

Response of Long-term Interest Rate to Fiscal Imbalance: Evidence from Pakistan

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The study analyzes the role of fiscal deficit in explaining movements in long-term interest rate in Pakistan. We have investigated the long run relationship between budget deficit and long-term interest rate along with GDP growth, expected inflation, capital inflows and short-term interest rate during the period from 1975 to 2008 by applying cointegration technique. We have found that a 1 percent increase in the budget deficit leads to more than 40 basis points increase in long-term interest rate in Pakistan thereby increasing the cost of funds for investment.

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1. Introduction

Interest rate affects saving and investment behavior of households and firms, and thus is a key determinant of growth and inflation dynamics of a country. Therefore, it is important to understand the factors responsible for changes in the interest rate. A number of theories attempt to explain the interest rate movements and yield curve including (a) liquidity effect theory, suggesting investors will choose longer term maturities if they are provided with additional yield that compensates them for lack of liquidity, (b) expectations theory, stating forward interest rates are representative of expected future interest rates and the shape of the yield curve and the term structure of rates are reflective of the market's aggregate expectations, (c) preferred habitat hypothesis, suggesting investors who usually prefer one maturity horizon over another can be convinced to change maturity horizons by providing an appropriate premium, (d) market segmentation theory, according to which different investors have different investment horizons that arise from the nature of their business or as a result of investment restrictions, and (e) loanable fund theory of interest rate.

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We have focused on loanable funds theory of interest that states the rate of interest is calculated on the basis of demand and supply of loanable funds present in the capital market. The rest of the paper has been organized as follows: The next section gives a description of empirical literature on the relationship between fiscal deficit, expected inflation, short-term and long-term interest rates, and section 3 presents theoretical background of the demand and supply of loanable funds in determining the interest rate along with estimation technique used in the paper. The section 4 discusses results and the last section concludes the paper.

2. Literature review

A renowned Swedish economist Wicksell pioneered the idea that interest rate in an economy is determined by the supply and demand of loanable funds in the capital market. A lot of theoretical and empirical research has been done to further explore the determinants of interest rate. Hoelscher (1983) empirically estimates that expected inflation, monetary factors and economic activity are primary determinants of short-term interest rates and concludes that there is no significant impact of federal borrowing on short term interest rates for the post World War II period. However, he finds that there is a strong relationship between long-term interest rate and budget deficit. Evans (1987) tests the assumption of a significant positive relation between budget deficit and nominal interest rate and the hypothesis of efficient market by using unrestricted and restricted reduced form models. He concludes that there is no significant positive relationship between budget deficits and nominal interest rates. On the other hand, Aschauer (1989) empirically disapproves the phenomenon of crowding out. Results of his study show that an increase in the public investment increases the return of private capital which crowds in private capital accumulation.

Cebula has undertaken a series of studies to explore the relationship between budget deficit and term structure of interest rate. Cebula (1991) determines the impact of budget deficit and the term structure of real interest rate on the quarterly data of United States from 1971:4 to 1985:4 by using IS-LM framework and shows that budget deficits impact significantly and positively to the rate of change in the yield curve. Cebula (1997) employs cointegration technique on quarterly data ranging from 1973 to 1993 on France's economy and concludes that in an industrialized country, capital inflows may reduce long term interest rates. Similarly, Cebula (1998) uses cointegration technique to test loanable fund framework during the post-Bretton Woods era in an open economy of Italy. He concludes that positive relationship between long-term interest rate and budget deficit exists in the long run.

Al-Saji (1993) explores relationship of the government budget deficits, nominal and ex-ante real long term interest rates in United Kingdom by using time series data ranging from 1960 to 1992. His study concludes that nominal and ex-ante real long term interest rates are impacted by the expected rate of inflation, the real money stock, the real government budget deficit, the real government spending, and the real balance of trade. Barnes (2008), on the other hand, explores this relationship for ten European countries by using cointegration technique. His study suggests the presence of significant cointegrating vectors for all ten countries. This explains the view of budget deficits having a positive impact on long-term interest rates.

There is hardly any study on the relationship between budget deficit and long term interest rate in case of Pakistan. The available studies usually investigate the relationship between inflation and budget deficit like Shabbir and Ahmed (1994), Chaudhary and Ahmad (1995), Agha and Khan (2006), etc. but missed the nature of midway link between budget deficit and interest rate. The present study is an attempt to fill this gap.

