Does Exchange Rate Pass-Through Even Exist in Asia or Inflation Targeting Framework is Irrelevant in its Determination?

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Abstract

This study aims to quantify a possible link between exchange rate pass-through (ERPT) and inflation targeting framework (IT) while focusing on four Asian economies which have adopted IT during the period of 1990-2010 against a control group of non-inflation targeters. By deploying a structural VAR model with non-recursive contemporaneous restrictions imposed on covariance matrix, we identify the impulse response of domestic inflation to the shocks of exchange rate and world commodity prices. The empirical evidences suggest that ERPT is absent in Asian IT and non-IT economies since 1990s. The adoption of IT has not lead to change in ERPT for the group of IT economies compared to their own pre-targeting period and the experiences of non-targeters after 2000s which is accepted as the average adoption date. It has been found however, that the movement in domestic inflation is predominately explained by world commodity prices in recent past and not by the depreciation of local currency in these economies.

Key Words: Exchange rate pass-through, Monetary policy, Inflation targeting, Asian economies
JEL Classification: E52, E58, F41

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1 Introduction

The impossible trinity states that a central bank can only achieve two of the three most desired objectives: Exchange rate stability, independent monetary policy and financial integration (Mundell-Fleming model). After the Asian Financial Crisis of 1997, an idea became a very popular belief that it is impossible to have a stable exchange rate and consequently, all central banks should more towards flexible exchange rate regime. This is how they will be able to have monetary policy independence in an increasingly financially open environment. Inflation targeting framework that was a hot issue among central banks since its first adoption by New Zealand became more attractive for central banks giving its salient feature of floating exchange rate regime. As a result, many emerging economies adopted this framework and promised to leave their exchange rate floating while entirely focusing on monetary management in the era of financial globalization. However, a possible constraint that can hamper their efforts to fully concentrate on monetary management is the higher vulnerability of their domestic prices (the ultimate objective under IT framework) to exchange rate shocks.

Recent robust evidences have shown surprisingly very little pass-through of exchange rate into domestic prices during the last two decades. Many studies attribute this decline in ERPT to credible low inflationary monetary regimes ((Taylor, 2000), (Choudhri & Hakura, 2006), (Gagnon & Ihrig, 2004)), and thus provoke an important query "*is it linked to the adoption of inflation targeting?*" given that credibility and low inflation are the two key characteristics of this regime. According to (Mishkin & Schmidt-Hebbel, 2007)), if inflation targeting improves the credibility of monetary policy and keeps inflation expectation anchored, it is expected to reduce the responsiveness of domestic prices to exchange rate shocks.

The main purpose of this paper thus is to quantify the link between exchange rate pass-through and to the changes in the conduct of monetary policy from any sort of policy to the adoption of inflation targeting framework. Specifically, we investigate what change in the behavior of ERPT has been brought by inflation targeting framework in four Asian economies (Indonesia, South Korea, Philippines and Thailand) that adopted this strategy during 1990 to 2010 by comparing the degree of ERPT during pre and post IT regimes.

The second purpose of this paper is to compare the exchange rate pass-through in inflation targeting countries with the degree of pass-through in some non-inflation targeting countries of Asia (Hong Kong, China, India, Malaysia, Pakistan and Singapore) during the post IT period. Any significant difference in the behavior of ERPT between these two countries group will further promote the possible link of inflation targeting framework with pass-through of exchange rate.

To achieve our dual objective, we use a comprehensive structural VAR model on panel data (one panel of IT countries, and one panel of non-IT countries) where the innovations are orthogonalized following the wisdom of economic theory. Although, a number of studies have used structural VAR[1] to estimate the exchange rate pass-through given the fact that it attends to possible endogeneity among the variables ((McCarthy, 2000), (Choudhri & Hakura, 2006), (Nogueira Junior, 2006), (Ito & Sato, 2007), (Mishkin & Schmidt-Hebbel, 2007)); but they have generally used Recursive approach of orthogonalization that makes these models sensitive to the ordering of variables, where changing the order changes the VAR equations, coefficients, and residuals, and there are always *n*! possible orderings. Our approach, however, instead uses the relationship from established 'economic theory' and develops the link among the variables.

The empirical evidences in this study suggest that ERPT is absent in Asian IT and non-IT economies since 1990s. For the group of IT economies, the adoption of IT has not lead to change in ERPT compare to their own pre-targeting period and the experiences of non-targeters after 2000s which is accepted as the average adoption date[2]. It needs to be emphasized however, the increasing role of world commodity prices in the determination of domestic inflation.

There can be several explanations for this non-existent and unchanged behavior of ERPT in IT economies during pre and post IT period as well as in comparison to non-IT countries. The first can be global disinflation since 1990s which has caused the absence of ERPT in these economies and thus made it difficult to identifying any role of inflation targeting. Second can be the role of globalization and higher competition investigated by (Chen, Imbs, & Scott, 2004). They claim that globalization and higher competition have contributed to the little transmission of exchange rate shocks to domestic prices in addition to monetary policy since the 1990s. This phenomenon can also potentially explain the increasing role of world prices in domestic inflation. As globalization and higher competitive environment is again a global phenomenon thus make it difficult to differentiate between IT and non-IT economies. Third explanation can be the possibility that micro factors are more important in explaining ERPT in these economies rather than macro-environment as also advocated by (Campa & Goldberg, 2002). Another possible explanation is provided by (Reyes, 2007) that exchange rate pass-through still exists but under inflation targeting framework, we are unable to observe it because of the central bank's frequent interventions to rectify the fluctuations in exchange rate.

[1] Recursive VAR is a special type of Structural VAR models in which the matrix of contemporaneous effects is in lower triangular form.

[2] This finding is in line with the results of Mishkin and Schmidt-Hebbel (2007) that report these results for the complete group of inflation targeters.

Moreover, our results show that relationship between depreciation and inflation although very small and insignificant has been negative in IT economies after the adoption of IT which is counter-theory. (He, Liu, & Zhang, 2009) provide an explanation for this inverse behavior. They show theoretically and empirically that depreciation can lead to fall in inflation. In their view, central bank will tend to offset the depreciation by purchasing local currency with Forex Reserves, which, in turn, makes the money supply decrease. The tightening monetary policy will lead the price to go down instead of going up. As the two effects are conflicting with each other thus ERPT can be positive, negative or unobvious in different countries since the control power of the central banks differs from country to country.

However, despite the findings that ERPT is absent or non-existent in Asian economies since 1990s and there is no difference observed in its behavior for IT economies during pre and post IT period and in comparison to non-IT economies; it does not mean that ERPT is no longer an issue for these economies as also argued by (Nogueira Junior, 2006). Our estimation results of inflation variance decomposition highlight this issue as exchange rate is still an important component in explaining the volatility of inflation in IT economies. Moreover, following our findings that the shocks of foreign prices have important explanatory power in the volatility of domestic inflation we can say that pass-through from exchange rate or foreign price shocks still impose a problem for the central banks of IT economies; where the greater role has been shifted to foreign prices.

The remainder of this paper is organized as follows. Section 2 provides an overview of the literature that relates the exchange rate pass-through to monetary policy followed by the literature of exchange rate pass-through that establishes a link between ERPT and inflation targeting. Section 3 provides comprehensive details of our structural VAR methodology including data description, structural equations and some of the VAR issue. Section 4 contains our empirical results and presents the results on contemporaneous co-efficients, impulse response functions (IRFs) and forecast error variance decomposition (FEDVs). Section 5 tests the sensitivity of our results to an alternative model of SVAR. Sections 6 provide a discussion of our results followed with the conclusion of this paper.

2 Review of Literature

2.1 Exchange Rate Pass-Through and Monetary Policy

The study of Exchange Rate Pass-through on domestic prices has acquired excessive importance during the last two decade due to its far reaching implications for monetary policy. There are various reasons defined in literature for this trend.

- First and the foremost reason is the inability of monetary authorities in forecasting inflation in the presence of high exchange rate pass-through in to domestic prices (Taylor, 2000).
- Second, exchange rate movements in addition to affecting the prices of imported goods and inputs also change the current account position which in turn affects aggregate demand (Woo & Hooper, 1984).
- Third, a high degree of ERPT is often a reason for a country to 'Fear' floating exchange rate and is thus a given rationale for the intervention in the foreign exchange market ((Ball & Reyes, 2008), (Nogueira Junior, 2006)). Consequently, ERPT is a constraint for independent monetary policy and its knowledge is important for effective monetary management.

Although, a number of studies report that ERPT on domestic prices is high for emerging economies as compared to developed economies but almost all studies have consensus that ERPT is incomplete and on declining trend in both groups. Many explanations have been provided at micro or disaggregated level for this changing behavior of ERPT like Demand elasticity in the market, market structure and competitiveness in the market, and composition of goods in the basket of price index ((Choudhri & Hakura, 2006), (Campa & Goldberg, 2002)). However, there is a wide recognition in literature that emphasizes the role of monetary policy and macroeconomic variables in the reduction of ERPT; and considers ERPT more as a macroeconomic phenomenon.

Mishkin highlights the importance of monetary policy in explaining ERPT by saying that "*a stable monetary policy--supported by an institutional framework that allows the central bank to pursue a policy independent of fiscal considerations and political pressures--effectively removes an important potential source of high pass-through of exchange rate changes to consumer prices. Moreover, with expectations of inflation anchored, real shocks arising from various channels--whether from aggregate demand, energy prices, or the foreign exchange rate--will also have a smaller effect on expected inflation and hence on trend inflation"* (Mishkin, 2008).

