Managing the Expectations and Monetary Policy effectiveness: Role of Inflation Targeting

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Introduction

Effectiveness of monetary policy, to ensure the macroeconomic stability, depends on its capability to anchor the expectations of different markets' players. This requires better understanding of the process through which expectations affect the economy and monetary policy stance affects the expectations. In a modern economy, full of complexities and uncertainties, rational agents take into account all possible unraveling of future economic events while making their decisions (Kryvtsov and Petersen 2013). Due to significant role of expectations in economic decisions, the expectations channel emerged as an effective mechanism to achieve monetary policy objectives. This channel works through following links: any changes in policy rate influence the expectations of different economic agents about the future course of key economic variables. These expectations about future income, interest rate, and inflation rate influence the households' decisions about consumption & saving and firms' decision about making investment & production. Therefore, shaping market expectations through policy signals can effectively be utilized by the central banks for stabilization purpose. As rightly pointed out by Bernanke (2007) that "*A deeper understanding of the determinants and effects of the public's expectations of inflation could have significant practical payoffs*".

The significance of expectations in monetary policy transmission mechanism has been recognized since 1950's [Guler (2016)]. Blinder (1998) maintained that victorious performance of monetary policy is an outcome of effective management of expectations rather than overnight interest rates. Recent literature on monetary policy in advanced economies like Japan and US etc. shows that unconventional monetary policy effects are transmitted mostly through expectation channel.

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Current experiences show that monetary policy has been effective to pull the economy out of recessionary phase even when the interest rate was near its l zero lower bound. The unconventional monetary policy like quantitative easing (QE) was used in many countries which has been effective in stimulating the economy by changing market expectations. Suji (2016) finds that QE in Japan worked mainly through expectations channel during 2000-06 period.

Though the key role of expectations in causing and managing macroeconomic fluctuations is commonly believed conjecture now, but the ability of monetary authority shaping them to ensure stability is not. For effective utilization of expectation channel to stabilize the inflation or economic activities around the set target level requires better understanding of; how expectation are formed; how monetary policy actions influence the expectations; how expectations change the track of the economy; and which policy measures are required to achieve the desired results by managing expectations. In case these understandings are lacking, monetary policy would even have destabilizing impacts on the economy. Bernanke (2007) stated that the state of inflation expectations have great impact on actual inflation and thus the central bank's ability to achieve its goal of price stability. But we are not sure on how to measure inflation expectations and how better we can utilize them to control inflation. Unfortunately, our knowledge on these fronts is less than complete as expectations cannot be observed directly; their evolving process is complex; and may be changing to new developments in economic atmosphere. Bernanke (2007) pointed out that "*Long-run inflation expectations do vary over time. That is, they are not perfectly anchored in real economies; moreover, the extent to which they are anchored can change, depending on economic developments and (more importantly) to the current and past conduct of monetary policy*".

The ultimate impacts of policy actions become most ambiguous through expectations channel as the outcome of the policy changes depends on how different economic agents interpret them, how it affects their expectations, and how they react in response to these changes. In words of Bernanke (2007) "*the policy implications of the much-improved but still imperfect anchoring of inflation expectations are not at all straightforward. To evaluate these implications, we must understand better the historical variation in inflation expectations, the effect of this variation on actual inflation and economic activity, and the relationship between policy actions and the formation of inflation expectations*". So, the same monetary policy action may result into completely opposite economic outcomes if the market expectations differ from whatever policy makers anticipate. For

example, people will increase their consumption/spending provided extra money gives them more confidence otherwise, they will hoard cash.

Another feature observed in the literature is asymmetric response of economy during expansionary and recessionary phases [see for example Neftci's (1984), Potter (1999)]. Álvarez and Hernando (2007) found asymmetric response of Spanish firms to recessionary and expansionary phases. Furthermore, asymmetry in expectations' formation process across the demographic groups also exist as socioeconomic factors play important role in this process [Pfajfar and Santoroz(2008)]. Due to these attributes of expectations generating process, the expansionary and contractionary phases of the business cycles exhibit quite dissimilar features from each other. Evidences show that growth rate falls drastically from the trend with a shorter duration when an economic boom ends. While recovery is gradual and growth rate does not depart much from trend when a slump ends [Nieuwerburgh and Veldkampy (2006)]. Baqaee (2015) observed the existence of asymmetry in formation of households' expectations of inflation during inflationary and disinflationary phase. Recent monetary policy experiences in Japan show that it was much harder to raise inflation expectations as compared to lower them, and it could possibly be true globally. However, New Zealand's experience shows that monetary policy has been successful in raising inflation expectations and hence the households' aggregate consumption. In addition to above mentioned asymmetries, the asymmetries in the relationship between inflation and economic activity also exist [Álvarez et al.(2015)]. The asymmetric characteristics of expectations during booms and recessions and across the demographic groups is a challenge for policy makers to achieve the desired economic targets with given instruments.

In this article, we discuss the best practices used by the central banks to anchor expectations and their application in emerging/developing economies to achieve the monetary policy goals of low inflation and stable economic growth.

