Buoyancy, Elasticity and Stability of Total Tax Revenues: Evidence from Pakistan

Nasser Shahzada

Lecturer of Economics at Government Postgraduate college No.01 Abbottabad,

Muhammad Siddique

Associate of Economics at Government Postgraduate College No.01 Abbottabad,

Kiran Mustafa

Lecturer, Department of Economics Abbottabad University of Science and Technology, Abbottabad,

Altaf Hussain

Assistant Professor Economics, Islamia College University Peshawar, Pakistan

Mazhar Ali Abbasi

M.Phil Scholar (Economics), Hazara University Mansehra, Pakistan.

Abstract:

This study intends to investigate the long and short run buoyancy and elasticity of total tax revenues and also evaluated the stability of TTR in Pakistan using Time Series Data for the period 1979-2015. The study employs Engel-Granger Test and Error Correction Mechanism to calculate the long and short run buoyancies and elasticity. The long run buoyancy for total tax revenue is 0.984 and short run buoyancy for total tax revenue is 0.973 which showed a non-buoyant and inelastic and inefficient tax system in short as well as in long run. The long run elasticity is 0.994 which is also less than unity. The long run elasticity of total tax revenues is greater than long run buoyancy showing that reforms are absolutely not working in raising revenue even the tax reforms have negative impact on the tax. Base to GDP buoyancy (1.017) is greater than tax to base buoyancy (0.967) reveals that along with increase in GDP base is increasing but tax revenue is not increasing.

Keywords: Elasticity, Total Tax Revenues, Co-integration, Error Correction Mechanism, Pakistan.

Introduction

One of the soaring problems faced by Pakistan perpetually is the ineffectiveness of fiscal policies. Low tax to GDP ratio becomes perennial issue. Consequently dependence on foreign resources to bridge the gap of fiscal deficit is increasing. Pakistan tax to GDP ratio was 10.40 in 2009-10, (Pasha, 2010) and 9.8 in 2011-12 (Pakistan Economic =Survey 2012-13) which is the lowest in the world and even less than the tax to GDP ratio of poor countries of sub-Saharan Africa. Wagner's hypothesis states that when GDP increases, government spending increases more than proportionally (Wagner 1911). In contrast Pakistan's tax revenues responded less than proportionally to GDP which generates a shortfall of tax revenues over the expenditures and in turn generates a huge fiscal deficit. Conceptually low buoyancy and tax elasticity accounts for gap in revenues and expenditures.

Buoyancy is the gross responsiveness of any tax revenue to any increase in the GDP. Buoyancy includes both automatic response of tax revenues to GDP and response generated through discretionary tax measures (DTMs) as well. DTMs include any effort by the Government and tax administration to enhance the tax revenues by bringing changes in the tax base or tax rate. Haughton, (1998) defines Tax Revenue buoyancy as

$TB = \% \Delta Revenue / \% \Delta GDP$ or

$$TB = \Delta TR \div \Delta GDP \times GDP \div TR$$

Total tax Buoyancy of any tax revenue is further divided into two parts: buoyancy of tax revenue to the tax base and buoyancy of tax base to the GDP. Tax base means from where the tax revenue is collected for example tax base for the direct tax is Non-Agriculture GDP

because agriculture GDP is exempted from tax in Pakistan. Calculation of buoyancy is illustrated by the following equations:

Tax Buoyancy (Tax to its Base) = % Δ tax Revenue / % ΔBase Or

$$TB\ (\text{Tax to its Base}) = \Delta TR \div \Delta Base \times Base \div TR$$

TB (Base to GDP) = % Δ Base /% ΔGDP Or

$$TB\ (\text{Base to GDP}) = \Delta Base \div \Delta GDP \times GDP \div Base$$

Buoyancy of tax revenues is calculated by multiplying tax to base buoyancy and base to GDP buoyancy. Tax buoyancy can be calculated for total tax revenues, direct tax revenues, and indirect tax revenues and for all sub categories of taxes like income tax, sales tax, excise duty and custom duty etc.

Tax elasticity defined as built in response of tax revenues to the Gross Domestic Product (GDP). Briefly, one percent increase in GDP brings how much percent change in total tax revenues or respective tax revenues when there is no change in the tax rate or tax base. To measure the net response, the discretionary response of tax revenues must be separated from the total response to arrive at automatic or net response of tax revenues to GDP.

