II Inflation Targeting Model for Indian Economy

Abstract

In this study I briefly explain the operational design of the inflation targeting framework and then derive a monetary policy rule (Taylor rule) for the Indian economy and thereby (1) to target the Indian domestic inflation and (2) to target domestic inflation with output stabilization. The reaction function of the monetary policy is derived in either of the case by minimizing the loss function of the monetary policy. Monetary policy affects the real variables of the economy in short run and in long run money becomes neutral. The Indian economy comprises of Keynesian markets in the formal sector and Classical markets in the informal sector. In this special amalgamation of Keynesian and Classical markets; study shows that when Reserve Bank of India (RBI) conducts monetary policy, the formal sector observes the fluctuations in real variables while nominal variables varies in the informal sector. In such an economic environment the study reveals that the performance of overall monetary policy is observed very poor in term of output stabilization because of this huge informal sector. Though Indian monetary authority is helpless to stabilize the real variables of the economy in the short run but at the same time it got a shiny edge, the informal sector which observes only nominal effects. The study shows that RBI got a pretty good command on price level, ceteris paribus, without affecting (or negligible effect on) the output/employment. Low and stable inflation is good for economic growth and development. How to keep the inflation low and stable? Inflation targeting framework has a solution to this issue. The study shows that RBI can efficiently control the inflation through managing general price level without making any negative impact on output/employment in short run then India should adopt inflation targeting regime to keep the inflation low and stable, which in turn good for economic growth and development. The study recommends in terms of policy that if India adopts the inflation targeting regime then the negative impacts of the inflation targeting are much less than that of the positive outcomes, therefore, India should adopt inflation targeting regime.

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Keywords: Inflation Targeting, Taylor Rule, Domestic Inflation, Monetary Policy, Reserve Bank of India, India
It is better to be roughly right than precisely wrong.

John Maynard Keynes

1 The Art of Rowing of an Inflation Targeting Yacht

1.1 Introduction and rationale

This section tries to explain various issues related to operational design of inflation targeting; a celebrated framework which facilitates the monetary authority to attain its foremost target i.e. price stability. It is not an easy task to find many areas in macroeconomics where almost full agreement has emerged in the last few years. However, there is today a widespread and growing consensus amongst leading policy makers and academic macroeconomists that the single most important goal of monetary policy should be the pursuit of price stability, Blejer and Leone (1999). To chase the price stability central banks have recently developed a new policy tactic called inflation targeting. Inflation targeting central bank targets publically announced numerical target for annual inflation through policy instrument to stabilize inflation itself and real variables of the economy. Price stability remains prime goal of the monetary authority while other goals become subsidiary during the inflation targeting regime. To decide the monetary policy instrument many variables come into picture apart from monetary aggregates and exchange rate. To conduct inflation targeting, a high degree of transparency by publishing objectives, decisions and plans of the central bank for public is indispensable. Inflation targeting central bank has always an obligation and accountability to meet the objectives. New Zealand was the pioneer one to adopt the inflation targeting regime in 1990 and as of now i.e. May, 2013, a total of 27 industrialized and non-industrialized countries have adopted the inflation targeting regime. The inflation targeting regime has been very successful, in terms of first stabilizing the inflation and then real variables of the economy, as hitherto no country has abandoned after taking it up or even articulated any regret.
There are several issues of debate to implement the inflation targeting regime in the best possible manner; some indispensable of them are discussed below.

1.2 Price Level Targeting versus Inflation Targeting

All the central banks who have adopted inflation targeting regime have chosen to target inflation rather than price level. Which one of these two tactics would result rather better economic performance is still an open question. Indeed, it is an issue of active research and debate. Both of these two strategies are discussed below.

Price stability is often recommended as a goal for monetary policy. Price stability has been interpreted in different ways, though. Price stability can be interpreted as price level stability, that is, a stationary price level with low variance. In practice, price stability has often been interpreted as low and stable inflation, Svensson (1999). Fischer (1996) defines price stability as the stability in the average price level and it never means the low inflation. Sweden is the only country that has ever implemented price level targeting. The experiment began in September 1931 and lasted until the outbreak of World War II. Two factors led to the adoption of a price-level target. The economic factor, the sharp deflation that began in the late 1920s, the onset of the depression in 1930, and the eventual abandonment of the gold standard necessitated the mapping out of a new, coherent strategy for monetary policy, Guender and Oh (2006).

Inflation targeting is a monetary-policy strategy that was introduced in New Zealand in 1990, has been very successful in terms of stabilizing both inflation and the real economy, and as of 2007 had been adopted by more than 20 industrialized and non-industrialized countries. It is characterized by an announced numerical inflation target, an implementation of monetary policy that gives a major role to an inflation forecast and has been called ‘inflation-forecast targeting’, and a high degree of transparency and accountability, Svensson (2007).

1.2.1 Pros and Cons of Price Level Targeting
The price level targeting got two crucial advantages over inflation targeting. The first one is that price level targeting reduces the uncertainty about where would be the price level in long run; hence, long run economic planning is well supported in less uncertain environment. Although, McCallum (1999) has argued that the amount of long-run uncertainty about the future price level that would arise from successful adherence to an inflation target may not be all that large, it still complicates the planning process and may lead to more mistakes in investment decisions. Secondly, there is less output variance under the price level targeting than that of under inflation targeting framework. Svensson (1999) found that price-level targeting delivers a better outcome (lower variability of inflation) than inflation targeting, when the central bank acts under discretion.

Price level targeting leads to more frequently episodes of deflation and the deflation has an ability to promote financial instability through the debt-deflation mechanism which results into potentially large costs to the economy. Economy suffers more by the repeated events of financial instability caused by deflation under price level targeting than the advantage to the economy in terms of lower variability of inflation thereby the decent inconsistency in the output.

Mishkin (2000) points out problem with price-level targets that is not often mentioned in the literature is that price-level targets may make it more difficult to conduct monetary policy. With more frequent periods of deflation resulting from a price-level target, it will become more common that short-term interest rates will hit a floor of zero during deflations as occurred during the Great Depression and in Japan recently. One argument that some economists make is that when the interest rate hits a floor of zero, monetary policy becomes ineffective. Mishkin (2000) believes this argument is a fallacy for the reasons outlined in Meltzer (1995) and in Mishkin (1996a). Monetary policy works through many other asset prices besides those of short-term debt securities, and so even when short-term interest rates hit the floor of zero, monetary policy can still be effective, and indeed was so during the Great Depression Romer (1992). Nonetheless, monetary policy becomes more difficult during deflationary episodes when interest rates hit a floor of zero because the usual guides to the
conduct of monetary policy are no longer relevant. In recent years, much of the research on how central banks should optimally conduct monetary policy focus on so-called Taylor rules, in which the central bank sets the short-term interest rates at a level which depends on both output and inflation gaps. The Taylor (1999) volume is an excellent example of this type of research. However, once the interest rate hits a floor of zero, all of the research on optimal monetary policy rules represented by work of the type in the Taylor (1999) volume is no longer useful because manipulating short-term interest rates is no longer an effective tool of monetary policy. In such a deflationary environment, central banks do have the ability to lift the economy out of recession by pursuing expansionary policy and creating more liquidity, but it becomes much less clear how far they need to go. This rightfully makes central bankers quite uncomfortable. Therefore, an important disadvantage of a price-level target is therefore that it makes it more likely that deflationary environments will occur in which central bankers will be more at sea without the usual knowledge to guide them, making it harder for them to get monetary policy exactly right.

1.2.2 Preeminence of Inflation Targeting over Price Level Targeting

Inflation targeting has not only an objective to stabilize inflation around an inflation target but, in practice, also to stabilize output. In practice inflation targeting is preferred over price level targeting for a variety of advantages as discussed in Jadranka and Marina (2008): Inflation targeting regime enables monetary policy to focus on domestic considerations and to respond to shocks to the domestic economy. Inflation targeting also has the advantage that velocity shocks are largely irrelevant because the monetary policy strategy no longer relies on a stable money inflation relationship. Because an explicit numerical inflation target increases the accountability of the central bank, inflation targeting also has the potential to reduce the likelihood that the central bank will fall into the time inconsistency trap in which it tries to expand output and employment by pursuing overly expansionary monetary policy. Thus inflation targeting acts as the potential to reduce political pressures on the central bank to pursue inflationary monetary policy and thereby reduce the likelihood of time
inconsistent policymaking. The decision by monetary authorities to choose inflation targets above zero and not price level targets reflects monetary policymakers’ concerns that too low an inflation can have substantial negative effects on real economic activity. There are particularly valid reasons for fearing deflation, including the possibility that it might promote financial instability and precipitate a severe economic contraction. Targeting inflation rates of above zero makes periods of deflation less likely. The evidence on inflation expectations from surveys and interest rate levels suggest that maintaining a target for inflation above zero, but not too far above, for an extended period does not lead to instability in inflation expectations or to a decline in the central bank’s credibility. Another key feature of inflation-targeting regimes is that they do not ignore traditional stabilization goals. Namely, inflation targets can increase the flexibility of the central bank to respond to declines in aggregate spending, because declines in aggregate demand that cause the inflation rate to fall below the floor of the target range will automatically stimulate the central bank to loosen monetary policy without fearing that its action will trigger a rise in inflation expectations. This strategy is readily understood by the public. In general, a central bank’s communications strategy means the central bank’s regular procedures for communicating with the political authorities, the financial markets, and the general public. It is closely linked to the idea of transparency and has many aspects and many motivations. Aspects of communication that have been particularly emphasized by inflation-targeting central banks are the public announcement of policy objectives, open discussion of the bank’s policy framework and public release of the central bank’s forecast or evaluation of the economy. Inflation-targeting regimes also put great stress on making policy transparent, policy that is clear, simple and understandable, and on regular communication with the public. Channels for communication are used by central banks in inflation-targeting countries to explain the following to the general public, financial market participants and the politicians: (a) the goals and limitations of monetary policy, including the rationale for inflation targets; (b) the numerical values of the inflation targets and how they were determined; (c) how the inflation targets are to be achieved, given current economic conditions and (d) reasons for any deviations from targets. These communication efforts
have improved private sector planning by reducing uncertainty about monetary policy, interest rates and inflation. Second, they have promoted public debate of monetary policy, in part by educating the public about what a central bank can and cannot achieve. Third, they have helped clarify the responsibilities of the central bank and of politicians in the conduct of monetary policy. Transparency and communication go hand in hand with increased accountability. The strongest case of accountability of a central bank in an inflation-targeting regime is in New Zealand, where the government has the right to dismiss the Reserve Bank’s governor if the inflation targets are breached.

