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UNIVERSITÀ COMMERCIALE LUIGI BOCCONI  
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# Report Documentation Page

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## PAKISTAN, DEFENSE EXPENDITURES AND EXTERNAL DEBT: PATTERNS OF CAUSATION AND CONSTRAINT

by  
ROBERT E. LOONEY \*

### *Introduction*

Increasing attention is being focused on the role of military expenditures in contributing to the external indebtedness of developing countries. Unfortunately, given the fungibility of funds, it is often difficult to find clear, statistically significant relationships between increases in defense expenditures and the subsequent expansion of foreign liabilities.

These dilemmas are reflected in seemingly contradictory results produced by several recent studies of Pakistani borrowing in external markets. On the one hand, cross section analysis (Looney, 1987, 1989; Looney and Frederiksen, 1986) suggests that Pakistan as a relatively resource constrained country might be expected to resort to extensive borrowing to support its level of defense expenditures. On the other hand, time series analysis questions whether external borrowing has been a major factor in funding the country's expanded defense expenditures (Looney, 1991). If anything, this analysis suggests that foreign lender concern over Pakistan's defense expenditures have caused them to cut back on lending to that country.

There are several ways these two sets of findings can be reconciled:

1. The cross section analysis is largely for the 1970s and early 1980s, and the patterns found there may not have held up in subsequent years.
2. Pakistan may not be a "typical" resource constrained country. The country has received considerable amounts of economic aid and, as recent studies suggest, this may be quite fungible into the military acquisition process.
3. As was the case for domestic borrowing, the time series analysis

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must, given the nature of the data, focus on longer run trends. Much of the external borrowing for defense could be of a short term nature and therefore not picked up by the causation tests.

To this list one could also add the fact that figures on total external borrowing may mask developments in individual categories. For example the country could be funding defense from one external source, but other external sources may actually cut back lending when they feel the country's allocations to the military have become excessive.

The purpose of the analysis below is to explore these latter two possibilities. In particular how have Pakistani defense expenditures affected year-to-year fluctuations in that country's external debt position? Have these patterns been similar across different sources of external funding? Have the imperatives of debt service and/or willingness of external lenders affected the expansion of defense expenditures?

### *Background*

Pakistan's total debt rose from around 30.6 million 1985 Rupees in 1953 to 462 million in 1989 (IMF). Year to year growth has been fairly erratic with debt increasing by 77 percent in 1972 and declining by 12 percent in 1973. However since 1982 the government's indebtedness has shown fairly steady year-to-year growth. There have been several notable shifts in the composition of this debt (Table 1):

1. Borrowing from the State Bank has gradually declined over time. In the early 1960s this source accounted for around one half of the government's borrowing. This figure had fallen to around 20 percent by the early 1980s. By the end of the 1980s it had fallen even further to around 15 percent.

2. Borrowing has also shifted from deposit banks with this source holding about 20 percent of the public sector's debt in the early 1960s. After falling below 10 percent in the early 1970s and rising to nearly 15 percent in 1980, debt held by this source appears to have leveled off at around 10 percent of outstanding issues.

3. Borrowing from other financial institutions (presumably all domestic) has not been significant – in recent years it has accounted for around 15 to 20 percent of the government's outstanding obligations.

4. The debt held by international institutions has fluctuated fairly widely. In the early 1950s this source accounted for around 15 percent of the government's debt.

TABLE 1

PAKISTAN: EVOLUTION OF PUBLIC SECTOR INDEBTEDNESS  
EXPENDITURES AND PUBLIC SECTOR DEBT, 1953-1989  
(billion 1985 rupees)