Tax to Base Elasticity:

$$TE\ tax\ to\ base = \Delta TR^{\circ} \div \Delta BASE \times BASE \div TR^{\circ}$$

The tax elasticity and buoyancy are distinguished by a small circle sign on the revenues and GDP in this article. Total tax elasticity of any tax revenue is also divided into two parts, elasticity of tax revenue to the tax base and elasticity of tax base to the GDP. Tax base means from where the tax revenue is collected for example tax base for the direct tax is Non-Agriculture GDP because agriculture GDP is exempted from tax. Calculation of Elasticity done by the same formulas as explained in the previous section. The Elasticity of tax revenue is calculated by multiplying tax to base elasticity and base to GDP elasticity. The prime objective of this study is to estimate the buoyancy and elasticity of total tax revenue for Pakistan and provide policy recommendation to increase the tax to GDP ratio.

Pakistan's Tax to GDP Ratio: A Retrospective: Ironically tax to GDP ratio of Pakistan cannot be reckoned as remarkable by any account. Only Bangladesh ranked behind Pakistan. A clear picture of dismal tax to GDP ratio is illustrated in table (1.1) below. In is clear from the table that some countries enjoy high tax to GDP ratio. A high tax to GDP is key for rapid economic growth.

Table: 1.1. Comparison of Tax to GDP Ratio with Other Countries, 2012

Country	Tax/GDP Ratio (2015)
UAE	36.3
UK	40.4
Uzbekistan	33.4
Sweden	51.3
Saudi Arabia	44.9
Pakistan	11.9
Netherlands	46.3
Namibia	36.8
Maldives	28.9
Libya	70.3
Lebanon	22.7
Kuwait	66.8
Kenya	18
Iraq	48.8

India	18
Algeria	39.1
Bangladesh	11.4

Sources: CIA Fact Book 2015.

Again if we look at the tax to GDP ratio of the Pakistan it remained 14 percent for the all of the fiscal years of Pakistan. The list of the tax to GDP ratio for various years is as following.

Table: 1.2 Tax to GDP ratio in Pakistan from 1991 to 2015.

Years	**FY91**	**FY92**	**FY93**	**FY94**	**FY95**	**FY96**	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**	**FY02**	
Fiscal deficit % of GDP	8.8	7.5	8.1	5.9	5.6	6.5	6.4	7.7	6.1	5.4	4.3	4.3	
Years	FY03	FY04	FY05	FY06	FY07	FY08	2009	2010	2011	2012	2013	2014	15
Fiscal deficit % of GDP	3.7	2.4	3.3	4.2	4.3	7.3	5.2	6.2	6.5	6.8	8.2	5.5	5

Source: Economic Survey of Pakistan, 2014-15.

Review of Literature

The empirical study on tax buoyancy and tax elasticity has served a voluminous and wide literature. These studies have wide variety of approaches. This paper reconciles only those results which fall within the domain of buoyancy, elasticity and stability of total tax revenues. The table 2.1 summarizes the results of few studies carries out to estimate the tax buoyancy, tax elasticity and stability.

Table 2.1 Summary of the Literature Reviews:

Estimates of Tax Buoyancy, Tax Elasticity and Stability

Study	country	method	Conclusion	
			Buoyancy	Elasticity
Manfield(1972)	Paraguay	Prest	1.69	1.2
Ghuman&Dhesi(1980)	India	Pam	-	1.23
Gillani (1986)	Pakistan	SLRM	1.17	1.26
Indarata(1991)	srilanka	PAM	01	0.58
Ahmed(1994)	Cameroon	SOLS	3.19	-
Ahmed (1994)	Burundi	SOLS	0.06	-
Akbar &ahmed(1997)	Pakistan	OLS	1.07	0.50
Haughton (1998)	Madagascar	OLS	1.527	-
Muhumuza (1999)	Uganda	PAM	1.21	0.91
Pasha &policy(2000)	Pakistan	-	-	-
Skeeteetal (2000)	Barbados	PAM	1.11	0.93
Mukarran (2001)	Pakistan	OLS	1	0.64
Bilguees (2004)	Pakistan	VAR	0.92	0.88
Rasheed (2006)	Pakistan	cointegration	0.174	-
Wolswijik (2007)	netherland	PAM	-	0.9
Timsina (2007)	Nepal	PAM	1.12	0.51
Gupta (2009)	india	-	2.28	-
Asmahetal (2010)	Ghana	DUM	1.08	-
Muhammad & ahmed (2010)	bd	PLSM	2.58	-
Do	Pakistan	PLSM	1.25	-
Do	Brazil	PLSM	0.16	-
Mburu&okrech (2011)	Kenya	PAM SOLS	0.261	0.509
Ahmed &sheikh (2011)	Pakistan	-	-	-
Milwood (2011)	Jamaica	SOLS,DI	-	1.03

A bird eye view on the existing literature reveals that buoyancy and elasticity of taxes with respect to GDP is more or less inelastic. So the present study formulates the null hypothesis as:

Total Tax Revenue, Direct Taxes and Indirect Taxes are elastic with respect to GDP.

