Fiscal Prerequisites for Inflation Targeting

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Abstract

Inflation targeting has been gaining significant attention of policy makers during last thirty years, so far 38 countries have adopted inflation targeting regime to conduct their monetary policy operations. Successful implementation of this framework requires some prerequisites, the most important one is independence of central bank and non-observance of fiscal dominance. The paper analyzed whether inflation targeting regime is associated with lower fiscal deficit or debt levels, it has been identified that from the sample of 38 countries, 22 have reduced their deficit and 16 have lowered their debt level after adopting inflation targeting regime. The study also attempted to find the level of fiscal deficit that should be adhere by fiscal authorities before adopting inflation targeting regime. The system dynamic panel approach has been employed using panel data set of inflation targeted countries for the period ranged from 2000 till 2017. Based on the methodology developed by Catao and Terrones (2005), the study estimated the elasticity of inflation with respect to fiscal deficit to M1 ratio and used this elasticity to compute the level of fiscal deficit to M1 ratio for Pakistan's economy.

1. Introduction

During last 30 years, growing number of industrial and emerging countries have adopted inflation targeting as a prime objective of their monetary policy. Focusing on the major goal of price stability, central banks are committed to achieve a target level of inflation in a certain time frame. In the inflation targeting framework, the authorities are required to decide the desirable range or numeric point of inflation and publicize it as a target for the future course of monetary policy actions. Inflation targeting regime refrains monetary and fiscal authorities to target other anchors such as unemployment, wages, and exchange rate.

Similar to other frameworks, economic literature defines certain pre-conditions, countries should implement before adopting inflation targeting regime. Carare et al., (2002) purposed initial conditions and clubbed them in four broad groups 1) central bank autonomy and accountability 2) supremacy of monetary policy over fiscal policy 3) sound and stable financial sector and 4) appropriate policy instruments to support inflation targeting[1]. The study emphasized most on role of central bank's autonomy in defining its policy instruments and enhancing the transmission mechanism in the economy.

Generally, central bank is considered as autonomous / independent if it has freedom to conduct monetary policy operations without direct or indirect influence from government (Walsh 2005). A broader definition of central bank autonomy has been discussed in IMF (2004), the study came up with four broad categories of central bank autonomy 1) goal autonomy which commend the central bank to determine its primary objectives for instance price stability, employment, exchange rate or any combination of these objectives 2) target autonomy aims at achieving a clearly defined primary object backed by the law, 3) instrument autonomy focuses on central bank autonomy in implementing the monetary policy targets through instruments of its own discretion however the target is decided by the government. 4) limited autonomy, in which central bank acts as a government agency and implement the government determined policies.

As in the inflation targeting regime, central banks need to have a clear mandate of pursuing the framework and independence in selection of appropriate instruments for policy actions; the authorities should focus on attainment of autonomy that full fill the objectives of target autonomy and instrument autonomy for the central bank.

[1] A brief description of different conditions in each group has been given in table 1a in Appendix A.

In addition to an independent central bank, literature builds emphasis over strong fiscal position, which minimizes the chance of fiscal dominance in an inflation targeting economy. Literature has highlighted the importance of strong fiscal position for the successful implementation of IT framework. These studies stressed that conducive and sustainable fiscal environment characterized by low level of fiscal deficits and sustainable burden of debt might support the monetary policy to accomplish its target of reasonable inflation. Calvo (2017) suggested, if the monetary policy is closely associated with fiscal discipline, central banks usually adjust policy instruments to meet the fiscal needs, in such cases, inflation cannot be adjusted in association with stabilization program.

Large fiscal deficits and unsustainable debt burden may fuel inflation by heavy government borrowing and reliance on central bank revenues (seigniorage). According to Sargent and Wallace (1981), if the fiscal policy is targeting revenues that must be finance through bond sale and seignorage, monetary authority has to meet the difference between bond revenues and fiscal deficits through seignorage. In this case, if selling of government bonds is not sufficient to fulfill the requirement of budget deficit, monetary authority is forced to create money which ultimately creates inflationary pressures. Eventually, monetary policy becomes less effective in controlling inflation.

In second case, when the interest rate on government bonds is higher than rate of growth in real economy, real stock of bonds will be growing faster than the economic growth rate. In this scenario, if the central bank tries to contain inflation with restricted base money growth, the deficit financing must be met through issuance of bonds. But deficit financing via bonds may not continue so long; at last limit reaches when the central bank must finance principal and interest expenses on already sold stocks of bond. If no room is available from fiscal space, seignorage revenues would be the only available resource to fund repayments on outstanding stocks of government bond.

Aris and Siegel (1986) explained that deficit monetization i.e., creation of money at a rate in excess of growth in goods and services or real output, may exploit inflation as an incentive in two scenarios; 1) if fiscal deficit is growing faster than GNP and debt accumulates, private sector would not purchase additional debt at prevailing rates, in return central bank must raise the real interest rates on government bonds. However, to counter the negative impact of higher interest rates on investment activity and overall economic growth, central bank may temperate the rise in real interest rate by increasing the growth rate of money supply which ultimately induce the inflation. 2) The government can reduce the real burden of its debt via causing inflation; in this scenario, government finance its interest expanses with taxes, higher

debt payment leads to higher tax incidence. The temptation to lower the real burden of debt through monetization may lead to continuous acceleration of inflation. Hence the motivation for engineering inflation in the system should be weigh against costs associated with elevated level of prices for the whole economy.

