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DOES PRIVATE SAVING OFFSET PUBLIC SAVING IN PAKISTAN: AN EMPRICAL EVIDENCE

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Abstract

The aim of this study is to analyze the effectiveness of fiscal policy in Pakistan. Specifically, the study measured the potency of fiscal policy via the relationship between private saving and public saving as a share of Gross Domestic Product (GDP). For estimation purposes, the study used annual data over the period 1973-2018. The study utilized the threshold autoregression (TAR) model to determine the long-run relationship between policy variables in case if adjustment process is nonlinear and the Momentum threshold autoregression (M-TAR) in the case to adjust larger changes in the policy variables. The magnitude of offset coefficient (ranges between -0.51 to -0.63) between private and public saving is estimated through Ordinary Least Square (OLS), Dynamic Ordinary Least Square (DOLS), and Fully Modified Ordinary Least Square (FMOLS). Since the result suggests very small fiscal multiplier, therefore any effort of fiscal authority to run a surplus budget and raise public saving is impotent.

Keywords: Fiscal policy, public saving, private saving, offset co-efficient.
JEL Codes: E6, H6.

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1. Introduction

The purpose of analyzing the potency of fiscal policy is to know how the private sector reacts to changes in the fiscal stance. For example, the discretionary fiscal policy amplifies the budget deficit through a cut in income taxes and an increase in government expenditure, including tax bonuses and an increase in transfers to counter short-term recessions. The government to increase private consumption and aggregate demand precisely adopts policies that lower public saving on the assumption that most of the amounts will be spent by households.

Pakistan also explicitly increases national savings during the 1980s and 2000s in order to have less reliance on foreign funding for investment requirement. Such type of fiscal policy objectives is similar to famous Keynesian consumption function which presumes that consumption depends on disposable income and because of the invariant nature of private saving; public saving is not offset by private saving. Higher domestic savings increase the level of investment which is crucial to the growth process in the developing world. On the other hand, in advanced economies, higher saving is promoted because the portion of the population which is growing old requires higher saving for their retirement.

The budget as a macroeconomic policy tool has been challenged on many academic and practical grounds (Cochrane et al., 2009). According to fiscal activism, aggregate demand is directly or indirectly changes by public expenditure and revenue. Nevertheless, if the private sector changing its saving behavior in response to changes in fiscal stance then the fiscal multiplier will not be larger in the case of the fiscal spur, representing that fiscal spur is less effective. In another way round, if there is an inverse relationship between the private sector and public sector saving during normal growth times, such fiscal strategy indicates that national saving is ineffective. The strength of fiscal policy can be assessed in both cases by the amount that private saving offsets public saving. This study is an attempt to explain and resolved empirically the importance of how and why these offsets may occur.

The purpose of the study is to inspect whether private saving offsets public saving or not in Pakistan over the period 1973 to 2018. To estimate the size of the offsets coefficient, time series method like Dynamic Ordinary Least Square (DOLS) and fully modified ordinary least square (FMOLS) along with Threshold Autoregressive (TAR) and Momentum Threshold Autoregressive (M-TAR) is used in this study.

The rest of the study is structured as follows. Following the introduction, the second section presents the collection of important literature on the topic, consisting of both theoretical and empirical studies. The justification and issues related to estimation methods such as Threshold Autoregressive (TAR) and Momentum Threshold Autoregressive (M-TAR) are discussed in the third section. The data section defines the proposed variables and sources of these variables. Descriptive analyses and interpretation of results are provided in section four while section five concludes the study and provides some policy suggestions.

2. Literature Review

The evidence in favor of Ricardian equivalence which states that a permanent rise in government saving fully offset by a decline in private saving is empirically tested mostly in developed countries (Bernheim, 1987; Masson et al., 1998; Hemming et al., 2002). Moreover (Edwards, 1995) find non-proportional offsets in 36 developing countries, where the estimation was based on instrumental variables methods. Literature does not demonstrate any clear evidence regarding the relationship between pension wealth and saving. This is because according to the life-cycle model presumption that increases in pension wealth is offset by a decrease in non-pension wealth by the household.

The (IMF, 2008) report also suggest that the effect of fiscal policy in the Keynesian framework on fundamental of the macroeconomy (like consumption and saving) is not the same but different in magnitude and sign. Some studies like (Blanchard & Perotti, 2002) predict that expansionary fiscal policy has the effect of the larger and positive fiscal multiplier, while (Alesina et al., 1998) and [1](Auerbach, 2002) do not support the Keynesian proposition.

