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Are Government Budget Deficits Inflationary? Evidence from Pakistan

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1. INTRODUCTION

In academia as well as policy-making institutions, there has been a long standing interest in analysing the phenomenon of inflation. Amongst the possible determinants of inflation, budget deficits may be one whose importance might have grown since the oil price hikes of 1973-74 and in 1979. For many a developing countries these increases in oil price have been responsible for the massive current account deficits as well as rapidly increasing domestic budget deficits of the last decade or so. During the 1980s, the budget deficit for Pakistan also grew rapidly reaching a record high of 8.6 percent of the GDP in 1987-88. Lately in the backdrop of the recent structural adjustment programmes, there has been much interest in determining the optimal size and the macro economic role of the budget deficits. However, despite its growing importance, the effects of budget deficits are not well understood.

While there have been some very useful studies for Pakistan which have looked into the effect of budget deficits on inflation, they have mostly modelled them in the quasi-monetarist spirit i.e. deficits exert only indirect impact via induced changes in money supply [Naqvi and Khan (1989)]. However, Siddiqui (1990) has conjectured that his finding of a probable two way causal relationship between money and inflation may be due to a common link with budget deficits.

In general, few attempts have been made for other countries both developed as well as developing to measure the direct impact of budget deficits on inflation. [Some notable exceptions are Niskanen (1978); Thornton (1990); Ahking and Miller (1985) and Giannaros and Kolluri (1986) for the industrialised countries and Minford and Walters (1989); Kolluri and Giannaros (1987) for the developing countries]. The existing empirical evidence on the nature of the direct effects on inflation is sketchy or mixed at best. For instance, Niskanen finds no evidence of

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Finally, u and v are the respective error terms with zero means and positive finite variances.

Note that since each of the above equations are given in the double-log form, the coefficient estimate for a given explanatory variable would measure its elasticity with respect to the dependent variable.

In terms of the specification, the inflation or the price equation[1] (i.e. Equation (1) postulates *Ln P* to be a function of budget deficit ("fiscal effects"), one period lagged money supply[2] ("monetary effects"), one period lagged *Ln P* ("inflationary expectations effects"), *Ln CS* and *D*1 (the last two representing the "real" sector or output related influences.

Further, as possible determinants of money supply, *Ln MS*, we include budget deficit in addition to measures for total bank credit in the economy (*Ln CR*) and foreign exchange reserves (*Ln FR*).

Perhaps the most significant characteristic of our specification is that unlike existing studies of this nature for Pakistan, it allows for a direct effect of budget deficit on inflation (*Ln P*) in addition to the usual indirect effect via the money supply channel. The direct effect is measured by a_1 while the indirect effect is given by b_1 times a_2 on the assumption that the money supply equation holds for all t and in particular for t–1 i.e.

$$Ln\ MS(-1) = b_0 + b_1\ Ln\ BD(-1) + b_2\ Ln\ CR(-1) + b_3\ Ln\ FR(-1) + v(-1) \quad \ldots \quad (2)$$

Of course, the total effect of budget deficit on inflation is then given by $(a_1 + b_1 \text{ times } a_2)$.

[1]Note that the *P* level can be estimated from this equation by taking the anti-log of the estimated equation and then we can calculate the $[P - P(-1)]/P$ to obtain the rate of price change. However, some studies of inflation prefer to directly analyse the rate of inflation. We believe that looking at *Ln P* is interesting and important in its own right especially as there is a tradition of existing literature for Pakistan in this vein. However, as a part of the related research agenda we are in the process of analysing the rate of inflation more directly to examine the direct as well as indirect effects of budgetary deficits.

[2]Of course, our specification implicitly assumes that money supply only affects *Ln P* with a one period lag. While including *Ln MS* in Equation (1) is possible, certain theoretical considerations as well as available empirical evidence [e.g. in Naqvi and Khan (1989)] supports the specification we have postulated. In any event, appropriateness of including *Ln MS* is a testable proposition and, in fact, we conduct albeit in a limited way such an exercise whose results are reported in Tables 2 and 3. (Incidentally, these results are supportive of the specification that we have given in the text.)

