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Empirical Nexus of Revenues and Economic Growth of Pakistan: Time Series Econometric Analysis

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Abstract

The study was conducted to observe the effectiveness of Total Revenue (TR_t), Tax Revenue (TXR_t) and Non-Tax Revenue (NTR_t) of Fiscal Policy Dynamics towards GDP Growth Rate of Pakistan for the time period ranging 1991-92 to 2021-22, wherein Results of Augmented Dickey Fuller Test towards LGDP revealed dependent variable ($LGDP_t$) was stationary at level 1(0), respective independent variables (TR_t , TXR_t , NTR_t) were stationary at 1st difference I(1). Findings of Autoregressive Distributed revealed that lag values of Total Revenue ($P < 0.10$) impacted positive and significant influence, whereas Tax Revenue ($P < 0.10$) and Non-Tax Revenue ($P < 0.10$) impacted negative and significant influence on GDP Growth Rate of Pakistan. Results of Bound Test indicated that test is inconclusive. The value of Co-integrating equation was negative (-0.725495) and significant provides speed of adjustment indicating that there was convergence from short run dynamics towards long run equilibrium. Centered VIF values of tested variables (i.e. TE_t , CE_t , DE_t) are less than 10 revealing non-existence of severe Multicollinearity in the Model. Heteroskedasticity test revealed the presence of homoskedasticity (no heteroskedasticity) in the model. F-Statistics value of LM Test revealed no serial correlation/ no autocorrelation in the model. F-Statistics value in case of Normality test revealed that sample data drawn from normally distributed population. Granger Causality Test revealed unidirectional causal relationship between LGDP and Total Revenue ($P < 0.05$), between LGDP and Non-Tax Revenue ($P < 0.05$), between Total Revenue and Tax Revenue ($P < 0.05$) and between Non-Tax Revenue and Tax Revenue ($P < 0.10$) indicating long-term relationship in the cointegration test, whereas no causality existed among rest of other combinations in the model. Since negative as well as positive responses existed in all three responses, so shock to LGDP noticed symmetric impact of Total Revenue, Tax Revenue and Non-Tax Revenue in Pakistan in

short as well as in long run. Wald test confirmed the set of independent variables (i.e TR_t , TXR_t , NTR_t) were significant for a model.

Keywords: Revenue, GDP, co-integration, economic growth, Pakistan.

INTRODUCTION

The past study concludes that tax revenue and non-tax revenue have insignificant effect on Nigeria's economic growth, recommending constant tax audits to mitigate evasion and avoidance Osamor et al. (2023). The findings suggest the need for tax policy changes to enhance economic development in the country Sharabidze (2023). The paper recommended some policy implications for people living in Chinese cities, focusing up-gradation of industrial units set up, market-based financial sector reforms and structural monetary policy Tang et al. (2023). Paper concluded that enhancement in money supply leads to rise in inflation if there is little difference in imports average and exports average then it leads to less average growth Ujkani and Gara (2023). The study underscored the importance of policymakers addressing and reducing uncertainties in macroeconomic policies, emphasizing transparency and effective management, especially in monetary policy decisions concerning liquidity and interest rates Zahid et al. (2023). Addressing the financial markets, investors, and socio-economic factors, the analysis concluded by stressing the importance of continuous monitoring and adaptation for fostering stable and balanced money supply growth Zaerpour (2023). The findings suggested the importance of increasing infrastructure and human resource spending through taxes and enhancing domestic industries for positive outcomes in free trade Al-kasasbeh et al. (2022).

The research emphasized the need for cautious management of monetary policy cessation in the short term and warns about potential long-term inflationary issues from continuous Money Supply expansion Amaral et al. (2022). As a result, it was said that if fiscal deficit lies within threshold, it improves GDP and beyond the limit it reduces economic growth of states Behera and Malick (2022). This research sheds light on the substantial influence of the exchange rate on Pakistan's overall economic development Gafurov et al. (2022). Findings revealed that both productive and wasteful government spending positively impacted economic growth in the short and long term. Institutional quality exhibits a positive influence on economic growth over both horizons, while short-term inflation positively affects but has a negative long-term impact. The study recommends a discerning approach to government spending, prioritizing productive sectors, and enhancing institutions for sustained economic growth Gardesi et al. (2022).