Catao and Terrones (2005) model inflation as non-linearly related to fiscal deficits through the inflation tax base and estimate this relationship as intrinsically dynamic, using panel techniques for 107 countries over1960–2001 they found a strong positive association between deficits and inflation among high-inflation and developing country groups.

Given the serious repercussion of weak fiscal position on inflation specially in developing economies, any attempt to adopt inflation targeting regime should be based on the fact that whether the country monetizes rapidly growing debt or not. Before adopting inflation targeting framework, the country should devise a threshold level of deficit, given the targeted level of inflation for medium or long-term period.

The objective of this paper is to analyze the identify the threshold level of deficit for Pakistan, since the country is in a phase of adopting inflation targeting regime. Currently the economy is facing high deficit ratio as percent of GDP, most of the time deficit has been financed with central bank borrowing which ultimately creates inflationary pressures. A threshold level of fiscal deficit might assist authorities to adhere a certain limit beyond which inflationary pressure will be generated.

The study attempted to employ the model developed by Catao and Terrones (2005) and calculated the elasticity of inflation with respect to fiscal deficit by using panel data set of 35 countries already adopted the inflation targeting regime. The computed elasticity has been used in back of the envelope approach to find out the level of fiscal deficit for different conventional levels of inflation targets for instance at 2%, 3%, 4% etc.

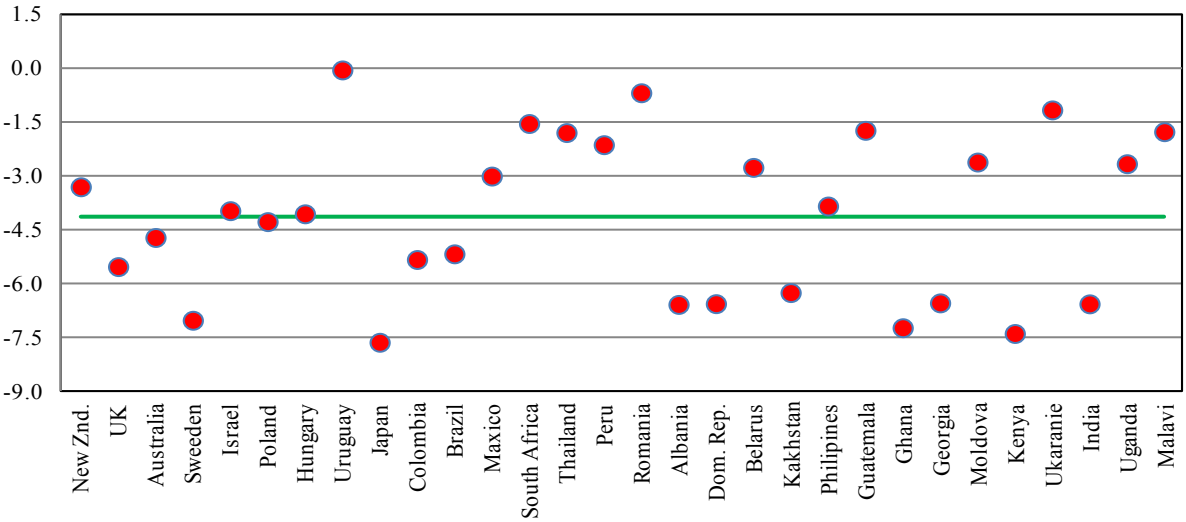
The rest of the paper will organize as follows. Section 2 will discuss in detail the cross-country comparison of fiscal deficit and debt level of countries before and after adopting inflation targeting regime, the section will also present current state of Pakistan's fiscal account; section 3 will cover the model and data discussion; results be given in section 4; conclusion and recommendation will be presented in section 5.

2. Fiscal soundness in inflation targeting countries and current state of Pakistan's fiscal account

So far 38 countries have adopted inflation targeting framework. The tables 2a and 2b illustrate fiscal balances and debt to GDP ratio before and after adoption of inflation targeting regime for almost of all of the inflation targeting countries except for those having missing data vales. These tables include 12 high income countries, 12 high middle income, 9 low middle income and 2 low income countries.

A closer look at fiscal balance as percent of GDP indicates all the countries adopted inflation targeting regime maintained a lower bound of fiscal deficit which is well below 10 percent of GDP **(Figure 1**). The table 1a gives the more detailed description of fiscal position of different countries before and after IT regime for different averages of 3 years period and five years period and had grouped the countries according to their per capita income. According to the given statistics we can draw different inferences for instance 1) except Uruguay and Japan; all the countries grouped in high income category have successfully improved their fiscal positions after implementing IT framework. 2) 6 out of 12 upper middle-income countries experienced a decline in fiscal deficit as percent of GDP after acquiring IT targets. 3) 6 out of nine lower middle-income countries had reduced their fiscal deficits in proportion to GDP after fixing inflation targets. The comparison of latest figures with statistics of adoption year suggests that out of 35 in- sample countries, 22 countries have successfully improved their fiscal position irrespective of their level of fiscal deficit to GDP before fixing the inflation targets.