Methodology

Theoretical Framework: The present study is based on Wagner's postulation which states that whenever GDP increases it brings a more than proportional increase in government's expenditures. According to Wagner the government is bound to spend in an exorbitant under social and political pressure leading to high growth in the public expenditures than the growth in the GDP. Consequently the ratio of Government expenditure to GDP increases continuously. The present study aims to estimate the short and long run buoyancies and elasticities of taxation system of Pakistan as well the stability of different taxes. This study begins with Cobb-Douglas tax function in log form to find elasticity and buoyancy directly.

$$\log TR = \log\alpha + \beta \log Y + \mu \quad \text{(i)}$$

Here β is an estimated coefficient of buoyancy and μ is the stochastic error term. The possibility of long run co-integrating relationship can also be investigated to estimate the long run β buoyancy co-efficients. The elasticity can be estimated by refining the data for changes in tax rates and changes in tax base (DTMs). To estimate elasticity an accurate data is required on revenue changes due to Discretionary Tax Measures (DTMs) introduced during the study. The buoyancies are further divided in two parts: Tax revenues to base buoyancies and base to GDP buoyancies.

Research Methodology: The current study focuses on estimating buoyancy and elasticity with respect to GDP in Pakistan. Methodologicaly Cobb-Douglas tax model in log form provides foundation to find elasticities and buoyancies directly, as this methodology was used by Twerefou et.al (2010),

$$\log TR = a + b \log Y + \mu \quad \text{(i)}$$

The equation (i) estimates the buoyancy and elasticity of taxes with respect to GDP. Here logTR is the log of respective tax revenues; b is an estimated co-efficient of buoyancy, a is the constant or intercept, log Y is the log of Gross Domestic Product and μ is the stochastic error term which is assumed to be normally and asymptotically distributed with zero mean and constant variance . The existence of long run Co-integrating relationship will be investigated through Augmented Dickey fuller Test and Engle Granger Test. If long run Co-integrated relationship proved between the Tax revenues and GDP then Co-integrated Least Square Regression Method (CLSRM) will be used to estimate the long run buoyancy coefficients and Error Correction Mechanism (ECM) will be used to capture the short run buoyancies. A tax with a progressive rate structure may be income inelastic and a tax with a regressive rate structure may be income elastic provided the marginal share of tax base to GDP exceeds the average rate or decrease. As GDP increases it affects the tax base and a change in tax base will do affect the tax revenues. So this study finds the buoyancy and elasticity in two steps; first tax revenues to tax base elasticity and tax base to GDP elasticity. Therefore, the elasticity and buoyancy of any individual tax with respect to income may be decomposed into the product of the elasticity and buoyancy of the tax-to-base and the elasticity and buoyancy of the base-to-income.

From equation (i) the tax buoyancy can be divided into two parts:

Tax-to-Base buoyancy: $\log TR_\kappa = a_k + b_\kappa \log B_\kappa + \nu$ (ii)

Base-to-Income buoyancy: $\log B_\kappa = c_k + \delta_\kappa \log Y + \mu$ (iii)

Where Total tax revenue (TR_k) is the time series tax data of the any k_{th} tax which can be total tax revenue or any individual taxes like direct tax, indirect tax, sales tax, custom duty,

and excise duty, B_k is tax base for the k_{th} tax like taxable non-agriculture GDP for income tax, Y is Real Gross Domestic Product which is base overall, b_K is buoyancy of the k_{th} tax to its base, δ_k is the buoyancy of k_{th} tax's base to income, a_k and c_k are constant intercepts and ν and μ are random stochastic errors. Now the estimates of buoyancy of the k_{th} tax to Gross Domestic Product TB_k can obtained as the product of b_K and δ_K.

Dummy Variable Method (DVM) will be employed to estimate the elasticity in which dummy variables D_s are used to account for any discretionary change. Every discretionary change or tax reform of the government in tax rate or tax base and tax administration is assigned a dummy variable to eliminate its effects on the tax revenues and to find the automatic response of tax revenues to GDP.

