2000).

The pass-through effect here can be briefly explained via two mechanisms as direct and indirect. Direct effect mechanism: It means that the increase in the ex-

4 Frankel (1999), Fischer (2001), Calvo and Reinhart (2002), Hausmann et al. (2002), Calvo et al. (2003), Aizaman and G and the following literature are the fundamental supporters of this approach.

5 Goldfajn and Werlang (2000), Hausmann et al. (2000), Cabellero et al. (2004), Muinhos (2004) and the relevant literature.

change rate due to the majority of the imported goods in the consumer sales creates a pressure on the inflation rates as well. Indirect effect mechanism: It can be explained that the increase in the exchange rates creates a pressure on the inflation rates due to an interaction among the production, total demand and prices.

In order to calculate the direct effects, the demand flexibility towards the imported goods and the weight of the imported goods in the consumer's basket should be known. And in order to calculate the indirect effects, due to the pass-through effect to what extent the changes occurring in the exchange rate and also the changes occurring in the relative prices and the demand for the domestic products should be known.

It can be seen that in either mechanism, the pass-through effect in the countries which face the dollarization problem is higher than the others. Therefore, it is expected that the pass-through effect and the effect of the foreign exchange rate on the inflation rates will be lower in the economies which has made important strides in terms of achieving price stability and which has entered a process of dedollarization. In the light of such estimations, this study has two fundamental aims. Firstly, it is aimed to determine whether a decrease on the pass-through effect has been observed or not in the emerging market economies which has had bad inflation records and which has faced the dollarization problem after they have adopted a flexible exchange rate regime. Secondly, it is aimed to determine the effect of an improvement in the price stability on the pass-through effect.

Related Literature

The Dornbusch (1987) study is one of the most basic articles studying the pass-through effect in the transition from exchange rates to prices. This study examines the reactions of the companies towards the exchange rate shocks within the mark-up pricing method without taking the flexible pricing models into account.

In recent periods, it has been observed that the pass-through effect is studied within the scope of "open economy macroeconomics". The study of McCarthy (2000) searching whether there is a relationship between a decrease in the inflation rates and changes in foreign exchange rates constitutes a basis for the other studies made in the field. Hunt and Isard (2003), Hahn (2003), Campa and Goldenberg (2006), and Ihrig et al. (2006) are some of them. These researches studied the pass-through effect with regard to the advanced economies. The studies of Mihaljek and Klau (2000), Frankel et al. (2005), Choudhri and Hakura (2006), Hahn et al. (2007)

can be listed as some of the most significant studies which handle the issue in terms of the developing economies.

According to Edwards (2001), the fluctuations in the production, the economy having a low income level, the currency of the country being over-valued, the level of openness and the inflation rates are the fundamental determiners of the pass-through effect.

Taylor (2000) detected a strong and positive relationship between the inflation rates and the pass-through effect. Accordingly, a decrease in the inflation rates also reduces the level of the pass-through effect. Honohan and Shi (2001) established a strong and positive correlation between the level of dollarization and the pass-through effect. The presence of dollarization hinders the functioning of the monetary transmission mechanism and blocks the way for taking measures against the exchange rate shocks.

According to Mishkin (2008), determining the time and extent of the pass-through effect is necessary for making estimations with regard to the inflation rates and for implementing the necessary monetary policy measures against the exchange rate shocks. However, Hunt and Isard (2003) emphasized the necessity for restructuring the inflation rate estimation models due to the fact that there is an uncertainty regarding to what the limits of the pass-through effect are in the economies in which this effect is particularly high. In other words, the central banks of the economies which have high levels of pass-through effect have to follow the exchange rate shocks and the exchange rate volatility in a closer sense. This constitutes one of the most fundamental arguments behind the “fear of floating” hypothesis.

In the study of Bhattacharya et al. (2011), the relationship between the pass-through effect and monetary policy transmission mechanism was handled. In this study, “A Structural Vector Error Correction Model-SVECM” was used. This model enables to decompose the long term and short term correlations among the variables as well as the structural shocks affecting different variables. According to the study, it was concluded that the pass-through effect has a distorting effect on the transmission mechanism. Furthermore, the study also supports the findings that the level of pass-through effect also decreases in the economies with low inflation rates.