(Taylor, 2000) argues that the establishment of a strong nominal anchor and credible low inflation policy regime leads to the very low pass-through of exchange rate depreciation to inflation. Moreover, he emphasizes the role of low inflation environment in explaining the decline in ERPT in many countries and shows that the inflation is positively correlated with persistence of inflation, suggesting that the low inflation itself has caused the low pass-through. (Choudhri & Hakura, 2006) tested the hypothesis suggested by (Taylor, 2000) for a large group of 71 countries that includes developing and industrial economies over the time period of 1979 to 2000. While finding a positive and significant association between the pass-through and the average inflation rates across countries and periods, they also infer that the dependency of ERPT

on inflation regimes implies that it would be easier for a country to implement a policy targeting for a low inflation rate. Thus, the importance of credible monetary policy should be emphasized for the realization of the benefits of low pass-through.

The relationship between the exchange rate pass-through and monetary policy regime is also highlighted by (Devereux & Yetman, 2002). They argue that ERPT is endogenous to the monetary policy regime or in other words, ERPT is highly sensitive to the choice of monetary policy; and the slow adjustment of prices (sticky prices) provides a possible explanation for this declining ERPT on domestic prices.

(Gagnon & Ihrig, 2004) while studying the ERPT on domestic inflation in twenty industrial economies during the period of 1971 to 2003; also propose that the anti-inflationary actions and credibility of the monetary authority are important factors behind the reduced pass-through of exchange rate changes into consumer price inflation.

(Goldfajn & da Costa Werlang, 2000) who did a panel study for 71 countries including developed and emerging economies for the period of 1980 to 1998 state that in addition to credible monetary policy regimes and low inflation environment, the cyclical component of output, the extent of initial overvaluation of the real exchange rate (RER), and the degree of openness of the economy are also the important determinants of pass-through; where, the most robust determinants are the real exchange rate overvaluation and the initial inflation.

2.2 Exchange Rate Pass-Through and Inflation Targeting

Despite the escalating importance of credible monetary policy and low inflation environment in the determination of low exchange rate pass-through to domestic inflation, there are very few studies that try to explain the dynamics of ERPT in the context of Inflation targeting (IT) framework. The idea for a possible link between ERPT and Inflation targeting lies in the salient features of IT as this monetary strategy is also characterized by the commitment of central bank for inflation stability, and the credibility of central bank to anchor inflation expectation; the two factors ascribed in literature as the possible explanations of declining ERPT.

(Reyes, 2007) shows analytically that the decline of the pass-through effect, measured as the share of accumulated depreciation that translates into inflation, is an expected result under IT due to fear of floating practices that are justified under this regime. In fact, the declining pass-through is the result of the high incidence that domestic currency depreciation would have on inflation if changes in the nominal exchange rate were left unchecked by an IT central bank. He categorically states that the adoption of IT is the *reason* behind the falling ERPT in emerging

economies as opposed to the studies that say that as the adoption of IT is an endogenous choice, so it is not the case that IT causes a decline in ERPT.

(Edwards, 2006) presents a comprehensive study on the relationship between IT and three specific exchange rate issues i.e., effectiveness of exchange rate as shock absorber; the volatility of exchange rate; and the inclusion of exchange rate in the monetary policy function, for a group of 7 IT countries (2 developed and 5 emerging) during the period of 1986Q1 to 2005Q1. While reinforcing the role of exchange rate as shock absorber, he argues that it is necessary to make a distinction between the pass-through of exchange rate changes into the prices of non-tradables (proxied by CPI) and tradables (proxied by PPI). He concludes that countries that have adopted IT have experienced a decline in the pas-through from exchange rate changes to CPI inflation. There is no evidence, however, of changes in the degree of effectiveness of the nominal exchange rate as a shock absorber as no significant difference is found in the pass-through effect between CPI and PPI.

(Nogueira Junior, 2006) using the structural VAR methodology addresses the question whether ERPT has fallen after the adoption of IT framework for a group of 8 IT countries (3 developed and 5 emerging) for the period 1985M1 to 2004M12 by dividing the sample period into pre and post IT period. He concludes that while ERPT is higher in emerging economies as compared to developed countries but ERPT has declined in all economies after the adoption of IT.

(Mishkin & Schmidt-Hebbel, 2007) compare the economic performance of IT countries before and after the adoption of IT as well as against the control group of non-IT industrial economies. While considering many other measures of economic performance like inflation level and its volatility, interest rate and output volatility; they also study the responsiveness of domestic inflation to oil price and exchange rate shocks using a panel VAR approach for a group of 21 industrial and emerging inflation targeting countries and 13 industrial non-inflation targeting economies during the period of 1989Q1 to 2004Q4. Apart from other benefits of IT (lower inflation in the long run, improve monetary policy efficiency and strength etc.); their results about the responsiveness of domestic inflation to oil price and exchange rate shocks are mixed. Their estimation results show that inflation response to exchange rate movements has not significantly changed with the adoption of IT in the full sample of inflation targeters. It is also shown that in industrial inflation targeters the adoption of both IT and stationary target IT has not lead to change in ERPT compare to their own pre-targeting period and experiences of non-targeters during post-IT period. However, in the sample of emerging inflation targeters, the exchange rate pass-through to consumer prices has fallen after the countries achieved a stationary target but remains positive and significantly different from zero.

3 Data and Methodology

In order to achieve our objective of estimating the exchange rate pass-through on domestic prices for the group of IT and non-IT countries, this section presents the econometric methodology applied in the study. We introduce the baseline SVAR model and a brief description of data followed by the contemporaneous restriction applied using economic theory and some of the VAR issues.

3.1 Model

The Structural VAR model[3] can be described as in (1):

$$A_0 y_t = B_0(L) y_{t-1} + \varepsilon_t \qquad (1)$$

Where A_0 is the matrix of contemporaneous co-efficients, B_0 represents the matrix in the lag operator L, y_t is the $n\,x\,1$ vector of data variables, ε_t is a vector of $n\,x\,1$ serially uncorrelated structural disturbances and $var\,(\varepsilon_t) = \Omega$, where Ω is a diagonal matrix and diagonal elements are the variances of structural disturbances, and therefore the structural disturbances are assumed to be mutually uncorrelated. Associated with this structural model is the general reduced-form VAR which after some basic algebra in (2) takes the final form in (3):

$$y_t = A_0^{-1} B_0(L) y_{t-1} + A_0^{-1} \varepsilon_t \qquad (2)$$

$$y_t = G_0(L) y_{t-1} + u_t \qquad (3)$$

Where $G_0(L)$ is the matrix polynomial in the lag operator ($G_0(L) = A_0^{-1} B_0(L)$) and u_t is the vector of serially uncorrelated residuals in the reduced form VAR termed as the unexpected movement in the variables or reduced form disturbances ($u_t = A_0^{-1} \varepsilon_t$) with $var\,(u_t) = \Sigma$. (VAR reduced-form residuals (u_t) are not the structural shocks (ε_t)).

There are several ways to recover the structural shocks ε_t and the parameter in the structural VAR equation (1) from the estimated parameters in the reduced form VAR equation (3). One way is to impose restrictions on the contemporaneous structural parameters and there should be $\frac{n(n-1)}{2}$ restrictions on A_0 for the equation (1) to be just identified.

Most of the studies have used the recursive approach of Choleski Decomposition of variance-covariance matrix to impose restrictions on A_0 assuming specific ordering of the variables ((McCarthy, 2000), (Choudhri & Hakura, 2006), (Nogueira Junior, 2006), (Ito & Sato, 2007), (Mishkin & Schmidt-Hebbel, 2007)). However, in this paper, we follow non-recursive approach.

[3] We have used SVAR model on panel data set which also takes into the country fixed effects.

We prefer to orthogonalized the innovations of VAR model using structural factorization based on economic relationship rather than using a Choleski decomposition of covariance matrix given the fact that it is highly sensitive to the choice of ordering of the variables and there is different factorization for every ordering.

We apply structural VAR model on panel data setting where; IT countries constitute one panel, and non-IT countries make the second panel. We separated these panels given the modeling characteristics of panel VAR that assumes fixed constant for the countries in panel. This assumption can be avoided in our model for inflation targeting countries under the global supposition of quite similar policy actions and responses expected from them as a group.

3.2 Data

The variables we used are world commodity price index (WCP), monetary base (MB), Interest rate proxied by call money rate (CMR), Domestic prices proxied by consumer price index (CPI), output proxied by index of industrial production (IIP), exchange rate (EX) in the form of local currency over US dollar or nominal effective exchange rate (NEER), international reserves (IR) and Foreign interest rate (FFR) proxied by Federal Fund rate.

$$[WCP \quad MB \quad CMR \quad CPI \quad IIP \quad EX/NEER \quad IR \quad FFR]$$

The exchange rate and domestic price index are the key variables of interest. World commodity prices and foreign interest rate are included to capture supply shocks whereas the other variables are included to control their potential influence on exchange rate pass-through.