Followings equations are used to find elasticities of tax revenues.

$$\log TR_k = d_k + \alpha_k \log B_k + \sum(i=1)_k \gamma_i D_i + v_k \quad \text{(iv)}$$

$$\log B_k = g_k + \beta_k \log Y + \sum(i=1)_k \delta_i D_i + u_k \quad \text{(v)}$$

Where γ_i and δ_i are the dummy variable co-efficients and the $\sum$ sign represents the sum of all Discretionary Tax Actions (DTMs) or dummy variables used for tax rate and base reforms. $\alpha_k$is the elasticity of k_{th} tax revenue to its base and the β_k is the elasticity of k_{th}tax revenue base to GDP. The total elasticity for k_{th} tax estimated by multiplying the α_k with β_k. Augmented Dickey Fuller test will be used to assess the stationarity of the all data series. If data is non stationary at level but stationary at first difference or integrated at *I* (1) then Engle-Granger Test (EGT) of Co-integration or Johansen Co-integration test will be used to confirm the long-run relationship between Gross Domestic Product and total tax revenues and for all individual taxes as well as for total tax revenues. Engel Granger Test will be preferred over Johansen because it is not appropriate to use Johansen Co-integration test with two variables having only one co-integrating vector. If results confirm the existence of long run Co-integrated relationship then Error Correction Mechanism (ECM) will be used for capturing the short run buoyancies and Co-integrated OLS will be used to estimate the long run buoyancies and elasticities. Co-efficient of Variation (CV) will be used to find the variability of different taxes. Brief description of co-integration method id given in subsequent sections.

Unit Root Test for Stationarity: The stationarity of a time series data is checked through Augmented Dickey Fuller test (ADF) based on null Hypothesis that Data series has Unit root.

Co-Integration: Co-integration shows the existence of long run equilibrium relationship among the time series variables. The short run relationship among the Co-integrated time series can be found by differencing them or employing the Error Correction Mechanism (ECM). Regression including Tax Revenues (TR) as a dependent variable and GDP (Y) as an independent variable is specified as: $R_t = \alpha + \beta Y_t + \mu_t$

Where TR is tax revenue and Y is GDP. α is the intercept and μ is the error term.

Two time series data to be Co-integrated must have the followings properties.

- Both Tax revenues and GDP time series data must be Non-Stationary.
- Both time series data must be integrated of order one *I* (1). Which mean data must become stationary after first difference.
- The residuals μ_t generated by regressing TR on Y must be stationary at level *I* (0).

If these conditions are satisfied then the two time series data are said to be Co-integrated and the parameters are long run Co-integrated parameters. In this case the spuriousness is eliminated because both time series data has common trends. A Simple Ordinary Least Square can be used now to estimate the long run relationship co-efficient without any threat of spuriousness and ECM to estimate the short run relationship.

Engel Granger Test: Engel Granger Test has the following steps to establish the presence of long run co-integrated relationship. (Asteriou, 2006)

- Run Ordinary Least Square Regression on the two Time Series Data and estimate the values of Residuals e_i.
- Apply Augmented Dickey Fuller Test to test the stationarity of these residuals.
- If residuals are stationary at level I (0) then it shows that the two variables are co-integrated and have a long run relationship and the regression results will no longer spurious. Co-integrated OLS can be used to calculate the long run values of buoyancies and elasticities and the Error Correction Mechanism can be used to calculate short run buoyancies and elasticities.

Error Correction Mechanism (ECM)

To capture the short run relationship the Error Correction Mechanism is used. ECM can be used only when all conditions of Co-integration are met. Following ECM equation is used to capture the short run relationship among the Co-integrated variables TR and Y and also to find the adjustment factor π.

$$\Delta TR = \lambda + \theta \Delta Y + \pi \mu\, t - 1 + vt$$

The above is the ECM equation for the short run relationship between the Tax revenue and the GDP ($Y_{t)}$. Where ΔTR is the first difference of Tax revenues and ΔY is the first difference of the GDP. The θ now showing the short run relationship between the tax revenues and GDP, θ also called impact multiplier and π is the adjustment factor showing that how much time it will take short run disequilibrium in the Tax revenues to correct itself towards the long run equilibrium path. No problem of spuriousness occurs because everything is stationary.

Data Source:

Population: The population of this study consists of all budgets of the Pakistan since 1947.

Sample: The study period for this study consist of 37 years from 1979 to 2015. E-views 8 will be used to analyze the data. Data on taxes and GDP has been taken from various sources which are follows:

- "State Bank of Pakistan (SBP) www.sbp.org.pk"
- "World Bank www.worldbank.org"
- "Pakistan Bureau of Statisticswww.psb.gov.pk"

Results and Discussion

In this section results based on methodology discussed on previous section have been presented. Results of unit root are reported in Table (4.1)

Table 4.1 Test of Stationarity of all Data Series

S.No	Variable	Tests for Unit Root	Include in the Equation	ADF Test statistics	ADF critical values	P-Value	Result
1	RGDP	Level	Constant Linear Trend	-2.86770	1% -3.626784 5% -2.945842 10% -2.611531	0.0592	***I (1)***
		1st difference	Constant, Linear rend	-8.14811	1% -3.632900 5% -2.948404 10% -2.612874	0.0000	
2	TTR	Level	Constant, Linear Trend	-1.69679	1% -4.234972 5% -3.540328 10% -3.202445	0.7320	***I (1)***

