Inflation Targeting, Asset Prices and Financial Globalization

Muhammad Naveed Tahir
Université Lyon II
mtahir@mail.univ-lyon2.fr
Groupe d'Analyse et de Théorie Economique (GATE)
31 Décembre 2010

Abstract

In this paper we investigate the impact of financial globalization on the behaviour of inflation targeting emerging market economies with respect to two assets - exchange rate and share prices. We use quarterly data for seven emerging market inflation targeting economies from the date of their inflation targeting adoption to 2008 Q4. The study uses two models namely forward-looking new Keynesian model and backward-looking ball's model. Both the models consist of IS curve, Phillips curve and the Taylor rule. The study employs multi-equation GMM technique to investigate the relationship. We find interesting results in the sense that in case of both forward-looking as well as backward-looking model the response of central bank to the exchange rate is statistically significant for all the economies in the sample. Although theoretically speaking it should not be so as even in flexible inflation targeting central bank responds to inflation deviation and output gap, however; we think that the peculiar characteristics of emerging markets, like fear of floating, weak financial system, low level of central bank credibility and dollarization, make exchange rate important for these economies. However, so for as share prices are concerned, the results are mixed. Some central bank respond to share prices and others do not. This attitude might be due to asset market participation structure. Where participation in asset market is higher there may be a tendency to smooth the fluctuations in the share price as it is a leading indicator of future output which, of course, is a leading indicator of inflation. So smoothing share prices smoothes output and subsequently reduces volatility in inflation. But this point needs further investigation.

JEL Classification: E52, F41

Keywords: Inflation Targeting; Asset Prices; Emerging Markets

1. Introduction:

The world has witnessed an increase in capital movement in the last two decades among the countries on the one hand and an increment in the number of countries who adopted inflation targeting on the other hand. Among the inflation targeting adopters there are advanced countries like New Zealand, Sweden and UK who are relatively less concerned about the exchange rate movements due to their peculiar economic structure, but there are also many emerging market economies, which are more concerned about exchange rate. The reason of assigning more importance to exchange rate by emerging markets is typical *fear of floating* well documented in Calvo and Reinhart (2002). Secondly, the liberalization of capital account by the emerging market economies has made the capital movement more volatile leading to volatility in exchange rate. Thirdly, when the capital comes in these countries, especially the hot money, it puts an upward pressure on assets like exchange rate, share prices and land prices. This phenomenon has recently reignited a debate that should central bank respond to asset prices or not. Theoretically speaking, under inflation targeting the central bank has been assigned with exclusive objective of price stability then there is less room to discuss about reaction of monetary policy toward asset prices but this is not the case. However, it is interesting to note that in most of the countries the central bank has dual objective i.e. price stability and financial stability. Also one might argue that regulatory framework is the tool to achieve financial stability. We do not deny the role of prudent regulations but we think that a prudent monetary policy can also contribute in this regard. Interestingly, in our sample all the central banks have been empowered with the mandate of ensuring not only price stability but also financial stability.

Furthermore, there is well known *"impossible trinity"* according to which high capital mobility can co-exist with independent monetary policy only when exchange rate is free float, otherwise, the monetary policy becomes subservient to exchange rate policy. So theoretically, a country cannot have all three goals simultaneously. For the last decade emerging markets have increasingly been adopting inflation targeting. On the other hand, in the environment of free capital mobility the role of exchange rate in stabilizing the economy cannot be underestimated, due to economic structure of emerging market economies. So in this backdrop the purpose of this study is to investigate empirically that the central bank of the sample countries respond to Asset Pries (Exchange Rate and Share Prices in our case) or not.

The rest of the document is structured as follows. Section 2 provides a brief overview of the literature. In section 3 we present model and theoretical explanation of the model. Section 4 describes the methodology and the data. Section 5 presents some stylized facts whereas section 6 explains the empirical results and the final section provides some concluding remarks.

2. Literature Review:

The paper by Calvo and Reinhart (2000) finds that the countries that say they allow their exchange rate to float mostly do not -- there seems to be an epidemic case of "fear of floating". Similarly, Cavoli (2009) concludes that fear of floating is justified in open and developing economies. Another paper with the same line of arguments is by Ball (2000) according to this paper the exchange rate should also be included in the reaction function of the central bank. However, it should be on the right side of the Taylor Rule or the left side is an empirical question. The paper introduces Monetary Condition Index (MCI). The question is why exchange rate is important? There is variety of channels through which exchange rate impacts the economy. As the paper by Svensson (1999) says that in an open economy there are additional channels of transmission mechanism. The interest rate differential impacts the exchange rate and the expected future exchange rate through the interest rate parity condition. And due to existence of sticky prices, the nominal exchange rate affects the real exchange rate. The real exchange rate will affect the relative price between domestic and foreign goods, which consequently, have an impact on both domestic and foreign demands for foreign goods and thus contribute to the aggregate demand channel for the transmission of monetary policy. Then there is a direct channel, which brings *imported inflation* in the case of depreciation. Typically the impact of direct channel is quicker relative to the aggregate demand channel. Besides these, another channel through which exchange rate affects the economy is the domestic currency prices of imported intermediate inputs. Due to depreciation the prices of the inputs increase and this leads to increase in the cost of production and subsequently to domestic Inflation, this is called *cost channel*. Furthermore, if the wages are indexed to the CPI the depreciation will cause an increase in nominal wages. This is the real side of the economy, then there is financial side, according to Calvo and Reinhart (2000) and Kaminsky and Reinhart (1999) if the liabilities of the banking sector and/or the government are dollar denominated the value of foreign debt in domestic currency goes up in the wake of depreciation and this makes the smooth functioning of these institutions quite difficult and even, in some cases, may lead to banking sector crises. According to another study, Aghion, Bacchetta and Banerjee, (2000), if nominal prices are rigid currency depreciation causes an increase in the foreign currency debt repayment obligations of the firms leading to a decline in their profits; this reduces firms borrowing capacity and subsequently investment and output in a credit constrained economy, which leads to depreciation spiral. Another channel, which recently has been identified by Lane and Milesi-Ferretti (2004) emphasize that larger gross cross-holdings of foreign assets and liabilities means that valuation channel of exchange rate has grown in importance, relative to the traditional trade balance channel. All these effects bring the exchange rate in central stage in an open economy, and in this globalized world economies are becoming more and more open.

Another strand of paper is that should monetary policy take other asset prices like share, stocks, houses and land prices into account. The genesis of this debate goes back to Alchian and Klein (1973). Semt (1997) in a mathematical model concludes that central bank response to asset price depends on transmission mechanism of asset prices and information contents in it. Goodhart (2001) concludes that house prices are important and should be included in the CPI but not exchange rate or share prices. The study is about advanced countries but our conjuncture is that situation may be different for emerging market economies so for as exchange rate is concerned because of their economic structure. Another study by Schwartz (2002), that gives historical discourse of Japan and USA, concludes that monetary policy should not be used to correct the asset prices and let the market decide the price of assets. The study recommends that capital requirement can be used as a tool to attain financial stability. So the focus is on regulation and not on monetary policy so for as asset prices are concerned. Undoubtedly, regulations cannot be underestimated but we think that prolonged loose monetary policy may provide an incentive to direct resources toward asset prices. Similarly, Bernanke and Gertler (1999, 2001) conclude that for a plausible parameter values the central bank should not respond to asset prices. However, Cecchetti, Genberg and Wadhwani (2002) prove theoretically that monetary policy that pursue inflation target should respond to asset price misalignment. The critiques of the response of monetary policy to asset prices are of the view that it is difficult to calculate the equilibrium asset prices and so the level of misalignment. Secondly, the tightening of monetary policy when the bust is just around can aggravate the problem by depressing the growth prospects even more. In this regard Borio and Lowe (2004) conclude that timely identification of the financial imbalances is hard but not impossible. Secondly the study concludes that a pre-emptive response calls for longer horizon (larger than one to two years), which is not compatible for inflation targeting. So the study is less content with inflation targeting framework due to its short policy horizon.

Why asset prices should be taken into account? Theoretically, if the asset prices are increasing they will give rise to wealth effect and thus put pressure on the inflation. As inflation targeting central banks respond to inflation deviation from the target so this rule out the discussion of response of central bank to asset prices. But the story is not so simple. Yes, theoretically, prices of assets are claims on future output. So the increased asset prices will lead to higher future output and output gap being leading indicator of inflation will guide the central bank to respond to inflation. According to Bean (2003) flexible inflation targeting economies need not explicit addition of financial imbalances or asset prices. The study is of the view that financial instability will also have a significant impact on activity and inflation that are very much cared by *"flexible inflation targeting regime"*. All these studies assume that asset prices are translated into inflation immediately before the financial sector confronts with the stress. But according to Palley (2006) there may be variety of reasons of high asset prices having little impact on inflation for example, asset prices like equity and house prices are not

included in CPI, in a global economy increased spending due to asset prices may appear in trade deficit, and the asset prices may also be unrelated to aggregate demand, for instance, increased asset value may be applied as a collateral to purchase more assets. Due to these reasons the connection between asset price increase and inflation may be quite week and keeping the monetary authority complacent that inflation is under control so to avoid unwanted hike in interest rate but building the financial instability, side by side.[1]

Before we discuss the existing literature about response of monetary policy to stock market we would like to shed some light on the channels through which capital inflows have an impact on asset prices. According to Kim and Yang (2008) financial globalization increases the demand for assets and thus leads to an increase in asset prices[2]. The other channel is liquidity channel such that capital inflows may increase in money supply and liquidity, unless fully sterilized, which in turn can boost the asset prices and thirdly, capital inflows tend to generate economic booms in the country and thus increase in asset prices. There are different studies, which have investigated the relationship between interest rate and stock market, for instance, Rigobon and Sack (2003) concludes that stock market movements have significant effect on short term interest rate and there exist positive co-movement between them. The study further says that the results are in line with the impact of stock movement on aggregate demand through wealth effects. Similarly Smets (1997) concludes that optimal response depends on how the asset-price movement affects the inflation forecast, which depends on role of asset price in transmission mechanism and information contents in it. Another study by Ehrman and Fratzscher (2004) concludes that monetary policy affects individual stocks in heterogeneous way, for instance, industrial sectors that are capital intensive react stronger to monetary policy and secondly, financially constrained firms respond strongly to monetary policy. In a recent study by Bautista (2008) the author concludes that loose monetary policy is not necessarily always the sole reason of asset price boom, the capital flow may also be. All this debate makes the task of monetary policy makers a complex one. Inflation targeting theory says that the targeters should response to output gap and inflation deviation so the developments in the exchange rate and /or stock prices should be taken into account only to the extent they have an impact on inflation. But the changing environment of real globalization might have put downward pressure on the inflation. On the other hand financial globalization may have increased the volatility in exchange rate. The increased liquidity availability due to financial globalization has made the stock markets more active.