3. DATA DESCRIPTION

In this paper, we use fiscal year[3] data for Pakistan for the period[4] 1972 to 1988. The names, definitions and respective source of the relevant variables is being given below:

Variable **Definition (Source)**

Ln P Natural Logarithm of Implicit GNP deflator calculated as the ratio of the Gross National Product at current prices to the Gross National Product at constant prices.
(*Source*: Pakistan Economic Survey 1989-90).

Ln MS Natural Logarithm of Nominal Money Supply.
(*Source*: Various Issues of Pakistan Economic Survey).

Ln BD Natural Logarithm of Budget Deficit.
(*Source*: Various Issues of Pakistan Economic Survey).

Ln CS Natural Logarithm of Ratio of value-added by commodity producing sectors to value-added by services sectors.

$$\frac{YA + Ym}{Yg - YA - Ym}$$

Where *Yg* is the Gross Domestic Product, *YA* is the value-added in Agriculture Sector and *Ym* is the value-added in Manufacturing Sector.
(*Source*: Pakistan Economic Survey 1989-90).

Ln CR Natural Logarithm of Bank Credit.
(*Source*: Various Issues of Pakistan Economic Survey).

Ln FR Natural Logarithm of Foreign Exchange Reserves measured in constant 1959-60 prices.
(*Source*: Annual Reports, State Bank of Pakistan; Various Issues).

Ln Y Natural Logarithm of Real Gross National Product measured in constant 1959-60 prices.
(*Source*: Pakistan Economic Survey 1989-90).

[3]In order to simplify we refer to a given fiscal year (which runs from July 1 to June 30th) by its higher calendar year i.e. 1971-72 is referred to as 1972 and so on.

[4]We are limiting ourselves to 1988 since the national income accounting methodology was changed after that and we did not wish to introduce a possible extraneous source of variation on this account. However, such an extension is feasible if appropriate adjustments are made and is, in fact, planned for a future revision of this paper.

DI A dichotomous (0,1) dummy variable which is equal to unity when the difference between the natural logarithm of real gross National Product and its trend value is positive.

Table 1

Means and Standard Deviations (S. D.) of Some Important Variables (1972–88; N = 17)

Variable	Ln P	Ln MS	Ln BD	Ln Y	Ln CR	Ln FR
Mean	5.98	11.3	9.12	11.0	10.82	9.38
S. D.	0.49	0.81	1.83	0.32	0.81	0.85

4. EMPIRICAL RESULTS

The empirical results that have a bearing on the question of the direct vs total effects of budget deficit on inflation are set out in Tables 2 through 5. Let us discuss some of the important aspects of these results.

(a) The Nature of the Direct Effects

The regression results presented in Table 2 reveal that the coefficient estimate of Ln BD is positive and significant at the 95 percent or higher level across the different specifications. For instance, estimates given in Column 4 imply that a 1 percent increase in budget deficit would lead to a 6 percent increase in the price level. This finding of significantly positive and substantial *direct* effects of budget deficit on inflation (Ln P) is very important analytically as well as in terms of its policy implications.

Based on the regression results given in this table, the other important finding is that Money Supply has a positive direct impact but in all probability it is the one period lagged effect that is more robust when important control variables such as last year's price level i.e Ln P (–1) are controlled for. Incidentally, Ln P(–1) has a significant, positive and relatively large effect on the current period's Ln P which reveals the dynamic nature of inflation and the role inflationary expectations may play in this process. Finally, note that we find that *DI* (as a measure of excess capacity in the economy) and Ln CS (as a measure of the relative importance of the commodity producing to service sector of the economy) are not significant. This implies an unexpectedly meager role of the 'real' sector variables in explaining the variation in Ln P.