	Total Debt		Share Held By					
	Amount	Growth	State Bank	Deposit Money Banks	Other Finan. Institut.	Inter-national Institut.	Foreign Govts, Banks	Other
1953	30.63	-	41.12	16.52	0.31	12.81	1.54	27.70
1954	33.02	7.79	42.22	16.96	0.42	11.82	2.12	26.46
1955	33.37	1.08	34.99	18.06	1.23	16.50	2.65	26.58
1956	37.00	10.87	44.04	15.29	2.44	13.25	2.33	22.67
1957	41.95	13.37	47.12	15.20	2.86	10.87	2.07	21.88
1958	39.91	-4.86	52.60	16.11	3.48	3.93	2.41	21.46
1959	41.35	3.60	47.79	8.87	2.68	5.31	2.45	22.88
1960	41.27	-0.19	48.21	9.11	2.83	5.38	2.46	22.01
1961	39.12	-5.20	49.54	19.55	3.34	5.15	2.98	19.44
1962	41.44	5.92	47.02	8.89	3.26	5.39	3.68	21.77
1963	48.76	17.68	40.16	16.30	2.84	5.14	12.05	23.50
1964	56.01	14.85	37.54	14.88	2.51	4.66	21.77	18.64
1965	62.94	12.37	32.28	4.14	1.95	5.60	29.38	16.64
1966	75.42	19.84	34.97	11.19	1.76	6.05	31.71	14.32
1967	74.82	-0.80	31.43	9.83	1.58	7.87	36.54	12.74
1968	80.01	6.93	28.54	0.13	1.68	9.48	37.80	12.35
1969	88.77	10.95	24.81	11.41	1.60	9.52	41.01	11.63
1970	102.94	15.96	28.52	9.68	1.44	8.73	41.27	10.35
1971	112.00	8.80	28.71	8.61	1.30	8.16	42.51	10.70
1972	198.67	77.38	17.45	7.36	0.66	11.23	54.94	8.35
1973	174.73	-12.05	17.57	9.97	0.79	11.22	53.25	7.20
1974	157.15	-10.06	14.20	8.05	0.87	10.76	57.83	8.30
1975	136.49	-13.15	15.69	9.16	0.83	10.57	53.47	10.26
1976	152.88	12.01	16.25	10.89	1.00	9.41	53.61	8.82
1977	160.67	5.09	18.00	10.99	1.18	9.22	52.88	7.74
1978	167.46	4.23	16.45	12.94	1.19	10.54	50.13	8.75
1979	190.20	13.57	20.74	12.31	1.23	9.80	48.13	7.78
1980	186.94	-1.72	19.82	14.90	1.31	9.79	45.70	8.49
1981	176.80	-5.42	19.21	14.52	1.88	10.30	44.86	9.24
1982	214.51	21.33	19.54	11.70	1.78	10.91	45.98	10.08
1983	227.73	6.16	13.66	13.06	2.02	14.15	41.61	15.51
1984	238.03	4.52	15.63	10.16	1.90	14.72	38.50	19.09
1985	284.09	19.35	19.26	10.66	1.44	14.63	34.71	19.30
1986	348.88	22.81	16.60	10.82	1.40	13.78	32.56	24.84
1987	381.74	9.42	13.51	11.06	2.09	13.90	31.46	27.97
1988	416.09	9.00	16.65	12.86	1.87	14.18	28.03	26.42
1989	462.00	11.03	15.49	10.50	1.81	15.92	27.73	28.55

SOURCE: International Monetary Fund, *International Financial Statistics Yearbook*, various issues.

This fell to around 5 percent during most of the 1960s. Since the early 1970s debt held by this source has risen fairly steadily so that by 1989 around 16 percent of the government's debt was held by these organizations.

5. The most dramatic movements in debt have come from fluctuations in issues held by foreign governments and banks. Lending from this source was rather insignificant (around 2-3 percent of outstanding debt) until the mid 1960s. By 1970 these organizations held around 40 percent of the public sector's debts. This reached nearly 58 percent in 1974, but since that time their share had gradually fallen to around 28 percent in 1989.

6. Debt held by "Other" organizations has also fluctuated widely, averaging about 20 percent in the 1950s and early 1960s. This figure fell to around 10 percent in 1970. This source of funding was relatively unimportant during most of the 1970s, usually averaging less than 10 percent. However, since 1979 borrowing from this source has increased fairly rapidly so that by 1989 it accounted for around 28 percent of total government indebtedness.