		1st difference	Constant, Linear Trend	-9.60144	1%-4.532598 5%-3.673616 10%-3.27736	0.0000	
3	NAGDP	Level	Constant, Linear Trend	-3.16729	1% -4.234972 5% -3.540328 10% -3.202445	0.1070	***I (1)***
		1st difference	Constant	-9.31713	1% -4.243644 5% -3.544284 10%-3.204699	0.0000	

Calculation are based on Statistical package E.view

All the variables are non-stationary at level but stationary at first difference *I* (1). Next is to check co-integration. Results are presented in table (A1) confirms that all the residual from two regressions are stationary at level *I* (0) and confirms the existence of the long run Co-integrated relationship inferring that there occurs a long run co-integrated relationship between the real total tax revenues and its base and tax revenue base to the RGDP. So a Co-integrated Least Square Regression Method will be used to estimate the long run buoyancies and elasticities of the taxes and Error Correction Model will be used for calculating the short run buoyancies.

Result of Co-integration Regressions and Long Run Buoyancy Co-efficient: The results of co-integrations and long run buoyancy coefficient are presented in Table (4.2).

Table 4.2: Result of Co-integration Regressions and Long Run Buoyancy

Tax Name	REG No	Name of the Co-efficient	Values of the Co-efficient	Value of t Statistic	P-Value	Value of the Long run Buoyancy
Total Tax Revenue	1. 2.	Tax to base (b1) Base to GDP (δ1)	1.017560 0.967769	49.28520 55.89553	0.0000 0.0000	**0.9847**

Source: Based on Data Collected from State Bank of Pakistan and Computer Program E.views.8

The long run buoyancy from total tax revenues to its base is 1.017 and from real total tax revenue base to its RGDP is 0.9677, hence the long run buoyancy for total tax revenues is 0.9847. Ultimately the buoyancy is less than one and showing that in long run the tax system of Pakistan in non-buoyant.

Short run Buoyancy: The short run buoyancy for each category of tax revenues can be calculated by using Error Correction Mechanism (ECM) as the data is Co-integrated and has a long run equilibrium relationship. Moreover, the two ECM regressions will be used one from tax revenues to Base and second is base to GDP ECM used to find the short buoyancy and the adjustment factor.

Tax-to-Base ECM:$\log D(TR\kappa) = \theta_o + \theta_\kappa D(\log B\kappa) + \pi\nu_\kappa(-1) + v^\circ$

Base-to-Income ECM: $\log D(B\kappa) = \lambda_o + \lambda_\kappa D(\log GDP) + \pi\mu_\kappa(-1) + \mu^\circ$

Table 4.3: Result of Co-integration Regressions and Short Run Buoyancy

S.NO	Tax Name	ECM No	Name of the coefficient	Values of the coefficient	Value of t statistic	P-Value	Short run buoyancy
1	Total Tax Revenue	01	Tax to base (θ1)	1.014311	49.68060	0.0000	**0.973**
		02	Base to GDP (λ1)	0.961440	55.58365	0.0000	

Source: Based on Data Collected from State Bank of Pakistan and Computer Program E.views.

The short run buoyancy for total tax revenue is 0.973 suggesting that the Pakistan Taxation system is non-buoyant in short run as well.

Values of Adjustment Factors π: The value of π is also calculated through Error Correction Mechanism, π is the adjustment factor showing that how much time the dependent variable takes to come back to its long run equilibrium path when any short run shock disturbs it. Following table shows the value of adjustment factor for each ECM regressions.

Table 4.4 Table of Adjustment Co-efficient π or ECM Factor

Tax Name	ECM No	Adjustment coefficient
Total Tax	01	-0.015341
Revenue	02	-0.338683

Source: Based on Data Collected from State Bank of Pakistan and Computer Program E.views.

The above table shows the value of adjustment factor for the total tax revenue -0.338 which means that 34 Percent of the total disturbances will be corrected in one year towards the long run equilibrium path.

