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# AN ANALYSIS OF THE TAX BUOYANCY RATES IN PAKISTAN

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## ABSTRACT

By using econometric techniques for estimating tax elasticities, this paper finds significant but low tax buoyancy rates for GDP,  $M_0$  and volume of trade. Surprisingly, the theoretically important factor of tax evasion (SFTR) was found to be ineffective. This indicates that SFTR is not an adequate measure of tax evasion. There is no significant association between tax revenue growth and investment, credit, public debt and inflation. This illustrates the weakness of the tax regime in Pakistan.

## **I. Introduction:**

Pakistan's economy in the second quarter of 2006 has continued an upswing for the fifth quarter running. This means that, technically, the economy has come out of an extended period of recession. The statistics given confirm that there is an ample evidence of recovery, but sustainability of this growth remains uncertain. Low savings and investment rates, persistent unemployment, poverty and need for improvement in tax revenue collection require further attention by policy makers.

Conceptually, one of the measures of the responsiveness of tax revenues to changes in the base is the 'elasticity' or buoyancy rate that seeks to relate the percentage change in tax revenue to a percentage change in various macro variables that affect tax receipts.

A very common problem in the analysis on tax responsiveness is the frequent changes in the policies of tax collection. In estimating the built-in elasticity of a tax, therefore, either the time series data on tax revenues needs to be adjusted to eliminate the effects of discretionary tax measures, or a suitable estimation methodology has to be adopted, or a combination of the two has to be used. The most appropriate method would clearly depend upon the availability, nature and reliability of information on tax revenues and discretionary changes in the tax structure.

In the light of the above, this paper presents an analysis of the estimates of tax buoyancy in relation to changes in various independent variables using an econometrics approach.

## **II. Literature Review:**

A study by Chaudhry, (2001) provides a review of optimal tax theory to devise an appropriate tax policy for the agriculture sector of Pakistan. Optimal tax theories expect buoyancy rates to be high and significant. The author has suggested that if local bodies are made responsible for tax collection then additional costs can be avoided and buoyancy rates can be high.

The literature suggests that economic development is expected to bring about both an increased demand for public expenditure (Tanzi, 1987) and a larger capacity to meet these demands (Musgrave, 1969). Musgrave argues that the lack of availability of 'tax handles' might limit revenue collection at low levels of income and these limitations should become less severe as the economy develops. Effectiveness of measures for increasing tax revenue must be estimated in order to identify their success. Analysis of buoyancy rate is a means for evaluating the effectiveness of policies for improvement in tax revenue. Since gross investment is one of the components of aggregate demand therefore tax buoyancy with respect to investment should also be estimated.

There is a consensus in the literature on the use of per capita income as a proxy for the overall level of development. (Bahl, 1971 and Ansari, 1982). A higher per capita income reflecting a higher level of development is held to indicate a higher capacity to pay taxes as well as a greater capacity to levy and collect tax revenue (Chelliah, 1971). But it is also possible that per capita income cannot reflect the real impact on tax buoyancy due to uneven income distribution in the economy. Therefore in this study income per capita is not selected as an independent variable. Today the human development index (HDI) is sometimes considered to be a better indicator of welfare than income per capita. However due to non-availability of timely HDI data, HDI is also not taken into account in this study.

Tanzi in a study emphasizes that trade taxes have historically been a major source of government revenue during the early stages of economic development because they are easier to collect than domestic income and consumption taxes when tax administration is rudimentary and tax handles are limited, (Tanzi 1989). This is also supported by a study by Linn and Weitzel (1990) which shows that the administrative ease with which trade taxes can be collected makes them an attractive source of government revenue when administrative capabilities are scarce (Linn and Weitzel, 1990). Therefore volume of trade has been given importance as a determinant of tax revenue specially in developing countries at early stages of development.

The existence of a large public debt has important implications for the taxation potential of a country. With a large debt, the government needs to raise revenues necessarily. When the interest on the debt exceeds net borrowing plus the possible reduction in non-interest expenditure, the level of taxation must go up unless the rate of growth of the economy is high enough to neutralize this increase. Therefore public debt and government spending play a role in determining the extent to which countries may take advantage of their taxable capacity (Tanzi, 1987). Therefore this study also

considered debt as a determinant. Public debt may be financed through inflationary financing, which results in acceleration of inflationary pressure. As a result the real value of tax collection falls because of the inevitable lag between the date the tax is due and its date of collection (Tanzi, 1988, 1989, Blejer & Cheasty, 1989; Linn & Weitzel, 1990). Therefore, the size of the public debt is expected to be a positive determinant of the buoyancy rate.