1.3 What Measures of Inflation to Target

Mankiw and Reis (2002) argue what measure of the inflation rate inflation targeting central bank should target. Measures of the overall price level, such as the consumer price index, are widely available. Yet a price index designed to measure the cost of living is not necessarily the best one to serve as a target for a monetary authority. This issue is often implicit in discussions of monetary policy. Many economists pay close attention to core inflation defined as inflation excluding certain volatile prices, such as food and energy prices. Others suggest that commodity prices might be particularly good indicators because they are highly responsive to changing economic conditions. Similarly, during the U.S. stock market boom of the 1990s, some economists called for Fed tightening to dampen asset price inflation suggesting that the right index for monetary policy might include not only the prices of goods and services but asset prices as well. Various monetary proposals can be viewed as inflation targeting with a nonstandard price index: The gold standard uses only the price of gold, and a fixed exchange rate uses only the price of a foreign currency. Mankiw and Reis (2002) propose and explore an approach to choosing a price index for the central bank to target. They suggest the price index that, if kept on an assigned target, would lead to the greatest stability in economic activity. They called it the stability price index concept. They further argue that the key issue in the construction of any price index is the weights assigned to the prices from different sectors of the economy. When constructing a price index to measure the
cost of living, the natural weights are the share of each good in the budget of typical consumer. When constructing a price index for the monetary authority to target, additional concerns come into play: the cyclical sensitivity of each sector, the proclivity of each sector to experience idiosyncratic shocks, and the speed with which the prices in each sector respond to changing conditions.

### 1.3.1 What Numeric Value of Inflation to Target

A million dollar question for any central bank following inflation targeting regime is that what numerical value of inflation should be targeted? The answer is simple; the rate of inflation which can serve the economy at its best in terms of escalation of economic growth, high employment and financial stability. The price stability can pierce all the issues in a single arrow. Thus, the best value of inflation to target is the rate of inflation which can arrest the price stability. Under inflation targeting regime, the price level becomes the economy’s nominal anchor, much as a monetary aggregate would be under a monetarist policy rule, Mankiw and Reis (2002). Again, in practice, price stability has often been interpreted as low and stable inflation, Svensson (1996). Low and stable inflation is good for economic growth and development for two reasons, firstly, it allows firms and households for better planning of their plans as they know that the purchasing power will not wear away swiftly and unevenly and secondly, interest rate will be lower, encouraging investment in the productivity growth. On the other side high and fluctuating inflation is devastating for the economic activities as it escalates the uncertainty of how the prices will get shaped in future. The high uncertainty of prices will, again, result into higher rate of interest. Higher rate of interest will hamper the investment and thereby devastation in economic activities and eventually, the economic down turn.

Central banks are equipped with a mixture of tools to vary the money supply in turn to capture price stability and thereby to escalate the economic growth, high employment and financial stability. So, what measures of price stability in practice are set during inflation targeting regime? Alan Greenspan has provided a widely cited definition of price stability as a rate of inflation that is sufficiently low that households and businesses do not have to take it into
account in making everyday decisions. The said definition is viable and functional and to meet this criterion the numerical value of the inflation could be 2±1 percent (in practice, inflation targeting is never strict but always flexible) for the industrialized countries and a few percent points higher for emerging market economies or developing countries.

However, inflation targeting practice deviates from theory. Theory suggests that the optimal inflation rate should be zero in the New Keynesian paradigm, or negative according to the Friedman Rule. In practice, all inflation-targeting central banks have positive targets. The deviation of inflation targeting practice from the theory is largely based on practical aftermaths.

It is argued that a positive inflation target decreases the probability of hitting the zero lower bound on nominal rates, a point that had operational importance in the global economic slowdown experienced in 2008–09.

Bernanke et al. (1999), suggest that maintaining a target for inflation above zero, but not too far above (less than 3%), for an extended period, does not lead to instability in the public's inflation expectations or to a decline in central bank credibility. Akerlof, Dickens and Perry (1996) argue that setting inflation at too low a level produces inefficiency and will result in increase the natural rate of unemployment. A more influential argument against an inflation goal of zero is that it makes it more likely that the economy will experience episodes of deflation which can be highly dangerous because it promotes financial instability and in addition can make monetary policy decisions harder. The implication is that undershooting a zero inflation target (i.e., a deflation) is potentially more costly than overshooting a zero target by the same amount. Thus, the costs of deflation are greater than the costs of inflation, so a positive inflation target is desirable to avoid the risk of deflation, and the resulting debt-deflation. The logic of this argument suggests that setting an inflation target a little above zero is worthwhile because it provides some insurance against episodes of deflation. In addition, the conventional wisdom in recent years has been that a positive inflation target is desirable if there is downward nominal wage resistance.

1.3.2 Target Horizon
The horizon for achieving the inflation target is a key element in the design of monetary policy under an inflation-targeting regime. The horizon determines the monetary policy response to shocks. The target horizon depends on the length of the transmission mechanism of monetary policy. With a longer transmission mechanism, the central bank is not able to affect inflation in the short run. Where a disinflationary strategy is employed, inflation targets are often set annually. In emerging markets, there is often a quicker pass through from policy rates to inflation, so a shorter policy horizon is warranted. And an annual target is often seen as good for accountability. Countries on a disinflationary path will often also indicate the medium-term target in order to anchor inflation expectations.

Monetary policy affects the economy and particularly inflation with long lags. In industrialized countries, lags from monetary policy to inflation are typically estimated to be on the order of two years. Shorter time horizons, such as one year, which have been common in inflation targeting regimes, can be highly problematic. The first problem with too short a horizon is that it can lead to a controllability problem: too frequent misses of the inflation target, even when monetary policy is being conducted optimally. The second problem is that it can lead to instrument instability, in which policy instruments are moved around too much in order to try to get inflation to hit its targets over the shorter horizon. A third problem is that too short a horizon implies that not enough weight is put on output fluctuations in the central bank's loss function, Mishkin (2000).

1.4 Strict versus Flexible Target

Inflation targeting central banks have different choices of their monetary policy goals, viz., stable inflation and or stabilization of other macroeconomic variables. Monetary authority adopts strict or point target of inflation when it plays a sole game of inflation stabilization. When central bank has many more goals apart from inflation target then strict or point target of inflation is relaxed to flexible target so that inflation can move in a target range or in a target band.
Except couple of inflation targeting countries, Chile and United Kingdom, all have adopted the range of inflation target. Central bank has more explicit flexibility under range target which also conveys an important message to the public that inflation is a volatile variable and monetary authority has imperfect control over it. Range target is flawed as it raises a serious question about the ability of monetary authority of hitting the inflation target. Therefore, in practice inflation targeting central bank makes the inflation targeting range very wide and thereby reduces incredibility of policy.

1.4.1 Rules versus Discretion

Right since the inception of the central banking to date; a heated debate has been continued over whether monetary policy should be conducted in accordance with legislative rules or through the discretion of the policymaker. To conduct monetary policy, discretion is essential to offset output fluctuations in Keynesian frameworks; on the other hand, monetarists propose a tight, fixed rule to ensure price stability. Under discretion, a monetary authority is free to act in accordance with its own judgment. For example, if legislation directed the monetary authority to do its best to improve the economy’s performance and gave the monetary authority the instruments that it has, the monetary authority would have a discretionary monetary policy. A rule based monetary policy restricts discretion of the policymaker. A rule involves the exercise of control over the monetary authority in such a way that restricts the monetary authority’s actions which are discretionary and deviate from rule. Whether the actions of the monetary authority should be irrevocably fixed in advance by rules, laws, and unchangeable plans or whether the monetary authority should be free to act with discretion ex post with ample margin of maneuver, Alesina and Stella (2011).

1.4.2 Role of Exchange Rate

Fluctuating exchange rate makes the inflation to dance like popcorn. Oscillation in exchange rate always has major impact on inflation in an open
economy. Depreciation of the currency, relative to one some countries, leads to rise in inflation because of pass through of higher import prices and greater demand for the country's export.

Emerging market countries, rightfully, have an even greater concern about exchange rate movements. Not only can a real appreciation make domestic industries less competitive, but it can lead to large current account deficits which might make the country more vulnerable to currency crisis if capital inflows turn to outflows. Depreciations in emerging market countries are particularly dangerous because they can trigger a financial crisis along the lines suggested in Mishkin (1996b, 1999c). These countries have much of their debt denominated in foreign currency and when the currency depreciates, this increases the debt burden of domestic firms. Since assets are typically denominated in domestic currency and so do not increase in value, there is a resulting decline in net worth. This deterioration in balance sheets then increases adverse selection and moral hazard problems, which leads to financial instability and a sharp decline in investment and economic activity. This mechanism explains why the currency crises in Mexico in 1994-95 and East Asian in 1997 pushed these countries into full-fledged financial crises which had devastating effects on their economies, Mishkin (2000).

