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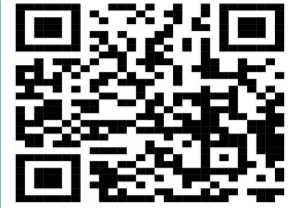
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#### Effect of the Role of Institutions and Exchange Rate Volatility on Tax Revenue in Pakistan

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	Abstract
<p><b>Farhatullah</b> Assistant Professor, Department of Economics, BUIITEMS, Quetta. <a href="mailto:farhatullahkhan2015@gmail.com">farhatullahkhan2015@gmail.com</a></p> <p><b>Muhammad Ali Kakar*</b> Assistant Professor, Department of Economics, BUIITEMS, Quetta. <a href="mailto:ali.kakar@buitms.edu.pk">ali.kakar@buitms.edu.pk</a></p> <p><b>Corresponding Author*:</b> Muhammad Ali Kakar</p> <p><b>Keywords:</b></p>	<p>Pakistan has been one of the fragile economies facing the danger of default after events like COVID-19, post COVID-19 developments, Russia and Ukraine war. Ever-rising debt and soaring public expenditure (mainly interest payments) have almost made it impossible for the country to run day-to-day business. The root of this agony lies in the low level of tax revenue by the government. Tax collection performance has been dismal in case of Pakistan and exchange rate volatility has added to the misery of Government. By employing ARDL and measuring exchange rate volatility through standard deviation the current study found the role of exchange rate volatility to be significantly damaging the tax collection efforts. This damaging effect can be marginalized by better institutional performance. The study suggests steps should be taken to address volatility and improve the institutional performance so that the Government will be able to collect more revenue and avoid danger of default and have enough resources to spend on education and health.</p>
	Exchange rate volatility, institutional performance, COVID-19, ARDL, Pakistan



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### INTRODUCTION

Most of the developing countries have been facing financial problems recently and the situation is getting worse with very passing year. Revenue is also extremely important for financing economic development, ever-rising debt financing, and tackling the issue of unemployment. Tax revenue is the single most important source of revenue for a state in developing countries. Tax is defined as a compulsory payment by individuals, business community and institutions without any direct quid pro-quo (World Bank, 1988). Tax is used by a state to perform different socio-economic activities along with financing security and judiciary for smooth running of the state functionaries. Tax can also be used as a very effective tool to achieve different targets set by state to sometimes encourage and discourage use of different goods and services. It is also used to protect local industry against international competitions at times though this practice is discouraged by world trade organizations for a longer period of time (Lee & Gordon, 2005; Arnold, 2008). The literature has been using different variables that determine tax revenue in less developed, developing, and developed economies across the globe. Variables like trade openness, agriculture and industrial production, GDP per capita, population growth rate, financial development, inflation, public expenditures, FDI, exchange rate, urbanization, and literacy rate are the most common variables used by Gaalya (2015), Gupta (2007), and Obeng (2008).

Pakistan is also facing a very challenging situation on this front. Fiscal deficit is increasing, which is putting huge pressure on government to improve its tax revenue or decrease development and non-development expenditures. And of course, curtailing developing expenditures always comes with economic and political costs in countries like Pakistan. The literature review regarding Pakistan, which is considered a developing country, also shows that the variables mentioned above are considered. The studies, such as Chaudry & Munir (2010) considered the exchange rate and found its negative effect on tax revenue. While literature on different economies also shows the negative effect of exchange rate on tax revenue (Bevan, Adam & Chambas, 2001; Fierro & Seisen, 1991).

The available literature, to the best of our knowledge, has not considered two very relevant and important factors, namely the risk attached with exchange rate volatility (ERV) and institutional quality. By considering these two important aspects, we can get a complete picture and also suggest policies to the government for more concrete and fruitful results. Pakistan has been facing exchange rate volatility, which is hindering the desired results through trade and public expenditures.

In a floating exchange rate regime, countries face vicissitudes in the exchange rate, and the persistent oscillation in the exchange rate is termed ERV (Ozturk, 2006). Since it is not possible to observe ERV over time, researchers have been using different methods to check the ERV. The current study uses the standard deviation method to find out the ERV in the case of Pakistan.