The findings suggested that Broad Money, exchange rate, and tax revenue had significant and positive influence on Pakistan's GDP, serving as indicators for measuring the country's economic condition Harit (2022). The research revealed that for the successful fiscal adjustment, spending based policy adoption is required. It can prevent economy from negative consequences at macro level like indefensible public debt Hussain et al. (2022). The study recommends enhancing money supply to stimulate private consumption and emphasizes maintaining favorable external reserves by monetary authorities Obeidat et al. (2022). The findings suggested that in the short run, the money supply, inflation rate and total capital formation impacted economic growth positively, but none of these variables influence long-term economic growth in Palestine Razia and Omarya (2022). The study recommends implementing a government debt ceiling, boosting non-oil exports, reducing imports, and enhancing revenue generation Sanni et al. (2022).

The study suggests that Pakistan's government should carefully set tax rates to balance revenue needs and economic growth Shafiq et al. (2022). Results revealed that Pakistan economy was positively impacted by monetary policy as well as fiscal policy but monetary policy was identified as more powerful in promotion of sustainable economic growth. It was suggested that sustainable monetary policy in banking sector provide secure atmosphere for investment through control on inflation Soharwardia (2022). The findings highlighted the varied impact of tax structures on economic growth in developed and developing nations Hakim et al. (2022). The study arrived at suggestion that there is dire need to introduce stable and consistent Fiscal and Monetary policy with a view to enhance economic development of country Chaudhry et al. (2021). The study suggested that fiscal policy measures exerted a more significant impact on Pakistan's economic performance as compared to monetary policy, emphasizing the need for improved coordination between the two for enhanced economic outcomes Esu and Atan (2021).

RESEARCH METHODOLOGY

Method, Structure of data, Range of data and Sources of data:

Time series data set ranges from 1991-92 to 2021-22 from authenticated sources (i.e Pakistan Economic Surveys and Federal Bureau of Statistics) have been utilized for present research study. Inferential statistics have been used for basic empirical analysis. In this regard, various statistical techniques and tests have been used such as Augmented Dickey-Fuller (ADF) Test for Unit Root (Dickey and Fuller, 1981), Log Linear Response Function based on Ordinary Least Square (OLS) Regression have been employed to describe the relationship between tested variable, Autoregressive Distributed lag (ARDL) Model to examine co-integrating relationships between parameters, Bounds Test to test long run relationships, Error Correction Mechanism (ECM) to make adjustment from short run dynamics towards long run equilibrium (Pesaram and Shin, 1998), Variance Inflation Factors to check the presence of Multicollinearity, Heteroskedasticity Test to identify the existence of heterogeneity, Lagrange Multiplier (LM) Test to inspect Serial Correlation/ Autocorrelation, Normality test to assess whether sample data drawn from normally distributed population or not, Granger Causality Test to verify the usefulness of one variable to forecast another, Impulse Response Function to indicate the direction and magnitude of causal relationship (Pesaran and Shin, 1998), At the end, Wald Test have been used to confirm whether a set of independent variables are collectively or individually found 'significant' for a model or not. EViews, being relevant statistical package have been employed for time series econometric analysis throughout research study.

Econometric Model

The econometric equation to assess the impact of Total Revenue (TR_t), Tax Revenue (TXR_t) and Non-Tax Revenue (NTR_t) of Fiscal Policy Dynamics on Economic Growth of Pakistan is symbolically presented as follows;

$$GDP_t = \alpha_0 + \alpha_1 TR_t + \alpha_2 TXR_t + \alpha_3 NTR_t + e_t \text{-----}i$$

Where,

GDP_t = GDP Growth Rate of Pakistan in year t.

α_0 = Constant Coefficient.

α_1, α_2 and α_3 = Slopes Coefficient
 TR_t = Total Revenue (% of GDP) in year t.
 TXR_t = Tax Revenue (% of GDP) in year t.
 NTR_t = Non-Tax Revenue (% of GDP) in year t.
 e_t = Stochastic term in year t.