A country's economic structure is one of the factors that could be expected to influence the level of taxation (Tanzi, 1992). An economy with a large GDP share of agriculture value added is expected to generate low tax revenues. Due to political reasons, it is usually difficult to directly tax the agricultural sector in Pakistan, though it is often very heavily taxed in many implicit ways, e.g., through import quotas, tariffs, controlled prices for output, and overvalued exchange rates (Bird, 1978; Ahmad and Stern, 1991).

Tax evasion is considered to be of serious concern to those dealing with taxation issues of a country because of several reasons, the major being that it results in the loss of revenue. Pyle (1989) points out that one of the implications of the existence of the underground economy is that some income goes untaxed and also certain indirect taxes are also evaded. Thus in this study a short fall in tax revenues (SFTR)<sup>1</sup> will be considered as a proxy to represent tax evasion. These shortfalls in tax revenues are normally inclusive of those shortfalls that are due to tax avoidance but not tax evasion. The expected sign of buoyancy rate for tax revenue due to SFTR is negative.

Estimating income tax elasticity is useful for determining the extent of the sensitivity and response of the tax system to the changes that take place in the composition and value of GDP. Moreover, a quantitative measure of the effectiveness of tax policy in terms of stimulating public resources, is given by the relationship between the proportional changes in tax revenue and those of national income (Harvey, 1993), and this relationship is measured by income tax elasticity. The elasticity of yield is an important aspect of the tax structure (Goode, 1984), and overall measures of elasticity and buoyancy may be useful as a descriptive tool, which may lead to further questions and point to a more detailed examination of particular taxes in certain countries (Ahmad and Stern, 1991). The larger the value of the elasticity or buoyancy, the faster is the rise in the tax ratio. This is because the effect of factors such as progressive elements in the tax system, distribution of income, and composition of bases, (which are in turn affected by discretionary tax measures and economic growth), on the size of the elasticity are felt on the tax ratio, so that countries with a tax elasticity greater than unity must have a rising tax ratio through time (Choudhry 1979), provided GDP is growing.

Nominal variables are affected by prices. Therefore variables such as  $M_0$ ,  $M_1$ ,  $M_2$ , and CPI have been also included in this study. These variables are measures of inflationary impact on tax buoyancy.

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<sup>1</sup> Measured by taking the difference of expected total tax revenues aimed at the beginning of the fiscal year and total tax revenue finally collected at the end of the fiscal year.

The rationale behind this study is to identify factors underlying GDP growth rates as determinants of tax buoyancy. Section III will explain data and methodology; section IV provides results and section V will conclude the study.

### **III. Data & Methodology:**

For the estimations of buoyancy rates, the literature suggests that over the years following four approaches have been used frequently:

- (a) Constant Rate Structure;
- (b) Proportional Adjustment;
- (c) Divisia Index; and
- (d) Econometric Methods.

The constant rate structure method involves the generation of a simulated tax revenue series for a given reference year and estimates of the tax base for subsequent years. It is relatively the most accurate approach. It is evident, however, that such a procedure will usually be extremely cumbersome if it is applied to the full range of tax instruments that exists in a country and data requirements are also necessarily very heavy. As a consequence, the constant rate structure method is rarely used for analytical purposes.

For most analytical work, one of the other three approaches is adopted. The Divisia index and the econometric methods are least demanding in terms of data requirements, since they rely mainly on actual tax collections; therefore they measure at aggregate levels. However, both these methods are subject to certain limitations. In the Divisia index approach, its calculation is predicated on the conditions that the underlying tax function is continuously differentiable and homogeneous, preferably linear and homogeneous. Although these may not seem to be particularly demanding conditions, there are serious doubts about their validity when the aggregate tax to which it is being applied comprises of a non-constant set of items on which taxes are being levied. If the estimation is being done over a sufficiently long period of time, experience shows that the composition of the tax base will exhibit significant change.

The proportional adjustment method cannot be applied to broad tax categories such as excise or customs, but only to individual products within these categories. This method is useful for instance in cases where revenue-neutral tax simplifications are being

worked out and disaggregated data on tax rates and tax bases are available. It cannot, on the other hand, make do only with actual tax collection data as is possible with the Divisia index method. It requires the use of budget estimates of tax yield arising out of discretionary changes. Such data are often not available in many countries, and thus restricts the applicability of this method.

The econometric models, which often rely on using dummy variables to capture discretionary changes in tax rates and tax structures, cannot be used if discretionary tax changes have been made frequently in the past, since this leads to an excessive reduction in the degrees of freedom and thereby to the efficiency of the estimators. Even if the number of such discretionary changes is relatively small, serious problems can arise in the specification of the estimation equations unless there is information on the nature of the tax changes and the extent to which their effects are independent of one another.

Keeping in mind the difficulties that exist in these methodologies, this study will use the econometric method. It is our judgement that during the period under study major changes have not occurred in the tax regime. This is a view open to contest, however.

Tax buoyancy will be estimated within the following relationships...

