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Determinants of Saving Behavior in Pakistan

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Authors' contributions

This work was carried out in collaboration between all authors. Author SS performed the research under the supervision of author MNKB, who provided guidance at each step of the study. Author MNKB also helped in designing of the study. Authors KZ, AR, MS and AM helped in data collection, data analysis and overall write-up of the manuscript with author SS, while author AR also formatted, submitted the manuscript and revised its final version. All authors read and approved the final manuscript.

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ABSTRACT

This study is an attempt to investigate the short run and long run determinants of National Saving behavior of Pakistan for annual time series data from 1981 to 2010. The study applies Augmented Dickey Fuller (ADF) and Auto Regressive Distributed Lag (ARDL) Model under the framework of bound testing approach. All the variables used in the study are taken as percentages of gross domestic products (GDP) and annual growth rate. GDP growth rate is found to be stationary in level and the remaining variables are first difference stationary in this study. The results show that in the

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short run and long run, GDP growth rate, exports and worker's remittances have positive significant impact on national savings of Pakistan. On the other hand government investment, total debt services and inflation rate have negative significant impact on national saving of Pakistan both in the short run and long run. The value of error correction mechanism or speed of adjustment is found highly significant. The empirical results fully support the previous studies as well as theories about national savings and its determinants, yet studies having more than 30 observations and incorporating additional variables have the possibility to improve these results further.

Keywords: Augmented dickey fuller test; gross domestic product; inflation rate; exchange rate.

1. INTRODUCTION

Saving is one of the crucial macroeconomic indicators that play an important role in the economic growth, employment generation and inflation stability especially in the perspective of developing countries like Pakistan. Pakistan is facing not only the problems of unemployment, rapid population growth, slow growth of economy and high inflation rates but also has the problem of low saving rates. Lucas [1] confirmed that higher savings and capital accumulation results in a long-run increase in the growth rates of an economy. According to the development theories of economics, the required saving rates for economic development needs to be 22-25%, while this required saving rates is not fulfilled in most of the developing countries like Pakistan. National savings of Pakistan estimated 10.7% of GDP in 2011-12 as compared to 13.2% during 2010-11. Domestic savings have also declined from 11.5% of GDP in 2007-08 to 8.9% of GDP in 2011-12. An amount of Rs.160, 2669 has been collected through National Savings Schemes [2]. National savings play a vital role in the economic development of any country, because high national saving tends to increase investment, and high investment in a country is one of the indicators of development. One of the major reasons for the deteriorating economic performance of Pakistan and the current account deficit are the low and declining rates of national savings and the gap of investment and saving. Domestic investment is financed very easily by the national savings along with foreign savings. Both household savings and National Savings are important to achieve and maintain higher level of investment which is a key determinant of Economic Growth. A high size of investment needs a high rate of savings, but the problem is that, the required savings could not be achieved by the developing countries like Pakistan due to lack of income constraint. To overcome this problem, it is important to get the marginal rate of saving higher than the average rate of saving, when there is an increase in income due to an increase in investment. Previous studies have already elaborated the vast model specification and determinants of saving. These studies have attempted to develop a model on the basis of basic theories of saving in order to pinpoint some key indicators which are helpful in the uplift of the economy. A number of determinants of saving behavior have been analyzed in Pakistan based on the time series analysis of macro variables or the cross-sectional studies of micro and macro data sets. As saving is crucial to maintain economic development, therefore, the issue of low saving rate needs to be highlighted frequently along with the study of determinants of saving in Pakistan. Development economics has for several decades accepted the importance of the enlistment of domestic savings for economic growth in developing economies. The association between saving and economic growth is positive and has been confirmed by development theories. Saving performance of Pakistan is not very notable as compare to the other developing countries in the region that have practiced invariable high growth. The saving performance of Pakistan in the previous decades was very low, yet household saving during the last four decades however around 80% of domestic saving and significantly enhanced and contributed to the total saving of Pakistan.

A few studies conducted on the factors determining saving in different countries including Pakistan in order to understand the problem comprehensively. Such as [3,4,5,6,7,8,9,10,11] expressed their views about the determinants of saving behavior in Pakistan, and found that per capita income, dependency ratio, term of trade, openness, urbanization, worker's remittances, foreign capital inflows, inflation rate, employment status, wealth, investment rates, consumer price index, interest rate, government consumption, exports, income and the rate of return on financial assets and real interest rate are statistically significant determinants of saving in Pakistan. And similarly some other foreign experts have discussed their

opinion about saving behaviors such as [12,13,14,15] confirmed that those countries which have inefficient capital markets depend more than enough on domestic savings to finance their development projects. And estimated the determinants of savings in Colombia, and concluded that higher government expenditures, increase in age dependency ratio and urbanization have statistically negative significant impact on private savings in Colombia and further discussed that household saving rate in China using a life cycle model that income growth, per capita income, lagged saving, inflation and the real interest rates, terms of trade, worker's remittances were significant determinants of private saving.

