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Time and frequency domain causality Testing: The causal linkages Revisited betweenFiscal Policy and Economic Growth in Pakistan

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ABSTRACT
Research on the impact of fiscal policy is a dire need in today's economic world. In this investigation, fiscal policy effectson economic growth have been explored.In this analysis,the researcher examined the relationships using the secondary data source for the 1972-2019 data series by employing Auto-Regressive Distributed Lagged Model (ARDL) and frequency domain causality Testing to investigate the causal linkages between Fiscal Policy and Economic Growth in Pakistan. The variables have been used as the budget deficit and economic growth as the core variables of theresearch and concluded the negative association between the fiscal policy (budget Deficit) and economic growth.
Keywords: Fiscal policy, economic growth, the budget deficit

INTRODUCTION

Term Fiscal policy is often used to stabilize the economyas Bobaşu (2015) defined fiscal policy is government spendings and taxation that influences economic growth. Simply government revenue raising and government revenue spending activities are collectively part of the fiscal policy. Changes in government tax and spending activities cause changes in aggregate demand and affect economic activities. According to Keynes fiscal deficit helps nations to climb out of the economic recession. IMF (2012) reported that Economic growth is the increase in the inflation

The adjusted market value can also take into account in fiscal policy.

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In the case of Pakistan, the major cause of the fiscal deficit is non-development expenditures that are high due to day by day increase in military and defense expenditures causing a sustained increase in deficit budgets and increases the government borrowing both from foreign and local resources. There is a dire need forstructural fiscal adjustment to avoid unnecessary fiscal deficits. It will reduce the lavish console spending and will improve public trust in politicians.Due to fiscal deficit economic crisis occurred and cause trouble to enhance the economic indicators and this type of crisis has had a negative impact not only on the economy. This causes several issues like financial sector difficulties and flagging confidence hitting private consumption and investment, low investment opportunities, and international trade, therefore the researcher used to address the issue to explore the core reasons behind this deficit and later to suggest some policy implications.

LITERATURE REVIEW

Ramzan et al. (2010) in which study applied OLS techniques from 1972-2009 describe domestic debt on economic growth and concluded a negative impact of domestic debt and economic growth in Pakistan.Imtiaz*et al.*(2017) pointed out the positive association betweentax rate and inflation rate. It was found that inflation is negatively related to GDP. The tax rate and fiscal deficit and inflation rate are four tools of economic balancing of the country. Gondor andNistor (2012) studied that fiscal policy big factor influencing the foreign direct investment. They used a yearly pooled data-set for the period 2000-2010 for six European countries and found that FDI did not need a corporate tax rates competition. Ejaz et al. (2019) conducted the debt sustainability of Pakistan and estimated fiscal response functions. The vector autoregressive model includes in their research from 1971 to 2018. The study estimated the impulse response functions and estimated the association of five variables as government spending GDP per capita, consumption per capita, debt GDP ratio, interest, and exchange rate.

Jalil et al. (2014) conducted a study to test the fiscal theory of price level for Pakistan. In their analysis, they applied an autoregressive distributed lag model framework for the time series data throughout 1972–2012. Their findings showed a significant relationship between fiscal deficit and price level.

Ishaq and Mohsin (2015) by using the data of 1981-2010 for Asian countries, concluded deficit creates inflationary pressure. Hurduze et al. (2015)researchedSouthern Euro Area member states. These countries registered high internal and external imbalances that could not be reduced through monetary devaluation. The research concluded the fiscal policy changes have a much more significant impact. Lawal et al. (2018), examined the impact of the interactions of fiscal and monetary policies on stock market behavior (ASI) and the impact of the volatility of these interactions on the stock market of Nigeria. They analyzed the monthly data using ARDL and EGARCH models.The ARDL results gave evidence of a long termrelationship between ASI and monetary policies. The results from the volatility estimates showed that ASI volatility is mainly sensitive to volatility in the interactions between the two policy instruments.