Calculating Long Run Elasticity of Taxes: Next step is to find out the long run elasticity of the real total tax revenues towards the RGDP which can be found by eliminating the changes in tax revenues due to any discretionary changes by the government which is called Discretionary Tax Measures (DTMs). The effects of DTMs on the tax revenues can be purified by four methods these includes Proportional Adjustment method, Divisia Index Method, Constant Rate Structure and Econometrics or Dummy Variable Method. This study uses the Dummy Variable or Econometric method as suggested by Singer, (1968) and Ehdaie, (1990), to estimate the long run elasticities of tax revenues to GDP from raw response. There are various reforms that government did in various time periods to increase the tax revenues and regulate the taxation system. These reforms were as: to increase in tax rate which categorized by this study as tax rate reforms and to enhance the tax base these reforms are categorized by this study as tax base reforms and last are administrative reforms, which increase the efficiency of tax system and remove corruption and malfunctions from tax authority. Each reform is assigned a dummy variable to remove the effects of discretionary changes from tax revenues total 23 dummy variables are used in various taxes. The following model is used to estimate the long run elasticities for total tax revenues, which found in two steps, from tax revenues to the base and the base to GDP. The model used is Co-integrated OLS because all the data series are stationary at first difference and their residuals are stationary at level.

Tax-to-Base elasticity: $\log TR_k = d_k + \alpha_k \log B_k + \sum(i=1)_k \gamma_i D_i + v_k$

Base-to-Income elasticity: $\log B_k = g_k + \beta_k \log Y + \sum(i=1)_k \delta_i D_i + u_k$

Following are the reforms that are incorporated as dummy variables in this study to find out the long run elasticities out of gross response (Buoyancy).

Table: 4.5. Major Reforms in Direct taxes

S NO	Year of Reform	Reforms Detail	Category of Reform	Dummy Variable Assigned
1. Reforms in Income Tax / Direct Taxes				
15	1991	Convert withholding taxes into presumptive represent full and final settlement of tax liabilities. To increase simplicity and reduce cost of tax compliance.(Pasha, H.2000)	Tax Base	D1
S NO	Year of Reform	Reforms Detail	Category of Reform	Dummy Variable Assigned
16	1991	The presumptive and withholding taxes were extended to the other income sources rather than only salary income tax to capital income and unearned income. (Pasha, H.2000)	Tax Base	D2
17	1991	Maximum income tax rate were reduced from max 60% to 35 %. (Pasha, H.2000)	Tax Rate	D3
18	1997	Tax free threshold changed from increased from 40,000 to 50,000. (Maqsood, A. 2009*)*	Tax Base	D4
19	2007	Tax free threshold changed for salaried to 150,000. (Maqsood, A. 2009*)*	Tax Rate	D5
20	2008	The corporate tax is downward revised from average 55% to 35 %. (Maqsood, A. 2009*)*	Tax Rate	D6
21	2009	Extension of the Withholding Tax Net (Bank Cash Withdrawals, Air Travel) (Pasha, H. 2010)	Tax Base	D7
22	1992	Withholding tax was imposed on the commercial and industrial users of the electricity and the rate of tax was linked with the consumption of electricity. (Pasha, H.2000)	Tax Base	D8
23	1994	5% withholding tax imposed on the issuance of the foreign exchange but this tax withdrawn in 1994. (Pasha, H.2000)	Tax Rate	D9

Table: 4.6 Dummy Variables Used for Indirect Taxes:

16	1991	The presumptive and withholding taxes were extended to the other income sources rather than only salary income	Tax Base	D2

		tax to capital income and unearned income		
17	1991	Maximum income tax rate were reduced from max 60% to 35 %.	Tax Rate	D3
18	1997	Tax free threshold changed from increased from 40,000 to 50,000.	Tax Base	D4
19	2007	Tax free threshold changed for salaried to 150,000.	Tax Rate	D5
20	2008	The corporate tax is downward revised from average 55% to 35 %.	Tax Rate	D6
21	2009	Extension of the Withholding Tax Net (Bank Cash Withdrawals, Air Travel)	Tax Base	D7
22	1992	Withholding tax was imposed on the commercial and industrial users of the industry and the rate of tax was linked with the consumption of electricity.	Tax Base	D8
23	1994	5% withholding tax imposed on the issuance of the foreign exchange but this tax withdrawn in 1994.	Tax Rate	D9

As we know that all the data series are integrated of order one *I* (1) and the residuals of all regressions are stationary at level the data series are ready for Co-integration Analyses. Incorporating these reforms we can find the elasticities by using the Dummy Variable Approach. Long run elasticity are calculated for total tax revenues.

Long Run Elasticity of all Taxes: Long run elasticity are calculated for all total tax revenues by using the co integration OLS approach.

Table 4.7 Long Run Elasticity of all Tax Revenue Serie

S.No	Tax Name	Reg No	Name of the Coefficient of Elasticity	Values of the Co-efficient	Value of t Statistic	P-Value	Long Run Elasticity
1	Total Tax	01	Tax to base (α 1)	1.036256	89.12748	0.0000	0.994
2	Revenue	02	Base to GDP(β 1)	0.966834	56.65137	0.0000	

Calculation are based on statistical package e.view

The results reported in table shows the elasticity for real total tax revenues as the results showed that RTTR is inelastic and their elasticity is less than one. Elasticity of the total tax revenue is 0.994. The total tax revenue elasticity is greater than buoyancy showing that the reforms in taxes are inefficient and unnecessary which instead of increasing tax revenues decreases the tax revenues.