Keeping in view the above background, rationale and importance of saving, this study examines the short-run and long-run relationship between national saving and income growth along with remittances growth, foreign debt services, inflation, exports, and government investment by using co-integration and error correction model for the period of 1981-2010. Auto regressive distributed lag model, bound testing approach to co-integration has been used as all the variables were found to be purely I(0) and I(1) or all the variables were mutually co-integrated.

1.2 Objectives of the Study

- To highlight the short and long run determinants of national saving in Pakistan and to examine the short-run and long-run impact of GDP growth rate, exports, government investment, worker's remittances, total debt services and inflation on national saving behavior of Pakistan.
- To see the flow of causality of the determinants of national savings of Pakistan.
- To suggest some policy recommendations regarding the improvement of national saving and its importance in economic growth of Pakistan.

2. METHODOLOGY AND DATA SOURCES

2.1 Methodology

The methodology used in this study based on the bounds testing technique constructed within an Auto Regressive Distributed Lag (ARDL) model framework [16,17,18]. Engle and Granger [19] test statistic is also applied to test the long run relationship between saving and its determinants with the prerequisite condition that the variables must be stationary at first difference I(1) form. Moreover, the problem of biasness arises in case of small sample size [20]. The benefit of auto regressive distributed lag model approach is valid irrespective of whether the variables are purely distributed of order I(0), first difference I(1) or mutually co-integrated. One advantages of ARDL method is that, auto regressive distributed lag model is efficient and unbiased even in case of small sample size and hence very much suitable for the present small sample study. ARDL model can easily estimate the short-run and long-run components simultaneously. It also avoids the problems associated with the omitted variables and autocorrelations. Finally, the ARDL method can differentiate between dependent and explanatory variables. The model can be written in the following form.

$$NSG_t = \beta_0 + \beta_1 (GDPG_t) + \beta_2 (EXP_t) + \beta_3 (INF_t) + \beta_4 (WRM_t) + \beta_5 (TDS_t) + \beta_6 (GIV_t) + e_t$$

2.2 Econometric Model

Following model specification is used under ARDL approach to co integration.

$$\Delta NSG_t = \beta_0 + \sum_{i=1}^{\ell} \beta_{1i} \Delta(NSG_{t-i}) + \sum_{i=0}^{\ell} \beta_{2i} \Delta (GDPG_{t-i}) + \sum_{i=0}^{\ell} \beta_{3i} \Delta(EXP_{t-i}) + \sum_{i=0}^{\ell} \beta_{4i} \Delta(INF_{t-i}) + \sum_{i=0}^{\ell} \beta_{5i} \Delta(WRM_{t-i}) + \sum_{i=0}^{\ell} \beta_{6i} \Delta(GIV_{t-i}) + \sum_{i=0}^{\ell} \beta_{8i} \Delta(TDS_{t-i}) + \lambda_1 (NSG_{t-1}) + \lambda_2 (GDPG_{t-1}) + \lambda_3 (EXP_{t-1}) + \lambda_4 (INF_{t-1}) + \lambda_5 (WREM_{t-1}) + \lambda_6 (GIV_{t-1}) + \lambda_7 (TDS_{t-1}) + e_t \quad (1)$$

Short-run and long-run saving behavior has been reported in equation (1). *β*'s are used for short-run and λ's are used for long-run dynamics in this model, where Δ is the first difference operator and "l" is the optimal lag length in the equation. To test the stationarity of the model, Augmented Dickey Fuller (ADF) test statistics have been used. The purpose of this test is to see whether the variables are stationary at I(0) or I(1), because ARDL test is not applicable in case of second order difference stationary variables I(2). Bounds testing approach for equation (1) has been used with lower and upper bounds of F-statistic for finding long-run relationship among the variables. Null hypothesis is that there is no co integration among the variables. This null hypothesis is rejected in case when the F-statistic value is greater than the upper bound values. It means that there is a long run co integration relationship among the variables. On the other hand if the value of F-statistic lies below the lower bound value, than it is the situation where one can say that there is no long run association among the variables and the null hypothesis is accepted in this case. But if the value of F-statistics lies between the upper and lower bound values than one can say that the result is inconclusive in this situation. The lag length is selected by Schwarz Bayesian Criterion (SBC) and Akaike Information criterion (AIC) using ARDL model. To see the short-run relationship between saving and its determinants the following Error Correction Model (ECM) was used.

$$\Delta NSGt = \beta 0 + \beta 1i\ \Delta(NSGt\text{-}i) + \beta 2i\ \Delta(GDPGt\text{-}i) + \beta 3i\ \Delta(EXPt\text{-}i) + \beta 4i\ \Delta(INFt\text{-}i) + \beta 5i\Delta(WRMt\text{-}i) + \beta 6i\ \Delta(GIVt\text{-}i) + \beta 7i\ \Delta(TDSt\text{-}i) + \lambda 1\ (NSG\ t\text{-}1) + \lambda 2\ (GDPGt\text{-}1) + \lambda 3\ (EXP\ t\text{-}1) + \lambda 4\ (INF\ t\text{-}1) + \lambda 5\ (WREM\ t\text{-}1) + \lambda\ 6\ (GIVt\text{-}1) + \lambda 7\ (TDSt\text{-}1) + ECt\text{-}1 + et \quad (2)$$

2.3 Data Sources

The data of all time series variables used in this study has been collected from the World Bank Data (WBD), World Development Indicators (WDI), Economic Survey of Pakistan, State Bank of Pakistan's Annual Reports, World Development Series and International Financial Statistics (IFS) etc. Time series data is used in order to extract meaningful statistics and other characteristics. This study aims to see national saving behavior of Pakistan in the latest years, but it is necessary in time series data that it should be long enough to capture the full life cycle of the variables and also ARDL model needs minimum 30 years observations, therefore three decades have been taken as an empirical sample, ranges from 1981-2010 for this study.