Kara and Ögünç (2005) studied the pass-through effect in terms of two periods (“1995/2- 2001/4” and “2001/5- 2004/9”). According to this study, the pass-through effect of the exchange rate occurred one-time delayed during the first period. However, in the second period, this effect occurred two and three times delayed. As a result of the VAR analysis that Özçiçek (2007) conducted, the highest reaction against

the foreign exchange rate changes is received by WSP. CPI is less affected by the foreign exchange rate changes than the WSP.

By using the VAR method, Aldemir (2007) also made estimations with regard to the pass-through effect in two different periods ("1988/01- 2001/01" and "2001/04-2004/12). In this study, it was put forward that the sensitivity of the general import price index towards the exchange rate changes display a significant decrease as a result of the disinflation policies applied in the second period. While the estimated error variance of the ratio of changes in the foreign exchange rates to the changes in the import prices was declared as 70% in the first period, this rate was reduced to 16% in the second period.

Peker and Görmüş (2008) analysed the pass-through effect of the changeability of the foreign exchange rates on the prices in Turkey. They tested their studies through the VAR method as well. The result of the study was that the price of the crude oil does not have a strong effect on the inflation rates. The foreign exchange rates have a much stronger effect on the inflation rates when compared to the monetary policy and demand shocks. It was also highlighted in the study that 72 % of the developments in the inflation rates is resulted from foreign exchange rates.

Model and Data Sets

In this study, the model framed by Leigh and Rossi (2002) is used as a reference. The model, which used in the calculation of the pass-through effect while transiting from the foreign exchange rates to the domestic prices, is based on a five-variable VAR approach. This study covers six countries. This means, there are both the time series and the cross section series in our study. Therefore, in this study, the Panel VAR approach is used in determining the pass-through effect while transition from foreign exchange rates to prices.

The six countries in the study, including Turkey, were chosen among the countries which encountered the problem of dollarization in the 1990s and then adopted the flexible exchange rate system. For the selection of the countries in the analysis, the study of Stone and Buhundia (2004) was used as a reference. Therefore, Brazil, Republic of South Africa, Mexico, Peru, Thailand and Turkey are eligible for the aim of this study.

The research is made in terms of two periods. The first period covers the years between 1995 and 2001. It is accepted that the problem of dollarization in the selected countries were relatively high in this period. And the second period covers the

years between 2002 and 2010. This period was determined as a common period for the selected countries to adopt inflation targeting and flexible exchange rate system. The data used in the study were obtained from IMF-IFS and Moody's databases. For the analysis made, the package programmes of STATA 9 and E-views 5.1 were used.

According to the studies of McCarthy (2000), Leigh and Rossi (2002), the data used in this study were determined as MCI (Moody's Commodity Index), real GDP, nominal foreign exchange rate (as a price of the currencies of all selected countries in terms of US dollars), producer price index and consumer price index.

The structural shocks included in the model were obtained from the VAR residuals by using Cholesky decomposition. In this respect, the supply shock was obtained by MCI; the demand shock was obtained by GDP; and the exchange rate shock was obtained by using nominal foreign exchange rate. (Leigh and Rossi, 2002, pp: 5-6).

$$1- cp_t = \alpha_1 cp_{t-1} + \varepsilon_t^{cp}$$

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

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

$$4- \pi_t^{wsp} = \delta_1 \pi_{t-1}^{wsp} + \delta_2 \varepsilon_t^{cp} + \delta_3 \varepsilon_t^{\Delta y} + \delta_4 \varepsilon_t^{\Delta e} + \varepsilon_t^{\pi^{wsp}}$$

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

Here cp indicates MCI (Moody's Commodity Index) commodity prices; Δy indicates the first difference of the real income logarithm; Δe_t indicates the first difference of the nominal exchange rate logarithm; π^{wsp} and π^{cpi} indicate producer price index and consumer price index, respectively.

As mentioned before, two different periods of 1995-2001 and 2002-2010 were taken into account and quarterly data sets were used in the study. For the stationary tests of the variables, ADF (individual root –Fischer ADF) test was used. According to the test of stationary for the variables, it was concluded that there are no unit roots in the series of selected variables for each period. The results obtained are shown at Table 1.

In the evaluation of the impact of the exchange rate movements on the domestic prices, it would be better to use the impulse and response functions based on the VAR model. The ADF test indicates that the first differences of the series should be used in the estimation of the VAR model for both 1995-2001 and 2002-2010 periods.

