
The Impact of Public debt on Inflation in Pakistan

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ABSTRACT

This paper explores the impact of public debt on inflation in Pakistan over the period 1986 to 2020 using annual time series data. The study examined the relationship among inflation and public debt using ARDL bounds testing cointegration approach and an ECM model to examine this linkage. The co-integrating regression outcome provides the indication of the existence of a stable long-run relationship between inflation and the independent variables. Furthermore, study showed a positive and significant impact of public debt on inflation in the long run where as in the short run the relationship was positive but insignificant. This study does not support the Ricardian framework.

Keywords: Public, Inflation, Pakistan

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INTRODUCTION

Public debt is used by the governments around the world to overcome their fiscal deficit. Many difficulties that fiscal deficit and public debt may bring to any economy includes inflation, sluggish growth, unemployment, balance of payments disequilibria, and high real interest rates. Among these problems or difficulties inflation is the crucial indicator that provides an insight in to the state of the economy as it affects people from all (different) walks of life. Therefore, the investigation of the association between public debt and inflation has lured a lot of studies in the recent years, but no consensus has been reached till date regarding their relationship. It is generally argued that the link among these variables is complex and is largely determined by cross-country difference.

There are different school of thoughts with opposing views regarding the causes of inflation. One of them is Monetarist School of thought, which claims that inflation is a

monetary phenomenon. They suggest that in the short run quantitative easing will surge output (real) and inflation, however only inflation will rise in the long run (Friedman, 1968). The monetarist view of the inflation is built on the argument that price level can be completely controlled by monetary authority. Moreover, they support active monetary and submissive fiscal policy operative under Ricardian framework. The classical Ricardian framework suggests that liquidity demand and its variation over time determine the direction of price level (Attiya et al., 2008). According to Barro (1976, 1989), Ricardian equivalence is grounded in monetarist interpretation on inflation, which suggests that public debt has no significant impact on the price level determination, denoting that government securities are not net wealth. Leeper (1991) and Marzieh (2015) also suggested that dominant monetary and submissive fiscal policy will produce Ricardian equilibrium, proposing that management of the debt does not have monetary implication. Hence, a dominant monetary policy and a submissive fiscal policy, where taxes are altered sufficiently to overcome the debt of government will always be inflationary. In another study, Walsh (2010) also examined the connection amongst public debt and inflation under the Ricardian and Non-Ricardian system. He argued that monetary and fiscal policies are related via public sector's budget limitations, where fiscal authority's choices can be inflationary. His model showed that public debt has no role in the determination of price level in the Ricardian system. Conversely, nominal supply of money and the nominal stock of government's debt play role in non-Ricardian system. Under non-Ricardian policies fiscal policy does not produce wealth effect. Households' lifetime budget set is affected by changes in the value of government securities. Fiscal instability disturbs price level by means of wealth effect on the private sector demand for consumption (Woodford, 1998). Therefore, inflation is predominantly a fiscal problem under non-Ricardian system, with monetary variables having a marginal role (Acre, 2007).

Contemporary studies show that inflation is not purely a monetary problem but a fiscal problem too, which exaggerates with the increase in public debt (Lin and Chu, 2013). Elmendorf and Mankiw (1999) proposed that expansionary fiscal policy tends to influence the aggregate demand in the short run by raising the disposable income and producing positive effect on wealth, that in turn might produce inflation. Sargent and Wallace (1981) have also shown in his study, that the interaction of the monetary and fiscal policy is crucial for the formation of the link between public debt and inflation. Hence, the control of inflation in any economy does not solely depend on the changes in money supply.