Briefly, the relationship between private and public saving is studied extensively in the literature by using the foundation of the Keynesian and non-Keynesian approach. The proposed study is aimed to approach this specifically by utilizing Pakistani data. Evidence of a high offset coefficient between private and public saving would suggest that fiscal policy has non-Keynesian effects on the fundamentals of the economy, while a low offset coefficient will defend the fiscal activism i.e. the Keynesian viewpoint.

3. Relations between Public and Private Saving

The essential condition of the standard Keynesian consumption function demonstrates how public and private savings are interlinked. Consider the conventional specification in the form

$$C = \bar{C} + cY^d \quad (1)$$

The notation is defined usually as private consumption (C), Autonomous consumption ($\bar{C}$), propensity to consume c and disposable income (Y^d) respectively.

Disposable income is defined as:

$$Y^d = Y - T + T^r \quad (2)$$

Where Y is national income, T is taxes and T^r is income transfers. The propensity to save, s, is defined as $1 - c$.

Private Saving S^p , which is the difference between disposable income and private consumption is defined as :

$$S^p = [Y - T + T^r] - [\bar{C} + c(Y - T + T^r)] \quad (3)$$

Differentiating with respect to Y, T and T^r, we get:

IMF, 2008) report 1 https://www.imf.org/external/pubs/ft/ar/2008/eng/pdf/ar08_eng.pdf

$\frac{dS^p}{dY} = 1 - c$ = s, $\frac{dS^p}{dT}$ = -s, $\frac{dS^p}{dT^r}$ = s

Government saving, S^g is defined as the difference between government tax revenue, fewer transfers, and government consumption spending, G, as follows

$$S^g = (T - T^r) - G \quad (4)$$

$\frac{dS^g}{dT}$ = 1, $\frac{dS^g}{dT^r}$ = -1, $\frac{dS^g}{dG}$ = -1

1. The propensity to consume and save is commonly assumed in macroeconomics textbooks around 0.6 and 0.4 or less (Littleboy & Taylor, 2009) respectively. The extreme case (c = 1, s = 0) suggests that public saving rises/fall is not offset by private saving, while the opposite extreme case (c = 0, s = 1) suggest that private saving fully offset public saving rise/fall and hence total national saving is unchanged. In the former case, an expansionary/contractionary fiscal policy successfully raises private consumption/saving, whereas the latter extreme case suggests that fiscal policy is ineffective.

More specifically, the Keynesian theory predicts that the fiscal policy aims to encourage private consumption through tax credit and transfers by reducing government saving. The decrease in government saving will not raise private savings substantially because of the presumption of a high propensity to consume. Hence the fiscal multiplier is high in the first round. Contrary, if the household saves all the income received from tax bonuses and transfer, then the rise in private saving will offset fully the fall in government saving and hence fiscal policy is completely ineffective i.e. fiscal multiplier is zero.

Non-Keynesian theories also provide a basis that how private saving behaves in response to the budget deficit. For example, as opposed to the Keynesian consumption function the life cycle consumption theory of (Modigliani, 1986) and the permanent income consumption theory of (Friedman, 1957) suggest that in response to a temporary increase in income household consumption will not rise equally.

4. Methodology

4.1 Estimating the Public-Private Saving Offset Co-efficient

Algebraically the relationship between private and public saving is defined as follows

$$S_t^p = \alpha + \beta S_t^g + \mu_t \quad (5)$$

Where S_t^p and S_t^g is private and public saving as a proportion of GDP respectively, whereas public-private offset is measure by β, which may be zero (no offset) or minus one (fully offset).

For estimation the annual data of Pakistan over the period 1973 to 2018 is used. The data on private and public saving in million rupees are obtained from the State Bank of Pakistan (Handbook of statistics on Pakistan economy). Before approaching to modeling procedure, we should keep in mind the following possibilities. On the first hand, there is strong evidence of co-integration between private and public saving which is to be determined empirically as depicted in figure 1 below. This first step is very pivotal because if in fact, the series are cointegrated then it will necessitate estimating the offset coefficient both in the short and long run.

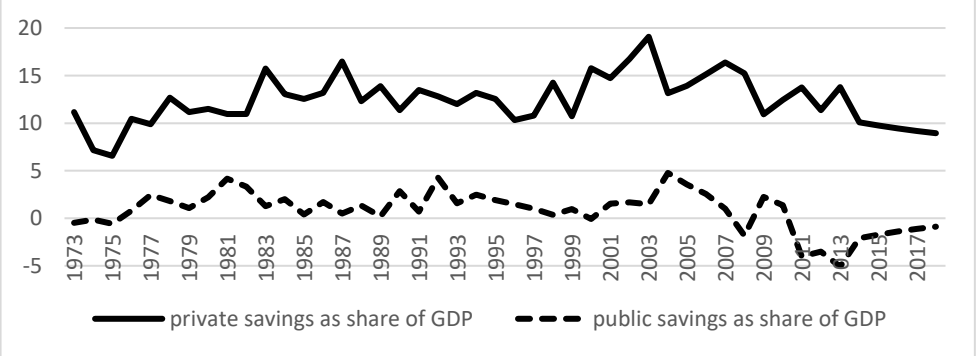
Table 1: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Coef of Variation (%)	Jarque-Bera
Private saving	46	12.4	2.54	6.56	19.08	20.48	0.228(0.89)
Public saving	46	0.83	2.07	-5.09	4.76	249.49	4.80(0.08)