2. Inflation targeting: a panacea to anchor expectations

The diffusion of monetary policy effects to ultimate goals, through expectations channel could be quick and pronounced [Guler(2016)]. However, in order to utilize the expectations as an effective tool to achieve desired economic outcomes, the transparency in conduct of monetary policy is an essential element. Transparent monetary policy enhances the credibility of central bank and hence

its ability to anchor the expectations. This also helps reduce uncertainty and increases predictability of monetary policy effects. The systematic part of monetary policy can play decisive role in determining economic outcome through its influence on expectations. The wage and price setting behavior of economic agents depends on their expectations about future course of the economy and can be manipulated through prudent policy actions. However, the real issue before policy makers arises while choosing appropriate policy action to shape up these expectations in the form they are yearning for. Inflation targeting is one of the monetary policy strategies used by many central banks to control the market expectations.

Inflation targeting "to peg the price level to a specific value for a certain period of time (Bernanke & Mishkin, 1997)", is considered best strategy by the monetary authorities to control expectations and enhancing the monetary policy effectiveness. The inflation targeting, it is believed, provides nominal anchor which places the obligation of responsibility and accountability on the central bank. Using the gauge of inflation targeting, the monetary authority can evaluate the performance of monetary policy. It also helps policy makers to guess the development in market expectations and ultimately to influence them as desired by the monetary authority. It enhances credibility of future stabilization policies and increases the effectiveness of monetary policy by managing expectations.

Many central banks have started the use of 'inflation-target' successfully and effectively as nominal anchor. This strategy has the following main features:

• Announcement of a numerical inflation target to be upheld in medium-term.

• Commitment of authority to the long-run goal of price stability.

• Provision/use of required information inclusively regarding policy objectives and strategy.

• Conduct of monetary policy in a more transparent way.

• Credibility of the central bank to achieve the stated objective of monetary policy.

The inflation targeting strategy has many distinctive advantages for example; it allows the monetary authorities to use all the available information while conducting monetary policy; it is

easily understandable; it also takes into account the fluctuations in other goal variables like output and employment.

The New Zealand was the first country which implemented IT in 1989. Since then 29 countries, both industrialized and emerging, have adopted IT framework as monetary policy option. The countries-which adopted inflation targeting strategy-have not only been successful in bringing the inflation rates down significantly, but have also reduced its volatility.

The performance of countries which adopted inflation targeting regime is shown in the Table A below. We divided these countries in four groups depending upon the period they adopted IT as monetary policy option. We compare their performance before and after the IT was implemented[2]. The comparison is based on the GDP growth an inflation rate before and after the adoption of IT regime. It can be seen that inflation rate as well as its volatility have reduced significantly in all of the four groups after implementation of IT framework. The inflation rate dropped from 18.4 percent to 2.2 percent on average in first group. While volatility reduced to 1.6 percent from 16.6 percent. The inflation rate falls to 4.9 from 181, to 7.2 from 34.9,to 4.2 from 7.4 percent respectively in second, third, and fourth group. The GDP growth on average also improved slightly while its volatility reduced for all groups except group 4 which adopted IT regime during the crises period (2009-2014). However, the IT does not assure improvement in GDP growth as growth rate has been declined in few countries after the implementation of IT[3]. Some studies even criticize the IT on the basis of its over reliance on achieving inflation target and hence creating stability biases. This may result into lower economic growth (Cecchetti and Ehrmann 1999). Though few researchers opined that there is no correlation between IT and output growth (Ball and Sheridan 2003). Some go even further by saying that IT helps reduce output gap and volatility in output growth in developing counties (Batini and Laxton 2006).

Table A: Performance of Countries

		IT Countries								NIT Countries
Indicator	statistics	G1(1989-1997)		G2(1998-2002)		G3(2005-2007)		G4(2009-2014)		-
		Before	After	Before	After	Before	After	Before	After	-

[2] The GDP growth and inflation is average of equal periods before and after the adoption of IT.
[3] See appendix A.

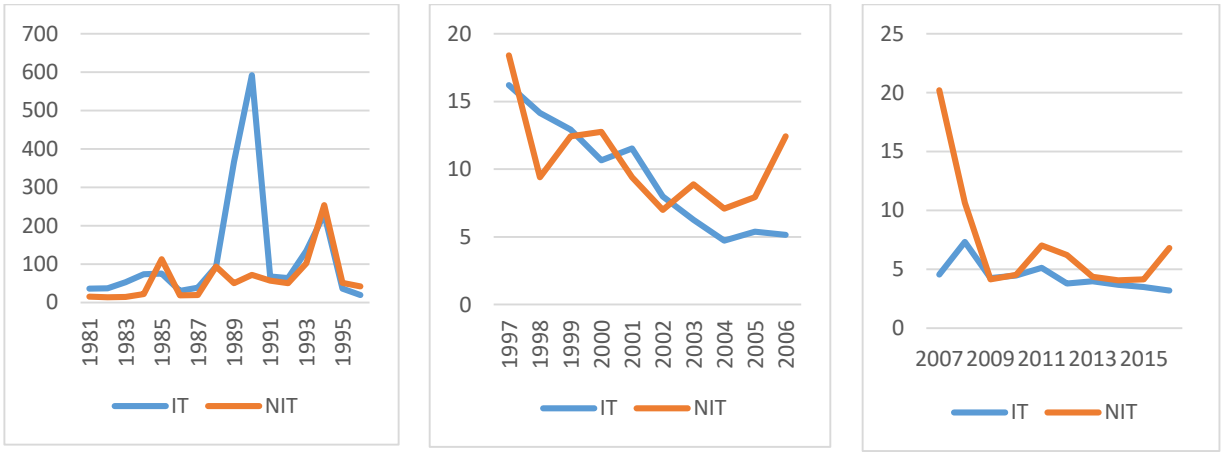
GDP	Growth	2.6	2.7	3.0	3.5	4.5	4.7	3.6	1.3	3.7
	Std.	2.7	2.0	3.5	2.1	4.4	3.6	2.7	1.7	4.9
INF	Rate	18.4	2.2	181.0	4.9	34.9	7.2	7.4	4.2	5.4
	Std.	16.6	1.6	344.0	2.7	32.2	2.8	7.3	2.7	4.9