3. RESULTS

3.1 Stationarity of the Data

To analyze the time series data, it is necessary to pre-test it for stationarity. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the gap between the two time periods and not the actual time at which the covariance is computed. There are various methods to see whether the time series data is stationary or non-stationary. The first step in analyzing the time series data is to see its visual plot. The following Figs. 1 and 2 are the plots of the data for NS, EXP, WRM, GIV, TDS, INF and GDP growth rate, which are clearly depicts that all the time series data seems to be trending upward. Getting a broad view of all the time series data including in this study, it is concluded that there exist the problem of non-stationarity.

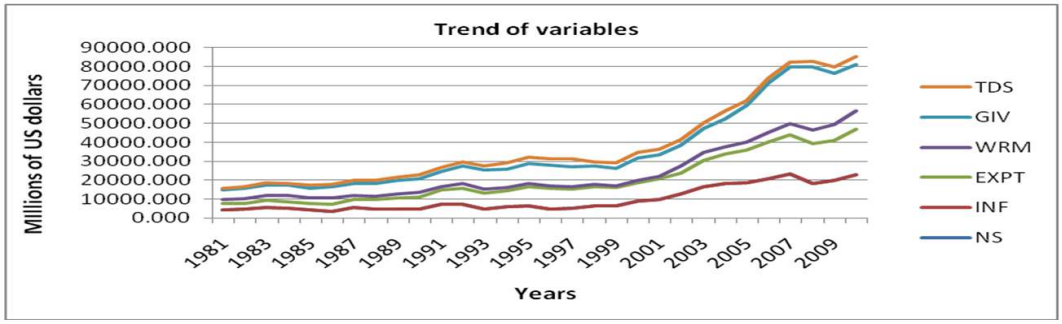

Fig. 1. Trend of saving variables, Pakistan, 1981-2010

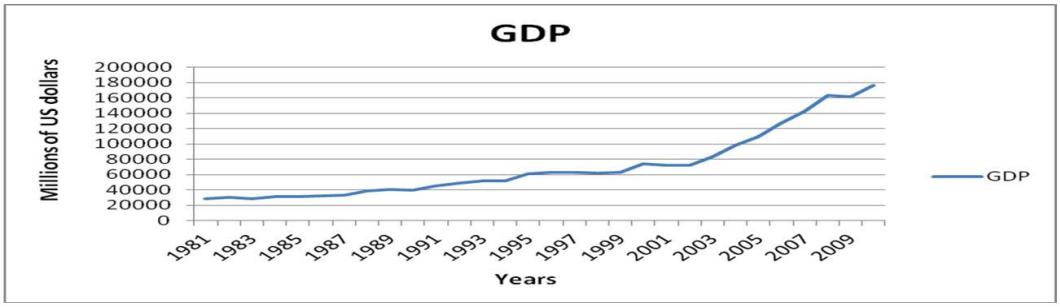

Fig. 2. Trend of GDP, Pakistan, 1981-2010

Table 1. Results of unit root test

Variables	ADF in levels with		ADF in 1ST difference with		LAG length
	intercept	Intercept and trend	Intercept	Intercept and trend	I( )
NS	-2.4037	-2.3596	-6.0272*	-5.9096*	I(1)
GDPG	-3.5959*	-3.7695*	-7.1858*	-7.0572*	I(0)
EXPT	-1.6037	-1.3185	-5.6336*	-6.1680*	I(1)
GIV	-2.6163	-2.5526	-5.2328*	-5.1603*	I(1)
TDS	-2.0294	-2.7320	-8.5436*	-9.0423*	I(1)
INF	-2.4549	-2.7237	-7.0987*	-7.0064*	I(1)
WRM	-1.4551	-0.9099	-4.9318*	-5.3073*	I(1)
5% critical value**	**-2.9665**	**-3.5731**	**-2.9705**	**-3.5796**	**----------**

Source:- Calculated

3.2 Augmented Dickey Fuller Test

The above figures give us the initial evidence about the non-stationarity of the time series. The proper way to see the stationarity of the data is the most popular unit root test, i.e., the Augmented Dickey-Fuller (ADF) test. The results of ADF test are given in Table 1.