In terms of the appropriateness of the estimation technique, an important question concerns the possibility of first order autocorrelation in the error terms. The *D. W.* for all six specifications estimated in Table 2 are, by and large, in the 'inconclusive' range at both the 5 percent and 1 percent level.[5] However, as is well known, when one of the explanatory variables is the lagged dependent variable, the *D. W.* statistic is no more an appropriate test statistic and is routinely replaced by

Table 2

OLS Estimates of the Inflation–Deficit Relationship
(Dependent Variable = Ln P; 1972–1988)

	1	2	3	4	5	6
Constant	–0.21*	0.53	0.20*	0.43	0.50	0.50
	(–0.11)	(3.98)	(1.20)	(2.94)	(4.60)	(2.28)
Ln BD	0.09	0.06	0.10	0.06	0.06	0.06
	(8.69)	(6.63)	(9.51)	(5.62)	(6.82)	(6.58)
Ln MS	0.37	–0.07*				
	(2.00)	(–0.56)				
Ln MS(–1)	0.10*	0.23	0.43	0.18	0.17	0.18
	(0.59)	(2.25)	(20.36)	(2.80)	(3.43)	(3.85)
Ln P(–1)		0.53		0.50	0.51	0.49
		(5.17)		(4.26)	(5.73)	(5.12)
DI					0.01*	
					(0.47)	
Ln CS						–0.03*
						(–0.11)
Adjusted R^2	0.99	0.99	0.99	0.99	0.99	0.99
D. W.	1.21	1.04	0.96	1.07	0.88	0.90
H-Stat		2.18		2.19	2.65	2.47
N	17		17	17	17	17
Est. Technique	OLS	OLS	OLS	OLS	OLS	OLS

Note: The *t*-values are given in the parentheses. Absence of asterisk signifies that the coefficient estimate is significant at least at the 95 percent level.

*Not significant at the 95 percent level.

[5]For the specification estimated in Column 3, the *D. W.* implies rejection of the null hypothesis at 1 percent but is in the 'inconclusive' range at 5 percent level.

the (Durbin) II Statistic.[6] The II-Stat is standard normal distributed and its calculated values for our cases imply a rejection of the null hypothesis of zero autocorrelation at the 5 percent level.[7] Though the problem does not appear to be of a very serious nature, in Table 3 we present another set of estimates of these specifications after applying the appropriate techniques to correct for possible first order autocorrelation.

Table 3

Non-OLS Estimates of the Inflation–Deficit Relationship (Dependent Variable = Ln P; 1972–1988)

	1	2	3	4	5	6
Constant	–0.13*	0.73	0.24*	0.44	0.63*	0.71
	(–0.55)	(2.98)	(0.87)	(1.75)	(1.55)	(1.57)
Ln BD	0.08	0.01*	0.09	0.07	0.05	0.05
	(7.61)	(0.64)	(7.25)	(2.63)	(2.52)	(2.52)
Ln MS	0.31	–0.17*				
	(1.96)	(–0.86)				
Ln MS(–1)	0.16*	0.31	0.44	0.18	0.19	0.20
	(1.06)	(2.69)	(13.70)	(2.41)	(3.21)	(3.25)
Ln P(–1)		0.61		0.48	0.47	0.44
		(2.11)		(3.42)	(3.29)	(2.87)
DI					0.01*	
					(0.58)	
Ln CS						–0.09*
						(–0.54)
Adjusted R^2	0.99	0.99	0.99	0.99	0.98	0.98
D.W.	1.64	1.97	1.35	1.45	1.56	1.55
H-stat		nd		1.33	1.07	1.14
N	17	16	17	16	16	16
Est. Technique	ML	CO	ML	CO	CO	CO

Note: The *t*-values are given in the parentheses. Absence of asterisk signifies that the coefficient estimate is significant at least at the 95 percent level.

*Not significant at the 95 percent level.

nd = not defined since $N \times$ Var (coeff. est. $Ln\,P(-1)) > 1$.