Data source: World Development indicator

The lack of consensus among the economists on IT-Growth relationship raises the doubts about the claim that low and stable inflation enhances the economic growth in the long run. This may be true as IT requires higher interest rate which hinder investment and ultimately economic growth.

There is disagreement among the economists even on the notion that the low inflation in these economies is a result of implementation of IT strategy. Instead they relate this decline to overall low inflation worldwide. Figure 1 presents the comparison of inflation between targeters and non targeters. It can be seen that inflation remained low after mid 90s in both groups except 2007-08 crisis period.

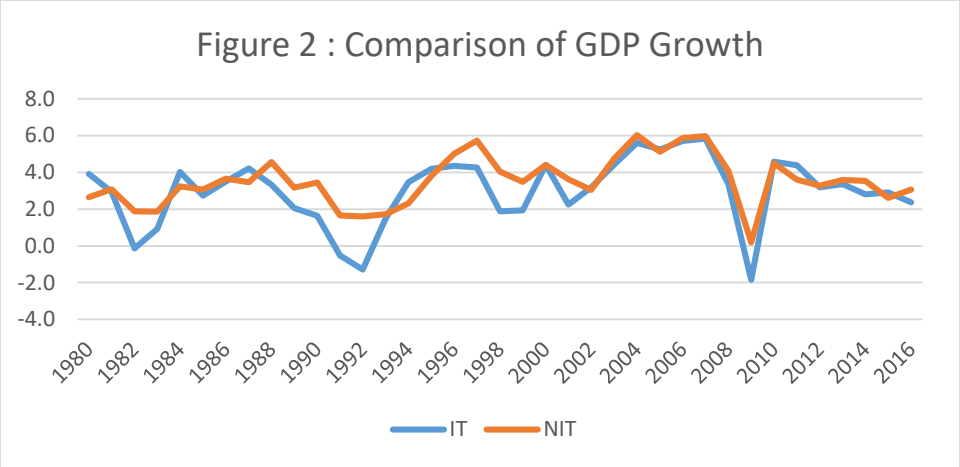
Table 1: Comparison of Inflation between IT and Non-IT Countries



Data source: World Development indicator

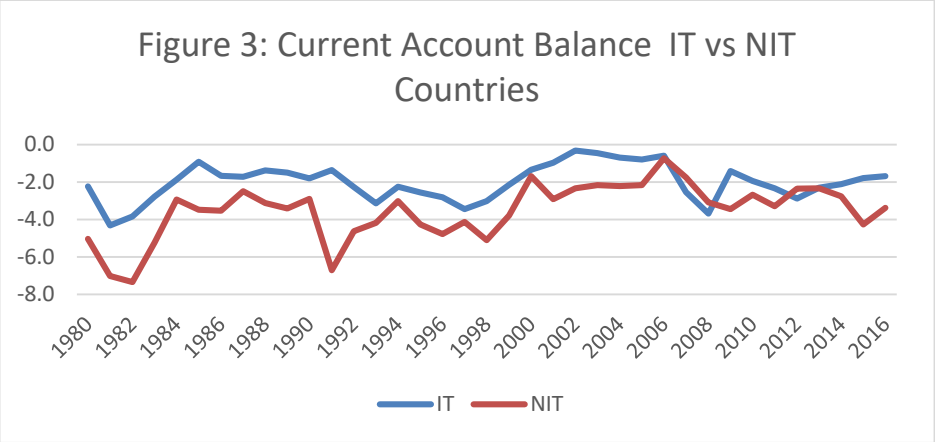
The comparison of output growth between targeters and non targeters (see Figure 2 below) shows that growth rate for non targeters was slightly higher during the same period (after mid 90s). The recessionary impacts of the recent crises were also larger for IT countries as compared to NIT countries.

These results show that IT framework is hardly advantageous over any other monetary policy set up implemented by Non-IT countries.