The patterns suggest that over time the authorities have gradually shifted to external sources of funding. No doubt this has been precipitated by the country's lagging foreign exchange earnings and rapidly growing import requirements. They may also be indicative of increased levels of arms imports. Particularly that from foreign governments and banks during the period of rapid defense expenditures in the 1960s.

As noted earlier, little empirical research has been undertaken on the link between defense expenditures and external indebtedness. Intuitively if these patterns exist one might imagine increased military expenditures to lead to follow on borrowing as the stream of spare parts, components, maintenance and the like expand over time. On the other hand, if lenders are unwilling to extend credit for the purpose of increasing military expenditures (but are willing to lend for other purposes) one might expect causation to be from increased debt to expanded military expenditures – the government borrows say for economic projects, but manages to divert funds to the military. In either case the impacts between debt and military expenditures would be positive (Khilji and Zampelli, 1991).

Recent research has indicated that another pattern may be present. In his analysis of defense expenditures and debt service in the South East Asian countries Snider (1990) found that increases in the previous year's debt service burden dampened increases in military expenditures as a percentage of central government expenditures. Specifically, a one percent increase in the previous year's debt service ratio accounted for an average decrease of two percent in the military's share of the total budget.

The link between debt and military expenditures may be even more complex: Snider suggests that countries that undergo frequent IMF stabilization policies may actually have increases in military expenditures. Specifically, he finds that the more frequently a Third World debtor must resort to Fund-approved economic stabilization programs, the greater the military share of central government expenditures (Snider, 1990, pp. 295-96):

When a debtor government must adopt a Fund-supported stabilization program, military expenditures increase by an average of about two and a half percent. The less able a government is to mobilize the resources at its nominal disposal, the greater the debt service ratio and the more frequently it must adopt Fund-supported stabilization programs. In other words the less a government can mobilize and direct the human and material resources under its symbolic control the more it must spend on the military for political survival... Hence (because of the unpopularity of stabilization programs), politically weak governments which adopt such packages may increase security expenditures as a hedge against an increase in domestic political unrest, in response to new austerity measures.

Clearly one must resolve the issue of causation between military expenditures and debt before any definitive conclusions can be drawn as to the role of defense allocations in affecting a country's external indebtedness.

### *The Issue of Causation*

The main questions we want to resolve here is: (1) to which extent expanded rates of expenditures have been financed with increased resort to expanded indebtedness in external markets? Do accelerations in expenditures necessarily lead to corresponding increases in indebtedness and if so after what time? (2) whether expanded indebtedness subsequently constrains the government's ability (or willingness) to sustain or increase allocations to defense; (3) if these constraints exist are they more stringent for loans for defense or non-defense activities? and (4) do any of the observed patterns between expenditure and debt vary by source of funding?

Ultimately, any statistical test for causation will be based on a number of arbitrary assumptions. Still, using a number of alternative specifications for the key variables it is possible to make some credible inferences concerning the timing of savings and GDP or of savings and private investment.

The original and most widely used causality test was developed by Granger (1969). According to this test (using expenditures and debt), debt (*DEBT*) affects the growth in expenditures (*EXP*) if this series (expenditures) can be predicted more accurately by past values of debt than by its

past rates of growth. To be certain that causality runs from debt to expenditures, past growth rates in debt must also be more accurate than past values of expenditures in predicting increases in debt.