Note: values in () are p-values

The results of descriptive statistics including the mean, standard deviation, minimum, maximum, coefficient of variation and Jarque-Bera for each variable is provided in table 1. Results show that for both the variables, the Jarque-Bera test is insignificant which means the particular series is normally distributed.

Figure 1: Private and Public Saving as a share of GDP



Source: Authors calculation based on data from World Bank

The empirical testing encompasses three stages. The integration properties of the data which is a pre-condition for testing of co-integration are tested in the first stage. For this purpose, the (Ng & Perron, 2001) test, which suggests four test statistics based on generalized least squares (GLS) are applied to each series. The results described in table 2 propose that both the series are stationary.

Table 2: Ng and Perron (2001) unit root test for the government and private saving

Government Saving	MZa	MZt	MSB	MPT
Test Statistics	-16.23	-2.84	0.17	1.51
CV-1%	-13.80	-2.58	0.17	1.78
CV-5%	-8.10	-1.98	0.23	3.17
CV-10%	-5.70	-1.62	0.27	4.45
Private Saving				
Test Statistics	-3.53	-21.32	0.37	6.92
CV-1%	-13.80	-2.58	0.17	1.78
CV-5%	-8.10	-1.98	0.23	3.17
CV-10%	-5.70	-1.62	0.27	4.45

The possibility of Co-integration between the two series is tested through (Engle-Granger's, 1987) methodology in the second stage. To establish the long-run relationship between variables through this technique, equation 5 is first estimated through OLS and the residuals obtain are subject to unit root test in the next step. For the variables to be co-integrated, the order of integration of residual series must be less than the actual series. The specification of the (Dickey & Fuller, 1979) unit root test is as follows

$$\Delta\hat{\mu}_t = \rho_1\hat{\mu}_{t-i} + \sum_{i=1}^{p}\gamma_i\,\Delta\hat{\mu}_{t-i} + \varepsilon_t \qquad (6)$$

A null of a unit root is rejected because the test statistic value is -4.96 which is significant at 1%. We have only intercept in the model and one lag is selected by Schwartz information criteria. Thus we have strong evidence (based on test result) of co-integration between public saving and private saving in the case of Pakistan.

Ender and Siklos (2001) were of the view that the linear relationship between variables is misspecified if the adjustment process is nonlinear. Therefore the given study also tests the possible existence of nonlinear co-integration between private saving and public saving through threshold autoregression (TAR), by using the following specification.

$$\Delta\hat{\mu}_t = I_1\rho_1\hat{\mu}_{t-i} + (1 - I_t)\rho_2\hat{\mu}_{t-i} + \varepsilon_t \qquad (7)$$

Where I_t is indicator function such that

$$I_t = \begin{cases} 1\ if\ \hat{\mu}_{t-i} \geq \tau \\ o\ if\ \hat{\mu}_{t-i} < \tau \end{cases} \qquad (8)$$

Where ρ_1 and ρ_2 are the coefficient to be tested for stationarity, for which the necessary and sufficient condition according to (Petrucelli & Woolford, 1984) is $\rho_1 < 0$, $\rho_2 < 0$ and $(1+\rho_1)(1+\rho_2) < 1$ for any value of τ.

Sometimes policymakers are aiming to adjust large changes in the policy variables. The Momentum threshold (M-TR) model in which the threshold depends on the previous period's change $\hat{\mu}_{t-i}$ are likely to be an appropriate technique instead of simple Threshold

auto regression (Enders & Granger, 1998; and Caner & Hansen, 1998). Algebraically the M-TAR model is specified as follows

$$\Delta\hat{\mu}_t = M_t\rho_1\hat{\mu}_{t-i} + (1 - M_t)\rho_2\hat{\mu}_{t-i} + \varepsilon_t \quad (9)$$

Where indicator function is

$$M_t = \begin{cases} 1\ if\ \Delta\hat{\mu}_{t-i} \geq \tau \\ o\ if\ \Delta\hat{\mu}_{t-i} < \tau \end{cases} \quad (10)$$

To make the residual white noise appropriate lags are selected based on Schwartz information criteria. The negative value of both ρ_1 and ρ_2 suggest that convergence is possible in which case the value of the t-max statistic is used. When only one of ρ_1 and ρ_2 value is negative then the joint hypotheses of ρ_1=$\rho_2 = 0$ is tested through F-statistics to determine whether the two variables are co-integrated or not.