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DATA SOURCE AND METHODOLOGY

In this research, the data for the period of 1975 to 2019 have been collected for various economic indicators. The estimations have been done by using the ARDL method. ADF was the test of unit root and the CUSUM is employed to test the stability of the model.

$$GDPt = \alpha 0 - \alpha 1\,(BDT) - \alpha 2\,(M2t) + \alpha 3\,(TRt) + \alpha 4\,(IND.SECt) + \alpha 5\,(P.GFIt) + \mu t$$

Where,

GDP = Gross Domestic Production
BD = Budget Deficit
IND. SEC = Industry sector
M2 = Broad money
TR = Trade
P. GFI = Public Gross Fixed Investment
μt = Error term

FREQUENCY DOMAIN CAUSALITY TESTING

As an initial causality test, the traditional Granger Causality test proposed by Granger (1969) is employed to explore the short-term interactions between budget deficit and and Economic growth rate. The idea is that BD(Budget Deficit) does Granger cause GDP (Economic Growth), only if the variable Economic Growth can be explained better by using the past values of both BD and GDP, rather than just by using the historical values. The equations of this technique can be expressed as follows:

$$GDPt = \alpha 0 + \alpha 1 BDt - 1 \ldots\ldots\ldots\ldots + \alpha z GDPt - z \quad (1)$$

$$BDt = \beta 0 + \beta 1 GDPt - 1 + \cdots \ldots\ldots\ldots \beta z BDt - z \quad (2)$$

whereGDPt denotes economic growth, and BDt denotes for budget deficit α's and β's are the parameters and both variables have a lag length of z.

In this study, we also used the Toda-Yamamoto causality test proposed by Toda and Yamamoto (1995). Granger causality is likely to produce a biased results if used variables are nonstationary (Granger and Newbold 1974). The test of Toda and Yamamotoemployed a Wald test not affected by the presence of unit root. This technique allows us to no information loss due to differencing the data series. Furthermore, this frequency-domain causality allows us to observe non-linearities and causality cycles, that is the causality in high or low frequencies.. We assume Xt has a finite-order VAR representation form as,

Θ(L)Xt = εt

where, Θ(L) is 2 × 2 lag polynomial of order p which can be shown as,$\Theta(L) = I - \Theta 1(L)1 - \ldots - \Theta pLp$ *with* $LkXt = Xt - k$ *with whire noise errors as* (εt) = 0.

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RESULT AND DISCUSSION

The results of the empirical estimation have been explored in detail in the section underlines.Summary statistics of the data have been provided in table 1. The results of the unit root process will be followed by the Cointegration that further conclude the long and short-run association among the variables.

i. Unit Root Analysis

The results for the stationary process of the time series are summarized in table 1.

Table 1: Unit Root Analysis

Variable	Test for unitroot	Included in theequation	F-statistic ADF statistic	Critical values	Result
GDP	**Level**	Intercept	-4.079677***	-3.605593	I(0)
	1st difference	Trend & intercept	-4.826659***	-4.205004	
		Intercept	-10.13268***	-3.610453	
INF	**Level**	Intercept	-6.266812***	-3.605593	I(0)
	1st difference	Trend & intercept	-6.313793***	-4.205004	
		Intercept	-7.854727***	-3.615588	
IND.SEC	**Level**	Intercept	-4.638383***	-3.605593	I(0)
	1st difference	Trend & intercept	-5.098303***	-4.205004	
		Intercept	-7.589342***	-3.615588	
M2	**Level**	Intercept	-1.965915*	-3.605593	I(1)
	1st difference	Trend & intercept	-3.635252**	-4.211868	
		Intercept	-5.423682***	-3.610453	
P.GFI	**Level**	Intercept	1.012919	-3.661661	I(10)
	1st difference	Trend & intercept	-4.881635***	-4.284580	

Source: Author's Estimations Using E-Views 9.5.