Table 1 shows the results of ADF in level and in first difference with trend and without trend. It shows that all the time series have the problem of unit root i.e. all the time series are non-stationarity except GDP growth rate. The last row of the Table 1 shows the Mackinnon critical values at 5% confidence interval. The second column of the table shows that all the time series except GDP growth rate are nonstationary, because the computed $|\tau|$ values of these variables do not exceed the Mackinnon critical tau values. The *asterisk* on -3.5959 means that GDP growth rate is stationary in level without trend and intercept i.e. I (0), as its computed value exceeds the critical value -2.9665 in absolute terms. Similar is the case of ADF with intercept and trend in the 3rd column of Table 1. All the values given in column 4 exceed the critical value (-2.9705) in absolute terms. It means that all the values given in column 4 are statistically significant and it can be concluded that the null hypothesis of $\delta=0$ is rejected. Similarly in column 5 the computed absolute values are greater than the critical value (-3.5796), hence the problem of non-stationarity has solved. All the *asterisk*s in the table show that calculated absolute tau values exceed the critical Mackinnon values and the *asterisk* values are stationary. The last column of Table 1 shows the lag length. All the time series are first different stationary I (1) except GDP growth rate, which is stationary in level or of order I (0). It is concluded that on the basis of graphical analysis and the Dickey-Fuller test that the time series data in this study are nonstationary; i.e. it contained a unit root.

3.3 Auto Regressive Distributed Lag Model

Given that all the time series are stationary of order I(1) or first different stationary, but GDP growth rate is stationary of order I(0). In this case when the variables are integrated of mixed order .i.e., integrated of order I(0) and order I(1), the usual ADF test is not applicable. This study uses bounds testing approach of co-integration

Table 2. Result of F-Test: ARDL approach to Co integration

Test statistics		Lag	Significance level	Bound critical values** (unrestricted intercept and no trend)		Bound critical values** unrestricted intercept and trend)	
F-Statistics				I(0)	I(1)	I(0)	I(1)
With intercept and no rend	With intercept and trend						
3.69	4.13	2	1%	3.15	4.43	4.60	4.90
			5%	2.45	3.61*	2.87	4.00*
			10%	2.12	3.23*	2.53	3.59*

***Bound critical values reported from Narayan (2004), Table C1.iii and Table C1 v*

working within the framework of Autoregressive Distributed Lag model (ARDL) developed by [21], as it can be applied without taking into account the same order of integration of all variables i.e. either they are integrated in level order I (0), or first different stationary I (1) or of mixed order.

The bound testing approach of ARDL is based on the F-test. The F-test is in fact state that there is no co integration among the variables under null hypothesis against the existence of co integration among the variables in alternative hypothesis. Here the ARDL bound test approach based on the Wald-test (F-statistic). For applying F-test [21] provides critical values based on their stochastic simulation. This test considers two extreme cases that are in I(0) and I(1), these two values are the lower and upper bands. The idea behind this test is that if the F-test value exceeds the upper critical band value and is less than the lower band value then one can reject the null hypothesis of no co-integration. If the F statistics value lies between the upper and lower bands then the result is inconclusive [17]. Co-integration test is applied in order to estimate the National saving behavior of Pakistan over the period of 1981 to 2010 [18]. In the first step, equation (1) have estimated by imposing two lags on each first differenced variable and calculated F-tests. The result obtained shows that there is strong evidence for co-integration because the calculated F-statistic values with intercept and no trend are 3.69 and 4.13 with intercept and trend. Both the values are greater than the critical values of the upper level of the band i.e. (3.61) and (4.00) at the 5 percent level of significance. This result gives an indication for the existence of a long-run relationship among the variables. However the results at this stage are considered initial and it needs further evidence of co integration in the second stage when an appropriate lag length criterion is employed. Given the existence of co integration among the variables, ARDL model is estimated to see the long run and short run dynamics of the variables.

Table 3 is the first step of estimating ARDL model. Here an appropriate lag length is selected on Schwarz Bayesian criterion. The appropriate lag length assigned to this study by Schwarz Bayesian criterion is (1, 0, 1, 0, 0, 2, 2,). All the summary tests and diagnostic tests are normal. R-square and adjusted R-square have the values of 0.92 and 0.84. It shows the goodness of fit. In other words 84 to 92 percent changes in national saving are explained by these explanatory variables. The value of DW is 2.13, which employs that there is no autocorrelation among the error terms, because the value of DW is close to 2. There is no serial correlation in the model as the probabilities of LM test and F-stats are (0.302 and 0.486) are greater than 5%. Functional form is good as its probability is 0.888. Similarly the error is normally distributed. The probability of normality is 0.39 which is very high. There is no heteroscedasticity because its probability is 0.91 which is too high. All the above discussion shows that there is co-integration among the variables. It is also concluded that this model passed all the tests .i.e. goodness of fit, no autocorrelation, no serial correlation, good functional form, normality test and no heteroscedasticity. Once the appropriate lag length is confirmed by Schwarz Bayesian criterion, the results of the long run ARDL model are estimated in Table 4.

