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Tax-Spend or Spend-Tax Hypotheses: A Case Study of Pakistan using Threshold Cointegration with Asymmetric Adjustment

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Abstract

Revenue-spending nexus has significant inferences for the political economy to understand the fiscal policies particularly in context of Pakistan economy. In the current study, the traditional tax-spend versus spend-tax view of fiscal policy is investigated based on asymmetrical TAR and M-TAR tests of cointegration. For this, we have used annual data on taxes and government spending for Pakistan over the period 1976 to 2019. The results show some evidence in favor of traditional tax-spend view. It implies that catering revenue from tax side results in more spending and increases the fiscal deficit. Hence, the devastating effect on fiscal balance is evident, if it is targeted through taxes. Therefore, it is required that fiscal adjustment should be from spending side rather than tax. Furthermore, the results indicate that both taxes and government spending are cointegrated (have long-run equilibrium relationship) with asymmetric adjustment process towards long-run equilibrium. Moreover, budgetary deviations below long-run equilibrium are corrected faster than deviations above it.

Keywords: *Fiscal Policy, Political Economy, Tax-spend, Cointegration*

JEL Classification: C10, E62, E63

1. Introduction

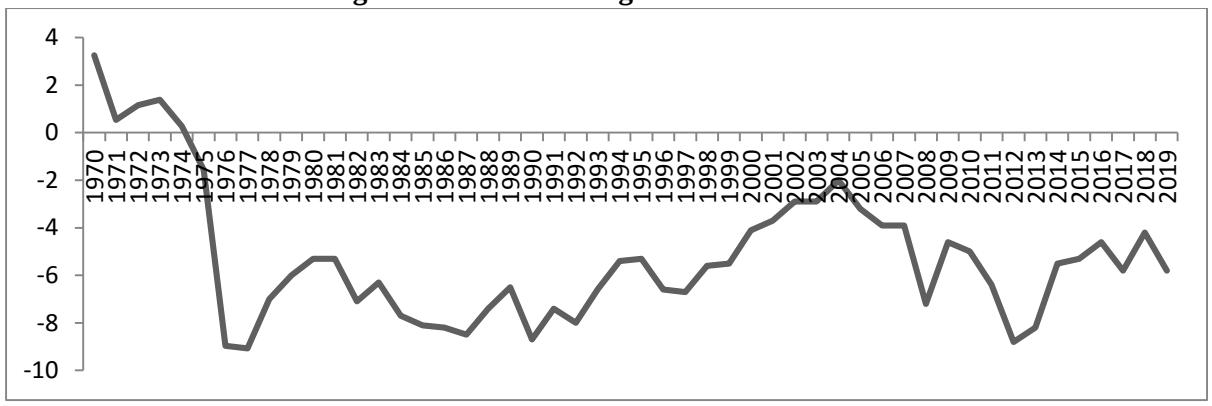
Fiscal policy is considered to be a fundamental part of economic policy. It is designed to achieve the major macroeconomic targets of an economy, which include mobilization of resources in order to finance government spending, stimulation of price stability, and sustaining growth in the long run. Additionally, it is also used to lessen the short term and medium term variations in investment, production and output. However, persistent budget deficits have distressing effects on macroeconomic targets. For instance, it reduces saving which consequently effects growth of the economy (Batrancea, 2021). Furthermore, it also has negative outcome on private investment, net exports and foreign direct investment (Tung, 2018). The worsening fiscal position due to economic crisis in developing countries has increased serious threats regarding long run fiscal sustainability of several economies. The direction and nature of the association among government taxes and spending help to define the pathway for fiscal consolidation to generate public finances. Therefore, it is important to understand the tax-spend nexus in the wake of fiscal complications (Narayan and Narayan, 2006). The issue of government revenues and expenditures remains very much essential in formulating any public policy due to its implications on fiscal deficits.