We use monthly data given the idea that monetary authorities are more interested in short-run pass-through dynamics, which are relevant for short-term inflation. Data is sourced from IMF IFS database over the sample period of 1991M01 to 2010M08. We divided this sample period into *pre* and *post* IT period. *Pre* IT sample spans from 1991M01 to 1997M06; and *post* IT period spans from 2001M07 to 2010M08. We exclude the time period of Asian financial crisis 1997 from *pre* IT period and the start of the post-IT period is the average of the IT adoption dates of our sample IT countries[4]. In order to compare our group of IT countries with the control group, we also estimate the ERPT for non-IT countries during post-IT period which is also accepted to span from 2001M07 to 2010M08.

The sample countries are the ten rapidly emerging economies of Asia that includes: China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, South Korea, Singapore and Thailand. Among them, Indonesia, Philippines, South Korea and Thailand have adopted *Inflation targeting*

[4] This scheme has been followed from Mishkin and Schmidt-Hebbel (2007)

framework as their monetary policy regime; whereas Hong Kong and Singapore, China, India Malaysia and Pakistan are *non-inflation targeting* economies used as the control group.

3.3 Structural Equations

Following the wisdom of Structural VAR model, we specify the functional form of structural equation of each variable that also reflects information from prior theoretical research.

The following restrictions are applied to the contemporaneous structural parameters of A_0 in (1). All the zero restrictions are on the contemporaneous structural parameters, and no restrictions are imposed on the lagged structural parameters B_0.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & G_{23} & G_{24} & G_{25} & 0 & 0 & 0 \\ 0 & 0 & 1 & G_{34} & G_{35} & G_{36} & 0 & 0 \\ G_{41} & 0 & 0 & 1 & G_{45} & G_{46} & 0 & 0 \\ G_{51} & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ G_{61} & G_{62} & G_{63} & G_{64} & G_{65} & 1 & G_{67} & G_{68} \\ G_{71} & 0 & G_{73} & 0 & 0 & G_{75} & 1 & G_{78} \\ G_{81} & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{WOP} \\ u_{MB} \\ u_{CMR} \\ u_{CPI} \\ u_{IIP} \\ u_{EX} \\ u_{IR} \\ u_{FFR} \end{bmatrix} = \begin{bmatrix} \varepsilon_{WOP} \\ \varepsilon_{MB} \\ \varepsilon_{CMR} \\ \varepsilon_{CPI} \\ \varepsilon_{IIP} \\ \varepsilon_{EX} \\ \varepsilon_{IR} \\ \varepsilon_{FFR} \end{bmatrix}$$

Following (Kim, 2003) and (Kim & Roubini, 2000), the first equation represents the exogenous factor of our model and it is assumed to contemporaneously affect all variables in the system except the money demand and monetary policy functions. The second equation represents the traditional money demand function in which money demand is a function of real income (IIP and CPI) and the opportunity cost of money (nominal interest rate CMR). The output is assumed to be the function of only inflationary pressure of world prices. The exchange rate receives the contemporaneous effect of all variables in the system and represents the equilibrium of financial market. The last equation also represents a supply shock arising from the foreign monetary policy and is affected by the shock of foreign prices.

Apart from the restrictions imposed by (Kim, 2003) and (Kim & Roubini, 2000), in the case of monetary policy reaction function. We assume a Taylor type policy function for Inflation targeting countries in which interest rate respond contemporaneously to inflation, output as well as exchange rate in line with (Sek, 2009). Exchange rate is added to capture any possibility of indirect intervention in forex market by monetary authorities as emerging IT countries are often blamed for due to 'fear of floating' doctrine (Calvo & Reinhart, 2002). The forth equation is the well estimated Philip curve in the literature of ERPT based on single equation model. Following (Edwards, 2006) and (Gagnon & Ihrig, 2004), the inflation respond

contemporaneously to demand shock, exogenous supply shocks and exchange rate shocks. The seventh equation captures the direct intervention of monetary authorities in the forex market; and therefore depends on exchange rate shocks and the differential of domestic and foreign interest rate. This variable has been included in Recursive VAR analysis by (Nogueira Junior, 2006) in which it receives the contemporaneous effect of demand shocks, exchange rate and inflation shocks.

3.4 Expected Sign of the Variables in Structural Equations

The expected signs of the variables according to economic theory as well as the signs expected in Structural VAR are summarized in Table 1.

Table 1: Expected Signs in Structural Equations

Dependent Variable	WCP	MB	CMR	CPI	IIP	EX	IR	FFR
	Economic Relation (Expected sign in Structural VAR)							
WCP	1	-	-	-	-	-	-	-
MB	-	1	Negative (+ve)	Negative (+ve)	Positive (-ve)	-	-	-
CMR	-	-	1	Positive (-ve)	Positive (-ve)	Positive (-ve)	-	-
CPI	Positive (-ve)	-	-	1	Positive (-ve)	Positive (-ve)	-	-
IIP	Negative (+ve)	-	-	-	1	-	-	-
EX	Positive (-ve)	Positive (-ve)	Negative (+ve)	Positive (-ve)	Positive (-ve)	1	Positive (-ve)	Positive (-ve)
IR	-	-	Positive (-ve)	-	-	Negative (+ve)	1	Negative (+ve)
FFR	Positive (-ve)	-	-	-	-	-	-	1

In the function of money demand, a positive shock to interest rate leads to the contraction of money whereas an increase in real incomes produces an expansionary effect.

According to Taylor's Rule, interest rate would rise whenever there is a positive shock to inflation and output; whereas a positive shock to exchange rate (depreciation of local currency) which is added to capture any practice of exchange rate smoothing by monetary authorities would trigger an increase in short term interest rate in order to stabilize the domestic currency.

In the literature of exchange rate pass-through, domestic prices would increase in the event of positive shocks to world commodity prices, output and exchange rate.

The output is expected to fall following a rise in the world prices whereas foreign interest rate will rise.

An increase in interest rate leads to the appreciation of exchange rate (negative exchange rate), whereas increase in FFR leads to the depreciation of domestic exchange rate (positive exchange rate). An increase in world prices, domestic prices and output should lead to exchange rate depreciation.

The standard economic theory suggests that the immediate response of international reserves to a positive monetary policy shock should be positive. Whenever there is an increase in domestic interest rate, it results into the appreciation of domestic currency and triggers an increase in international reserves denominated in US dollars whereas the reverse is true in the case of increase in the foreign interest rate. In case of exchange rate, a positive shock (depreciation of local currency) would prompt a purchase of domestic currency and would results into the sale of foreign reserves.

3.5 VAR Issues

Having decided the variables to be used and the identification scheme of structural VAR, the variables are tested for stationarity in order to decide whether structural VAR should be used in level form, differenced form or a Vector Error Correction Model would be more viable. Table 2 reports the results of panel unit root tests.

Table 2: Panel Unit Root Test Results

	Inflation Targeter				**Non-Inflation Targeter**	
Variables	Pre IT (1991M01-1997M06)		Post IT (2001M06-2010M08)		Post IT (2001M06-2010M08)	
	Levin, Lin & Chu	Breitung	Levin, Lin & Chu	Breitung	Levin, Lin & Chu	Breitung
Lniip	3.3135***	-1.0856	7.2081***	-1.7134	5.3150	-1.7029
d(lniip)	11.098***	-7.352***	20.366***	-8.747***	-3.571***	-0.5394
Lncpi	1.3791*	0.6184	1.5571*	0.2225	-0.2342	4.0222
d(lncpi)	13.905***	-7.422***	15.829***	-11.08***	-20.19***	2.8631
Lnmb	0.69485	0.55057	1.9538**	0.2283	-1.0745	-1.3940*
d(lnmb)	6.8696***	-3.835***	19.711***	-4.903***	-27.27***	-6.062***
Lnir	3.2235	3.7112	0.8155	0.0255	1.9823	3.4903
d(lnir)	19.050***	-4.445***	16.699***	-11.17***	-18.91***	-15.507***
Dlnxr	0.16208	-1.5039*	0.1507	-1.8713**	-1.7945**	0.7135
d(lnxr)	12.025***	-8.296***	17.545***	-4.441***	-15.20***	-7.536***
Cmr	4.8685***	-2.385***	0.1348	-0.5131	-0.6642	-1.4233*
d(cmr)	23.547***	-12.87***	18.115***	-8.269***	-27.66***	-16.971***
	ADF	PP	ADF	PP		
Ffr	-2.1505	-2.7760	-2.4638	-1.1147		
d(ffr)	-2.6491	-7.264***	-4.303***	-4.116***		
Lnwcp	-0.16832	0.56898	-3.6557**	-2.3610		
d(lnwcp)	-2.6396	-2.5311	-7.180***	-7.0535***		

Note: *** denotes significance of test statistic at 1% level
** denotes significance of test statistic at 5% level
* denotes significance of test statistic at 10% level

d denotes the first difference of the series where all series are in logarithm form except *cmr* and *ffr*
Levin, Lin & Chu test and Breitung test are the common unit root tests and their specification consists of constant term, trend term and SIC based lags both for level and differenced variable
In case of *wcp* and *ffr*, we conduct ADF and PP tests for stationarity

Given the non-stationarity of the variables both in IT and non-IT countries in *pre* and *post* IT period, we opted for a structural VAR model in differenced form in order to generate efficient estimators. In the existence of co-integrating vector, however, favoring a VAR in first differences, as opposed to a Vector Error Correction model (VECM) may lead to misspecification. But given the focus of this paper on short term dynamics as opposed to long term equilibrium relationships as well as the relatively short sample period available for Asian emerging economies, our choice seems a viable option. Moreover, VECM would yield inconsistent and biased estimates if the wrong co-integration vector is imposed on the model.