*Note: ***,**, and * denotes statistical significance at the 0.01, 0.05 and 0.10 levels respectively.*

Table 1 interpreted that the M2 is not stationary but the variable is stationary at its 1st difference. All the other variables included in the analysis are stable and the series does not possess any unit root and the estimated ADF value that is greater than the critical value of level 1% and probability is lower than 5% in table 2except for M2. All variables are integrated of order one (0) accept M2 that is integrated or order(1). There is a combination of stationary and non-stationary data series used in the analysis.

ii. ARDL Bound Test

If the value of lower bound (I0) and value of upper bound (I1) are greater than the f-static units then the researcher will accept the null hypothesis that there is a long-term association among the variables. And if the lower bound and upper bound value is smaller than the probability value the

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researcher should accept that there is no long-term affiliation among the variables and should reject the null hypothesize.

Table: 2 Bound Test of Cointegration

F − Statistic		**7.770400** ***
Critical value of Bounds		
Significance	**Lower Bound**	**Upper Bound**
10%	2.26	3.35
5%	**2.62**	**3.79**
2.5%	2.96	4.18
1%	3.41	4.68

Source: Author's Estimations Using E-Views 9.5.
*Note: *** denotes statistical significance at the 0.01levels.*

iii. Auto-Regressive Distribution Lagged Model

Auto-regressive Distributed Lagged Model usually utilized for the co-integrated time series. The ARDL model gives themboth short & long estimation of the coefficients. ARDL is a distributed lagged model that takes lagged value of a dependent variable.

Table3: Short-Run ARDL Co-integration

Variable	Coefficient	Prob.
D(GDP(-1))	3.255903***	0.0015
D(GDP(-2))	1.455652**	0.0141
D(GDP(-3))	0.426538**	0.0737
D(BD)	-0.143825	0.4196
D(BD(-1))	0.344632	0.1639
D(TR)	0.000000*	0.9247
D(TR(-1))	0.000000**	0.0296
D(TR(-2))	0.000000**	0.0693
D(M2)	0.187090	0.1354
D(M2(-1))	-0.034921	0.7964
D(M2(-2))	0.239124**	0.0565
D(IND.SEC)	0.578364***	0.0001
D(IND.SEC(-1))	-1.030820***	0.0001
D(IND.SEC(-2))	-0.624570***	0.0076
D(IND.SEC(-3))	-0.445574**	0.0240
D(P.GFI)	-0.000012***	0.0021
D(P.GFI(-1))	0.000008**	0.0690
D(P.GFI(-2))	-0.000003	0.3840
D(P.GFI(-3))	0.000004*	0.0884

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CointEq(-1)	-0.56196	0.0001

Source: Author's Estimations Using E-Views 9.5.
*Note: *** ,**, and * denotes statistical significance at the 0.01, 0.05 and 0.10 levels respectively.*

Table 3 elaborated the short-run association variables. This condition proved that all variables included in the model are correlated in long run. GDP and its lagged values show that the GDP relationship is positive and significant throughoutthe period. In the short-run budget deficit shows inconsistent & insignificant results. TR shows insignificant results shows a significant and positive association. Industry sector estimation confirmed the significant association. P.GFI in the current year exhibit a negative and significant correlation with GDP. However, it was concluded that budget deficit is negatively correlated with economic growth (GDP). The ECM term is -0.56196 which is highly significant and shows the 56% adjustment in the short run to accomplish the long-run equilibrium.

Table 4: Long-Run ARDL Co-integration

Variable	Coefficient	t-Statistic	Prob.
BD	-0.052522**	-2.221119	0.0483
TR	-0.000000***	-3.188969	0.0086
M2	-0.058057	-1.795355	0.1001
IND.SEC	0.610189***	23.058352	0.0000
P.GFI	-0.000003***	-6.283541	0.0001
C	3.937939***	2.818663	0.0167

Source: Author's Estimations Using E-Views 9.5.
*Note: *** ,**, and * denotes statistical significance at the 0.01, 0.05 and 0.10 levels respectively.*