Most of the developing countries are facing a problem of large and growing fiscal deficit, including Pakistan. Large budget deficit is associated with adverse effect on GDP growth and investment (Chaudhary and Abe, 1999). Moreover, it also has disturbing effect on financial stability due to over borrowing (Reinhart and Rogoff, 2010). Fiscal adjustments are required to correct the budget deficit

through cuts in government expenditures or increase in the revenue sources. Huge quantities of resources should be collected and spend in the most efficient manner. However, it is critical to observe the financing channels and its implication in terms of sustainability. In addition, the fiscal deficit must be manageable in terms of debt to GDP ratio. Therefore, several measures have been proposed and implemented in Pakistan to ensure the sustainability of deficit. It includes broad-based tax reforms, restructuring of a tax system and administration, elimination of tax exemptions and tax shelters along with decrease in unproductive expenditures. However, it is unfortunate, that tax reform polices to target deficit turned out to be unsuccessful (Ahmed, 2018).

The trend of budget deficit in Pakistan is shown in Figure 1 over the period of 1970 to 2019. Pakistan is among one of the developing countries which has to face lot of financial constraints. Expansionary fiscal policies, short term and long term developmental plans and necessary imports play significant role in reducing national saving. The graph shows that Pakistan has been experiencing the problem of deficit since 1975. However, it is important to note that the intensity of the deficit has remained high in most of the years, particularly in recent years. The inability of government to cater revenues and restrict expenditures is clearly visible from the trend of budget deficit. If timely policies are not formulated to lessen the intensity of deficit then it may create severe problems that can lead to government failure. Hence, this study is an attempt to show the existing trend of the association between revenue and expenditure which may further guide to determine the direction of public policy.

Figure 1: Trend of Budget deficit in Pakistan



Source: Author's construction

The association of government taxes and expenditure is essential in assessing the role of government in resource distribution. However, the revenue-spending nexus is still an unsettled issue, despite of various theoretical and empirical developments in the literature. Hence, it is essential to recognize the causal connection between spending and revenue to define the appropriate policy for reduction in budget deficit. The issue of causation; spend-tax, tax-spend, bidirectional (fiscal synchronization) or nonexistent (fiscal independence or institutional separation) is important for the formulation of effective fiscal policy that targets to achieve reduction in deficit along with other short-term and long-term targets.

The empirical research on the relationship of tax-spend hypothesis has raised several observations which suggest the directions for new research. First, limited literature is available for transition and less developed economies. However, recent literature has taken into account these economies but still there is need to expand the research for transition and less developed economies as the available literature is too old or limited in scope. Secondly, there should be more empirical investigation on national and sub-national level for developing countries in order to take into consideration regime shifts, institutional setting and the macroeconomic situation. Thirdly, more recent, non-linear approaches are used that allow changes in fiscal behavior and budget sustainability below or above some particular threshold estimate.

These non-linear methodologies provide certain additional understanding related to fiscal behavior; therefore, it should be applied more extensively. Hence, in this study, focus is given to the issue of tax-spend nexus by applying the nonlinear approach. Although, there is intensified concerns among economists and politicians on the growing and large deficits but the literature seems to be silent in explaining the recent tax-spend or spend-tax causation in case of Pakistan with asymmetric behavior. Therefore, looking at the trend of budget deficit in Figure 1 for the economy of Pakistan, this study specifically try to comprehend the following questions keeping in view the tax-spend nexus. First, the study determines the long-run association concerning government spending and revenues. Second, it investigates that whether the budgetary adjustment follows symmetric or asymmetries process. Third, it explains the influence of government spending and revenues on short-run and long-run adjustment of the budget deficit.

