INVESTIGATING ASYMMETRY IN FISCAL THEORY OF PRICE LEVEL: INSIGHTS FROM PAKISTAN

IBRAR HUSSAIN, MUHAMMAD RAFIQ AND ZAHOOR KHAN*

Abstract. This study investigates the asymmetric impact of fiscal deficit on inflation under the framework of Fiscal Theory of Price Level (FTPL) in the context of Pakistan. To test the FTPL, keeping in view the characteristics of Pakistani economy for the sample period, the empirical estimation has been calibrated on the New-Keynesian model of small economy. Specifically, the calibration has been made on the models of Gali and Monacelli (2008) adopted by Çekin (2017) and the model of Cerisola and Gelos (2009). The estimates of the Non-Linear ARDL are found reliable as the model does not suffer from the degenerate problems. Remarkably, the finding conforms with the view of the FTPL and therefore evidences that the theory holds in the long run. However, the tests of asymmetry show that the impact of the fiscal deficit on inflation is likely to be asymmetric only in the long run. Our analysis also reveals that the impact of money supply and exchange rate depreciation becomes insignificant when the influence of the fiscal deficit is allowed to be asymmetric under the framework of NARDL model. Their signs are however in line with the expectations of their respective theories. Besides fiscal deficit, this study finds external factors as the main cause of inflation in the country. The estimates show that the current account deficit and the international oil prices have a significant positive impact on the domestic inflation in Pakistan. To reduce domestic inflation, fiscal austerity

*The authors are respectively Assistant Professor at Department of Economics, University of Malakand, Associate Professor and Assistant Professor at Institute of Management Sciences, Peshawar – Pakistan.

Corresponding author's e-mail: ibrarhussain_uom@yahoo.com

measures would work and such impact would become more visible if other associated policies are accommodative.

I. BACKGROUND OF THE STUDY

The role of fiscal policy in the achievement of the internal and external equilibrium, simultaneously, has been extensively debated in the turn of the twenty-first century. The low and unsustainable economic growth with high inflationary pressure on the pace of twin-deficit has put Pakistan on the line of default and was therefore thought to be addressed by the current study. Currently, the economy is confronted with unprecedented pressure on both the fiscal side and external front in the form of high budget and current account deficits. The public debt liabilities have reached to the level where a sizeable portion of the federal budget is consumed by debt servicing on the face of the depleted foreign exchange reserves.

Official statistics indicate that over the past five years, Pakistan's economy has grown on an average rate of 4.7 percent against the 5.4 percent target which was mainly driven by consumption led growth. Unplanned and unproductive expenditures with low revenue growth, coupled with stagnant exports and sky-rocketed imports, have led to twin-deficit problem on the pace of inflation in the country. Against a pensive target of 6.2 percent, the economy grew at a meager speed of 3.29 percent in FY 2018-19. During the same year, saving-investment gap was recorded as 4.7 percent of the GDP with total investment of 15.4 percent and savings of 10.7 percent of the GDP. The average fiscal deficit over the past five years remained 5.6 percent whereas average total revenue reached to 14.9 percent against the average total expenditure recorded at 20.5 percent of the GDP. The average inflation on the basis of Consumer Price Index (CPI) over the last five years remained 4.8 percent with 7 percent during July-April 2018-19, while current account deficit stood at 6.3 percent of the GDP in 2017-18 amounting to US $19.9 billion. During 2017 and 2018, a persistent

increase in budget deficit has put unprecedented pressure on aggregate demand and hence aggravated inflation situation in the country (Economic Survey of Pakistan [ESP], 2018-19).

Looking at the tax structure over the past decade, it is evident that Pakistan is facing dramatic shifts in its revenue structure and is on the move from indirect to direct taxation. Similarly, political instability, inconsistent macroeconomic policies, floods and internal insurgency did not leave the fiscal space for rainy days. Such situation often leads to domestic inflationary pressure and therefore the need for further research over the issue at hand increases. The headline inflation (measured CPI) during 2013 and 2018 remained on average at 4.8 percent. In FY 2018, inflation was recorded at 3.9 percent, with an end-period inflation of 5.2 percent and 4.2 percent during FY 2017. The prices of non-food items have been largely responsible for domestic inflation which rose by 5.4 percent (ESP, 2018-19). Figure 1.1 depicts a quick review of annual inflation on the basis of CPI, money supply growth, current account balance, and primary fiscal balance for the sample period. The figure reveals a relatively clearer picture of the relationship among inflation, current account balance and primary fiscal balance, while money supply growth has no visible relationship with inflation trends.