*Granger Test.* – More formally, Granger (1969) defines causality such that  $X$  Granger causes (G-C)  $Y$  if  $Y$  can be predicted more accurately in the sense of mean square error, with the use of past values of  $X$  than without using past  $X$ . Based upon the definition of Granger causality, a simple bivariate autoregressive (AR) model for expenditures ( $EXP$ ) and debt ( $DEBT$ ) can be specified as follows:

$$(1) \quad DEBT(t) = c + \sum_{i=1}^p a(i) DEBT(t-i) + \sum_{j=1}^q b(j) EXP(t-j) + u(t)$$

$$(2) \quad EXP(t) = c + \sum_{i=1}^r d(i) EXP(t-i) + \sum_{j=1}^s e(j) DEBT(t-j) + v(t)$$

where  $DEBT$  is the growth in public sector debt and  $EXP$  = the growth in public expenditures (both defense and non-defense);  $p$ ,  $q$ ,  $r$  and  $s$  are lag lengths for each variable in the equation; and  $u$  and  $v$  are serially uncorrelated white noise residuals. By assuming that error terms ( $u$ ,  $v$ ) are “nice” ordinary least squares (OLS) becomes the appropriate estimation method<sup>1</sup>.

Within the framework of unrestricted and restricted models, a joint  $F$ -test is appropriate for causal detection. Where:

$$(3) \quad F = \frac{RSS(r) - RSS(u) / (df(r) - df(u))}{RSS(u) / df(u)}$$

$RSS(r)$  and  $RSS(u)$  are the residual sum of squares of restricted and unrestricted models, respectively; and  $df(r)$  and  $df(u)$  are, respectively, the degrees of freedom in restricted and unrestricted models.

The Granger test detects causal directions in the following manner: first, unidirectional causality from  $EXP$  to  $DEBT$  if the  $F$ -test rejects the null hypothesis that past values of  $EXP$  in equation (1) are insignificantly different from zero and if the  $F$ -test cannot reject the null hypothesis that past values of  $DEBT$  in equation (2) are insignificantly different from zero.

<sup>1</sup> If the disturbances of the model were serially correlated, the OLS estimates would be inefficient, although still unbiased, and would distort the causal relations. The existence of serial correlation was checked by using a maximum likelihood correlation for the first-order autocorrelation of the residuals [AR(1)]. The comparison of both OLS and AR(1) results indicated that no significant changes appeared in causal directions. Therefore, we can conclude “roughly” that serial correlation was not serious in this model.

That is, *EXP* causes *DEBT* but *DEBT* does not cause *EXP*. Unidirectional causality runs from *DEBT* to *EXP* if the reverse is true. Second, bi-directional causality runs between *EXP* and *DEBT* if both *F*-test statistics reject the null hypotheses in equations (1) and (2). Finally, no causality exists between *EXP* and *DEBT* if we can not reject both null hypotheses at the conventional significance level.

The results of Granger causality tests depend critically on the choice of lag length. If the chosen lag length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag is greater than the true lag length, the inclusion of irrelevant lags causes estimates to be inefficient. While it is possible to choose lag lengths based on preliminary partial autocorrelation methods, there is no *a priori* reason to assume lag lengths equal for all types of deficits.

*The Hsiao Procedure.* — To overcome the difficulties noted above, Hsiao (1981) developed a systematic method for assigning lags. This method combines Granger Causality and Akaike's final prediction error (*FPE*), the (asymptotic) mean square prediction error, to determine the optimum lag for each variable. In a paper examining the problems encountered in choosing lag lengths, Thornton and Batten (1985) found Hsiao's method to be superior to both arbitrary lag length selection and several other systematic procedures for determining lag length.

The first step in Hsiao's procedure is to perform a series of autoregressive regression on the dependent variable. In the first regression, the dependent variable has a lag of one. This increases by one in each succeeding regression. Here, we estimate *M* regressions of the form:

$$(4) \quad G(t) = a + \sum_{i=1}^m b(t-i) G(t-i) + e(i)$$

where the values of *m* range from 1 to *M*. For each regression, we compute the *FPE* in the following manner

$$(5) \quad FPE(m) = \frac{T + m + 1}{T - m - 1} ESS(m)/T$$

Where: *T* is the sample size, and *FPE* (*m*) and *ESS* (*m*) are the final prediction error and the sum of squared errors, respectively. The optimal lag length, *m\**, is the lag length which produces the lowest *FPE*. Having determined *m\** additional regressions expand the equation with the lags on the other variable added sequentially in the same manner used to determine *m\**. Thus we estimate four regressions of the form:

