Inflation Targeting Framework: Is the story different for Asian Economies?

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Abstract

This paper aims to measure and compare the economic performance of four Asian economies who adopted Inflation Targeting (Indonesia, Philippines, South Korea and Thailand) against their six neighboring Asian non-targeting economies (China, Hong Kong, India, Malaysia, Singapore and Pakistan). Using the methodology of Ball and Sheridan, firstly, behavior of inflation, output growth and short term interest rate has been measured for both groups (Targeters vs. Non-Targeters) in pre and post IT adoption period in order to see whether performance has improved in targeting countries after the adoption of IT. Secondly, we try to find out whether Inflation Targeting has played any significant role in the changed behavior of these variables. Thirdly, we measure the effect of output gap and supply shock on inflation and see whether economic structure of these countries has changed between pre and post targeting period; and then we measure the role of IT in the structural change of these economies if there is any. The results force us to believe that economic performance has improved in all Asian economies in post targeting period. However, IT does not seem to play any significant role in this improvement of targeting countries. In addition to this, we find strong evidence that all variables showed strong reversion to mean suggesting that improved performance of variables today is in fact the outcome of poor economic performance in the past.

Keywords: Inflation Targeting, Asian countries, Output gap, Targeters vs Non Targeters, Economic Performance

JEL Classification: E30, E31, E52, E58

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I: Introduction

In 1980s, the monetary policy framework became a difficult task for monetary authorities around the world due to the instability of the demand for money function and this issue opened new avenue of debates among economists. The journey that started from the time inconsistency problem and led to rule vs. discretion debate emerged in the form of Inflation Targeting Framework (IT or ITF). Since then, there is an ongoing debate concerning the benefits of IT framework for both developed and emerging economies.

The debate that "Inflation Targeting matters" is yet inconclusive even after almost 20 years' experience with Inflation targeting. The experience of countries has been documented extensively starting with the early work of Leiderman and Svensson in 1995. Economists have worked on different dimensions of Inflation Targeting, most importantly looking at the impact of IT strategy on macro-economic variables (output volatility, and output gap), inflation level, inflation persistence, inflation expectations, cost of disinflation, and the conduct of monetary policy. Those (Mishkin and Posen, 1997; Neumann and Hagen, 2002; Corbo et al., 2002; Levin et al., 2004; Bernanke et al., 1999; Johnson, 2002, 2003), who brought optimistic evidence about the good performance of Inflation Targeting, argue that IT is associated with low rate of inflation, curb the volatility of inflation and output, anchor inflation expectation, and reduce inflation persistence.

However these empirical studies reviewed fail to produce *convincing* evidence. An important challenge is the economic environment of 1990s, a period friendly to price stability (Neumann and von Hagen, 2002; Sikklos, 1999), and inflation was on a downward trend in many countries, especially developed countries, prior to adoption of IT. Moreover, non-IT countries also went through the same experience as IT countries (Cecchetti and Ehrmann, 1999). Ball and Sheridan (2003), in their thought provoking paper "Does Inflation Targeting Matter?", kept reservation about the improved performance of Inflation Targeters against Non-Targeters while comparing the economic performance of 20 OECD countries (7 Targeters vs. 13 Non-Targeters).

Following the methodology of Ball and Sheridan, Batini and Laxton (2007) and Gonçalves and Salles (2008) compared the economic performance of *emerging economies* (Targeters vs. Non-Targeters) keeping this conjecture in mind that "it is entirely possible that IT has not brought gains for developed countries as these countries are not suffering from severe inflation problems and destabilizing macroeconomic disturbances to begin with, but IT may have enhanced macroeconomic performance of developing countries". Gonçalves and Salles (2008) found that those emerging economies who adopted IT framework experienced greater reduction in inflation and GDP growth variability, even after controlling for mean reversion. Batini and Laxton (2007) also reported similar results by saying that Inflation targeting appears to have been associated with lower inflation, lower inflation expectations, and lower inflation volatility.

However, many economists found less strong empirical evidence in favor of Inflation targeting even in the case of emerging economies. Fraga et al (2003) shows that emerging economies working within an IT framework have high volatilities of output, inflation, interest rate and exchange rate than developed countries using IT. Berument and Yuksel (2006) also suggest that the empirical support for the lower inflation and its variability for the inflation targeting regimes are limited. A strict argument against IT in emerging economies has been given by Bystedt and Brito (2008). They say that although there is some relation between IT and lower inflation, this relation seems weaker than previously affirmed in the literature. More important, in opposition to the previous views that IT adoption was costless in term of output growth, they showed that there is a negative significant relation between IT adoption and output growth to be taken into account for purposes of evaluation of the IT policy. Angeriz and Arestis (2005b) says that our evidence of IT in emerging economies, though, suggests that non-IT central banks have also been successful in achieving and maintaining consistently low inflation rate. This evidence clearly implies that an emerging country central bank does not need to pursue IT strategy to achieve and maintain low inflation.

Our study is in direct comparison with Batini and Laxton (2007) and Goncalves and Salles (2008). These two studies followed the methodology of Ball and Sheridan and used emerging economies as their sample set. In this paper, we are following the same methodology but with specific focus on the

Asian neighboring economies. Our sample includes ten Asian countries China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, South Korea and Thailand (three developed, seven emerging[3]). We divide them in to two groups: inflation targeters and non-inflation targeters'; where Indonesia, Singapore, South Korea and Thailand are inflation targeters and others are non-IT countries. These countries are interesting to analyze because of the increasing role of these economies (especially China and India) in world's economies. The basic intuition to select Asian countries is that these countries share common characteristics that facilitate a comparative analysis, and the most important characteristic is that the Asian crisis (1997 - 99) that marked our sample period mainly affected Asian countries and allow us to test the vulnerability of different monetary policy regimes in order to decide whether Inflation Targeting countries out-performed non-targeting countries. Another benefit from this sample selection (1987 – 2007) is that four Inflation Targeters in our sample adopted ITF in late 90s and early 2000. This eliminates the criticism that improved performance was the result of having an environment friendly to price stability at the time of IT adoption and after its adoption (Siklos, 1999); and giving IT strategy a complete chance to prove its significance in improving the economic performance of IT countries.

We have examined uni-variate and multivariate behavior of inflation, output and interest rate (broadly denoted by symbol X) using Difs-in-Difs strategy. In uni-variate analysis, we first find the averages of inflation, output growth and interest rate in pre and post targeting periods and then we try to find whether the change in these variables in the post and pre targeting periods ($X_{post} - X_{pre}$) has anything to do with IT framework or not. Overall, we find no evidence that inflation targeting plays any significant role in improved economic performance. If we examine inflation targeters and non-targeters separately, we find that almost all measures of economic performance have improved for two groups in post targeting period (Post targeting period in the case of non-inflation targeters is defined as the average of the adoption time period of inflation targeters. In our sample, this average comes out to be 2002 Q2. However, we have tested our results with different dates for non-

[3] Three countries Hong Kong, Singapore and South Korea are labeled as Developed Countries according to IMF classification of countries
http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/weoselco.aspx?g=110&sg=All+countries+%2f+Advanced+economies

targeters). For example, average inflation fell between pre-targeting and targeting period, inflation variability decreased, and in addition output growth rose while growth variability decreased. But when, we examined whether this improvement in economic performance is due to Inflation Targeting Framework, we find no convincing evidence. In multivariate analysis, we try to find whether Inflation Targeting has changed the economic structure of targeters or not. We estimate the effect of output gap and supply shock on change in inflation in both pre and post targeting period and then analyze whether this behavior has changed after the adoption of IT in targeting countries. Our results are inconclusive regarding multivariate results and IT seems to be insignificant in affecting the structure of the economies in these countries.