Coming to the sample countries, if we look the recent history, before adoption of IT, the situation is very interesting. According to Calvo et al. (1995) Chile provides an example of Purchasing Power

[1]. Theoretical reasons that why asset prices should be used to measure inflation has been provided by Robert Pollack(1998), whereas Shibuya (1992), Wynne (1994), Shiratsuka (1999), Flemming (1999) and Goodhart and Hofmann(2000) have done empirical work

[2]. However, it is notable that asset bubble can also exist in closed economy for example, Ventura (2002).

Parity (PPP) rule, the study further says that in July 1985, an exchange rate band was established whose central parity was adjusted at daily intervals according to the schedule based on the inflation rate during the previous month minus the estimated world inflation rate and this rule was intact until January 1992. According to Carstens and Werner (1999) Mexico experienced a forced transition to the floating regime. The study says that current account deficit; illiquidity of the Mexican government and the looming banking crises paved the path for balance of payment and financial crises. These developments compelled the central bank to let the peso float. Brazil was under a crawling pegged system from 1994 to 1998. After the late-1998 currency crises, Brazil adopted floating exchange rate system. On the other hand, in South East Asia, too, the situation was more or less similar to the above mentioned Latin American countries. According to Osawa (2006) Korea was under the managed floating regime until October 1997, however, it became independently floater after November 1997, whereas Thailand was under fixed exchange rate regime till June 1997, and then it moved to managed floating. Conversely to the above mentioned two East Asian countries, Philippine was under independently floating regime since 1988, that is, a long time ago before adoption of Inflation Targeting in 2002. In the Eastern Europe, Czech Republic was under the fixed exchange rate regime against Deutsche Mark (DM) when the Czech Republic was struck by currency crisis in 1997. According to a study by Creel and Levasseur (2004) the root cause of the crisis was excessive credit to the firms by the state-owned banks and on the other hand, the firms did not go for restructuring and lost competitiveness, consequently, the external imbalances engulfed the economy. Central Bank increased the interest rate to defend the regime but in vain and ultimately, it abandoned the fixed exchange rate regime in favour of managed float against DM. and few months later in December 1997, Czech Republic adopted inflation targeting regime.

If we look their level of financial globalization with respect to movement toward flexible exchange rate movement. Brazil adopted independent floating in 1999, Chile also in 1999, although it is interesting to note that Chile adopted inflation targeting in 1991, Mexico adopted independent floating exchange rate at the end of 1994. According to Dooley et al. (2002) before the crisis in 1997 Korea was characterized by a tightly managed exchange rate regime. Similarly, according to Osawa (2006) Korea was under the managed floating regime until October 1997 whereas Thailand was under fixed exchange rate regime until June 1997, and then it moved to managed floating. Conversely to the above mentioned two East Asian countries, Philippine was under independently floating regime since 1988, that is, a long time ago before adoption of IT in 2002.

But the situation of emerging markets, that constitute our sample, is different than that of advanced economies as discussed above. In this back ground the purpose of this study is to investigate that the central banks respond to exchange rate and share prices movements or not.

3. Did Monetary Policy Respond to ER or Share Prices?

In this part of the study we will investigate whether central banks responded to the movement in exchange rate and /or share prices? One might argue that it is evident from the theory that central banks main objective is to attain price stability and even in flexible inflation target the only output gap is added in addition to the inflation deviation. But we get a motivation from the well-known paper of Calvo and Reinhart (2000) that central bank not necessarily do what they say. Our second source of motivation is the peculiar structure of emerging market economies. These economies are not blessed with hard currency advantage and strong financial sector, although, stock prices can play havoc even with the so-called strong financial sector that is evident from the recent subprime crises (2007) of USA.

3.1 The Model:

Inflation targeting in closed economy does not require exchange rate in the model as according to the New Keynesian Phillips Curve (NKPC), current inflation is function of output gap and expected future inflation. As output is also being taken into account and if monetary authority also takes output into account along with the inflation, it is called *"flexible"* inflation targeting [Svensson (1999)]. However, Echingreen (2002) is of the opinion that as output is important for future inflation so even if a central bank does not care about it, it would be reflective in the decisions of the central bank about interest rate changes. On the other hand, in an open economy where exchange rate is also a variable to care about due to its variety of impacts on economy, as discussed above, it can also not be ignored altogether.

Here we use a small econometric model for the inflation targeting framework for open economies, it includes three basic equations: an aggregate demand or IS type equation, which expresses the output gap as a function of its own lags, the lags of real interest rate and current level of exchange rate. The second equation is Phillips Curve, expressing the rate of inflation as a function of its own lags and the lags of the output gap and the nominal exchange rate; and our third equation is an interest rate rule equation in terms of a modified Taylor rule. This small model is similar to Bean (1998), Werlang et al (2000), Ball (2000) and Eichengreen (2002). However it is worth mentioning that all these models are backward looking whereas the Keynesian model is forward looking. As inflation targeting can be said inflation forecast targeting being inflation forecast as an intermediate target so we think that forward looking model is right one for the inflation targeting countries. However, it is interesting to mention that there is no consensus that forward-looking always fit the data best. The discussion is going on, for

instance, Lindé (2001) concludes that backward-looking model fit the data better relative to purely forward-looking model. However, Gali and Gertler (1999) conclude that forward-looking behaviour is dominant and provides a good approximation to the dynamics of inflation.

Before we write down the model we would like to list assumptions of the model well documented by Gali (2008). Firstly, the prices of the goods and inputs are set by the private economic agents instead of Walrasian auctioneer seeking to clear all the markets at once that is that is economic agents face monopolistic competition. Secondly, there exist nominal rigidities, that is, firms are subject to some constraints on the frequency with which they can adjust the prices of the goods and services they sell. Alternatively, existence of menu cost has been assumed. Thirdly, wages are sticky. Last but not least, these nominal rigidities induce short run non-neutrality of monetary policy. In the long run, however, monetary policy is no more non-neutral. Furthermore, our model is open economy model as we have introduced exchange rate that we think have gained much importance due to financial globalization in the recent past.

$$y_t - y^* = \lambda (y_{t+1} - y^*) + \beta (i_t - E_t (\pi_{t+1})) + \delta (e_t - e_{t-1}\}) + \varepsilon^y_t \quad \text{----------(1)}$$

$$\pi_t = \varphi\pi_{t+1} + \alpha (y_t - y^*) + \omega (e_t - e_{t-1}) + \varepsilon^\pi_t \quad \text{----------(2)}$$

$$i_t = \theta + \gamma(\pi_t - \pi^*) + \lambda(y_t - y^*) + \eta (e_t - e_{t-1}) + \varepsilon^i_t \quad \text{----------(3)}$$

y^* is equilibrium output, π^* is inflation target, *i* is the nominal interest rate, *e* is the nominal exchange rate and ε^y is the stochastic error term. In the second equation Fisherian ex-ante equation has been used to calculate real rate if interest. The π^*, is the target set by the central bank whereas ε^π is stochastic error term. π^* that is long term inflation in the model and according to Ball (2000) interest rate setting is such that the expected value of the inflation rate two period ahead is equal to the inflation target, that is, $Et(\pi t+2) = \pi^*$. The subscript t denotes time as usual.

Under the inflation targeting regime central bank aims to keep inflation within the predefined band, which requires the adoption of a forward-looking attitude as there is effectiveness lag. In this sense, the future expected inflation becomes a guidepost for the policy makers. According to Svensson (1999), the conditional inflation forecast is intermediate target variable in inflation targeting regime.

Equation (1) which represents the demand side of the economy is an open economy expectational, forward-looking IS curve where current output gap is a positive function of one period ahead expected output gap, and a negative function of the real interest rate, as it is commonly argued that an increase in the real interest rate will depress the level of investment on one hand, and increase the level of

saving on the other hand, thus having downward impact on output level through investment and consumption, while the opposite holds true for the decline in real interest rate (Chadha and Dimsdale, 1999). However, the story is not as smooth as it looks, for example, Bilbiie (2008) emphasize the role of degree of asset market participation in the determination of slope of IS curve. The study is of the view that moderate participation strengthen the role of monetary policy while low enough participation can cause an inversion of the IS curve. This can lead to blatant opposition to the 'Keynesian' conventional wisdom. This also in fact depends upon the relative strength of the *substitution effect*, which works toward more saving at higher interest rate, and the *income effect* which works toward less saving at higher interest rate. So the substitution effect and income effect are not only concerned with the asset market participation but also with the income distribution in the society. Similarly, in deflationary episode the potency of monetary policy becomes questionable as despite very low interest rates economy does not grow as it would in normal days. This is the situation where zero bound interest rate becomes a constraint on the monetary authorities and they resort to tools like fiscal stimulus and /or quantitative easing. The other factor that explains negative relationship between real interest rate and output is investment. It would not be out of place to mention here that in developing countries political instability also matters though it is almost always there in developed economies. Besides all that, recent research emphasizes that it is not the level of real rate as such rather the *'natural' or 'equilibrium'* value of the real rate that matters for the output gap (Neiss and Nelson, 2001; Woodford, 2003). However, the academic questions arise there with what certainty one can calculate the 'natural' or 'equilibrium' value of the interest rate and does it remains constant for a reasonable period of time to implement and see the results. The other explanatory variable in the equation is exchange rate and it is assumed that output gap is positively correlated with the exchange rate (a higher e means depreciation), the simple line of argument is the classic text book economics where real depreciation brings competitive gains and improves foreign sector of the economy and subsequently level of output and employment but there exists theoretical reasons that why devaluation can have contractionary impacts on the economy. First is the redistribution argument that says that devaluation can redistribute income from groups with a lower to higher marginal propensity to save and this may cause a decline in output and employment (Krugman and Taylor, 1978). Secondly, a nominal devaluation can decrease the aggregate demand through negative real balance effect due to higher price level and thus a decrease in output level. Third is the Marshal-Lerner Condition, according to which if the elasticity of import and export are very low the balance of trade can deteriorate and can have contractionary impacts on the economy. Now we turn to the case when we will replace variable of exchange rate with the share prices. If we assume that at least some portion of increase in the asset price is explained by the fundamentals of the economy, that is productivity shock, leading to confidence of investors we can infer that it will have positive effect on the output gap. Needles to say that they tell us about future expectations and the overall mood of the economic agents.

If we believe that income effect or the wealth effect react slowly and thus share prices are leading indicator of output gap. So we tend to say that they are good predictive of the future output at least to the extent of fundamental component of asset prices keeping the bubble part aside, which is difficult to measure nonetheless. The last term ε^{y}_{t} is an unanticipated demand shock (like public spending or exogenous productivity disturbance) or expectation error. It is white-noise and temporary in nature.