The movements of exchange rate are one of the major concerns of the monetary policy and the central banks always put too much focus to limit the fluctuations of exchange rate. Limiting the exchange rate movement would produce exchange rate as nominal anchor of monetary policy and thereby discoursing inflation targeting. Under the inflation targeting framework hitting the inflation target should be prime goal while setting the policy instrument. There are two major issues; firstly, should inflation targeting central banks focus only on inflation target? Secondly, should they not pay any attention to limit exchange rate fluctuation? Mishkin (2000) articulates inflation targeting central banks should keep their eyes only on inflation target and they should not pay any attention to limit exchange rate fluctuation.

1.4.3 Nuts and bolts
It is turning out to be a consensus amongst the policymakers and academic macroeconomists that inflation targeting central bank must have, firstly, the inflation targeting goal above all the rest, secondly the absence of fiscal dominance and finally, independency of policy instrument. While keeping the inflation target in mind it never means that monetary authority is unconcerned to the development issues, most important is output gap but it is the responsiveness of the central bank to a shock to the economy and the way she prefers inflation stability and output gap stability over one another.

The factor that has received considerable attention in the literature on inflation targeting in emerging economies is the presence or absence of fiscal dominance. If the central bank is required to finance the government deficit by lending directly to the government or by purchasing all new issues of government bonds that the public is unwilling to purchase, it will not also be able to target the pre-announced rate of inflation. That is, if the central bank tries to use its single policy instrument to aim at two goals, one involving financing the government deficit and the other being the achievement of an inflation target, it will simply not be able to succeed in achieving both goals with the one instrument. Put more technically, if the central bank has to finance the government deficit; it will not have control over the size of its own balance sheet. Hence, it will not be able to exert a sufficient degree of influence over the policy interest rate to set in motion the effects on the transmission mechanism needed to respond to an overly high or overly low rate of inflation. Some emerging economies have dealt with this potential problem by prohibiting direct financing of government deficits by the central bank, Freedman and Robe (2010).

The condition of independency policy instrument of the monetary authority from clutches of government has been documented in the literature widely in order to facilitate the central bank to achieve her goals. Central banks have performed exceptionally well wherever they are equipped with independency of policy instrument than that of their counterparts where government interventions have been observed. The direct control of government over monetary policy actions has resulted in poor monetary policy outcomes, with a strong tendency to high rates of inflation and the use of monetary policy for political goals.
Emerging market economies, in general, suffer from some institutional weaknesses that must be taken into account to derive sound theory and policy advice. These weaknesses relate to weak fiscal regimes, risks associated with poorly regulated financial system and susceptibility to external shocks. They are suffered from structural weakness in the form of many structural bottlenecks (namely constraints occurring due to underdeveloped infrastructure such as poor irrigation and transport facilities among others). These weaknesses make the application of inflation targeting more difficult in emerging market economies as each of these problems may dominate the monetary policy and hinder the use of inflation target. This requires the careful analysis of the existing state of affairs in these economies before putting inflation target into practice so that depending upon the institutional characteristics present in the economy, the policy can be suitably amended, Mishra and Mishra (2009).

1.5 A High Degree of Transparency and Accountability of the Central Bank

It is a tradition for the central banks to keep their objectives and policy decisions confidential but inflation targeting framework demands a very high degree of transparency in terms of publication of monetary policy report, viz., plans & decisions of the policy and forecasting of nominal & real variables of the economy, on the regular basis where various analysis of monetary regime are discussed. A key aspect of such an increased communication with the public is that monetary policy actions are explained to the public thereby enhancing both the transparency of monetary policy and the degree of accountability of the central bank. However, while greater policy transparency is desirable, and indeed necessary, for an inflation targeting strategy to be effective, it is not without costs. Notably these include heightened market sensitivity to policy announcements and publications, and the difficulty of reversing transparency once attained. Furthermore, with such heightened accountability there is a danger that a deflationary bias may emerge where given the uncertainty attached to actually attaining the inflation target, central bankers may act to reach the target in advance of the specified period, which may conflict with output stabilization. The central banks need to be held accountable for their
actions in the conduct of monetary policy. The presence of preannounced inflation targets serve as a benchmark on which the performance of the monetary authorities can be evaluated, thereby increasing their accountability.

### 1.6 Independency of the Central Bank

Independency of the central banks simply means unleashing the monetary authority from direct political or governmental influence in the conduct of monetary policy; however, it is a multi dimension concept. Grilli et al. (1991) distinguishes between two concepts of independent central bank: political independency and economic independency but Debelle and Fischer (1994) describe them as goal independence and instrument independence. Central bank’s liberty to determine goals of monetary policy is referred as goal independence central bank. When monetary policy goals are set by the government, the central bank lacks the goal independency. The instrument independence means central bank’s autonomy to freely adjust its policy tools in pursuit of the goals of monetary policy without influence from the government.

The widespread agreement among the policymakers across the globe is that price stability, the ultimate goal of the monetary authority, should be entrusted to an independent central bank where both goal independence and instrument independence are required. The independent central bank is well equipped with sophisticated tools to achieve macroeconomic goals with low and stable inflation as opposed to fiscal policy through government spending often triggers higher rates of inflation.

### 1.7 Course of Action

Svensson (1997) provides a clear exposition of the standard inflation targeting approach. He argues that the solution to the potential problem in implementing inflation targeting consists of making the central bank’s inflation forecast an explicit intermediate target. Further he says, it is a very straightforward result that hardly requires a model, he believes that it is best demonstrated with the help of a very simple model.
In a standard forward-looking open economy model, for example, in Clarida, Gali, and Gertler (1999) and Woodford (1999b, 2003), optimizing private-sector behavior is represented by two structural equations, an aggregate-supply equation (a forward-looking 'New Keynesian Phillips Curve', NKPC), an aggregate-demand equation ('Dynamic IS curve', DISC), and Taguchi Loss Function. An aggregate-supply equation, NKPC, is derived from a first-order condition for optimal price-setting by the representative supplier following Clarida, Gali, and Gertler (1999) along the lines of Calvo sticky-pricing model, Calvo (1983). Even though there are more realistic formulations, Taylor (1979, 1980) and Fischer (1977), Calvo pricing is more comfortable, simple and gives very similar results in comparison to more complicated models. An aggregate-demand equation, DISC, is derived from the consumption Euler equation for the optimal timing of purchases following Woodford (1999a) along the lines of Dixit-Stiglitz (1977). In the model, inflation and output are both predetermined for one period, as in Bernanke and Woodford (1997), Rotemberg and Woodford (1997, 1999), and Svensson (2003), except for an unforecastable random error term that cannot be affected by monetary policy. Taguchi Loss Function (Taguchi Method), Taguchi (1986), is used to calculate the loss caused to the society for an off-target quality characteristic. Variables of the economy, viz., inflation, output gap, rate of interest (with its smoothing) and exchange rate (with its smoothing) are introduced to write the Taguchi Loss Function (monetary policy loss function). Taguchi Loss Function is minimized, subject to NKPC and DISC to get the optimal reaction (the instrument rate) of the central bank to hit the inflation target.

1.8 Concluding Remarks

A widespread consensus has been developed that price stability should be the leading goal of the monetary policy. Inflation targeting regime, one of the recently developed strategies of monetary authority, is competent enough to capture the price stability in a most efficient way with no negative effect on the economy in the long run; however, there are several issues of debate to implement this tactic in the best possible manner. Pro inflation targeting
arguments stand very firmly against the price level targeting regime, another monetary policy tactic implemented only once in the history of central banking to arrest price stability. A heated debate is going on what measures of inflation to target and what magical figure of inflation to target. Under this framework the target horizon depends on the length of the transmission mechanism of monetary policy and on response of monetary policy to the shocks. When monetary authority keeps an eye on the sole objective of inflation stabilization then central bank has a point target of inflation. The point target is relaxed to flexible target so that inflation can move in a target range or in a target band while central bank has multiple goals apart from inflation stabilization. Policymakers always have some degree of discretion as oppose the toughened policy rule à la Friedman under this regime. Inflation targeting central bank closes her eyes for exchange rate fluctuation. Structural weaknesses are bottlenecks in implementation of this regime. Lastly, a very high degree of transparency, accountability and independency of central bank is very much warranted to implement the inflation targeting framework.

2 Which Inflation to Target, Domestic or CPI?

One of the main objectives of monetary policy is to stabilize price inflation. In a closed economy context inflation is well defined. However, in open economy two measures of inflation coexist: domestic inflation (which excludes the direct effects of exchange rate movements on domestic prices) and CPI (consumer price index) inflation (which encompasses the price movements of imported goods and services). Which one of these two measures of inflation should be targeted by the monetary authority? Movements in the exchange rate can have short-lived effects on CPI inflation. Domestic inflation, on the other hand, can be thought of as a measure of ‘core’ or persistent inflationary pressures by excluding the temporary effects of exchange rate movements. In practice inflation targeting central banks have adopted CPI inflation as target variable while most of the New Open Economy Macroeconomics literature suggests that monetary authority should stabilize domestic inflation as target variable.
Literature shows that trying to stabilize CPI inflation may result in higher volatility in output, interest rates and the exchange rate than targeting a measure of domestic inflation. The reason for this is that by targeting CPI inflation, monetary policy often responds to offset the inflationary effects arising from the direct exchange rate pass-through. As a result, monetary policy becomes more responsive to short-term fluctuations in inflation, leading to higher variability in interest rates, the exchange rate and output. Hence, Gali and Monacelli (2005), Clarida, Gali and Gertler (2001) and Gali (2008) suggest that targeting domestic inflation may achieve better macroeconomic outcomes (lower interest rate, exchange rate and output variability, but higher CPI inflation variability) by ‘looking though’ the direct exchange rate effects.