The coefficient of GDP growth rate is positive and statistically significant. A one percent increase in income growth leads to increase in National saving by 31%. It means that there is positive significant impact between national saving and income growth. A result similar to [22, 21,23,24,25,26] and others. The coefficient of export is also positive and highly statistically significant with (1.532) value. It means that a one

percent increase in exports leads to an increase in national saving by more than 150 percent. This result is consistent with the results those established [26,10]. Government investment has a negative impact on national saving with coefficient (-.3846) and statistically significant. It implies that a one percent increase in government investment leads to decrease national saving by 38 percent. The sign of government investment is different to some extent from literature, but all the economists agree that an increase in the deficit caused by a rise in government purchases reduces national saving and imposes a real burden on the economy. The negative sign here means that government spending is not providing the extra returns for private/individual and corporate sector to save more. The result is in line with [27]. Worker's remittances have the expected positive sign with significant coefficient value 0.8952 suggesting that a one percent increase in worker's remittances increases national saving by 89%. Same results are found by [10,27]. Total debt services have the expected negative and significant value of -2.37. A one percent increase in total debt services decreases national saving by 237 percent. This result is in contrast with [26]. These authors find a positive relationship between debt services and national saving in case of Nigeria. But in case of Sub-Saharan Africa [27] argued that large stock of external debt and debt services payment attributed to negative effect on investment. In case of Pakistan, the negative sign of total debt services may be due to their indirect impact of debt services on investment and hence on national saving. If investment decreases with the decline in debt payments, it will automatically decline national saving. Other factors may be the inefficient allocation of resources and political corruption which leads to miss utilize the debts and consequently leads to reduction in national saving. Inflation rate is highly significant with -0.5631. It means that with the increase in inflation, Consumers have to pay higher prices and its results are low in domestic savings.

Table 3. ARDL dynamic model (1, 0, 1, 0, 0, 2 and 2) selected based on Schwarz Bayesian criterion

Regressor	Coefficient	Standard Error	T-Ratio (Prob)
NS(-1)	-.33377	.18354	-1.8185(.091)
GDPG	.42003	.17300	2.4280(.029)
EXPT	1.1495	.28628	4.1053(.001)
EXPT(-1)	.89394	.45967	1.9447 (.072)
GIV	-.51306	.19276	-2.6617(.019)
WRM	1.1941	.37645	3.1720(.007)
TDS	-.88677	.44949	-1.9728(.0691)
TDS(-1)	-1.0681	.38136	-2.8007(0.014)
TDS(-2)	-1.2153	.40199	-3.0233(.009)
INF	-.17742	.094970	-1.8365(.088)
INF(-1)	-.29916	.10644	-2.8107(.014)
INF(-2)	-.27750	.094348	-2.9412(.011)
C	10.4993	5.9996	1.7500(.102)
R-squared	.92051	R-Bar-Squared	0.84670
S.E. of Regression	1.2403	F-stat. F (13, 14)	12.4790(.000)
Mean of Dependant Variable	13.5166	S.D. of Dependent Variable	3.1678
Residual Sum of Squares	21.5368	Equation Log-Likelihood	-36.0561
Akaike Inf. Criterion	-50.0561	Schwarz Bayesian Criterion	-59.3815
Dw-Statistic	2.1309		

Diagnostic Tests

Test Statistics	LM Version	F Version
A: serial correlation	CHSQ(1) = 1.0673 (.302)	F(1, 13) = .51516 (.486)
B: Functional form	CHSQ(1) = .019743 (.888)	F(1, 13) = .0091728 (.925)
C: Normality	CHSQ(2) = 1.8787 (.391)	Not Applicable
D: Heteroscedasticity	CHSQ(1) = .012811 (.910)	F(1, 26) = .011901 (.914)

A: Lagrange multiplier test of residual serial correlation, B: Ramsays RESET test using the fitted square values C : Based on a test of skewness and Kurtosis of residuals, D: Based on the regression of squared residuals on squared fitted values

Table 4. Estimated Long Run Coefficient using the ARDL approach ARDL (1, 0, 1, 0, 0, 2, 2) selected on Schwarz Bayesian criterion

Regressor	Coefficient	Standard Error	T-ratio (Prob)
GDPG	.31492	.12292	2.5619(.023)
EXPT	1.5321	.21723	7.0528(.000)
GIV	-.38467	.14345	-2.6815 (.018
WRM	.89528	.23778	3.7652(.002)
IDS	-2.3769	.44052	-5.3956(.000)
INF	-.56312	.069457	-8.1075 (.000)
C	7.8719	4.5183	1.7422(.103)

Source:- Calculated

Table 5. Error Correction Mechanism for the selected ARDL model (1, 0, 1, 0, 0, 2 and 2)

Regressor	Coefficient	Standard Error	T-ratio (Prob.)
dGDPG	.42003	.17300	2.4280(0.027)
dEXPT	1.1495	.28628	4.0153(.001)
dGIV	-.51306	.19276	-2.6617(.016)
dINF	-.17422	.094970	-1.8365 (.084)
dINF1	.27750	.094348	2.9412(.009)
dWRM	1.1941	.37645	3.1720(.006)
dTDS	-.88677	.44949	-1.9728(.065)
dTDS1	1.2153	.40199	3.0233(.008)
dC	-0.4993	5.9996	1.7500(.098)
Ecm(-1)	-0.9338	.18354	-7.2670(.000)