2. Review of Literature

Rich empirical and theoretical literature is available on the association between spending and revenues in view of fiscal balance. Furthermore, it is observed that most of the frequent studies are found in developed economics, while fewer studies are available for less developed and emerging economics due to non-availability of reliable data. However, in the recent time focus has shifted to developing and emerging economies. It is important to note that the policy intervention in view of fiscal balance has regained the attention particular in economic crises, as has been experienced by all the economies during COVID-19. The debate on tax-spend association has generated four types of hypotheses. First, the hypothesis of tax-spend (revenues-expenditures) is validated if one way causation exists from taxes to spending. Whenever, there is raise in taxes to reduce budget deficit, it increases government expenditure, resulting more increase in deficit (Friedman, 1978). Therefore, it is desirable that fiscal adjustment should be via spending rather than tax (Panagiotis, 2004). Among others, the findings of Mounts and Sowell (1997), Husain (2004), Obeng (2015), Mutascu (2016), Khan et al. (2021), Nzimande and Ngalawa (2022) and Karakas and Turan (2019) endorsed this hypothesis.

The second hypothesis i.e. spend-tax (expenditures-revenue) is validated if causality is found from expenditure to taxes. In this case, government first defines its total expenses and later modifies the sources of revenue to finance expenditures. Barro (1979) also proposed this type of hypothesis in view of deficit financing expenditures. The hypothesis of spend-tax type is generally proposed and justified in the situation of crisis (Peacock and Wiseman, 1961; Roberts, 1978 and Konukcu-Onal and Tosun, 2008). Empirical support of this hypothesis is found in the studies of Ross and Payne (1998), Richter and Paparas (2013), Al-Zeaud (2015) and Karakas and Turan (2019).

The third one is fiscal synchronization hypothesis which maintained if there exists feedback or bidirectional causation among taxes and expenditures (Meltzer and Richard, 1981). In this case, government takes simultaneous decisions regarding taxes and consumption. In this context, Mehrara et al. (2011), Vamvoukas (2012), Raza et al. (2019), Akram and Rath (2019) and Soomro (2020) are few studies which are providing support for simultaneous intervention. The fourth hypothesis of institutional separation or fiscal independence indicates that revenues and spending are not dependent of each other (Baghestani and McNown, 1994; Payne, 2003). In this instance, the decision of taxes and spending are taken separately by the government. Hence, the empirical studies of Hoover and Sheffrin (1992), Iqbal and Wasim (2010) and Athanasenas et al. (2014) confirmed this hypothesis and provide support pertaining to independent decisions. The empirical validation of four types of hypotheses is due to country specific characteristics. Moreover, difference in period of analysis, lag length, model specifications and methodology are also important in generating inconsistent results across economies.

It is further noted that empirical literature is mostly dominated by applying the methodology of Granger (1969) causality. Therefore, earlier studies performed bivariate causation technique to analyze the association between taxes and expenditures. Hence, utilizing this technique, Blackley (1986), Ram (1988), Bohn (1991), Hakkio and Rush (1991) and Mounts and Sowell (1997) validated tax-spend hypothesis in USA, Payne (1997) in Canadian economy and Husain (2004) provided evidence in case of Pakistan. Later on, Engle and Granger (1987) presented the technique of cointegration, therefore, a different set of studies appeared based on error correction modeling which provides both short run and long run outcomes. Moreover, bivariate cointegration analysis extended as to a multivariate analysis (Johansen and Juselius, 1990). Hence, larger number of studies is available based on VAR and VECM (Richter and Paparas, 2013; Takumah, 2014; Afonso and Jalles, 2015). In this context, tax-spend hypothesis is supported in the studies of Park (1998) for Korea; Panagiotis (2004) for Greece; Al-Khulaifi (2012) for Qatar; Obeng (2015) for Ghana; Khan et al., (2021) for Malaysia; Nzimande and Ngalawa (2022) for Bostwana. However, utilizing same technique, spend-tax hypothesis is established in the study of Takumah (2014) for the low income economy of Ghana and Al-Zeaud (2014) confirmed this hypothesis for Malaysia.