The rest of this paper is organized as follow. **Section II** describes our data and methodology for measuring the effect of Inflation Targeting. **Section III** presents our uni-variate results concerning average inflation, inflation variability, average output growth, output growth variability and short term interest rate variability. We find that IT does not have significant effect on any of these measures. In line with Ball and Sheridan (2003), there are occasional hints that targeting has beneficial effects and occasional hints of adverse effects. **Section IV** examined the effect of inflation targeting on two bivariate relations: slope of output-inflation tradeoff and inflationary effect of supply shock following Ball and Sheridan (2005). Here our results are also imprecise and suggest no note worthy impact of Inflation Targeting. **Section V** presents our results of emerging economies. We estimate uni-variate regression after excluding developed countries from our sample in order to test the assumption that IT can be a beneficial strategy for emerging economies, but our findings do not change as far as the emerging economies of Asia are concerned and **Section VI** concludes our results.

II: Data and Methodology

We have selected a sample of ten Asian countries: China, India, Hong Kong, Indonesia, Malaysia, Philippines, Pakistan, Singapore, South Korea and Thailand. These countries are interesting to analyze as they share some common characteristics and they employ different monetary policy regimes as

well; providing us the opportunity to compare inflation targeting against different monetary policy regimes[4].

- South Korea, Philippines, Indonesia and Thailand are Inflation Targeters
- China and Pakistan are Monetary Aggregate Targeters
- Hong Kong and Singapore are Exchange Rate Targeters
- India and Malaysia are Multiple Targeters

Following the methodology of Ball and Sheridan (2003); we are interested in comparing the performance of economic variables of inflation targeters before and after the adoption of Inflation Targeting framework. Then, we'll compare the performance of these targeting countries with those of non-targeters (control group) in order to test whether targeting matters? Ball and Sheridan used the following Difs-in-Difs strategy to determine the effect of inflation targeting on economic variables while considering the problem of correlation between pre-targeting period variable (X_{pre}) and dummy variable D and also taking account of mean reversion problem.

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e \qquad (1)$$

Here, X means any economic variable like average inflation, average output growth, inflation variability, output variability, and interest rate variability. Pre subscript indicates the time period before the adoption of ITF and post subscript indicates the time period after the adoption of ITF. D is the dummy variable, taking the value of 1 if the country is a targeter and 0 if it is non-targeter. This equation measures the difference in average inflation rate (for example) between the two time periods (post minus pre) as the function of inflation targeting framework (dummy variable D) and pre targeting period's average inflation (X_{pre}).

Our sample ranges from 1987:1 to 2007:4, a 20 years period. Although these countries except Hong Kong were included in the sample of Gonçalves and Salles (2008) but our sample is more focused; also they used annual data, whereas our data is based on quarterly frequency. Another significant difference is that they considered Indonesia as Non-Targeting country, whereas we take Indonesia as

[4] The source of classification of monetary regime is Deutsche Bank

Inflation Targeter as it adopted Inflation Targeting in 2000[5]. In order to run the above mentioned regression for different variables; we have taken four sample periods, three are pre targeting and one is post targeting sample.

Sample 1 Pre Targeting sample	(1987 Q1 to 1993 Q4)
Sample 2 Pre Targeting sample	(1994 Q1 to 2000 Q2 for Non-IT countries); and (1994 Q1 to IT adoption date for IT countries)
Sample 3 Post Targeting Sample	(2000 Q3 to 2007 Q4 for Non-IT countries) and (IT adoption date to 2007 Q4 for IT countries)
Sample 4 Pre Targeting Sample*	Robust Test sample excluding time period of Asian Crisis

*The time period selected for our study is hit by two world renowned shocks: one was the Exchange Rate Mechanism (ERM) crisis of 1992-93 and the second was The Asian Crisis of 1997-99. As shown by interest rate movement in Graph 3, there was no significant movement or turbulence in interest rate during ERM crisis, so we can say that this crisis did not affect Asian countries and need not to be considered in re-arranging our sample. As far as Asian Crisis of 1997 is concerned; this crisis severely affected the countries included in our sample as shown by the trends of inflation rate, Real GDP growth rate, interest rate and output gap in Graph 1, 2, 3 and 4. So, we re-arranged our pre targeting sample in order to take out the effect of Asian Crisis. Asian crisis hit Asia in July 1997 and lasted up to 1999. That's why; we have thrown out few troublesome outliers from 1997:3 to 1999:2[6].

Table 1 summarizes the starting and ending dates of pre and post targeting periods for both IT countries and Non-IT countries. As far as the demarcation of pre and post targeting period for IT countries is concerned, break date is simple as their post targeting period starts when they adopted IT framework.[7] However, this demarcation is not a simple task for non-inflation targeters. While no

[5] Hong Kong Institute of Monetary Research

[6] By 1999, analysts saw signs that economies of Asia have began to recover.

[7] The adoption dates are taken from HKIMR (Hong Kong Institute of Monetary Research) Occasional Paper No. 1, March 2004

partitioning of sample is perfect; we follow Ball and Sheridan (2003). The starting date for the non-targeting countries in the case of post-targeting period is calculated as the average of the adoption date of targeting countries. Batini and Laxton (2007), who used the partitioning approach of Ball and Sheridan (2003) and some other partitions of sample as well, reported that in all cases results do not differ significantly.

III: Uni-variate Results

A. Inflation Targeting and Inflation

The rationale of inflation targeting framework is that in long run, inflation rate is the only macro-economic variable that Monetary Policy (MP) can affect and even moderate inflation rate is harmful for economic efficiency and growth. So, the first question being considered is whether adopting Inflation Targeting affects inflation or not? Inflation variability is also important to analyze as economists have almost consensus about its negative impact on the most important economic variables, like output and growth rate via different channels.

Average Inflation: Average/mean inflation rate is calculated as quarterly growth rate on year-on-year basis from Consumer Price Index (IMF International Financial Statistics), in other words, we calculate the percentage change in CPI with its value from the corresponding quarter in previous year.

Table 2 reports our results of average inflation for targeters and non-targeters for each country for three different sample periods. In sample 1, the average inflation for targeters and non-targeters is almost the same that is 7, 1465% for non-targeters and 7, 2751% for targeters.

In sample 2, the average inflation for non-targeters is low (5.7227%) as compared to sample 1; whereas the average inflation is high in targeting countries (9.004%) that is in agreement with the finding of Ball and Sheridan; that before the adoption of inflation targeting, these countries were facing high inflation. But we cannot ignore the fact that one possible reason for this high inflation among targeters is Indonesia, whose average inflation was 18.9837% during this time period. The reason for this double digit inflation is the Asian Crisis of 1998 that affected Indonesia severely.

In sample 3, in the post targeting period, the average inflation for all countries: targeters and non-targeters is at decreasing trend, where the average inflation for targeters is 4.80545 whereas, this figure is 2.422145 (half of targeters) in case of non-targeters. Even if we exclude Indonesia (the high inflation country) from our sample of targeters, the average inflation is still 3.3849; indicating larger reduction for targeters as compared to non-targeters. In order to see, whether this decrease in inflation rate in targeting countries is due to the adoption of ITF; we run the regression (1) for average inflation.

After controlling for the possibility of mean reversion, we find out that regression to the mean is quite strong as the co-efficient is -0.55102; and it is statistically significant at less than 1 percent level of significance. Whereas, the estimated co-efficient of IT dummy variable is 0.91171, which means that IT is having a negative impact on inflation (meaning that IT is causing increase in average inflation) but it has weak statistical significance (t=0.9387 and p-value= 0.3791). This model explains the variation in inflation changes well as the R^2 of this regression is 0.81. The targeting countries were having high initial inflation and the reason for large decrease in inflation is regression to mean rather than ITF.