Adolfson (2001), McCallum and Nelson (2001) and Smets and Wouters (2002) on the other hand, have tended to suggest the opposite. One of the main assumptions in these studies is the speed of transmission from movements in the exchange rate into inflation. In the earlier studies, the typical assumption was that the direct pass-through happened very quickly. This meant that exchange rate movements had only temporary effects on inflation. There is little empirical evidence to support the notion of very quick direct exchange rate pass-through and as a result, the more recent studies have assumed only gradual adjustment of import prices to exchange rate fluctuations. With this assumption, exchange rate movements tend to have more gradual and persistent effects on inflation. Some studies have also modeled imports as an intermediate good used as an input into domestic production. Under this approach, exchange rate movements and import prices can influence inflation indirectly through firms’ costs of production. Under these different assumptions, the research suggests that monetary policy should target CPI inflation.

Despite the apparent differing views from the literature, the common element that can be taken from the discussion is that monetary policy should focus on the measure of inflation that matters for the behavior of individuals and firms. If exchange rate movements have only short lived effects on inflation, then looking through these effects would be appropriate. If, on the other hand, exchange rate movements result in persistent effects on inflation, then responding to them makes sense.
I model domestic inflation following Gali (2008) instead of CPI inflation as there is no clear consensus in the literature on which variable of inflation is superior to target, domestic or CPI.

3 Monetary Policy Objectives in India

Low and stable inflation is good for economic growth and development but out of control inflation is the second most devastating phenomenon next to the external war for any nation, therefore, to keep the inflation low and stable i.e. (long term) price stability has become foremost goal of the monetary authority in any nation, BIS\(^1\) (1998), Svensson (2000) and Bernanke et al. (1999).

In practice, however, central banks are responsible for a number of objectives besides price stability, such as currency stability, financial stability, growth in employment and income. The primary objectives of central banks in many cases are legally and institutionally defined. However, all objectives may not have been spelt out explicitly in the central bank legislation but may evolve through traditions and tacit understanding between the government, the central bank and other major institutions in an economy, Reddy (2002).

However, in a developing economy, like ours, the action of monetary authority is much more complex than that of her counterpart in an industrialized (developed) economy because of the supply constraints, underdeveloped financial markets and resource gap. The monetary policy has to address multiple objectives of achieving high employment level, reasonable rate of economic growth and to ensure macroeconomic stability for equitable development. But above all, monetary authority of an underdeveloped country always remains in a dilemma; what to choose from price stability and economic growth. Though the economic growth is very important and crucial factor for the inhabitants of any nation but rising prices takes the bread away from the poorest. In addition, governments in developing countries often tend to assign the monetary policy quasi fiscal responsibilities too, which include creating conditions for equitable supply of credit to various sectors in magnitude (volume) and composition

\(^1\) Bank of International Settlements.
deemed fit by the government; financing government budget deficits, managing
government debt, helping towards increasing exports while reducing the
dependence on imports at the same time and developing, regulating, and
monitoring financial institutions. Thus, the objectives of monetary policy in most
developing countries often appear to be vague and unclear. In the case of India,
the preamble of the Reserve Bank of India describes the basic functions of the
Bank as: “… to regulate the issue of Bank Notes and keeping of reserves with a
view to securing monetary stability in India and generally to operate the
currency and credit system of the country to its advantage.”, Singh and Kalirajan
(2006). The Reserve Bank of India has enshrined the dual objective of: (1)
maintaining a reasonable degree of price stability in the economy through the
regulation of monetary growth and (2) ensuring adequate expansion of credit to
assist economic growth, Rangrajan (1998) with the relative emphasis on these
two objectives changing from time to time.

Price stability involves deciding between price level stability and low
(including zero) inflation, choosing the appropriate price index, and selecting the
appropriate level for a quantitative target. It also involves deciding on the role of
real variables, like output, in the objectives for monetary policy. Thus, defining
price stability boils down to defining the monetary policy loss function, Svensson
(1999a).

4 Strict Inflation Targeting

Under the strict inflation targeting regime, central bank is committed to
keep the inflation as close to a given inflation target as possible and nothing else.
No (zero) weight is given to the (other) variables (nominal or real) in the loss
function of the monetary policy except inflation. In this section I derive a
monetary policy rule when central bank follows the strict inflation targeting
framework.

Rewriting (1.3.51) as:
\[ E_t \pi_{H,t+1} = \frac{1}{\beta} \pi_{H,t} - \frac{\rho}{\beta} \tilde{y}_t \]  

(2.2.1)

Plugging \( \frac{1}{\beta} = a_1 \) and \( -\frac{\rho}{\beta} = a_2 \) in (2.2.1)

\[ E_t \pi_{H,t+1} = a_1 \pi_{H,t} + a_2 \tilde{y}_t \]

\[ \pi_{H,t+1} = a_1 \pi_{H,t} + a_2 \tilde{y}_t + \eta_{t+1} \]  

(2.2.2)

Where I have used \( \pi_{H,t+1} = E_t \pi_{H,t+1} + \eta_{t+1} \). Where, \( \eta_{t+1} \) is an i.i.d. shock.

Rewriting (1.3.56) as:

\[ E_t \tilde{y}_{t+1} = \tilde{y}_t + \frac{1}{\varepsilon_\alpha} i_t - \frac{1}{\varepsilon_\alpha} i_t^{Rn} - \frac{1}{\varepsilon_\alpha} E_t \pi_{H,t+1} \]  

(2.2.3)

Plugging \( \frac{1}{\varepsilon_\alpha} = a_3 \) and \( -\frac{1}{\varepsilon_\alpha} = a_4 \) in (2.2.3).

\[ E_t \tilde{y}_{t+1} = \tilde{y}_t + a_3 i_t + a_4 i_t^{Rn} + a_4 E_t \pi_{H,t+1} \]

\[ \tilde{y}_{t+1} = \tilde{y}_t + a_3 i_t + a_4 i_t^{Rn} + a_4 E_t \pi_{H,t+1} + \eta_{t+1} \]  

(2.2.4)

Where I used \( \tilde{y}_{t+1} = E_t \tilde{y}_{t+1} + \eta_{t+1} \). Where, \( \eta_{t+1} \) is an i.i.d. shock.

Rewriting (2.2.2) as:

\[ \pi_{H,t+2} = a_1 E_t \pi_{H,t+1} + a_2 E_t \tilde{y}_{t+1} + \eta_{t+2} \]  

(2.2.5)

Plugging (2.2.2) and (2.2.4) in (2.2.5)

\[ \pi_{H,t+2} = a_1 \left( a_1 \pi_{H,t} + a_2 \tilde{y}_t + \eta_{t+1} \right) + a_2 \left( \tilde{y}_t + a_3 i_t + a_4 i_t^{Rn} + a_4 E_t \pi_{H,t+1} + \eta_{t+1} \right) + \eta_{t+2} \]
\[ \pi_{H,t+2} = a_1 a_1 \pi_{H,t} + a_1 a_2 \bar{y}_t + a_1 \eta_{t+1} + a_2 \bar{\eta}_t + a_2 a_3 \bar{y}_t + a_2 a_4 \eta_{t+1} + a_2 a_4 a_3 \pi_{H,t} \\
+ a_2 a_4 a_2 \bar{\eta}_t + a_2 a_4 \eta_{t+1} + a_2 q_{t+1} + \eta_{t+2} \]

\[ \pi_{H,t+2} = (a_1 a_1 + a_2 a_4) \pi_{H,t} + (a_1 a_1 + a_2 + a_2 a_4 a_2) \bar{y}_t + a_2 a_3 \bar{y}_t + a_2 a_4 \eta_{t+1} + a_2 q_{t+1} + \eta_{t+2} \]

\[ \pi_{H,t+2} = b_1 \pi_{H,t} + b_2 \bar{y}_t + b_3 \bar{y}_t + b_4 \bar{r}_{t} + b_4 \bar{r}_{t} \]

(2.2.6)

Where I have used \((a_1 a_1 + a_2 a_4 a_2) = b_1, (a_1 a_1 + a_2 + a_2 a_4 a_2) = b_2, a_2 a_3 = b_3\)
and \(a_2 a_4 = b_4\)

### 4.1 Monetary Policy Rule

Suppose monetary policy is conducted by the central bank with inflation target \(\pi^T\). Interpret inflation targeting as implying that central bank’s objective in period \(t\) is to choose a sequence of current and future instrument rates of monetary policy \([i_t]_{t=0}^{\infty}\) so as to minimize

\[ E_t \sum_{t=0}^{\infty} \beta^t \mathcal{L}(\pi_{H,t}) \]  

(2.2.7)

\[ \mathcal{L}(\pi_{H,t}) = \frac{1}{2} (\pi_{H,t} - \pi^T)^2 \]

(2.2.8)

That is, central bank wishes to minimize the expected sum of discounted squared future deviations of domestic inflation from the target.