Engle Granger Test for the Elasticity's Regression

Table 4.8 Results of Engle Granger Test for the Elasticities Regression.

S.No	Regression name	Tests for Unit Root	Equation included	ADF Test statistics	ADF critical values	P-Value	Result
1.	Total tax revenue to base	Level	None	-3.18560	1% -2.68575 5% -1.95907 10% -1.60745	0.0292	*I (0)*
2.	TTR base to GDP	Level	None	-92.5261	1% -4.234972 5% -3.540328 10%-3.20244	0.0000	*I (0)*

Source: Based on Data Collected from State Bank of Pakistan and Computer Program E.views. 8

The above result of the Engle Granger Test revealed that dependent variable and independent variable are Co-integrated and have a long run equilibrium relationship.

Short run Total tax revenues Elasticity:

Table 4.9 . Short Run Elasticities of all Tax Revenue Series:

S.No	Tax Name	Reg No	Name of the Coefficient of Elasticity	Values of the Co-efficient	Value of t Statistic	P-Value	Long Run Elasticity
1	Total Tax	01	Tax to base (α 1)	1.021967	53.74851	0.0000	0.985
2	Revenue	02	Base to GDP(β 1)	0.969693	61.16400	0.0000	

Source: Based on Data Collected from State Bank of Pakistan and Computer Program E.views. 8

The short run elasticity is 0.985 which is also less than unity and the short run elasticity is greater than long run elasticity which shows that in short run the system is elastic as compare to the long run.

Stability of the Tax Revenues: Now we find out the stability of all type of taxes which include total tax revenues, direct tax, indirect tax, income tax, sales tax, excise duty, and custom duty. As we know that stability of tax revenuse is calculated by finding out its Co-efficient of Variation (CV).
Coefficient of variation can be found by following formula:

$$Coefficient\ of\ Variation = \frac{Standard\ Deviation}{Mean} \times 100$$

$$Coefficient\ of\ Variation = \frac{\sigma}{\mu} \times 100$$

The Co-efficient of Variation can be found by above formula by dividing the Standard Deviation of the k_{th}tax revenue to it mean. The CV can be used to assess the comparative stability of tax revenues across the taxes and regions. The lower CV value is highly desirable.
Table 4.12 Value of Coefficient of Variation of all Taxes

Table 4.10: Value of Coefficient of Variation of all Taxes

S.No	Tax Name	Values of the S.D	Value of Mean	Value of the Coefficient of variance
1	Total tax Revenue	2641.706	4730.586	0.558431

Source: Based on Data Collected from State Bank of Pakistan and Computer Program E.views. 8

As the estimates of the mean deviations showed that real total tax revenues is the most stable tax and has the mean deviation (0.5584).

CONCLUSIONS AND SUGGESTIONS

Conclusions: The major objective of the present study is to analyze the long and short run buoyancies and elasticity of real total tax revenues and also evaluated the stability of RTTR in Pakistan using Time series data for the period 1979-2015 (37 years). The real total tax revenues data analyses shows that there exists a long run Co-integrated relationship between tax data series to their bases; and between tax bases to the Real GDP. The results suggest that tax to base buoyancy and elasticity is less than one while base to RGDP buoyancy is greater than unity.

The long run elasticity is 0.994 which is also less than one shows an inelastic tax system for Pakistan. In the absence of the tax reforms if GDP increases by one million PKR the Real Total Tax Revenue will increase by 0.994 million PKR. The long run elasticity of total tax revenues is less than long run buoyancy but the difference is insignificant showing that reforms are absolutely not working in raising revenue but even the very tax reforms have negative impact on the tax revenues and its responsiveness because these reforms were inappropriate and based on adhoc policies. The frequent alteration in tax rates and bases reduces the tax revenues instead of increasing.

Base to GDP buoyancy (1.017) is greater than one while tax to base buoyancy (0.967) is less than one reveals that along with increase in GDP base is increasing but tax revenue is not increasing. This also shows the inefficient, incapable and corrupt tax collection system. The value of Co-efficient of Variance (CV) for TTR is 0.55843 which shows volatile, unpredictable and uncertain tax revenues. This study negates the findings of Muhammad, S., & Ahmed, Q, (2010) and Sheikh, (2012) that overall buoyancy is greater than unity. Whereas it confirms the results of Rasheed (2006) that the overall buoyancy for Pakistan is less than unity.