Figure 1: Fiscal Balance as Percent of GDP in year of IT Adoption



Similar analyses can also be made on debt positions of the inflation targeting countries. The table 1b gives the detailed description of debt position of different countries before and after IT regime for different

averages of 3 years period and five years period. The table 1b reflects that excluding Japan average debt to GDP ratio for inflation targeting countries hovered around 45 percent in the year of execution of IT regime. 16 out of 35 countries remained successful in lowering their debt to GDP ratio prior to implement IT regime. In most of these countries, debt burden actually increased after putting IT regime in practice. The scenario prevails irrespective to their income group; the table 1b suggests that only 4 high income, 2 upper middle income, 2 low middle income and 1 lower income countries from the sample of 35 countries could reduce their burden of debt after implementation of inflation targeting.

Successful implementation of IT regime requires prudent fiscal policy as discussed above, the average fiscal balance and debt to GDP ratio of countries before adoption of IT regime provide crude bench mark showing tolerable fiscal imbalances for a particular economy. However, these bench marks could not present a precise standard for fiscal targets. The sustainability of these fiscal imbalances may vary from country to country and depends on the current economic conditions for a particular economy.

In Pakistan, fiscal imbalances remained serious concern for the economy. The fiscal indicators like debt to GDP ratio and revenue deficits had often created difficulties in managing scarce financial sources. The country has a long history of creating debt and exceeding expenditures above than given revenues which ultimately lead to domestic and external financing of domestic debt. The debt to GDP ratio of the country experienced different episodes of very fast growth like in 1972 it rose by 90.6 percent, in 1982 by 32.7 percent and more recently in 2008 by 26.6 percent. The higher level of debt growth is also reflected in debt to GDP ratio as given in figure 2.

Table 1a: Fiscal Balance as Percent of GDP

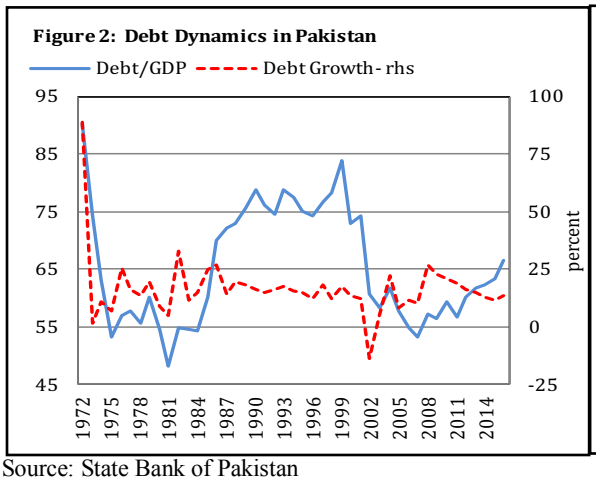
Countries	Year of adoption	In year of adoption	Before adopting IT		After adopting IT		Latest position
			3-yeasr Avg.	5-years Avg.	3-yeasr Avg.	5-years Avg.	
High Income Countries							
New Zealand	1989	-3.30	-3.47	-4.53	-3.64	-1.81	0.62
United Kingdom	1992	-5.53	-1.16	-0.87	-5.89	-4.64	-3.11
Australia	1993	-4.72	-2.59	-1.27	-2.62	-1.72	-2.71
Sweden	1995	-7.03	-9.43	-4.84	-1.28	0.03	-0.21
Israel	1997	-3.97	-3.54	-3.44	-5.10	-5.17	-2.52
Poland	1998	-4.28	-4.64	-4.00	-3.36	-4.20	-2.44
Korea	1998	0.65	2.99	2.63	2.99	2.10	0.34
Norway	2001	13.34	8.03	7.52	9.03	12.00	2.86
Hungary	2001	-4.06	-5.21	-5.11	-7.45	-7.90	-1.82
Iceland	2007	4.92	3.34	0.82	-10.83	-8.36	11.32
Uruguay	2007	-0.05	-1.05	-1.93	-1.56	-1.66	-3.94
Japan	2013	-7.64	-8.85	-8.09	-4.38	-4.38	-4.24
Upper Middle-Income Countries							
Colombia	1999	-5.33	-3.17	-2.13	-3.09	-2.64	-3.39
Brazil	1999	-5.18	-6.06	-6.06	-3.64	-3.79	-8.97
Mexico	2000	-3.01	-5.56	-5.18	-2.91	-2.24	-2.88
South Africa	2000	-1.54	-1.54	-3.83	-1.33	-1.13	-3.53
Thailand	2000	-1.79	-5.66	-2.24	-2.17	-0.80	0.47
Peru	2001	-2.13	-2.09	-0.40	-1.34	-0.49	-2.34
Romania	2005	-0.68	-2.71	-3.06	-3.06	-4.52	-2.41
Albania	2009	-6.59	-3.78	-3.99	-3.49	-4.23	-1.68
Dominican Republic	2012	-6.57	-2.93	-2.39	-2.23	-2.23	-3.16
Belarus	2013	-2.76	0.03	-3.65	-3.46	-2.88	-4.60
Azerbaijan	2014	3.19	5.67	7.90	-3.11	-4.83	-1.38
Kazakhstan	2015	-6.26	3.95	3.83	21.89	-4.37	-4.37
Low Middle-Income Countries							
Philippines	2002	-3.84	-3.12	-2.07	-2.74	-1.72	-0.39
Guatemala	2005	-1.73	-1.59	-1.77	-1.67	-2.29	-1.08
Indonesia	2005	0.42	-0.64	-1.11	-0.17	-0.68	-2.48
Ghana	2007	-7.24	-3.53	-3.55	-8.42	-8.80	-8.31
Georgia	2009	-6.54	0.74	1.63	-2.13	-1.94	-1.62
Moldova	2010	-2.61	-2.37	-1.22	-2.21	-2.17	-2.10
Kenya	2014	-7.40	-4.95	-4.72	51.33	-7.75	-7.34
Ukraine	2015	-1.16	-4.52	-4.42	80.08	-2.23	-2.23
India	2016	-6.57	-7.09	-7.43	-6.57	-6.57	-6.57
Low Income Countries							
Uganda	2011	-2.66	-3.45	-2.45	-3.42	-3.32	-3.60
Malawi	2012	-1.77	-1.95	-2.48	-5.88	-6.36	-7.80