Log-Linear Model is specified when the logarithm (Log) of the dependent variable is modeled using a linear combination of independent variables as;

$$\text{LogGDP}_t = \alpha_0 + \alpha_1 TR_t + \alpha_2 TXR_t + \alpha_3 NTR_t + e_t \text{-----}ii$$

Unit Root Tests for Tested Variables: Augmented Dickey-Fuller (ADF) Test has been employed for assessing Unit Roots of tested variables ($LGDP_t, TE_t, CE_t, DE_t$) have confirmed the integration order of stationary at I(0) level in case of variable ($LGDP_t$) and at I(1) level in respect of variable (TR_t, TXR_t, NTR_t) as presented in Table-1.

Table-1 Unit Root Test for Tested Variables ($LGDP_t, TR_t, TXR_t, NTR_t$)

Variables	ADF (Levels)		ADF in 1st Differences		Integration order through differencing approach I()
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
$LGDP_t$	-4.07	-3.95	-6.56	-6.42	I(0)
TR_t	-0.68	-2.84	-5.43	-5.29	I(1)
TXR_t	0.74	-0.77	-4.84	-5.09	I(1)
NTR_t	-2.84	-2.99	-5.63	-5.50	I(1)

Note: All tested variable estimated in log linear form;
 Critical values at 95 percent = -2.96 (without constant and without trend); and
 Critical values at 95 percent = -3.57 (with constant and trend)

Table-2 Ordinary Least Square (OLS) for variables ($LGDP_t, TR_t, TXR_t, NTR_t$)

Response Variable: Log(GDP)				
Method: Least Squares				
Sample: 1991-92 to 2021-22				
Counted observations after adjustments: 31				
Variable(s)	Co-efficient	Standard Error	t-Statistics	Probability
TR	0.677032	0.449867	1.504960	0.1439
TXR	-0.392095	0.291601	-1.344629	0.1899
NTR	-0.607734	0.595268	-1.020942	0.3163
C	0.858684	3.326469	0.258137	0.7983
R ²	0.079543	Durbin-Watson Statistics (DW)		1.280455
Adjusted R ²	-0.022730			
F-Stat.	0.777753			
Prob (F-Stat.)	0.516666			

The estimated econometric equation to assess the impact of Total Revenue, Tax Revenue and Non-Tax Revenue on GDP Growth Rate of Pakistan is presented as follows;

$$LGDP_t = \alpha_0 + 0.677032* TR_t - 0.392095* TXR_t - 0.607734* NTR_t + e_t \text{-----}iii$$

Table-2 indicated insignificant impact of impact of Total Revenue, Tax Revenue and Non Tax Revenue on GDP Growth Rate of Pakistan on GDP Growth Rate of Pakistan over a period of time 1991-92 to 2021-22. The perusal of Table-2 provides that R^2 value is 0.08 (8%) and which indicated that independents variable such as TR_t , TXR_t , NTR_t are predicting 8% variation in Dependent Variable as $LGDP_t$. F value is worked out as 0.78 ($P < 0.10$) revealing overall combined effects and overall unfitness of the Model.

Table-3 Autoregressive Distributed Lags Model for Tested Variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

Response Variable: Log(GDP)				
Method: ARDL(4, 0, 0, 1)				
Sample: 1991-92 to 2021-22				
Counted observations after adjustments: 27				
Fixed regressors: C				
Models evaluated: 500				
Variable(s)	Co-efficient	Standard Error	t-Statistics	Probability*
LGDP(-1)	0.564669	0.184308	3.063723	0.0067*
GDP(-2)	-0.379978	0.223665	-1.698870	0.1066
GDP(-3)	0.094967	0.237791	0.399372	0.6943
GDP(-4)	-0.551549	0.206942	-2.665228	0.0158
TR	0.966684	0.480253	2.012866	0.0593***
TXR	-0.577459	0.286586	-2.014960	0.0591***
NTR	-0.459558	0.621432	-0.739514	0.4691
NTR(-1)	0.986976	0.580502	1.700210	0.1063***
C	-3.816885	3.932733	-0.970543	0.3446
R^2	0.529099	Durbin-Watson Statistics (DW)		2.279240
Adjusted R^2	0.319810			
F-Stat.	2.528075			
Prob (F-Stat.)	0.048731			