List of additional temporary variables created
dNS = NS-NS(-1)
dGDPG = GDPG-GDPG(-1)
dEXPT = EXPT-EXPT(-1)
dGIV = GIV- GIV (-1)
dINF = INF-INF(-1)
dINF1 = INF(-1) –INF(-2)
dWRM = WRM- WRM(-1)
dTDS = TDS- TDS(-1)
dTDS1 – TDS(-1) –TDS(-2)
dc = c- c(-1)
Ecm = NS- .31492*GDPD -1.5321EXPT + .38467* GIV + .56312*INF -.89528*WRM 2.3769*TDS -7.8719*C

R – squared	0.88810	R-Bar-squared	.78420
S. E of Regression	1.2403	F.stat (10, 17)	11.1115 (.000)
Mean of dependent variable	-.093439	S.D. of Dependent Variable	2.6699
Residual sum of squares	21.5368	Equation of Log-liklihood	-36.0561
Akaike Info. Criterion	-50.0561	Schwarz Bayesian Criterion	-59.3815
DW-statistic	2.1309		

R-squared and R-bar-squared measures refer to the dependent variable dNS and in cases where the error correction model is highly restricted, these measures could become negative

National saving also decreases as domestic saving is a part of national savings. The result of inflation rate is consistent with the results found by [22,26,24]. Once the long run relationship between saving and its determinants found, now error correction model is estimated to tie the short run behavior of national saving determinants.

3.4 Error Correction Mechanism

The results of error correction model are given in Table 5. The lagged error correction term ECM (-1) is negative and highly significant. It's co-efficient (-0.9338) shows a very rapid adjustment in case of any shock to the disequilibrium of the previous year national saving to the current year long run equilibrium. If there is any disequilibrium in the previous year about 93 percent equilibrium will take place in the current year. GDP growth rate, Exports and worker's remittances have the same positive and significant impact in the short run as that in the long run. Total debt services, government investment and inflation also have negative impact on national saving but their

coefficients have little declined along with their significance level. One year lag government investment and inflation have positive impact on national saving in the short run.

3.5 Stability of the Model

According to [16] to find the stability of the long run coefficients of the estimated national saving along with the short run coefficient, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) should be applied. The (CUSUM) and (CUSUMQ) squares test is the test that analyzes the overall stability of the ARDL (short run and long run) model. This stability test is appropriate in time series data, especially when one is uncertain about whether structural change might have taken place or not. The null hypothesis is that the coefficient vector is the same in every period and the alternative is simply that it is not the same in every period [28]. CUSUM and CUSUMQ statistics are plotted against the critical bound of 5% significance and further suggested that if the plot of these statistics remains within the critical bound of the 5% significance level, the null hypothesis (i.e. that all coefficients in the error correction model are stable) is accepted then one can say that the model is stable.

The plots of the cumulative sum and cumulative sum of squares residuals are presented in Figs. 3 and 4. As shown, that the CUSUM and CUSUMQ residuals are falling within the boundaries; therefore the test confirms the stability of the national saving equation.

Fig. 5 shows that fitted national saving is tracking very well the actual values of national saving of Pakistan. It means that the movements in national saving are very well explained by the estimated model.

Fig. 6 shows the normality of residuals.The Histogram of the Residual is used to check whether the variance is normally distributed. A symmetric bell-shaped histogram which is equally distributed around zero shows that the normality assumption of the model cannot be rejected. It is clear from the above histogram that the model is normally distributed and the normality assumption of the model is fulfilled.