If monetary authority changes its instrument rate at time \(t\) then the instrument rate will affect the output in the \(t + 1\) time. In turn the output will affect the inflation in \(t + 2\) time, thus monetary policy affects the inflation with a longer leg than it affects the output.
Since instrument rate affects the inflation in $t + 2$ time, therefore, inflation is expressed in $\pi_{H,t+2}$ terms in (2.2.6). Instrument rate in time $t$ will not affect the inflation in time $t$ and in time $t + 1$ but will affect in time $t + 2$, $t + 3$, $t + 4$, ..., Instrument rate in time $t + 1$ will only affect the inflation in time $t + 3$, $t + 4$, ... The solution to the optimization problem can be found by assigning the instrument rate in time $t$ to hit the inflation target for time $t + 2$ on an expected basis and instrument rate in time $t + 1$ to hit the inflation target for time $t + 3$ and so on. Thus, central bank can find the optimal instrument rate in time $t$ as the solution to the period by period problem.

$$\min_{i_t} E_t \beta^2 L(\pi_{H,t+2}) \quad (2.2.9)$$

Plugging (2.2.8) in (2.2.9)

$$\min_{i_t} E_t \beta^2 \frac{1}{2} (\pi_{H,t+2} - \pi^T)^2 \quad (2.2.10)$$

Plugging (2.2.6) in (2.2.10)

$$\min_{i_t} \beta^2 \frac{1}{2} \left( \left[ b_1 \pi_{H,t} + b_2 \bar{y}_t + b_3 i_t + b_4 i^R_t + (a_1 \eta_{t+1} + a_2 a_4 \eta_{t+1} + a_2 q_{t+1} + \eta_{t+2}) \right] - \pi^T \right)^2$$

First order condition with respect to $i_t$ makes:

$$\beta^2 \frac{1}{2} \frac{2}{1} \frac{b_3}{1} \left( \left[ b_1 \pi_{H,t} + b_2 \bar{y}_t + b_3 i_t + b_4 i^R_t + (a_1 \eta_{t+1} + a_2 a_4 \eta_{t+1} + a_2 q_{t+1} + \eta_{t+2}) \right] - \pi^T \right) = 0$$

Plugging (2.2.6)

$$\beta^2 \frac{b_3}{1} \left( E_t \pi_{H,t+2} - \pi^T \right) = 0$$
\[ E_t \pi_{H,t+2} = \pi^T \]  

(2.2.11)

It simply means that the instrument rate should be set so that the forecast of the one year forward inflation rate from time \( t + 1 \) to time \( t + 2 \), conditional upon information available in time \( t \), equals to inflation target. Thus, time \( t + 2 \) inflation forecast can be considered as an explicit intermediate target. It follows that inflation targeting loss function (2.2.8) can be replaced by an intermediate loss function, the inflation targeting loss function and can be given as:

\[
L^i(E_t \pi_{H,t+2}) = \frac{1}{2} (E_t \pi_{H,t+2} - \pi^T)^2
\]

(2.2.12)

Instead minimizing the expected squared deviations of future inflation rate in time \( t + 2 \) from the inflation target as given in the (2.2.9), central bank can minimize the squared deviation of current \( t + 2 \) time inflation forecast \( E_t \pi_{t+2} \) from the inflation target.

\[
\min_{i_t} L^i(E_t \pi_{H,t+2})
\]

(2.2.13)

The \( t + 2 \) time inflation forecast as given in (2.2.6) depends only on the current state of economy, i.e. on \( \pi_{H,t}, \tilde{y}_t \) and on \( i_t \), therefore, for the current state of economy (2.2.6) becomes as:

\[
E_t \pi_{H,t+2} = b_1 \pi_{H,t} + b_2 \tilde{y}_t + b_3 i_t + b_4 i_t^n
\]

(2.2.14)

And instrument rate, \( i_t \), can be given as:

\[
b_3 i_t = E_t \pi_{H,t+2} - b_1 \pi_{H,t} - b_2 \tilde{y}_t - b_4 i_t^n
\]

Plugging (2.2.11)
\[ b_3 i_t = \pi^T - b_1 \pi_{H,t} - b_2 \tilde{y}_t - b_4 i_t^R \]

\[ i_t = \frac{1}{b_3} \pi^T - \frac{b_1}{b_3} \pi_{H,t} - \frac{b_2}{b_3} \tilde{y}_t - \frac{b_4}{b_3} i_t^R \]

\[ i_t = d_1 \pi^T - d_2 \pi_{H,t} - d_3 \tilde{y}_t - d_4 i_t^R \quad (2.2.15) \]

Where I have used \( \frac{1}{b_3} = d_1, \frac{b_1}{b_3} = d_2, \frac{b_2}{b_3} = d_3 \) and \( \frac{b_4}{b_3} = d_4 \). (2.2.15) is a monetary policy rule which is identical to Taylor rule.

The instrument rate dependents on current inflation, not because current inflation targeted but because current inflation together with output predict future inflation. With this reaction function the \( t + 2 \) time inflation forecast will equal the inflation target, for all values of \( \pi_{H,t} \) and \( \tilde{y}_t \). If the inflation forecast exceeds (falls short of) the inflation target, the instrument rate should be increased (decreased) until the inflation forecast equals the target.

The actual inflation in time \( t + 2 \) will in equilibrium be given by (2.2.6), (2.2.11) and (2.2.14) as:

\[ \pi_{H,t+2} = E_t \pi_{H,t+2} + (a_1 \eta_{t+1} + a_2 a_4 \eta_{t+1} + a_2 \tilde{q}_{t+1} + \eta_{t+2}) \]

\[ \pi_{H,t+2} = \pi^T + (a_1 \eta_{t+1} + a_2 a_4 \eta_{t+1} + a_2 \tilde{q}_{t+1} + \eta_{t+2}) \]

\[ \pi_{H,t+2} - \pi^T = (a_1 \eta_{t+1} + a_2 a_4 \eta_{t+1} + a_2 \tilde{q}_{t+1} + \eta_{t+2}) \quad (2.2.16) \]

Thus, (2.2.16) shows that central bank cannot prevent deviation of inflation target caused by the i.i.d. shocks. At best it can only control the deviations of time \( t + 2 \) forecast from the target. It can, therefore, be argued that the central bank should be held accountable for the forecast deviations from the target rather than the realized inflation deviations, if the forecast deviations can be observed.
5 Flexible Inflation Targeting and Output Stabilization

When central bank has more goals apart from inflation target itself then strict or point target of inflation is relaxed to flexible target so that inflation can move in a target range or in a target band. Central bank puts weight on the other variables (nominal or real) in the loss function of the monetary policy as asked by the social planner. In this section I derive a monetary policy reaction function when central bank tries to relax inflation target in order to capture the level of output assigned by the social planner.

Consider the case when there additional stabilization goals with regards to real variables, like output. More specifically, consider the situation when there is a long run inflation target $\pi^T$ but no long run output target (other than the natural rate of output), since monetary policy cannot affect the real variables of the economy in the long run. In the short run, suppose the goal of the monetary policy is to stabilize both inflation and output around the long run inflation target and natural output rate, respectively. Thus, in the goals of monetary policy, there is symmetry between inflation and output in the short run but not in the long run. This situation can be described with a period loss function:

Rewriting (2.2.2) as:

$$\pi_{H,t+1} = \pi_{H,t} + \Phi_1 \tilde{y}_t + \eta_{t+1}$$  \hspace{1cm} (2.2.17)

Where I assume $\eta_{t+1} = 1$ and used $\eta_{t+1} = \Phi_1$.

Rewriting (2.2.4)

$$\tilde{y}_{t+1} = \tilde{y}_t + a_3 i_t + a_4 \pi_{H,t} + a_4 \Phi_1 \tilde{y}_t + \rho_{t+1}$$

Where I used, $i^{rn}_t$, the natural rate of real interest rate to be zero.

\[ I \text{ borrow this section from Svensson (1997).}\]
\[ \ddot{y}_{t+1} = (1 + a_4 \phi_1) \ddot{y}_t + a_3 i_t + a_4 \pi_{H,t} + \varrho_{t+1} \]

\[ \ddot{y}_{t+1} = (1 + a_4 \phi_1) \ddot{y}_t - \phi_2 i_t + \phi_2 \pi_{H,t} + \varrho_{t+1} \]

Where I used \( a_3 = -\phi_2 \), \( a_4 = \phi_2 \)

\[ \ddot{y}_{t+1} = \phi_1 \ddot{y}_t - \phi_2 (i_t - \pi_{H,t}) + \varrho_{t+1} \] (2.2.18)

Where I used \((1 + a_4 \phi_1) = \phi_1\)

\[ E_t \sum_{t=0}^{\infty} \beta^t E(\pi_{H,t}, \ddot{y}_t) \] (2.2.19)

\[ L(\pi_{H,t}, \ddot{y}_t) = \frac{1}{2} (\pi_{H,t} - \pi^*)^2 + \varepsilon (\ddot{y}_t)^2 \] (2.2.20)

One year control lag for inflation:

\[ E(\pi_{H,t}) = \min_{\ddot{y}_t} \left\{ \frac{1}{2} \left( (\pi_{H,t} - \pi^*)^2 + \varepsilon \ddot{y}_t^2 \right) + \beta E_t E(\pi_{H,t+1}) \right\} \] (2.2.21)

Subject to (2.2.17)

\[ \pi_{H,t+1} = \pi_{H,t} + \phi_1 \ddot{y}_t + \eta_{t+1} \]

Where output gap \( \ddot{y}_t \) is control variable. The indirect loss function is given as, \( E(\pi_{H,t}) \) and will be quadratic function as:

\[ E(\pi_{H,t}) = \mathcal{K}_0 + \frac{1}{2} \mathcal{K}_1 (\pi_{H,t} - \pi^*)^2 \] (2.2.22)
Where $\mathcal{K}_0$ and $\mathcal{K}_1$ required to be determined.