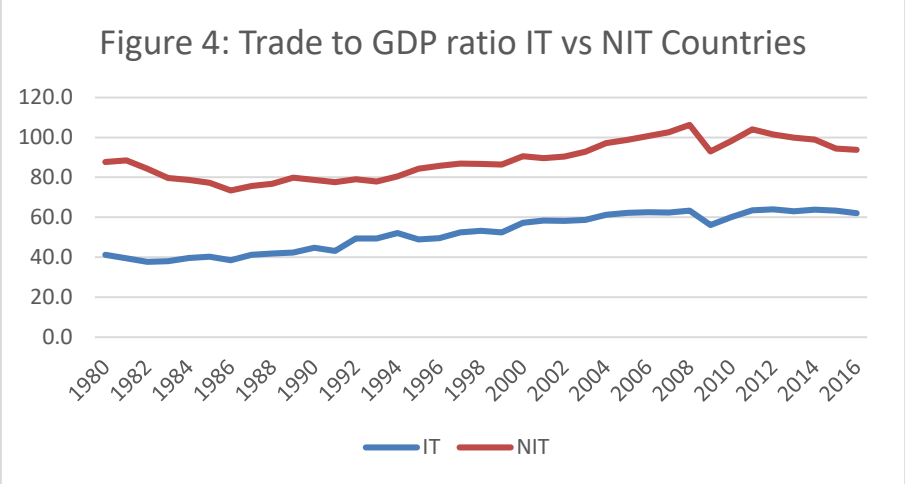
Data source: World Development indicator

Another important consideration from monetary policy prospective is to keep balance in external accounts. As external imbalances are considered potential threats to economic as well as financial stability in the country (Bonga, 2019). Mundell (1962) emphasized the role of monetary policy in correcting the external imbalances. Duarte and Schnabl (2015) finds that monetary policy rather the exchange rate is main determinant of current account balance in East Asia and oil-exporting countries. Figure 3 provides a comparison of current account position of inflation targeting versus other countries. Though current accounts are in deficit for both types on average, these are much more severe in case of non-inflation targeting countries. Both types have shown improvements in current account deficits, however, it is more pronounced in case of the non-inflation targeting countries in recent periods. So again the IT framework does not offer any advantage over other alternatives practiced by non-inflation targeting countries on improving the external position. It even performs poorly on these fronts despite the fact that inflation targeting group is less open as compared to other group.



Data source: World Development indicator

Figure 4 shows that trade-to-GDP ratio on average is lower (40-64%) for tageters as compared to non-targeters (75-108%).



Data source: World Development indicator

3. Developing/Emerging Economies:

Though inflation targeting framework demonstrates advantage of managing inflation rate in advanced economies, will it suit developing economies equally? The problems related to fiscal, financial and, monetary institutions are much more severe in developing economies and this makes the application of inflation targeting more challenging in such an environment. Thus, the issue of economic and institutional preconditions necessary for the successful implementation of inflation targeting becomes extremely relevant. A careful analysis of the existing state of affairs in these

economies- before putting inflation target into practice -is required so that the policy can be suitably amended according to the existing institutional characteristics of the economy.

Most of the countries in IT group are either from high income or from upper middle-income countries. Only few lower middle-income countries have joined the group recently. None from the low-income countries implemented IT strategy so far. The main features of the advanced economies joining the IT group as highlighted by Masson et al.(1997) were; a) high flexibility of exchange rate; b) a measure of central bank independence; c) forward looking inflation target; d) the IT was used as tool for policy credibility; e) IT was introduced at time of fairly low inflation[4]. As far as developing economies are concerned, their features are not only different from advanced economies but are also heterogeneous. The inflation rate is high and volatile in these developing economies. Most important challenge faced by these economies is the dominant role of supply shocks in economic fluctuations.

Furthermore, these developing economies heavily depend on revenues from seigniorage due to poor tax collection procedures and skewed income distribution. This is perhaps the most important reason for fiscal dominance in these countries. Besides this, shallow and under developed financial market in these countries is another cause of fiscal dominance.

The other main challenge of these economies is their vulnerable external position. The developing/emerging economies are more prone to external shocks as compared to industrialized economies. This is because these economies depend heavily on imports and especially on imported machinery and inputs. Their exports consist of mainly low-tech products and primary goods. They face severe current account deficit problems. Their position on exchange rate is more like between the devil and deep sea. The literature asserts that flexible, market-determined exchange rate is a precondition for IT framework to be successful policy option. As discussed above the developing countries heavily depend on imports, therefore, they cannot afford fully flexible exchange rate regime. The flexibility of exchange rate will not only create volatility in exchange rate but also reduce their credibility, a necessary element for anchoring expectations. Because more volatility in exchange rate translates into volatile inflation which lessens capability of monetary policy to anchor expectations. Though some researchers claim that IT can be implemented with managed

[4] See appendix C for detail.

exchange rate regime[5]. The Israel is one such example where central bank has used both exchange rate and inflation targets in monetary policy formulation for many years. However, the Bank of Israel has faced tradeoff between easing monetary policy stance to arrest the exchange rate appreciation due to capital inflows or maintaining level of interest rate consistent with inflation target (Masson et al.1997). This shows that the exchange rate management is not an easy task in developing countries with volatile inflows and limited stock of foreign reserves.