Figure 1

Selected Macroeconomic Variables
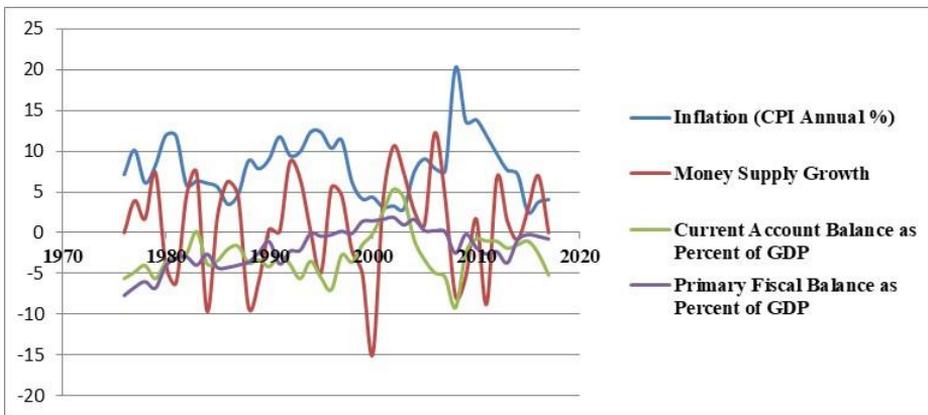
In Pakistan, more recently, the focus has been on the fiscal consolidation and attempts are being made to encompass both revenue-based and expenditure-based consolidations in order to curtail the overall fiscal deficit to a manageable level. In this regard, Fiscal Responsibility and Debt Limitation Act have been implemented since 2005 to keep the public finance on a sustainable path. However, internal insurgency, world financial crises of the 2007-08 and floods of 2010 in Pakistan put unprecedented pressure on the public exchequer. Nevertheless, the fiscal consolidation measures including prudent expenditure management, rising revenue receipts, and rationalization of subsidies have curtailed the overall budget deficit from 8.2 percent in FY 2013 to 4.6 percent of GDP in FY 2016. The total expenditures decreased from 21.5 percent of GDP to 19.9 percent, while the total revenue took upward trajectory and rose from 13.3 percent of the GDP to 15.3 percent during the same period (ESP, 2016-17). Such austerity measures have contained domestic inflation in the country from 9.68 percent to 3.76 percent as evident from Figure 1.

Price stability has been the prime concern of public policy (Christiano & Fitzgerald, 2000). However, there is lack of studies that address the FTPL and its interaction with Monetary Theory of Price Level (MTPL) in Pakistan to get insights into the optimal stabilization policy. In case of the fiscal activism as is the case of majority of the developing countries including Pakistan, the researchers often associate the domestic inflationary pressure to expansionary monetary policy and exchange rate depreciation. For example, in the case of Pakistan, the studies of Chaudhry, Ismail, Farooq, and Murtaza (2015), Chaudhry, Qamber, and Farooq (2012), and Khalid (2005) have attributed domestic inflation to monetary expansion and exchange rate depreciation besides fiscal deficit and other external factors. In situation of inflation targeting by the central bank on the pace of the fiscal activism, it seems that fiscal policy directly influences monetary policy and indirectly, the inflation.

In the similar way, Farmer and Zabczyk (2019) claim that FTPL does not lead to a unique price level determination and reject the theory in case of overlapping generation model. Other studies like Kemal (2006) and Qayyum (2006) declare monetary expansion as a major cause behind the domestic inflation in Pakistan. Likewise, Khan and Schimmelpfennig (2006), in case of Pakistan, point out other factors including the structural

bottlenecks besides money supply as the main contributing factors towards inflationary pressure. The failure of some studies to the find the causal connection of the fiscal deficit and inflation in Pakistan and elsewhere, may be attributed to the irrelevant estimation methods and the omission of the fiscal policy variable from the empirical models. Similarly, the use of overall fiscal balance instead of primary fiscal balance may influence the findings of such studies which hold monetary policy being responsible for domestic inflation. Moreover, the use of unadjusted fiscal balance with business cycles may make their results different from the established notion of FTPL. Another flaw seems to lie in the assumption of equal impact of expansionary fiscal policy with that of contractionary one in the form of so-called symmetric impact.

Although, in the emerging economies, monetary policy is assigned the role of inflation targeting with stable growth; nonetheless, it is not always a successful story elsewhere. The failure of inflation targeting in controlling inflation in some emerging economies like Brazil and Turkey in the early 1990s or Indonesia and Philippines in 2008, demonstrate that tightening monetary policy was unable to contain inflation (Tran, 2018). This failure could be attributed to persistent fiscal deficit and the resulting fiscal dominance that impedes the ability of the monetary policy in reducing inflation (Mishkin, 2004). Inflation targeting, therefore becomes a difficult assignment in countries with low price credibility, weak institutions and fiscal un-sustainability (Eichengreen, 2002). Today Pakistan is confronted with low price credibility, weak institutions, corruption and fiscal un-sustainability. In such situation, the assignment of inflation targeting by the central bank via monetary policy changes in Pakistan seems knocking at the wrong door.

Besides this, there are certain drawbacks in the empirical studies conducted in Pakistan. Most of the studies have assumed a linear impact of fiscal policy on domestic inflation, which seems a bit restrictive as such impact could be of asymmetric nature. Such asymmetry presumes that the impact of an increase in the fiscal deficit on general price level is not necessarily equal to the impact of a decrease in the fiscal deficit. Another issue is that these studies either use government spending or the overall fiscal deficit to proxy fiscal policy. In a nutshell, the empirical literature lacks comprehensive analyses on the issue of FTPL and has

investigated such impact of the relationship in a linear way. It is therefore open to debate to re-investigate the possible asymmetric effect of the fiscal deficit on inflation at least on empirical grounds. Moreover, investigation of FTPL in the developing countries seems to have practical relevance as they issue debt in domestic currency, often fail to raise sufficient revenue and are more concerned with capital flows (Beck-Friis & Willems, 2017). This is what exactly happening in Pakistan and has made the fiscal policy more active with pushing monetary policy on the back foot, thereby making it passive.

The current study, therefore, aims to conduct dynamic asymmetric analysis of FTPL, keeping in view many developments in Pakistan including the exchange rate volatility, mounting public debt, unsustainable current account balance, and international oil embargo. Moreover, to quantify the dynamic asymmetric impact of the fiscal policy on general price level, the Shin, Yu, and Greenwood-Nimmo (2014) NARDL techniques will be complemented with augmented ARDL method of Sam, McNown, and Goh (2019). Besides this, a unique feature of this study is the application of rich dynamic approach of NARDL techniques that would allow and test asymmetries between the fiscal deficit and inflation over both the short and long runs. In a nutshell, the present study attempts to cover the deficiencies of the previous studies in terms of their poor proxy and irrelevant econometric methods. Such analyses of the fiscal policy are expected to bring forth important insights that may help in the macroeconomic management of the economy of a developing country.