As Graph 1 shows that Indonesia is the country having abnormal inflation that causes an increase in the average inflation rate of targeters, we run regression (1) excluding Indonesia. As shown by Table 2, our results change after excluding Indonesia. The co-efficient of IT dummy becomes negative opposing our first finding that IT causes increase in inflation. But this co-efficient is still insignificant as before. As far as regression to mean is concerned, this co-efficient is now very strong (a2= -1.1318) and with statistical significance (P-value=0.0467) confirming the initial conclusion that decrease in inflation is due to regression to mean rather than ITF.

Inflation Variability: Inflation variability is measured as the standard deviation of inflation rate. We have calculated standard deviation of inflation for each country for each sample periods and the results are reported in Table 3.

The inflation variability was high in pre-targeting period for both targeters (7.477%) and non-targeters (4.091%). This variability has reduced in post targeting periods where this variability is

1.635% for non-targeters and 2.362% for targeters. Although, the variability decreased more in targeters as compared to non-targeters, but once we control for regression to mean, then we find out that the reason for this greater decrease was simply high initial inflation variability. The co-efficient of initial inflation variability is -0.8761 and is highly statistically significant (p-value= 0.0000).

As far as the effect of inflation targeting on inflation variability is considered, we found the same result as in the case of average inflation. After controlling for the regression to mean, inflation targeting is in fact raising inflation variability (co-efficient= 0.3076) but this estimate is not statistically significant (p-value=0.3876) forcing us to keep reservations about the negative impact of IT on inflation variability. We also run this regression after excluding Indonesia from our sample but our results remain the same. There is reversion to mean (a2=-0.8773, P-Value=0.0000) and IT has statistically no beneficial effects on inflation variability.

Gonçalves et Salles (2008) while comparing the performance of 36 emerging economies using the methodology of Ball and Sheridan, claim that countries that adopted IT experienced larger reduction in inflation, but in line with Ball and Sheridan (2003), Berument and Yuksel (2007) and Lin and Ye (2007); we found no clear evidence that IT has a relationship with reduced average inflation in case of targeting countries of Asia. As far as inflation variability is concerned, our empirical work suggests that *IT adoption increases inflation variability* but this finding bears less statistical support. Therefore, the empirical support for the lower inflation and its variability for the inflation targeting regime are limited.

B. Inflation Targeting and Output Growth

The basic monetary framework generally implies that policymakers face a trade-off between inflation volatility and real economic volatility and Inflation Targeting has been criticized for its perceived focus on inflation (Friedman and Kuttner (1996)). However, Bernanke et al. (1999) conclude that "output and employment remain concerns of policy-makers after the switch to inflation targeting can be seen in the fact that all the targeting countries have undertaken disinflation only gradually, to avoid putting undue pressure on the real economy (p.291)". These arguments suggest that although there is ambiguous link between IT and output growth, but IT do consider that output should grow and its

volatility should be minimized. So, the next question is related to the impact of inflation targeting on output growth, its variability and output gap variability. We estimate whether IT has increased the variability of output in an effort to reduce inflation variability?

Average Output Growth: The quarterly growth rates are calculated on year-on-year basis by taking forth lagged difference of natural logarithms of Real GDP.

Table 4 shows our results of average growth rate. The average growth rate increased for both targeters and non-targeters in post targeting period. In order to test the hypothesis that inflation targeting has positive impact on output growth, we run the regression (1) on output growth.

The results indicate that inflation targeting has negative impact on average growth rate. The estimated effect is -0.5676 but this is not statistically significant (p-value = 0.5683). Even after excluding Indonesia from sample, our findings do not change. The co-efficient of IT dummy is still having negative sign (but with no statistical significance) and reversion to mean is significant.

Output Growth Variability: Table 5 reports our results of output variability measured as the standard deviation of output growth. Output variability is less in targeting countries in pre and post targeting periods as compared to non-targeters. To see the effect of inflation targeting on output growth variability, we run regression (1) on output variability. Our results indicate that Inflation targeting helps in reducing output variability as the sign of the co-efficient is negative. But this effect is not statistically significant (p-value = 0.4455) even up to 40 percent level of significance. Whereas, the co-efficient of initial output variability is strong (co-efficient = 0.7602) and is also statistically significant at 1% level of significance (p-value = 0.0076). When Indonesia is excluded from the sample, our results still indicate that IT does not increase output growth variability.

Output Gap Variability: The next variable that we considered is output gap variability. Output gap is calculated as the difference between real GDP and potential GDP (calculated by applying Hoddrick-Prescott Filter on real GDP). The output gap variability is calculated as the standard deviation of output gap. Table 6 reports the results of averages of output gap volatility across countries and across different time periods.

The averages of output gap volatility are the same in case of targeters and non-targeters and there is no noteworthy difference. The output gap volatility has decreased in the post targeting period for both groups. To estimate the effect of inflation targeting on output gap volatility, we run regression (1) on output gap volatility. The regression estimates indicate that IT has reduced output gap volatility but this effect is not statistically significant as the p-value is 0.2524. As far as mean to regression is considered, like all other variables being considered, this estimate is significant at less than 1% level of significance. So, we do not find conclusive evidence about the positive effect of IT on output gap volatility. Excluding Indonesia does not make any worth mentioning difference. The sign of co-efficients are the same and this does not change the statistical significance of co-efficients.

Although there is no theoretical and empirical consensus about the overall impact of IT on output growth, it is well accepted that all IT central banks "not only aim at stabilizing inflation around the target but also put some weight on stabilizing the real economy" (Svensson, 2007, p. 1).
Results reported by Ball and Sheridan (2003) and Bystedt and Brito (2008) indicate negative effect of IT on output growth and its variability whereas, some like Mollick et al. (2008) find positive impact of IT on output growth. While considering this variable, we found that IT has negative impact on output growth but this relationship is not statistically significant. As far as output variability and output gap variability are concerned, our results indicate that *IT does not raise these variabilities in targeting countries* but this conclusion is imprecise as there is less statistical significance for this result.

C. Inflation Targeting and Short term Interest Rate

The next variable is short term interest rate. We have taken interbank rates from IMF – International Financial statistics on quarterly basis. As this is the major instrument in the hands of monetary authorities to control inflation. So its behavior can tell about the responsiveness of monetary authorities.

Interest Rate Variability: Table 7 reports our results of interest rate variability. The path of average interest rate variability is smooth is case of non-targeters (2.6453 for sample 1, 2.6342 for sample 2 and 2.5452 for sample 3), whereas the interest rates were very volatile for targeters before the adoption of inflation targeting. Even if we exclude Indonesia from our sample, whose interest rate

volatility was 20.2227% during this period, still the variability is high for targeters (4.0421% excluding Indonesia) before adopting Inflation targeting. One possible reason for this high variability can be the Asian crisis of 1997. After the adoption of ITF, the interest rate variability has decreased tremendously (1.9759%) in targeting countries. In order to test whether IT caused this decrease in interest rate volatility, we run our regression on this variable for each sample period.

The results of our regression show that IT reduces interest rate volatility in targeting countries, but the estimated co-efficient is not statistically significant (p-value = 0.3711). As far as, the estimate of initial interest rate volatility is concerned, it shows that there is regression to mean and it is statistically significant at 1% level of significance (p-value = 0.0025) indicating that larger reduction in interest rate volatility is due to the larger initial variability. However, when we exclude Indonesia from sample, the initial values become insignificant along with IT co-efficient. One possible reason for this can be inflation targeters do not respond strongly to inflation movement questioning the activism of monetary authorities in these countries. However, there can be other factors for these less volatile interest rates (for example, low inflation worldwide, Golden Decade (1998 - 2007) for financial institutions etc.).