$$(6) \quad G(t) = a + \sum_{i=1}^{m^*} b(t-i)G(t-1) + \sum_{i=1}^n c(t-i)D(t-1) + e(i)$$

with  $n$  ranging from one to four. Computing the final prediction error for each regression as:

$$FPE(m^*, n) = \frac{T + m^* + n + 1}{T - m^* - n - 1} ESS(m^*, n)/T$$

we choose the optimal lag length for  $D$ ,  $n^*$  as the lag length which produces the lowest  $FPE$ . Using the final prediction error to determine lag length is equivalent to using a series of  $F$  tests with variable levels of significance<sup>2</sup>.

The first term measures the estimation error and the second term measures the modeling error. The  $FPE$  criterion has a certain optimality property that "balances the risk due to bias when a lower order is selected and the risk due to increases in the variance when a higher order is selected (Hsiao, 1979, p. 326)". As noted by Judge et al. (1982), an intuitive reason for using the  $FPE$  criterion is that longer lags increase the first term but decrease the  $RSS$  of the second term, and thus the two opposing forces are optimally balanced when their product reaches its minimum.

Depending on the value of the final prediction errors, four cases are possible: (a) *Expenditures cause Debt* when the prediction error for debt decreases when expenditures are included in the debt equation. In addition, when debt is added to the expenditure equation, the final prediction error should increase; (b) *Debt causes Expenditures* when the prediction error for expenditures increases when expenditures are added to the regression equation for debt, and is reduced when debt is added to the regression equation for expenditures; (c) *Feedback* occurs when the final prediction error decreases when expenditures are added to the debt equation, and the final prediction error decreases when debt is added to the expenditure equation; and (d) *No Relationship* exists when the final prediction error increases both when expenditures are added to the debt equation and when debt is added to the expenditures equation.

### *Operational Procedures*

The data used to carry out the causation tests were deflated by the GDP deflator and are in constant 1985 prices. For best statistical results

<sup>2</sup> Since the  $F$  statistic is redundant in this instance it is not reported here. It is, however, available from the author upon request.

(Hsiao, 1981; Joerding, 1986), the variables were transformed into their annual growth rates<sup>3</sup>.

Relationships were considered valid if they were statistically significant at the ninety-five percent level of confidence. That is, if ninety-five percent of the time we could conclude that they had not occurred by pure chance, we considered them statistically significant.

As noted above, there is no theoretical reason to believe that expenditure aggregates and changes in debts have a set lag relationship – that is they impact on one another over a fixed time period. To find the optimal adjustment period of impact, lag structures of up to four years were estimated. The lag structure with the highest level of statistical significance was the one chosen best depicting the relationship under consideration (the optimal lag reported in Tables 2-4). To assess the robustness of our findings definitions of tests were undertaken for the growth in the share of expenditures (total, defense and non-defense) in GDP as well as the actual growth rates of these categories.

### *Results*

As a basis for comparison, causation tests were first performed on total public sector debt. Surprisingly, few statistically significant relationships could be found for the period as a whole (Table 2) or the earlier, 1958-73 period (Table 3). However, this pattern changed significantly during the latter (1973-89) period (Table 4):

1. During this period a clear pattern developed whereby increases in total expenditures were translated directly into expanded international indebtedness. For expenditures themselves the lag structure was fairly long, averaging four years. That is increases in total government expenditures in the previous four years produced a significant increase in debt during the current year.

2. The relationship between increased government involvement in the economy and debt was less defined, with last year's increase in the share of government expenditures in GDP producing only a weak increase in debt.

3. For defense, causation was reversed. Here increased debt tended to retard the expansion of defense expenditures. The lag was strong and occurred only after a year – increases in debt in the previous year tended to reduce defense expenditures during the current year. As was the case for

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<sup>3</sup> Data is from the International Monetary Fund. Tests were performed using *Regression Analysis For Time Series, RATS386 Version 4.0* (DOAN, 1992).