Equation (2) which represents the supply side of the economy is an open economy new Keynesian Phillips Curve, which can be derived from various price setting behaviour and a measure of excess demand. The coefficient φ measures the degree of forward-looking behaviour of price setting of the firms. So when a firm sets the price it must be concerned with the future inflation as it may not be able to adjust its price for several periods. It depends upon the communication strategy and credibility of the central bank. According to which inflation process is forward looking with current inflation as a function of expected future inflation. According to Robert (1995) much of the analysis of inflation comes under what is called New Keynesian Phillips Curve, a model of price setting based on nominal rigidities well documented by Taylor (1980) and Calvo (1983). This forward-looking Phillips curve has been extensively used by researchers. Similarly, it is positively correlated with the output gap, if output gap is positive central bank will increase the nominal interest rate to slow down the overheated economy and α captures the speed of price adjustment, the larger α implies that larger proportion of firms adjust price at each period. In the open economy, a change in the domestic output has an effect on marginal cost through its impact on employment and the terms of trade and substitutability between domestic and foreign goods. This phenomenon can reduce the impact on inflation; this has been described aptly by Gali and Monacelli (2005). In passing, we would like to point out that although there is debate in the recent literature that real marginal cost is better suited as compare to detrended output in a Calvo pricing model (Neiss and Nelson 2005) and a study by Dees et al.(2008) is skeptic about the use of HP filter. Similarly, Clarida and Gali (1999) also stressed that detrended GDP is an inappropriate proxy for real marginal cost. However, this study relies on detrended (HP Filter) output gap. The exchange rate (increase in e means depreciation) wills positively affect inflation through 'imported inflation'. Now we turn to the case when we will replace exchange rate variable with the asset prices. If the increase in asset prices lead to increase in income and consequently in consumption it can put upward pressure on inflation; however, if increase in share prices is due to increase in productivity and thus increased availability of goods matches the increased income effects because of share prices there may not an increase in pressure. Whereas ε^{π}_{t} is a cost push shock, for example, an adverse supply shock of oil. In new Keynesian literature this causes the trade-off between inflation and output variance. It would not be out of place to mention here that despite being the darling of so many researchers forward-looking Phillips curve is not immune to criticism.

Equation (3) closes the model by a monetary policy rule. It is a type of Instrument Rule adopted by the central bank for an open economy, where nominal interest rate is a positive function of inflation deviation that is if current inflation is higher than the long term (target inflation, in this model two periods ahead inflation), and central bank will jack up the nominal interest rate and vice versa. For this the central bank will rely on its forecast of inflation, as inflation forecast becomes its intermediate target. It is also a positive function of output gap, in case of positive output gap central bank will increase interest rate to slow down the overheated economy. Assuming that substitution effect is stronger than income effect and thus putting downward pressure on aggregate demand the increase in interest rate will pay the dividends. The third term exchange rate also enters with positive sign in the equation (increase in e is depreciation) and this is due to imported inflation, the other possible explanation may be to stop outflows in the backdrop of deprecation or encourage inflows, if the economy is much integrated with the world economy, especially financially. As mentioned in the explanation of the above two equations we will also replace exchange rate here with share prices and we expect that central bank will increase the interest rate in the wake of increasing share prices. However, there is a need to be cautious here, if the central bank is of the view that the increase is genuine and fundamental based then central bank will wait and see. Although it is not an easy task to disentangle the 'fundamental based' and bubble based increase in the share prices. Growing productivity can lead to increase in share prices without putting pressure on inflation and thus leaving interest rate unchanged, this debate has been well captured by Laurence (2004). The intercept term θ is any exogenous stochastic process as described by Woodford (2001). The equation also has ε^{i}_{t} stochastic monetary policy shock.

Although Taylor type reaction function is very much in use; however, there are other potential candidates also. Batini, Harrison and Millard (2003) discuss a battery of rules. Beside Taylor rule their study gauge the performance of naïve MCI rule, Ball (1999), inflation-forecast-based rule (IFB) and some other variants. Study finds that IFB, a rule that reacts to deviations of expected inflation from target, is a good simple rule. The study further says that, an IFB rule, with or without exchange rate adjustment, appears robust to different shocks, in contrast to naïve or Ball's MCI-based rules. Furthermore, a study by Svensson (1997) goes this way "even though I believe instrument rules like the McCallum and Taylor rules are important advances in the theory of monetary policy, I consider a commitment to a target rule to be more advantageous than a commitment to an instrument rule. A target rule focuses on the essential, that is, to achieve the goal, and allows more flexibility in finding the corresponding reaction function". However, we use this Taylor type rule due to its simplicity and we use this small scale canonical New Keynesian model because of its parsimony. Although it is without solid micro foundations we think that it yet provides the stylized representation of the key aggregates in the economy and captures the essence of transmission mechanism of monetary policy.

As we have mentioned earlier that literature is divided about the behaviour of economic agents that they are forward-looking or backward-looking so we will use both the forward-looking and backward-looking models to capture the bahviour of the economy. Our backward-looking model will also be like the earlier explained three equation models with the difference that here the decisions of the agents regarding the current variables will be influenced by the lagged values of the variables. This is in line with the adaptive expectations. Although one might argue that inflation targeting regime is inherently a forward-looking regime so there are less chances of economic agents being backward-looking, but we think that this is an empirical question so it should be answered by the data au lieu de our intuition. Backward-looking models are well suited to explain inertia in the thinking of economic agents. Furthermore, in New Keynesian model in the IS Curve, the relationship between current output gap and real interest rate is contemporaneous that we think is not realistic. Keeping in mind the transmission mechanism we feel it difficult to digest that there is no transmission lag so in this background backward-looking model becomes relevant. Similarly, in adaptive expectations households and firms formulate their expectations as the weighted average of the present and past values of economic variables. So the backward-looking Phillips curve, otherwise known as accelerationists' Phillips Curve cannot be rules out altogether. This model resembles Bean (1998), Werlang et al (2000) and Eichengreen (2002).

4. Methodology:

The study uses quarterly data form IMF IFS. The study uses Generalized Method of Moments to find the values of the parameters; more specifically the study uses multi-equation GMM. The multi-equation GMM is considered efficient as compare to the single-equation GMM. We will make no assumption about the interequation (or contemporaneous) correlation between the error terms and no prior restrictions are placed on the coefficients from different equations. We use lagged values of explanatory variables as instruments. To be consistent with our model we use two lags for the current variables and three lags for the past. The orthogonality condition for the system of equation is just a collection of orthogonality condition for individual equation Hayashi (2000). It is worth mentioning here that selection of instrument and lag selection has always been a ticklish task. A good instrument is a predetermined variable that is correlated with the endogenous regressor. Then there is an issue of week instruments. To the best of our knowledge there is no hard and fast rule for lag selection. Tauchen (1986) is of the view that it is better to use small instruments set, because the confidence intervals are more reliable. For further discussion on this issue see Gallant and Tauchen (1996) and Bates and Halbert (1988).

This technique is widely used in the literature to estimate the reaction function of the central banks and Phillips Curve. A lot of literature has used GMM to estimate Phillips Curve and reaction function, for

example, Clarida, Gali and Gertler (1998) estimate forward-looking monetary policy reaction function for the United States for Pre-Volcker and Volcker-Greenspan period and Gali, Gertler and Lopez-Salido (2001) use GMM to estimate Phillips Curve. Similarly, Fuhrer and Rudebusch (2004) used GMM to estimate equation of output.

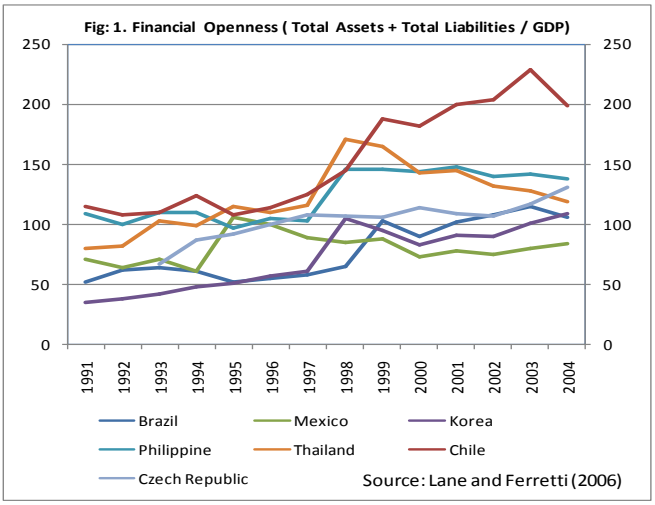
We use quarterly data from IFS-IMF. The starting date corresponds to the date of adoption of inflation targeting by the respective countries and up till the fourth quarter of year 2008. We calculate output gap by log difference of real GDP from its detrended value. To detrend we use H-P filter (The smoothing parameter is set to the default of 1600 for quarterly data). To calculate real interest rate we use Fisherain equation. We use nominal exchange rate (domestic currency per US Dollar), we take the log difference, and an increase in e means depreciation. For inflation deviation we use Ball's formula. In the Taylor rule (our third equation in the model) we use, of course, the policy rate of the central bank. Indeed, we would like to mention that for Brazil, as GDP values were not available in the IFS data set so we use industrial production as a proxy, which is quite customary in the literature and for Chile discount rate, the policy rate, was not available since 1991 so we started the estimation using data since 1993. To check the stationarity of variables we use Augmented Dickey Fuller (ADF) and Kwiatkowski, Phillips, Schmidt and Shin (1992). According to Verbeek (2004) in the latter test the stationarity is the null hypothesis and the existence of a unit root is the alternative. The basic idea is that a time series is decomposed into the sum of a deterministic time trend, a random walk and a stationary error term (typically not white noise). The null hypothesis (of trend stationarity) specifies that the variance of the random walk component is zero. Although we report the results of both the tests, however we rely on KPSS test. As some time the result so ADF and KPSS were somewhat different so we also tested the normality of residuals of the regressions.

5. Stylized Facts:

In this section we well describe the stylized facts and try to have an idea about the relationship between variables. For this purpose we will use covariance matrix that indicates the direction of linear relationship between two variables, for example, if covariance between two variables is greater than zero then there is a positive relationship between two variable and vice-versa. However, one should be cautious that covariance does not tell us much about the strength of such relationship. It is pertinent to mention here that covariance is influenced by the unit of measurement. To avoid this problem we also report correlation coefficient, which uses standardized data. Furthermore, graphic relationship has also been reported to provide a visual analysis to the reader. Needless to say that these techniques are just to have a quick view of the relationship among variables although when they interact in model they may behave differently. See Table in Appendix. Generally speaking, the trend is in line with the theory however, exception is there. Similarly we have also put graphic presentation in the Appendix.

The one question that comes to mind here is that what the evolution of financial globalization tells us about these countries. See the figure below.