We estimate panel SVAR model for inflation targeters before (*pre* IT) and after (*post* IT) the adoption of inflation targeting framework and for non-targeters during post IT period. The length of lag is determined by referring to the optimum lag suggested by Akaike and Schwarz Information Criterion as well as a number of specification tests[5]. All these variables are in the log form except domestic and foreign interest rates (*cmr* and *ffr*); and the models are estimated with constant, seasonal dummies and trend as exogenous variables.

4 Empirical Results

The results of structural VAR are based on the contemporaneous coefficients in SVAR model, the impulse responses and the forecast error variance decompositions. These results together are used to draw inference about the pass-through from exchange rate fluctuations to domestic prices. Contemporaneous coefficients will indicate the immediate response of domestic prices to the shocks to exchange rate, world commodity prices and output. Impulse response functions (IRFs) trace out the expected responses of current and future values of domestic prices to a shock in one of the VAR equations; whereas variance decompositions (FEDVs) provide the percentage of the variance of the error made in forecasting domestic prices at a given horizon due to a specific shock more specifically exchange rate shock.

4.1 Contemporaneous Coefficients

Appendix 1 summarizes our result of estimated coefficients. We needed to impose 28 restrictions on the matrix A_0 for our model to be just *identified*, but we imposed 35 restrictions which mean that our model is over-identified by 7 restrictions. However, the log likelihood test

[5] The optimal lag length varies with the sample period and for IT and non-IT groups.

suggests that the over-identified restrictions are valid as the null hypothesis cannot be rejected even at 10% level of significance in any case.

In case of inflation targeting countries, the contemporaneous response of domestic prices to the exchange rate shocks in the post IT adoption period is although *negative* but insignificant which means that the depreciation of exchange rate leads to a decline in inflation.

$$u_{dcpi,t} = \underbrace{1.1454}_{(0.0001)} u_{dwcp,t} - \underbrace{0.0114}_{(0.1126)} u_{diip,t} - \underbrace{0.1810}_{(0.1379)} u_{dex,t} + \varepsilon_{dcpi} \qquad (4)$$

Equation (4) suggests that a 10 percent depreciation of the exchange rate at T=1 will decrease the inflation rate by 1.81 percent in the group of IT countries contemporaneously. Although, the vast strand of literature on ERPT suggests that the depreciation of currency should lead to an increase in inflation. But there are few recent studies that report either the non-existence of exchange rate pass-through or even the negative relationship between exchange rate depreciation and inflation for some economies ((Ca' Zorzi, Hahn, & Sánchez, 2007), (Mwase, 2006)). Moreover an explanation for this inverse behavior has been provided by (He, Liu, & Zhang, 2009). They show theoretically and empirically that depreciation can lead to fall in inflation as the central bank will tend to offset the depreciation by purchasing local currency with Forex Reserves, which, in turn, makes the money supply decrease. The tightening monetary policy will lead the price to go down instead of going up. As the two effects are conflicting with each other thus ERPT can be positive, negative or unobvious in different countries since the control power of the central banks differs from country to country.

Our results also show that the impact of foreign prices shocks on domestic prices in positive as well as significant where the inflation in these economies increase by 11.45 percent due to an increase of 10 percent in world's prices.

In comparison to post-IT period, before the adoption of inflation targeting, however, our results do not suggest any significant impact of exchange rate shocks and world commodity price shocks to domestic inflation (Equation 5).

$$u_{dcpi,t} = \underbrace{0.1814}_{(0.2103)} u_{dwcp,t} - \underbrace{0.0103}_{(0.0877)} u_{diip,t} - \underbrace{0.0173}_{(0.8485)} u_{dex,t} + \varepsilon_{dcpi} \qquad (5)$$

For the group of non-inflation targeters, the contemporaneous impact of the exchange rate shock on inflation in the post IT period is positive suggesting that the depreciation of exchange rate would lead to a rise in inflation in non-inflation targeting countries.

$$u_{dcpi,t} = \underbrace{1.0908}_{(0.0000)} u_{dwcp,t} - \underbrace{0.0048}_{(0.2324)} u_{diip,t} + \underbrace{0.0995}_{(0.0021)} u_{dex,t} + \varepsilon_{dcpi} \qquad (6)$$

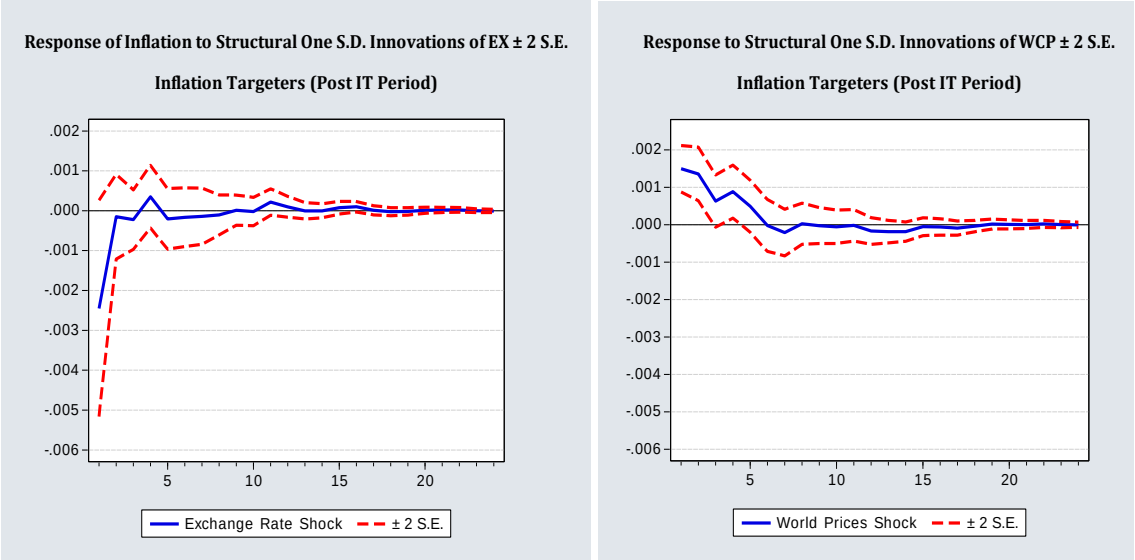
The pass-through though significant is low in these economies where 10 percent depreciation results in an increase of 1 percent in inflation. However, again, the impact of foreign prices shocks on inflation is much stronger here where a 10 percent increase in foreign prices will lead to a rise of 10.9 percent in domestic inflation.

4.2 Impulse Response Functions (IRFs)

Figure 1 shows the impulse response of domestic prices to structural innovations of exchange rate and world commodity prices for IT countries during the post IT period. The middle line shows the response of inflation to shocks whereas the upper and lower dashed lines are the two standard deviations bands.

During the post-IT period, the expected response of current and future inflation to exchange rate shocks is not only low (close to zero) rather the only noteworthy response is at T=1 when this response is negative indicating that a 10 percent depreciation of exchange rate results into an immediate expected fall in inflation of 0.02 percent. This largely follows from the contemporaneous negative relationship between exchange rate and inflation shocks in the estimated system of SVAR. At T=4, the response of inflation to exchange rate shocks though becomes positive where a 10 percent depreciation translates into a rise of 0.0035 percent inflation; but since then the response is almost zero where it completely dies out after 4 quarters (T=12).

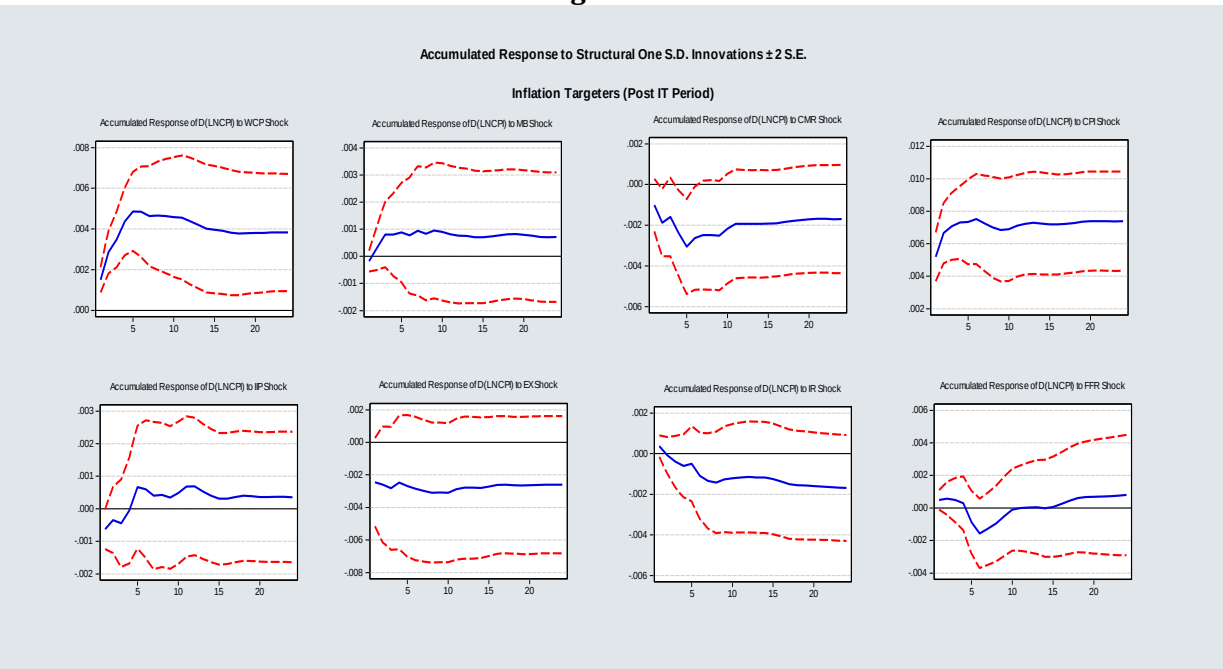
Figure 1



In addition to the response of inflation to exchange rate shocks, Figure 1 also shows the response of inflation to the structural innovations of world commodity prices. This response though is positive but again is very small where 10 percent increase in world prices leads to an expected increase of around 0.01 percent at T=1 where it becomes non-existent after T=6 when the response is not statistically different from zero. The accumulated response functions in