TABLE 2

PAKISTAN: INTERACTION OF  
GOVERNMENT EXPENDITURES AND TOTAL DEBT, 1958-89

	Causation Patterns				Dominant Pattern
	Debt Debt	Debt Expen.	Expen. Expen.	Expen. Debt	
Total Expenditures					
Optimal Lag (years)	1	1	2	1	No Relationship
Final Prediction Error	(273.59)	(205.14)	(152.12)	(162.02)	
Total Expenditures Share of GDP					
Optimal Lag (years)	1	1	3	1	No Relationship
Final Prediction Error	(273.59)	(289.14)	(90.40)	(96.19)	
Defense Expenditures					
Optimal Lag (years)	1	1	2	1	No Relationship
Final Prediction Error	(273.53)	(280.15)	(145.38)	(154.84)	
Defense Burden					
Optimal Lag (years)	1	1	2	1	Defense-> Debt (+w)
Final Prediction Error	(273.53)	(273.15)	(143.20)	(152.51)	
Non-Defense Expenditures					
Optimal Lag (years)	1	1	1	1	No Relationship
Final Prediction Error	(273.59)	(274.94)	(238.87)	(254.31)	
Non-Defense Share of GDP					
Optimal Lag (years)	1	1	1	1	No Relationship
Final Prediction Error	(273.59)	(277.98)	(183.84)	(195.69)	

NOTES: Summary of results obtained from Granger Causality Tests: A Hsiao Procedure was incorporated to determine the optimal lag. All variables are in the form of growth rates. The dominant pattern is that with the lowest final prediction error. The signs (+, -) represent the direction of impact. In the case of feedback the signs refer to the second and fourth set of causation patterns (i.e., Defense/Revenues and Revenues/Defense). Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment ( $s$  = strong;  $m$  = moderate;  $w$  = weak) based on the size of the standardized regression coefficient and  $t$  test of statistical significance. Defense burdens are the share of defense expenditures in GDP. Defense expenditures are from: Stockholm International Peace Research Institute, *SIPRI Yearbook* (New York: Oxford University Press), various issues. Economic data are from: International Monetary Fund, *International Financial Statistics Yearbook*, various issues.

TABLE 3

PAKISTAN: INTERACTION OF  
GOVERNMENT EXPENDITURES AND TOTAL DEBT, 1958-73

	Causation Patterns				Dominant Pattern
	Debt Debt	Debt Expen.	Expen. Expen.	Expen. Debt	
Total Expenditures					
Optimal Lag (years)	1	1	2	1	No Relationship
Final Prediction Error	(455.61)	(494.00)	(251.77)	(284.64)	
Total Expenditures Share of GDP					
Optimal Lag (years)	1	1	3	1	No Relationship
Final Prediction Error	(455.61)	(505.28)	(178.17)	(192.40)	
Defense Expenditures					
Optimal Lag (years)	1	1	2	2	No Relationship
Final Prediction Error	(455.61)	(489.93)	(312.39)	(318.52)	
Defense Burden					
Optimal Lag (years)	1	1	1	1	Defense-> Debt (+w)
Final Prediction Error	(455.61)	(473.41)	(306.22)	(294.83)	
Non-Defense Expenditures					
Optimal Lag (years)	1	1	1	1	No Relationship
Final Prediction Error	(455.61)	(471.23)	(400.13)	(453.79)	
Non-Defense Share of GDP					
Optimal Lag (years)	1	1	1	1	No Relationship
Final Prediction Error	(455.61)	(465.80)	(320.63)	(363.60)	

NOTES: Same as Table 2.

total expenditures, the defense burden (the share of defense in GDP) followed a pattern similar to total defense expenditures, albeit with a weaker response to increased indebtedness.

4. Finally, non-defense expenditures were found to have a weak impact on total indebtedness. This lag averaged one year for expenditures and two years for their share in GDP.