The Fiscal Theory of Price Level (FTPL) theorizes that fiscal policy tools like debt, expenditures, revenues, and deficit play major role in determining the price level in an economy. The major postulate of FTPL is that the price level is determined by the fiscal policy, and monetary policy has a subordinate role (Leeper 199 and Woodford 1995). Whereas Kwon et al. (2006) and Sargent and Wallace (1981) are of the view that monetary policy alone may not be enough to curb inflation. Furthermore, to accomplish the goal of controlling inflation, the monetary policy must be in harmonization with fiscal policy; so, massive stock of public debt can be inflationary and they should be cautiously used in financing budget deficits. The FTPL have a specific significance for developing economies as they issue debt in domestic currency and every so often are lacks the capacity to mobilize the required tax revenues, inducing an active fiscal policy and a passive monetary policy (Beck-Friis and Willems, 2017). Blanchard (2004) proposed for developing economies, that a rise in interest rate (in countries with large public debt) intended to control price

increases can surge debt servicing cost, debt level, country premium & probability of default; which in turn might initiate flight of capital and depreciation of the exchange rate. The ultimate impact would be the inflation. Therefore, FTPL can be used to describe the source of the variation in the price level for an economy on the basis of public debt and its impact on household spending (Castro et al., 2003 and Kwon et al., 2006).

The crux of the theories presented above is that the coordination among monetary and fiscal policy is necessary for the control of inflation. Therefore, the usefulness of monetary policy is obstructed if fiscal policy turns out to be dominant. In economies where there is fiscal dominance, the fiscal policy has a strong impact on the monetary authority or the central bank capability to overcome inflation and it is difficult for them to control inflationary pressures efficiently. The fiscal domination sometime leads macroeconomic variables towards an unsustainable track from where the recovery is a daunting task. Islam and Wetzel (1991) said that the fiscal deficit is the major factor behind, heightened inflation and meager economic growth in developing countries. Sims (2016) argued that sustained and increasing deficit in the government budget are ultimately inflationary, irrespective of the central bank's policies. Therefore, effective policy coordination is required between monetary and fiscal authorities for a controlled inflation level. Reinhart and Rogoff (2010) also concluded that high level of debt's stock is likely to be inflationary specially in emerging economies. Bleaney (1996) and Romero and Marin (2017) also shows that there exists a positive relationship among inflation and public debt.

Though numerous studies have been done to study the linkage between public debt and inflation but studies related to Pakistan have mostly focused on the impact of public debt on economic growth only, where public debt has been used extensively to fund fiscal deficits. Therefore, the key aim of the current study is to explore the effect of public debt on inflation in Pakistan using the ARDL approach. This investigation is of vital importance for the policy makers and government to pay attention towards rising public debt and its macroeconomic effects, particularly its effect on price level in Pakistan. The rest of this paper is organized as follows: Section 2 discusses literature review. Section 3. presents data and estimation technique Section 4 presents empirical analysis and results of the study. Section 5 provides conclusion of the study.

Literature review

The relationship of public debt with inflation has generated an enormous interest in both theoretical and empirical literature. There is a broad agreement among policy makers and researchers that a persistent increase in Public debt will create inflationary pressure in the economy. The empirical literature reviewed in this section is restricted on investigations carried out between public debt and its impact on (inflation).

Musgrave (1949) and Phelps (1973) pioneered the connection between inflation and public debt. Musgrave (1949) initiated the discussion on the relationship between inflation and debt(public) signifying that, if the holder (public) of securities (government) tries to sell up all or a percentage of their holding, with government buying them. This liquidation of securities will increase the size of bank credit supply promptly. Such expansion might generate an enormous inflationary pressure in the economy. Phelps (1973) presented his argument on inflation through the lens of public finance. He advocated that Central Bank should be given the role of monitoring inflation, whereas fiscal authorities should be given

the sovereignty over providing compensating variations in government deficit. Numerous other studies have followed the footsteps of Musgrave and Phelps in determining the relationship between public debt and inflation. Fisher and Easterly (1990) in their study found that inflation is a fiscal phenomenon and monetary and fiscal policy coordination is required to control inflation. Taghavi (2001) investigated for large European economies over the time period 1970 to 1997, the proposition that public debt adversely impacts inflation, investment and economic growth. His study found that debt has significant negative effects on investment but its influence on growth is ambiguous. Likewise, public debt has an inflationary effect in long run, but this relation is not clear in the short run. For a sample of 71 countries, Kwon et al. (2006) found that a growth in public debt is highly inflationary in developing economies with high debt, weakly inflationary in other countries that are not highly indebted, and no impact in highly developed countries. Lopes Da Veiga et al. (2016) found a positive connection between inflation and public debt in developing countries with high public debt levels. Afonso and Ibraimo (2018) used VAR technique to determine the relationship of public debt with inflation in Mozambique. He found a positive connection, implying that a surge in public debt tends to be inflationary. Wheeler (1999) and Karakaplan (2009) found that the developed countries and developing countries where public debt level is low there exist a negative association among public debt and Price level. Wijnbergen and Budina (2001) also found same result for the countries where debt market is at initial stages.