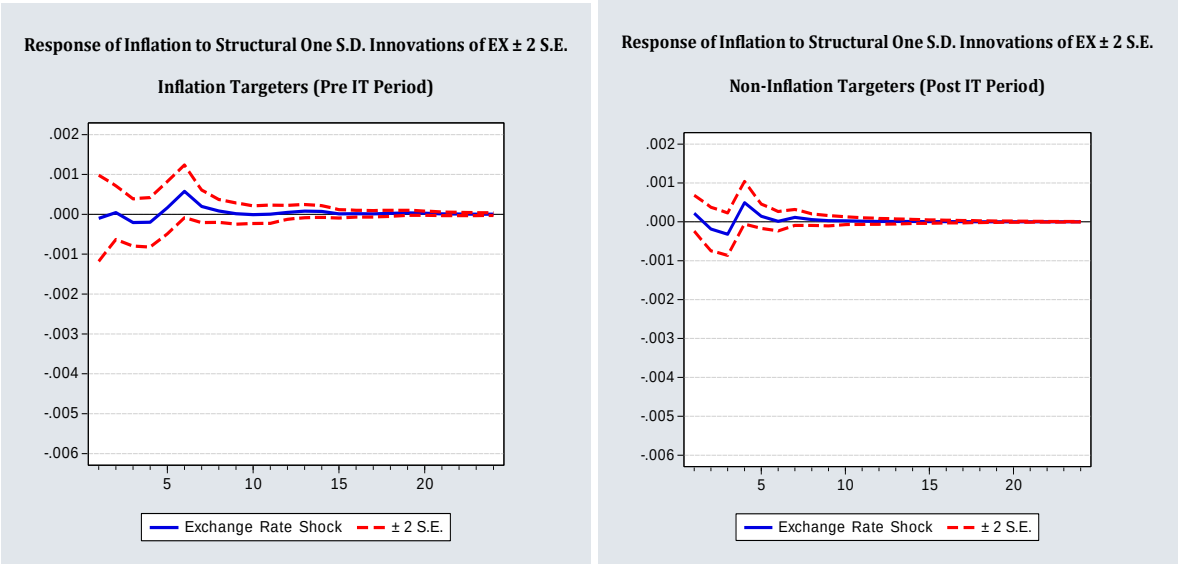
Figure 2 show that response of inflation to its own shocks is rather stronger than to the shock of exchange rate and world prices.

Figure 2



In order to trace out what has been the expected behavior of pass-through in IT economies in pre-IT period and did the adoption of IT made any difference in this behavior; Figure 3 provides a comparison by showing the response of inflation to exchange rate shocks in IT countries in the pre-IT period[6]. It shows that even before the adoption of IT, the ERPT has been very low in IT economies where a 10 percent depreciation of exchange rate triggered an expected increase of only 0.0057 percent at T=6; and afterward it has been almost non-existent.

Figure 3



[6] Appendix 2 shows the accumulated impulse response of inflation to the structural innovations of exchange rate, foreign prices and domestic inflation for IT countries in pre IT period and for non-IT countries in post IT period)

Figure 3 also provides a comparison of the exchange rate pass-through to domestic prices in non-inflation targeting countries during the post-IT era. In contrast to inflation targeting countries, the expected response of current inflation to exchange rate shocks is positive in these economies at T=1 in line with our results of contemporaneous relationship between exchange rate and inflation. However, the size of ERPT is even lower in non-IT countries as compared to IT countries where the exchange rate depreciation of 10 percent triggers an expected rise of only 0.0022 percent in inflation. Moreover, the pass-through becomes non-existent after T=5.

4.3 Variance Decompositions

In this section, we complement our analysis of impulse response functions with the results of variance decompositions as the former give information only on the size of the exchange rate pass-through to domestic prices and the latter highlights the importance of exchange rate shocks in explaining the fluctuations and the volatility of domestic prices.

Table 3 shows the variance decomposition of inflation for the group of IT countries before and after the adoption of inflation targeting. During post-IT period, the volatility of inflation is mainly driven by domestic inflation where domestic prices account for 72 percent in the volatility of inflation at T=1. The Exchange rate shocks account for about 16 percent of the inflation fluctuations at T=1 where this impact reduces to about 12 percent after 8 quarters. However, the importance of foreign prices in explaining inflation variance increases with the passage of time where this impact is 6 percent at T=1 and 11 percent at T=24.

Table 3: Variance Decompoistion of Inflation: IT Countries (Post IT period)

Variance Decomposition of Inflation To Shocks									
Period	S.E.	WCP	MB	CMR	CPI	IIP	EX	IR	FFR
1	0.006	6.039	0.082	2.728	72.85	1.063	16.201	0.369	0.663
2	0.006	9.639	0.615	4.175	68.81	1.121	14.242	0.802	0.591
3	0.006	10.322	1.170	4.256	67.52	1.116	14.007	1.009	0.591
4	0.006	11.634	1.123	5.467	64.92	1.407	13.718	1.064	0.654
8	0.007	11.213	1.141	6.307	59.65	2.414	12.736	1.862	4.667
12	0.007	11.088	1.173	6.543	58.82	2.502	12.634	1.885	5.346
24	0.007	11.177	1.184	6.518	58.44	2.591	12.578	1.959	5.543

The decomposition of inflation volatility was different in IT countries before the adoption of IT where this volatility was mainly determined by the volatility of past inflation and the role of exchange rate fluctuations along with world prices seemed to be very weak (Table 4).

Table 4: Variance Decomposition of Inflation: IT Countries (Pre IT Period)

Variance Decomposition of Inflation To Shocks									
Period	S.E.	WCP	MB	CMR	CPI	IIP	EX	IR	FFR
1	0.0046	0.501	0.0001	0.004	98.388	1.042	0.0474	0.015	0.0006
2	0.0048	0.477	0.0385	0.312	95.796	2.814	0.0497	0.130	0.3798
3	0.0049	0.596	0.0414	0.973	93.827	2.898	0.2240	0.184	1.2540
4	0.0049	0.620	0.1773	1.302	92.494	3.520	0.3809	0.187	1.3153
8	0.0051	0.646	0.4655	1.578	88.968	4.053	1.9136	0.623	1.7493
12	0.0051	0.977	0.5179	1.594	88.366	4.088	1.9101	0.724	1.8212
24	0.0051	1.121	0.5387	1.597	88.080	4.086	1.9593	0.782	1.8329

Compared to IT countries, Table 5 indicates that the role of exchange rate in explaining the fluctuation of domestic prices in non-IT countries is almost non-existent during post IT period whereas the impact of domestic prices on the volatility of domestic inflation is at its peak. The volatility of inflation being explained by domestic prices and exchange rate is 94 percent and 0.11 percent respectively with the increasing role of international commodity prices in the fluctuation of domestic commodity prices from 3.7 percent at T=1 to 7.6 percent at T=24.