The newest noteworthy development regarding the relationship of revenue and expenditure is the application of non-linear modeling approaches. This nonlinear modeling allows studies to investigate the sustainability of budget variations below or above some particular threshold estimate. Therefore, in recent times the studies are focusing on the threshold autoregressive (TAR) and MTAR to examine the relationship of taxes and expenditures. Hence, some asymmetric behavior on the tax-spend relationship is found in the US economy in the study of Young (2011). Moreover, similar results are obtained in the studies of Paleologou (2013) for Greece; Aworinde and Ogundipe (2015) for Nigeria and Tiwari and Mutascu (2016) for Romania. Whereas, no asymmetric behavior is found in the studies of Zapf and Payne (2009) for the USA, Paleologou (2013) for Germany and Sweden and Phiri (2019) for the South Africa.

In case of Pakistan the hypothesis of tax-spend is confirmed in the study of Husain (2004). While, spend-tax hypothesis is validated in Husain et al. (2010) and Aisha and Khatoon (2010). The results of Sadiq (2010) and Iqbal and Malik (2010) show no evidence of causation in any direction, hence; provide validation for fiscal independence hypothesis. The case of fiscal synchronization is also validated in the study of Baffes and Shah (1994) and Soomro (2020). Limited and inconclusive literature in case of Pakistan provides a rationale to determine the relationship between government revenues and expenditures. Moreover, the empirical results are not available using the recent dataset with asymmetric budgetary adjustments.

3. Methodology

The study includes annual data for Pakistan over the 43 years during 1976 to 2019. In order to explore the association between tax-spend hypothesis, the data on federal government tax receipts and current expenditures are collected from the Statistical Year Book of FBR and Economic Survey of different years. The series of tax receipt and expenditures are converted into log and then it is scaled by taking log of GDP. Data transformation technique is similar to the one provided in Ewing et al. (2006) and Young (2009).

3.1. Unit Root Test

ADF test is employed to look at the stationarity of the selected data. If unit root exists in both series i.e. revenues and expenditure then it is suggested to test the long-run association among revenues and spending by applying the technique of Engle-Granger (1987).

3.2. Cointegration

For cointegration analysis, Engle-Granger (1987) technique is applied among the series of revenues and expenditure. The existence of cointergation in the revenue and expenditures allow to estimate the long-run association given in specification (1) through OLS.

$$\mathrm{Re}\, v_t = \phi_0 + \phi_1 Exp_t + \varepsilon_t \qquad (1)$$

Where, Rev_t shows tax revenues and Exp_t is representing the current government expenditures. Error term is shown by ε_t. Cointegration among the variables of revenues and expenditures indicates the presence of long-run association among the given series and therefore, it is recommended to use the error-correction procedure. This error-correction mechanism offers the short-run adjustment process to its long run equilibrium value in case of any short run disequilibrium.

$$\Delta Exp_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta Exp_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta \mathrm{Re}\, v_{t-i} + \delta \hat{\varepsilon}_{t-1} + \mu_t \qquad (2)$$

$$\Delta \mathrm{Re}\, v_t = \tilde{\alpha}_0 + \sum_{i=1}^{p} \tilde{\alpha}_i \Delta Exp_{t-i} + \sum_{i=1}^{p} \tilde{\gamma}_i \Delta \mathrm{Re}\, v_{t-i} + \tilde{\delta} \hat{\varepsilon}_{t-1} + \tilde{\mu}_t \qquad (3)$$

The traditional tax-spend hypothesis is given in equation (2) and spend-tax hypothesis is presented in equation (3). These equations show that changes in expenditure (revenue) have symmetric effect on revenue (expenditure). Akaike information criterion is applied for the selection of lag length and $\hat{\varepsilon}_t$ is estimated residual from the cointegrating relationship using equation (1). The equations (2) and (3) are estimated by ordinary least square (OLS).