Bildirici and Ersin (2007) found for nine countries over the period 1980 to 2004, that the inflation is inevitable with the increase in domestic debt due to wealth effect. Furthermore, inflation can be described through the cost of domestic. The results of their study showed that the use of monetary tightening to overcome inflationary episodes escalates interest payments and magnifies the stock of domestic debt which ultimately will intensify inflationary pressure. Ahmad et al. (2012) in a related study, examined the effect of domestic debt on inflation from the year 1972 to 2009 for Pakistan. Their study found that domestic debt and the cost of the debt servicing has contributed massively to the instability in price level in Pakistan. Nastansky et al. (2014) empirically examined the relationship between public debt and inflation for Germany over the period 1991 to 2010. Their study showed that the public debt level significantly and positively impacts consumer price level. Whereas, Essien et al. (2016), suggested a negative relationship between inflation and public debt. Lopes et al. (2016) proposed that the connection among inflation and public debt is dependent on debt level of a country. For 52 African countries over the period 1950 till 2012, they found that high debt level added to growing inflation rates. Romero and Marin (2017) in their study on 52 countries found that in countries having high public debt, positive association exists amid public debt and inflation. Urquhart (2021) investigated the relation among public debt and inflation in view of the FTPL for Paraguay. Their study suggested a positive association between price level and public debt. Furthermore, their study supported non-Ricardian framework. Aimola and Odhiambo (2021) also studied the relationship between inflation and public debt for Nigeria. Empirical results of their study showed that there exists no influence of public debt on inflation. Therefore, other factors might be the reason behind inflation in Nigeria. In another study, Aimola and Odhiambo (2021) studied the impact of public debt on inflation in Ghana where they found positive relation between inflation and public debt.

The studies on the negative relationship between the price level(inflation) and public debt is rare. Though the relationship between them is inconclusive, majority of the studies have shown that this relationship depends on countries, estimation approach and the variables selected. The literature in this study incline towards a positive relationship between inflation and public debt.

Estimation technique and Data

Model specification

The study examines the relationship between inflation and public debt in Pakistan. Based on the empirical literature, the model specified is as follows:

$$INF = f(PD, UNEMP, GDPG, IR, GFC) \dots\dots\dots (Eq-1)$$

Where

INF=Inflation rate

PD=Public debt

UNEMP=Unemployment

GDPG=GDP growth rate

IR=Inflation Rate

GFC=Gross Capital formation

The study utilized an ARDL bounds testing approach to study the connection between public debt and inflation. The benefit of using the ARDL approach is that it can provides consistent and reliable estimates when the sample size is small. This approach also provides unbiased results of the long-run model and valid t-statistics even when some of the independent variables are endogenous. The system of ARDL-based cointegrating equations associated with the causality model employed in this study can be given as follows (see Pesaran et al., 2001).

$$\begin{aligned} \Delta INF_t = & \alpha_0 + \alpha_1 \Delta INF_t + \sum_{i=1}^p \alpha_2 \Delta INF_{t-i} \\ & + \sum_{i=0}^q \alpha_3 \Delta PD_{t-i} + \sum_{i=0}^q \alpha_4 \Delta UNEMP_{t-i} \\ & + \sum_{i=0}^q \alpha_5 \Delta GDPG_{t-i} + \sum_{i=0}^q \alpha_6 \Delta IR_{t-i} + \\ & + \sum_{i=0}^q \alpha_7 \Delta GFC_{t-i} + \gamma_1 INF_{t-1} + \gamma_2 PD_{t-1} + \gamma_3 UNEMP_{t-1} \\ & + \gamma_4 GDPG_{t-1} + \gamma_5 IR_{t-1} + \gamma_6 GFC_{t-1} + \epsilon_t \end{aligned}$$

represent short run coefficients and γ represents long term coefficients.