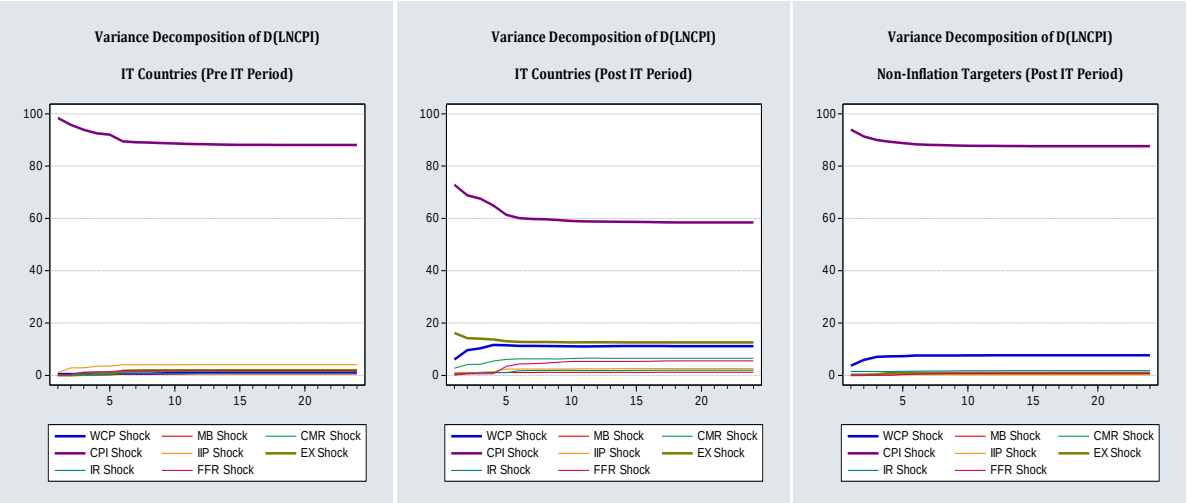
Table 5: Variance Decomposition: Non-IT Countries (Post IT period)

Variance Decomposition of Inflation To Shocks									
Period	S.E.	WCP	MB	CMR	CPI	IIP	EX	IR	FFR
1	0.006	3.713	0.0027	0.4452	93.957	0.2603	0.1147	1.4655	0.0399
2	0.007	5.904	0.3268	0.4251	91.330	0.2547	0.1861	1.5285	0.0431
3	0.007	7.098	0.3142	0.4244	89.977	0.2743	0.3958	1.4695	0.0462
4	0.007	7.267	0.3008	0.5441	89.274	0.2619	0.8696	1.4362	0.0444
8	0.007	7.573	0.3234	0.5566	88.006	0.2650	0.9207	1.6732	0.6801
12	0.007	7.662	0.3229	0.5680	87.694	0.2647	0.9212	1.7837	0.7825
24	0.007	7.679	0.3248	0.5723	87.611	0.2645	0.9207	1.8325	0.7939

Figure 4 while highlighting the comparison of IT countries between pre and post IT period on the one hand and the comparison between IT and non-IT countries in post-IT period on the other hand conclude our earlier evidences on variance decompositions. It underlines few important results.

While comparing IT economies during pre and post IT period; firstly, fluctuation in inflation is mostly driven by domestic price shocks, exchange rate shocks and foreign prices shocks after the adoption of inflation targeting; whereas during pre IT period, the fluctuations of domestic prices were the only main driver for the volatility of inflation. Secondly, when we compare IT and non-IT countries during post IT period, we find that though fluctuations in inflation is mostly driven by domestic price and foreign prices shocks in both groups; the shocks to exchange rate are much important and significant for inflation targeters as compared to non-inflation targeters.

Figure 4



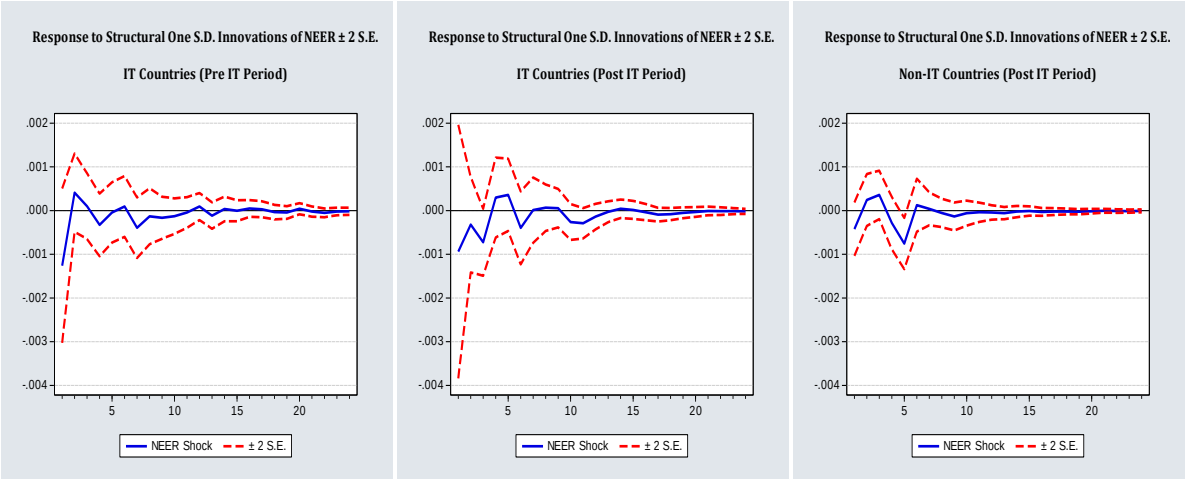
5 Robustness Tests/ Alternate Model

In this section, we test the robustness of our results to the choice of nominal exchange rate and in this alternative model, instead of using US denominated exchange rate; we use nominal effective exchange rate (where an increase in NEER means appreciation of domestic currency against a basket of currencies) given the argument that it can better capture the changes in the import costs that would influence the domestic prices (Ito & Sato, 2007).

Figure 5 shows the impulse response of inflation to the structural innovations of effective exchange rate for the group of IT countries in the pre and post IT period and for the group of non-IT countries during post-IT period.

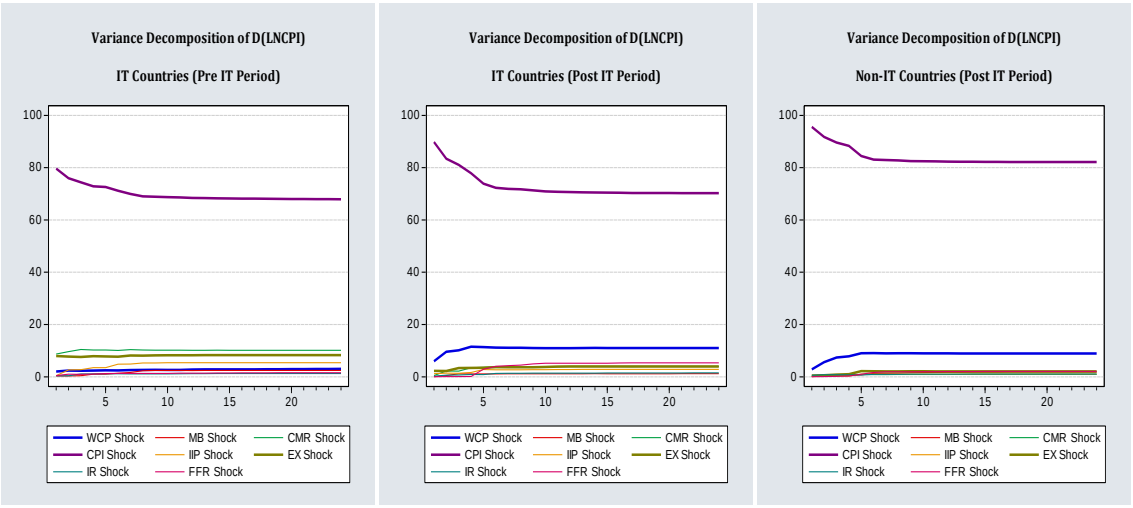
Our estimates of pass-through under this alternative model of exchange rate are generally very similar to those discussed in the previous section with few exceptions for the group of IT economies; which make them even greatly closer to recent studies on pass-through. Our results show though after the adoption of IT, the response of inflation to exchange rate shocks has slightly fallen where the depreciation of 10 percent creates the inflation of 0.0098 percent during post IT period. But in line with the overall results of our baseline model, this responsiveness has been low in these economies even before the adoption of IT where the depreciation of 10 percent creates the inflation of 0.012 percent. For the group of non-IT countries, our earlier results are robust to nominal effective exchange rate where the responsiveness of inflation has been even much lower in non-IT countries as compared to IT countries during post IT period.

Figure 5



The results of inflation variance decomposition also do not change in our alternative model for these two groups. Figure 6 shows the variance decomposition of inflation for IT countries during pre and post IT period and the comparison of IT economies with non-IT group during the post IT period.

Figure 6



The fluctuations in inflations are mainly driven by domestic inflation with the increasing role of foreign prices for IT and non-IT economies during the post IT period in line with our base model. However, the decomposition of inflation variance here shows the weak role of nominal effective exchange rate in explaining the fluctuations of inflation for the group of IT countries during post-IT period; whereas our results of base line model indicate that US denominated exchange rate has been an important components in the volatility of inflation.

6 Discussion

The results of our baseline model with US denominated exchange rate and alternative model with nominal effective exchange rate signal the apparent absence of pass-through in Asian

economies irrespective of their monetary regimes (inflation targeters vs. non-targeters) since 1990s. The very low level of exchange rate pass-through in Asian economies has been extensively documented in literature. (Ca' Zorzi, Hahn, & Sánchez, 2007) examined the ERPT for the countries from three different continents of the world including few Asian economies and found that pass-through is not only low in Asian economies (Hong Kong, China and South Korea) rather for some countries (e.g., Singapore), it is also negative. Similarly, some other studies while considering the ERPT on country level found that ERPT is zero or non-existent in some of the Asian economies like Pakistan and Singapore (Choudhri & Hakura, 2006). (Bhattacharya, Patnaik, & Shah, 2008) estimated the ERPT to CPI inflation in India and they conclude that the accumulated response of CPI inflation to exchange rate shock is very low where 10 percent depreciation leads to an increase of only 0.05 percent after 5 months.