Rewriting (2.2.22) as:

$$E(p_{H,t+1}) = \mathcal{K}_0 + \frac{1}{2} \mathcal{K}_1 \left( p_{H,t+1} - \pi_T \right)^2$$  \hspace{1cm} (2.2.23)

Rearranging (2.2.23) as:

$$E_t E(p_{H,t+1}) = \mathcal{K}_0 + \frac{1}{2} \mathcal{K}_1 E_t \left[ \left( p_{H,t+1} \right)^2 + \left( \pi_T \right)^2 - 2 \left( p_{H,t+1} \right) \left( \pi_T \right) \right]$$

Taking partial derivation of the equation with respect to $p_{H,t+1}$

$$E_t E_{\pi}(p_{H,t+1}) = \frac{\partial \left[ E_t E(p_{H,t+1}) \right]}{\partial p_{H,t+1}} = \frac{\partial \left\{ \mathcal{K}_0 + \frac{1}{2} \mathcal{K}_1 E_t \left[ \left( p_{H,t+1} \right)^2 + \left( \pi_T \right)^2 - 2 \left( p_{H,t+1} \right) \left( \pi_T \right) \right] \right\}}{\partial p_{H,t+1}}$$

$$E_t E_{\pi}(p_{H,t+1}) = \frac{\partial \left[ E_t E(p_{H,t+1}) \right]}{\partial p_{H,t+1}} = \left\{ \frac{1}{2} \mathcal{K}_1 E_t \left[ 2 p_{H,t+1} - 2 \pi_T \right] \right\}$$

$$E_t E_{\pi}(p_{H,t+1}) = \frac{\partial \left[ E_t E(p_{H,t+1}) \right]}{\partial p_{H,t+1}} = \left\{ \mathcal{K}_1 \left[ E_t \pi_{H,t+1} - \pi_T \right] \right\}$$  \hspace{1cm} (2.2.24)

First order condition of (2.2.21) is given as:

$$(\mathcal{E} \bar{y}_t + \varphi_1 \beta E_t E_{\pi}(p_{H,t+1}) = 0$$

Plugging (2.2.24)

$$(\mathcal{E} \bar{y}_t + \varphi_1 \mathcal{K}_1 \left[ E_t \pi_{H,t+1} - \pi_T \right] = 0$$
\[ E_t \pi^*_{H,t+1} - \pi^T = -\frac{\beta \varphi_1 \chi_1}{3} \hat{\gamma}_t \]
\[(2.2.25)\]

\[ \hat{\gamma}_t = -\frac{\beta \varphi_1 \chi_1}{3} [E_t \pi^*_{H,t+1} - \pi^T] \]

Plugging \( E_t \pi^*_{H,t+1} = \pi_{H,t} + \varphi_1 \hat{\gamma}_t \)

\[ \hat{\gamma}_t = -\frac{\beta \varphi_1 \chi_1}{3} \left[ \pi_{H,t} + \varphi_1 \hat{\gamma}_t - \pi^T \right] \]

\[ \left( 1 + \frac{\beta \varphi_1^2 \chi_1}{3} \right) \hat{\gamma}_t = -\frac{\beta \varphi_1 \chi_1}{3} [\pi_{H,t} - \pi^T] \]

\[ \left( \frac{\beta \varphi_1^2 \chi_1}{3} \right) \hat{\gamma}_t = -\frac{\beta \varphi_1 \chi_1}{3} [\pi_{H,t} - \pi^T] \]

\[ \hat{\gamma}_t = -\frac{\beta \varphi_1 \chi_1}{3} + \frac{\beta \varphi_1^2 \chi_1}{3 + \beta \varphi_1^2 \chi_1} [\pi_{H,t} - \pi^T] \]

\[ \hat{\gamma}_t = -\frac{\beta \varphi_1 \chi_1}{3 + \beta \varphi_1^2 \chi_1} [\pi_{H,t} - \pi^T] \]
\[(2.2.26)\]

Plugging \((2.2.26)\) in \( E_t \pi^*_{H,t+1} = \pi_{H,t} + \varphi_1 \hat{\gamma}_t \)

\[ E_t \pi^*_{H,t+1} = \pi_{H,t} + \varphi_1 \left[ -\frac{\beta \varphi_1 \chi_1}{3 + \beta \varphi_1^2 \chi_1} [\pi_{H,t} - \pi^T] \right] \]

\[ E_t \pi^*_{H,t+1} = \pi_{H,t} + \left[ -\frac{\beta \varphi_1^2 \chi_1}{3 + \beta \varphi_1^2 \chi_1} [\pi_{H,t} - \pi^T] \right] + \pi^T - \pi^T \]

[106]
\[
E_t \pi_{H,t+1} = \pi^T + \left[ \pi_{H,t} - \frac{\beta \varphi_1^2 \mathcal{J}_1}{\varepsilon + \beta \varphi_1^2 \mathcal{J}_1} \left[ \pi_{H,t} - \pi^T \right] \right] - \pi^T
\]

\[
E_t \pi_{H,t+1} = \pi^T + \left[ \pi_{H,t} - \frac{\beta \varphi_1^2 \mathcal{J}_1}{\varepsilon + \beta \varphi_1^2 \mathcal{J}_1} \pi_{H,t} + \frac{\beta \varphi_1^2 \mathcal{J}_1}{\varepsilon + \beta \varphi_1^2 \mathcal{J}_1} \pi^T \right] - \pi^T
\]

\[
E_t \pi_{H,t+1} = \pi^T + \left[ \left( 1 - \frac{\beta \varphi_1^2 \mathcal{J}_1}{\varepsilon + \beta \varphi_1^2 \mathcal{J}_1} \right) \pi_{H,t} - \left( 1 - \frac{\beta \varphi_1^2 \mathcal{J}_1}{\varepsilon + \beta \varphi_1^2 \mathcal{J}_1} \right) \pi^T \right]
\]

\[
E_t \pi_{H,t+1} = \pi^T + \left( 1 - \beta \varphi_1 \mathcal{J}_1 \right) \left( \pi_{H,t} - \pi^T \right)
\]

\[\text{(2.2.27)}\]

Exploiting envelope theorem on \[2.2.21\]

\[
\mathcal{E}(\pi_{H,t}) = \left\{ \frac{1}{2} \left[ \left( \pi_{H,t} - \pi^T \right)^2 + \varepsilon \tilde{y}_t^2 \right] + \beta E_t \mathcal{E}(\pi_{H,t+1}) \right\}
\]

\[
\mathcal{E}(\pi_{H,t}) = \frac{1}{2} \left( \pi_{H,t} \right)^2 + \frac{1}{2} \left( \pi^T \right)^2 - \left( \pi_{H,t} \pi^T \right) + \frac{1}{2} \varepsilon \tilde{y}_t^2 + \beta E_t \mathcal{E}(\pi_{H,t+1})
\]

\[
\mathcal{E}_\pi(\pi_{H,t}) = \frac{\partial}{\partial \pi_{H,t}} \mathcal{E}(\pi_{H,t})
\]

\[= \frac{\partial}{\partial \pi_{H,t}} \left[ \frac{1}{2} \left( \pi_{H,t} \right)^2 + \frac{1}{2} \left( \pi^T \right)^2 - \left( \pi_{H,t} \pi^T \right) + \frac{1}{2} \varepsilon \tilde{y}_t^2 + \beta E_t \mathcal{E}(\pi_{H,t+1}) \right]
\]

\[
\mathcal{E}_\pi(\pi_{H,t}) = \frac{\partial}{\partial \pi_{H,t}} \mathcal{E}(\pi_{H,t}) = \pi_{H,t} - \pi^T + \mathcal{J}_1 \left[ E_t \pi_{H,t+1} - \pi^T \right] = 0
\]

Where I used \[2.2.24\] \[E_t \mathcal{E}_\pi(\pi_{H,t+1}) = \left\{ \mathcal{J}_1 \left[ E_t \pi_{H,t+1} - \pi^T \right] \right\}

Plugging \[2.2.27\] makes:

\[107\]
\[
E_{\pi}(\pi_{H,t}) = \pi_{H,t} - \pi^T + \beta \mathcal{K}_1 \left[ \pi^T + \left( \frac{3}{\epsilon + \beta \varphi_1^2 \mathcal{K}_1} \right) (\pi_{H,t} - \pi^T) - \pi^T \right]
\]

\[
E_{\pi}(\pi_{H,t}) = \pi_{H,t} - \pi^T + \beta \mathcal{K}_1 \left( \frac{3}{\epsilon + \beta \varphi_1^2 \mathcal{K}_1} \right) (\pi_{H,t} - \pi^T)
\]

\[
E_{\pi}(\pi_{H,t}) = \left( 1 + \frac{\beta \mathcal{K}_1}{\epsilon + \beta \varphi_1^2 \mathcal{K}_1} \right) (\pi_{H,t} - \pi^T)
\]  \hfill (2.2.28)

Exploiting envelope theorem on (2.2.22)

\[
E_{\pi}(\pi_{H,t}) = \frac{\partial}{\partial \pi_{H,t}} E(\pi_{H,t}) = \frac{\partial}{\partial \pi_{H,t}} \left[ \mathcal{K}_0 + \frac{1}{2} \mathcal{K}_1 (\pi_{H,t} - \pi^T)^2 \right]
\]

\[
E_{\pi}(\pi_{H,t}) = \mathcal{K}_1 (\pi_{H,t} - \pi^T) = 0
\]

\[
E_{\pi}(\pi_{H,t}) = \mathcal{K}_1 (\pi_{H,t} - \pi^T)
\]  \hfill (2.2.29)

By (2.2.28) and (2.2.29)

\[
\mathcal{K}_1 (\pi_{H,t} - \pi^T) = \left( 1 + \frac{\beta \mathcal{K}_1}{\epsilon + \beta \varphi_1^2 \mathcal{K}_1} \right) (\pi_{H,t} - \pi^T)
\]

\[
\mathcal{K}_1 = 1 + \frac{\beta \mathcal{K}_1}{\epsilon + \beta \varphi_1^2 \mathcal{K}_1}
\]

\[
\beta \varphi_1^2 \mathcal{K}_1^2 + \epsilon \mathcal{K}_1 - \beta \varphi_1^2 \mathcal{K}_1 - \beta \mathcal{K}_1 \epsilon - \epsilon = 0
\]

\[
\beta \varphi_1^2 \mathcal{K}_1^2 + (\epsilon - \beta \varphi_1^2 - \beta \epsilon) \mathcal{K}_1 - \epsilon = 0
\]

\[
\mathcal{K}_1^2 + \frac{(\epsilon - \beta \varphi_1^2 - \beta \epsilon)}{\beta \varphi_1^2} \mathcal{K}_1 - \frac{\epsilon}{\beta \varphi_1^2} = 0
\]
\[ \mathcal{J}_1^2 + \left( \frac{3}{\beta \varphi_1^2} - \frac{\beta \varphi_1^2}{\beta \varphi_1^2} - \frac{\beta \varphi_2^2}{\beta \varphi_1^2} \right) \mathcal{J}_1 - \frac{3}{\beta \varphi_1^2} = 0 \]

\[ \mathcal{J}_2^2 + \left( \frac{3}{\beta \varphi_1^2} - 1 - \frac{\beta \varphi_1^2}{\beta \varphi_2^2} \right) \mathcal{J}_1 - \frac{3}{\beta \varphi_2^2} = 0 \]

\[ \mathcal{J}_3^2 + \left( \frac{3(1 - \beta)}{\beta \varphi_1^2} - 1 \right) \mathcal{J}_1 - \frac{3}{\beta \varphi_1^2} = 0 \]

\[ \mathcal{J}_4^2 - \left( 1 - \frac{3(1 - \beta)}{\beta \varphi_1^2} \right) \mathcal{J}_1 - \frac{3}{\beta \varphi_1^2} = 0 \]