Furthermore, a significant part of developing economies consists of informal sector. The dynamics of expectations formation in informal sector may be totally different from the formal sector and are less known. The conduct of monetary policy in such a situation becomes more difficult. The presence of informal economy reduces forecasting capability of central bank, a compulsory element for IT framework. This not only reduces the coverage of monetary policy effects but also lowers the government revenues from the conventional sources. This in turn reduces the incentives of implementing IT framework to bound inflation rate at lower level as it is a main source of financing in these countries. Fiscal constraints in these countries with poor governance and leakages hinder the central bank autonomy and its credibility to fulfil its promise of keeping inflation low and stable.

Other potential challenges in implementation of IT framework in developing economies are; identification of optimal inflation level; the speed at which the medium term inflation target ought to be attained; which of the price indices is the best candidate to be targeted; and the role of administered /controlled prices prevalent in these economies.

In the light of above issues, it is hard to assume that inflation target would take any primacy over other monetary objectives in developing countries. Furthermore, one cannot expect much benefits from adoption of IT framework in such circumstances as discussed above.

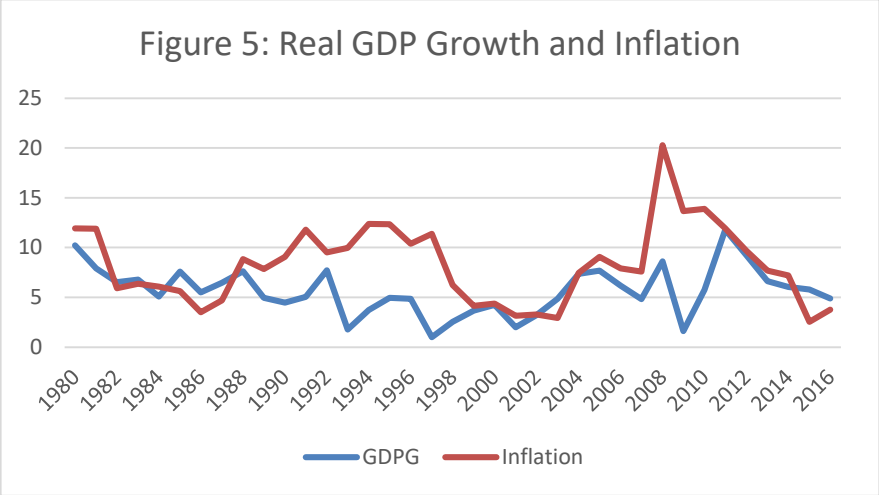
4. Is Pakistan ready for IT?

The State Bank of Pakistan, the central bank, is planning to adapt inflation targeting framework by 2020. In this section, we will provide some facts about the Pakistan economy and its comparison with IT countries as well as the suitability of IT for Pakistan in given scenario.

[5] See for example Airaudo et al. 2016.

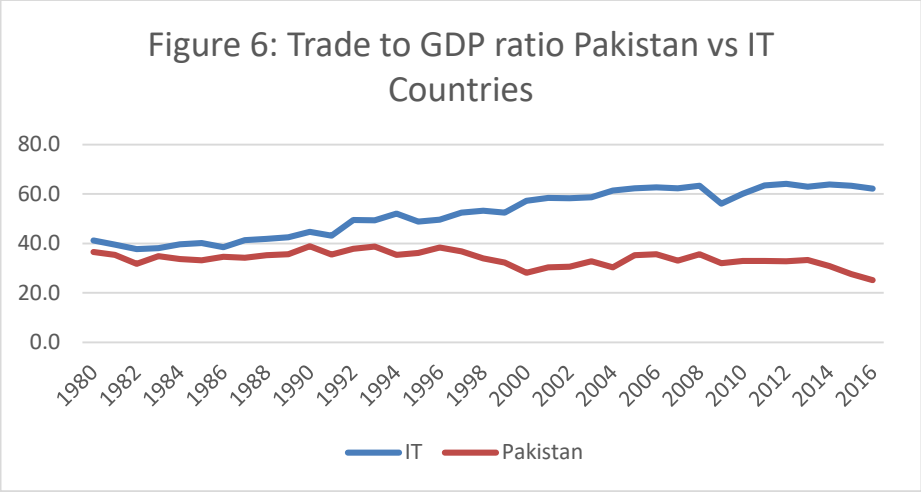
Monetary policy in Pakistan has witnessed different policy regimes - from controlled to market oriented one. Like other developing economies, Pakistan is small open economy vulnerable to internal as well as to external shocks. The economic growth and inflation rate have been more volatile in Pakistan as compared to IT countries. Similarly, it also faces challenges on external fronts specially the persistent and significant balance of payment problem.

Figure 5 shows the real GDP growth and inflation rate during 1991-2017. The average GDP growth rate during this period was 4.5 percent while average inflation rate was 8.5 percent per annum. However, the GDP growth and inflation show opposite trends. During the episodes with growth higher than average, inflation remained below the average and vice versa. This indicates that supply side plays dominant role in case of Pakistan.