Table 3 report the results of point estimation of ρ_1 and ρ_2 for TAR and M-TAR beside t-max and F-statistics. The result shows that both the coefficient ρ_1 and ρ_2 are negative and significant for TAR and M-TAR models. The t-max statistic value for both TAR and M-TAR model is -4.19, -2.93 respectively which is greater than (Enders & Siklos, 2001) critical values of -2.64 and -2.57 at 1% and hence we reject the null of no co-integration between private saving and public saving. Similarly the, F,,-statistic value of 11.72 and 12.16 for TAR and M-TAR are both greater than the critical values at 1% extracted from (Enders & Siklos, 2001) which also suggest that the two series are co-integrated.

Table 3: Threshold co-integration test

	Threshold	Momentum Threshold
ρ_1	-3.08 (-4.19)	-2.14 (-2.93)
ρ_2	-4.13 (-4.79)	-3.19 (-3.34)
Threshold value	-0.624	-0.066
T-max value	-4.19	-2.93
F-joint(phi) $\rho_1 - \rho_2 = 0$	11.72	12.16

We then estimate in the third step the coefficient of β by three different estimators i.e. ordinary least square (OLS), dynamic ordinary least square (DOLS) suggested by (Stock & Watson, 1993), and fully modified ordinary least square (FMOLS) proposed by (Phillips & Hansen, 1990) to examine the impact of government saving on private saving. Which estimation procedure to be used to avoid spurious regression is to be determined by the time-series properties of the variables under consideration? If the order of integration of the series is 0 i.e. I(0) then the O LS estimation procedure is the appropriate technique. However, if all the series are integrated of order one i.e. I(1), then for estimation of a single cointegrating vector describing the long-run relationship among the series, dynamic OLS is the appropriate choice.

In the literature, different studies use different estimation procedures to test threshold co-integration, which is based on the assumption that residuals are identically and

independently distributed (i.i.d). In the case when residuals are weakly stationary, FM_OLS is likely to be an appropriate estimation procedure to provide estimates of threshold co-integration which are free from endogeneity. Originally the fully modified estimator is aimed to estimate co-integrating relation by adjusting conventional OLS for the problems of endogeneity and serial correlation.

The results of all the three regression are given below, where the coefficient of β ranges between -0.82 to -0.95.

Table 4: Measuring offset coefficients: Results based on OLS, DOLS, and FMOLS

Estimation method	Estimated equation
OLS	$S_t^p = 11.01 - 0.51S_t^g$
	(16.07) (-2.01)
DOLS	$S_t^p = -14.55 - 0.59S_t^g$
	(-15.96) (-16.8)
FMOLS	$S_t^p = 0.28 - 0.63S_t^g$
	(0.33) (-1.93)

Note: The t-statistics are in () parenthesis. To compute the long-run variance matrix Newey-West automatic bandwidth selection is used in FMOLS estimation. For leads and lags selection in DOLS, the AIC criteria are used.

The above result shows that offset is partial i.e. public saving offset private saving with a very reasonable magnitude. The t-values in parenthesis are greater than the critical values at 5% at the 2-t rule of thumb and hence is significant.

5 Conclusion

The central idea to analyze the potency of fiscal policy is to know how the private sector reacts to changes in the fiscal stance. For example, the discretionary fiscal policy amplifies the budget deficit through a cut in income taxes and an increase in government expenditure, including tax bonuses and an increase in transfers to counter short-term recessions. The government increases private consumption and aggregate demand precisely adopt policies that lower public saving on the assumption that most of the amounts will be spent by households. Pakistan also explicitly increases national savings during the 1980s and 2000s to have less reliance on foreign funding for investment requirements. Such type of fiscal policy objectives is similar to the famous Keynesian consumption function which presumes that consumption depends on disposable income and so because of the invariant nature of private saving, public saving is not offset by private saving.

The result of this study is partially compatible with the non-Keynesian effects. Broadly speaking the result neither supports the full Ricardian equivalence nor full Keynesian. Now the question arises that which viewpoint is good to explain the offset, is a future research task. As for the implication of this study (based on result) is concerned, the suggestion for

fiscal authority is that during a recession either to adopt an expansionary fiscal policy or reduce the budget deficit and leave the task of raising national saving for some other times. Both policies are ineffective in attaining their projected goals. Moreover, this also means that raising national savings through the surplus budget in good times is also impotent.

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