*Significant at 1%

***Significant at 10%

Perusal of Table-3 provided the application of Auto-Regressive Distribute Lags Model (ARDL) included lags of both dependent and independent variables as regressors. Since both order of integration at level $I(0)$ and at 1st difference $I(1)$ conditions are present in Table 4.41, thereafter the findings of ARDL approach, revealed that ARDL values of Total Revenue ($P < 0.10$) impacted positive and significant influence, whereas Tax Revenue ($P < 0.10$) and Non-Tax Revenue ($P < 0.10$) impacted negative and significant influence on GDP Growth Rate of Pakistan, Hence, ARDL examined co-integrating relationships between tested variables in the model. The perusal of Table-3 provides that R^2 value is 0.53 (53%) which indicated that independents variable such as TR_t , TXR_t , NTR_t are predicting 53% variation in Dependent Variable as $LGDP_t$. F value is worked out as 2.53 ($P < 0.05$) revealing overall combined effects and overall fitness of the Model.

Table-4 Bound Test for estimating long run relationships among Variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

ARDL Bounds Test		
Sample: 1991-92 to 2021-22		
Counted observations after adjustments: 27		
HO: No long-run relationships		
Test Statistics	Value(s)	k
F-Stat.	3.477476	3
Critical Bounds Value		
Significance level	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Perusal of Table-4 provided value of F statistics as 3.48, which is greater than lower limit and lower than upper bound critical value, hence the Model testing is inconclusive.

Table-5 Error Correction Mechanism for estimating short run relationships and long run adjustment among tested variables ($LGDP_t$, TR_t , TXR_t , NTR_t)**Part-A**

Response Variable: DLog(GDP)				
Method: Error Correction Mechanism				
Sample: 1991-92 to 2021-22				
Counted observations after adjustments: 30				
Variable(s)	Co-efficient	Standard Error	t-Statistics	Probability*
C	-0.114737	0.358169	-0.320344	0.7514
D(TR)	0.694561	0.522764	1.328631	0.1960
D(TXR)	-0.374627	0.325831	-1.149758	0.2611
D(NTR)	-1.178312	0.666615	-1.767604	0.0893***
ECT(-1)	-0.725495	0.212142	-3.419853	0.0022*
R ²	0.528761	Durbin-Watson Statistics (DW)		1.828817
Adjusted R ²	0.453362			
F-statistics	7.012901			
Prob (F-statistics)	0.000626			

*Significant at 1%

The estimated econometric equation for short run model to assess the impact of Total Revenue, Tax Revenue and Non-Tax Revenue on GDP Growth Rate of Pakistan is presented as follows;
 $LGDP_t = \alpha_0 + 0.694561 * TR_t - 0.374627 * TXR_t - 1.178312 * NTR_t - 0.725495 ECT(-1) \text{ -----iv}$

Part-B: Long and Short Run adjustments

Variable	Model			
	Long run	p-value	Short run	p-value
TR_t	0.677032	0.1439	0.694561	0.1960
TXR_t	-0.392095	0.1899	-0.374627	0.2611
NTR_t	-0.607734	0.3163	-1.178312	0.0893***
ECT(-1)	n/a	n/a	-0.725495	0.0022*

Since all tested variables are stationary at I(1) and error term at I(0), it means cointegration and long run relationship exists. Perusal of Table-5 (Part-A) indicated the short run relationships between tested variable (TR_t , TXR_t , NTR_t) and the value of Co-integrating equation is negative (-0.725495) and significant ($P < 0.01$) provides speed of adjustment as 72% per unit time indicating that there is convergence from short run dynamics towards long run equilibrium. Since the error correction term is -0.72, this means that the 72 percent of the error will be corrected in the next period in converging to the long run relationship. Perusal of Table-5 (Part-B) provides long run and short run adjustments towards long run equilibrium. Moreover, DW (1.83) lies within acceptable range of 1.5 to 2.5 revealing no autocorrelation in the model.

Table-6 Variance Inflation Factors for checking the presence of Multicollinearity for variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

Variance Inflation Factors			
Sample: 1991-92 to 2021-22			
Counted observations after adjustments: 31			
	Co-efficient	Uncentered	Centered
Variable(s)	Variance	VIF	VIF
TR	0.202381	290.3930	5.179987
TXR	0.085031	69.49473	4.099248
NTR	0.354344	28.81647	1.579319
C	11.06539	76.15660	NA

Variance Inflation Factors ($VIF \geq 10$) indicate existence of severe Multicollinearity in the Model. Perusal of Table-6 indicated that Centered VIF values of tested variables (i.e TE_t , CE_t , DE_t) are less than 10 revealing non-existence of severe Multicollinearity in the Model.