In general, the results suggest that links between expenditures and debt have strengthened over time. In addition, it is apparent that the composition of government expenditures (between defense and non-defense) affects the nature of this interaction with non-defense expenditures usually leading to future expansion in indebtedness and increased indebtedness tending to

TABLE 4

PAKISTAN: INTERACTION OF GOVERNMENT  
EXPENDITURES AND TOTAL SECTOR DEBT, 1973-1989

	Causation Patterns				Dominant Pattern
	Debt Debt	Debt Expen.	Expen. Expen.	Expen. Debt	
Total Expenditures					
Optimal Lag (years)	3	4	1	2	Expendit-> Debt (+ <i>m</i> )
Final Prediction Error	(141.14)	(105.78)	(48.03)	(53.10)	
Total Expenditures Share of GDP					
Optimal Lag (years)	3	1	1	1	Expendit-> Debt (+ <i>w</i> )
Final Prediction Error	(141.14)	(140.61)	(31.29)	(34.69)	
Defense Expenditures					
Optimal Lag (years)	3	1	1	4	Debt-> Defense (- <i>m</i> )
Final Prediction Error	(141.14)	(158.87)	(28.01)	(26.99)	
Defense Burden					
Optimal Lag (years)	2	2	1	1	Debt-> Defense (- <i>w</i> )
Final Prediction Error	(141.14)	(159.91)	(27.89)	(26.97)	
Non-Defense Expenditures					
Optimal Lag (years)	3	2	1	1	Expend-> Debt (+ <i>w</i> )
Final Prediction Error	(141.14)	(133.52)	(102.31)	(114.39)	
Non-Defense Share of GDP					
Optimal Lag (years)	3	1	1	1	Expend-> Debt (+ <i>w</i> )
Final Prediction Error	(141.14)	(139.35)	(83.74)	(93.45)	

NOTES: Same as Table 2.

retard the expansion of the government's allocations to defense. At this point however, it is impossible to say whether the links between defense come about because of debt servicing problems (diverting money from defense to foreign payments) on the part of the Pakistani government or whether the source of reduced rates of growth in defense stems from lender concern over the high (and presumably unproductive) levels of Pakistani defense expenditures.

The patterns are somewhat sharper for the disaggregative analysis. For

example in the case of indebtedness to foreign governments over the time period as a whole<sup>4</sup>:

1. The dominant pattern is one whereby increased debt facilitates future increases in both defense and non-defense activities. This effect is much stronger for defense, but in all cases the lag structure is fairly long (averaging three to four years). That is increased external indebtedness gradually relaxes the fiscal constraints on expenditures. Again it should be stressed that in the case of defense the link between debt and expenditures are particularly strong.

2. These patterns were also present in the earlier (1958-73) period, although during this period the links between expanded debt and non-defense expenditures were somewhat greater than those over the period as a whole. Again, the link is particularly strong between increased indebtedness to this source and the subsequent expansions in allocations to defense.

3. Finally, in the latter (1973-89) period another pattern forms whereby increased indebtedness begins to retard the expansion of defense expenditures. Again the lag is fairly long with increased indebtedness over the previous four years negatively impacting on this year's defense expenditures. In the case of the defense burden, there is a weak positive link between defense expenditures and debt.

4. In contrast, non-defense expenditures appear to initiate future debt accumulation with increases in allocations to this category of expenditure last year producing a fairly strong increase in this year's indebtedness to foreign banks and governments. Again, this link is weaker for increases in the share of GDP allocated to non-defense budgetary categories.

Summing up, again the relationship between expenditures and debt appears to have shifted over time. Pakistan's indebtedness to foreign banks and governments appears to have changed significantly with time. In earlier years lending by these organizations appears to have had the net effect of reducing fiscal constraints for all categories of expenditures. This may have developed because of the fungibility of these loans or because the banks and governments made general "balance of payments loans". Over time the accrued debt either produced lender concern over future repayment or concern within Pakistan itself over debt serving. The net result was that in more recent years the accumulated debt from this source appears to have forced the government to restrain its allocations to the military.