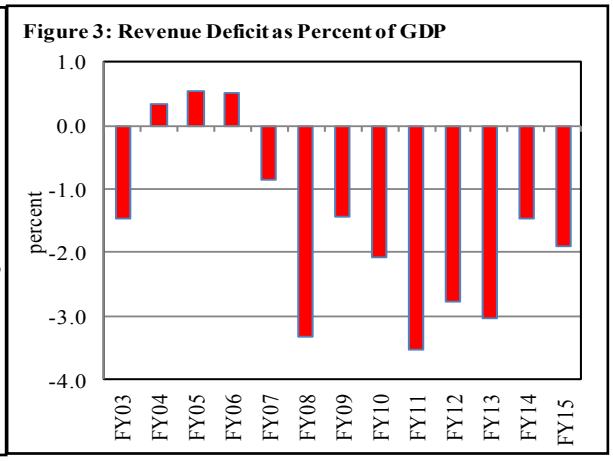
Source: Central bank and ministry of finance websites of respective countries

Table 1b: Debt to GDP Ratio

Countries	Year of adoption	In year of adoption	Before adopting IT		After adopting IT		Latest position
			3-yeasr Avg.	5-years Avg.	3-yeasr Avg.	5-years Avg.	
High Income Countries							
New Zealand	1989	58.4	69.69	68.73	62.12	61.30	29.95
United Kingdom	1992	33.66	30.14	33.48	41.47	42.56	88.98
Australia	1993	30.32	23.88	23.85	30.48	28.19	37.64
Sweden	1995	81.06	78.01	67.07	83.11	77.36	43.40
Israel	1997	99.4	104.16	110.08	93.37	93.12	64.08
Poland	1998	38.89	45.10	52.27	37.83	40.37	51.28
Korea	1998	14.67	8.06	7.88	17.19	17.91	37.89
Norway	2001	26.7	27.04	29.09	39.88	42.79	27.94
Hungary	2001	51.74	58.35	61.75	57.04	59.25	75.33
Iceland	2007	27.33	28.97	33.00	79.57	85.29	67.59
Uruguay	2007	67.99	84.39	89.43	63.42	61.27	64.29
Japan	2013	244.48	228.49	217.50	248.55	248.55	247.98
Upper Middle-Income Countries							
Colombia	1999	39.56	50.17	45.32	72.44	72.24	73.70
Brazil	1999	73.9	30.07	28.82	44.10	43.65	50.57
Mexico	2000	41.85	44.34	47.28	43.11	41.84	54.03
South Africa	2000	43.32	45.83	45.76	37.79	36.20	49.78
Thailand	2000	55.31	48.10	34.26	50.76	48.06	42.72
Peru	2001	39.33	39.09	37.83	39.85	38.15	23.98
Romania	2005	17.55	24.11	24.65	12.86	18.49	39.30
Albania	2009	59.67	55.13	56.21	59.76	64.34	73.32
Dominican Republic	2012	30.46	24.08	21.87	34.64	34.64	34.94
Belarus	2013	34.45	32.52	28.87	45.54	45.54	53.74
Azerbaijan	2014	11.17	12.71	12.61	28.32	28.32	28.32
Kazakhstan	2015	21.89	12.67	11.69	21.89	21.89	21.89
Low Middle-Income Countries							
Philippines	2002	63.26	57.1	56.2	64.3	57.8	34.8
Guatemala	2005	20.76	20.2	20.0	21.0	22.0	24.2
Indonesia	2005	42.61	56.4	66.1	32.8	29.9	27.3
Ghana	2007	31.04	44.0	57.7	38.6	41.7	70.8
Georgia	2009	41.00	29.6	35.8	37.9	36.8	41.5
Moldova	2010	26.85	24.3	28.0	24.2	29.1	41.5
Kenya	2014	46.67	42.1	42.3	51.3	51.3	51.3
Ukraine	2015	80.08	49.5	45.2	80.1	80.1	80.1
India	2016	69.07	68.5	68.8	69.1	69.1	69.1
Low Income Countries							
Uganda	2011	23.64	20.81	24.10	27.69	29.37	34.39
Malawi	2012	82.05	59.47	51.92	80.38	80.38	72.97