$$\Delta Exp_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta Exp_{t-i} + \sum_{i=1}^{p} \gamma_i^{NEG} D^{NEG} \Delta \mathrm{Re}\, v_{t-i} + \sum_{i=1}^{p} \gamma_i^{POS} D^{POS} \Delta \mathrm{Re}\, v_{t-i} + \delta \hat{\varepsilon}_{t-1} + \mu_t \qquad (4)$$

Where D^{POS} = 1 if Δ Rev> 0
= 0 otherwise

D^{NEG} =1 if Δ Rev<0
= 0 otherwise

Specification (4) permits variations in tax revenues for having asymmetric effects on spending depending whether the tax revenue changes are negative or positive.

$$\Delta \mathrm{Re}\, v_t = \tilde{\alpha}_0 + \sum_{i=1}^{p} \tilde{\gamma}_i \Delta \mathrm{Re}\, v_{t-i} + \sum_{i=1}^{p} \tilde{\alpha}_i^{NEG} D^{NEG} \Delta Exp_{t-i} + \sum_{i=1}^{p} \tilde{\alpha}_i^{POS} D^{POS} \Delta Exp_{t-i} + \tilde{\delta} \hat{\varepsilon}_{t-1} + \tilde{\mu}_t \qquad (5)$$

Where D^{POS} = 1 if Δ Exp> 0
= 0 otherwise

D^{NEG} =1 if Δ Exp<0
= 0 otherwise

Similarly, specification (5) in view of spend-tax, permits variation in expenditure for having asymmetric effects on tax revenues depending on whether the expenditure changes are negative or positive. The models of TAR and M-TAR are used to check the symmetry assumption of the ECM. Estimates of TAR and M-TAR models are based on the residuals $\hat{\varepsilon}_t$ of specification (1).

$$\Delta \hat{\varepsilon}_t = I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_t) \rho_2 \hat{\varepsilon}_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta \hat{\varepsilon}_{t-i} + \upsilon_t \qquad (6)$$

Where, for TAR

$I_t = 1$ if $\hat{\varepsilon}_{t-1} \geq \tau$

$= 0$ if $\hat{\varepsilon}_{t-1} < \tau$

For M-TAR

$I_t = 1$ if $\Delta\hat{\varepsilon}_{t-1} \geq \tau$

$= 0$ if $\Delta\hat{\varepsilon}_{t-1} < \tau$

The threshold level, τ, is obtained by following Chan (1993) procedure. This will enable to test the null hypothesis of no cointegration ($\rho_1 = \rho_2 = 0$) using the Φ-stat (F-statistic) from Enders and Granger (1998). If null hypothesis of no cointegration is rejected, then the assumption of symmetric vs. asymmetric with the related null hypothesis (H_0: $\rho_1 = \rho_2$, symmetric adjustment) is tested using Wald test. These threshold values are used for the estimation of ECM with short-run asymmetric effects.

$$\Delta Exp_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta Exp_{t-i} + \sum_{i=1}^{p} \gamma_i^{NEG} D^{NEG} \Delta \mathrm{Re}v_{t-i} + \sum_{i=1}^{p} \gamma_i^{POS} D^{POS} \Delta \mathrm{Re}v_{t-i} + I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_{t-1}) \rho_2 \hat{\varepsilon}_{t-1} + \mu_t \quad (7)$$

$$\Delta \mathrm{Re}v_t = \tilde{\alpha}_0 + \sum_{i=1}^{p} \tilde{\gamma}_i \Delta \mathrm{Re}v_{t-i} + \sum_{i=1}^{p} \tilde{\alpha}_i^{NEG} D^{NEG} \Delta Exp_{t-i} + \sum_{i=1}^{p} \tilde{\alpha}_i^{POS} D^{pOS} \Delta Exp_{t-i} + I_t \tilde{\rho}_1 \hat{\varepsilon}_{t-1} + (1 - I_{t-1}) \tilde{\rho}_2 \hat{\varepsilon}_{t-1} + \tilde{\mu}_t \quad (8)$$