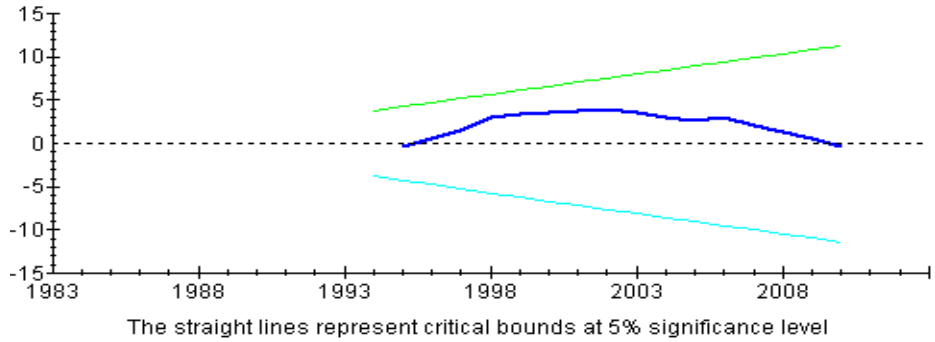

Fig. 3. Plot of CUSUM of Recursive Residuals

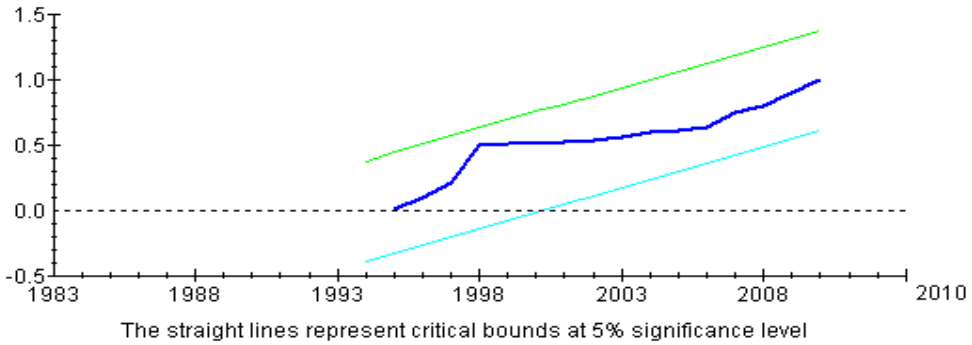

Fig. 4. Plot of CUSUMQ of Recursive Residuals

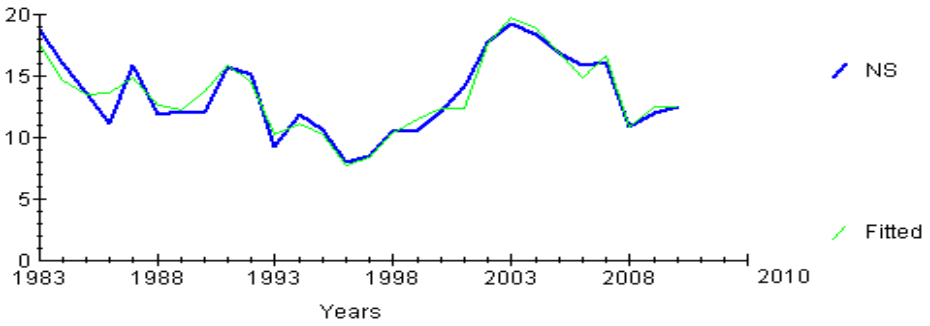

Fig. 5. Plot of Actual and Fitted National Saving values

Fig. 7 is the proof of normality test. To capture the outliers of residuals, the variations of residual plots are very useful. If someone suggests that the data is normally distributed, i.e. the normality assumption is fulfilled, then about 95% data points should be located within the standard bands. This condition is clear from Fig. 7, where the residual falls within the standard error bands. All these figures suggested that the date in normally distributed.

3.6 Granger Causality Test

The idea behind the granger causality test is that, although regression analysis deals with the dependence of one variable on another variable, but it does not show the causation. It means that regression just shows the impact of one variable on another variable, but unable to show the direction of influence. To see whether it is independent variable that causes the explanatory variables to changes in the independent variable Granger causality test is used. Granger causality test was developed by C.W.J.Granger in 1969, also known as Wiener-Granger causality test, as was first suggested by Wiener. The causal relationship among national saving and the explanatory variables has shown in Table 6.

Table 6 shows that there is bilateral causation between GDP growth rate and National savings. GDP growth rate Granger causes national saving and national saving Granger causes GDP growth rate, as both the values of F-statistics (3.208) and (2.8638) are statistically significant with 5% and 7% significant level. Similarly national saving granger causes government investment, but government investment does not granger cause national saving. It means that a change in national saving changes government investment, not government investment changes national saving. There is no granger causality among national saving and the remaining explanatory variables. It is therefore concluded that GDP and national saving both effect each other, while there is unidirectional causality between national saving and government investment, which runs from national saving to government investment. One of the possible reasons of negative sign of government investment may be the causation effect. If government improves saving first, it will improve government investment, rather than to increase in government investment.

Table 6. Results of Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Probability
GDPG does not Granger cause NS	28	3.20896	0.05900
NS does not Granger cause GDPG		2.86383	0.07752
EXP does not Granger cause NS	28	0.50123	0.61225
NS does not Granger cause EXP		1.26575	0.30095
TDS does not Granger cause NS	28	0.34352	0.71285
NS does not Granger cause TDS		1.17294	0.32729
WRM does not Granger cause NS	28	1.42560	0.26082
NS does not Granger cause WRM		1.83968	0.18149
INF does not Granger cause NS	28	1.64847	0.23393
NS does not Granger cause INF		0.90864	0.41706
GIV does not Granger cause NS	28	1.53393	0.23695
NS does not Granger cause GIV		3.93230	0.03397