For the determination of the estimated lag length of the model, AIC (Akaike Information Criterion) was utilised. According to the results obtained in terms of determining the model estimation, 5-lag values were used for the series whose first differences were considered for the period of 1995-2001 while 4-lag values were used for the series whose first differences were considered for the period of 2002-2010.

Table 1: Unit Root Analyses

For the period of 1995-2001					
Method	Δcp	Δy	Δe	Δwsp	Δcpi
ADF - Fisher Chi-square	47.0910**	83.8924**	32.4015**	24.8470*	67.5128**
ADF - Choi Z-stat	-5.0429**	-6.9223**	-3.2381**	-2.1120*	-5.8764**
For the period of 2002-2010					
ADF - Fisher Chi-square	53.1643**	62.5487**	94.5316**	85.2098**	60.3567**
ADF - Choi Z-stat	-5.5358**	-2.9054**	-8.0982**	-7.6775**	-6.0233**

Note: ** and * indicate that the level of significance of the series are 1% and 5% stationary, respectively.

Findings

The main aim of our study is to obtain the pass-through effect of the exchange rate shocks over prices according to the six countries examples in a manner to compare periodical differences. Therefore, no other impulse-response functions are required.

At this point, the pass-through coefficients were obtained from impulse-response functions estimated separately for each period. In the study, pass-through coefficients were obtained by dividing the response of each price index to the shocks resulting from exchange rates at the end of j months in the response of exchange rate to the shocks resulting from exchange rates at the end of j months (Leigh and Rossi, 2002). It is formulated as $PT_{t,t+j} = P_{t,t+j} / E_{t,t+j}$. In this case, $P_{t,t+j}$ indicates the cumulative change at the price level between the months t and t+j whereas $E_{t,t+j}$ indicates the cumulative change in the nominal exchange rate between the months t and t+j.

The pass-through coefficients during the periods of 1995-2001 and 2002-2010 are shown at the Table 2. The pass-through coefficients on the Table were calculated by using impulse-response functions based on VAR approach.

Table 2: Pass-through Coefficients for the periods of 1995-2001 and 2002-2010

	1995-2001	2002-2010
CPI	30.79	4.36
WSP	21.93	7.51

Source: Calculated by the authors.

In the calculation of the pass-through coefficients, the responses of the producer (WSP) and consumer price indexes (CPI) to the shocks were estimated for a period of one year (first four quarters). According to the pass-through coefficients shown on the Table 2, the level of the pass-through coefficients with regard to the consumer prices for both periods was slightly higher than the pass-through coefficients calculated for the producer prices. The reason behind this might be that South Africa and Brazil are commodity exporting countries. These findings are the results obtained for emerging market economies on the basis of the selected country samples. These results are different from the results obtained for Turkey in the study of Leigh and Rossi (2002).

On the other hand, after the inflation targeting programme was adopted in the selected countries, which was between 2002 and 2010, the pass-through effect started to decrease. These findings are also in compliance with the findings of the studies made by Leigh and Rossi, (2002), Aldemir (2007), Kara and Ögünç (2005), and Honohan and Shi (2001). Furthermore, these findings are also in coherence with the fact that there is a positive correlation between the decrease in the inflation rates and the decrease in the pass-through effect, as stated in the study of Taylor (2000).

Table 3: Inflation Rates in the Selected Countries (1995-2010)

Inflation Rates /Year	Brazil	South Africa	Mexico	Peru	Thailand	Turkey
1995	147.9	8.7	34.7	11.1	5.8	92.2
1998	3.20	6.8	15.8	7.2	8.04	86.5
2000	7.05	5.3	9.5	3.7	1.5	56.4
2003	14.7	5.9	4.5	3.4	1.8	25.5
2005	6.8	3.3	3.9	1.6	4.5	10.1
2008	5.7	11.4	5.3	5.9	5.08	10.5
2010	5.3	4.2	4.5	1.5	3.2	8.5

Source: IMF, IFS databases.

In order to calculate the predicting power which explains the change of the shocks stemming from the foreign exchange rate in the producer and consumer

price indexes, “variance decomposition” calculations included in VAR Model were used. In the calculations to be made by taking the pass-through effect into account, observations concerning the effect of exchange rate shocks on WSP and CPI covering the first 24 months (the first eight quarters) were used. In this respect, the calculations of variance decomposition are shown on the Tables 4 a. and 4 b.