Table 4demonstrates the long termassociation among the variables. The basic focus in this table is on budget deficit impact on economic growth. The table demonstratesthat there is a negative correlation between economic growth (GDP) and Budget Deficit. Due to one unit change (change) in BD, there isa -0.0525 unit change in GDP.Trade shows a negative affiliation with GDP growth. Researchers concluded the negative association that is an increase in payment to import goods and a sharp decline in exchange reserves.When the Broad money ratio in an economy changes it largely affects the currency in circulation. In this long run table, estimates for M2 demonstrate an insignificant impact of M2 on GDP growth. Here, the probability is higher than 0.05. In the industrial sector, the economic growth in an entity in the long-run industry sector value-added affects the GDP growth positively. As a consequence of one unit increase in IND.SEC economic growth (GDP) increases by 0.6101. The root cause behind this affiliation is that with the growth of industry sector economic activities (like production, cost and price structures, quality, etc.) changes and technical innovation also occurred in the production process.Pakistan is a developing country and surrounded by many economic diseases such as poverty, high inflation, and corruption, etc. that hinders economic growth, for example, inefficient allocation of resources, high-interest rate, unemployment, lack of good governance,

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low investment levels, socio-economic backwardness and high expenditures on non-developmental programs like high defense expenditures.

So, this fiscal policy shows ineffective results. In the case of Pakistan, this inefficiency results in a budget deficit an economic phenomenon in which government revenue lowers down as compared to government expenditures. The budget deficit is also an economic disease that badly affects economic activities in an entity. The government controlsthe money supply by increasing & decreasing its revenue and spending schedules. In Pakistan, due to a budget deficit, this control cannot properly be done.Pragmatic pieces of evidence on the association of fiscal policy with economic growth are inconclusive. A glance at the literature review shows multiple effects some studies suggest negative, while some Chandia and Javid (2013) and Nayab (2015) etc suggest positiveeffects. While some Padurean and Stoian (2013), suggesta positive effect of fiscal deficit on economic growth.This study confirms the negative association between budget deficit and economic growth Responsibility of the fiscal policy in economic growth has been deliberated extensively in literary studies in the past decade. Researchers concluded that fiscal policy blocks economic expansion via placing stress on the interest rate on the support of enlarged borrowing which crowds out classified investment in an entity.

Table 3. Causality test results.

	GDP → BD	**BD → GDP**
Granger causality	{0.076}	{4.637}***
	(0.918)	(0.037)
Toda-Yamamoto Causality	< 0.289 >	< 6.696 > **
	(0.817)	(0.011)
Fourier Toda-Yamamoto	[1.627]	[14.876]***
Causality	(0.891)	(0.006)

*Note: The values within the [ ], (), { }, and < > symbols indicate test stat, p-value, F-stat and modified Wald statistic, respectively. → denotes the direction of causality. *** , ** and * denotes statistical significance at the0.01, 0.05 and 0.10 levels, respectively.*