Table-7 Heteroskedasticity Test for tested variables ($LGDP_t$, TE_t , CE_t , DE_t)

Heteroskedasticity Test:			
F-Stat.	1.175675	Probability. F(3,27)	0.3374
Obs*R ²	3.581672	Prob. Chi-Square(3)	0.3103
Scaled explained SS	3.329500	Prob. Chi-Square(3)	0.3436

Ho: No Heteroskedasticity

HI: Heteroskedasticity

Perusal of Table-7 indicated that probability value of F-Statistics and Chi-square are greater than 5% level of significance, hence HO is accepted revealing presence of homoskedasticity (no heteroskedasticity) in the model.

Table-8 Lagrange Multiplier (LM) Test for checking Serial Correlation/ Autocorrelation among variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

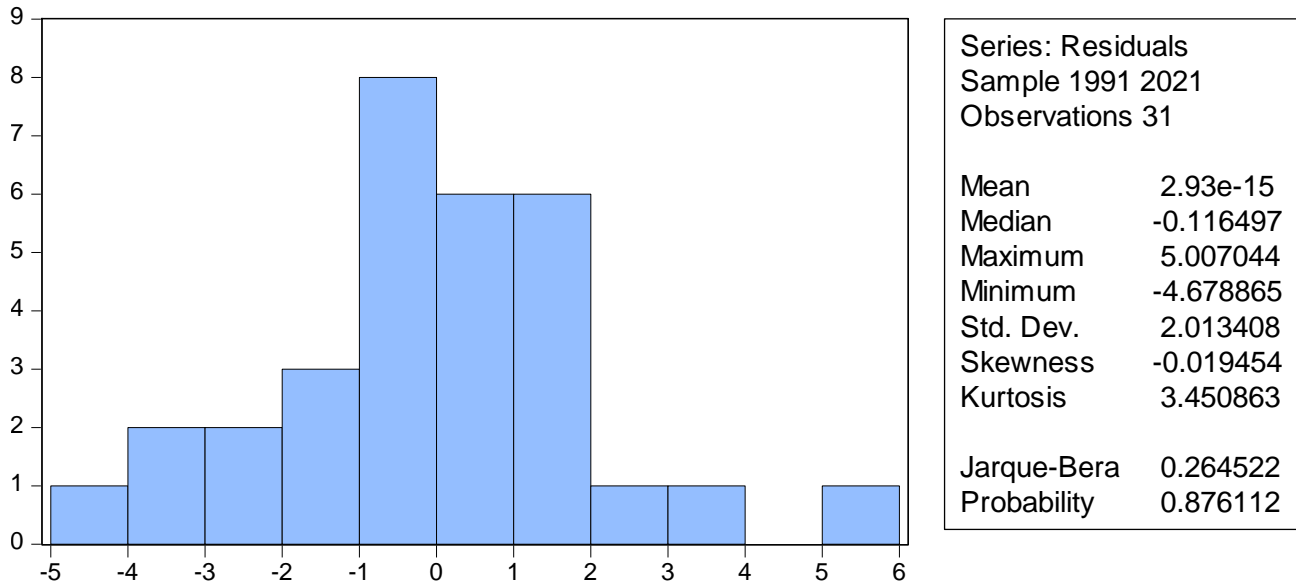
Serial Correlation LM Test:			
F-Stat.	2.886301	Probability. F(2,25)	0.0745
Obs*R ²	5.815260	Prob. Chi-Square(2)	0.0546

HO: No serial correlation exist between variables

H1: Serial correlation exist between variables

Since the probability values of all tested variables (i.e TR_t , TXR_t , NTR_t) are greater than 5% significance level ($P>0.05$) as shown in Table-8, hence HO is accepted, which revealed that model is free from serial correlation/ autocorrelation and does not need to be treated.