Table 4 a: Results of Variance Decomposition Calculations for the Period of 1995-2001

Period	Consumer Price Index (CPI)				
	CPI	CP	Y	ER	WSP
2	87.18	0.004	0.22	6.90	5.68
8	71.03	0.78	5.90	10.19	12.07
12	70.65	1.93	5.20	8.16	14.18
24	73.38	4.53	4.64	5.04	12.41
Period	Producer Price Index (WSP)				
	WSP	CP	Y	ER	
2	98.14	0.004	0.99	0.85	
8	87.01	1.99	9.05	1.48	
12	85.23	1.88	10.88	1.98	
24	84.45	2.40	10.34	2.79	

Source: Calculated by the authors.

Table 4 b. Results of Variance Decomposition Calculations for the Period of 2002-2010

Period	Consumer Price Index (CPI)				
	CPI	CP	Y	ER	WSP
2	95.18	0.03	2.43	0.72	1.6
8	75.38	2.34	20.55	0.62	1.08
12	75.37	2.35	20.56	0.62	1.08
24	75.37	2.35	20.56	0.62	1.08
Period	Producer Price Index (WSP)				
	WSP	CP	Y	ER	
2	85.07	1.16	13.75	0.006	
8	78.29	2.68	17.68	2.11	
12	77.51	2.69	17.71	2.11	
24	77.47	2.69	17.71	2.11	

Source: Calculated by the authors.

The calculation of variance decomposition is important in determining the predicting power of exchange rate shocks over the fluctuations in the CPI and WSP

within the mentioned periods. In this study, in order to determine to what extent the exchange rate shocks and the other shocks obtained via the system created by Leigh and Rossi (2002)'s equations from 1 to 5 affect the fluctuations in CPI and WSP, separate calculations in variance decomposition were made for both periods 1995-2001 and 2002-2010.

According to our findings, the predicting power of the exchange rate shocks over the CPI fluctuations in the first eight quarters of the period of 1995-2001 (10.19) is significantly higher than the predicting power over the WSP fluctuations (1.48) (see Table 4a). These findings are coherent with the findings of pass-through coefficients shown on the Table 2 (for CPI: 30.79, for WSP: 21.93). It is seen that the predicting power of fluctuations of CPI results from shocks based CPI within the period defined (71.03). The second higher shock is coming from the WSP (12.07).

When the predicting power of the exchange rate shocks over the CPI and WSP is studied within the first eight quarters in the period of 2002-2010, one can observe that the predicting power of the exchange rate shocks over the WSP fluctuations (2.11) is much higher than their predicting power over the CPI fluctuations (0.62) (see Table 4b). These findings are also coherent with the findings on Table 2 (for CPI: 4.36, for WSP: 7.51). In addition, it can be observed that the predicting power of the shocks resulting from CPI over the CPI fluctuations in the second period is the highest (75.38). However, that the predicting power of the shocks resulting from revenues is higher than the ones in the previous period attracts attention (for CPI and WSP in the first and second periods: 5.90 and 9.05, 20.55 and 17.68, respectively). The predicting power of the shocks resulting from commodity prices within the determined period is observed to be slightly more visible in the second period than in the first one (for CPI and WSP in the first and second periods: 0.78 and 1.99, 2.34 and 2.68). The reason behind the fact that the effect of the shocks stemming from commodity prices is small in both periods is considered because of the fact that some of the selected countries are commodity exporting countries.

When the predicting powers of the variables other than the shocks stemming from exchange rates over the WSP fluctuations is studied, it can be observed that the predicting power of the shocks stemming from WSP over the WSP fluctuations is at its highest in both periods (in the first and second periods: 87.01 and 78.29, respectively).

Conclusion

The fact that the countries selected for this study were the ones which applied intermediary exchange rate regimes in 1990s, yet they preferred to apply inflation targeting and flexible exchange rate systems as of 2001 makes it possible to calculate to what extent the inflation targeting practices affect the pass-through effect.

The findings of the study indicate that the pass-through effect tend to be reduced with the introduction of the inflation targeting practices. These findings are also coherent with the literature which suggests a positive correlation between the inflation rates and the pass-through effect and which follows the study of Taylor (2000). The results obtained from the variance calculations indicate that the inflation rate estimations continue to be the most important factor in explaining both the CPI and WSP fluctuations in the emerging market economies despite a decrease in the pass-through effect after the inflation targeting practices. In addition, considering the fact that some of the countries selected in the study are commodity exporting countries, it can be concluded that the share of the commodity prices is particularly small in affecting the inflation rates.

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