3. Model and estimation technique

According to the loanable fund theory, equilibrium attained by the supply and demand of the loanable funds is the determinant of the long-term interest rate. We briefly discuss both supply and demand functions individually.

$$SLF = f(Pe, IL, NCI, IS) \quad (1)$$

The above equation represents the supply function of loanable funds having arguments of expected inflation (Pe), short term interest rate (IS), long-term interest rate (IL) and net capital inflows (NCI). An increase in net capital inflows is expected to increase the amount of funds available for the domestic investment in the economy, so it has a positive relationship with supply of loanable funds. Whereas IS and Pe, both variables have the same effect on the supply of loanable funds, i.e., increase in IS will attract people towards short term financial instruments and negatively affects the supply of long-term loanable funds, and higher expected inflation (Pe) reduces the purchasing power and hence supply of loanable funds. On the other hand, the demand for loanable funds can be expressed by the following function.

$$DLF = f(GDP, BDEF, Pe, IL) \quad (2)$$

The demand for loanable funds is the function of income (proxied by GDP), budget deficit (BDEF), expected inflation (Pe) and long-term interest rate (IL). At demand side, high expected inflation (Pe) reduces the real cost of borrowing and has a positive impact on demand. The level of national income and budget deficit are also expected to affect demand for loanable funds positively. A reduced form equation for long-term interest rate can be derived by equating equation (1) and (2) as an equilibrium condition as given below:

$$IL = f(Pe, GDP, BDEF, NCI, IS) \quad (3)$$

The above equation gives a relationship of the long-term interest rate with expected inflation (Pe), GDP, budget deficit, short-term interest rate (IS) and net capital inflows (NCI). We have used Johansen (1988) cointegration technique to make a quantitative representation of this relationship in the long run.

The analysis is performed by using annual data spanning from 1975 to 2008. The main sources of data are Economic Survey of Pakistan and different publications of the State Bank of Pakistan. Long-term interest rate is the central series of our study and chosen as an appropriate measure in accordance with loanable fund framework. It is the weighted average of return on long-term deposits (3-year and over). The series of GDP and budget deficit are transformed into natural log from. The series of inflation is calculated as percentage change in consumer price index; actual inflation (π) is taken assuming rationale expectations. The short term interest rate is the weighted average of return on deposits (up to 6 months). Net capital inflows are computed as the summation of net private transfers and foreign direct investments into a country and the resulting series is transformed into natural log.

Before testing for the existence of a long run relationship between the above mentioned variables, we have applied the augmented Dickey-Fuller (ADF) test for determining their order of integration.

4. Results

The results of unit root tests are reported in the Table 1 which shows that all the variables are integrated of order 1. As all the variables are integrated of order 1, a cointegration test is applicable; however, before applying the Johansen (1988) test, we have estimated an unrestricted VAR to determine the optimal lag for the model. A lag length of 1 was found optimal for our series of annual data. The results of Johansen test as reported in Table 2 shows the existence of three

conintegrating vectors in the set of variables.

Table 1. ADF Test statistics (constant and no intercept)

	Level	1st difference
GDP	-0.366	-5.3392 *
BDEF	-1.519	-7.6901 *
IL	-2.282	-7.832 *
NCI	-2.286	- 4.5605*
π	-2.52	- 8.0968*
IS	-1.835	- 7.832*

* reflects the significance at 1 %,

.Note: Schwarz information criterion is used to select the optimum lag length

Table 2. Johansen unrestricted cointegration rank test

Hypothesized No. of CE(s)	Hypothesis	Trace		Max Eigen statistic	
		Statistic	Critical value	Statistic	Critical value
None	Ho; r=0, H1; r \geq 1	219.95*	127.71	75.06*	50.47
At most 1	Ho; r=1, H1; r \geq 2	144.89*	97.60	58.13*	44.02
At most 2	Ho; r=2, H1; r \geq 3	86.77*	71.48	43.36*	37.49
At most 3	Ho; r=3, H1; r \geq 4	43.41	49.36	20.22	30.83
At most 4	Ho; r=4, H1; r \geq 5	23.19	31.15	13.35	23.98
At most 5	Ho; r=5, H1; r \geq 6	9.845	16.55	9.85	16.55

* denotes rejection of the hypothesis at the 0.01 level.