Data source: World Development indicator

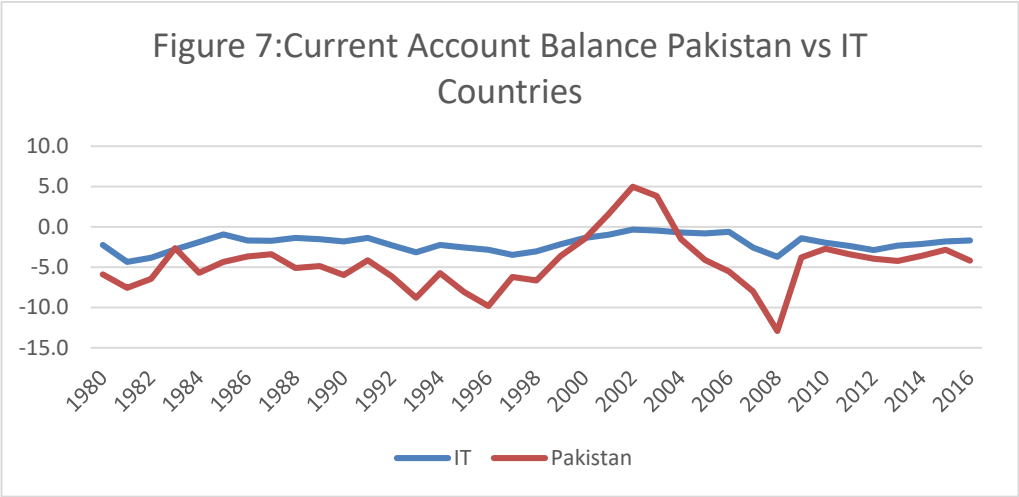
Figure 6 shows the trade to GDP ratio for Pakistan. The average ratio during 1991-2017 was 33 percent, but with a downward trend. This decreasing trend is mainly due to fall in exports. Trade to GDP ratio for Pakistan is well below average of other countries and much lower than IT countries.



Data source: World Development indicator

Figure 7 shows that Pakistan's current account is persistently in deficit except 2001-03. Despite the fact that Pakistan is less open as compared to IT countries on average, its current account deficit is not only higher but also much more volatile. This is mainly due to falling country's exports to rest of the world. This shows the vulnerability of the country to external shocks. As mentioned in the previous section the inflation targeting does not have any superiority over other alternatives in improving the current account position as well as the trade balance. Therefore, it would be better for Pakistan to first minimize its external risks and then go for IT implementation. This will increase capability of central bank and hence its credibility- essential component for IT to be effective.

Like other developing economies, Pakistan is small open economy and depends heavily on imported machinery and oil. Due to severe balance of payment problem, exchange rate has been under pressure and Pakistan is pursuing managed floating exchange rate policy. As exchange rate, depreciation is less likely to improve the trade balance due to less elastic imports/export demand. Furthermore, the foreign liabilities of the countries make fully flexible exchange rate even less beneficial. On the other hand, the exchange rate would be more volatile in case fully flexible exchange rate regime is adopted. This will reduce credibility of Sate Bank of Pakistan, because more volatility in exchange rate results into volatile inflation, which lessens capability of monetary policy to anchor expectations. Since flexible exchange rate is a prerequisite for IT but exchange rate stability is, at the same time, also important to keep inflation low and stable. So, the exchange rate would be a big challenge before Sate Bank of Pakistan while implementing the IT framework.



Data source: World Development indicator

Another problem faced by Pakistan economy is low tax to GDP ratio due to weak tax collection system, low tax base and loopholes that encourage the tax avoidance/escape. Tax revenues in Pakistan remained as low as 11 percent of GDP, on average, between 2010 and 2018. Even larger parts of tax revenues are collected through indirect taxes. Due to larger gap between government revenues and expenditures, almost 6.5 percent of GDP during 2010-2018, country has accumulated huge debt both internally and externally. Total debt of Pakistan has crossed the limit of 73 percent of total national income in FY2018.

Finally yet importantly, a significant part of the economy consists of informal sector. According to studies estimating the size of informal sector in Pakistan, the informal sector contribution in total national income is between 30 to 40 percent[6]. Existence of this significant informal part is not only a challenge for implementation of IT framework but also the effectiveness of monetary policy in effect.

In the light of above discussion, the main steps required before implementation of IT framework in Pakistan are:

- To find out the range for inflation rate consistent with sustainable economic growth rate[7].

[6] See for example Arby et al. (2010).

[7] Studies show that threshold level of inflation for developing countries is 11 to 18 %(Khan and Abdelhak, 2001 Pollin and Zhu,2006, Sepehri and Moshiri,2004)

- The suitable inflation measure to be targeted.
- Assessment of policy lags and setting target horizon.
- Increase forecasting/modeling capability of key economic indicators.
- Fiscal discipline and compatibility of different economic policies.
- Improvement in external balances.
- Documentation of economy and improving the quality of statistics important from policymaking point of view.
- Strengthen financial system.

5. Other Alternatives: Nominal GDP Targeting

After the recession that occurred in 2008-9, some economists and policy experts started criticizing inflation targeting due to inadequate response by some IT central banks to slump because of the fear of increased inflation. They argued that these central banks failed to provide sufficient monetary stimulus in late 2008 that resulted into larger decline in nominal spending. They believe that nominal GDP targeting could have reduced the severity of recession to maximum extent without any fiscal stimulus.