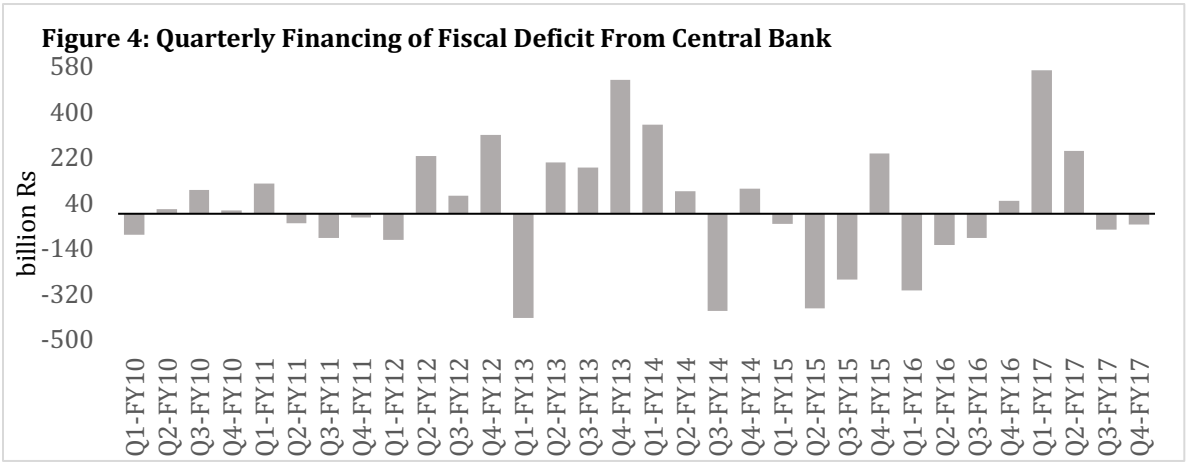
Source: Central bank and ministry of finance websites of respective countries





Source: State Bank of Pakistan

The fiscal imbalances resulted in higher financing requirement; government often financed the gap through seigniorage rand central bank borrowing which ultimately fueled inflation in the economy. To curtail the ill effects of high debt on the economy and put fiscal consolidation in practice, the government had approved the act of Fiscal Responsibility and Debt Limitation Act (FRDLA), in 2005. The act aimed at reducing fiscal deficit and ratio of public debt to GDP to a prudent level and laid following main principles of sound fiscal and debt management; 1) Reducing revenue deficit to nil at 30th June 2008 and maintaining a surplus after that. 2) In every financial year, from 2003, till 2013, total public debt must be decline by 2.5 percent of GDP in any given year.



Source: State Bank of Pakistan

The government could not successfully adhere to any of this condition and debt to GDP ratio as well as primary fiscal deficit continued to rise in the desired period. The gap between resources and expenditures

often met by central bank borrowing that induced inflationary pressures in the economy. To curtail the deficit monetization, the government introduced amendments in the SBP Act in 2011 and 2015. The act required federal government to retire its borrowing from central banks at the end of each quarter and the total debt owed to central bank on 30th April 2011 shall be retired in twelve years from that date. The government could not meet this requirement too and its borrowing from central bank exceeds the limits imposed in SBP Act (**Figure 4**).

The unsustainable fiscal deficit and its implications on the economy had forced the government to initiate new amendments in FRDLA: the government once again amended the Act and proposed new conditions in 2016 given as ; 1) The federal fiscal deficit excluding foreign grant will not be exceeded 4 percent of GDP during 2018-2021 and 3.5 percent thereafter ; 2) The total public debt shall be reduced to 60 percent of GDP from 2016-17 ;3) The total public debt shall be reduced by 0.5 percent every year from 2018-19 and from 2023-24 till 2032-33 by 0.75 percent every year. This entire reduction would lower the debt to GDP ratio to 50 percent of GDP.

The recent amendments in SBP Act and FRDLA provide a framework that may reduce the fiscal imbalance of the country in medium term outlook. The better fiscal soundness would offer more autonomy to the central bank in managing its operations. However, it is unclear whether maintaining fiscal deficit of 4 percent of GDP will sufficient to reduce the inflationary pressure in the economy, or to achieve target range of inflation (2%-4% traditional), deficit should be more constricted. In the next section, an empirical approach is followed to estimate the volume of fiscal deficit beyond which higher inflationary pressure could emerge in the economy.

3. Model Specification

As discussed earlier, study follows the model developed by Catao and Terrones (2005). In this framework, money is assumed to reduce the in transactions costs (‘‘shopping time’’), enabling a fiscally dominant government to affect nominal money demand and inflation. The main features of this model and conditions of steady-state equilibrium are given in the Appendix A2. The final estimation equation has been given as,

$$\pi = \varphi \frac{G - T}{M}$$

Where, $G - T \approx P[g - \tau + b^{g}\left(\frac{R-1}{R}\right)]$, is the nominal equivalent of the real budget deficit concept underlying the theoretical model, and φ is the semi-elasticity parameter to be estimated.

Arellano–Bover/Blundell–Bond dynamic panel-data method has been used to estimate following equation.

$$\Delta\pi_{i,t} = \phi_i \pi_{i,t-1} + \varphi_i x_{i,t} + \sum_{j=1}^{p-1} \lambda_{i,j} \Delta\pi_{i,t-j} + \sum_{l=0}^{q-1} \delta_{i,l} \Delta x_{i,t-l} + \varepsilon_{i,t}$$

where $\pi_{i,t}$ represents observed inflation rate in group i at time t; and $x_{i;t}$ is a (k x 1) vector of explanatory variables which includes the oil price, openness and GDP.