In the above equations ρ_1, ρ_2 and $\tilde{\rho}_1, \tilde{\rho}_2$ are interpreted as speed of adjustment parameters. ρ_1, ρ_2 show the responsiveness of expenditures to above and below threshold budgetary disequilibria, respectively. Similarly $\tilde{\rho}_1, \tilde{\rho}_2$ represent the responsiveness of tax revenues to above and below threshold budgetary disequilibria. For cointegration to exist, at least one of the adjustment parameters must be non-zero. The traditional literature on tax-spend or spend-tax hypotheses consist of applying the Granger causality test on the lag coefficients of expenditure (Exp_t) in revenue equation (Rev_t) and vice-versa. In simple words using equations (2) and (3), there will be tax-spend hypothesis only if we'll be able to reject the following null hypothesis,

$H_0 : \gamma_1 = \gamma_2 = \ldots\ldots\ldots = \gamma_P = 0$

and accept the following given null hypothesis,

$H_0 : \tilde{\alpha}_1 = \tilde{\alpha}_2 = \ldots\ldots\ldots = \tilde{\alpha}_P = 0$

Furthermore, more recently the inclusion of asymmetries into the tax-spend or spend-tax hypotheses allow us to consider the effect of changes in revenues on expenditures depends on whether those changes in revenues are negative or positive, in a similar way. However, there is widely held believe in time series literature that granger causality test does not capture all aspects of causality. So, one need to proceed cautiously for testing tax-spend or spend-tax hypotheses using granger causality test.

On the other hand, an important insight regarding the causation relationship among government spending (Exp_t) and its revenues (Rev_t) can be gained by interpreting the speed of adjustment parameters ρ_1, ρ_2 and $\tilde{\rho}_1, \tilde{\rho}_2$. If only ρ_1 and/or ρ_2 are non-zero, it means that only government expenditures respond to the deviations from long run equilibrium relationship among government revenues and taxes, proving the spend-tax hypothesis and vice-versa.

4. Results and Discussions

The unit root test of ADF is offered in Table 1. The series of revenue and expenditure are found to be non-stationary at level, whereas, the series are stationary at first level. Therefore, it is suggested to check the coitegration relation between the variables under consideration. The series of revenue and expenditure is considered to have a cointegration relationship if the error term of equation (1) is turns out to be stationary. In this regard, computed ADF statistic (-3.27) is larger than the critical value at 10% level of significance, therefore, ADF test rejects the null hypothesis of unit root in error series which indicates that the series of revenues and expenditures are simply co-integrated.

Table 1: Results of Unit

Variables	ADF Test	Conclusion
Rev	-2.27	
ΔRev	-7.82***	I(1)
Exp	-2.56	
ΔExp	-7.52***	I(1)

Note: The symbols *** show significant at 1% level

Recent development in time series literature is the non-linear relationship among macroeconomic variables over business cycle. Furthermore, Enders and Granger (1998) show that model with symmetric adjustment will be misspecified if actual relationship among given variables is asymmetric. We next estimate equation (6) using TAR & M-TAR tests for asymmetric adjustment. Chan (1993) procedure is used to determine the consistent value of threshold. Following this technique, the values of $\widehat{\varepsilon_t}$, and $\Delta\widehat{\varepsilon_t}$ are arranged for TAR and M-TAR models in ascending order then 15% below and above (largest and smallest) values are discarded. Hence, the threshold value "τ" is the consistent estimate yields the smallest residual sum of squares is found to be laying in the middle of remaining 70% values. In this study, the resulted threshold value for TAR is τ = 0.000787 and for M-TAR is τ =0.000703