II. REVIEW OF LITERATURE

Inflation bothers every segment of an economy. These segments can be households, business firms or even governments. High inflation is generally associated with business uncertainty and redistribution of income from poor segments of the society to rich segments and hence leads to mass poverty. But the question is what causes inflation in an economy? Disagreement exists between the two schools of thought in their pursuit of an answer to such eternal question. Of these schools, the conventional view is based on Ricardian Fiscal Policy Regime (RFPR), while the Fiscal Theory of Price Level (FTPL) relies on non-Ricardian fiscal policy regime. The conventional view is also known as the

monetarist view and FTPL is coined as the so-called Keynesian view. Leeper (1991) and Cochrani (2001) were among the first who advocated FTPL, while Sargent and Wallace (1981); McCallum (2001); and Bassetto (2002) were among those who have strongly criticized the FTPL and support the monetarist's view.

FTPL indicates that the fiscal deficit causes inflation in an economy, while monetarists argue that it is the supply of money which causes inflation. According to Kocherlakota and Phelan (1999) FTPL is an alternative selection device towards equilibrium price path as against the traditional monetarist's view. Consequently, FTPL has been emerged as an alternative to the traditional analysis of inflation, and associates domestic inflation with budgetary policies (Carlstrom & Fuerst 2000). Irrespective of the time and location, the monetarist approach declares inflation as a monetary phenomenon. Apparently, the disagreement between the two schools of thought can plausibly be explained by the differences over the interpretation of how adjustment takes place in intertemporal budget constraints[1]. Such disagreement is based on whether economic agents behave in Ricardian or non-Ricardian passion (Tkacevs, 2006). RFPR presumes the endogeneity and automatic movement of the primary fiscal balance in order to ensure fiscal solvency for any price level and therefore the fiscal policy is ineffective in influencing the general price level. Whereas money supply changes by the central bank has the potential to influence price levels in an economy through the Quantity Theory of Money. But Sargent and Wallace (1981), in their monetary policy arithmetic, argue that growth of the monetary base would be directly determined by the strategy of the fiscal authority in the form to finance fiscal deficit. The model with forward-looking behavior predicts that seigniorage gains arising from money creation will lead to inflation hike even on the pace of tight monetary policy.

Moreover, in a situation of 'fiscal dominance' when intertemporal budget constraint is viewed as equilibrium condition, then current primary surplus has no role in determining the future surpluses; rather

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[1] The intertemporal budget constraints requires that the discounted value of both the current and expected future surpluses shall be just enough to repay the initial debt (Tkacevs, 2006).

equality is restored by the price level changes (Beck-Friis & Willems, 2017; Łyziak & Mackiewicz-Łyziak, 2020). Leeper (1991) terms such autonomous form as 'active', while Woodford (1995) has characterized such mechanism as 'non-Ricardian' FTPL.

Theoretically, there are two difficulties in the analysis of the fiscal policy: firstly, it depends on the theoretical description in which the policy maneuvers and hence makes both the micro and macroeconomic theory relevant; secondly, time spans influence such analyses and become more complicated when done over the long-run on the pace of the changing financial and real stock of assets (Palley, 2013). Further, among macroeconomic perspectives, there has been a complex debate over the fiscal policy effects. Such perspectives compare Classical with Keynesian; Neo-classical with Neo-Keynesian; New-classical with New-Keynesian; and Post-Keynesian with Monetarists. However, numerous analytical issues remain intact despite ruling out microeconomic effects arising from the tax distortion and the inclusion of the public spending in production and utility functions. Other important elements include the sources of deficit financing, type of fiscal adjustment, and the question of whether the economy behaves in Ricardian or non-Ricardian passion (Palley, 2013).

There is dearth of empirical studies on how the fiscal deficit determines inflation in the emerging and developing economies with conclusive results (Tran, 2018). A strand of research grounded in the conventional IS-LM model indicates that expansionary fiscal policy increases the interest rate, but does not explain the response of exchange rate depreciation to such shocks (Enders, Müller, & Scholl, 2011). On the contrary, some studies (Corsetti, Meier, & Müller, 2012) affirm that expansionary spending policy exerts negative impact on interest rate. Whereas the studies of Celasun, Gelos, and Prati (2004) and Canzoneri, Cumby, and Diba (2010) report that higher fiscal imbalances lead to higher inflation rate. However, countries confronted with the problem of long-run stagnation can boost their GDP by increasing their public purchases through a multiplier process. Sometimes such implications of the multiplier process become quite different from the conventional Keynesian view and work via increase in disposable income through moderation of deflation (Murota & Ono, 2015). Even in the conventional framework, the multiplier effect may be often misunderstood and the true

effect seems to depend not only on the amount of spending, but on the benefits directly generated by such spending (Ono, 2011).