5.2 Recommendations: As the results of buoyancy and elasticity Co-efficient showed that taxation system in Pakistan is non-buoyant and inelastic towards the GDP and all buoyancies and elasticities Co-efficients are less than one. Moreover, the Co-efficient of Variance reflects that overall tax revenue is highly volatile and has a high variance. This non-responsiveness of taxes is the major cause of fiscal deficit and excessive borrowing. Excessive borrowing in turn causes another wave of fiscal imbalances, this borrowing and fiscal imbalances spiral continue to decrease the internal and external value of the currency and cause hyper inflation.

Main reason for low tax to GDP ratio and reduced elasticity and buoyancy of taxes is a reduced share of provincial tax system in total taxes. The provinces contribute less than 7 percent to national exchequer and in term of expenditure provinces take more than 35 percent share of national exchequer, (Bahl, Wallace & Cyan, 2008).

Based on the findings it is recommended to formulate policies to increase the documentation of the economy and reduce the informal sector as different studies suggest that about 71 percent of the Pakistan economy is informal, (Farooq, Jehanzeb and Nadeem, 2010).

Even some studies show that informal sector account for about 75 percent of the Pakistan economy. (Ali and Waqar, 2009). To reduce the informal sector and to enhance the tax base and tax revenues, documentation of the economy must be effectively managed so that to bring informal sector in tax net. Again female education and skill development programs must be initiated to increase the proportion of women in active workforce. Moreover, the tax rate needs to be rationalized so that black marketing and smuggling can be abated.

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APPENDEX

Table: A. Engel Granger Test Summary:

S.No	Buoyancy Regression Name	Tests for Unit Root	Include in the Equation	ADF Test Statistics	ADF Critical Values	P-value	Results
1	Real total tax revenue to base Regression	Level	None	-5.071006	1% -4.243644 5% -3.544284 10% -3.204699	0.0012	*I (0)*
2	TTR base to RGDP Regression	Level	None	-3.66024	1% -3.632963 5% -2.948404 10% -2.612874	0.0093	*I (0)*

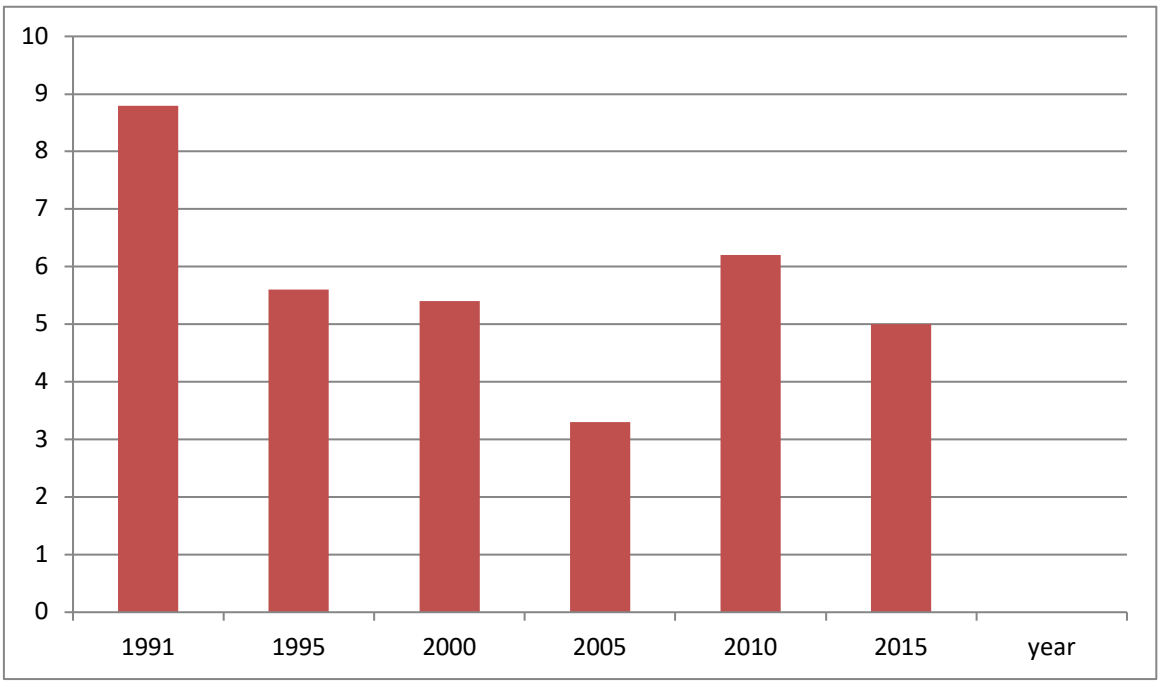

Figure A1 Fiscal Deficit as a percentage of GDP