It is clear from the figure that the level of financial globalization increased rapidly. Almost all the countries observed an increasing trend except Mexico. Mexico is the single country that registered a downward trend; it may be due to the policies adopted by the Mexican government or the health of the Mexican economy that could not catch the foreign inflows due to low level of investors' confidence. We cannot say definitively unless we know the policies regarding the capital account liberalization during the period under discussion. Although the data is only up to 2004 yet we tend to believe that in the recent years the trend was not reversed. However, it is worth mentioning here that government of Brazil imposed capital inflow tax in October 2009 in the wake of heavy capital inflows that were creating problems for monetary authorities in the conduct of monetary policy. Otherwise, to the best of our knowledge we do not find any country that have had adopt such a discouraging step to the inflows.



6. Estimation and Results:

The overall results are in line with our expectations; however, we also find some interesting results so far as share prices are concerned. The negative relationship between share prices and interest rate seems bit odd but one might argue that central banks just don't care about share prices so the negative sign is just a matter of econometrics and not of policy actions. Our first country in the regression is Brazil. Our first equation is the IS curve, in this equation the expected output gap and exchange rate are statistically significant and with correct signs. Although one might argue that how to interpret positive sign with exchange rate, as we have discussed in detail somewhere above that if exports is a vibrant sector in the economy then depreciation (in our case increase in e is depreciation) can put upward pressure on output gap. Although one might still argue that if input prices are increased due to depreciation it can lead to decrease in output. For this one need to have a look on sectoral exports if exports are mostly primary goods then the argument of input price hike through depreciation becomes relatively week and competitiveness through depreciation brings more fruits for the economy. Although it is an empirical question and relevance of Marshal-Lerner condition is of high importance.

Table 1: NK Model with Multi-Equation GMM

Country	Brazil	Chile	Mexico	Korea	Philippines	Thailand	Czech Rep.
	Asset: Exchange Rate						
	New Keynesian Model (Forward-Looking)						
IS Curve	Dependent Variable: Output Gap						
Expected Output gap	.65 (.05)	.12 (.08)	.59 (.08)	.85 (.10)	0.04(.04)	.03(.02)	.98 (.03)
Real Interest Rate	.007 (.004)	-.13 (.02)	.03 (.01)	-.46 (.04)	-.95(.21)	-.20(.06)	.03 (.006)
Current Exchange Rate	.01 (.004)	-.07 (.02)	.21 (.05)	.03 (.009)	.19(.03)	-.15(.02)	-.01 (.005)
R^2	-.29	-.10	.10	-.07	-.05	.09	.80
Phillips Curve	Dependent Variable: Inflation						
Expected Inflation	1.02 (.009)	1.03 (.01)	1.06 (.006)	.98 (.02)	.93(.01)	.95(.02)	1.01 (.02)
Current Output gap	-.36(.01)	-.21 (.03)	.09 (.01)	-.13 (.01)	-.13(.01)	-.07(.01)	-.12 (.03)
Current Exchange Rate	-.04 (.002)	-.01 (.01)	-.13(.02)	.02 (.001)	-.01(.01)	.02(.005)	-.02(.005)
R^2	.78	.93	.80	.46	.67	.53	.67
Taylor Rule	Dependent Variable: Nominal Interest Rate						
Constant	22.65 (.14)	8.17 (.42)	8.37 (.12)	2.65(.03)	5.53(.07)	.99(.007)	4.17 (.16)
Inflation Deviation	.26 (.04)	2.45 (.21)	3.35 (.08)	-.008 (.008)	.21(.02)	.04(.006)	.70 (.02)
Output gap	-1.09(.09)	1.08 (.38)	-.04(.04)	.13 (.01)	.09(.01)	.02(.007)	.45 (.03)
Exchange Rate	.04(.006)	.24 (.11)	.36 (.06)	.01(.001)	.07(.01)	.03(.003)	.09 (.01)
R^2	.15	-.03	.47	.27	.15	.80	.35
J-Stat (p-Value)	.42	.08	.44	.34	.50	.46	.34

Note: Multi-equation GMM technique has been used. We use lagged independent variable as instruments. We use two lag for current variable and three for lagged one. In parenthesis are the standard errors. Estimates are based on quarterly data and sample starts from the date of IT adoption and ends in last quarter 2008

Interestingly real interest rate is with positive sign but insignificant. It is against the conventional wisdom where it is almost a sin to imagine that interest rate will become insignificant with respect to output. What could be the possible reasons if economic agents are smoothing their consumption intertemporally then the interest rate might become less important. Secondly, if a reasonable number of firms are raising funds from abroad then domestic interest rate might become less important although one might argue that if this is the case then domestic interest rate should also toe the line of foreign interest rate and secondly, when sovereign risk is added up with the foreign interest rate it might become equal to domestic interest rate and then there may be fear of depreciation of domestic currency that increase the liability of domestic firms in terms of domestic currency. So a complex relationship of uncovered interest rate parity comes in the picture. Another possible reason may be the weak connection between domestic interest rate and capital market. Nevertheless, it is difficult to digest that output is not sensitive to interest rate. Theoretically, it may be so in case of severe depression but we know that there is no such case with the Brazilian economy.

In our second equation, we have Phillips curve or aggregate supply curve. The estimated equation with New-Keynesian model is not good. The equation tells us that all the current inflation depends upon the expectation of future inflation. As there is a wide literature debating the issue that Phillips curve is a

backward-looking or forward-looking. So we think that the poor estimation is due to the specification of the equation. For the same country when we use ball's method that is backward-looking results become in line with the theory and output gap and exchange rate also becomes important. The excessively high coefficient of expected future inflation is due to misspecification but to be consistent we do not contaminate it with lagged values of output gap and exchange rate rather we leave this issue to our Ball's model specification. No doubt about it that in inflation targeting central banks publish forecast of inflation and stick to the announced target. This makes economic agents to anchor their expectations and they become forward looking due to communication strategy but it does not rule out inertia in inflation and in the thinking of economic agents. Although one might argue that the impact of output and exchange rate is embedded in the future inflation so in Phillips curve equation output and exchange rate becomes irrelevant. This seems fascinating so for as imagination is concerned but rules out adaptive expectation and backward-lookingness, which is still in very much fashion when economic agents process information to make decisions. We tend to conclude that not only Brazil but other countries also (see table 1 above) do not support purely forward-looking Phillips curve.

In our third equation we estimate Taylor rule. Dependent variable is nominal interest rate. On the right hand side we have a constant, inflation deviation, output gap and exchange rate. The sign of inflation deviation is as expected. It is positive and significant. It means that when current inflation higher than the target inflation, central bank increases the interest rate to bring it down. So interest rate is a tool in the hands of central bank and it is exogenous. Central bank manipulates interest rate to control inflation. The central bank response to output gap is negative and statistically significant. It seems bizarre but Minella et al. (2002) also find the same relationship for Brazil. Their sample consists of monthly data from July 1999 to June 2002. The central bank response to the exchange rate is positive and significant as we were expecting because of long relationship of Brazil with managed exchange rate regime. So on the basis of these empirical results with this sample we tend to conclude that central bank of Brazil takes into account the movements in exchange rate while making the policy decisions regarding interest rate. The reason might be high pass-through or perhaps the central bank has not reached that level of credibility where the exchange rate is of no worry. We think that it is not only the pass-through, the financial sector stability also demands stability of exchange rate. Furthermore, Correa and Minella (2006) indicate that there exists a short-run pass-through of nonlinear nature in Brazil.

When we come to the share prices the response of central bank is highly insignificant (see table 1 in Appendix). It reveals that the central bank of Brazil does not care about the share prices. There is a long debate, as we have mentioned above, that central bank should respond to stock market or not. The opinion is divided. Some are of the view, for example, Cecchetti, Genberg and Wadhwani (2002) that the repercussion of capital market on economy are very much serious so the monetary authorities

should care about the assets like, share. However, on the other side, there are those, for example Bernanke and Gertler (1999, 2001), who say that it is difficult to segregate fundamental component from the bubble component so respond to misalignment is unnecessary. We think that it is a tricky issue. On one hand, once the bubble bursts it harms the economic activity for a long time and reduces welfare of the society due to reduction in employment. On the other hand, unnecessary reaction to the asset market can stifle the economic growth and thus can cause a reduction in economic welfare. So it is a matter of cost benefit analysis. For better cost benefit analysis one needs complete knowledge of the economy so that one may be able to distinguish between fundamental component and bubble component.

The second country I our sample is Chile. The first equation is IS equation. The current output gap is positively related with the expected future output gap. The low magnitude of the coefficient reveals that agents are relatively less forward-looking. Our explanation becomes reasonable when we look at the corresponding coefficient in the ball's model. However, still one can say that future expectations play a vital role in determining the current output gap. Our second variable real interest rate is statistically significant and has a negative sign, which indicates that as real interest rate goes up the output gap declines. As the agents find it relatively costly to spend in the environment of high real interest rate so they boost savings and on the other hand, investment opportunities become less attractive rather financial investment seems more attractive and this slows down the process of investment. The other signal to investment comes from the household as they consume less, it means they cast vote for less production. This causes a reduction in output gap and thus real interest rate has negative impact on output gap and our results are in line with the theory. Our third variable is nominal exchange rate and it is not straight forward to explain because of its expansionary as well as contractionary effects. Here the depreciation is decreasing output gap. The link may be due to two reasons. One, if input prices increase due to depreciation it can lead to slowdown in economic activity as output prices are rigid at least for some time. Second, if wages are indexed with CPI-inflation then depreciation can lead to decrease in output gap due to increase in wages. We tend to conclude that depreciation has contractionary impacts on Chilean output. Our second equation is Phillips Curve and like the Brazilian one, here again our equation is poorly estimated. Without contaminating our forward-looking Phillips curve we quote the results as it is and would like to say that the in corresponding Ball's model we have better estimated Phillips curve. The third equation is Taylor rule. All the signs are in line with theory. Although statistically significant reaction to exchange rate is not in line with our expectations. As Chile is among the pioneers who adopted inflation targeting so we were expecting that exchange rate would be nowhere in reaction function of central bank of Chile. But the situation is reverse. Perhaps out model is not fully micro founded so the relationship is not structural one. There is international evidence that pass-through has decline due to trade competition

but in case of Chile in a recent study Alvarez et al (2008) found high and not declining exchange rate pass-through. So our results are not entirely against the findings in the literature. Furthermore, perhaps the valuation channel of external adjustment has also grown in importance that makes exchange rate a variable to be care about.

When we come to the share prices the response of central bank is significant and positive (see table 1 in Appendix). According to this, central bank of Chile responds to movement is share prices. As we have already mentioned above that opinion is divided on the issue but we are not saying Chilean central bank should respond to share prices. We have just explored what the central bank did. This may be just due to procyclicality of share prices and output gap.