In case of Uganda, Ssebulime and Edward (2019) have recently confirmed the view of FTPL. The study finds the long-run relationship based on the estimates of Johansen co-integration. On the basis of Granger causality test, the study suggests that causality runs from deficit to inflation. Catão and Terrones (2005), in case of those emerging economies which suffer from high inflation, find strong nexus between the two, but find low links in the case of advanced nations. Similar conclusions were derived by Levin and Piger (2002) in a group of twelve industrial countries. Habibullah, Cheah, and Baharom (2011) in case of the Asian developing countries find the influence of the budget deficit to be inflationary and attribute it to the deficit financing by the central banks. Ndanshau (2012) in case of Tanzania finds unidirectional causality running from deficit to inflation, while Bwire and Nampewo (2014), in the context of Uganda, reveal that causality runs from inflation to deficit. Others (Aghevli & Khan, 1978) find bidirectional causality stemming from Olivera-Tanzi effect. According to Tanzi (1991) such bidirectional effect will hold when budget deficit not only influences inflation, but there exists a feedback from inflation through lags in tax collection. Real revenue falls due to inflation hike leads to further deficit in the budget and hence becomes a self-fulfilling phenomenon. Still other studies (Vieira, 2000; Akcay, Alper, & Özmucur, 2001) find evidence of no such causality. Despite the fact that FTPL is controversial, yet it has attracted prominent critics including Buiter (2002) and McCallum (2001, 2003) as well as vocal proponents like Leeper (1991), Cochrane (2001), and Leeper and Walker (2013). In a very recent attempt, McClung (2020) illustrates important cases in which fiscal policy remains non-Ricardian thereby determining inflation and still the forward guidance puzzles are there. Brunnermeier, Merkel, and Sannikov (2020) in their paper highlight the importance of bubble term in FTPL. They argue that although FTPL distinguishes between monetary and fiscal dominance, however, the bubble term cannot be ignored in situations of policy shifts.

In Pakistan, few studies have been attempted to analyze the effect of budget deficit on inflation. Shabbir and Ahmad (1994) employed OLS; Mughal, Khan, and Aslam (2011) used Granger causality and co-

integration techniques; Agha and Khan (2006), Serfraz and Anwar (2009) used Johansen co-integration analysis and VECM, while Jalil, Tariq, and Bibi (2014) employed ARDL techniques in their analyses. Similarly, Wakeel and Ullah (2013) employed 3-Stage Least Square method to ascertain the impact of the fiscal deficit on output, inflation and balance of trade. These studies have found significant positive impact in case of Pakistan. On the contrary, Khan and Gill (2010) in their pursuit of factors determining inflation in Pakistan find no evidence of such relationship in the long run. The study adopts OLS in their estimation and finds currency depreciation, import price hike and support prices to sugarcane, wheat, rice and cotton as the major factors that fuel domestic inflation. This study, however, suffers from serious methodological errors. The authors justify the applications of OLS to time series data on the basis of one criterion: that the value of Durban-Watson (DW) statistic exceeds the value of R-square.

In classical regression model, very low value of DW statistic with high R-square indicates that the underlying series is non-stationary (Newbold & Granger, 1974). This is the initial step towards more formal test of stationarity on the pace of availability of a wide array of tests of stationarity (Nkoro & Uko, 2016). Similarly, time series data often possess trend and structural breaks; hence OLS and VAR are not appropriate methods of estimation in cases of non-stationary data (Shresta & Bhatta, 2018). However, Bashir, Nawaz, Yasin, Khursheed, Khan, and Qureshi (2011) have gone one step further and have applied Johansen co-integration in their analysis. The paper shows positive effect of public expenditure on inflation, besides money supply, import prices and GDP; while revenue influence was found to be negative.

However, in a study Farmer and Zabczyk (2019) demonstrate that in the overlapping-generations model the FTPL fails to uniquely[2] determine the general price level. The authors challenge the established view regarding the optimal combination of the fiscal policy with monetary policy for the achievement of the desirable goals and argue that both can be active simultaneously. The reason lies in that as long as the primary

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[2]FTPL indicates that active fiscal policy in combination of passive monetary policy lead to a unique price level determination.

fiscal balance in not too large, the authority can conduct the fiscal policy that is unresponsive to endogenous movement of public debt. In case of Brazil, Cerisola and Gelos (2009) constructed a distributed lag model to ascertain the relationship between the fiscal policy and inflation. The study regressed inflation expectation on nominal interest rates, fiscal deficit, real wages and real exchange rate in the model. Very recent studies of Tran (2019), in case of BRICS countries, while Sriyana and Ge (2019) in the context of Indonesian economy, applied Shin et al. (2014) NARDL approach to determine the asymmetric effect of the fiscal deficit on inflation. Estimating the model over data spanning from 1971 to 2017, Sriyana and Ge (2019) reveal asymmetric effect of the fiscal deficit on inflation. Ajaz, Nain, and Kamaiah (2016), in case of India, employ the NARDL framework that shows the asymmetric impact of openness on domestic inflation in both the long and short runs. The authors reject the hypothesis of Romer (1993) regarding the negative impact of openness on inflation. The study, however, does not carry out the asymmetric impact of the components of fiscal deficit on inflation.

III. DATA AND ECONOMETRIC MODEL

DATA, SOURCE AND VARIABLES' DEFINITIONS

The annual data, on the selected variables for the empirical model testing the FTPL in Pakistan, have been taken from three main sources: World Development Indicators WDI, State Bank of Pakistan (SBP) and ESP. The data range from 1976 till 2017. The data on Current Account Balance (CAB) as percent of the GDP, inflation rate (based on CPI) and broad money as percent of the GDP were taken from the WDI. The primary fiscal balance and public debt as percent of the GDP were obtained from various issues of the ESP. The output gap and nominal effective exchange rate were obtained from the handbook of statistics published by the SBP, while data on the price of crude oil (nominal dollar) per barrel were retrieved from www.InflationData.com. The detailed description of the data, sources of data and variables' definitions is presented in Appendix A.