Source:- Calculated

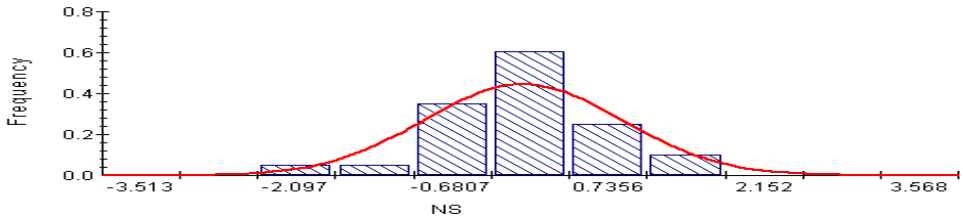

Fig. 6. Histogram of Residuals and the Normal Density

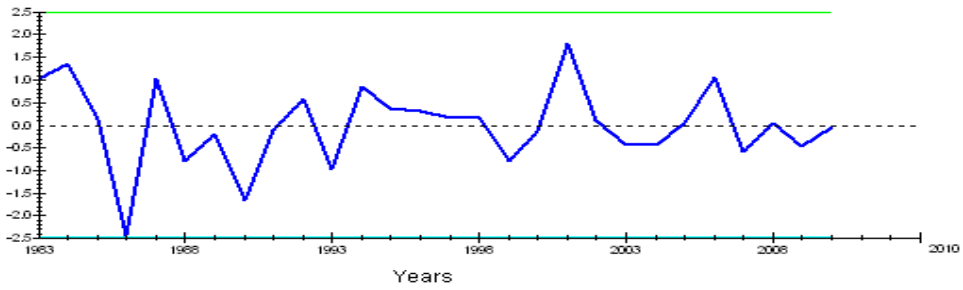

Fig. 7. Plot of residuals and two standard error bands

4. CONCLUSION

In the short run and long run GDP growth rate have a positive statistically significant impact on national saving with coefficient 42% and 31% respectively? The study confirmed Mackinnon finding, suggesting that if there is random big push in GDP growth for some period it would lead to increase savings, increased saving would positively affect investments, and increase in investments, would increase GDP and GDP would again increase Savings.

The short run and long run exports coefficients are positive (1.149) and (1.532) and statistically significant. As exports increases, the revenue of the government also increases, this increase in government revenue leads to the increase in national savings. The results are consistent with [26,10], who also found positive relationship between exports and national saving. Government investment has statistically significant short run and long run coefficients (-0.384) and (-0.513) respectively. It means that government investment has negative impact on national saving in Pakistan. It is therefore clear that there is no Ricardian equivalence in Pakistan, rather people or government make investment in such fields like defense and military related activities, which do not increase the saving of individuals and corporate. Another possible reason of negative sign is the causality between national saving and government investment. It is shown in Table 6 that causality runs from national saving to government investment. The sign of government investment is different to some extent from literature, but all the economists agree that an increase in the deficit caused by a rise in government purchases reduces national saving and imposes a real burden on the economy. The negative sign here means that government spending is not providing the extra returns for private/individual and corporate sector to save more. The result is in line with [27]. Worker's remittances have positive impact on national saving with significant short run and long run coefficient values (1.194) and (0.895). [27] also reported the same results.

Total debt services is negative and statistically significant with coefficient values in the short run and long run (-0.886) and (-2.376) respectively. The short run negative impact of total debt service payments is comparatively smaller than the long run. In case of Pakistan, the negative sign of total debt services may be due to the indirect impact of debt services on investment and hence on national saving. If investment decreases with the decline in debt payments, it will automatically decline national saving. R.M (2013) found positive relationship between debt services and saving rate for Nigeria which is in contrast to this study. But in case of Sub-Saharan Africa argued that large stock of external debt and debt service payment attributed to negative effect on investment [29].

- Inflation is negative and statistically significant with the short run and long run coefficients (-0.174) and (-0.563) respectively. There are two possible implications of inflation on national saving rates. First the impact of inflation on national savings from the producers point of view, while the other impact is from the consumer point of view. If prices increase in the economy, producer will charge high prices and earn more profit. This increase in profit leads the producers to save more, hence national savings increases. [10] has also found positive relationship between National Savings and inflation rate. On the other hand if prices increase, the consumer pay more for few goods, which decrease their savings, hence inflation leads the consumers to consume more and save less. [26] has also reported negative relationship between National Savings and inflation rate.
- It is found that there is bilateral causation between GDP growth rate and National savings. GDP growth rate Granger causes national saving and national saving Granger causes GDP growth rate, as both the values of F-statistics (3.208) and (2.8638) are statistically significant with 5% and 7% significant level. Similarly national saving granger causes government investment, but government investment does not granger cause national saving. It means that a change in national saving changes government investment, not government investment changes national saving. There is no granger causality among national saving and the remaining explanatory variables. It is therefore concluded that GDP and national saving both effect each other, while there is unidirectional causality between national saving and government investment, which runs from national saving to government investment. One of the possible reasons of negative sign of government investment may be the causation effect. If government improves saving first, it will improve government investment.

5. RECOMMENDATIONS

On the basis of above conclusions, following policy recommendations are made.

The government should increase GDP growth rate to increase national saving and overall economic growth of the country. It is implied that exports improve national savings therefore government should increase exports by adopting import substitution and exports promotion policies and both quantitative and qualitative exports should be enhanced.

The government should increase national savings to increase investment, rather increasing investment to increase national savings.

The government should make effective policies regarding the improvement of skills, training and vocational education for its surplus labour force. It is further added that government should make agreements with the foreign countries for the exporting of its surplus labour force.

It is suggested that government should not depend on external debts to promote its economic growth, rather it should improve its domestic investment and national savings. The government should control inflation in order to increase national savings and hence economic growth.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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