### Problem Statement

Pakistan has been going through economic turmoil over the last few years including pre and post COVID-19 periods. Among many challenges low tax revenue stands high. Pakistan in 2019 approached International Monetary Fund (IMF) for the 21<sup>st</sup> time to address its economic woes. During all these programs IMF has asked Pakistan to open its economy for international trade and increase tax revenue. As a result, Pakistan has been opening its economy to international trade and it is coupled with floating exchange rate from managed exchange rate slowly and gradually. These actions, along with political instability, have been causing ERV, which has not allowed Pakistan to realize the desired results.

The current study considers ERV along with other variables, trade openness, Govt. expenditure, industrial production as a percentage of GDP, financial development, GDP growth, and institutional quality to assess how tax revenue has been affected, particularly by ERV and institutional quality. One can't find the true effect of the exchange rate unless it takes into account the risk attached to such policy actions. Moreover, the presence of sound and well-performing institutions is needed to execute policy measures taken by Govt.

### Research Questions

A country needs to assess completely the effects of different policy measures in order to know how the proposed policies will bring the desired result. The current study also seeks the answers of how exchange rate and institutional quality is affecting tax revenue. The following three questions are focus of current study.

1. Effect of ERV on tax revenue in Pakistan.
2. How is institutional quality affecting tax revenue?
3. Does institutional quality improve ERV effect on Tax revenue?



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### Literature Review

Lotz and Morss (1967) calculated the tax revenue-to-GNP ratio using data from developed and developing countries. For this, he used per capita GNP and openness. His findings revealed a favorable and statistically significant influence on both per capita GNP and per capita GDP. For the sake of transparency, only the per capita income effect was determined to be positive by Tanzi (1987). By exclusively using data from impoverished countries, we can make a substantial difference.

Chelliah et al. (1975) regressed the tax share in GNP on agricultural share, mining share, and export share using data from 47 nations from 1969 to 1971. The findings revealed that agriculture had a negative and substantial influence, while mining and export had a favorable and significant effect. Tait et al. (1979) obtained the same conclusions using data from 47 nations from 1972 to 1976.

According to Bird (1976); Ahmad and Stern (1991), an economy with a high GDP share of agriculture value added will have low tax revenues. It is normally difficult to tax the agriculture industry directly in Pakistan due to political considerations, but it is frequently highly taxed in many other ways, such as import quotas, tariffs, restricted output prices, and inflated currency rates.

Teera (2002) investigated the factors affecting Uganda's tax revenue by looking at the country's tax system and tax structure. He estimated a model using time series data spanning the years 1970 to 2000. His findings revealed that the ratio of agricultural to population density, as well as tax evasion, have an impact on all types of taxation. The GDP per capita exhibited an unexpectedly negative trend. The negative impact of tax evasion and openness (as judged by the import ratio) was significant. Help exhibited a positive sign, which is not surprising given that aid in Uganda has historically encouraged imports, particularly raw materials.

Bahl (2003) analyzed the factors of tax revenue using data from the OECD and less developed economies. He looked at the non-agricultural share of GDP, openness, and population growth rate, all of which were positive and statistically significant. The finding of a simple link between tax effort and the extent of the shadow economy was negative but statistically significant.

Alm et al. (2004) used data from rich and developing nations to determine the factors of total tax to GDP ratio: agricultural/GNP, mining/GNP, GNP per capita, taxes on international trade/GNP, and shadow economy/GNP. His findings revealed a negative but not statistically significant relationship between agriculture and international trade, a positive and statistically significant relationship between mining and GNP, and a negative but statistically significant relationship between GDP per capita and shadow economy/GDP.

Bilquees (2004) used the Divisia Index Approach to assess the buoyancy and elasticity of Pakistan's tax revenue system from 1974 to 2003, and then looked at the factors that influenced the size of the elasticity coefficients. Her estimations of buoyancy indicated that tax adjustments did not result in a large increase in revenue. However, the high sales tax coefficient in relation to GDP base reflected the inclusion of the service sector and utilities in the sales tax net, which has major consequences for the poor.