Figure-1 Normality Test for tested variables ($LGDP_t$, TR_t , TXR_t , NTR_t)



HO: Sample data drawn from normally distributed population

H1: No sample data drawn from normally distributed population

Since the probability value of Normality Test (0.87) is greater than 5% level of significance ($P>0.05$) depicted in Figure-1, hence null hypothesis is accepted, confirming that sample data has been drawn from normal distributed population. Hence relationships among tested variables are normal in the model.

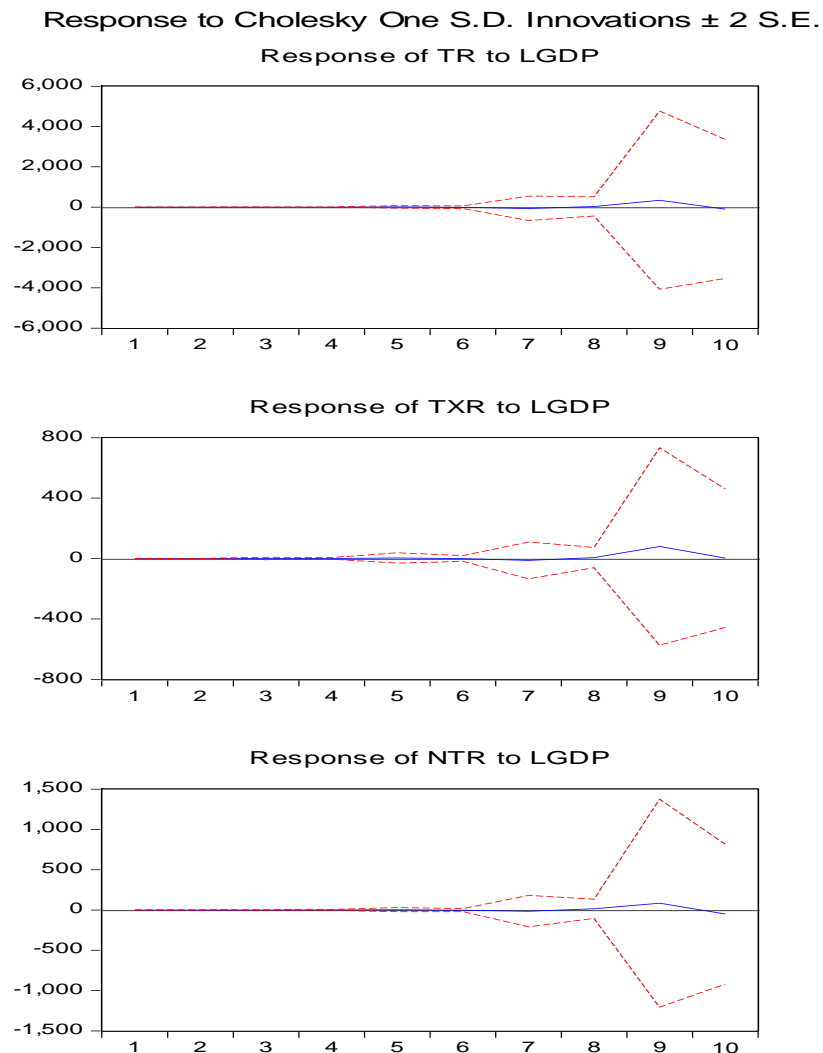
Table-9 Granger Causality Test for tested variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

Pairwise Granger Causality Tests			
Sample: 1991-92 to 2021-22			
Lags: 2			
HO:	Obs	F-Statistics	Probability
TR not Granger Causing LGDP	29	1.14354	0.3354
LGDP not Granger Causing TR		4.29071	0.0255**
TXR not Granger Causing LGDP	29	0.10750	0.8985
LGDP not Granger Causing TXR		0.74830	0.4839
NTR not Granger Causing LGDP	29	1.20615	0.3169
LGDP not Granger Causing NTR		5.48382	0.0109**
TXR not Granger Causing TR	29	5.33976	0.0121
TR not Granger Causing TXR		3.89491	0.0343**
NTR not Granger Causing TR	29	0.88805	0.4246
TR not Granger Causing NTR		0.14332	0.8672
NTR not Granger Causing TXR	29	2.90399	0.0742***
TXR not Granger Causing NTR		1.14630	0.3346

**Significant at 5%

***Significant at 10%

Perusal of Table-9 revealed uni-directional causal relationship between LGDP and Total Revenue ($P < 0.05$), between LGDP and Non-Tax Revenue ($P < 0.05$), between Total Revenue and Tax Revenue ($P < 0.05$) and between Non-Tax Revenue and Tax Revenue ($P < 0.10$) indicating long-term relationship in the cointegration test, whereas no causality exists among rest of other combinations in the model. .