Which is in the form of a quadratic equation and has a solution.

\[ \mathcal{J}_1 = \frac{- \left[ - (1 - \frac{3(1 - \beta)}{\beta \varphi_1^2}) \right] + \sqrt{\left[ - (1 - \frac{3(1 - \beta)}{\beta \varphi_1^2}) \right]^2 - 4 \left( - \frac{3}{\beta \varphi_1^2} \right)}}{2} \]

\[ \mathcal{J}_1 = \frac{\left[ \frac{(1 - \frac{3(1 - \beta)}{\beta \varphi_1^2})}{\beta \varphi_1^2} \right] + \sqrt{\left[ \frac{(1 - \frac{3(1 - \beta)}{\beta \varphi_1^2})}{\beta \varphi_1^2} \right]^2 + \left( \frac{4 \varphi_1^2}{\beta \varphi_1^2} \right)}}{2} \]

\[ \mathcal{J}_1 = \frac{\left[ \frac{(1 - \frac{3(1 - \beta)}{\beta \varphi_1^2})}{\beta \varphi_1^2} \right] + \sqrt{1 - \left( \frac{2 \varphi_1^2}{\beta \varphi_1^2} + \frac{(3(1 - \beta))}{\beta \varphi_1^2} \right)^2 + \left( \frac{4 \varphi_1^2}{\beta \varphi_1^2} \right) - \left( \frac{4 \varphi_1^2}{\beta \varphi_1^2} \right) + \left( \frac{4 \varphi_1^2}{\beta \varphi_1^2} \right)}}{2} \]
\[ J_1 \]

\[
\left[ 1 - \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right) \right] + \sqrt{1 - \left( \frac{2 \beta (1 - \beta)}{\phi_1^2} \right) + \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right)^2 + \left( \frac{4 \beta}{\phi_1^2} \right) - \left( \frac{4 \beta}{\phi_1^2} \right)} + \left( \frac{4 \beta}{\phi_1^2} \right)
\]

\[ J_1 = \frac{\left( 1 - \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right) \right) + \sqrt{1 - \left( \frac{2 \beta (1 - \beta)}{\phi_1^2} \right) + \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right)^2 + \left( \frac{4 \beta}{\phi_1^2} \right) - \left( \frac{4 \beta}{\phi_1^2} \right)} + \left( \frac{4 \beta}{\phi_1^2} \right)}{2}
\]

\[ J_1 \]

\[
\left[ \left( 1 - \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right) \right) + \sqrt{1 - \left( \frac{2 \beta (1 - \beta)}{\phi_1^2} \right) + \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right)^2 + \left( \frac{4 \beta}{\phi_1^2} \right) - \left( \frac{4 \beta}{\phi_1^2} \right)} + \left( \frac{4 \beta}{\phi_1^2} \right) \right]
\]

\[ J_1 = \frac{\left( 1 - \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right) \right) + \sqrt{1 + \left( \frac{2 \beta (1 - \beta)}{\phi_1^2} \right) + \left( \frac{\beta - \beta \phi_1^2}{\phi_1^2} \right)^2 + \left( \frac{4 \beta}{\phi_1^2} \right) - \left( \frac{4 \beta}{\phi_1^2} \right)} + \left( \frac{4 \beta}{\phi_1^2} \right)}{2} \geq 1 \]  

(2.2.30)

Rewriting (2.2.21) as:

\[
E(\pi_{H,t+1|t}) = \min_{\tilde{\gamma}_{t+1|t}} \left\{ \frac{1}{2} \left[ (\pi_{H,t+1|t} - \pi_t)^2 + \beta \gamma_{t+1|t}^2 \right] + \beta E_t E(\pi_{H,t+2|t+1}) \right\}
\]

(2.2.31)

Subject to

\[
\pi_{H,t+2|t+1} = \pi_{H,t+1} + \phi_1 \tilde{\gamma}_{t+1}
\]

\[
\pi_{H,t+2|t+1} = \pi_{H,t+1|t} + \eta_{t+1} + \phi_1 (\tilde{\gamma}_{t+1|t} + \xi_{t+1})
\]
\[ \pi_{H,t+2|t+1} = \pi_{H,t+1|t} + \varphi_1 \hat{\gamma}_{t+1} + (\eta_{t+1} + \varphi_1 \vartheta_{t+1}) \]  \hfill (2.2.32)

Where, \( \hat{\gamma}_{t+1|t} \) is a control variable.

Given that:

\[ \hat{\gamma}_{t+1} = E_t \hat{\gamma}_{t+1} + \vartheta_{t+1} \]

Plugging (2.2.18)

\[ \Phi_1 \hat{\gamma}_t - \Phi_2 (i_t - \pi_{H,t}) + \vartheta_{t+1} = E_t \hat{\gamma}_{t+1} + \vartheta_{t+1} \]

\[ \Phi_2 (i_t - \pi_{H,t}) = \Phi_1 \hat{\gamma}_t - E_t \hat{\gamma}_{t+1} \]

\[ (i_t - \pi_{H,t}) = \frac{\Phi_1}{\Phi_2} \hat{\gamma}_t - \frac{1}{\Phi_2} E_t \hat{\gamma}_{t+1} \] \hfill (2.2.33)

In this case first order condition, analogous to, (2.2.25) can be given as:

\[ [\pi_{H,t+2|t} - \pi^T] = -\frac{3}{\beta \varphi_1 \vartheta_1} \hat{\gamma}_{t+1|t} \] \hfill (2.2.34)

That is, \( t + 2 \) time inflation forecast should equal the inflation target only if \( t + 1 \) time output forecast equals the natural output rate. Else it should exceed the inflation target in proportion to how much \( t + 1 \) time output forecast falls short of the natural output level. The proportionality coefficient, \( \frac{3}{\beta \varphi_1 \vartheta_1} \), is increasing in the relative weight on output stabilization, \( \vartheta \), and decreasing in (short run) inflation / output trade off. Where \( \vartheta_1 \) is given in the (2.2.30).

Given that:

\[ \pi_{H,t+2|t} = \pi_{H,t+1|t} + \varphi_1 \hat{\gamma}_{t+1|t} \]
\[ \pi_{H,t+2|t} = \pi_{H,t} + \varphi_1 \bar{y}_t + \varphi_1 \left[ \phi_1 \bar{y}_t - \phi_2 (i_t - \pi_{H,t}) \right] \]

\[ \pi_{H,t+2|t} = \pi_{H,t} + \varphi_1 \bar{y}_t + \varphi_1 \phi_1 \bar{y}_t - \varphi_1 \phi_2 (i_t - \pi_{H,t}) \]

\[ \pi_{H,t+2|t} = \pi_{H,t} + \varphi_1 (1 + \phi_1) \bar{y}_t - \varphi_1 \phi_2 (i_t - \pi_{H,t}) \]

\[ \pi_{H,t+2|t} - \pi^T = \pi_{H,t} - \pi^T + \varphi_1 (1 + \phi_1) \bar{y}_t - \varphi_1 \phi_2 (i_t - \pi_{H,t}) \]  \( (2.2.35) \)

Rewriting the reaction function \( (2.2.33) \)

\[ (i_t - \pi_{H,t}) = \frac{\phi_1}{\phi_2} \bar{y}_t - \frac{1}{\phi_2} E_t \bar{y}_{t+1} \]

Plugging \( (2.2.34) \) as:

\[ -\frac{\beta \varphi_1 K_1}{\epsilon} \left[ \pi_{H,t+2|t} - \pi^T \right] = \bar{y}_{t+1|t} \]

\[ (i_t - \pi_{H,t}) = \frac{\phi_1}{\phi_2} \bar{y}_t + \frac{1}{\phi_2} \frac{\beta \varphi_1 K_1}{\epsilon} \left[ \pi_{H,t+2|t} - \pi^T \right] \]

Plugging \( (2.2.35) \)

\[ (i_t - \pi_{H,t}) = \frac{\phi_1}{\phi_2} \bar{y}_t + \frac{\beta \varphi_1 K_1}{\epsilon \phi_2} \left[ \pi_{H,t} - \pi^T + \varphi_1 (1 + \phi_1) \bar{y}_t - \varphi_1 \phi_2 (i_t - \pi_{H,t}) \right] \]

\[ (i_t - \pi_{H,t}) = \frac{\beta \varphi_1 K_1}{\epsilon \phi_2} \left( \pi_{H,t} - \pi^T \right) - \frac{\beta \varphi_1 K_1}{\epsilon \phi_2} \phi_1 \phi_2 (i_t - \pi_{H,t}) \]

\[ + \left( \frac{\beta \varphi_1 K_1 \phi_1}{\epsilon \phi_2} [(1 + \phi_1)] \right) \bar{y}_t \]
\[
(i_t - \pi_{H,t}) + \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon} (i_t - \pi_{H,t}) = \beta \varphi_1 \mathcal{K}_1 \varphi_2 \left( \pi_{H,t} - \pi_T \right) + \left( \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \right) \left( (1 + \phi_1) \right) + \frac{\varphi_1}{\varphi_2} \tilde{y}_t \\