- (i) Tax Revenue and GDP.
- (ii) Tax Revenue and high powered money ( $M_0$ ).
- (iii) Tax Revenue and narrow money supply ( $M_1$ ).
- (iv) Tax Revenue and broad money supply ( $M_2$ ).
- (v) Tax Revenue and CPI.
- (vi) Tax Revenue and Gross Investment.
- (vii) Tax Revenue and Volume of Trade.
- (viii) Tax Revenue and Tax Evasion (SFTR)
- (ix) Tax Revenue and Public Debt

The required data has been taken from various issues of Pakistan Federal Budget reports, IFS, SBP annual reports and Economic Survey of Pakistan on annual basis from the period 1980 to 2004. All data is in nominal form as the effect of CPI and monetary aggregates is separately measured.

The following linear regression equation has been estimated to calculate buoyancy rates.

$$\ln (TR) = a_j + b_j \ln (j) \dots\dots\dots (1)$$

Where TR is the tax revenue, “b” is the tax buoyancy of the “j<sup>th</sup>” variable. “j” being GDP, money supply, CPI, Gross Investment, Volume of Trade, Public Debt and SFTR.

#### **IV. Results:**

##### ***a. Unit Root Tests.***

Table 1 presents the results of unit root test for all series in log form with base exponential.

**Table 1**  
**Unit Root Tests - Augmented Dicky Fukller test (ADF)**  
 Calculated on Linear Deterministic Trend in each Data series with lag 1.

Variables	ADF Test	Ho	Stationary at?
Ln GDP	-13.25	Reject	First Difference
Ln Tax Revenue	-9.12	Reject	First Difference
Ln Money Supply $M_0$	-9.15	Reject	First Difference
Ln Money Supply $M_1$	-12.41	Reject	First Difference
Ln Money Supply $M_2$	-11.57	Reject	First Difference
Ln CPI	-7.24	Reject	First Difference
Ln Gross Investment	-14.55	Reject	First Difference
Ln Volume of Trade	-7.95	Reject	First Difference
Ln Public Debt	-12.72	Reject	First Difference
SFTR	-0.34	Accepted	Level

5% critical value is  $-1.96$  Ho: There is a unit root thus no stationarity.

For all the variables the null hypothesis is rejected except for (SFTR). The results show that except for SFTR, all the other series are stationary at the first difference, which means that the possibility for co-integration between them can be tested. The positive results of the co-integration test explain the existence of a long run relationship. In the subsequent analysis SFTR has been dropped.

***b. Co-integration tests.***

Table 2 shows the results of co-integration tests.

**Table 2**  
**Co-Integration Tests**

Assuming linear deterministic trend in data with no constant. All the data is in natural log form.

Pair: Tax Revenue with...		Likelihood Value	Ho	Co-
		integrating?		
GDP	21.410	Rejected	Yes	
Money Supply ( $M_0$ )	16.319	Rejected	Yes	
Money Supply ( $M_1$ )	18.922	Rejected	Yes	
Money Supply ( $M_2$ )	9.393	Accepted	No	
CPI	16.641	Rejected	Yes	

<b>Gross Investment</b>	20.317	Rejected	Yes	
<b>Volume of Trade</b>	16.122	Rejected	Yes	
<b>Public Debt</b>	18.448	Rejected	Yes	5%
critical value is 15.41		Ho: There is no co-integration prevails		

From Table 2 it is seen that all the series are co-integrating with tax revenue except money supply ( $M_2$ ). This suggests that there exists a long run relationship between the pairs tax revenue & GDP, tax revenue &  $M_0$ , tax revenue &  $M_1$ , tax revenue & CPI, tax revenue & gross investment, tax revenue & public debt and tax revenue & volume of trade. The lack of a long run relationship between broad money supply ( $M_2$ ) and tax revenue is unexpected. Note that SFTR has been not tested here because it was disqualified under unit root tests.

### *c. Estimation of Buoyancy Rates.*

After performing unit root and co-integration tests, the estimation of buoyancy rates have been performed by using Equation 1.

Table 3 presents the results for the overall data from 1980 to 2004. To recall: the equation used was...

$$\ln(\text{TR}) = a_j + b_j \ln(j) \quad \dots\dots\dots (1)$$

**Table 3**  
**Tax Revenue Buoyancy Rates for the period 1980-2004**

Response from...	Buoyancy Rate	t-Statistics	Ho	Is significant?	
<b>j = GDP</b>	0.174	5.61	Rejected	Yes	
<b>j = Money Supply (<math>M_0</math>)</b>		0.061	4.55	Rejected	Yes
<b>j = Money Supply (<math>M_1</math>)</b>		0.021	0.71	Accepted	No
<b>j = Money Supply (<math>M_2</math>)</b>		0.005	0.22	Accepted	No
<b>j = CPI</b>	-0.073	-0.15	Accepted	No	
<b>J = Gross Investment</b>		0.0006	0.13	Accepted	No
<b>j = Volume of Trade</b>		0.0885	2.6	Rejected	Yes
<b>j = Public Debt</b>	0.0066	0.06	Accepted	No	



Table 3 shows that only the tax buoyancy rates due to GDP,  $M_0$ , and Volume of Trade are significant. However the tax buoyancy rates of volume of trade and  $M_0$  are very low. The tax buoyancy rate due to GDP is the highest.