Ahsan and Wu (2005) looked at the tax share in GDP in developed and developing countries from 1979 to 2002 and discovered a negative and significant relationship between agriculture, GDP per capita, and population growth and the tax ratio, while trade share in GDP has a positive and significant relationship, but corruption has a negative and insignificant relationship. Lutfunnahar (2007) used a panel data analysis to identify the factors of tax sharing and revenue performance for Bangladesh and ten other developing nations over a 15-year period. International commerce, wide money, external debt, and population expansion are all key predictors of tax efforts, according to the findings. According to the study, Bangladesh and other nations have low tax effort (less than unity index) and are not employing their full tax revenue capacity, and hence have the opportunity to finance budgetary imbalances by increasing tax income. Kemal (2007) investigated the long-term relationship between the subterranean sector and the formal economy. The findings revealed that the underground economy causes the formal economy, but not the other way around. To reduce tax evasion, he advised increasing the quantity of legal documents, strengthening institutions, improved governance, reducing the number of rules, and restricting smuggling through tariff rationalization.

Mahdavi (2008) applied advanced estimating approaches to unbalanced panel data for 43 DCs, including Pakistan, from 1973 to 2002. His findings revealed that aid had a negative effect, as did non-tax revenue, whereas agriculture sector share had a positive but small correlation. The trade sector share had a positive influence, while the economically active female variable had a net negative but minor effect, while the elderly population had a negative correlation with both income and sales tax. Both the extent of urbanization and the literacy rate had a positive influence. The relationship between population density, monetization, and inflation rate remained inverse. The degree of taxation was highly and negatively connected with the inverse of GDP per capita. Political rights and civil liberties have a large net influence.

Profeta and Scabrosetti (2010) investigated the determinants of tax revenue in 39 nations from 1990 to 2004: 11 Asian countries, 19 Latin American countries, and 9 European Union members. According to their findings, GDP per capita and the debt-to-GDP ratio had no effect on tax revenues in Asian nations but had a positive influence in Latin

American ones. Agriculture's percentage of GDP had a negative impact on tax revenue in Latin America but not in Asia; economic openness had a good impact on tax revenue in Asia and Europe but a negative impact in Latin America. The higher the indexes of democratic rights, civil liberties, and political rights, the greater the gain in tax efficiency. The level of education in Latin American countries, the share of the over-65 population, the proportion of female labor, and the size of the underground economy all had a positive and significant impact on tax collection, although population density had little effect. In Asia, the variables for high school graduation rate and proportion of urban population had little effect on tax revenue, while the proportion of over-65s had a considerable negative influence.

Dioda (2012) utilized a panel data regression method to evaluate the determinants of tax collection in 32 Latin American and Caribbean nations from 1990 to 2009. According to the findings, civil freedoms, the number of female workers, political stability, education level, population density, and the size of the underground economy all have a substantial impact on tax income.

Castro and Camarillo (2014) analyzed the factors that influence tax revenue in 34 OECD member nations from 2001 to 2011. They show that GDP per capita and the size of the manufacturing sector have a favorable impact on tax revenue, whereas FDI rates, agriculture, civil liberties indices, and life expectancy have a negative impact. From 1990 to 2003, Imam and Jacobs (2014) analyzed the factors influencing tax income in 12 Middle Eastern nations. According to their research, inflation has a beneficial impact on tax revenue, whereas GDP per capita has a negative impact.

Ehrhart (2009) estimated that democracy influences domestic tax revenue using a panel of 66 developing nations from 1990 to 2005, adequately accounting for the endogeneity of democracy with an innovative instrument. He discovered considerable evidence that a country's political regime influences the extent to which domestic tax reforms are enacted and higher domestic revenues are realized. Castaeda Rodriguez (2018) studied an imbalanced panel dataset with a wide sample of industrialized and developing nations over a 40-year period (1976–2015) to discover which long-term determinants (economic, social, political, and cultural characteristics) affect taxes and explain tax performance discrepancies. The findings indicate that taxation exhibits path dependency depending on the importance of lags, while also taking into account the total tax burden, revenue from consumption and income taxes, and a progressiveness index. The findings show that taxation is highly influenced by both historical and structural factors, such as the economic climate and the dynamics of other public income sources (e.g., inflation).

Ahmad and Mohammad (2010) used cross-section data from 1998 to 2008 and the pooled least square method to explore the factors of tax buoyancy in 25 developing countries. It demonstrated a minor influence in the agriculture sector and a positive and significant effect in the services sector, as opposed to the previous insignificant results of several studies. Monetization and the budget deficit had a favorable impact on tax buoyancy, whereas grant growth had a negative impact.