While comparing the behavior of exchange rate pass-through for Asian IT economies during pre and post IT period; we find that even before the adoption of Inflation Targeting, the pass-through was very low in these economies almost close to zero which during the post IT period on the one hand turned out to be against the economic convention that the depreciation of domestic currency vis-à-vis US dollar is associated with a fall in inflation while on the other hand left the pass-through of nominal effective exchange rate to inflation largely unchanged with little drop. Finally by comparing the group of inflation targeters after the adoption of inflation targeting to the group of non-inflation targeters in post 2000 era, we find no difference between these two groups as the pass-through has been non-existent in non-IT economies too during post IT period. More precisely, we can say that on the one hand, the ERPT is absent in Asian IT and non-IT economies since 1990s; while on the other hand, for the group of IT economies, the adoption of IT has not lead to change in ERPT compare to their own pre-targeting period and the experiences of non-targeters after 2000s which is accepted as the average adoption date.

There can be many factors behind this unchanged behavior of ERPT for IT countries after the adoption of IT compare to their own pre-targeting period and the experiences of non-targeters during post-IT period.

The first possible factor that could have changed the behavior of ERPT for IT countries after the adoption of IT compare to their own pre-targeting period and the experiences of non-targeters during post-IT period is through the achievement of low inflation environment given the widely accepted argument that low inflation is associated with low ERPT. However, the world economy have experienced global disinflation since the mid-1990s (Siklos, 1999). Both industrial and emerging market countries – regardless of their monetary policy stance-- have had lower inflation environment since the mid-1990s. Moreover, there are plentiful of empirical studies

that report the indifference of inflation performance between IT and non-IT countries during the post IT period ((Ball & Sheridan, 2003), (Naqvi & Rizvi, 2010)). Therefore, the indifference of inflation environment and inflation performance between IT and non-IT countries as well as the prevalence of disinflation even before the adoption of IT explains this unchanged behavior.

The second possible factor that could have created a difference in ERPT for IT economies after the adoption of IT relative to pre-targeting period and other control group countries is by making their monetary policy more credible. As the credibility of monetary policy is directly related and is the fundamental characteristic of the inflation targeting, consequently, the credible monetary policy channel might be accepted as the basic effect of IT regime on the decline of ERPT ((Mishkin & Schmidt-Hebbel, 2007), (Gagnon & Ihrig, 2004)). However, given the estimation results that ERPT was low in these economies even before the adoption of IT as well as in non-IT economies, it is difficult to identify that this low level of pass-through in IT Asian economies is due to the adoption of credible IT policy. Moreover, a credible monetary policy needs not always to be the inflation targeting regime as argued by the proponents of fixed exchange rate regimes. They also claim that fixed exchange rate regime fosters credibility in economic policies by imposing an automatic mechanism that regulates money and interest rate as well as by importing the credible monetary policy (Baqueiro, Díaz de León, & Torres, 2003).

The third possible factor that could explain the behavior of low zero ERPT in IT economies during post IT adoption period is the "fear of floating" argument raised by (Reyes, 2007). He analytically shows that the decline of the pass-through effect, measured as the share of accumulated depreciation that translates into inflation, is an expected result under IT due to fear of floating practices that are justified under this regime. In fact, the declining pass-through is the result of the high incidence that domestic currency depreciation would have on inflation if changes in the nominal exchange rate were left unchecked by an IT central bank. Given this argument as the possible reason for low pass-through in IT economies, we can say that even before the adoption of IT, the central banks of these economies were concerned about the depreciation of currencies; if not because of its negative impact on inflation outlook and inflation expectations then probably due to its long recognized negative effect on dollar liabilities (Eichengreen, 2002); which left the behavior of ERPT unchanged in these economies after the adoption of IT compare to pre-IT period.

Another important factor can be the role of globalization and higher competition investigated by (Chen, Imbs, & Scott, 2004). They claim that not only monetary policy, but also globalization i.e., the entry of India, China and Eastern Europe in the trading system and higher competition have contributed to the little transmission of exchange rate shocks to domestic prices in the 1990s.

However, despite the findings that ERPT is absent or non-existent in Asian economies since 1990s and there is no difference in its behavior for IT economies during pre and post IT period and in comparison to non-IT economies; it does not mean that ERPT is no longer an issue for these economies as also argued by (Nogueira Junior, 2006)[7]. Our estimation results of variance decomposition highlight this issue as exchange rate is still an important component in explaining the volatility of inflation in IT economies. Moreover, following our findings that the shocks of foreign prices have important explanatory power in the volatility of domestic inflation we can say that pass-through from exchange rate or foreign price shocks still impose a problem for the central banks of IT economies.

7 Conclusion

This paper set out to assess the effect of the adoption of inflation targeting frameworks on the behavior of exchange rate pass-through to domestic inflation focusing on the four Asian countries which have adopted IT during the period of 1990-2010. We also compared the behavior of ERPT in the group of IT economies during post IT period against the control group of those Asian economies that have some other monetary regimes in place. To conduct this empirical work, we used non-recursive structural VAR approach using panel data of ten Asian economies (4 targeters, 6 non-targeters). We orthogonalized the innovations of VAR model using structural factorization based on economic relationship rather than using a Choleski decomposition of covariance matrix given the fact that it is highly sensitive to the choice of ordering of the variables and there is different factorization for every ordering.

The results of our baseline model with US denominated exchange rate and alternative model with nominal effective exchange rate signal the absence of pass-through in Asian economies irrespective of their monetary regimes (inflation targeters vs. non-targeters) since 1990s. While comparing the behavior of exchange rate pass-through for Asian IT economies during pre and post IT period; we find that even before the adoption of Inflation Targeting, the pass-through was very low in these economies almost close to zero which during the post IT period on the one hand turned out to be against the economic convention that the depreciation of domestic currency vis-à-vis US dollar is associated with a fall in inflation while on the other hand left the pass-through of nominal effective exchange rate to inflation largely unchanged. Finally by comparing the group of inflation targeters after the adoption of inflation targeting to the group of non-inflation targeters in post 2000 era, we find no difference between these two groups as the pass-through has been non-existent in non-IT economies too during post IT period.

[7] While reinforcing the view of Reyes (2004) that we are unable to see pass-through in IT economies because of fear of floating practice; he conclude that the Central Banks in IT economies may choose to smooth short-run exchange rate movements to attain its target inflation rate. This does not mean that the Central Banks do not allow the currency to adjust to a new long run equilibrium following a shock, but that it will not let this movement interfere with their attainment of the inflation targets.

More precisely, we can say that on the one hand, the ERPT is absent in Asian IT and non-IT economies since 1990s; while on the other hand, for the group of IT economies, the adoption of IT has not lead to change in ERPT compare to their own pre-targeting period and the experiences of non-targeters after 2000s which is accepted as the average adoption date.

However, our results of variance decompositions highlight the issue that exchange rate is still an important component in explaining the volatility of inflation in IT economies. Moreover, following our findings that the shocks of foreign prices have important explanatory power in the volatility of domestic inflation we can say that pass-through from exchange rate or foreign price shocks still impose a problem for the central banks of IT economies.

8 Bibliography

Ball, C. P., & Reyes, J. (2008). Inflation Targeting or Fear of Floating in Disguise: A Broader Perspective. *Journal of Macroeconomics, 30(1)* , 308 - 326.

Ball, L., & Sheridan, N. (2003). Does Inflation Targeting Matter? *International Monetary Fund Working Paper WP/03/129* .

Baqueiro, A., Díaz de León, A., & Torres, A. (2003). *Fear of Floating or Fear of Inflation? The role of the Exchange Rate Pass-through.* Retrieved 2010, from Bank of International Settlements: www.bis.org/publ/bppdf/bispap19n.pdf

Bhattacharya, R., Patnaik, I., & Shah, A. (2008, March 27). *Exchange Rate Pass-Through in India.* Retrieved 2010, from National Institute of Public Finance and Policy: macrofinance.nipfp.org.in/PDF/sl_0211_bhattacharya.pdf

Ca' Zorzi, M., Hahn, E., & Sánchez, M. (2007). Exchange Rate Pass-Through In Emerging Markets. *European Central Bank Working Paper Series No. 739* .

Calvo, G. A., & Reinhart, C. M. (2002). Fear of Floating. *The Quarterly Journal of Economics, CXVII (2)* .

Campa, J. M., & Goldberg, L. S. (2002). Exchange Rate Pass-Through Into Import Prices: A Macro Or Micro Phenomenon? *National Bureau of Economic Research Working Paper 8934* .

Chen, N., Imbs, J., & Scott, A. (2004). Competition, Globalization and the Decline of Inflation. *Centre for Economic Policy Research Discussion Paper 4695* .

Choudhri, E. U., & Hakura, D. S. (2006). Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter? *Journal of International Money and Finance, 25* , 614-639.

Devereux, M. B., & Yetman, J. (2002). Price Setting and Exchange Rate Pass-Through: Theory and Evidence. *Hong Kong Institute for Monetary Research Working Paper 22/2002* .

Edwards, S. (2006). The Relationship Between Exchange Rates and Inflation Targeting Revisited. *National Bureau of Economic Research Working Paper 12163* .

Eichengreen, B. (2002). Can Emerging Markets Float? Should They Inflation Target? *Central Bank of Brazil Working Paper Series 36* .

Gagnon, J. E., & Ihrig, J. (2004). Monetary Policy and Exchange Rate Pass-Through. *International Journal of Finance and Economics, 9* , 315-338.

Goldfajn, I., & da Costa Werlang, S. R. (2000). The Pass-through from Depreciation to Inflation: A Panel Study. *Central Bank of Brazil Working Paper Series No. 5* .