**Table 4: Summary of Result**

Variable	Unit Root Test	Co- Integrating With Tax Rev	Significance of Buoyancy Rate
Tax Rev	Exists	—	—
GDP	Exists	Yes	Yes
$M_0$	Exists	Yes	Yes
$M_1$	Exists	Yes	No
$M_2$	Exists	No	No
CPI	Exists	Yes	No
Gross Inv	Exists	Yes	No
Vol of Trade	Exists	Yes	Yes
Public Debt	Exists	Yes	No
SFTR	Do not Exist	—	—

### Conclusions:

Table 4 shows that only statistically significant buoyancy rates were found to be for GDP,  $M_0$  and volume of trade.

The elasticity method has the advantage of showing precisely how the different economic effects come into play for determining tax revenue patterns. Thus tax revenue optimizers must keep the buoyancy rate information in mind to put in any tax policy.

The ineffectiveness of the overall tax regime is graphically illustrated. Tax revenue does not respond to growth in investment, credit, ( $M_2$ ) the rate of inflation and public debt. The response to growth in money supply and the trade/GDP is negligible (and likely to decline due to import liberalization incentives). Tax buoyancy to GDP is moderate given developing countries average bouyancy level. The lack of association between STFR and tax revenue indicates that STFR is not an adequate measure of tax evasion. Falling STFR levels show that the govt. remains content with its very modest tax performance.

### REFERENCES

Ahmed, E. and Stern N. (1991), "Taxation for developing Countries" in *Handbook of development Economics*, Vol. 2, ed. by Chenery H. And Srinivasan T.N.,

Ansari M. (1982), "Determinants of Tax Ratio: A Cross-Country Analysis", *Economic and Political Weekly*, June 19, pp. 1035-1042.

Bahl R.W. (1971), "A Regression Approach to Tax Effort and Tax Ratio Analysis", *IMF Staff Papers*, Vol. 18, No. 3, November, pp. 570-612.

Bird, R.M. (1978), "Assessing Tax Performance in Developing Countries: A Critical Review of the Literature", in *Taxation and Economic Development*.

Blejer M.I. and Cheasty A. (1989), "Fiscal Implications of Trade Liberalization", in *Fiscal Policy in Open Developing Economies*, ed. By Vito Tanzi, IMF.

Chaudhry, M. G. (2001), "Theory of optimal taxation and current tax policy in Pakistan's Agriculture", *Pakistan Development Review*, Vol. 40, No. 4, pp. 489-502.

Chelliah R.J. (1971), "Trends in Taxation in Developing Countries", *IMF Staff Papers*, Vol. 18, No. 2, July, pp. 254-325.

Choudhry, N.N. (1979), "Measuring the Elasticity of Tax Revenues: A Divisia Index Approach", *IMF Staff Papers*, vol. 26, March 1979.

Linn F.J. and Weitzel D. (1990), "Public Finance, Trade and Development: What Have We Learned?" in *Fiscal Policy in Open Developing Economies*, ed. By Tanzi, pp. 9-28.

Musgrave R.A. (1969), *Fiscal Systems*, Yale University Press, London, UK.

Pyle D. J. (1989), *Tax Evasion and the Black Economy*, The Macmillan Press Ltd.

Radhkrishnan H. (1991), "Tax Effort: An Appraisal of India", *Msc. Thesis*.

Tanzi V. (1987), "Quantitative Characteristics of the Tax Systems of Developing Countries", in *The Theory of Taxation for developing Countries*, ed. By Newbery and Stern, Oxford University Press, New York, pp. 205-241.

Tanzi V. (1989), "Impact of Macroeconomic Policies on the Level of Taxation and the Fiscal Balance in Developing Countries", *IMF Staff Papers*, Vol. 36, pp. 633-56.

Tanzi V. (1992), "Structural Factors and Tax Revenue in Developing Countries: A Decade of Evidence", in *Open Economies: Structural Adjustment and Agriculture*, ed. by Goldin, I. and Winters, A.L., Cambridge University Press, Cambridge. pp. 267-281.

Tanzi V. and Blejer M.I. (1988), “Public Debt and Fiscal Policy in Developing Countries”, in *The Economics of Public Debt*, ed. by Arrow & Boskin. Chapter 8.