### **Data and Methodology**

The current study used data from 1980 to 2022. Using this data the study attempts to know how ERV affects TR in Pakistan. The literature reviewed for the current study pointed towards the GDP per capita, Inflation, industrial and agricultural production share in share GDP, trade openness and literacy rate being determinants of TR. As mentioned earlier the instability of TR and volatility of ER are totally missing in literature in case of Pakistan. While the individual effect of institutional quality and combined effect of ERV and institutional quality is also missing.

Tax Revenue is the dependent variable in this study and it is measured through a ratio of tax revenue to GDP follow the work of Gaalya (2015). According to ability to pay theory people with higher per capita income must be able to pay more taxes so we use ratio of GDP and population to capture this effect. The effect of inflation on TR is expected to be positive because the inflation pushes the masses into higher income brackets (Rad, 2003). The inflation is measured by Consumer price index. Trade openness is believed to be a positive contributor to TR and it is calculated by taking the ratio of total trade and GDP (Gupta, 2007). Industrial production is important variable in our study. This variable IS positive contributor in increasing TR through increase in economic activity directly and higher per capita income indirectly (Teera & Hudson, 2004). Pakistan economic survey's different editions, handbook of statistics on Pakistan Economy and world economic indicators are used for data extraction.

### **Finding Exchange Rate Volatility and Instability in TR**

ERV is calculated by taking first the growth rate and then three years non-overlapping standard deviation. When it is plotted the volatility is confirmed.

### **Model**

There is no link between TR and ERV in available literature but our attempt of linking the two are in line with the buoyancy theory of tax revenue which is also used by Isaac et al (2018). Tax buoyancy is defined as the percentage response of tax revenue to the percentage change in GDP (Ahmed & Muhammad, 2010).

### Data Description and Sources

The study uses annual time series data from 1980 to 2020. Based on the literature review the study investigates the impact of exchange rate volatility on tax revenue collection controlling for GDP growth, institutional quality, trade openness, share of industrial production in GDP in Pakistan. Following Gaalya, 2015 and Gupta, 2007 the dependent variable is formed by taking ratio of total tax revenue to GDP.

### Methodology

The study adopts the model presented by Gaalya 2015 and Le, Moreno – Dodson and Rojchaichchaninthorn which expresses the tax revenue collection as a ratio of GDP as a function of its determinants.

$$\ln(TGDPR)_t = \beta_1 + \beta_2 \ln T\_O_t + \beta_3 \ln GOVT\_EXPD_t + \beta_4 \ln REER_t + \beta_5 \ln INST_t + \beta_6 \ln IND_t + \beta_7 \ln FIN\_DEV_t + \beta_8 \ln GDP\_GR_t + \tau_t \quad (1)$$

$$\ln(TGDPR)_t = \beta_1 + \beta_2 \ln T\_O_t + \beta_3 \ln GOVT\_EXPD_t + \beta_4 \ln REER_t + \beta_5 \ln INST_t + \beta_6 \ln IND_t + \beta_7 \ln FIN\_DEV_t + \beta_8 \ln GDP\_GR_t + \beta_9 \ln INST * REER_t + \tau_t \quad (2)$$

### Estimation Strategy

The study uses auto regressive distributed lag model (ARDL) to investigate the contemporaneous and lag relation of tax revenue collection as a ration to GDP to its determinants.

Therefore, the above model was transformed to ARDL form as given below:

ARDL model:

$$\ln(TGDPR)_t = \beta_1 + \beta_2 (TGDPR)_{t-1} + \beta_3 \ln T\_O_t + \beta_4 \ln GOVT\_EXPD_t + \beta_5 \ln REER_t + \beta_6 \ln REER_{t-1} + \beta_7 \ln INST_t + \beta_8 \ln INST_{t-1} + \beta_9 \ln IND_t + \beta_{10} \ln IND_{t-1} + \beta_{11} \ln FIN\_DEV_t + \beta_{12} \ln FIN\_DEV_{t-1} + \beta_{13} \ln GDP\_GR_t + \beta_{14} \ln GDP\_GR_{t-1} + \tau_t \quad (3)$$

$$\ln(TGDPR)_t = \beta_1 + \beta_2 (TGDPR)_{t-1} + \beta_3 \ln T\_O_t + \beta_4 \ln GOVT\_EXPD_t + \beta_5 \ln GOVT\_EXPD_{t-1} + \beta_6 \ln REER_t + \beta_7 \ln REER_{t-1} + \beta_8 \ln INST_t + \beta_9 \ln INST_{t-1} + \beta_{10} \ln IND_t + \beta_{11} \ln IND_{t-1} + \beta_{12} \ln FIN\_DEV_t + \beta_{13} \ln FIN\_DEV_{t-1} + \beta_{14} \ln GDP\_GR_t + \beta_{15} \ln INST * REER + \tau_t \quad (4)$$

### Results and Discussion

This section will rather start with introduction of variables and their descriptive statistics.