D. Uni-variate Robustness Check

We run different robustness checks on our sample. First of all, we re-arranged our sample in order to take out the effect of Asian Crisis of 1997 as this time period resulted in outliers in our sample data. Our results indicate that this controlled sample does not change any relationship and the statistical significance of any variable being estimated. Secondly, we test the sensitivity of our estimates to different demarcation dates between pre and post targeting period for non-targeting countries. Not surprisingly, we did not find any change in our previous results. Thus, our robust finding is that IT seems to be insignificant in the improvement of economic performance of Asian countries and many of our findings are in agreement with those, who claim that IT is somehow imposing cost on economic growth (although not statistically significant); and the improvement of economic variables in targeting countries is perhaps due to some factor other than Inflation Targeting framework.

IV: Bivariate Analysis

After the uni-variate analysis, we now move to multivariate analysis again following the methodology of Ball and Sheridan, 2005. We are interested in estimating the effect of output gap on change in inflation and effect of supply shock on change in inflation. We run these regressions in pre and post targeting periods in order to see whether there is any change in the structure and patterns of these effects and whether Inflation Targeting played any role in this change if change exists.

$$\Delta\pi = a(y - y^*) \qquad (2)$$

$$\Delta\pi = b_0 + b_1(\Delta P_{com} - \pi_{USA}) \qquad (3)$$

Here y^* is the potential output (measured by applying the Hodrick-Prescott filter with smoothing parameter 1600), P_{com} is the quarterly index of all commodity prices (average) in US dollar from The Economists, π_{USA} is the quarterly inflation rate of USA. Equation (2) measures the effect of output gap on change in inflation whereas; equation (3) shows the effect of change in relative commodity prices after controlling for inflation in USA (as indicator of supply shock). The expected movement of "a" is debatable because "a" can fall if inflation becomes more anchored in targeting countries and "a" can rise if inflation reduces cost of disinflation (Corbo et al., 2002); whereas "b_1" should be falling for Targeters as Inflation Targeting reduces the effect of supply shocks.

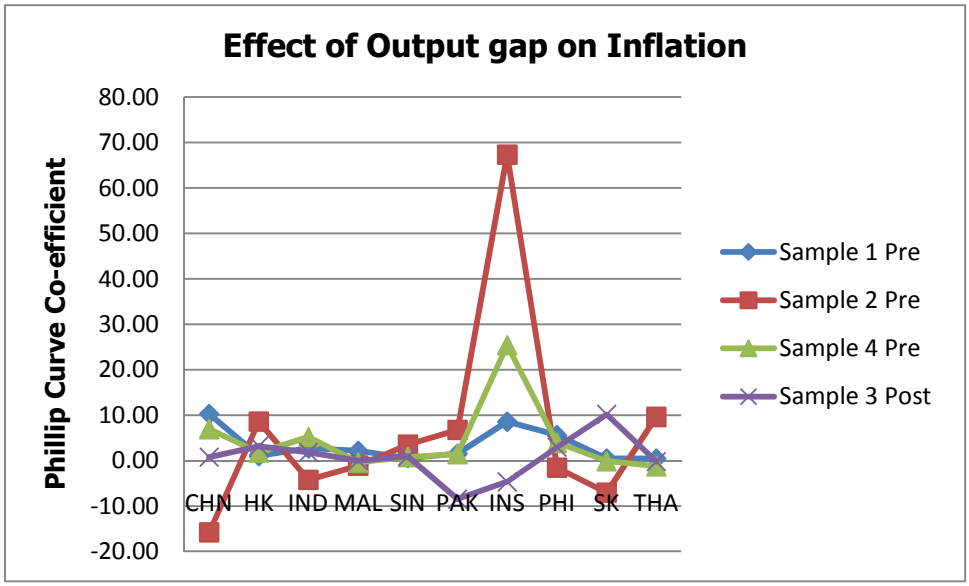
In addition to estimate any change in co-efficients, we are also interested in estimating whether Inflation Targeting played any role in the change in the co-efficients between post and pre targeting periods. Therefore, we estimated the following equations.

$$a_{post} - a_{pre} = c + IT\ Dummy + \epsilon \qquad (4)$$

$$b_{1_{post}} - b_{1_{pre}} = c + IT\ Dummy + \epsilon \qquad (5)$$

A. Inflation and Output Gap

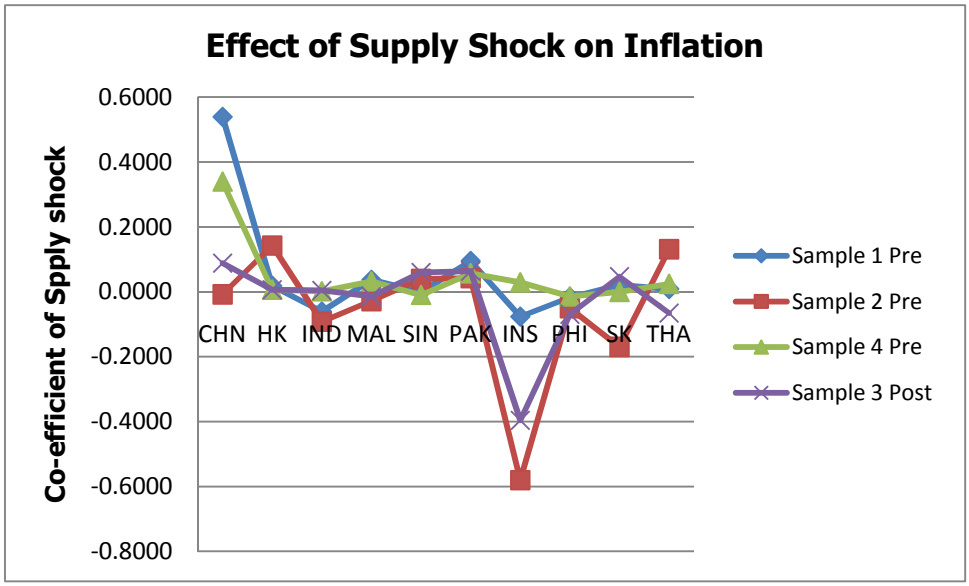
The results of equation (2) are imprecise. The individual analysis of countries shows that these countries differ in their structures of economy. The effect of output gap on inflation varies across countries and across time.



After the adoption of ITF, the co-efficient of output gap has decreased in Targeters as well as for non-targeters. One possible explanation for this can be that the sensitivity of inflation to output gap has decreased and inflation has become more anchored. When we estimate whether Inflation Targeting has played any role in the change of this structure, we find that after the exclusion of Asian Crisis time period, IT has a strong effect with IT co-efficient= -20.9801 (P-value=0.0002) meaning that adoption of IT results in the decrease of sensitivity of inflation to output gap. But this result is just because of a sharp decline of the co-efficient of output gap in Indonesia. Once we exclude Indonesia from our sample, we get the same result that IT seems to be unimportant for any change in the structure of economy.

B. Inflation and Supply Shock

As far as the effect of supply shock on inflation is concerned, our findings suggest that co-efficients differ across countries and over time. The effect of supply shock on inflation is different as this effect is sometimes positive and sometime negative for individual country.



The weighted average of the co-efficient of supply shock among targeters and non-targeters shows that the structure of economy has not changed significantly as inflation response to commodity prices is quite similar way. However, this co-efficient is negative in case of Targeters. One possible interpretation for this result can be that the central banks in targeting countries over react to any supply shock and this trend has not changed even after the adoption of Inflation Targeting. In contrast, we do not find any evidence that Inflation Targeting plays any significant role in the change of this co-efficient and this effect between pre and post targeting period.