We have focused on the first cointegrating vector as a relationship of our interest. The parameters of 1st normalized cointegrating equation are interpreted as the estimates of long run relationship among the variables. The coefficients represent estimate of the long run elasticities of long-term interest rate with respect to budget deficit, inflation rate, GDP, net capital inflows and short term interest rate. The derived equation is given below (standard errors are in parenthesis).

$$IL = 0.42 BDEF_t + 4.29 GDP_t - 0.59 NCI_t + 0.08 \pi - 0.60 IS_t \quad (4)$$

(0.05) (0.60) (-0.06) (0.04) (-0.10)

The above equation states the long-run relationship between long-term interest rate and the other economic variables which can be summarized as follows:

1. The BDEF has a positive and significant effect on long-term interest rate. One

percent increase in government budget deficit is associated with an increase of long term interest rate by 0.42 percentage points.

2. One percent increase in gross domestic product is associated with an increase in long-term interest rate of 4.29 percentage points.
3. One percent increase in net capital inflows leads to 0.59 percentage points decrease in long-term interest rate.
4. One percent increase in inflation rate leads to 0.08 percentage points increase in long-term interest rate.
5. One percent increase in short term interest rate is associated with a decrease in the long-term interest rate by 0.6 percentage points.

The government sector is a major borrower of banking sectors funds; a higher demand from the government due to high budget deficit has considerable implications for long-term interest rate. Our results imply that the budget deficit potentially crowd out private sector investment through its increasing impact on long-term interest rate.

A large value of GDP coefficient, on the other hand, shows that growing economy leads to increasing demand of the loanable funds for the investors [Cebula (1998), Al-Saji(1993) and Hoelscher(1983) suggested the same in their studies]. Net capital inflows impacting the long term interest rate negatively suggests that the higher capital inflow into a country leads to the greater amount of available funds in the economy, reduces the real cost of lending and encourages the investment. According to the theory of rationale expectations, actual and expected inflation are equal; so a positive sign of inflation rate, which is representing expected inflation depicts that fisher effect prevails in Pakistan's economy but with low magnitude.

More interestingly, our results suggest that expectation hypothesis of interest rate determination does not hold in Pakistan as short term interest and long term interest rate have negative relationship.

5. Conclusion

This study explores the long run relationship between budget deficits and long-term interest rates along with other key macroeconomic variables including GDP, inflation, net capital inflow and short-term interest rate for Pakistan over a period of thirty four years ranging from 1975-2008. The results suggest that a long run relationship exists among these variables. It is found that budget deficit, gross

domestic product and inflation positively affect long-term interest rate whereas short term interest rate and net capital inflows negatively affect the long-term interest rate. We establish that high budget deficit has a potential of crowding out private investment through its impact on the long-term interest rate.

References

- Agha, A. Idrees and M. Saleem Khan (2006). "An Empirical Analysis of Fiscal Imbalances and Inflation in Pakistan", *SBP Research Bulletin*, 2(2), 343-362.
- Al-Saji, Amer, K. (1993). "Government Budget Deficits, Nominal and Ex ante Real Long-Term Interest Rates in the UK 1960:1-1990:2", *Atlantic Economic Journal*, 21, 71-77.
- Aschauer, D. A. (1989). "Does Public Capital Crowd out Private Capital", *Journal of Monetary Economics*, 24(2), 171-188.
- Barnes, J. Bob (2008). "A Cointegrating Approach to Budget Deficit and Long Term Interest Rates", *Applied Economics*, 40(2), 127-133.
- Cebula, R. J. (1991). "A Note on Federal Budget Deficits and the Term Structure of Real Interest Rates in the United States", *Southern Economic Journal*, 57(4), 1170-1173.
- Cebula, R. J. (1997). "The Impact of Net International Capital Inflows on Nominal Long-Term Interest Rates in France", *Atlantic Economic Journal*, 25(2), 179-190.
- Cebula, RJ (1998). "Budget Deficits and Long-Term Interest Rates: 1973-1991", *International Advances in Economic Research*, 4(4), 374-388.
- Chaudhary, M.Asalm and Naveed Ahmad (1995). "Money Supply, Deficit and Inflation in Pakistan", *The Pakistan Development Review*, 34(4), 945-956.
- Evans, P. (1987). "Do Budget Deficits Raise Nominal Interest Rates: Evidence From Six Countries", *Journal of Monetary Economics*, 20(2), 281-300.
- Hoelscher, G. (1983). "Federal Borrowing and Short-Term Interest Rates", *Southern Economic Journal*, 50(2), 319-333.
- Johansen, S. (1988). "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
- Shabbir, T. and Ayaz Ahmed (1994). "Are Government Budget Deficit Inflationary: Evidence from Pakistan", *The Pakistan Development Review*, 33(4), 955-967.