An analysis of Tax Buoyancy Rates in Pakistan

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Abstract

By using the econometric technique of for estimating tax elasticities, this paper shows that the significant buoyancy rates were found for GDP, M_0 and volume of Trade. Surprisingly, a theoretically important factor of tax evasion was found ineffective during unit root test. A better tax structure is needed in which the effect of tax evasion, and political influence on tax collection should be addressed.

I. Introduction:

According to the SBP annual report, Pakistan's economy has maintained its 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 ample evidence of recovery, but the economy still needs to reach the level of maturity. Low savings and investment rates, persistent unemployment, poverty and need of 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 for most analytical applications is the 'elasticity' or buoyancy rate that seeks to relate the percentage change in tax revenue to a percentage change in various variables that effect 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 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 device an appropriate tax policy for agriculture sector of Pakistan. Under the treatment of optimal tax theories it is expected that buoyancy rates could be high and significant. The author has suggested that if local bodies make responsible for tax collection then the additional cost can be avoided. This means that buoyancy rates can be high.

The literature suggests that economic development is assumed to bring about both an increased demand for public expenditure (Tanzi, 1987) and a larger supply of taxable capacity to meet such 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. So the improvement in tax revenues is necessary and effectiveness of all efforts for increasing tax revenue must be estimated in order to check the success of such polices. Analysis of

buoyancy rate is a means for evaluating the policies effectiveness for improvement in tax revenue. Since gross investment is one of the components of aggregate demand therefore it has been taken to conduct this study.

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 them (Chelliah, 1971). But it is also possible that per capita income cannot reflect actual impact on buoyancy due to uneven income distribution in the economy. Therefore in this study income per capita is not selected. 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 HDI data, HDI is also not taken into account. GDP as an indicator justifies its inclusion in this study.

Tanzi (1989) 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 taxes 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 implication 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 the 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. Many studies highlight the importance of debts. Public debt may be financed by 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 such as; 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) will be considered as a proxy to represent tax evasion. The expected sign of buoyancy rate for tax revenue due to SFTR is negative.

Estimating income tax elasticity is useful for displaying 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 & 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.

According to classical dichotomy, nominal variables are affected by prices but not the real variables. Therefore the variables such as M_0, M_1, M_2, and CPI has been also included in this study. Apart from CPI, all these monetary aggregates are also inflationary in nature.

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

3. Data & Methodology:

For the estimations of buoyancy rates, 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 that its data requirements are necessarily very heavy indeed. 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 to individual products within these categories. This method is useful for instance in cases where revenue-neutral tax simplifications are being worked out 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, which restrict 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.

For that matter the estimation of buoyancy rates will be within the following relationships…

(i) Tax Revenue and GDP.

(ii) Tax Revenue and the money supply (M_0).

(iii) Tax Revenue and the money supply (M_1).

(iv) Tax Revenue and the money supply (M_2).

(v) Tax Revenue and Inflation 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 IFS, SBP annual report and the economic survey of Pakistan on annual basis from the period 1980 to 2004. All data is in nominal form as the effect of CPI is separately measured.

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

$$\mathbf{Ln\ (TR) = a_j + b_j\ Ln\ (j)\ \ldots\ldots\ldots\ldots\ (1)}$$

Where TR is the tax revenue, "b" is the tax buoyancy of the "j" variable. "j" would be from GDP, money supply, CPI, Gross Investment and the Volume of trade.

IV. Results:

a. Unit Root Tests.

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

Table 1

Unit Root Tests - Augmented Dicky Fukller test (ADF)

Variables	ADF Test	5% Critical Value	Ho	Stationary at?
Ln GDP	-13.25	-1.96	Reject	First Difference
Ln Tax Revenue	-9.12	-1.96	Reject	First Difference
Ln Money Supply M_0	-9.15	-1.96	Reject	First Difference
Ln Money Supply M_1	-12.41	-1.96	Reject	First Difference
Ln Money Supply M_2	-11.57	-1.96	Reject	First Difference
Ln CPI	-7.24	-1.96	Reject	First Difference
Ln Gross Investment	-14.55	-1.96	Reject	First Difference
Ln Volume of Trade	-7.95	-1.96	Reject	First Difference
Ln Public Debt	-12.72	-1.96	Reject	First Difference
SFTR	-0.34	-1.96	Accepted	Level

Calculated on Linear Deterministic Trend in each Data series with lag 1.

Ho: There is a unit root thus no stationarity.

For all the variables the null hypothesis is rejected accept for short falls in tax revenue (SFTR). The results are showing that except SFTR, all the other series are stationary at the first difference which means the possibility for the co-integration between them can be tested. The positive results of co-integration test explain the existence of a long run relationship. For the remaining econometric techniques SFTR will not be used any more.

b. Co-integration tests.

Table 2 shows the results of co-integration tests.

Table 2

Co-Integration Tests

Pair: Tax Revenue with…	Likelihood Value	5% Critical Value	Ho	Co-integrating?
GDP	21.410	15.41	Rejected	Yes
Money Supply (M_0)	16.319	15.41	Rejected	Yes
Money Supply (M_1)	18.922	15.41	Rejected	Yes
Money Supply (M_2)	9.393	15.41	Accepted	No
CPI	16.641	15.41	Rejected	Yes
Gross Investment	20.317	15.41	Rejected	Yes
Volume of Trade	16.122	15.41	Rejected	Yes
Public Debt	18.448	15.41	Rejected	Yes

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

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 is 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 shows such results for the overall data from 1990 to 2004. To recall: the equation used was…

$$\mathbf{Ln\ (TR) = a_j + b_j\ Ln\ (j)\ \ldots\ldots\ldots\ldots\ldots\ (1)}$$

Table 3

Tax Revenue Buoyancy Rates for the period 1980-2004

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

Ho: The parameter is insignificant

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 low. The tax buoyancy rate due to GDP is the highest.

V. Conclusions:

The summary of the results is presented in table 4 below.

Table 4

Results Précis

Variable	Unit Root Test	Co Integrating With Tax Rev	Significance of Buoyancy Rate
Tax Rev	√	-	-

GDP	√	√	√
Mo	√	√	√
M1	√	√	M
M2	√	M	M
CPI	√	√	M
Gross Inv	√	√	M
Vol of Trade	√	√	√
Public Debt	√	√	M
SFTR	M	-	-

As it is obvious from table 4 that only statistically significant buoyancy rates were found to be for GDP, M_0 and volume of trade. Tax revenues in practice differ significantly in terms of buoyancy rates for various factors. The results of this study also prove the same. Developing countries make much less use of broad-based taxes, relying instead on excise taxes, tariffs, GST etc. Thus these countries collect much less revenue as a fraction of GDP than is collected in developed economies. Corruption is quite common in such countries. This single factor of corruption is the major reason for low buoyancy rates in Pakistan. Apart from corruption, within the political framework, the key problem is the political pressures faced by the tax authorities. Such pressures are meant to have low or no tax policies specifically on agriculture sector. A weak financial sector also make tax evasion easy. Tax reforms are also needed for improving tax revenue from the financial sector like stock markets of the countries. The elasticity method has the advantage of showing precisely how the different economic effects come into play for understanding tax revenues patterns. Thus tax revenue optimizers must keep the buoyancy rate information in mind to put in any tax policy.

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