Since most of the time inflation experiences inertia and depend on its own lagged value, fixed and random-effect models cannot be used, since lagged value of dependent variable is also a function of the invariant term, which shows that the lagged dependent variable is correlated with the error term. This makes the OLS estimator biased and inconsistent. Additionally, variables such as GDP, and money supply may work as endogenous variables. Considering endogeneity of variables as well dynamic nature of inflation, the system dynamic panel data estimation techniques is used to estimate the model (Arellano-Bover/Blundell-Bond linear dynamic panel data estimation in Stata 10 with command xtdpdsys). This estimator is designed to cover the different aspects of panel data model, for instance; 1) for datasets with many panels and few periods means (N >T); 2) having linear functional relationship; 3)the dependent variable is dynamic and depending on its own past realization; 4)independent variables that are not strictly exogenous, meaning they can be correlated with past and possibly current realizations of the error. This method assumes that there is no autocorrelation in the idiosyncratic errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable (Baum F 2013).

The study used panel data set comprised of 35 countries that have already adopted inflation targeting regime. The dataset has been gathered from number of sources including central bank and ministry of finance websites of respective countries, IMF data set, World Bank data set and Federal Reserve Bank of St. Lois. 4 variables were identified relevant to adopted methodology, GDP, CPI, Fiscal Deficit, M1 money supply as employed by Catao and Terrones (2005).

4. Results

Results are presented in table 2, the panel regression involved 35 countries already have adopted inflation targeting regime. Five different regressions have been estimated varying on the basis of different independent variables. For instance, regression 1 only includes the fiscal balance to M1 ratio as an

independent variable, regression 2 adds openness, regression 3 comprises of oil price along with log of GDP. In regression 4, oil prices and openness are added and in regression 5 openness, oil price, log GDP all are included simultaneously. The results did not show the autocorrelation problem as suggested by Arellano-Bond test for zero autocorrelation in first-differenced errors.

Regression results suggest that coefficient of fiscal deficit to M1 (FD/M1) ratio shows mixed results for level and first lag in most of the regressions, in some regressions, the coefficients remain negative and significant, but in other equations positive and insignificant. However, in all of the regressions, coefficient of fiscal deficit to M1 is significant and positive in 2^{nd} lag depicting consistent behavior of the variable in second lag. Moreover, the coefficient of second lag of FD/M1does not change much in magnitude across regressions and lies in the range of 0.009 to 0.019. Hence, the paper will use this coefficient as an elasticity of inflation with respect to FD/M1 ratio. For 1^{st} regression, the coefficient can be interpreted as with 1 percent rise (fall) in FD/M1 ratio, inflation will increase (decrease) by 1.9 percentage point on average, all else constant. Similar interpretation can be made for same coefficient in other regressions.

Table 2: Results of System Dynamic Panel -Data Estimation

	Regression 1			Regression 2			Regression 3			Regression 4			Regression 5		
	Coef.	Std. Err.	Z	Coef.	Std. Err.	Z	Coef.	Std. Err.	Z	Coef.	Std. Err.	Z	Coef.	Std. Err.	z
_cons	3.120	0.656	4.750	-0.554	3.060	-0.180	16.631	19.529	0.850	0.173	2.936	0.060	19.443	19.142	1.020
Inf.L1	0.460	0.075	6.110	0.487	0.077	6.330	0.331	0.073	4.540	0.460	0.080	5.760	0.341	0.074	4.620
FB/M1	-0.016	0.016	-1.000	-0.027	0.012	-2.250	-0.041	0.009	-4.360	-0.030	0.012	-2.500	-0.050	0.012	-4.190
L1.	-0.007	0.006	-1.220	0.004	0.007	0.540	-0.011	0.007	-1.660	0.005	0.007	0.650	-0.001	0.008	-0.110
L2.	**0.015**	**0.004**	**3.570**	**0.018**	**0.005**	**3.450**	**0.009**	**0.004**	**2.120**	**0.019**	**0.006**	**3.130**	**0.011**	**0.005**	**2.050**
Openness				56.898	11.306	5.030				54.684	14.750	3.710	53.601	13.828	3.880
L1.				-21.738	7.208	-3.020				-16.439	9.030	-1.820	-21.735	9.142	-2.380
L2.				-25.298	10.835	-2.330				-26.612	11.070	-2.400	-31.979	10.604	-3.020
log GDP							30.289	9.786	3.100				31.612	8.242	3.840
L1.							-29.537	10.166	-2.910				-25.263	7.029	-3.590
L2.							-1.316	2.018	-0.650				-7.075	3.146	-2.250
Oil Price							-0.002	0.019	-0.130	-0.005	0.020	-0.250	-0.033	0.022	-1.500
L1.							0.007	0.027	0.260	-0.014	0.025	-0.560	0.025	0.028	0.880
L2.							0.001	0.010	0.050	0.001	0.013	0.050	0.028	0.014	1.980

Arellano-Bond test for zero autocorrelation in first-differenced errors

Ho: no Autocorrelation

	Z	Prob > z	z	Prob > z	Z	Prob > z	z	Prob > z	z	Prob > z
Order 1	-2.81	0.00	-2.79	0.01	-2.82	0.00	-2.84	0.00	-2.93	0.00
Order 2	-1.56	0.12	-1.60	0.11	-1.68	0.09	-1.61	0.11	-1.61	0.11

Openness has been computed as [((exports + imports)/GDP)*1/2], the coefficient is positive and significant at its level but becomes negative for lags 1 and 2, showing openness first led to create inflationary pressures but after a certain time lag, high degree of openness tend to reduce inflationary pressures in the economy. Coefficient of oil price remained insignificant for all regressions showing oil price fails to induce any change in inflation in panel of selected inflation targeting countries.