He, Y., Liu, W., & Zhang, H. (2009). Analysis on Exchange Rate Pass-Through with Evidence from Northeast Asia. *International Symposium on Risk Management and Derivatives (ISRMD).* Xiamen, China.

Ito, T., & Sato, K. (2007). Exchange Rate Pass-Through and Domestic Inflation: A Comparison between East Asia and Latin American Countries. *Research Institute of Economy, Trade and Industry Discussion Paper Series 07-E-040* .

Kim, S. (2003). Monetary Policy, Foreign Exchange Intervention, and the Exchange Rate in a Unifying Framework. *Journal of International Economics, 60* , 355-386.

Kim, S., & Roubini, N. (2000). Exchange Rate Anomalies in the Industrial Countries: A Solution with a Structural VAR Approach. *Journal of Monetary Economics, 45* , 561-586.

McCarthy, J. (2000). Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialised Economies. *Federal Reserve Bank of New York Staff Report No. 111* .

Mishkin, F. S. (2008). Exchange Rate Pass-Through and Monetary Policy. *National Bureau of Economic Research Working Paper 13889* .

Mishkin, F. S., & Schmidt-Hebbel, K. (2007). Does Inflation Targeting Make A Difference? *National Bureau of Economic Research Working Paper 12876* .

Mwase, N. (2006). An Empirical Investigation of the Exchange Rate Pass-Through to Inflation in Tanzania. *International Monetary Fund Working Paper WP/06/150* .

Naqvi, B., & Rizvi, S. K. (2010). Inflation Targeting Framework: Is the Story Different for Asian Economies? *EuroConference, 16-18 July.* Milas, Turkey.

Nogueira Junior, R. P. (2006). *Inflation Targeting, exchange rate pass-through and "Fear of Floating".* Retrieved 2010, from University of Kent Discussion Paper 0602: ftp://ftp.ukc.ac.uk/pub/ejr/RePEc/ukc/ukcedp/0605.pdf

Reyes, J. (2007). Exchange Rate Pass-through Effect and Inflation Targeting in Emerging Economies: What is the Relationship? . *Review of International Economics, 15(3)* , 538 - 559.

Sek, S. K. (2009). Interactions between Monetary Policy and Exchange Rate in Inflation Targeting Emerging Countries: The Case of Three East Asian Countries. *International Journal of Economics and Finance, 1 (2)* .

Siklos, P. L. (1999, March/April). *Inflation-Target Design: Changing Inflation Performance and Persistence in Industrial Countries.* Retrieved 2010, from Federal Reserve Bank of St. Louis Review : http://research.stlouisfed.org/publications/review/1999index.html

Stulz, J. (2007). Exchange Rate Pass-Through in Switzerland: Evidence from Vector Autoregressions. *Swiss National Bank Economic Studies, No. 7* .

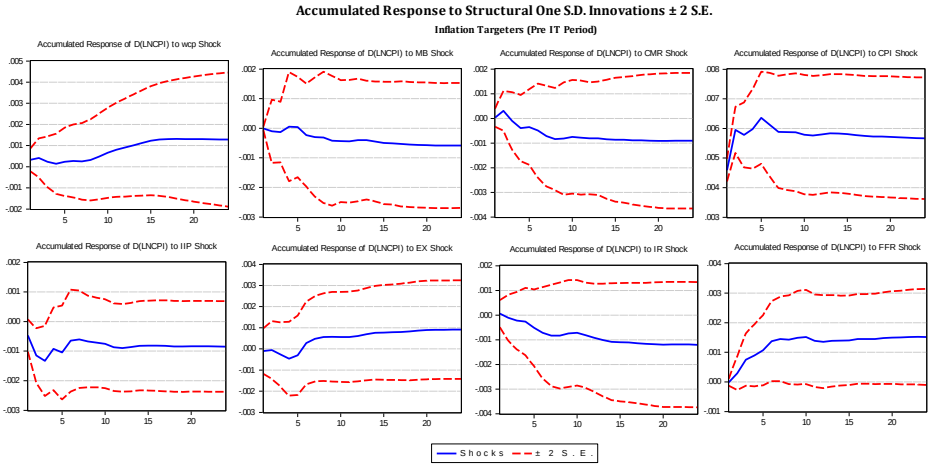
Taylor, J. B. (2000). Low Inflation, Pass-Through and the Pricing Power of Firms. *European Economic Review, 44* , 1389-1408.

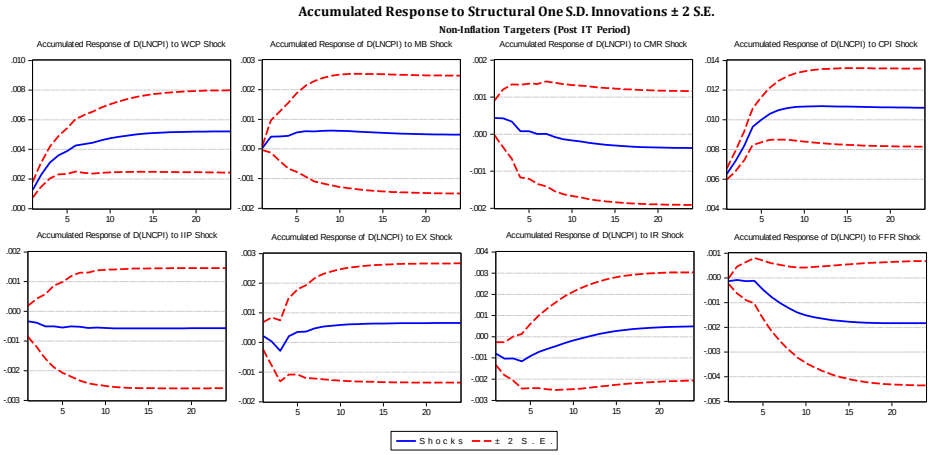
Woo, W., & Hooper, P. (1984). Exchange Rates and the Prices of Nonfood, Nonfuel Products. *Brookings Papers on Economic Activity, 2* , 511-530.

Appendix 1: Estimated Coefficients of SVAR (Baseline Model)

SVAR Equations			Inflation Targeter		Non-Inflation Targeter
		Co-efficients	Pre IT (1991M01-1997M06)	Post IT (2001M06-2010M08)	Post IT (2001M06-2010M08)
Inflation		A_{23}	0.0888	0.0045	-0.0045
			(0.8933)	(0.1788)	(0.0104)
		A_{24}	-0.5079	-1.5744	0.0674
			(0.9469)	(0.0004)	(0.7291)
		A_{25}	0.2143	0.0565	0.0407
			(0.8627)	(0.2279)	(0.0402)
		A_{32}	-111.25	-	-
			(0.7984)		
		A_{34}	-43.046	-21.921	3.1726
			(0.7790)	(0.2109)	(0.6216)
		A_{35}	-1.7461	-2.4492	0.9250
			(0.9169)	(0.0065)	(0.1059)
		A_{36}	-243.022	17.2601	34.9079
			(0.7891)	(0.0906)	(0.0893)
	WCP	A_{41}	-0.1814	-1.1454	-1.0908
			(0.2103)	(0.0001)	(0.0000)
	IIP	A_{45}	0.0103	0.0114	0.0048
			(0.0877)	(0.1126)	(0.2324)
	EX	A_{46}	0.0173	0.1810	-0.0995
			(0.8485)	(0.1379)	(0.0021)
		A_{51}	-0.3893	-0.1804	-1.2122
			(0.7813)	(0.9322)	(0.5563)
Exchange Rate	WCP	A_{61}	-0.0891	2.9321	0.1242
			(0.7561)	(0.0679)	(0.8685)
	MB	A_{62}	-0.0494	-0.0322	-0.0910
			(0.2973)	(0.2786)	(0.0507)
	CMR	A_{63}	0.0004	-0.0100	-9.93E-05
			(0.7717)	(0.0792)	(0.9775)
	CPI	A_{64}	-0.1005	-1.6131	-0.0243
			(0.6481)	(0.0948)	(0.8396)
	IIP	A_{65}	-0.0131	-0.0094	-0.0101
			(0.2251)	(0.7251)	(0.4196)
	IR	A_{67}	0.1004	0.1391	0.5199
			(0.4204)	(0.1775)	(0.0588)
	FFR	A_{68}	-0.0051	0.0337	0.0047
			(0.2565)	(0.0008)	(0.5052)
		A_{71}	1.5587	-1.5644	-12.281
			(0.3542)	(0.0956)	(0.3517)
		A_{73}	0.0020	0.0002	0.0765
			(0.6828)	(0.9227)	(0.3363)
		A_{76}	-2.3736	0.3730	-10.901
			(0.6102)	(0.0127)	(0.4033)
		A_{78}	0.0265	0.0029	-0.1527
			(0.4533)	(0.7684)	(0.3628)
		A_{81}	-12.2378	7.9691	-4.1939
			(0.0006)	(0.1217)	(0.3040)
		LR Test			
		χ^2	1.2441	6.7182	5.2575
		Probability	0.9406	0.3477	0.5112
		Specification	C, S, T, 5 lags	C, S, T, 6 lags	C, S, T, 3 lags

Appendix 2: Accumulated Response of Inflation to Shocks (Baseline Model)





Appendix 3: Accumulated Response of Inflation to Shocks (Alternate Model)