Model Specification

To test the FTPL, keeping in view the characteristics of Pakistan's economy for the sample period, the empirical estimation has been calibrated on the New-Keynesian model in case of small economy. Specifically, the calibration is being made on the models of Gali and Monacelli (2008) adopted by Çekin (2018) and the model of Cerisola and Gelos (2009).The general form of the FTPL model is as:

$$Inf_t = \lambda_0 + \lambda_1 FP_t + \lambda_2 X_t + \varepsilon_t ------- (1)$$

Where Inf_t indicates inflation; FP_t is the fiscal policy variable; X_t is the set of control variables and would include growth of money supply, exchange rate and external balance.

Non-Linear ARDL (NARDL)

To ascertain the techniques of NARDL and analyze their distinguishing features, the ECM version of Linear ARDL of FTPL equation is as:

$$\Delta Inf_t = \alpha + \sum_{i=1}^{p1} \beta_{1i}\Delta Inf_{t-i} + \sum_{i=0}^{p2} \beta_{2i}\Delta CAPB_{t-i} + \sum_{i=0}^{p3} \beta_{3i}\Delta CAB_{t-i} + \sum_{i=0}^{p4} \beta_{4i}\Delta GBM_{t-i} + \sum_{i=0}^{p5} \beta_{5i}\Delta GNEER_{t-i} +$$

$$\sum_{i=0}^{p6} \beta_{6i}\Delta OIL_{t-i} + \lambda_1 Inf_{t-1} + \lambda_2 CAPB_{t-i} + \lambda_3 CAB_{t-i} + \lambda_4 GBM_{t-i} + \lambda_5 GNEER_{t-i} + \lambda_6 OIL_{t-i} + \varepsilon_t ----- (2)$$

In this model, the explanatory variables including fiscal policy have linear impact on the dependent variable. Shin et al. (2014) methodology is suitable to be employed when the impact of one or more explanatory variables is hypothesized to be non-linear. To implement the techniques, first changes in the primary fiscal deficit have to be constructed as $\Delta lnFP_{t-i}$. This newly constructed variable incorporates both the positive and negative changes denoted by $\Delta \ln FP^+$ and $\Delta \ln FP^-$ respectively. From these, two new variables would be constructed; the one reflecting contractionary fiscal policy denoted by POS_t and the other reflecting expansionary fiscal policy denoted by NEG_t. Such partial sums of positive and negative changes are shown as:

$$POS_t = \sum_{i=1}^{t} \Delta CAPB_{t-i}^+ = \sum_{i=1}^{t} \max(\Delta CAPB_{t-i}, 0)$$

$$NEG_t = \sum_{i=1}^{t} \Delta CAPB_{t-i}^- = \sum_{i=1}^{t} \min(\Delta CAPB_{t-i}, 0) ---- (3)$$

Following Shin *et al*. (2014), $\Delta CAPB$ of equation-2 is substituted by POSt and NEGt as below:

$$\Delta Inf_t = \alpha + \sum_{i=1}^{p1} \beta_{1i} \Delta Inf_{t-i} + \sum_{i=0}^{p2} \beta_{2i}^+ \Delta POS_{t-i} + \sum_{i=0}^{p3} \beta_{3i}^- \Delta NEG_{t-i} + \sum_{i=0}^{p4} \beta_{4i} \Delta CAB_{t-i} + \sum_{i=0}^{p5} \beta_{5i} \Delta GBM_{t-i} + \sum_{i=0}^{p6} \beta_{6i} \Delta GNEER_{t-i}$$

$$+ \sum_{i=0}^{p7} \beta_{7i} \Delta OIL_{t-i} + \lambda_1 Inf_{t-1} + \lambda_2^+ POS_{t-i} + \lambda_3^- NEG_{t-i} + \lambda_4 CAB_{t-i} + \lambda_5 GBM_{t-i} + \lambda_6 GNEER_{t-i} + \lambda_7 OIL_{t-i} + \varepsilon_t \; - - - -(4)$$

The above specification in equation-4 is another ECM which is not only estimable by the OLS, but also the conventional ARDL techniques of Pesaran et al. (2001) are uniformly applicable to it (Shin *et al*., 2014).

IV. EMPIRICAL ESTIMATION

Before the application of the ARDL techniques, the variables of the model were checked for stationarity via DF-GLS and PP tests (see Table 1). Since many authors (Harris, 1992, 2009; Elliot, Rothenberg, & Stock, 1996) have shown that the conventional ADF test is not reliable in small sample studies and prefer DF-GLS test. Both the tests report that cyclically adjusted primary balance (CAPB) and oil prices (Oil) are stationary at the first difference, while inflation (Inf), current account balance (CAB), growth of broad money (GBM) and growth of real effective exchange rate (GNEER) are stationary at their levels. In short, both the tests justify the application of the NARDL techniques.

TABLE 1

Evidence from DF-GLS (ERS) and PP Tests

Variables	DF-GLS				Philips-Perron			
	Drift		Drift & Trend		Drift		Drift & Trend	
	Level	Δ	Level	Δ	Level	Δ	Level	Δ
Inf	-2.92*	-6.75*	-2.97***	-7.67*	-3.02**	-7.87*	-2.97	-7.78*
CAPB	-0.40	-2.52**	-1.66	-3.66**	-2.60	-3.03**	-2.19	-4.31*
CAB	-2.55**	-6.37*	-2.82	-6.37*	-2.97**	-6.31*	-2.87	-6.27*
GBM	-5.40*	-7.24*	-5.50*	-7.66*	-7.85*	-16.15*	-8.15*	-15.83*
GNEER	-5.05*	-8.94*	-5.21*	-9.33*	-5.14*	-24.07*	-5.11*	-23.94*
Oil	-1.51	-6.72*	-2.17	-6.73*	-1.69	-6.66*	-2.12	-6.58*

Note: *, **, and *** symbolize significance at 1%, 5% and 10% respectively.