Data Sources

Annual time-series data over the period 1986 to 2020 was utilized for the study. The data on GDP growth rate and Gross capital formation was collected from WDI. The data on Interest rate was collected from International Financial Statistics published by IMF. The data on Unemployment and Public debt was collected from various Annual Economic survey published by ministry of finance; Government of Pakistan.

Result and Discussion

Descriptive Statistics

Table 1 shows the descriptive analysis of all variables used in this study. It indicates that the average value of Inflation (INF) is 8.19. The maximum value is 20.82 and the minimum value is 2.52. The standard deviation value is 3.90. The mean value of Public debt (PD) is 15.16 with the standard deviation of 1.30. The mean value of GDP growth rate (GDPG) is 4.24 with the standard deviation of 2.0. The mean value of gross fixed capital formation (GCF) is 13.0 with a standard deviation of 1.51. The mean value of interest rate (IR) is 8.49 with standard deviation of 2.62 and the mean value of Unemployment (UNEMP) is 5.77 with a standard deviation of 1.41.

Table-1

	INF	PD	GDPG	GCF	INR	UNEMP
Mean	8.1972	15.1611	4.2433	13.021	8.4978	5.7731
Median	7.9210	15.1222	4.6747	13.425	8.5708	5.9000
Maximum	20.286	17.4100	7.7058	15.499	12.471	8.2700
Minimum	2.5293	12.8739	-0.9353	10.093	2.1391	3.0500
Std. Dev.	3.9076	1.30386	2.0149	1.5172	2.6274	1.4196
Observations	35	35	35	35	35	35

Correlation Matrix Table-2

	INF	PD	GDPG	GCFPVT	INT	UNEMP
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INF	1.0000	-0.0306	-0.3759	0.1477	0.6549	-0.1773
PD	-0.0306	1.0000	-0.3598	-0.6888	0.1603	0.5072
GDPG	-0.3759	-0.3598	1.0000	0.1863	-0.6374	-0.1548
GCF	0.1477	-0.6888	0.1863	1.0000	-0.0400	-0.0977
INR	0.6549	0.1603	-0.6374	-0.0400	1.0000	-0.1260
UNEMP	-0.1773	0.5072	-0.1548	-0.0977	-0.1260	1.0000

Table 2 shows the correlation matrix of the variables. It shows that there exists a negative correlation between inflation and public debt. Also gdp growth rate and unemployment are negatively related to inflation. While Gross capital formation and Interest rate are positively related to Inflation.

Unit Root Test

Before continuing with ARDL estimation it is necessary to conduct the unit root test, in order to verify that none of the variable is integrated of order 2 or above. We used Augmented Dickey-Fuller (ADF) Test and Phillips Perron (PP) to check for the stationarity of the variables. Table 3 and 4 indicates the results of the ADF and PP tests at level and at first difference.

The result of ADF test for unit root is exhibited in the table 3 and table 4 shows the result of Phillips Perron test. It is evident from the table that no variable is of integration order 2 i.e. I (2) or higher for both ADF and PP tests for unit root. The hypothesis for the presence of unit root is tested at a 5 percent level of significance.

Table 3

Variables	(at level)	(1st difference)
INF	-2.8046	-6.7286 ***
PD	-2.3993	-3.6816 **
GDPG	-2.9458**	-
GCF	-2.7619	-5.7642 ***
INR	-2.2947	-5.3083 ***
	-2.9224	-6.4784 ***

ADF TEST STATISTIC

Notes: *, ** and *** shows 10%, 5% and 1% level of significance

Table 4:PP TEST STATISTIC

Variables	(at level)	(1st difference)
INF	-2.9072	-6.7064 ***
PD	-2.0787	-3.6682 **
GDPG	-2.6000***	-
GCF	-2.8355	-5.8853 ***
INR	-2.3884	-5.3083 ***
	-2.9962	-6.4783 ***

Notes: *, ** and *** shows 10%, 5% and 1% level of significance.