Table 2: Estimate for the Budgetary Disequilibrium

Model	Lags	T	ρ_1	ρ_2	$\rho_1 = \rho_2 = 0$	$\rho_1 = \rho_2$	D-W
TAR	1	0.000787	-0.71	0.066	4.32	5.11	2.05
			(-2.89)	(0.37)			
M-TAR	0	0.000703	0.27	-0.38*	5.34***	5.39**	2.02
			(1.08)	(-3.08)			

Note: t-statistic is given in brackets, ***, **,* shows the level of significance at 1%, 5% and 10%

TAR and M-TAR tests are used for the estimation of equation (6). The actual value of threshold parameter "τ" is used to examine whether the adjustment process is ideally captured as a TAR or M-TAR. The null hypothesis $\{H_0 = \rho_1 = \rho_2 = 0\}$ is tested for both TAR and M-TAR models. The test doesn't follow the standard distribution and the reported F- statistics is compared with the critical values provided by Enders and Siklos (2001). For symmetric adjustment the null hypothesis is $\{H_0 = \rho_1 = \rho_2\}$

and the F- statistics is compared to the standard F-distribution. Table 2 shows the outcome of the threshold cointegration by using the consistent estimate of the threshold.

Table 3: Results of M-TAR ECM Versions of Expenditure and Revenues Equations

Revenues ECM equation			**Expenditure ECM Equation**		
Variables	M-TAR		Variables	M-TAR	
$\tilde{\alpha}_0$	-.001	(-0.96)	α_0	-0.002	(-0.61)
$\tilde{\alpha}_1^{NEG}$	-0.14	(-1.01)	γ_1^{NEG}	-0.98	(-1.15)
$\tilde{\alpha}_1^{pos}$	0.078	(0.52)	γ_1^{POS}	0.32	(0.39)
$\tilde{\rho}_1$	0.28	(1.01)	ρ_1	-0.10	(-0.14)
$\tilde{\rho}_2$	-0.40***	(-2.90)	ρ_2	-0.31	(-0.92)
R^2	0.30		R^2	0.15	
AIC	-7.65		AIC	-5.82	
D-W stat	2.03		D-W stat	2.05	
F –stat ($\gamma_1^{NEG}=0$)	1.03		F-stat ($\gamma_1^{NEG}=0$)	1.34	
F-stat ($\gamma_1^{POS}=0$)	0.27		F-stat ($\gamma_1^{pos}=0$)	0.15	
F-stat $\rho_1=\rho_2$	5.06**		F-stat	0.075	

Note: t-statistic is given in brackets, ***, **,* shows the level of significance at 1%, 5% and 10%

ρ_1 represents the adjustment process above the threshold budgetary disequilibrium while ρ_2 shows the adjustment process below the threshold budgetary disequilibrium. For TAR test, point estimates of ρ_1, ρ_2 suggest that there will be convergence with rapid speed for positive discrepancies than for negative ones from τ=0.000787. An important hypothesis is to test the existence or nonexistence of cointegration where $H_{o:}\ \rho_1 = \rho_2 = 0$, rejecting null hypothesis (H_O) means that there is cointegration among given variables once both TAR and M-TAR values are obtained. Since this test follows non-standard F or Φ distribution, critical values for comparison are used from Enders and Siklos (2001). For TAR, critical values of 90%, 95%, and 99% for 50 observations with one-lag change are 5.55, 6.62, and 9.10, respectively. Since our computed value (4.32) does not exceed any of these critical values, therefore, we fail to reject the null hypothesis of no cointegration using TAR model. On the other hand, in case of M-TAR model, critical values of 90%, 95%, and 99% for 50 observations with no lag change are 5.02, 6.02, and 7.09, respectively. In comparison, our computed value in M-TAR model (5.34) exceeds one of the given critical values, therefore, we reject the null hypothesis of no cointegration. The next step is to test null hypothesis of cointegration with symmetric adjustment $H_o : \rho_{1=} \rho_2$ contrary to the alternative of cointegration with asymmetric adjustment using standard F-test or Wald test. The results are demonstrated in the second last column of Table 2. The computed F-stat of 5.39 (with *p-value*=0.02)

exceeds the critical value, we reject the null hypothesis of symmetric adjustment in favour of asymmetric adjustment. Therefore, estimation results reveal that in case of TAR model, cointegration with asymmetric adjustment of budgetary disequilibrium is rejected, however for M-TAR, asymmetric adjustment process is accepted at 5% significance level.