V: Case of Emerging Economies

This section is based on the assumption that *"IT can be a beneficial framework for emerging market economies even if it is not beneficial for developed countries"*. The above analysis was based on ten Asian countries, in which three were developed countries (Hong Kong, Singapore and South Korea) and seven were emerging economies. Now, we consider only emerging economies in order to test assumption proposed by Gonçalves and Salles (2008) of fruitfulness of IT strategy for emerging economies. This leaves us with four non-inflation targeting countries (China, India, Malaysia and Pakistan) and three inflation targeting countries (Indonesia, Philippines and Thailand).

In this section, we have estimated uni-variate regression (1) following the same methodology as we considered in case of ten Asian countries and results are presented in Table 9. The definition of the

sample is the same as previously mentioned; the only difference is the exclusion of three developed countries for analysis purpose.

The economic performance of targeters has improved in post targeting period.

Average Inflation ↓	Inflation Variability ↓
Average Output Growth ↑	Output Growth Variability ↓
Interest Rate Variability ↓	Variability of Output Gap ↓

If we exclude the time period of Asian Crisis (period of outliers in data), then overall performance is positive in post targeting period in comparison to pre targeting period except that there is a decrease of 1% in output growth and the magnitude of benefit is small.

As far as the economic performance of non-targeters is concerned, their performance has also been better in post targeting period.

Average Inflation ↓	Inflation Variability ↓
Average Output Growth ↑	Output Growth Variability ↓
Interest Rate Variability ↓	Variability of Output Gap ↓

Even after the exclusion of Asian crisis' period from our sample, the overall performance of non-targeters is positive in line with targeters and average growth fell as well, but one noteworthy difference is that the fall in output growth is very minor in case of non-targeters (from 6.92% to 6.81%) instead of 1% fall in targeting countries.

Looking at the effect of Inflation Targeting on the measures of economic performance, we find that for average inflation and inflation variability, the co-efficient of IT Dummy is positive, indicating negative effect of Inflation Targeting (although it is not statistically significant in any case). This forces us to infer that improved performance of inflation in Targeters in post targeting period is not due to adoption of Inflation Targeting rather there were some other factors and there was also reversion to mean. For output growth measure, the effect of inflation targeting on average output growth is

indefinite but the impact of IT on growth volatility is positive. This indicates that IT helps in reducing the volatility of output growth in targeting countries but this finding is not statistically significant. As far as interest rate variability is concerned, our results indicate that IT reduces the variability of interest rate but this co-efficient is also insignificant forcing us to keep our reservations on questioning the activism of monetary authorities.

In a nutshell, we can say that there is no vital difference in the economic performance of targeters and non-targeters in post targeting period. As far as the role of Inflation Targeting in the change in the economic performance is concerned, we find no significant effect of Inflation targeting on any economic variable even in the case of emerging economies.

VI: Conclusion

This study is our first endeavor to measure the economic performance of Asian countries in particular; as the prospects and the role of these countries (especially China and India) in the world's economy are mounting rapidly. One benefit provided by this sample is that the average of the adoption period is 2000 for non-targeters that is the date of adoption of targeting for two out of four targeting countries. This enables us to start the comparison between these two groups, while being in almost the same world's economic environment and trends.

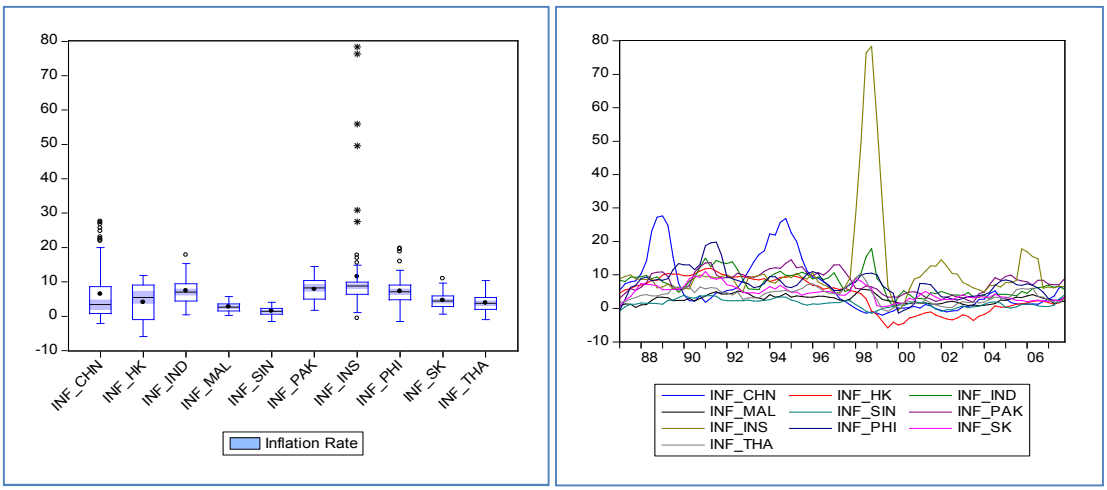
Our findings suggest that performance of both groups have improved in post 2000 period. But the role of Inflation Targeting in improved economic performance in Targeting countries does not come out to be significant. One important finding is that the central banks in targeting countries do not strongly respond to inflation movement as indicated by reduced interest rate volatility in targeting countries in post targeting period. This questions the activism of monetary authorities in these countries.

Although, we do not find evidence that IT improves performance as reported by Gonçalves and Salles (2008) and Batini and Laxton (2007); but at the same time, we do not find any statistical evidence that IT is harmful for an economy. This can be interpreted as: "in Asian economies, our data does not support the case for Inflation targeting".

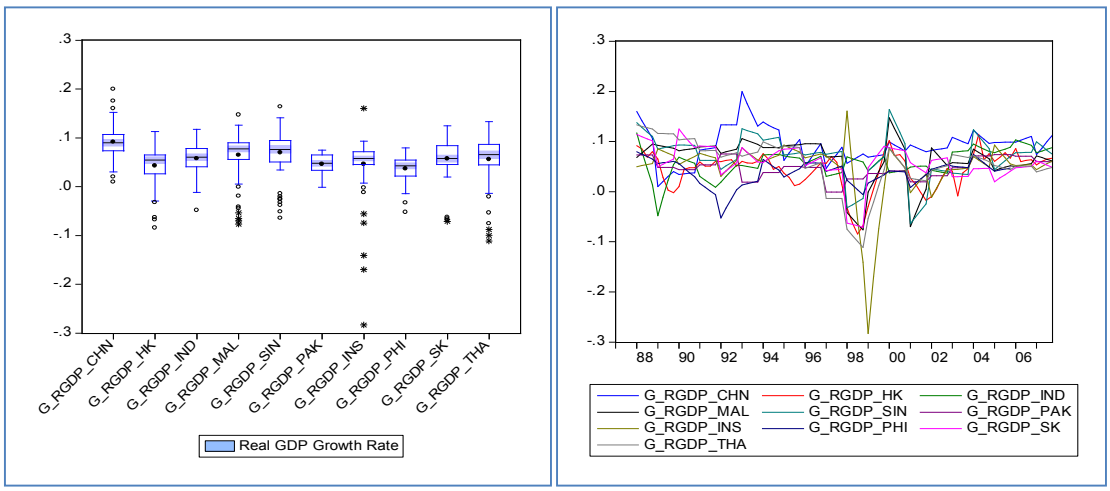
Our findings suffer from this fact that these countries are different in their economic structure (see bivariate results), we plan to address this issue in our forthcoming paper in order to analyze where these countries show symmetry and where they are different from each other.