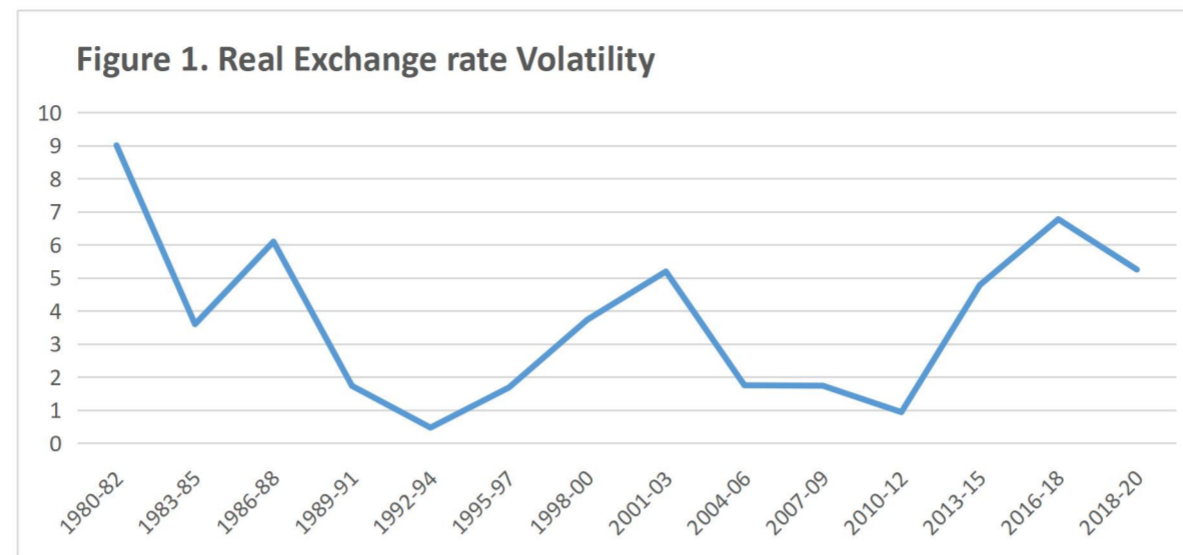
**Table 1: Descriptive**

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP_GR	41	1.991	2.013	-2.88	6.7
REER	41	4.814	.263	4.57	5.47
IND	41	22.019	2.166	18.71	25.8
GOVT_EXP	41	13.439	1.381	10.98	15.74
FIN_DEV	41	22.757	3.998	15.39	29.79
TGDPR	41	6.49	3.059	1.52	11.1
INST	41	2.33	1	-2.77	2.884
T_O	41	3.576	.126	3.32	3.955

Source: Author Calculation

### Evidence of volatility in real exchange rate in Pakistan:

ARCH and GARCH are normally used for measuring volatility of a variable for high frequency data while standard deviation is also used for measuring volatility, Gnanngone (2020). The volatility of exchange rate is measured through three years non-overlapping standard deviation of growth rate of effective exchange rate following previous studies of Sato et al (2016) and Gnanngone (2020). Furthermore, there is no prior transformation of the said variable.



Source: Author Calculation

### Analysis on tax revenue collection to GDP and exchange rate:

#### Unit Root Test

Before regression analysis all the variables were checked to know that they are stationary in order to avoid the spurious regression. The stationarity of the variables was checked by using Dickey fuller and augmented Dickey Fuller tests and result shows that the variables of the study are stationary either at level (I0) or first difference (I1). On the basis of these findings the study chooses ARDL test for regression analysis as in this case the ARDL is preferred over all the others that are available.