ARDL bound cointegration test

The results of bound cointegration test is shown in table 5. The value of F-statistic surpasses the upper bound critical value at 10% significance level, as recommended by Pesaran, Shin, and Smith (2001). Therefore, the null hypothesis of no cointegration is rejected, signifying that there exists a long-run association among inflation, public debt, interest rate, gdp growth rate, gross capital formation and unemployment.

Long-run and short-run estimates

Since there exists a long run relationship amid inflation and independent variables, long run and short run estimations are presented in Table 6. The Panel A shows the long run estimates and Panel B shows the short run estimates. The result shows that the coefficient of the variable public debt is positive and is significant (statistically) in long run though it is positive and insignificant in short run. This result indicates that there is a positive relationship between public debt and inflation in Pakistan. This finding is consistent with previous studies such as Kwon et.al.(2009) and Ahmad et.al.(2012). The coefficient of economic growth is negative and statistically significant in both short- and long run. We can conclude from this result that there is a negative influence of gdp growth on the inflation in Pakistan. This finding is in line with by Stockman (1981), who also found negative connection between these variables. The coefficient of Gross capital formation is positive. The variable interest rate has a positive and statistically significant impact on inflation in the short run, but has negative and insignificant impact over inflation in the long run. Furthermore, unemployment and inflation are negatively related in both short and long run. Panel B of the table 6 indicates that the sign of CointEq (-1) is negative as expected and is also significant statistically. This signifies that a shock to the system in the previous year will be corrected by 47% towards its convergence to the steady state in the current year. The value of R-squared is about 92% which signifies that the results of the regression are a good fit.

The stability of estimated ARDL model was checked by using cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) tests in accordance with the previous studies (see Pesaran and Pesaran ,1997). Figures 1 and 2 displays the plots of cumulative sum and the cumulative sum of square statistics which are inside the critical bounds of 5% , indicating that the selected model is stable over the time.

The stability and reliability of the model was confirmed by conducting various diagnostic tests on the estimated parameters of the model. The results for serial correlation test, ARCH test for heteroscedasticity and Ramsey Reset test for functional form are shown in the table 7. The statistics of the tests revealed that the selected model passed all diagnostic tests. There is no serial correlation among the residuals The heteroscedasticity test showed that the error variance is homoscedastic. The probability value of the Ramsey RESET test is less than 5 percent level, which clearly indicated that the overall model is correctly specified.

Table 5: ARDL Bounds Test

Test Statistic	Value	k
F-statistic	31.11652	6
Critical Value Bounds		
Significance	I(0)	I(1)
10%	2.75	3.79
5%	3.12	4.25
1%	3.93	5.23

Table 6: Results of the Long run and Short run model

<i>Panel A: Long run coefficient of regression</i>			
Variables	Coefficient	t-Statistic	P-value
PD	44.064	-1.845	0.0980
GDPG	-19.159	-1.460	0.0784
GCF	3.089	1.015	0.0366
INR	-4.675	-1.202	0.0599
UNEMP	-9.155	-1.392	0.0172
<i>Panel B: Short run coefficient of regression</i>			
Variables	Coefficient	t-Statistic	P-value
D(PD)	1.2079	0.2119	0.8369
D(GDPG)	-1.3441	-4.7752	0.0010
D(GCF)	2.2372	4.6356	0.0012
D(INR)	0.5898	3.0572	0.0136
D(UNEMP)	-1.3794	-2.2053	0.0549
CointEq(-1)*	-0.4781	-6.0042	0.0002
C	346.4730	6.0616	0.0002
@TREND	-0.2562	-2.3464	0.0002
R-squared	0.9221		
Adjusted R-squared	0.8275		
F-statistic	19.7466		
Prob(F-statistic)	0.0000		

Table 7: Post Estimation Diagnostic Tests

Null Hypothesis	F-statistic (P-value)
BG Serial Correlation LM Test: No Serial Correlation	1.6483(0.2591)
Heteroskedasticity Test	0.5745(0.4546)
Ramsey RESET Test for the Functional Form	1.5625(0.0209)