Like openness, economic growth showing by Log of GDP, is also showing positive relationship at level but relationship turns negative in the first lag, in second lag, GDP doesn't show any significant impact on inflation. The relationship supports the conventional view that economic growth causes an expansionary impact on inflation initially, but the impact doesn't last so long, and eventually turns out to be insignificant.

Table 3: Approximation for Fiscal Deficit

		Current level of FD/M1 in Pakistan	Current level of Inflation	Required Fiscal Deficit for given Inflation Target		
	Elasticity			at 2 %	at 3 %	at 4 %
Catao and Toren (2013),						
Emerging Economies	1.14	4.33	4.16	2.36	3.28	4.19
Overall countries	1.51	4.33	4.16	2.84	3.54	4.23
The current study						
Overall countries	1.90	4.33	4.16	3.15	3.70	4.25

As discussed earlier, one of the objective of this study is to use back of the envelope approach to compute level of fiscal deficit given the conventional target inflation rate of 2%, 3% and 4% for Pakistan's economy. The study uses the elasticity of inflation with respect to FD/M1 ratio estimated in regression 3 to compute the level of fiscal deficit to M1 ratio. The level of FD/M1 has also been computed with elasticities shown in Catao and Terrones (2005). Results have been presented in table 2, which show relatively higher elasticity of inflation with respect to FD/M1 in current method, compared to Catao and Torreness (2013). Hence for a country like Pakistan, if requires adhering inflation target of 2.0 percent on annual basis, with current FD/M1 at 4.33 percent and inflation rate of 4.16 percent, the fiscal deficit should not lie more than 3.15 percent. For high inflation targets of 3% and 4%, the FD/M1 ratio should be should not be higher than 3.7 percent and 4.25 percent respectively. In FY17, inflation in Pakistan remained at 4.16 percent, with a FD/M2 ratio of 4.33 percent, the current estimates are in line with actual statistics.

5. Conclusion

The inflation targeting regime gained significant recognition during last 30 years, 38 countries have already adopted this regime as a prime objective of the monetary policy. However, this policy requires some prerequisites, including independence of central bank in selection of monetary policy tools and non-observance of fiscal dominance. Emerging and developing economies frequently deal with fiscal dominance since governments heavily relied on borrowing from central bank to mitigate their deficit. Literature suggest that financing of fiscal deficit from central bank borrowing often creates inflationary pressures in the economy. Hence, with high fiscal deficit and heavy borrowing from central bank, it is difficult to achieve the desired target of inflation under inflation targeting regime.

The study analyzed past and present level of fiscal deficit and debt level of countries already adopted the inflation targeting regime and identified that 22 out of 35 countries have experienced a decline in their fiscal deficit whereas 16 countries have seen reduction in their debt level after adopting this regime. The study stressed on the importance of strong fiscal position of the country before attempting to adopt inflation targeting framework and suggested that before adopting this framework, the country should devise a threshold level of deficit, with a particular targeted level of inflation for medium or long-term period. Pakistan seems an ideal economy to develop this approach since the country is attempting to adopt the inflation targeting regime but at the same time is struggling with high deficit and debt burden.

The paper used the model developed by Catao and Terrones (2005) for the panel data set of inflation targeting countries and estimate elasticity of inflation with respect to fiscal deficit to M1 ratio. The dynamic system panel data approach has been employed to estimate different equations. The elasticity then used to calculate level of FD/M1 given specific level of initial and targeted inflation and preliminary level of FD/M1 ratio.

As stated earlier, the study computed required level of fiscal deficit to M1 ratio given current level of inflation and fiscal deficit to M1 ratio for Pakistan. The paper also computed the required FD/M1 ratio with elasticities reported by Catao and Terrones (2005). The results were in line with current status of inflation and fiscal deficit in Pakistan and suggested that maintaining fiscal deficit of 4 percent of M1 will be sufficient to achieve target range of inflation (2%-4% traditional) in the country.

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Appendix 1A

Table 1a: Pre-Conditions for Inflation Targeting Regime:

Condition I: Autonomy and Accountability of Central Bank			
Mandate and Instrument Independence	Mandate to pursue an inflation targeting		
	Independence of central bank in deciding its instruments for policy actions		
Accountability & Transparency	Public accountability	Publicizing explicit inflation targeting	
		publicize the principal monetary operations	
		communicate any change in the monetary policy stance to public immediately and explain its impact on inflation target	
		central bank should announce any potential breach of target well ahead of time along with reasons and future actions to restore inflation target.	
		Ex-post assessment of performance of monetary policy	
	Transparency	Build expertise in economic research and external relations to enhance transparency	
		Employ techniques for instance issue press releases, publish regular inflation reports, and special central bank publications	
Condition II: Macroeconomic Stability			
Absence of Fiscal Dominance	Monetary policy should not be dominated by fiscal concerns		
	Strong Fiscal Positions		
	Adherence of certain conditions		
	instrument independence		
	limits on deficit financing from central bank		
	limits on use of central bank facilities such as credit lines and positive balances		
External Stability	Stability in foreign exchange market		
Level of inflation before adopting inflation targeting regime	low level of inflation which ensures reasonable degree of monetary control		
Condition III: Financial System Stability and Development			
Financial system stability	Minimal vulnerability to crisis		
	Strengthen the soundness of financial institutions	Resolution of insolvent financial institutions	
		adoption of sound supervisory practices	
Development of Financial Markets	develop deep and liquid financial markets that can absorb shocks		
	Financial markets should not be highly dollarized which may limit the effectiveness of monetary policy		
Condition IV: Conduct of Monetary Policy and Transmission Mechanism			
Conduct of Monetary Policy	Influencing the aggregate liquidity circulating in financial institutions via monetary aggregates or short-term interest rate		
	To set the operating guide, central bank should use indirect monetary policy instruments	liberalizing key interest rates	
	Modalities of OMOs should be designed to facilitate policy signaling		
Transmission of Monetary Policy	strengthen the understanding of monetary policy transmission through different steps	Tighten the links between money markets and other financial markets	
		improve data collection of corporate and bank balance sheets by government agencies	