**TABLE 2: Unit root**

Variables	Level		1 <sup>st</sup> Difference			Decision	
	None	Intercept	Trend & Intercept	None	Intercept		
TGDPR	1.321 (0.945)	-1.233 (0.650)	-3.004 (0.143)	-5.897 (0.000)	-6.113 (0.000)	-6.087 (0.000)	I(1)
INST	-2.519 (0.013)						I(0)
LT_OPN	-0.875 (0.330)	-3.647 (0.009)	-3.781 (0.028)				I(0)
LREER	-2.135 (0.033)						I(0)
LGOVT_EXP	7.740 (1.000)	-0.715 (0.831)	-2.874 (0.181)	-1.191 (0.209)	-7.206 (0.000)		I(1)
IND	1.006 (0.276)	-1.555 (0.495)	-2.329 (0.409)	-6.882 (0.000)	-6.882 (0.000)		I(1)
FIN_DEV	-0.704 (0.405)	-1.236 (0.649)	-3.164 (0.106)	-5.291 (0.000)	-5.259 (0.000)		I(1)
GDP_GR	-2.960 (0.004)						I(0)

Source: Author Calculation

### Bound test for Cointegration

#### Model # 1

**Table 1.1: Bound Test Result for Cointegration**

**Critical Value Bound of the F-statistic: intercept and no trend**

F-statistic		4.308025					
K	1%	5%		10%			
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
7	2.96	4.26	2.32	3.5	2.03	3.13	

Source: Author Calculation

Table 1.1 depicts the result of bound test of first specification. The test is performed to establish the cointegration among the variables. The calculated F value 4.308 exceeds the upper bound value at 1 % of significance. So the null hypothesis of no-co-integration cannot be accepted.

**Table 1.2: Long and short run Estimates**

Variables	SHORTRUN	LONGRUN
LT_O	-3.801*** (0.000)	-2.845*** (0.000)
LGOVT_EXP	3.233** (0.011)	0.739*** (0.000)
LEER	-1.925 (0.317)	-5.679*** (0.000)
INST	0.175** (0.017)	0.860*** (0.000)
IND	0.180 *** (0.000)	0.223*** (0.000)
FIN_DEV	-0.008 (0.870)	0.104*** (0.000)
GDP_GR	0.064* (0.058)	0.336*** (0.000)
C		48.013*** (0.000)
R-squared	0.808691	
Adjusted R-squared	0.775015	
Durbin-Watson stat	2.468433	

Source: Author Calculation

The table 1.2 shows the result of regression analysis for 1<sup>st</sup> specification. The R<sup>2</sup> shows that 81 % variation in tax revenue is explained by the independent variables. The DW value of 2.468 shows that the model also free from the problem serial correlation of the error term.

The result shows that trade openness reduces tax revenue collection in Pakistan, contrary to the conventional view of its positive impact on revenue collection. This result finds support in Keen and Simone (2004), the coefficient of trade openness is negative and highly significant both in the long run and short run. An increase of 1 percent in trade openness reduces tax revenue collection by 3.801 percent in the short run and 2.845% in the long run.

The coefficient of government expenditure is positive and shows that government expenditure has positive impact on tax revenue collection in Pakistan. This finding is consistent with previous results obtained by Fasano and Wang (2002). The result shows that 1 percent increase in government expenditure enhances tax revenue collection by 3.233 percent in the short run and 0.739 percent in the long run.

The results shows that real exchange rate volatility has damaging effect on tax revenue in Pakistan this conclusion is in line with the result reached by Isaac et al (2018). The coefficient of real effective exchange rate is negative and highly significant and shows that a 1 percent decrease in real exchange rate decreases tax revenue by 1.925 percent, in the long run. Whereas, the damaging impact of a similar change in real exchange rate is even higher, in the long run, i.e. it reduces tax revenue 5.679 percent, though insignificantly. The coefficient of institutional quality is positive both in the short and long run which shows an improvement in institutions significantly enhances tax revenue collection in Pakistan. The finding is consistent with literature and findings of Beyera, (2021) The result shows that an improvement of 1 percent in institutional quality enhances tax revenue collection by 0.175 percent in the short run and 0.86 percent in the long run.

The result shows that the increasing share of industrial sector to GDP has desirable positive impact on tax revenue collection in Pakistan both in the long and short run. This is an interesting finding and may be due to Pakistan's tax revenue being partly dependent on tax on imports. In short run an increase in industrial share in GDP increases tax revenue collection by .19 percent in the short run whereas a similar increase supports the tax revenue by .22 percent. Both long in short run findings of this study are in line with findings from previous study of Ayenew (2016).