Appendix I:

Graph 1: Inflation Rate (Sample: 1987:1 – 2007:4)[8]

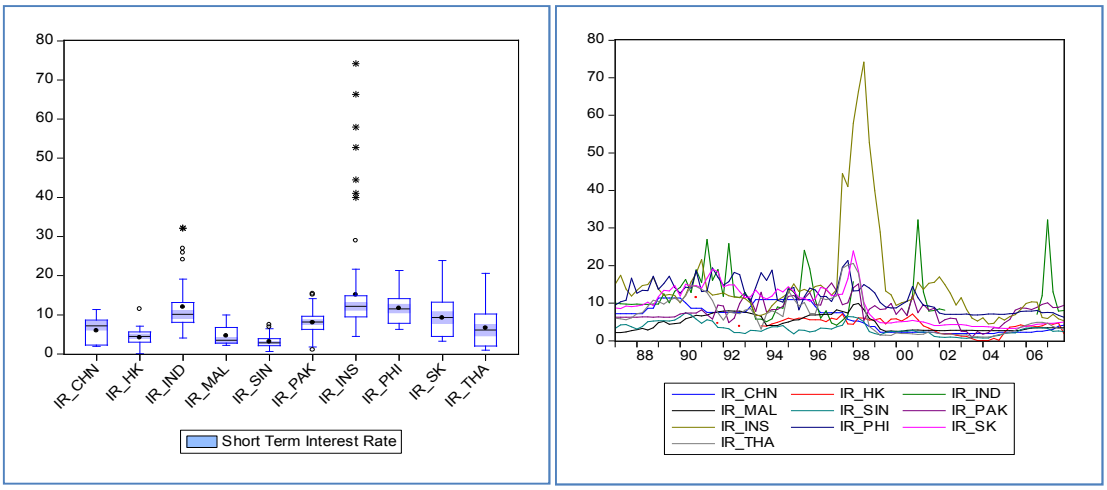


Graph 2: Real GDP Growth rate (Sample: 1987:1 – 2007:4)

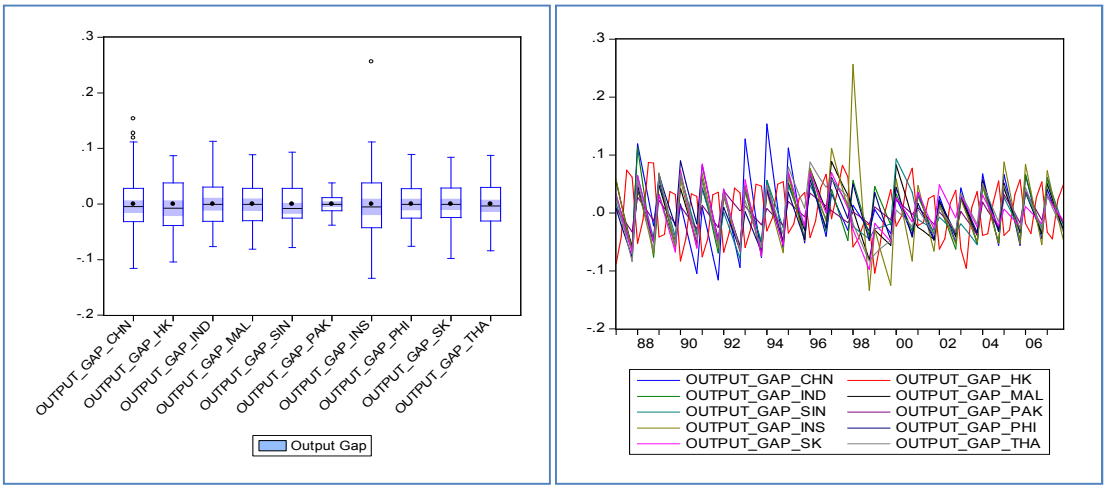


[8] CHN means China, HK means Hong Kong, IND means India, MAL means Malaysia, SIN means Singapore, PAK means Pakistan, INS means Indonesia, PHI means Philippines, SK means South Korea and THA means Thailand.

Graph 3: Short Term Interest Rate (Sample 1987:1 – 2007:4)



Graph 4: Output Gap (Sample 1987:1 – 2007:4)[9]



[9] Output gap is the difference between Real GDP and Potential GDP where Potential GDP is taken as the trend series by applying Hodrick-Prescott Filter to Real GDP.

Appendix II:

Table 1: Sample Periods[10]

Country		Sample 1 Pre	Sample 2 Pre	Sample 3 Post	Sample 4[11] Pre
CHN	Start	1987 Q1	1994 Q1	2002 Q3	1987 Q1
	End	1993 Q4	2000 Q2	2007 Q4	2000 Q2
IND	Start	1987 Q1	1994 Q1	2002 Q3	1987 Q1
	End	1993 Q4	2000 Q2	2007 Q4	2000 Q2
HK	Start	1987 Q1	1994 Q1	2002 Q3	1987 Q1
	End	1993 Q4	2000 Q2	2007 Q4	2000 Q2
MAL	Start	1987 Q1	1994 Q1	2002 Q3	1987 Q1
	End	1993 Q4	2000 Q2	2007 Q4	2000 Q2
SIN	Start	1987 Q1	1994 Q1	2002 Q3	1987 Q1
	End	1993 Q4	2000 Q2	2007 Q4	2000 Q2
PAK	Start	1987 Q1	1994 Q1	2002 Q3	1987 Q1
	End	1993 Q4	2000 Q2	2007 Q4	2000 Q2
INS	Start	1987 Q1	1994 Q1	2000 Q1	1987 Q1
	End	1993 Q4	1999 Q4	2007 Q4	1999 Q4
PHI	Start	1987 Q1	1994 Q1	2002 Q1	1987 Q1
	End	1993 Q4	2001 Q4	2007 Q4	2001 Q4
SK	Start	1987 Q1	1994 Q1	1998 Q2	1987 Q1
	End	1993 Q4	1998 Q1	2007 Q4	1998 Q1
THA	Start	1987 Q1	1994 Q1	2000 Q2	1987 Q1
	End	1993 Q4	2000 Q1	2007 Q4	2000 Q1

[10] The adoption dates for Targeters in Sample 3 are taken from HKIMR (Hong Kong Institute of Monetary Research) Occasional Paper No. 1, March 2004; whereas the starting date of Sample 3 for non-targeters is the average of the adoption date of IT of the targeters.