[6]See Maddala (1988), pp. 204-5.

[7]The critical value is 1.96 at the 5 percent level.

The results given in Table 3 are qualitatively very close to the first approximation OLS results the last table presented. However, the results in Table 3 may be more precise as appropriate techniques (i.e. ML = Maximum Likelihood or CO = Cochrane-Orcutt) have been applied. In fact, the new set of the diagnostic statistics are reassuring... the H-Stat signify that at 5 percent level we do not reject the null hypothesis of zero autocorrelation in the error terms. In general, the coefficient estimates of Ln BD are positive and significant.

For instance, consider this coefficient estimate in column 4... our most preferred specification ..... it implies that a 1 percent increase in BD increases P level by 7 percent i.e. quite close to what we obtained in the OLS case. The remaining results are also qualitatively as well quantitatively similar to those in the previous table.

(b) The Indirect Effects of Budget Deficit on Inflation

These effects work via the impact of Ln BD on money supply (Ln MS) which in turn affects inflation (with one period lag in our model). Table 4 presents the estimates for the money supply equation. Note that while the bank credit (Ln CR) and foreign exchange reserves (Ln FR) have significant and positive effects on Ln MS, the coefficient estimate of Ln BD is positive (.01) but not statistically significant. This last result is interesting on account of its implications for the nature of the indirect effect of budget deficit on inflation.

Table 4

Estimates of the Money Supply Equation
(OLS; Dep. Var. = Ln MS; 1972–1988)

Constant	Ln BD	Ln CR	Ln FR	Adj. R^2	D. W.
0.40*	0.01*	0.91	0.10	0.99	1.62
(1.36)	(0.36)	(15.15)	(2.03)		

Note: The *t*-values are given in the parentheses. Absence of asterisk signifies that the coefficient estimate is significant at least at the 95 percent level.

*Not significant at the 95 percent level.

Thus, based on the evidence reported in Tables 2 through 4 we can safely say that the indirect effect of budget deficit on Ln P is small at best. Such a conclusion can be supported by the following observations.

Firstly, as noted earlier, be reminded that the coefficient estimate of Ln BD in Table 4 is not significantly different from zero.

Secondly, even if we decide to ignore the question of the significance level and just consider the size of the (positive) coefficient estimate, the indirect effects

work out to be quite small perhaps even negligible. In this regard, let us note the following results.

Direct effect of Ln BD on Ln P = .09 (Using col 1/Table 2)
(Contemporaneous) Indirect effect of Ln BD on Ln P = (.01) (0.37) = .0037
(Using col 1 of Table 2 and Table 4)
Total Effect = .0937

Alternately, the result is not much different if we use specification given in column 4/Table 3 which incidentally we consider to be the 'best' one for explaining the variations in Ln P in this sample.

Direct effect of Ln BD on Ln P = .07 (Using col 4/Table 3)
Indirect effect8 of Ln BD(–1) on Ln P = (.01) (0.18) = .0018
(Using col 4 of Table 3 and Table 4)
Total Effect = .0718

The above results imply that indirect effects are small because budget deficit has insignificant effect on Ln MS. Incidentally, as can be noted from Table 4 measures such as credit availability (Ln CR) and foreign exchange reserves (Ln FR) have significantly positive coefficient as well as more pronounced indirect effects on Ln P.

Table 5

Determinants of Expected Inflation (Dep. Var. = Ln P^e; 1972–1988)

	1	2
Constant	–0.59 (–4.13)	0.15* (0.07)
Ln BD	0.08 (10.06)	0.08 (7.68)
Ln MS	0.48 (26.68)	0.53 (3.92)
Ln Y		–0.12* (–0.38)
Adjusted R^2	0.99	0.99
D. W.	1.45	1.51
F	2639.03	1651.52

Note: The *t*-values are given in the parentheses. Absence of asterisk signifies that the coefficient estimate is significant at least at the 95 percent level.

*Not significant at the 95 percent level.