Some of the arguments in favor of using nominal GDP targeting as an alternative to inflation targeting are: a) it allows to directly target output fluctuations b) it is less volatile aggregate than the consumer price index c) it accommodates beneficial supply shocks d) it provides stronger responses in bad times, and is a more efficient rule when supply responses are limited or structural reform is needed.

Analogous to inflation targeting, a nominal GDP targeting central bank strives to hit a certain level of nominal GDP or its growth rate. The main idea behind this concept is that it can help to stabilize output fluctuations. The nominal GDP (NGDP) targeting is considered as an alternative monetary policy strategy for emerging/developing economies with dominant role of supply shocks in shaping economic and inflation dynamics. Meade (1978) and Tobin (1980) were among the earliest advocates of nominal GDP targeting. The background for search an alternative policy strategy was monetary credibility with a desire of lower inflation rates.

The consideration of inflation and nominal GDP targeting as policy options was result of problems associated with monetary targeting then practiced in most of the countries. The Inflation Targeting was adopted by many advanced economies and spreads to many emerging market countries as monetary policy framework. The concept of nominal GDP targeting, however, was on the backburner for several decades and was not adopted anywhere.

As discussed earlier, it was believed that IT has contributed much in bringing inflation down and providing a reliable anchor to expectations. However, after the Global Financial Crisis that provoked in 2008-09, the possible shortcomings of IT were revealed. Some of these include; its narrow focus; ignoring the asset market bubbles, missing announced inflation targets, and mistaken tightening in response to supply shocks such as the mid-2008 oil price spike [Bhandari and Frankel (2015)].

After the recognition of these weaknesses associated with IT, the interest in NGDP targeting revived. Many advanced economies such as the US, UK, and Japan, facing the issue of 'zero lower bound', started to consider NGDP targeting as an alternative monetary policy framework. In developing/emerging economies, this policy option is still out of focus.

As discussed earlier the developing/emerging economies have different economic dynamics than the advanced economies as far as the conduct of monetary policy is concerned. It is observed that IT central banks in emerging market countries are more likely to miss announced inflation targets than the their advanced counterparts [Fraga et. all (2003)]. Therefore, the central banks of these economies need more credible anchor. This intensifies the need to choose a nominal target that is less likely to be missed repeatedly.

Furthermore, being price takers in the world markets, the developing/emerging economies tend to be more exposed to trade shocks. These are also more prone to supply shocks due to high share of agriculture sector in GDP. Besides, these also suffer from political instability and productivity changes.

Therefore, while making the best choice of target variable it is imperative to keep in mind the type of shock to which the country is susceptible [Bhandari and Frankel (2015)]. If supply shocks have leading role, it is argued that NGDP targeting would be the preferred prescription. As it takes into account both inflation and GDP growth, so the loss in terms of GDP would be smaller due to

adequate policy response in case of adverse supply shocks. The advocates of nominal GDP targeting argued that this framework would distribute the impacts of supply shock between inflation and real GDP growth. For example, under inflation targeting the central bank would loose monetary stance in response to a positive supply shock. This could create bubbles in asset market, however, opposite would happen under NGDPT. Thus, NGDPT can possibly avoid asset price bubbles or at least mitigate them. Furthermore, this strategy would also work well in case of negative external shock say term of trade shock. Suppose, oil price increases or export price falls, the currency depreciates under NGDPT. The trade balance as well as GDP growth will improve which would not be possible under IT framework due to fear of increased inflation.

Despite the advantages discussed above, there are some challenges associated with NGDPT. For example, how to make the concept better understandable to general public. The data on nominal GDP is not available frequently. The problem of how to forecast the nominal GDP as policy makers look at future expectations rather than at current value of the target variable and accordingly make policy adjustment. The other technical issues like choosing growth rate or level of nominal GDP and use of lagged adjustment or forecast adjustment, to make policy decisions, are unresolved.

5. Conclusion

The role of expectations channel in transmission of monetary policy effects to ultimate goals is now well recognized. However, the effective utilization of expectation channel to stabilize the inflation or economic activities around the set target level requires better understanding of process through which expectations are generated. As the outcome of the policy changes depends on how different economic agents interpret policy changes. One major issue is that expectations cannot be observed directly and measured quantitatively. Therefore, it is hard to investigate empirically the impact of monetary policy changes on expectations and finally on policy goals through this channel. The tools of behavioral economics may be useful in understanding the formation process of expectations, their economic outcomes, and appropriate policy measures to make them an effective policy instrument.

Inflation targeting has been used by many central banks around the clock to manage the expectations of main players in the economy. However, the experts are divided on whether IT

strategy has any advantage over other policy alternatives in effect. For a developing country like Pakistan, it would be even more challenging to implement IT. It seems IT suites only after a threshold level of per capita income is achieved. As low economic growth can be a bigger concern than high inflation in the developing countries[8]. Furthermore, supply shocks are dominant (due to high dependence on agriculture and imported energy) in most developing countries and these may result into simultaneous decline in growth and rise in inflation and vice versa. In this context nominal GDP targeting or flexible IT with a wider range might be a better option as credibility is earned over time. As Blinder(1998) stated " *In the real world, such credibility is not normally created by incentive-compatible compensation schemes nor by rigid pre commitment. Rather it is painstakingly built up by a history of matching deeds to words. A central bank that consistently does what it says will acquire credibility by this definition almost regardless of the institutional structure*".