[11] The values from 1997:3 to 1999:2 have been excluded to be more precise in restriction

Table 2: Mean Inflation Rate (Year-on-Year Basis)[12]

Country	Sample 1	Sample2	Sample 3	Sample 4
CHN	10.3257	7.7251	1.7360	10.7335
HK	9.0921	4.0840	-0.5331	7.4691
IND	9.4114	8.7513	4.5133	8.9498
MAL	2.9684	3.4253	2.0155	3.0316
SIN	2.2625	1.3004	0.9572	2.0522
PAK	8.8191	9.0505	5.8440	9.2977
INS	8.3205	18.9837	8.7701	8.0531
PHI	9.9776	6.8020	4.8611	8.2382
SK	6.4051	5.2598	3.0620	5.9715
THA	4.3970	4.9562	2.5286	4.4174
Averages:				
NIT	7.1465	5.7228	2.4221	6.9224
IT	7.2751	9.0004	4.8055	6.6701
Excluding INS	6.9266	5.6727	3.4839	6.2091

Regression (1)

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e$$

Dependent Variable: Change in mean Inflation between Samples

	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 – 4)**
			Ex INS	Ex INS	
Constant **a0**	0.3157	-0.1472	6.0126	4.6120	5.0877
P-Value	0.8927	0.8634	0.0794	0.1662	0.1542
IT Dummy **a1**	2.3454	0.9117	-0.4403	-0.3806	0.8500
P-Value	0.1930	0.3791	0.8505	0.8766	0.7195
Initial Value **a2**	-0.7052	-0.5510	-0.5510	-1.1318	-1.1776
P-Value	0.0404	0.0011	0.0011	0.0467	0.0241
R-Square	0.5399	0.8080	0.6908	0.5103	0.5478
Adjusted R-Sqr	0.4085	0.7531	0.5878	0.3471	0.4186

[12] The calculations have been done using methodology of Ball & Sheridan, 2005

Table 3: Standard Deviation of Inflation Rate[13]

Country	Sample 1	Sample 2	Sample 3	Sample 4
CHN	7.7291	9.7772	1.9728	8.4647
HK	1.8299	5.1845	2.1034	4.2351
IND	2.9044	3.5914	1.1939	2.9966
MAL	1.3871	1.1099	0.9253	1.1912
SIN	1.0844	1.2562	1.0164	1.0497
PAK	2.7388	3.6254	2.6001	3.1947
INS	1.6205	22.6089	4.2402	1.9419
PHI	4.6908	3.2429	2.0897	4.5283
SK	2.2786	1.2602	1.5517	2.0111
THA	1.4085	2.7951	1.5682	1.7733
Averages				
NIT	2.9456	4.0908	1.6353	3.5221
IT	2.4996	7.4768	2.3625	2.5637
Excluding INS	2.7926	2.4327	1.7365	2.7710

Regression (1)

$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e$

Dependent Variable: Change in standard deviation of Inflation between Samples

	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 4)**
			Ex INS	Ex INS	
Constant **a0**	1.4782	1.1285	1.2929	1.1332	1.2312
P-Value	0.0542	0.0017	0.0135	0.0229	0.1339
IT Dummy **a1**	0.7509	0.3076	0.1190	0.3047	0.6796
P-Value	0.2897	0.3867	0.7832	0.4743	0.3690
Initial Value **a2**	-0.9467	-0.8761	-0.8837	-0.8773	-0.8852
P-Value	0.0007	0.0000	0.0001	0.0000	0.0010
R-Square	0.8360	0.9941	0.9321	0.9645	0.8281
Adjusted R-Sqr	0.7892	0.9924	0.9095	0.9526	0.7790

[13] The calculations have been done using methodology of Ball & Sheridan, 2005

Table 4: Average Growth Rate (Year-on-Year Basis)[14]

Country	Sample 1	Sample 2	Sample 3	Sample 4
CHN	9.6250	8.3150	9.6074	9.2969
HK	5.2689	2.7390	4.8700	5.1763
IND	3.9417	5.8478	7.2338	4.8626
MAL	8.7721	5.9239	5.1239	8.8617
SIN	9.0405	6.8146	5.5313	9.006
PAK	5.2168	3.3551	5.2689	4.6515
INS	6.4533	2.5741	4.8168	6.2792
PHI	2.8619	3.6120	5.1122	3.482
SK	8.0052	5.7433	4.3690	7.5536
THA	9.6616	2.3145	5.1138	8.2239
Averages				
NIT	6.9775	5.4992	6.2726	6.9758
IT	6.7455	3.5610	4.8530	6.3847
Excluding INS	6.8429	3.8899	4.8650	6.4198

Regression (1)

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e$$

Dependent Variable: Change in mean Growth rate between Samples

	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 4)**
			Ex INS	Ex INS	
Constant **a0**	5.5569	3.8554	5.5573	3.7532	5.0076
P-Value	0.0099	0.0287	0.0175	0.0497	0.0257
IT Dummy **a1**	-1.3958	-0.5676	-1.3938	-0.6703	-1.0821
P-Value	0.2045	0.5683	0.2820	0.5497	0.3047
Initial Value **a2**	-0.8974	-0.5604	-0.8975	-0.5419	-0.8186
P-Value	0.0035	0.0498	0.0072	0.0814	0.0110
R-Square	0.7408	0.4613	0.7398	0.4241	0.6342
Adjusted R-Sqr	0.6667	0.3073	0.6531	0.2321	0.5296

[14] The calculations have been done using methodology of Ball & Sheridan, 2005

Table 5: Growth Rate Variability (measured as standard deviation)[15]

Country	Sample 1	Sample 2	Sample 3	Sample 4
CHN	5.5060	2.5240	1.1605	4.5235
HK	2.3209	4.7933	3.1492	2.3303
IND	3.2535	1.4789	2.1303	2.837
MAL	0.8334	5.9325	3.7502	1.6157
SIN	2.7254	4.7117	4.7665	2.6865
PAK	1.9484	1.7090	1.9607	1.8883
INS	1.3884	1.0025	2.3497	2.7316
PHI	3.5089	1.7339	0.8565	2.7093
SK	2.5463	3.4989	3.7156	2.3027
THA	2.1779	6.8737	1.4787	3.3638
Averages				
NIT	2.7646	3.5249	2.8196	2.6469
IT	2.4054	3.2773	2.1001	2.7769
Excluding INS	2.7444	4.0355	2.0169	2.7919

Regression (1)

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e$$

Dependent Variable: Change in standard deviation of Growth between Samples

	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 4)**
Constant **a0**	4.2254	1.9742	4.3009	1.6995	4.5164
P-Value	0.0033	0.0617	0.0073	0.1334	0.0073
IT Dummy **a1**	-0.9021	-0.6601	-0.8135	-0.9649	-1.0958
P-Value	0.2748	0.4455	0.3943	0.3378	0.1465
Initial Value **a2**	-1.5085	-0.7602	-1.5358	-0.6822	-1.6410
P-Value	0.0017	0.0076	0.0043	0.0266	0.0064
R-Square	0.7793	0.6675	0.7754	0.6380	0.7261
Adjusted R-Sqr	0.7163	0.5725	0.7006	0.5173	0.6479

[15] The calculations have been done using methodology of Ball & Sheridan, 2005

Table 6: Volatility of Output Gap (measured as Standard Deviation)[16]

Country	Sample 1	Sample 2	Sample 3	Sample 4
CHN	6.2095	4.9881	3.7793	6.1392
HK	5.4632	4.5784	4.4537	4.7588
IND	4.7021	3.6417	3.4937	4.3420
MAL	3.6890	4.8526	2.9507	4.2651
SIN	4.0336	3.8334	3.0500	4.1001
PAK	1.7867	1.4569	1.8923	1.6903
INS	4.5967	8.4693	4.5730	5.3515
PHI	4.4615	3.3819	2.9685	4.0202
SK	4.6707	3.7566	2.9980	4.5765
THA	4.3555	5.2263	2.4856	4.6294
Averages				
NIT	4.3140	3.8919	3.2700	4.2159
IT	4.5211	5.2085	3.2563	4.6444
Excluding INS	4.4959	4.1216	2.8174	4.4087

Regression (1)

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e$$

Dependent Variable: Change in standard deviation of output gap between Samples

	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 4)**
			Ex INS	Ex INS	
Constant **a0**	0.9792	1.7623	1.0256	1.8487	0.9076
P-Value	0.2809	0.0129	0.0598	0.0658	0.3639
IT Dummy **a1**	-0.1236	-0.5237	-0.5472	-0.5365	-0.4439
P-Value	0.7740	0.2524	0.0623	0.2887	0.3728
Initial Value **a2**	-0.4690	-0.6126	-0.4797	-0.6348	-0.4396
P-Value	0.0386	0.0015	0.0027	0.0193	0.0755
R-Square	0.4905	0.8420	0.8388	0.6714	0.4720
Adjusted R-Sqr	0.3450	0.7969	0.7851	0.5618	0.3212

[16] The output gap is calculated as difference of Ln RGDP and trend value of Ln RGDP after applying Hodrick-Prescott Filter.