The third country in our sample is Mexico. Instead of explaining again we would say that the result is broadly as expected except one coefficient that is there in IS curve where the real interest rate takes positive sign. But we would like to mention here that in corresponding Ball's model, that is backward-looking, the sign is correct. What does this indicate? One explanation may be that investors still are adaptive and they make decisions looking at past real interest rate instead of future interest rate. We also tend to say that perhaps there is much procedural lag and it makes implementation of investment non-contemporaneous to the real interest rate. The other relationship that irritates is the relationship between nominal interest rate and output gap in Taylor rule, our third equation; again we would like to say that in Ball's model the relationship is quite in line with theory. So we would like to say that Mexican economic agents are perhaps more backward-looking than forward-looking. So far as response to exchange rate is concerned, the results are in line with our expectations and central bank of Mexico responds positively to the exchange rate depreciation. The base of our expectation was the study of Hebbel and Werner (2002) where they conclude that for Mexico the nominal depreciation has statistically significant role for inflation expectation. One might argue that the study is a bit old and things might have changed since the Mexico has gone a long way after inflation adoption.

Coming to the share prices the response of central bank is significant and negative (see table 1 in Appendix). It is difficult to interpret. What could be the reason that nominal interest According to this, central bate has negative relationship with the share prices. Perhaps the central bank of Mexico just doesn't care about share prices. Why? Perhaps the wealth effect is weak in Mexico. Why? Perhaps the participation in asset market is low and capital market is less developed relative to the level where wealth effect becomes important to influence and subsequently to output gap. But all these demand empirical investigations that are beyond the scope of the study.

So for we have discussed three North American countries namely Brazil, Chile and Mexico and it is interesting to note that all the three countries respond to exchange rate. Although almost two decade for Chile and one decade for Brazil and Mexico has elapsed since the adoption of inflation targeting

but according to our study the entrenched importance of exchange rate is still there. Despite the fancy arguments that trade liberalization brought competition and inflation targeting provided credibility, the phenomenon of pass-through is has not gone down in significance. The competition by trade liberalization might have been nullified by the valuation channel of external adjustment.

From Asia we selected three inflation targeting countries namely, Korea, Philippines and Thailand.

In case of Korea, the IS curve is in line with the theory. The relationship of future expected output gap and real interest rate with the output gap is as it should be. The exchange rate shows expansionary effects on the output gap. However, in the Phillips curve there is negative sign with the current output gap. It may be argued that output gap does not affect inflation contemporaneously. It takes time that inflation receives pressure from the output gap. Current exchange rate is increasing inflation in the Phillips curve that is in line with the expansionary effects of depreciation in IS curve. In the third equation that is Taylor rule the central bank of Korea responds to exchange rate. The response to exchange rate is according to the conventional wisdom as the small open economies like Korea care exchange rate not only because of inflation but also because of financial stability considerations. However, the coefficient attached with inflation deviation is insignificant. So for as asset prices are concerned, according to our estimation, though the coefficient is significant and negative yet the magnitude of the coefficient is very small (see Table 1 A in Appendix). Perhaps we can conclude that the central bank of Korea also does not care about the share market. Again we would like to say that unless we quantify the wealth effect and the level of asset market participation we cannot say with a reasonable confidence that the central bank of Korea should be worried about the movement is share prices or not.

Coming to our next country Philippines the central bank of Philippines responds to exchange rate. As Philippine was under independently floating regime since 1988, a long time ago before adoption of inflation targeting we were expecting that central bank of Philippines has less incentive to respond to exchange rate. We were expecting that economic agents might have adjusted to the floating exchange rate and pass-through might has gone down. This development will provide a ground to the central bank to be less attentive to exchange rate but our study does not support it. Perhaps the financial globalization has made the exchange rate more important due to valuation channel and financial stability considerations. So far as Share Prices is concerned central bank of Philippines respond to share prices according to our estimation. As the share prices go up, it is an indicator of overheating of the economy, keeping in mind that if it is not accompanied by productivity, then it is a form of bubble and central bank of Philippines respond to it. It is a debatable point that if share prices are increasing due to fundamentals still there remains a case to respond to it to the extent that it is increasing future income and thus inflation. However, one might argue that if wage is increasing so is the case with

production thus increased wage can absorb increased production and subsequently there is no inflationary pressure thus any need to respond to share prices can be ruled-out. It is our personal opinion that in developing countries if investment opportunities are scare and economic agents finds it better to invest in share prices they can increase the share prices for nothing and thus shift scare resources toward financial investment instead of real investment. Keeping in mind the development objective central bank may be tempted to respond to share prices. So there may be different reasons, either due to wealth effect or due to developmental reasons but it is an empirical question and it. So we think that reason of respond to share price may differ from country to country.

In case of Thailand and Czech Republic in both cases the respective central banks respond to exchange rate. However, in case of asset price Thailand respond to share prices whereas Czech Republic not. One reason may be that Thailand economy is more open as compare with Czech Republic so it receives more capital inflows that comes into stock exchange and put upward pressure on share prices that lead to overheating of the economy and demands interest rate increase from the central bank of Thailand.

Our forward looking new-Keynesian model gives us the results for all the countries that they respond to exchange rate. Although in case of Chile and Philippine we were not expecting this as these countries adopted flexible exchange rate in the reasonable past. Our was the view that economic agents might have formed their expectation in a way where credibility of central bank becomes more important, exchange rate pass-through declines and subsequently inflation expectation anchoring does not demand respond to exchange rate. But this is not the case in our estimation. There may be reason of valuation channel, or financial sector's stability considerations. Generally speaking overall model is best estimated especially the third equation in which we are very much interested in. However, we admit that our second equation' the Phillips Curve, is poorly estimated in the sense that the coefficient with the current output gap is consistently negative. That is not in line with the theory. To our knowledge this may be due to the contemporaneous relationship between current output gap and current inflation. As there is ongoing debate, as we have mentioned earlier, that Phillips curve is forward-looking or backward-looking or even hybrid one. So we tend to believe that it is due to the contemporaneous relationship between output gap and inflation. To check this we have also estimated a backward-looking model where current value of an independent variable depends upon lagged values of explanatory variables. As time is required to transmit effect of change in one variable in the other so we think that it would be interesting to estimate backward-looking model also. As we have mentioned above our backward-looking models resembles with Bean (1998), Werlang et al (2000), Ball (2000), and Eichengreen (2002). In this model current independent variable depends upon the lagged explanatory variable thus it is an adaptive model. Like the forward-looking new-Keynesian model described above here too we have a small model consists of three equations. The IS equation

that capture the dynamics of Aggregate Demand, the Phillips Curve that describes the Aggregate Supply dynamics and the third one is the Taylor rule that close the model.

Table 2: Ball's Model with Multi-Equation GMM

Country	Brazil	Chile	Mexico	Korea	Philippines	Thailand	Czech Rep.
	Asset: Exchange Rate						
	Ball's Model (Backward-Looking)						
IS Curve	Dependent Variable: Output Gap						
Lagged Output gap	.78 (.06)	.60 (.14)	.74 (.04)	.61 (.05)	.06(.03)	.03(.03)	.87 (.01)
Lagged Real Interest Rate	-.01 (.003)	-.21 (.03)	-.05(.01)	.000 (.03)	-.51(.29)	-.11(.04)	-.05(.006)
Lagged Exchange Rate	-.01 (.003)	-.06 (.02)	-.19 (.02)	-.03 (.005)	.004(.03)	-.16(.02)	.02(.003)
R^2	-.25	-.10	.30	.25	.01	.10	.76
Phillips Curve	Dependent Variable: Inflation						
Lagged Inflation	.95 (.01)	.95 (.01)	.95 (.003)	.92 (.01)	1.03(.01)	.88(.02)	.85(.02)
Lagged Output gap	.35 (.01)	.06 (.04)	-.05 (.006)	.15 (.02)	.14(.01)	.09(.02)	.01(.004)
Lagged Exchange Rate	.05 (.003)	-.02 (.01)	.10 (.01)	-.02 (.00)	-.006(.01)	-.04(.005)	.20(.03)
R^2	.79	.94	.76	.37	.70	.58	.64
Taylor Rule	Dependent Variable: Nominal Interest Rate						
Constant	22.59 (.17)	7.99 (.65)	8.48 (.18)	2.64 (.01)	5.50(.06)	.99(.007)	4.55 (.13)
Inflation Deviation	.27 (.036)	2.06 (.22)	3.44 (.09)	-.01(.01)	.21(.02)	.04(.007)	.76 (.04)
Output gap	-1.10 (.12)	1.93 (.27)	.16 (.06)	.14 (.01)	.09(.01)	.02(.006)	.27 (.02)
Exchange Rate	.05 (.005)	.24 (.06)	.19 (.05)	.01 (.003)	.07(.01)	.03(.00)	.13 (.008)
R^2	.15	-.07	.53	.27	.15	.80	.43
J-Stat (p-Value)	.99	.07	.46	.34	.59	.46	.34

Note: Multi-equation GMM technique has been used. We use lagged independent variable as instruments. We use two lag for current variable and three for lagged one. In parenthesis are the standard errors. Estimates are based on quarterly data and sample starts from the date of IT adoption and ends in last quarter 2008

We would like to say that the backward-looking model is closer to the theory relative to our forward-looking model. It is evident from the Table 1 and Table 2 that in the former table, which is forward-looking the real interest rate does not behave well in the IS curve and the same is the case with output gap in the Phillips curve whereas in the Table 2 which is backward-looking these variable behave as the theory expect them to do. What could be the possible reason of this phenomenon? The one immediate reason that comes to our mind is the time required to translate the effect of one variable in the other. In the forward-looking new-Keynesian model real interest rate and output gap in IS curve and Phillips curve respectively seeking contemporaneous effects? This makes the case week as transmission needs some time. In the first equation, in case of real interest rate it is not difficult to assume that investment decisions are not taken immediately rather it take some time to formulate the decision and secondly, there is gestation period due to which time lag appears between real interest rate and output gap. Similarly, on the consumption side, consumers take some time in adjusting their consumption. We think that due to "ratchet effect" the consumers do not reduce their consumption instantly rather it takes some to adjust consumption in the wake of change in interest rate. Similarly, in

Phillips curve the output gap has positive sign that is in line with the theory. Again, the explanation is that output gap and inflation is not contemporaneous. As the markets under discussion are emerging markets where labour reforms are not so entrenched, financial markets are not so efficient, so transmission lag is order of the day and economic agents are still backward-looking. Although even in developed economies like USA and Euro area the agents are not purely forward-looking. For instance, Fuhrer (1997) concludes that the forward-looking model is empirically insignificant. However, one might argue that the study is relatively old and lot has changed since then. Similarly, Jondeau and Le Bihan (2001) conclude for major European countries, euro area and US that pure forward-looking Phillips curve is less close to real data generating process as compare to hybrid Phillips curve and the fraction of backward-looking price setters is quite high as much as 50 percent in most cases. However, so for as Taylor rule is concerned the results almost remain the same and emerging markets central banks tend to response to movement in exchange rate. Needless to say, exchange rate occupies an important place in monetary policy despite the inflation targeting framework that theoretically rules out response to exchange rate. Like the new-Keynesian model the results of Ball's model are also mixed so for as response to share prices is concerned. To see the results of Ball's model with respect to share prices see Table 2 A in Appendix. We have summed up the results of Emerging Market Economies (EMEs) in table 3 below.