[8] Some argued that IT may hurt economic growth (see Epstein, 2008 and Galindo and Ros, 2008)

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Appendix A: Average GDP Growth and its Slandered Deviation before and after the adoption of IT					
S. No.	Country	GDPG%(average)		STD	
		Before IT	After IT	Before IT	After IT
1	New Zealand	2.1	2.6	1.7	1.9
2	Canada	3.7	2.3	2.2	1.9
3	United Kingdom	2.6	2.1	2.5	1.7
4	Sweden	2.1	2.5	1.9	2.5
5	Australia	3.3	3.3	2.2	0.9
6	Israel	4.6	3.6	2.4	2.0
7	Czech Republic	0.2	2.4	6.3	2.9
8	Poland	3.4	3.7	4.9	1.6
9	Brazil	2.2	2.4	3.6	3.0
10	Chile	5.0	3.8	5.3	2.4
11	Colombia	3.5	3.7	1.7	2.5
12	South Africa	1.5	3.0	2.3	1.9
13	Mexico	3.0	2.2	3.4	2.5
14	Norway	3.2	1.6	1.6	1.3
15	Peru	1.6	5.6	6.7	2.3
16	Philippines	3.5	5.4	2.3	1.7
17	Guatemala	3.7	3.7	0.9	1.4
18	Indonesia	3.8	5.6	5.7	0.6
19	Romania	1.0	3.0	6.2	4.3
20	Armenia	8.5	4.0	7.4	7.4
21	Turkey	4.8	5.1	5.1	4.3
22	Ghana	4.9	6.8	0.9	3.4
23	Georgia	7.6	3.7	3.5	3.4
24	Serbia	5.9	0.3	1.5	2.1
25	United States	0.9	2.1	2.5	0.6
26	Japan	0.0	1.1	4.0	0.7
27	Russian Federation	3.6	-0.8	2.0	1.8

Appendix B: Average Inflation Rate and its Slandered Deviation before and after the adoption of IT					
S. No.	Country	INF (average)		STD	
		Before IT	After IT	Before IT	After IT
1	New Zealand	12.6	2.3	4.1	1.5
2	Canada	6.2	1.9	3.0	1.0
3	United Kingdom	6.6	2.1	1.2	1.1
4	Sweden	7.9	1.3	2.9	1.3
5	Australia	8.2	2.5	3.7	1.2
6	Israel	77.6	2.4	100.8	2.5
7	Czech Republic	9.3	2.9	0.6	2.8
8	Poland	64.8	3.4	124.2	3.4
9	Brazil	645.5	6.7	873.0	2.5

10	Chile	16.3	9.8	7.5	8.5
11	Colombia	23.3	5.5	4.1	2.4
12	South Africa	11.8	5.8	3.9	2.2
13	Mexico	39.0	4.2	38.6	0.9
14	Norway	3.8	2.0	2.2	1.0
15	Peru	815.7	3.0	2038.4	1.1
16	Philippines	8.8	4.0	4.2	1.9
17	Guatemala	8.1	5.3	2.2	2.8
18	Indonesia	13.4	6.8	14.8	2.8
19	Romania	92.5	4.3	86.9	3.3
20	Armenia	21.2	4.5	51.7	3.0
21	Turkey	54.9	8.3	29.4	1.3
22	Ghana	19.3	13.7	8.0	3.9
23	Georgia	6.7	3.1	3.1	3.4
24	Serbia	22.8	5.6	29.5	3.7
25	United States	1.6	1.3	1.5	0.7
26	Japan	-0.6	0.9	0.6	1.3
27	Russian Federation	6.8	10.1	1.7	4.7

Appendix C: Inflation Rate at the time when IT was adopted

S. No.	Country	Year adopted IT	Inflation Rate	S. No.	Country	Year adopted IT	Inflation Rate
1	New Zealand	1989	5.7	15	Peru	2002	0.2
2	Canada	1991	5.6	16	Philippines	2002	2.7
3	United Kingdom	1992	4.3	17	Guatemala	2005	9.1
4	Sweden	1993	4.6	18	Indonesia	2005	10.5
5	Australia	1993	1.8	19	Romania	2005	9.0
6	Israel	1997	9.0	20	Armenia	2006	2.9
7	Czech Republic	1997	8.5	21	Turkey	2006	9.6
8	Poland	1998	5.5	22	Ghana	2007	10.7
9	Brazil	1999	4.9	23	Georgia	2009	1.7
10	Chile	1999[1]	3.3	24	Serbia	2009	8.1
11	Colombia	1999	10.9	25	United States	2012	4.3
12	South Africa	2000	5.3	26	Japan	2013	0.3
13	Mexico	2001	6.4	27	Russian Federation	2014	7.8
14	Norway	2001	3.0				