		frequent discussions of central bank representatives with money market participants
Inflation Forecasting	Central bank inflation forecast should incorporate all available information	
	Forecasts should be considered as credible by financial market participants and general public	
	maintain the data base of leading macro-indicators not only confined to aggregate demand and supply variables, monetary aggregates, interest rate, exchange rate, inflation, price and expectation measures, yield on government bonds, interest rate differentials.	
	build sophisticated forecasting models	
Exchange Rate Policies	Inflation targeting must have supremacy over exchange rate objective	
	Central bank should make it clear that policies that alter exchange rate are purposely used to smooth the temporary shocks and to attain inflation target.	
	Intervention in forex markets need not to be large and not use frequently, in addition these interventions should be publicly known	
Coordination issues	No conflicts among fiscal, debt and monetary policy.	
	Monetary policy decisions should not be driven by debt management considerations	

Source: Derived from Crare et al. (2002)

Appendix 2A

Household maximizes the life time utility,

$\sum_{t=0}^{\infty} \beta^t u(c_t\, l_t)$, (1)

Where, β is the discount factor, and ($0 < \beta < 1$), c_t is consumption in period t and l_t is the leisure in period t, (the consumption function is strictly concave). Household endowment is given by y_t, which can be spent on taxes, risk free bonds or money holding. As a result, the household is subject to a sequence of budget constraints given by,

$$c_t + \frac{b_{t+1}^p}{R_t^*} + \frac{m_{t+1}}{P_t} = y_t - \tau_t + b_t^P + \frac{m_t}{P_t} \quad (2)$$

where b_t^p is the real value of the household holdings of one-period risk-free bonds that matures at period t; m_{t+1} denotes the household's holdings of money balances between t and t + 1; τ_t is a lump-sum tax, P_t is the price level; and R^*_t is the international real gross rate of return on one-period bonds. The initial stocks of b_0 and m_0 are given and $y_t < \infty$.

In each period t, the time can be allotted to leisure (l_t) or the shopping activities(s_t), and $l_t + s_t = 1$, s_t is assumed to be directly related to c_t and inversely proportional to m_{t+1} / P_t, which individual holds between t and t+1.

$$s_t = S(c_t, \frac{m_{t+1}}{P_t}) \quad (3)$$

where S; Sc; Scc; $S_{m=p;m=p} > 0$ and $S_{m=p}$ and $S_{c;m=p} < 0$. The return on money can be lower than the return in the risk-free bond sine the transaction cost is negatively related to money holdings. First-order conditions with respect to c_t l_t b_{t+1} and m_{t+1} gives the following money demand function,

$$\frac{m_{t+1}}{P_t} = M^d[c_t, \frac{1}{R_t^*(1+\pi_t)}] \quad (4)$$

where M^d is increasing on consumption (c_t) and decreasing on the international real interest rate R^*_t as well as on the domestic inflation rate.

The government can finance its spending with tax collection, issuance of bond, the reduction of international assets, or by printing money. Government budget constraint is given by,

$$\frac{b_{t+1}^g}{R_t^*} = \tau_t + b_t^g - g_t + \frac{M_{t+1} - M_t}{P_t} \quad (5)$$

where b^g_t is the real value of the government's net asset holdings denominated in consumption units of period t; and M_t is currency issued by the government at the beginning of the period t. Both b^g_0 and M_0 are given, if $b_0^g < 0$, the government is a net borrower in period t.

With money supply equal to money demand ($m_t = M_t$) and b_{t+1} 1= $b^p_{t+1} + b^g_{t+1}$ for all t; the economy wide budget constraint is

$$\frac{b_{t+1}}{R_t^*} = y_t - c_t - g_t + b_t \qquad (6)$$

b

where b_{t+1} is the net holdings of foreign assets of the economy as a whole and b_0 is given, so that the current account is defined as b_{t+1} - b_t

With no tax and trade restriction, both purchasing power parity condition and the uncovered interest rate parity conditions hold, resulting in the equalization of domestic (R_t) and international real interest rates R^*_t. Stationary equilibrium in this small open economy then demands:

$$R = R^* = \beta^{-1}$$

$$\frac{M}{P} = M^d\left(c, \frac{1}{R(1+\pi)}\right) = \vartheta(\pi) \qquad (7)$$

By substituting equation 7 into 5 we can get stationary equilibrium,

$$\frac{\pi}{1+\pi} = \frac{P[\,g - \tau + \frac{b^g(R-1)}{R}]}{M} \qquad (8)$$

This is the long run relationship which states that the rate of inflation is proportional to the ratio of gross-of-interest government deficit to the average stock of transaction or ‘‘narrow’’ money during the period. With the demand for transaction money being negatively related to inflation, the size of the inflation tax base will be lower (higher) as inflation is higher (lower). This implies that fiscal consolidation will be a more powerful instrument of price stabilization the higher the inflation rate.