Finally, using the values of momentum threshold, expenditure as well as tax revenues ECM equations (7) and (8) are estimated with short-run asymmetric effects and results are presented in Table 3. We estimate equations (7) and (8) for different lag lengths and find one lag to be optimal for both equations using AIC criteria. The value of Durbin-Watson statistic also indicates that the errors are not autocorrelated, which further reinforces the choice of optimal lag length. We also include the lagged values of dependent variables in an asymmetric way. However, all of these values from both equations (7) and (8) are found insignificant, given by very low t-stat of these coefficients provided in Table 3. The speed of adjustment coefficients provides an interesting story of adjustment towards long run equilibrium relationship of government tax revenues and expenditure after short-run disequilibrium. The t-statistic of error correction terms indicate that government spending is weakly exogenous but government revenues adjusts only to the deviations from long run equilibrium if $\hat{\varepsilon}_{t-1} < 0.000703$. In other words, revenues responds to the below threshold deviations from long run relationship, whereas in case of positive deviations it shows persistence. We can also infer an important insight regarding the causation relationship among government tax revenues and its spending. Since only tax revenues responds to the deviations from long-run relationship, it means causality is running from taxes to spending and not the other way around. On this reasoning, a point can be made in support of tax-spend hypothesis. The implication of this type of hypothesis suggests that increase in the taxes induces more spending. This actually increases more fiscal deficit through higher spending. Hence, the appropriate policy is to decrease the taxes in order to curtail the budget deficits. Another, policy option is to do adjustments from spending side through efficient management of spending allocation.

5. Conclusions and Policy Implications

This study reconsiders the important issue of fiscal imbalance in order to define the direction of relationship among the series of revenues and expenditure. The understanding of this relationship is critical to achieve sustainable development. The risks linked to increasing or high levels of debt and deficits are extensively recognized in the literature. Hence, it is important to comprehend the relationship between revenues and spending for addressing fiscal imbalances in developing economies, keeping in view their ongoing budgetary position. However, the available reported literature regarding the revenue-expenditure nexus for Pakistan is inconclusive. Some studies are providing support in view of both types of spend-tax and tax-spend hypothesis, while some other have shown no causation in either direction. Furthermore, most of the previous empirical literature is too old and relies on Granger causality test.

The present study aims to empirically investigate the tax-spend or spend-tax nexus for Pakistan using the models of asymmetrical TAR and M-TAR cointegration. These techniques are applied to examine whether the government revenues and spending respond asymmetrically to the level as well as changes in budgetary disequilibrium in Pakistan by using annual data from 1976 to 2019. The TAR and M-TAR tests provide some evidence of the long run association among government revenues and expenditures characterize by asymmetric adjustment, whereby deviations below long-run equilibrium are corrected faster than deviations above it. The results also show some evidence in favor of tax-spend hypothesis during the time period of analysis. It concludes that revenue drives expenditures; therefore, fiscal balance can be achieved through raising taxes. The implication of this result indicates that taxes are raised in order to reduce budget deficit but it induces more spending and therefore, increases more gap between revenues and expenditures. In this scenario, it is more appropriate to adjust expenditures rather than bringing increase in taxes. Public expenditure management is crucial for fiscal discipline which needs effective and efficient allocation of resources. However, broadening the tax base can bring improvement in revenue

collection. A more transparent and flexible tax system can increase the government revenue, which consequently finances its expenditures. In addition, policies in view of curtailing tax evasion and avoidance can also serve as an important instrument in enhancing government collections of revenues.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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