Figure 1

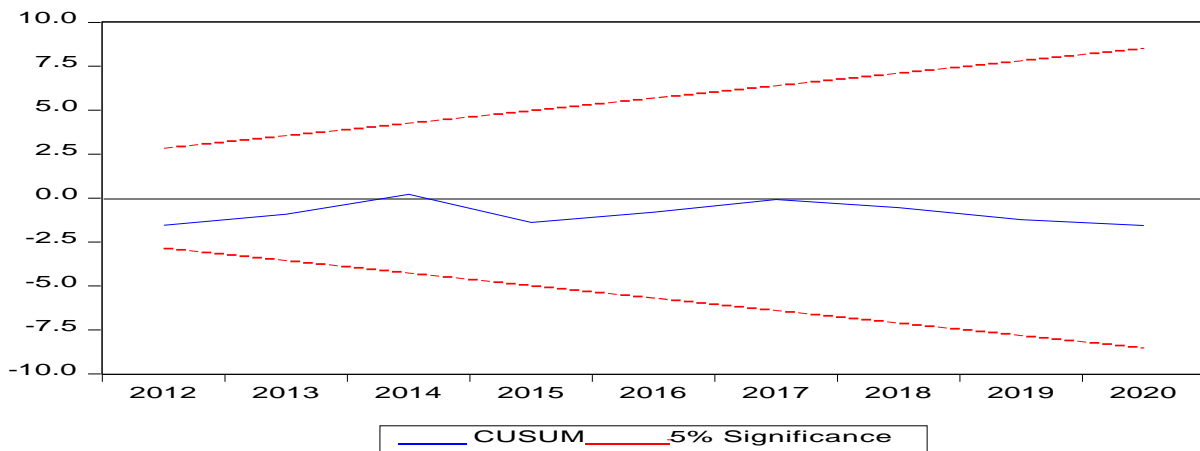
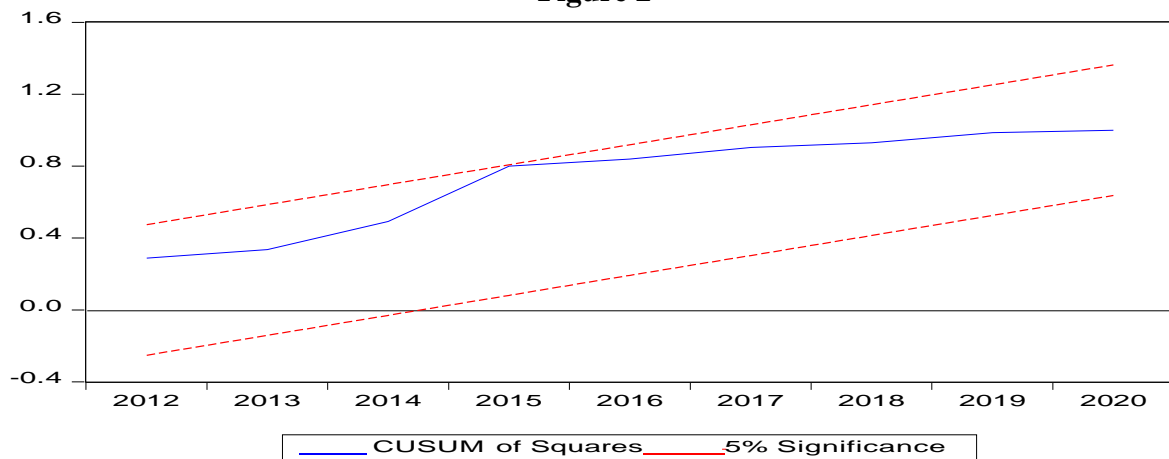


Figure 2



Conclusion

The objective the study was to analyze the association between public debt and inflation in Pakistan over the period 1986 to 2020. The study utilized the ARDL approach to cointegration and the error-correction model for empirical estimation. The results of the study showed that a stable long-run cointegration exists between inflation, public debt, interest rate, economic growth, private investment and unemployment. The ARDL model results indicated that public debt has a positive and statistically significant effect on

inflation in Pakistan which is in contradiction to the Ricardian equivalence theorem. The findings of the study highlight challenges for the policy makers and authorities to stabilize price level in a highly indebted country like Pakistan. Besides, the study also provides evidence that fiscal policy can be a dominant factor in promoting inflation specially in developing countries with high debt.

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