\left[ 1 + \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon} \right] (i_t - \pi_{H,t}) = \beta \varphi_1 \mathcal{K}_1 \varphi_2 \left( \pi_{H,t} - \pi_T \right) + \left( \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \right) \left( (1 + \phi_1) \right) + \frac{\varphi_1}{\varphi_2} \tilde{y}_t \\

\left[ \epsilon + \beta \mathcal{K}_1 \varphi_1^2 \right] (i_t - \pi_{H,t}) = \beta \varphi_1 \mathcal{K}_1 \varphi_2 \left( \pi_{H,t} - \pi_T \right) + \left( \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \right) \left( (1 + \phi_1) \right) + \frac{\varphi_1}{\varphi_2} \tilde{y}_t \\

(i_t - \pi_{H,t}) = \left[ \frac{\varphi_1 \mathcal{K}_1}{\varphi_2 (\epsilon + \beta \mathcal{K}_1 \varphi_1^2)} \right] (\pi_{H,t} - \pi_T) \\

+ \left[ \frac{\epsilon}{\epsilon + \beta \mathcal{K}_1 \varphi_1^2} \right] \left( \beta \mathcal{K}_1 \varphi_1^2 \left( \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \right) \left( (1 + \phi_1) \right) + \frac{\varphi_1}{\varphi_2} \right) \tilde{y}_t \\

(i_t - \pi_{H,t}) = \left[ \frac{\varphi_1 \mathcal{K}_1}{\varphi_2 (\epsilon + \beta \mathcal{K}_1 \varphi_1^2)} \right] (\pi_{H,t} - \pi_T) \\

+ \left( \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \left[ \frac{\epsilon}{\epsilon + \beta \mathcal{K}_1 \varphi_1^2} \right] + \beta \mathcal{K}_1 \varphi_1^2 \phi_1 \left[ \frac{\epsilon}{\epsilon + \beta \mathcal{K}_1 \varphi_1^2} \right] \right) \tilde{y}_t \\

+ \frac{\phi_1}{\varphi_2} \left[ \frac{\epsilon}{\epsilon + \beta \mathcal{K}_1 \varphi_1^2} \right] \tilde{y}_t \\

(i_t - \pi_{H,t}) = \left[ \frac{\varphi_1 \mathcal{K}_1}{\varphi_2 (\epsilon + \beta \mathcal{K}_1 \varphi_1^2)} \right] (\pi_{H,t} - \pi_T) \\

+ \frac{1}{\varphi_2} \left( \left[ \beta \mathcal{K}_1 \varphi_1^2 \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \right] + \left[ \beta \mathcal{K}_1 \varphi_1^2 \phi_1 \frac{\beta \mathcal{K}_1 \varphi_1^2}{\epsilon \varphi_2} \phi_1 \right] \frac{\phi_1}{\varphi_2} \epsilon \left[ \frac{\epsilon}{\epsilon + \beta \mathcal{K}_1 \varphi_1^2} \right] \right) \tilde{y}_t \\

\]
Macroeconomic Goals and Inflation Targeting in India

\[
(i_t - \pi_{H,t}) = \left[ \frac{\beta \varphi_1 \mathcal{K}_1}{\Phi_2(\delta + \beta \mathcal{K}_1 \varphi_1^2)} \right] (\pi_{H,t} - \pi^T) \\
+ \frac{1}{\Phi_2} \left[ \beta \mathcal{K}_1 \varphi_1^2 \left( \frac{1}{\delta + \beta \mathcal{K}_1 \varphi_1^2} + \phi_1 \right) \right] \tilde{y}_t
\]

\[
(i_t - \pi_{H,t}) = \left[ \frac{\beta \varphi_1 \mathcal{K}_1}{\Phi_2(\delta + \beta \mathcal{K}_1 \varphi_1^2)} \right] (\pi_{H,t} - \pi^T) \\
+ \frac{1}{\Phi_2} \left[ \beta \mathcal{K}_1 \varphi_1^2 \left( \frac{1}{\delta + \beta \mathcal{K}_1 \varphi_1^2} + \phi_1 \right) \right] \tilde{y}_t
\]

(2.2.36)

(2.2.36) is the desired reaction function of the central bank when social planner asks to the monetary authority to assign a weight, \( \delta \), on the output to stabilize it and monetary authority needs to accomplish dual responsibilities of targeting inflation and stabilizing output together in the short run. In the long run inflation tends to its target while output tends to its natural level.

Given that:

\[
\pi_{H,t+2|t} = \pi_{H,t+1|t} + \varphi_1 \tilde{y}_{t+1|t}
\]

\[
\tilde{y}_{t+1|t} = \frac{1}{\varphi_1} \left( \pi_{H,t+2|t} - \pi_{H,t+1|t} \right)
\]

(2.2.37)

Plugging (2.2.37) in (2.2.34)

\[
[\pi_{H,t+2|t} - \pi^T] = - \frac{\delta}{\beta \varphi_1 \mathcal{K}_1} \left[ \frac{1}{\varphi_1} \left( \pi_{H,t+2|t} - \pi_{H,t+1|t} \right) \right]
\]

[114]
Where I have used, \( c = \frac{\beta \kappa_1 \Phi_1^2}{\beta \kappa_1 \Phi_1^2 + \epsilon} \) and \( 0 < c \leq 1 \). Thus, \( t + 2 \) time inflation forecast should equal to a weighted average of the long run inflation target and \( t + 1 \) time inflation forecast. When \( \epsilon = 0 \), \( c = 1 \) then the first order condition collapses to (2.2.11).

Thus, when there is some weight on output stabilization, instead of adjusting \( t + 2 \) time inflation forecast all the way to the inflation target, the central bank should let it return gradually to the long run inflation target. The intuition for this is that always adjusting \( t + 2 \) time inflation forecast all the way to the long run inflation target, regardless of \( t + 1 \) time inflation forecast, requires more output fluctuations. If there is a positive weight on output stabilization, a gradual adjustment of \( t + 2 \) time inflation forecast towards the long run inflation target reduces output fluctuations. Higher the weight on output stabilization, slower would be the adjustment of the inflation forecast.
towards the long run inflation target. Both output and inflation are mean reverting, output towards the natural output level and inflation towards the inflation target.

In summary, some weight on output stabilization motivates a gradual adjustment of $t + 2$ time inflation forecast towards the long run inflation target. The $t + 2$ time inflation forecast is brought closer to the long run inflation target than the predetermined $t + 1$ time inflation target, but not all the way, in order to reduce output variability. Less the weight on output stabilization, the faster would be the adjustment towards long run inflation target.

Thus, a weight on output stabilization makes inflation targeting more complicated but not overly so. The central bank has to explain that the inflation forecast is only gradually adjusted towards the long run target. The outside monitoring of the central bank needs to be somewhat more sophisticated. Inflation targeting remains intuitive and transparent.

6 Conclusion and Policy Recommendation

As monetary policy cannot affect real variables of the economy (viz., output and employment) in long run, except natural level of output/employment, Friedman (1968) and Phelps (1968) but it works well to influence the real variables in short run through sticky prices and rigid wages which explain non neutrality of money. The Indian economy comprises of two sectors, formal and informal. The formal sector shows sluggish prices and rigid wages and imperfections in the markets while informal sector of Indian economy characterizes the complete flexibility in prices and wages and perfections in markets. Thus, Indian economy comprises of Keynesian markets in the formal sector and Classical markets in the informal sector. In this special amalgamation of Keynesian and Classical markets; when central bank conducts monetary policy, the formal sector has a real consequences (fluctuations in real variables) in the short run while informal sector has a nominal consequences (variation in the nominal prices level only). In such an economic environment, where more than 90 per cent of workforce and about 50 per cent of the national product are accounted for by the informal economy, (National Statistical Commission,
Government of India, New Delhi, 2012), performance of the monetary policy is observed very poor in term of output stabilization in short run because of this huge informal sector which has pure Classical markets. Though Indian monetary authority is helpless to stabilize the real variables of the economy in short run but at the same time it got a shiny edge, the informal sector (pure Classical markets) which observes only nominal effects when monetary policy is conducted. To conduct monetary policy, monetary authority varies the instrument rate (of the monetary policy) which in turn makes the money supply to fluctuate then it (monetary policy by fluctuating the money supply) can only affect the general price level and has a very poor influence on output/employment in short run. Summarily, Reserve Bank of India got a pretty good command on price level, ceteris paribus, without affecting the output/employment (tolerable effect on output/employment).

Low and stable inflation (consistency in general price level, price stability) is good for economic growth and development. How to keep the inflation low and stable? Inflation targeting framework has a solution to this issue. The Reserve Bank of India can efficiently control the inflation through managing general price level without making any negative impact on output/employment in short run then India should adopt inflation targeting regime to keep the inflation low and stable, which in turn good for economic growth and development.

If India adopts the inflation targeting regime then the negative impacts of the inflation targeting in short run are much less than that of the positive outcomes, therefore, India should adopt inflation targeting regime.

This conclusion is based on pure theory and may have deviation from reality. This study provides opportunities for further empirical work.

7 References


8 Appendix B

8.1 Proof of Presentation of a Paper in a Conference
8.2 Proof of Acceptance of a Manuscript for Publication

Dear Mr. Girish Kumar Paliwal,

Greetings from UAE Team!

This has reference to your paper titled “A Tale of Two Macroeconomic Issues: Public Spending and Households Preferences”, submitted for considering for the IUP Journal of Applied Economics (IUAЕ).

We are glad to inform you that the review team has recommended your paper for publishing in the IUP Journal of Applied Economics.

We shall keep you duly informed about the issue in which your paper will appear.

With Regards,

[Signature]

Dr. S.V. Sri Rama Rao
Associate Editor
The IUP Publications

Mr. Girish Kumar Paliwal
D-95, Azad Nagar,
Pannadhay Crossroad,
Bhilwara-311 001, Rajasthan (India).

8.2.1 Manuscript