Table 3: Summary of Results for EMEs

Policy Rate Response to Asset Prices				
	Ball's Formula		New Keynesian Formula	
Country	Exchange Rate	Share Prices	Exchange Rate	Share Prices
Brazil	Yes	No	Yes	No
Chile	Yes	Yes	Yes	Yes
Mexico	Yes	Yes	Yes	Yes (with - Sign)
Korea	Yes	Yes (with - Sign)	Yes	Yes (with - Sign)
Philippines	Yes	Yes	Yes	Yes
Thailand	Yes	Yes	Yes	Yes
Czech Rep.	Yes	Yes (with - Sign)	Yes	Yes (with - Sign)

The above table reveals that in case of exchange rate the response of all the central banks of the emerging markets is clear; however, there are confusing results for share prices. Particularly the results with negative sign are difficult to interpret, perhaps this also shows the "don't care" attitude of central banks toward share prices. This attitude may be due to volatile nature of share prices as excessive volatility demands frequent changes in the interest rate that leads to interest rate volatility. The increased interest rate volatility can confuse the economic agents regarding the direction of monetary policy. Therefore, no response to share prices seems a prudent policy particularly when wealth effect is low as it may be in emerging markets due to limited asset market participation.

7. Concluding Remarks:

In this document we try to estimate the question that the inflation targeting emerging countries respond to asset prices - exchange rate and share prices. Our sample includes 7 emerging economies. Study uses quarterly data from the adoption of IT regime to the fourth quarter of the year 2008. We employ small NK canonical model that contains IS curve, Phillips curve and the Taylor rule. As the new-Keynesian model is forward-looking and there is no consensus that true data generating process is purely forward-looking so the study also uses Ball's model that is backward-looking. Interestingly we find that all the emerging market inflation targeters in our sample respond to exchange rate movements. On one hand the theory of inflation targeting convince us to think that there should be no response to exchange rate and on the other hand the peculiar conditions of emerging economies remind us that what is true for advanced economies is not necessarily true for emerging markets. De Gregorio et al. (2005) conclude that the pass-through from exchange rate to inflation has declined. This makes unnecessary for the central bank to respond to exchange rate but our results are different. Our study shows that central bank of Chile responds to exchange rate. The study of De Gregorio et al. is a bit old, one might think that the recent developments in the world economy like more integration, financial crisis and worry about the health of financial system might have tempted to the central bank of Chile to respond to exchange rate. In case of Brazil too, we find statistically significant response to the exchange rate movement. Possibly, the long association of Brazilian economy with the fixed and managed floating regime has made the economic agents more considerate toward exchange rate movements and the "inertia" in their thinking towards inflation pressure through the exchange rate pass-through has made it justifiable for the central bank to respond to the exchange rate movements even in the IT regime. The situation of fiscal dominance in Brazil demands that exchange rate should be taken care of. The point of fiscal dominance has been highlighted in case of Brazil by Blanchard (2004). Similarly, in case of Mexico, Korea, Philippines, Thailand and Czech Republic the response to exchange rate is statistically significant. According to our results all these countries are still under the shadow of "fear of floating". The increasing financial integration has instigated again the debate of "impossible trinity". We call it "compromised impossible trinity". As free float is restricted by response to exchange rate movement (and intervention in the foreign exchange market) and capital movement is also restricted, for instance, Brazil imposed tax on capital inflows. So this study concludes that sample countries have not yet reached yet the stage where the central bank assigns statistically insignificant value to exchange rate. It is pertinent to mention that in both the case, the forward-looking model and backward-looking model, the response to exchange rate is same and statistically significant. So for as share prices are concerned, the study is inconclusive. We cannot say

with confidence that our sample countries respond to share prices or not. The results are mixed. Some central banks respond to asset prices and others not and even in case of some countries the interest rate show negative relationship with the share prices. We think that a further investigation is needed to explain the results, for instance, market capitalization to GDP ratio and shares used as collateral by firms can give us the relative importance of share prices. Similarly, asset market participation rate can be a good proxy for wealth effect.

However, the result should be interpreted with caution as there are certain caveats in our study. The stylized model that we used is intended for developed economies. Secondly, GMM technique is considered efficient for large sample size. Thirdly, we use nominal exchange rate one might question that real effective exchange rate is appropriate for this purpose. Similarly, there are several ways to measure output gap and one might be skeptic about the measurement of output gap by H-P filter method.

References:

Aghion, P., Bacchetta, P. & Banerjee, A. (2001), "Currency Crisis and Monetary Policy in an economy with credit constraints", European Economic Review 45(7), 1121-1150.

Alchain, A.A. & Klein, B. (1973), « On a Correct Measure of Inflation », Journal of Money Credit and Banking, Vol 5. No.1, Part 1. Pp 173-191.

Alvarez, R. Jaramillo, P. & Selaive, J. (2008), Exchange Rate Passthrough into Import Prices : The Case of Chile » Bank of Chile, Working paper 465.

Ball, L. (2000), "Policy rules and external shocks" Central Bank of Chile, Working paper 82.

Batini, N., Harrison, R., & Millard, S. P. (2003) "Monetary policy rules for an open economy", Journal of Economic Dynamics and Control, 27, 2059-2094.

Bean, C. (1998), "The new UK monetary arrangements: a view from the literature", The Economic Journal, 108, 1795-1809.

Bean, C. (2003), "Asset Prices, Financial Imbalances and Monetary Policy: Are Inflation Targets Enough?", BIS Working Paper No. 140.

Bernanke, B. & Gertler M. (1999), "Monetary Policy and Asset Price Volatility", Federal Reserve Bank of Kansas City, *Economic Review 4th Quarter, 84(4) pp 17-52*.

Bernanke, B. & Gertler M. (2001), "Should Central Banks Respond to Movements in Asset Prices?", *The American Economic Review, Vol. (91), No.2, May, pp 253-257*.

Bilbiie, F. O. (2008), "Limited Asset Markets Participation, Monetary Policy and (Inverted) Aggregate Demand Logic", *Journal of Economic Theory 140, pp 162-196.*

Blanchard, O. (2004), "Fiscal Dominance and Inflation Targeting: Lessons from Brazil", NBER Working Paper 10389.

Borio, C. & Lowe, P. (2004), "Securing Sustainable Price Stability: Should Credit Come Back from the Wilderness?", *BIS Working Paper no.157*.

Calvo, G. A. (1983), "Staggered Prices in a Utility-Maximizing Framework", *Journal of Monetary Economics, 12, pp 383-398*.

Calvo, G. A., Reinhart, C. M. & Végh, C.A. (1995), "Targeting the real exchange rate: theory and evidence", Journal of development economics, Vol. (47), 97-133.

Calvo, G. A. & Reinhart, C. M. (2000), "Fear of floating", NBER Working Paper No. 7993.

Calvo, G. A. & Reinhart, C. M. (2002), "Fear of floating", The quarterly journal of economics, Vol. (CXVII), 379-408.

Carstens, A. G. & Werner, A. M. (1999), "Mexico's monetary policy framework under a floating exchange rate regime", Central Bank of Mexico, Research Paper No. 9905. (May).

Cavoli, T. (2009), "Is fear of floating justifies? The East Asia experience", Journal of Policy Modeling, 31, 1-16.

Cecchetti, G.S., Genberg, H. & Wadhwani, S. (2002), "Asset Prices in Flexible Inflation Targeting Framework", *NBER Working Paper No. 8970.*

Creel, J. & Levasseur, S. (2004), "How would a fixed-exchange-rate regime fit the transition economies? The case of the Czech Republic, Hungary and Poland, Central Bank of Czech Republic, Special Issue, April 2004.

Chadha, J. S. & Dimsdale, N. H. (1999), "A Long View of Real Rates", *Oxford Review of Economic Policy, Vol. 15 No. 2. pp 17-45.*

Clarida, R., Gali, J. & Gertler, M., (1998), « Monetary Policy Rules in Practice : Some International Evidence », *European Economic Review, 42 pp 1033-1067.*

Correa, A. S. & Minella, A. (2006), "Nonlinear Mechanism of the Exchange Rate Pass-Theorugh: A Phillips Curve Model with Threshold for Brazil", Central Bank of Brazil Working Paper No. 122.

Dees et al. (2008), "Identification of new Keynesian Phillips curves from a global perspectives", CESifo, Working Paper No. 2219.

De Gregorio, J., Tokman, A. & Valdés, R. (2005), "Flexible Exchange Rate with Inflation targeting in Chile: Experience and Issues", *Inter-American development Bank WP No. 540*.

Dehejia, V. H. & Rowe, N. (2000), "Macroeconomic Stabilization: Fixed Exchange Rate vs Inflation Targeting vs Price Level Targeting", *CEPR Discussion Paper No.2460.*

Dooley, M., Dorbusch, R. & Park, Y. C. (2002), "A Framework for Exchange Rate Policy in Korea", Korean Institute for International Economic Policy, Working Paper No. 2.

Ehrmann, M. & Fratzscher, M. (2004), " Taking Stock: Monetary Policy Transmission to Equity Markets", *European Central bank, Working Paper 354*.

Eichengreen, B. (2002), "Can emerging markets float? Should they inflation target?, Central Bank of Brazil, Working Paper no. 36.

Fuhrer, J.C. (1997), "The (Un)Importance of Forward-Looking Behaviour in Price Specifications", *Journal of Money, Credit and Banking, Vol. 29, No. 3 pp. 338-350.*

Fuhrer, J. C. & Rudebusch, G. D. (2004), "Estimating the Euler Equation for Output", Journal of Monetary Economics, 51, pp. 1133-1153.

Gali, J. (2008), *"Monetary Policy, Inflation, and the Business Cycle An Introduction to the New Keynesian Framework"* Princeton University Press.

Gali, J. & Gertler, G. (1999), "Inflation Dynamics: A Structural Econometric Analysis", Journal of Monetary Economics, 44, pp. 195-222.

Gali, J. & Monacelli, T. (2005), "Monetary Policy and Exchange Rate Volatility in a Small Open Economy", The Review of Economic Studies, Vol. 72, No. 3, pp. 707-734.

Gali, J., Gertler, M. & Lopez-Salodi, J. D. (2001), « European Inflation Dynamics », European Economic Review, 45, pp.1237-1270.

Gallant, A. R. & Tauchen, G. (1996), "Which Moments to Match?" Econometric Theory, Vol. 12, No. 4, pp. 657-681.