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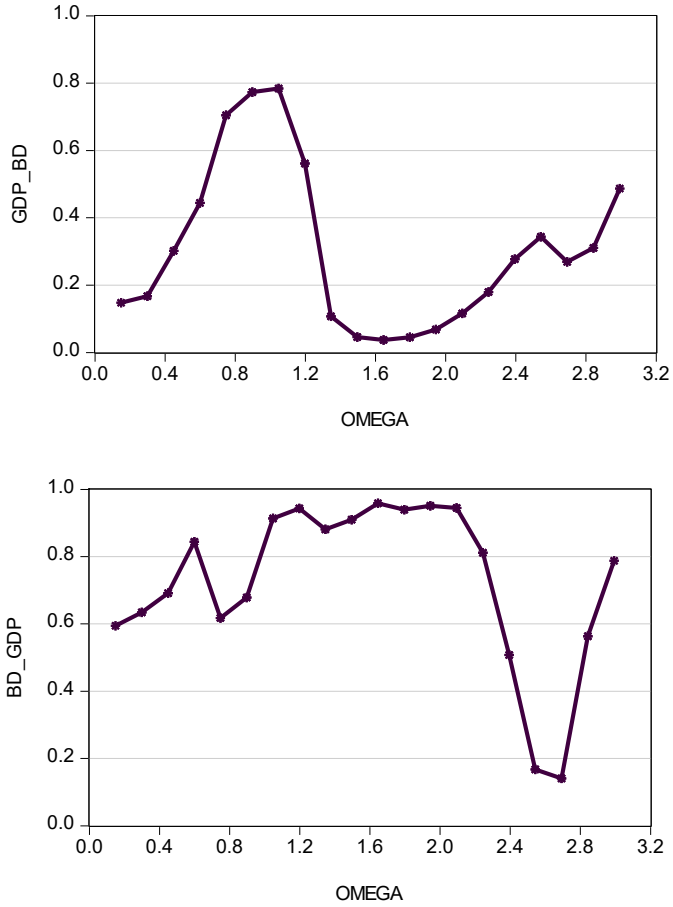
Empirical Results Using Spectral Granger Causality in Frequency Domain

Causality in the frequency domain | H0: There is not causality at frequency Omega | P-value D.F. (2,5) | Selected lag: 12 | Exogenous variables:BD TR, M2, IND.SEC, P.GFI, c



Note: Coefficient of coherence lies on vertical-axis, horizontal line parallel to horizontal-axis indicated critical values for the acceptance of null hypothesis at 5% level of significance and on horizontal-axis low frequency areas from origin shows long run causality, medium frequency areas shows medium run frequency and high frequency areas shows short run frequency proposed by Beritung and Candelon (2006).

Diagnostic analysis

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	5.45678	Prob. (F)	0.1342
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.69952	Prob. (F))	0.5657
Scaled explained SS	1.44844	Prob. Chi-Square	0.6765

Source: Author's Estimations Using E-Views 9.5.

The LM test for the Model demonstrates no serial correlation because the probability value is 0.1342 which is higher than 0.05 or a 5% significance level. And the Heteroskedasticity test indicates that there is no Heteroskedasticity in the Model. Because the probability is 0.5657that is greater than 0.05.

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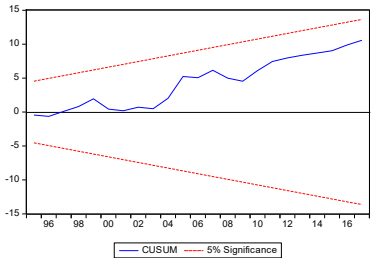
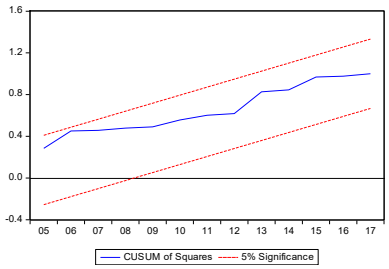
iv. Stability Analysis

To show that the model has stable parameters the CUSUM and CUSUM Square was employed as follows:

CUSUM



CUSUM SQUARE



THE above-displayed CUSUM plot demonstrated that either the model utilized in this analysis is stable or not. So, after the examination of the CUSUM diagram researcher can predict that model is stable as the blue line is never touching with the red line.

CONCLUSION AND POLICY RECOMMENDATION

Fiscal policy plays a vital role in the economic growth of any country. In developing nations like Pakistan fiscal policy shows negative affiliation with GDP this study also confirmed negative affiliation of economic growth and fiscal policy as the Budget Deficit.Due to this government faces a budget deficit a situation in which expenses higher-up than economic growth.The final discussion exhibits the negative association of fiscal policy with economic growth and the existence of a budget deficit is also proved. So, the following implications will help the policymakers to improve economic growth. As the control, the inflation rate, improvement in trade policies, increase in government revenues by driving new ways such as decline in defense expenses, utilization of natural resources, etc. industrial sector development brings technical innovation and lead Pakistan towards prosperity.

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