The results of the FTPL model under the frameworks of both the LARDL and NARDL are presented in Table 2. The value of F-statistic (2.471) of LARDL is less than the lower critical value at even 10 percent level, and hence shows no long-run relationship. The bound F-Statistic (5.575) under the NARDL is greater than the upper critical value at conventional level of significance. This confirms the existence of co-integration. The empirical model includes other explanatory variables besides proxy of fiscal policy including CAB, growth of money supply (GBM), growth of nominal effective exchange rate (GNEER) and price of crude oil per barrel in the US dollar.

To detain the effect of the output gap and debt to GDP ratio in excess of 60 percent, two dummy variables have been created. The one represented by DUM_{Debt} takes the value of '1' when the public debt exceeds 60 percent of the GDP and '0' if otherwise; while the other is denoted by DUM_{Gap}, taking the value of '1' if the output gap is positive and '0' if otherwise. The study of Jašová, Moessner, and Takáts (2019) shows the importance of both the domestic and global output gaps in influencing the domestic level of inflation, with positive output gap having positive impact. Similarly, public debt in excess of 60 percent of the GDP is considered as growth retarding and inflationary. In a study, Cherif and Hasanov (2012) reveal that high levels of public debt and fiscal deficit create vulnerabilities and a debt-reduction strategy should therefore constitute the elements of the fiscal adjustment, high growth, low interest rate and large inflation. The current study therefore includes a dummy variable to capture such possible impact of higher debt to GDP ratio.

TABLE 2

Bound F-test of FTPL Model

Level of Significance	Linear-ARDL (1, 0, 0, 0, 1, 0) F-Statistic =2.471		NARDL (1, 2, 1, 2, 3, 0, 0) F-Statistic = 5.575	
	I(0)	I(1)	I(0)	I(1)
10%	3.032	4.213	2.831	4.04
5%	3.577	4.923	3.327	4.7
1%	4.885	6.55	4.527	6.263

Note: DGP is assumed to be case-V; while lag selection is based on SIC. Critical values are obtained from Narayan (2005) for n=40.

Pesaran et al. (2001) and other recent studies (for example, Goh, Yong, Lau, & Tang, 2017; McNown, Sam, & Goh, 2018; Sam et al., 2019) have warned to test the degenerate cases in the application of the ARDL techniques. The study therefore conducted tests for the degenerate-dependent and degenerate-independent cases which may arise in both the LARDL and NARDL modeling of the co-integration relationship. The LARDL model suffers from degenerate-dependent problem (Table 3) as the t-bound value (-3.366) in absolute term falls below the upper critical value at 10 percent probability level.

TABLE 3

Degenerate-Dependent and Degenerate-Independent Cases of
FTPL Model

Level of Significance	LARDL				NARDL			
	t-Stat = 3.366		Wald-F = 4.289		t-Stat = 4.742		Wald-F = 4.639	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
10%	-3.13	-4.21	2.03	3.54	-3.13	-4.37	1.98	3.45
5%	-3.41	-4.52	2.51	4.24	-3.41	-4.69	2.42	4.11
1%	-3.96	-5.13	3.69	5.96	-3.96	-5.31	3.46	5.68

Note: The lower and upper critical bound values for Wald-F under DGP case-V are taken from Sam et al. (2019), while that of t-static. are obtained from Pesaran et al. (2001) table.

However, NARDL model does not suffer from either of the degenerate problems. The t-bound value (-4.742) in absolute term is greater than the upper critical bound value at 5 percent level of probability, while in testing the degenerate-independent case the Wald test (4.639) indicates that NARDL model does not suffer from this problem. Similarly, for NARDL model, the weak exogeneity tests of explanatory variables have been conducted via the Likelihood Ratio (L.R.) test (reported in Table 4). The L.R. test shows that CAPB, CAB, and Oil are weakly exogenous at 5 percent level of probability, while the test statistic rejects the null hypothesis of weak exogeneity in cases of GBM and GNEER.

TABLE 4

NARDL Weak Exogeneity Test (Likelihood Ratio) of FTPL Model

	α_{CAPB}	α_{GBM}	α_{CAB}	α_{OIL}	α_{GNEER}
χ^2	0.096	19.129	1.610	0.195	24.350
Prob.	0.953	0.000	0.447	0.907	0.000

The long-run estimates of both the LARDL and NARDL are reported in Table 5. The estimates of LARDL are not reliable as the model did not confirm the co-integration relationship and also suffers from the degenerate-dependent problem; whereas, that of NARDL are reliable. The coefficient associated with (CAPB_POS) is significant at standard level of probability. This implies that positive change in the fiscal balance (contractionary fiscal policy) reduces inflation. Similarly, expansionary fiscal policy (CAPB_NEG) positively and significantly affects inflation over the long run. Remarkably, this finding conforms with the view of FTPL and therefore evidences that the theory holds in Pakistan.