[8]Assume that the estimated Ln MS equation as reported in Table 4 is true for all time periods then in particular it would hold for one period lagged. So we get the indirect effect by multiplying the coefficient of Ln BD(–1) i.e. .01 from such an equation with the coefficient of Ln MS(–1) in column 4 of Table 3. Thus in a sense the indirect effects of BD would be not contemporaneous but lagged one period.

(c) The Nature of the Direct Effects of Budget Deficit on Inflation

We consider our finding of large direct effects of budget deficit on inflation (as discussed in part (a) earlier) to be quite significant and thus worthy of further investigation. As a preliminary step towards developing additional insight into the nature of these significant direct effects on Ln P we consider the possibility that they are due to the role played by deficits in the formation of price expectations. As an exploratory first step in this direction we consider a price expectation (P^e) variable which we have generated using an adaptive expectation scheme.[9] In Table 5 we report regression estimates of a double-log specification where Ln P^e is the dependent variable and Ln BD, Ln MS and Ln Y (real GNP) are the explanatory variables. These findings are very interesting albeit of a preliminary nature. In particular, note that Ln BD has a positive and significant coefficient estimate (.08). This suggests that the direct effects of budget deficits on Ln P in (Tables 2 and 3) may really be due to their intermediate effects on formation of price expectations.

5. CONCLUDING REMARKS

Based on data for Pakistan for fiscal years 1971-72–1987-88, the most important finding of this paper is that budget deficits have a positive and significant direct effect on inflation (Ln P) independent of its indirect effect via money supply which in this case turns out to be minor or negligible. In fact, a 1 percent increase in budget deficit is shown to lead to 6-7 percent increase in general price level (Ln P). Further, a preliminary investigation into the nature of this large and significant direct effect shows that budget deficits may be influencing formation of price expectations which is a viable channel of transmission.

Besides investigating the direct as well as indirect effects of deficits, the empirical estimates also shed light on other important determinants of Ln P and

[9]Consider the following equation:

$$Ln\, P_t^e = c_0 + c_1\, Ln\, DF + c_2\, Ln\, MS + c_3\, Ln\, Y$$

Since P_t^e, is unobserved therefore we use the Adaptive Expectations Model

$$P_t^e = P_{t-1}^e + \lambda\,(P_t - P_{t-1}^e) \qquad \text{where } 0 < \lambda < 1.$$

As is well known, through successive substitution the above model can be written as the following distributed lag model:

$$P_t^e = \lambda P_t + \lambda\,(1-\lambda)\,P_{t-1} + \lambda\,(1-\lambda)^2 P_{t-2} + \ldots\ldots\ldots$$

In the estimates presented in Table 5, we have used a moving average of actual past values of P to represent P_t^e.

Ln MS – Ln P is affected mostly by money supply lagged one period and lagged value of the price itself; the real variables or measures of excess capacity do not perform too well. In terms of the money supply it is positively and significantly affected by bank credit and foreign exchange reserves–the effect of budget deficit is positive but statistically not significant. As a part of the ongoing research agenda we are in the process of looking deeper at the nature of the mechanism that may underlie the direct effects of budget deficits on inflation.

REFERENCES

Ahking, F. W., and S. Miller (1985) The Relationship between Government Deficits, Money Growth and Inflation. *Journal of Macroeconomics* 7: 447–67.

Giannaras, D. S., and B. R. Kolluri (1986) Deficit Spending, Money, and Inflation: Some International Empirical Evidence. *Journal of Macroeconomics* 7:3.

Kolluri, Bharat R., and Demetrios S. Giannaras (1987) Deficit and External Debt Effects on Money and Inflation in Brazil and Mexico, Some Evidence. *Eastern Economic Journal* 13:3 243–248.

Maddala, G. S. (1988) *Introduction to Econometrics.* New York: Macmillan Publishing Company.

Miller, P. J. (1983) Higher Deficit Policies Lead to Higher Inflation. Federal Reserve Bank of Minneapolis. *Quarterly Review* Winter.