Table 7: Volatility of Short Term Interest Rate (measured as Standard Deviation)[17]

Country	Sample 1	Sample 2	Sample 3	Sample 4
CHN	1.6244	3.4333	0.5218	2.5351
HK	3.6933	0.7020	1.9240	1.5183
IND	5.0108	5.5927	8.5306	5.3529
MAL	2.0486	2.1740	0.3230	1.9570
SIN	1.4863	1.3430	0.9887	1.3848
PAK	2.0081	2.5599	2.9834	2.5762
INS	3.1183	20.2227	3.7107	2.7628
PHI	2.6833	3.2438	0.4099	3.0406
SK	2.8648	3.1174	2.5555	2.4387
THA	2.9528	5.7651	1.2276	3.2309
Averages				
NIT	2.6453	2.6342	2.5452	2.5540
IT	2.9048	8.0873	1.9759	2.8683
Excluding INS	2.8336	4.0421	1.3977	2.9035

Regression (1)

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + e$$

Dependent Variable: Change in standard deviation of Interest rate between Samples

	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 4)**
			Ex INS	Ex INS	
Constant **a0**	-2.5329	1.9620	-2.4319	-0.1221	-2.2088
P-Value	0.1305	0.1214	0.1538	0.9425	0.1453
IT Dummy **a1**	-1.0676	-1.7767	-1.5020	-2.5733	-1.6402
P-Value	0.3350	0.3711	0.2323	0.1900	0.1479
Initial Value **a2**	0.9197	-0.7786	0.8815	0.0126	0.8614
P-Value	0.1100	0.0025	0.1327	0.9810	0.1072
R-Square	0.3638	0.8332	0.4248	0.3017	0.4306
Adjusted R-Sqr	0.1821	0.7855	0.2331	0.0689	0.2680

[17] The calculations have been done using methodology of Ball & Sheridan, 2005

Table 8: Multivariate Results

Phillip Curve Co-efficient

Weigthed Averages				
	Sample 1	Sample 2	Sample 3	Sample 4
NIT	4.3943	-1.1663	1.0557	3.5250
IT	3.7578	4.4502	3.7406	0.3681
Excluding INS	2.1508	3.0795	4.5954	-0.4920

$X_{post} - X_{pre} = a_0 + a_1 D + e$						
Dependent Variable: Change in estimated co-efficient between Samples						
Weighted Least Square						
	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 4)**	**(3 - 4)**
			Ex INS	Ex INS		Ex INS
Constant **a0**	-0.4334	2.3417	-0.4335	2.3417	-6.1755	-0.3714
P-Value	0.7867	0.5560	0.8004	0.5827	0.0000	0.7527
IT Dummy **a1**	-2.9345	-6.2756	-3.9199	-4.3929	-20.9801	0.0265
P-Value	0.6915	0.7454	0.6702	0.8524	0.0002	0.9893

Effect of Commodity Price Changes on Inflation

Weigthed Averages				
	Sample 1	Sample 2	Sample 3	Sample 4
NIT	0.0225	0.0318	0.0204	0.0119
IT	-0.0058	-0.0266	-0.0400	0.0124
Excluding INS	0.0110	-0.0239	-0.0236	0.0121

$X_{post} - X_{pre} = a_0 + a_1 D + e$						
Dependent Variable: Change in estimated co-efficient between Samples						
Weighted Least Square						
	(3 - 1)	**(3 - 2)**	**(3 - 1)**	**(3 - 2)**	**(3 - 5)**	**(3 - 4)**
			Ex INS	Ex INS		Ex INS
Constant **a0**	-0.0192	0.0172	-0.0192	0.0172	-0.0388	-0.0387
P-Value	0.4445	0.1121	0.4579	0.1389	0.0117	0.0038
IT Dummy **a1**	-0.0477	-0.0052	-0.0469	-0.0054	0.0282	0.0499
P-Value	0.1356	0.9595	0.1542	0.9604	0.5838	0.2371

Table 9: Case of Emerging Economies (Uni-variate Results)

Inflation Rate:

Average	**Average Inflation**				**Standard Deviation of Inflation**			
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4
IT	7.5650	10.2473	5.3866	6.9030	2.5733	9.5490	2.6327	2.7479
NIT	7.8812	7.2381	3.5272	8.0032	3.6899	4.5260	1.6730	3.9619

	Average Inflation			**Standard Deviation of Inflation**		
	(3 - 1)	(3 - 2)	(3 - 4)	(3 - 1)	(3 - 2)	(3 - 4)
Constant **a0**	0.8232	0.5016	0.4640	1.5513	1.1341	1.4477
P-Value	0.8045	0.6765	0.8944	0.1973	0.0318	0.2210
IT Dummy **a1**	1.9679	0.6015	2.2805	0.9965	0.3616	1.0287
P-Value	0.3690	0.6228	0.3103	0.3512	0.5155	0.3351
Initial Value **a2**	-0.6569	-0.5820	-0.6172	-0.9670	-0.8809	-0.9431
P-Value	0.1425	0.0083	0.1786	0.0115	0.0000	0.0097

Output Growth:

Average	**Average Growth**				**Standard Devaition of Growth**			
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4
IT	6.3256	2.8335	5.0143	5.9950	2.3584	3.2034	1.5616	2.9349
NIT	6.8889	5.8605	6.8085	6.9182	2.8853	2.9111	2.2504	2.7161

	Average Growth			**Standard Deviation of Growth**		
	(3 - 1)	(3 - 2)	(3 - 4)	(3 - 1)	(3 - 2)	(3 - 4)
Constant **a0**	5.9373	2.0794	5.4509	3.7077	1.8590	3.9595
P-Value	0.0419	0.3167	0.0820	0.0012	0.0602	0.0167
IT Dummy **a1**	-1.7230	0.6483	-1.6131	-0.9549	-0.7281	-0.5511
P-Value	0.2742	0.6227	0.3016	0.0688	0.3985	0.4163
Initial Value **a2**	-0.8735	-0.1931	-0.8038	-1.5051	-0.8655	-1.6292
P-Value	0.0290	0.5503	0.0643	0.0003	0.0077	0.0086

Interest Rate and Output Gap:

Average	**Standard Deviation of IR**				**Standard Deviation of Output Gap**			
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4
IT	2.9181	9.7439	1.7827	3.0115	4.4712	5.6925	3.3424	4.6670
NIT	2.6730	3.4400	3.0897	3.1053	4.0968	3.7348	3.0290	4.1092

	Standard Deviation of IR			**Standard Deviation of Output Gap**		
	(3 - 1)	(3 - 2)	(3 - 4)	(3 - 1)	(3 - 2)	(3 - 4)
Constant **a0**	-3.2955	2.1719	-4.0470	0.3984	2.0449	0.9685
P-Value	0.0859	0.2757	0.1437	0.7372	0.0253	0.3314
IT Dummy **a1**	-1.8926	-2.9888	-1.0914	0.5090	-0.5232	0.0336
P-Value	0.1366	0.3382	0.4621	0.4164	0.3044	0.9508
Initial Value **a2**	1.3888	-0.7332	1.2982	-0.3479	-0.6402	-0.4986
P-Value	0.0454	0.0337	0.1206	0.1770	0.0048	0.0655

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