Gochoco-Bautista, M. S. (2008), "Asset Prices and Monetary Policy: Booms and Fate Tails in East Asia" , BIS Working Paper No. 243.

Goodhart, C. (2001), "What Weight Should be Given to Asset Prices in the Measurement of Inflation?", The Economic Journal, Vol. 111, No. 472, pp F335-F356.

Hayashi, F. (2000), "Econometrics", Princeton University Press.

Hebbel, K.S. & Werner, A. (2002), "Inflation Targeting in Brazil, Chile and Mexico: Performance, credibility and the exchange rate" *Economia, spring*.

Jondeau, E. & Le Bihan, H. (2001), "Testing for Forward-Looking Phillips Curve. Additional Evidence from European and US Data" NER No. 86, Banque De France.

Kaminsky, G. L. & Reinhart, C. M. (1999), "The twin crisis: the causes of banking and balance-of –payments problems", The American Economic Review, June. 473-500.

Kim, S. & Yand, Y.D. (2008), "The Impact of Capital Inflows on Emerging East Asian Economies: Is Too Much Money Chasing Too Little Good?", Asian Development Bank, *Working Paper Series on Regional Economic Integration No.15*.

Krugman, P. & Taylor, L. (1978), "Contractionary effects of devaluation", Journal of International Economics (8), 445-456.

Lane, P. R. & Milesi-Ferretti, G. M. (2006), "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004", IMF Working Paper No. 69.

Laurence, H. M. (2004), "A Term at the Fed: An Insider's View", Harper Collins.

Lindé, J. (2001), "The Empirical Relevance of Simple Forward- and Backward-looking Models: A View from a Dynamic General Equilibrium Model", *Sveriges Riksbank WP 130.*

Minella, A., De Freitas, P. S., Goldfajn, I. & Muinhos, M. K. (2002), "Inflation Targeting in Brazil: Lessons and Challengees", Central Bank of Brazil, Working Paper No. 53.

Mishkin, F. S. & Schmidt-Hebbel, K. (2001), "One decade of inflation targeting in the world: What do we know and what do we need to know?", NBER Working Paper 8397.

Neiss, K.S. & Nelson, E. (2005), "Inflation Dynamics, Marginal Cost and the Output gap: Evidence from Three Countries", *Journal of Money, Credit and Banking, Vol. 37, No. 6.*

Neiss, K.S. & Nelson, E. (2001), "The real interest rate gap an inflation indicator", Bank of England, Working Paper No. 130.

Osawa, N. (2006), " Monetary policy responses to the exchange rate: Empirical evidence from three east asian inflation targeting countries", Bank of Japan, Working Paper Series (September).

Palley, T. I. (2006), "A Handbook of Alternative Monetary Economics" Chapter 15, Philip, A. and Malcolm, S. (eds), published by Cheltenham, UK and MA, USA, Edward Elgar.

Rigobon, R. & Sack, B. (2003), "Measuring the Reaction of Monetary Policy to the Stock Market", *Quarterly Journal of Economics, Vol. 118, Issue 2, pp 639-669.*

Roberts, J. M. (1995), "New Keynesian Economics and the Phillips Curve", *Journal of Money, Credit and Banking, Vol. 27, No. 4, Part 1, pp. 975-984.*

Schwartz, A. J. (2002), "Asset Price Inflation and Monetary Policy", NBER Working Paper 9321.

Smets, F. (1997), "Financial Asset Prices and Monetary Policy: Theory and Evidence", *BIS Working Paper no.47.*

Svensson, E. O. Lars. (1997), "Inflation forecast targeting: Implementing and monitoring inflation targets", European Economic Review (41), 1111-1146.

Svensson, E. O. Lars. (1999), "Inflation Targeting as a Monetary policy rule", Journal of Monetary Economics (43), 607-654.me

Tauchen, G. (1986), "Statistical Properties of Generalized Method-of-Moments of Structural parameters Obtained from Financial Data", Journal of Business and Economic Statistics, Vol. 4, No. 4, pp. 397-416.

Taylor, J. B. (1980), "Aggregate Dynamics and Staggered Contracts", *The Journal of Political Economy, Vol. 88, No. 1, pp. 1-23.*

Verbeek, M. (2004), "A guide to modern econometrics", John Wiley & Sons, Ltd.

Werlang, C et al.(2000), "Implementing Inflation Targeting in Brazil", Central Bank of Brazil, Working Paper No. 1.

Woodford M. (2001), "The Taylor Rule and Optimal Monetary Policy", The American Economic Review, Vol. 91, No. 2, pp. 232-237.

Woodford, M. (2003), "*Interest and Prices: Foundations of a Theory of a Monetary Policy",* Princeton University Press.

Appendix

Table 1 A: NK Model with Multi-Equation GMM

	Brazil	Chile	Mexico	Korea	Philippines	Thailand	Czech Rep.
	Asset: Shares						
	New Keynesian Model (Forward-Looking)						
IS Curve	**Dependent Variable: Output Gap**						
Expected Output gap	.65(.05)	.04 (.06)	.50 (.05)	0.27 (.06)	.10 (.03)	.06(.02)	1.06 (.01)
Real Interest Rate	.02(.01)	-.13 (.02)	-.05 (.02)	-0.27(.13)	-1.54(.23)	-.14(.05)	.06 (.01)
Current Share Price Index	-.01 (.005)	-.01 (.005)	.03 (.006)	.02 (.00)	-.01(.004)	.02(.004)	-.01 (.001)
R^2	-.28	.07	.20	.15	-.18	.03	.85
Phillips Curve	**Dependent Variable: Inflation**						
Expected Inflation	.93 (.007)	1.06 (.004)	1.12 (.007)	1.00 (.01)	.91(.007)	.98(.02)	1.00 (.01)
Current Output gap	-.46(.04)	-.38 (.03)	.21 (.01)	-.10 (.02)	-.15(.01)	-.05(.01)	-.08 (.02)
Current Share Price Index	.02(.001)	.01 (.00)	-.02 (.002)	-.004 (.000)	.003(.001)	-.02(.001)	-.02 (.001)
R^2	.75	.89	.91	.43	.64	.58	.74
Taylor Rule	**Dependent Variable: Nominal Interest Rate**						
Constant	23.05 (.31)	7.60 (.37)	10.31 (.21)	2.64 (.02)	5.12(.04)	.97(.008)	3.57 (.11)
Inflation Deviation	.05(.03)	3.11 (.24)	2.41 (.08)	.03 (.007)	.18(.02)	.07(.005)	-07 (.02)
Output gap	-1.57 (.05)	1.28 (.31)	.64 (.11)	.18 (.01)	.01(.005)	.01(.004)	.22 (.02)
Share Price Index	-.007(.009)	.07 (.02)	-.07 (.01)	-.003(.000)	.005(.0008)	.004(.000)	-.02 (.003)
R^2	-.05	-.10	.61	.30	.11	.79	.16
J-Stat (p-Value)	.33	.09	.44	.36	.51	.46	.37

Note: Multi-equation GMM technique has been used. We use lagged independent variable as instruments.
We use two lag for current variable and three for lagged one. In parenthesis are the standard errors.
Estimates are based on quarterly data from the date of IT adoption to the last quarter 2008

Table 2 A: Ball's Model with Multi-Equation GMM

	Brazil	Chile	Mexico	Korea	Philippines	Thailand	Czech Rep.
	Asset: Shares						
	Ball's Model (Backward-Looking)						
IS Curve	**Dependent Variable: Output Gap**						
Lagged Output gap	.83 (.05)	.20 (.13)	.76 (.03)	.35 (.02)	.16(.03)	.07(.03)	.90 (.01)
Real Interest Rate	-.04 (.008)	-.16 (.03)	-.08 (.01)	-.11(.02)	-.25(.28)	-.04(.05)	-.12 (.009)
Lagged Share Price Index	.02 (.004)	-.003 (.006)	.007 (.003)	.02 (.001)	.001(.002)	.03(.006)	.01 (.006)
R^2	-.26	.05	.032	.38	.11	.06	.88
Phillips Curve	**Dependent Variable: Inflation**						
Lagged Inflation	1.037 (.009)	.92 (.01)	.93 (.002)	.91 (.01)	1.01(.01)	.88(.02)	.91 (.006)
Lagged Output gap	.46 (.04)	.16 (.04)	-.07 (.004)	.13 (.02)	.15(.02)	.08(.02)	.12 (.01)
Lagged Share Price Index	-.02 (.002)	.01 (.00)	.009 (.000)	.003(.000)	.002(.001)	.02(.002)	.02 (.001)
R^2	.74	.94	.87	.36	.70	.63	.77
Taylor Rule	**Dependent Variable: Nominal Interest Rate**						
Constant	23.04 (.40)	7.37 (.48)	9.93 (.12)	2.64 (.01)	5.11(.04)	.97(.006)	3.35 (.05)
Inflation Deviation	.11 (.06)	2.50 (.27)	2.85 (.06)	.03 (.003)	.20(.02)	.07(.005)	.04 (.01)
Output gap	-1.48 (.08)	2.05 (.35)	.59 (.07)	.17 (.008)	.01(.006)	.01(.003)	.26 (.007)
Lagged Share Price Index	-.009 (.013)	.09 (.02)	-.01 (.003)	-.003(.000)	.006(.000)	.005(.0006)	-.01(.001)
R^2	-.008	.07	.54	.31	.11	.79	.23
J-Stat (p-Value)	.42	.07	.47	.36	.59	.46	.37

The note of above table (Table 1 A) applies.