Figure-2 Impulse Response Analysis for tested variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

Perusal of Figure-2 depicted red lines and blue line in all three responses of Total Revenue, Tax Revenue and Non-Tax Revenue to LGDP. Red lines referred to 95% confidence interval and blue line referred to Impulse Response Function.

In case of Response of Total Revenue to LGDP revealed that one standard deviation shock or impulse or innovation given to LGDP resulted in stability of Total Revenue from 1st 8th period, then gradual increases from 8th to 9th period becomes positive and thereafter gradual declines from 9th to 10th period becomes negative.

In case of Response of Tax Revenue to LGDP revealed that one standard deviation shock or impulse or innovation given to LGDP resulted in stability of Total Revenue from 1st 8th period, then gradual increases from 8th to 9th period becomes positive and thereafter gradual declines from 9th to 10th period becomes negative. .

In case of Response of Non-Tax Revenue to LGDP revealed that one standard deviation shock or impulse or innovation given to LGDP resulted in stability of Total Revenue from 1st 8th period,

then gradual increases from 8th to 9th period becomes positive and thereafter gradual declines from 9th to 10th period becomes negative. .

Since Impulse Response Function indicated direction and magnitude of casual relationships among tested variables, hence in all three responses, negative as well as positive responses existed, so shock to LGDP noticed symmetric impact on Total Revenue, Tax Revenue and Non-Tax Revenue in Pakistan in short as well as in long run.

Table-10 Wald Test for tested variables ($LGDP_t$, TR_t , TXR_t , NTR_t)

Wald Test: ARDL(4, 0, 0, 1)			
Test Statistics	Value(s)	df	Probability*
F-Stat.	2.528075	(8, 18)	0.0487**
Chi-square	20.22460	8	0.0095*
HO: C(1)=0 to C(8)=0			

*Significant at 1%

**Significant at 5%

HO: The value of independent variable is zero (0)

H1= The value of independent variable is not equal to zero (0)

Since the results of Wald Test in Table-10 indicated the probability values at F-test and Chi-Square values in case of independent variables (i.e TR_t , TXR_t , NTR_t) are less than 5% ($P<0.05$) and 1% ($P<0.01$) respectively, it means Null Hypothesis of assuming the values of independent variable is zero (0) is rejected, confirming independent variables are significant for a model. The present study is related with past studies conducted by Raed et al. (2016); Ali and Ahmad (2010); Degala (2023) and Gulsen and Cicek (2023).

CONCLUSION AND RECOMMENDATIONS

The study revealed that Total Revenue impacted positive and significant influence, whereas Tax Revenue and Non-Tax Revenue impacted negative and significant influence on GDP Growth Rate of Pakistan. The study concludes the implications in terms of causes and effects of Total Expenditure, Total Revenue and Fiscal Deficit Fiscal Deficit as proxies of Fiscal Policy Dynamics and Money Supply, Interest Rate, Inflation Rate and Exchange rate as proxies of Monetary Policy Dynamics significantly impacted economic growth of Pakistan during 1991-92 and 2021-22, emphasizing the need to reduce the burden of fiscal deficits by boosting exports through good fiscal managerial strategy, providing employment and investment opportunities, generating capital accumulation so necessary to alleviate poverty and accelerate economic growth of Pakistan's economy on the one hand and also to reduce uncertainties in macroeconomic policies, emphasizing transparency and effective financial management, especially in monetary policy decisions concerning money supply, interest rate, inflation rate, exchange rate and related liquidity matters in Pakistan. Good Fiscal Strategy will leads to foreign lending and helps in avoiding crowding out of personal investments inflows. Hence, there is dire need to frame sound fiscal strategy in Pakistan's economy so as to reduce all three deficits at all means on one hand and to promote economic growth by boosting exports on another, rather an economy growing with rising deficits trends would leads towards unproductive and uncompetitive and resultantly, local and foreign investors may not be willing to invest in such type of economy.

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