The result shows that financial development has negative impact on tax revenue collection in short run and positive relationship in the long run. This is a confirmation of the finding of Ackay et al (2016). An improvement of 1 percent in financial system of Pakistan reduces slightly and insignificantly by 0.8 percent in short run whereas a similar improvement enhances revenue collection significantly by 10.4 percent in the long run.

The GDP growth has positive impact on tax revenue collection in Pakistan. This result is also in line with the findings of Ahmed and Muhammad (2010), Stotsky et al (2006) and Isaac et al (2018). The result shows a 1 percent increase in GDP growth enhances tax revenue collection by 6.4 percent in the short run at 5 percent significance and 0.34 percent significantly at zero percent in the long run.

**Table 1.3: Diagnostic Tests**

Tests	F/Chi Values	P Values
Serial Correlation	1.528	0.246
Heteroscedasticity	2.099	0.059
Functional Form	0.639	0.434
Normality	0.243	0.885

Source: Author Calculation

Table 1.3 shows that the 1<sup>st</sup> model of the study is free from all the post estimation problems. The p values of all the post estimation tests i.e. serial correlation, heteroscedasticity, functional form and normality, are insignificant.

### MODEL #2

**Table 2.1: Bound Test Result for Cointegration**

Critical Value Bound of the F-statistic: intercept and no trend

F-statistic	3.898790							
	1%		5%		10%			
K	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
7	3.15	4.43	2.55	3.68	2.26	3.34		

Source: Author Calculation

Table 2.1 depicts the result of bound test of 2<sup>nd</sup> specification. The test is performed to establish the cointegration among the variables. The calculated F value 3.899 exceeds the upper bound value at 1% of significance. So the null hypothesis of no-cointegration cannot be accepted.

**Table 2.2: Long and Short run Estimates**

Variables	SHORTRUN	LONGRUN
LT_O	-7.444*** (0.000)	-4.696*** (0.000)
LGOVT_EXPD	-0.656*** (0.000)	-4.819*** (0.000)
LEER	-5.074*** (0.000)	-6.017*** (0.000)
INST	3.757** (0.014)	2.877*** (0.005)
INST_REER	-0.710** (0.024)	-0.448* (0.085)
IND	-0.102*** (0.000)	-0.544*** (0.000)
GDP_GR	-0.035* (0.062)	0.123*** (0.000)
FIN_DEV	-0.017*** (0.000)	0.093*** (0.000)
C	-0.116*** (0.000)	112.914*** (0.000)
@TREND		0.643*** (0.000)
@TREND	1.019*** (0.000)	-4.696*** (0.000)
R-squared	0.82389	
Adjusted R-squared	0.803541	
Durbin-Watson stat	2.649566	

Source: Author Calculation

The table 2.2 shows the result of regression analysis for 3<sup>rd</sup> specification. The R<sup>2</sup> shows that 82 % variation in tax revenue is explained by the independent variables. The DW value of 2.65 shows that the model also free from the problem serial correlation of the error term.

The result of the 3<sup>rd</sup> specification also shows that trade openness has suppressing impacts on tax revenue collection both in the short and long run. The coefficients are negative and highly significant which shows that an increase in government revenue by 1 percent reduces tax revenue collection by 7.44 percent in the short run whereas the long run impact of similar increase is 4.696 percent.

$$\ln(TGDPR)_t = \beta_1 + - 5.014362 T_{O_t} + - 5.051143 GOVT_{EXPD_t} + - 5.921533 EER_t + 5.191047 INST_t + 5.191047 IND_t + 5.191047 FIN_{DEV_t} + 0.101589 GDP_{GR_t} + - 0.934794 INST * REER_t + \tau_t \quad (2)$$

$$\frac{\partial TGDPR}{\partial INST} = 5.1910 - 0.9347 REER$$

$$\frac{\partial TGDPR}{\partial INST} = 5.1910 - 0.9347 \overline{REER}$$

$$\frac{\partial TGDP}{\partial INST} = 5.1910 - 0.9347 (4.801)$$

The institutional quality has positive impact on tax revenue collection in this specification as well. The result shows the effect of institution on tax revenue and also the combined effect of institutions and exchange rate. The result shows the importance of the role of institutions on bringing down the negative effect of exchange rate volatility and positive effect of institutional quality.