TABLE 5

Long-Run Estimates of FTPL Model

Variable	Linear-ARDL			Variable	NARDL		
	Co-efficient	t-Stat	Prob		Co-efficient	t-Stat	Prob
CAPB	0.49	0.56	0.58	CAPB_POS	-12.41	-3.12	0.01
-	-	-	-	CAPB_NEG	12.46	3.38	0.00
GBM	-11.63	-0.75	0.46	GBM	29.62	1.29	0.21
CAB	-1.03	-2.18	0.04	CAB	-1.55	-3.66	0.00
OIL	0.10	1.05	0.30	OIL	0.24	3.51	0.00
GNEER	0.25	0.03	0.98	GNEER	3.47	0.55	0.59

Reverting to the speed of adjustment measured by the ECM term for both LARDL and NARDL (see Table 6), it is apparent that the ECM term is significant for the NARDL-model only. The size of ECM term indicates that 64.8 percent errors are being restored each year when a shock occurs.

TABLE 6

ECM t-Bound Test of FTPL Model

Level of Significance	Linear-ARDL		NARDL	
	ECM_{t-1} = -0.454 t-bound = -4.159		ECM_{t-1} = -0.648 t-bound = -7.123	
	I(0)	I(1)	I(0)	I(1)
10%	-3.13	-4.21	-3.13	-4.37
5%	-3.41	-4.52	-3.41	-4.69
1%	-3.96	-5.13	-3.96	-5.31

The short-run estimates of both the LARDL and NARDL are presented in Table 7. The impact of the fiscal consolidation, represented by the coefficient associated with D(CAPB_POS), is not only negative but also significant in the short run. This implies that contractionary fiscal policy would successfully reduce inflation, however, in the next period, the fiscal consolidation increases inflationary pressure. The expansionary fiscal policy, represented by the coefficient associated with D(CAPB_NEG), significantly increases inflation. The short-run impact of the money supply is negative and significant in the first two consecutive periods. This highlights that the expansionary monetary policy reduces inflation. This can plausibly be attributed to the impact of the monetary expansion on the pace of stable demand for money that results in a significant fall in the domestic interest rate. The declining interest rate reduces the cost of production on the one hand, while encourages investments on the other hand, thereby boosting the supply of goods and services. As a consequence, more goods and services become available which reduce the domestic inflation. Shortage of certain commodities may fuel inflation in the short run, but falls soon after the supply situation improves.

TABLE 7

ECM Estimates of FTPL Model

NARDL			LARDL		
Variable	Co-eff.	Prob.	Variable	Co-eff.	Prob.
C	4.018	0.056	C	2.699	0.104
TREND	2.593	0.000	TREND	-0.077	0.046
D(CAPB_POS)	-24.052	0.000	D(OIL)	0.128	0.000
D(CAPB_POS(-1))	20.875	0.000	DUM$_{Debt}$	0.431	0.660
D(CAPB_NEG)	1.743	0.640	DUM$_{GAP}$	-0.495	0.544
D(GBM)	-9.949	0.025	ECM$_{(t-1)}$*	-0.454	0.000
D(GBM(-1))	-19.299	0.001	--	--	--
D(CAB)	0.093	0.550	--	--	--
D(CAB(-1))	0.655	0.003	--	--	--
D(CAB(-2))	0.302	0.065	--	--	--
DUM$_{Debt}$	3.025	0.012	--	--	--
DUM$_{GAP}$	0.425	0.566	--	--	--
ECM$_{(t-1)}$*	-0.648	0.000	--	--	--

Note: * indicates that p-value is not compatible. The t-bound critical values for the ECM terms are reported in Table 6.

The results of our study also highlight that improvement in the current account balance enhances the domestic inflationary pressure in the short run against its negative impact in the long run. This positive impact is statistically insignificant in the first period but becomes significant over the next two consecutive periods. Such positive impact of the improved current account balance on the domestic inflation may be attributed to the relative elasticities of the imports and exports. It is obvious that the current account balance improves when the imports fall and/or exports rise. Intuitively, when the demand for exports rises in the international market, the domestic suppliers often rush to exports at the cost of squeezing supply from the domestic market. On the pace of inelastic supply in the short run, such exports are expected to add to the domestic inflationary pressure. Imposition of custom duties on the import of essential raw materials and consumption goods is another factor that adds to the domestic inflation.

Similarly, the results of estimated model show that public debt in excess of 60 percent of the GDP is found to fuel inflation and the impact

is significant at conventional level of probability. This finding conforms to the findings of Ahmad, Sheikh, and Tariq (2012) who found high domestic debt as the main cause of inflation in Pakistan. Positive output gap is also found to add to inflationary pressure, but this effect is statistically insignificant.

TABLE 8

Testing Impact Asymmetry under FTPL Model

Type of Asymmetry	Wald/F-Stat.	I(0)	I(1)	Conclusion
Long-Run Impact Asymmetry	29.454	5.387	6.437	Asymmetry
Short-Run Impact Asymmetry	2.476	4.510	5.643	No Asymmetry

The tests of asymmetry (reported in Table 8) do not confirm the short-run impact asymmetry. The value of Wald = 2.476 does not exceed the upper critical value at 5 percent level of probability. The Wald test only evidences the long-run asymmetric impact of the CAPB on inflation. The calculated value of this statistic (29.454) is greater than the upper critical value at 5 percent level of probability.

Both models were scanned for the conventional diagnostic tests (see Table 9). The LARDL model passes the test of normality, serial correlation and heteroskedasticity, but could not qualify the RESET test, and hence suffers from wrong functional form. The model rejects the hypothesis of correct specification under Ramsey RESET test at 1 percent level of significance. This may be attributed to the underlying assumption of symmetry. Contrarily, the NARDL model passes all these tests including the functional form test. Similarly, parameters of the NARDL model are found to be stable. These tests have been conducted on the basis of both the CUSUM and square of CUSUM tests, and are reported in Appendix B.