Table 3 A

Key Facts of Sample Economies		
	Year Started Inflation Targeting	**Targeted Inflation Concept**
Brazil	1999	CPI
Chile	1991	CPI
Mexico	19999	CPI
Korea	1998	Core CPI
Philippines	2002	CPI
Thailand	2000	Core CPI
Czech Republic	1998	CPI

Source: Mishkin and Schmidt-Hebbel (2001); Ho and McCualey (2003)

Table 4 A

Stationarity Tests						
	Brazil		**Chile**		**Mexico**	
Variable	**ADF**	**KPSS (Andrew)**	**ADF**	**KPSS (Andrew)**	**ADF**	**KPSS (Andrew)**
output gap	-3,90	0,05	-3,36	0,13	-3,05**	0,13
Real interest rate	-10,01	0,14	-8,28@	0,13	-4,51@	0,42
Exchange Rate	-3,92*	0,37	-3,40	0,24	-6,18@	0,05
Inflation	-3,73*	0,18	-3,80	0,34	-4,88	0,35
Nominal Interest Rate	-3,80@	0,31	-2,92	0,06@	-3,86@	0,40
Inflation Deviation	-5,70	0,30	-5,49*	,14*	-2,52**	0,28
Share Prices	-3,21	0,10	-3,07	0,15	-2,32**	0,11

For KPSS we use Bartlett Kernal and Andrews Bandwidth. For ADF we use Schwartz Information criterion
All the result have been reporteda t conventional 5% significant level.
* stationary with trend and intercept
** stationary without trend and intercept
@ stationary at first difference

Table 5 A

Stationarity Tests								
	Korea		**Philippines**		**Thailand**		**Czech Republic**	
Variable	**ADF**	**KPSS (Andrew)**	**ADF**	**KPSS (Andrew)**	**ADF**	**KPSS (Andrew)**	**ADF**	**KPSS (Andrew)**
output gap	-3,51	0,06	-6,68	0,35	-2,66**	0,27	-4,11@	0,4
Real interest rate	-3,47	0,13	-3,42	0,26	-3,50	0,22	-2,25**	0,38
Exchange Rate	-3,95	0,14	-2,19@	0,15	-2,43**	0,37	-4,05	0,21
Inflation	-6,70	0,14	-3,53	0,20	-3,29	0,07	-6,92@	0,29
Nominal Interest Rate	-3,08	0,44	-6,28@	0,19	-3,81@	0,27	-6,94	0,38
Inflation Deviation	-4,85	0,13	-5,37	0,23	-5,49	0,31	-4,23	0,24
Share Prices	-5,39	0,15	-3,97@	0,20	-2,96	0,14	-3,27	0,14

For KPSS we use Bartlett Kernal and Andrews Bandwidth. For ADF we use Schwartz Information criterion
All the result have been reporteda t conventional 5% significant level.
* stationary with trend and intercept
** stationary without trend and intercept
@ stationary at first difference

Table 6 A: Normality Test for Exchange Rate for Brazil									
New Keynesian Model					**Ball's Mosel**				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 1999:3 2008:4					Sample: 1999:3 2008:4				
Included observations: 66					Included observations: 66				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	-0.181667	0.270303	1	0.6031	1	-0.459387	1.644869	1	0.1997
2	0.559797	2.379158	1	0.1230	2	-0.015814	0.002068	1	0.9637
3	0.532747	2.170878	1	0.1406	3	0.451005	1.588600	1	0.2075
Joint		4.820338	3	0.1854	**Joint**		3.235537	3	0.3567
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	2.659932	0.012590	1	0.9107	1	2.525150	0.751094	1	0.3861
2	2.870465	0.258084	1	0.6114	2	2.497141	0.008859	1	0.9250
3	2.873252	0.153447	1	0.6953	3	2.830451	0.032447	1	0.8571
Joint		0.424122	3	0.9352	**Joint**		0.792400	3	0.8513
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	0.282893	2	0.8681		1	2.395963	2	0.3018	
2	2.637242	2	0.2675		2	0.010927	2	0.9946	
3	2.324325	2	0.3128		3	1.621047	2	0.4446	
Joint	5.244460	25	1.0000		**Joint**	4.027937	25	1.0000	

Table 7 A: Normality Test for Exchange Rate for Chile									
New Keynesian Model					**Ball's Mosel**				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 1992:2 2008:3					Sample: 1992:2 2008:3				
Included observations: 66					Included observations: 66				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	0.711121	5.669924	1	0.0173	1	0.052433	0.036475	1	0.8485
2	-0.215177	0.596951	1	0.4397	2	0.246567	0.789923	1	0.3741
3	1.728212	21.92005	1	0.0000	3	0.901928	8.563479	1	0.0034
Joint		28.18693	3	0.0000	**Joint**		9.389877	3	0.0245
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	3.882634	0.030026	1	0.8624	1	1.996389	3.575115	1	0.0587
2	3.169369	0.618926	1	0.4314	2	3.412474	1.391700	1	0.2381
3	7.099043	10.06041	1	0.0015	3	5.376706	2.192397	1	0.1387
Joint		10.70936	3	0.0134	**Joint**		7.159212	3	0.0670
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	5.699950	2	0.0578		1	3.611590	2	0.1643	
2	1.215877	2	0.5445		2	2.181623	2	0.3359	
3	31.98046	2	0.0000		3	10.75588	2	0.0046	
Joint	38.89629	25	0.0377		**Joint**	16.54909	25	0.8975	

Table 8 A: Normality Test for Exchange Rate for Mexico									
New Keynesian Model					**Ball's Mosel**				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 1999:4 2008:4					Sample: 1999:4 2008:4				
Included observations: 66					Included observations: 66				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	-0.317524	0.792882	1	0.3732	1	-0.788934	4.226195	1	0.0398
2	0.061531	0.030615	1	0.8611	2	-0.224013	0.391706	1	0.5314
3	0.324412	0.826637	1	0.3632	3	0.471762	1.658345	1	0.1978
Joint		1.650135	3	0.6481	**Joint**		6.276246	3	0.0989
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	2.179741	1.488211	1	0.2225	1	3.695693	0.002442	1	0.9606
2	1.737946	4.198673	1	0.0405	2	2.130969	1.204490	1	0.2724
3	2.807516	0.023530	1	0.8781	3	2.489210	0.880779	1	0.3480
Joint		5.710414	3	0.1266	**Joint**		2.087711	3	0.5544
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	2.281093	2	0.3196		1	4.228638	2	0.1207	
2	4.229288	2	0.1207		2	1.596196	2	0.4502	
3	0.850167	2	0.6537		3	2.539123	2	0.2810	
Joint	7.360549	25	0.9998		**Joint**	8.363956	25	0.9993	

Table 9 A: Normality Test for Exchange Rate for Korea									
New Keynesian Model					**Ball's Mosel**				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 1998:3 2008:4					Sample: 1998:3 2008:4				
Included observations: 66					Included observations: 66				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	0.332067	0.956764	1	0.3280	1	0.475077	1.895649	1	0.1686
2	2.996083	30.48670	1	0.0000	2	-1.865631	17.50578	1	0.0000
3	0.460340	1.786581	1	0.1813	3	0.649611	3.369392	1	0.0664
Joint		33.23005	3	0.0000	**Joint**		22.77083	3	0.0000
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	3.035477	0.230765	1	0.6310	1	5.912870	15.65610	1	0.0001
2	15.82556	15.24625	1	0.0001	2	11.63307	5.903889	1	0.0151
3	4.102734	3.400692	1	0.0652	3	4.277741	2.110527	1	0.1463
Joint		18.87771	3	0.0003	**Joint**		23.67051	3	0.0000
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	1.187529	2	0.5522		1	17.55175	2	0.0002	
2	45.73295	2	0.0000		2	23.40967	2	0.0000	
3	5.187273	2	0.0747		3	5.479919	2	0.0646	
Joint	52.10775	25	0.0012		**Joint**	46.44134	25	0.0057	

Table 10 A: Normality Test for Exchange Rate for Philippines

New Keynesian Model					Ball's Mosel				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 2002:1 2007:4					Sample: 1998:3 2008:4				
Included observations: 24					Included observations: 24				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	1.006108	4.837911	1	0.0278	1	1.239733	6.810794	1	0.0091
2	-0.475155	1.242058	1	0.2651	2	0.860029	3.695143	1	0.0546
3	-0.156603	0.140969	1	0.7073	3	-0.176521	0.178838	1	0.6724
Joint		6.220937	3	0.1013	**Joint**		10.68477	3	0.0136
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	3.318046	1.681766	1	0.1947	1	3.116790	15.32167	1	0.0001
2	2.431870	0.413420	1	0.5202	2	2.480385	6.054703	1	0.0139
3	2.606961	0.118350	1	0.7308	3	2.324314	0.050941	1	0.8214
Joint		2.213536	3	0.5293	**Joint**		21.42731	3	0.0001
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	6.519676	2	0.0384		1	22.13246	2	0.0000	
2	1.655477	2	0.4370		2	9.749845	2	0.0076	
3	0.259319	2	0.8784		3	0.229778	2	0.8915	
Joint	8.434473	25	0.9992		**Joint**	32.11209	25	0.1548	

Table 11 A: Normality Test for Exchange Rate for Thailand

New Keynesian Model					Ball's Mosel				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 2000:1 2008:4					Sample: 2000:1 2008:4				
Included observations: 36					Included observations: 36				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	0.531942	2.076510	1	0.1496	1	0.455863	1.554350	1	0.2125
2	2.131983	18.76852	1	0.0000	2	-0.780162	4.144822	1	0.0418
3	-0.889600	5.191299	1	0.0227	3	-0.541043	2.142982	1	0.1432
Joint		26.03633	3	0.0000	**Joint**		7.842155	3	0.0494
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	1.604977	18.62501	1	0.0000	1	1.654552	12.40495	1	0.0004
2	8.846489	6.460234	1	0.0110	2	5.630198	7.477938	1	0.0062
3	3.392859	1.197052	1	0.2739	3	2.549534	1.163000	1	0.2808
Joint		26.28229	3	0.0000	**Joint**		21.04589	3	0.0001
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	20.70152	2	0.0000		1	13.95930	2	0.0009	
2	25.22876	2	0.0000		2	11.62276	2	0.0030	
3	6.388351	2	0.0410		3	3.305982	2	0.1915	
Joint	52.31862	25	0.0011		**Joint**	28.88805	25	0.2686	

Table 12 A: Normality Test for Exchange Rate for Czech Republic									
New Keynesian Model					**Ball's Mosel**				
System Residual Normality Tests					System Residual Normality Tests				
Orthogonalization: (Doornik-Hansen)					Orthogonalization: (Doornik-Hansen)				
Null Hypothesis: residuals are multivariate normal					Null Hypothesis: residuals are multivariate normal				
Sample: 1998:3 2009:3					Sample: 1998:3 2009:3				
Included observations: 45					Included observations: 45				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**	**Component**	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	0.635587	3.418793	1	0.0645	1	-0.232013	0.474962	1	0.4907
2	0.747715	4.556552	1	0.0328	2	0.085354	0.065208	1	0.7984
3	0.531018	2.463598	1	0.1165	3	0.412996	1.454600	1	0.2278
Joint		10.43894	3	0.0152	**Joint**		1.994769	3	0.5735
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**	**Component**	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	5.318023	8.060867	1	0.0045	1	6.253612	22.17428	1	0.0000
2	4.936460	3.674643	1	0.0552	2	3.814753	4.288164	1	0.0384
3	4.152466	2.801703	1	0.0942	3	3.923463	2.944523	1	0.0862
Joint		14.53721	3	0.0023	**Joint**		29.40697	3	0.0000
Component	**Jarque-Bera**	**df**	**Prob.**		**Component**	**Jarque-Bera**	**df**	**Prob.**	
1	11.47966	2	0.0032		1	22.64924	2	0.0000	
2	8.231196	2	0.0163		2	4.353371	2	0.1134	
3	5.265302	2	0.0719		3	4.399123	2	0.1109	
Joint	24.97616	25	0.4637		**Joint**	31.40174	25	0.1761	