$$\frac{\partial TGDP}{\partial REER} = -5.9215 - 0.9347 \overline{INST}$$

$$\frac{\partial TGDP}{\partial REER} = -5.9215 - 0.9347 \overline{INST}$$

$$\frac{\partial TGDP}{\partial REER} = -5.9215 - 0.9347 (2.33)$$

$$\frac{\partial TGDP}{\partial REER} = -8.0993$$

Third specification also confirms the detrimental impact of real exchange rate volatility on tax revenue collection in Pakistan, both in the long and short run. The coefficients are negative and highly significant which shows that an increase of 1 percent in real exchange rate volatility reduces tax revenue collection by 5.074 percent in the short run and a similar increase reduces tax revenue in the long run by 6.02 percent. The combined effect is the other finding that this paper is focusing on. The Impact of 1% exchange rate volatility on tax revenue given the role of institutions reduces tax revenue by 8%. This result is in line with the earlier finding by Obeng (2018).

The output share of industry in total GDP has detrimental effect on tax revenue collection in Pakistan according to the result of this third specification as well. Both long and short run coefficients are negative and highly significant which shows that 1 percent increase in output share of industrial product in total GDP decrease tax revenue collection by 0.102 percent in short run and 0.544 percent in the long run.

The detrimental effects of GDP growth on tax revenue collection in Pakistan have also been confirmed in the 3<sup>rd</sup> specification. The coefficients of long and short run are negative and significant which shows that a 1 percent increase in GDP growth reduces tax revenue collection by 0.035 percent in the short run and 0.123 percent in the long run. This finding is supported by Teera and Hudson (2004) and Gupta (2007).

The effect of financial development is suppressing in the short run while expressing in the long run. The coefficients are highly significant both in long and short run. The result shows that an improvement of 1 percent of financial system in Pakistan reduces tax revenue collection by 0.017 percent in the short run in the country. Whereas, a similar improvement enhances tax revenue collection by 0.093 percent in the long run.

**Table 2.3: Diagnostic Tests**

Tests	F/Chi Values	P Values
Serial Correlation	2.598	0.093
Heteroscedasticity	0.784	0.704
Functional Form	0.634	0.437
Normality	0.207	0.901

Source: Author Calculation

Table 2.3 shows that the 3<sup>rd</sup> model of the study is free from all the post estimation problems. The p values of all the post estimation test, i.e. serial correlation, heteroscedasticity, functional form and normality, are insignificant.

### Conclusion

Fiscal performance has become a yardstick for countries to perform well and keep the smooth trajectory of economic growth. Fiscal deficit has been a challenge to overcome for developing countries over the years and recent event of COVID-19 and post COVID-19 scenario has exposed fiscal vulnerability of many countries. Russian invasion of Ukraine also increased the miseries for all those countries who pay huge amount on imports of oil. These events eventually pushed many nations on verge of default and Sri Lanka was the unfortunate country which even defaulted. Many countries rushed to IMF for bailout package where they have been asked for tougher fiscal actions to implement.



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Pakistan is not an exception to the difficulties of COVID-19, post COVID-19 developments and then an imported inflation due to high oil prices as it fulfils most of its power generation through Furnace oil. Pakistan also faced the scare of default but thanks to the Government for taking tougher decisions and making IMF tranche possible. The root of all these problems lies in low tax revenue and there are many determinants of tax revenue pointed out in literature. Exchange rate volatility has become a very regular event in developing countries which affects macroeconomic stability of already troubled nations.

Current study took this issue along with the role of institutional quality and their combined role in determining tax revenue in Pakistan. The study also considered controlled variables trade openness, GDP growth rate, share of industrial production, financial development and Government expenditure. ARDL has been used for analysis and the controlled variables have all turned to be consistent with literature. The deleterious effect of institutional quality and exchange rate volatility on tax revenue is the main finding of this research which highlights the role of institutions in this regard. The individual effect of institutions has been negative on tax revenue and this research also affirms the same finding. The important part of the finding is 'better institutions will mitigate the negative effect of exchange rate volatility on tax revenue.

The current study proposes policies regarding exchange rate stability. The speculation and uncertainty have been creating exchange rate volatility along with deficits in trade. The role of institutions as ever is paramount in tackling the issue of tax revenue indirectly through making exchange rate stable.

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