TABLE 9

Diagnostic Checking of FTPL Model

Problem	LARDL-Model		NARDL-Model	
	test-Stat.	Prob.	test-Stat.	Prob.
Normality	J.B. =1.036	0.596	J.B. = 0.497	0.780
Serial Correlation	F_{LM} =0.256	0.776	F_{LM} = 2.013	0.162
Heteroskedasticity	$\chi^2_{B.P.G}$ =13.100	0.218	$\chi^2_{B.P.G}$ = 20.088	0.328
Specification	F_{RESET} =8.270	0.007	F_{RESET} =4.828	0.041

IV. CONCLUSION AND POLICY RECOMMENDATION

In case of the fiscal activism as is the case of majority of the developing countries including Pakistan, the researchers often associate the domestic inflationary pressure to expansionary monetary policy and exchange rate depreciation. In situation of inflation targeting by the central bank on the pace of the fiscal activism, it is the fiscal policy that directly influences monetary policy and indirectly, the inflation. Our analysis shows that the impact of money supply and exchange rate depreciation becomes insignificant when the influence of the fiscal deficit is allowed to be asymmetric under the framework of NARDL model. Their signs are however in line with the expectations of their respective theories. Besides domestic factors, this study finds external factors as the main cause of inflation. The estimates reveal that the current account deficit and the international oil prices have a significant positive impact on the domestic inflation in Pakistan.

To test the FTPL, keeping in view the characteristics of Pakistani economy for the sample period, the empirical estimation has been calibrated on the New-Keynesian model of small economy. Specifically, the calibration has been made on the models of Gali and Monacelli (2008) adopted by Çekin (2017) and the model of Cerisola and Gelos (2009). The dynamic relationship between the fiscal policy and inflation is captured by the application of LARDL and more specifically, the possible asymmetric effect that the fiscal policy has on the general price level via NARDL techniques. The estimates of LARDL are not reliable as the model does not confirm the co-integration relationship and even

suffers from the degenerate-dependent problem. The estimates of the NARDL are reliable as the model does not suffer from the degenerate problems. Remarkably, the finding conforms with the view of the FTPL and therefore evidences that the theory holds in the long run. However, the impact of the fiscal deficit on inflation is found to be asymmetric. From the tests of asymmetry under the NARDL modeling, the present study only confirms the long-run asymmetric impact of CAPB on inflation. The NARDL techniques isolate the impact of the expansionary fiscal policy from the contractionary fiscal policy and assume that both the impacts are not equal. Contrarily, the LARDL techniques presume such impact to be equal and co-integration relation is therefore lost in the present case.

Based on the outcomes, the study carries important policy implications and recommendations to the government of Pakistan in general and the fiscal managers in particular. To reduce the domestic inflationary pressure, the fiscal austerity measures would work and such impact would become more visible if the other associated policies are accommodative.

It is obvious that the current account balance improves when the imports fall and/or exports rise. Intuitively, when the demand for exports rises in the international market, the domestic suppliers often rush to exports at the cost of squeezing supply from the domestic market. On the pace of inelastic supply in the short run, such exports are expected to add to the domestic inflationary pressure. Imposition of custom duties on the import of essential raw materials and consumption goods is another factor that adds to the domestic inflation. Thus, the domestic inflationary pressure may be minimized by adopting the tax policy that restricts the import of luxury items and exempts essential raw materials and consumption goods. This will not only impact the inflation directly, but would also reduce the inflationary pressure via the channel of improvement in the current account balance, indirectly. Similarly, the analysis has shown high public debt liabilities as inflationary, therefore, the Fiscal Responsibility and Debt Limitation Act need to be implemented in its true spirit to monitor and limit the opportunistic behavior by the political parties in power in creating political business cycle and mounting public debt. Besides this, the current tax structure

carries a variety of tax exemptions and is skewed towards the indirect taxes; therefore the fiscal reforms that may make the tax system fairer and efficient with a switch from the indirect to direct taxes would be helpful in generating sufficient revenue and reducing inflationary pressure in Pakistan.

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APPENDICES

Appendix A

Definitions of Variables, their Measurement and Data Sources

Definition	Notation	Measurement	Data Source
Current Account Balance	CAB	Current Account Balance [net exports of goods and services + net income from abroad + net unilateral transfers] as percent of GDP	WDI-2017
Primary Fiscal Balance	PFB	Primary fiscal balance=Total revenue less total government spending excluding interest payment as a percent of GDP	ESP (Various Issues)
Inflation	Inf	Inflation based on Consumer Price Index (CPI) annual in percent	WDI-2017
Ratio of Debt to GPD	Debt	Total publically guaranteed debt as percent of GDP	ESP (Various Issues)
Output Gap	Gap	Output gap is difference between actual GDP and potential GDP	Handbook of Statistics (SBP)
Growth of Money Supply	GBM	Broad money as percent of GDP $[GBM=\log(BM)-\log(BM)_{t-1}]$	WDI-2017
Growth of Nominal Effective Exchange Rate	GNEER	Index of nominal effective exchange rate $[GNEER=\log(NEER)-\log(NEER)_{t-1}]$	Handbook of Statistics (SBP)
Oil Price	Oil	Nominal price in US dollar per barrel	InflationData.com

Note: Increase in exchange rate represents depreciation, while decrease indicates appreciation of Pakistani currency. For cyclical adjustment of the variables Hodrick-Prescott Filter with Lambda= 6.25. Hodrick and Prescott suggest to use lambda=100, whereas Ravn and Uhlig (2002) recommend to set Lambda equal to 6.25.

Appendix B

CUSUM and Square of CUSUM Tests of FTPL Model