The links between the country's indebtedness to international institu-

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<sup>4</sup> Due to space limitations the remaining findings are summarized. A full set of tables similar to Tables 2-4 are available upon request.

tions and its expenditures present even another pattern<sup>5</sup>. With regard to defense expenditures:

1. For the period as a whole, increased defense expenditures have resulted in subsequent increases in indebtedness to these sources. The lag between increases in defense and debt is fairly short (averaging one year) and not particularly strong. More or less the same patterns characterized the relationship between the defense burden and indebtedness to the international organizations.

2. Again, no discernible patterns appear to have existed between defense and debt from these organizations in the earlier (1958-73) time period.

3. Finally, in more recent (1973-89) years debt appears to act as a force restraining allocations to defense. This pattern occurs for both defense expenditures and the growth in their share of GDP (the defense burden). Here the lag is short (one year). However the restraining force from this source does not appear to be as strong as that produced by increased indebtedness to foreign governments and banks. Also in the case of defense expenditures (but not the defense burden) increases in defense do result in subsequent increases in indebtedness to the international organizations.

4. Interestingly enough, there were no statistically significant relationships between expanded non-defense expenditures and expanded indebtedness to the international organizations.

This final result is important in that nearly all of the loans from international institutions are for non-defense activities. The lack of any statistically significant relationships between the debt accrued for this purpose and non-defense expenditures suggest that much of this funding is diverted to the defense budget. This is consistent with the evidence of fungibility of United States aid noted above. If this interpretation is correct it would also suggest that Pakistani concern over debt servicing and not lender concern over excessive military expenditures were responsible for the negative effect of indebtedness (to this source) on military spending.

### *Conclusions*

With regard to the questions asked at the beginning of this paper:

1. Defense expenditures in Pakistan have had a major role in affecting the country's external indebtedness. This effect has shifted over time, with Pakistani defense expenditures clearly expanding external debt in the first

<sup>5</sup> Because the analysis of total government expenditures did not lend anything to the analysis, these results are omitted.

(1958-73) period. In recent years this link has weakened and if anything the debt accrued in the earlier period is currently acting as a constraining force on the government's allocations to the military.

2. There are a number of fundamental differences between the way in which defense and non-defense allocations interact with external indebtedness. In general these links are much stronger for non-defense expenditures.

3. Also there are minor differences in the manner in which the debt to foreign governments/banks and that to international organizations has affected government expenditures.

4. Over time foreign governments and banks appear to have sensed the fungibility of their lending to Pakistan. In recent years this may have led them to monitor more closely their lending to the country or to cut back lending when they sensed that funds were diverted to the military. This is evidenced by the fact that in the earlier time period a common pattern developed between debt and expenditures, both defense and non-defense. In more recent years, expenditures in non defense activities produced a subsequent increase in debt, with debt having a fairly strong retarding effect on defense.

5. Interestingly enough, international organizations may have been willing to lend for increased defense expenditures. This is evidenced by the numerous causal linkages from defense to increased indebtedness with these international lending organizations. Similarly these organizations do not appear as concerned as governments and foreign banks over increased spending for military purposes in Pakistan. The forces retarding increased military expenditure due to indebtedness to this source may be more from Pakistani concern over debt servicing.

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#### PAKISTAN, SPESE PER LA DIFESA E DEBITO ESTERO: MODELLI DI CAUSALITÀ E VINCOLO

Scopo di questo articolo è di stabilire se e in che misura le spese per la difesa del Pakistan hanno influenzato la sua posizione debitoria verso l'estero. Usando un modello di causalità di Granger modificato, il principale risultato ottenuto è che le spese per la difesa del Pakistan hanno avuto un ruolo importantissimo nel determinare l'indebitamento estero del paese. Questo effetto è variato nel tempo in quanto le spese militari del Pakistan hanno decisamente fatto aumentare il debito estero nel primo periodo (1958-73). In anni più recenti, tuttavia, questa relazione si è indebolita e se non altro il debito accumulato nel periodo precedente agisce ora come una forza frenante sugli stanziamenti militari del governo.