Minford, Patrick, and Alan Walters (1989) Modelling the Role of Government Deficits in Developing Countries. Butterworth and Co Ltd.

Naqvi, Syed Nawab Haider, and Ashfaque H. Khan (1989) *Inflation and Growth: An Analysis of Recent Trends in Pakistan.* Islamabad: Pakistan Institute of Development Economics.

Niskanen, W. A. (1978) Deficits, Government Spending and Inflation: What is the Evidence? *Journal of Monetary Economics* 4.

Siddiqui, Anjum (1990) Money and Inflation in Pakistan: Some Tests. *The Indian Economic Journal* 38:1.

Thornton, D. L. (1990) Do Government Deficits Matter? *Federal Reserve Bank of St. Louis Review.* September/October.

Comments on "Are Government Budget Deficits Inflationary? Evidence from Pakistan"

The paper deals with a topic highly important from the policy implication point of view. It is also strong in its estimation techniques. But it is substantially weak in its theoretical framework and model specification. Five comments in this context are in order.

The considered wisdom on the subject spells out two major mechanisms through which the budget deficit affects inflation, namely, the displacement of investible funds and monetary expansion. The deficit financed by borrowed resources displaces or crowds out the private sector demand for credit. Given the low productivity of investment in the public sector and/or borrowed money sometimes used to finance current expenditure, this displacement essentially retards production of goods and services which would have been otherwise possible if the credit was made available to the private sector. This squeeze in GDP generates inflation via the supply side. It is surprising that the paper ignores this aspect completely.

To the extent that borrowed money is from the banking system which basically amounts to money expansion, the fiscal deficit exerts pressure on prices from the demand side. Though the paper does consider this aspect under what it calls "the indirect effect" but fails to capture it properly. The contribution of budget deficit (*BD*) to money supply (*MS*) as envisaged in Equation (2) is highly under-estimated as it is robbed by the variable of bank credit (*CR*) which already includes the monetised budget deficit. The misspecification of the equation is also obvious from the insignificant coefficient of *BD*. The true specification would have been:

$MS = MBD + OCR + NFA$;
MBD = Monetised Budget Deficit;
OCR = Domestic Credit Excluding *MBD*; and
NFA = Net Foreign Assets.

The conclusion that the indirect effect is small because the budget deficit has an insignificant effect on *MS* as derived from Equation (2) is therefore highly misleading and is a result of misspecification.

The only effect of *BD* on inflation claimed to be significant in the paper is the one called "direct effect" occurring through inflationary expectations incorporated in the price equation Equation (1) through using *BD* as one of the explanatory variables. The equation suffers both from theoretical and econometric defects. Theoretically, nowhere in the paper it has been investigated as to what extent it is true to assume that economic agents in Pakistan have adequate and before hand knowledge of the fiscal deficit, particularly its monetised portion which affects the price level; and that they use this knowledge in forming expectations about inflation; and that these expectations are put in force in wage-price contracts. Replication of models applicable to developed economies like the US, to a developing economy having a non-consistent environment tend to produce spurious results with no practical utility. Econometrically, even if expectations are assumed, a variable capturing expectations is already there in the equation, (*Pt*-1). The redundancy of using *BD* as an expectation variable is also reflected in the insignificant coefficient for *BD* in Equation (1) (column 2 in Table 3).

The impact of real variables has not been specified properly. Instead of Dummy used for over and under capacity production, which is empirically hard to estimate in the context of a developing country, it is simpler to use GNP. Moreover, restricting to sample period up to 89 has further reduced the practical utility of the paper. In fact, GNP series with a new base of 1980-81 can easily be extended to recent years.

Finally, the numerical interpretation of the coefficients of log equations is erroneous. The coefficient of 0.06 implies that a 1 percent change in the independent variable leads to a change in the dependent variable of 0.06 percent and not 6 percent as reported in the paper.

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