GOVERNMENT EXPENDITURE AND ECONOMIC GROWTH: AN ARDL APPROACH FOR THE CASE OF IRAN

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This paper examines the relationship between Government Recurrent Expenditure (GRE) and economic growth in Iran for the period 1970-2010, based on the autoregressive distributed lag (ARDL) approach. The study finds a cointegrating relationship among real GDP, government expenditure, capital stock, oil revenues and education, yet government expenditure do not make a significant marginal contribution to the economic growth in Iran. The results thus do not support the Keynesian approach which claims that demand side fiscal policy stimulate economic growth.

Keywords: ARDL; Government Recurrent Expenditure, Economic Growth, Iran Economy

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1.Introduction

The impact of government expenditure on economic growth is an unsettled topic theoretically as well as empirically (Al-Yousif, 2000). However, two approaches to public expenditure have been launched in literature: Wagner's and Keynes approach. The Wagner's law predicts that as income per capita increases, the share of the public sector in the national economy grows continually (Musgrave and Musgrave, 1988). The Wagner's approach implies that government expenditures are endogenous to economic development. Wagner identified three key reasons for increased government spending. First, administrative and protective role of government will rise as a country's economy develops. Second, with expansion of an economy, government welfare expenditures would raise, particularly on education and health. He implicitly assumed that the income elasticity of demand for public goods is more than unity. Finally, progress in technology requires government to take on certain economic services for which private sector may downside (Cooray, 2009).

The second proposition is associated with Keynesians. To Keynes, public expenditure is an exogenous factor and a policy instrument for increasing national income. Consequently, he supposes that the causality of the relationship between public expenditure and national income runs from expenditure to income. Moreover, Governments performs two functions- protection (and security) and provisions of certain public goods (Abdullah, 2000). Protection function consists of the rule of law and enforcement of property rights. This helps to minimize risks of criminality, protect life and property, and the nation from external aggression. The provisions of public goods include defense, roads, education, health, and power, to mention few. Some scholars argue that increase in government expenditure on socio-economic and physical infrastructures promotes economic growth. For example, government expenditure on health and education raises the productivity of labor and increase the growth of national output. Similarly, expenditure on infrastructure such as roads, communications, power, etc, reduces production costs, increases private sector investment and profitability of firms, thus encouraging economic growth. Supporters of this view concluded that expansion of government expenditure contributes positively to economic growth.

However, some economists claim that increasing government expenditure threat economic growth and higher expenditure may shrink performance of the economy. For example, in an attempt to finance growing expenditure, government may raise taxes and/or borrowing. Higher tax discourages firms and laborers, reducing investment, income and demand. Moreover, if government increases borrowing (especially from the banks) in order to finance its expenditure; it will crowd out the private sector, leading to reducing private investment. Furthermore, in a tender to remain in power, politicians and governments officials sometimes increase expenditure and investment in unproductive plans or in goods that the private sector can manufacture more efficiently.

In this paper we examine the short- and long-run relationships between government recurrent expenditure and real gross domestic production (GDP) for Iran over the period 1970 to 2010, using Autoregressive Distributed Lag (ARDL) approach to cointegration and error correction models (ECM) suggested by Pesaran et al.(2001). Whilst other single-equation cointegration techniques apply just under the restrictive assumption that all the model's variables are integrated of order 1, the ARDL approach based on bounds allows testing for cointegration when it is not known with certainty whether the regressors are purely I(0), purely I(I) or mutually

cointegrated. Given the uncertainty concerning the time series properties of the variables, we consider this methodology as the most appropriate one in this context.
The rest of the paper is organized as follows. Section 2 describes data sources and the empirical methodology. Results are reported in Section 3, conclusions and policy prescriptions are offered in the final section.

2. Data and Methodology

To allow for causality and dynamics and given that not all of our time-series are stationary to the same order (some are I(0) while others are I(1)), the cointegration technique suggested by Pesaran et al. (2001), the autoregressive distributed lag model (ARDL) procedure will be used. the approach can be implemented regardless of whether the variables are integrated of order (1) or (0) and can be applied to small finite samples. Based on empirical literature, theories of economic growth, and diagnostic tests, the long run relationship between economic growth and government expenditure can be specified as:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln GRE_t + \beta_2 \ln K_t + \beta_3 \ln OILREV_t + \beta_4 SER_t + u_t \qquad (1)$$

Where RGDP is GDP at constant price, GRE is real government recurrent expenditure, K is real capital stock, OILREV is real oil revenues, SER is the secondary enrolment ratio and proxies for the quality of human capital. ε_t is an stationary error term. All variables except SER are expressed in natural logarithm (ln stands for logarithm). The main sources of variables are from the Central Bank of Iran (CBI) and Statistical Center of Iran (SCI). The time period of the study is over the years 1970 to 2010.

To examine long run relation among the series we implement ARDL bounds testing approach to cointegration developed by Pesaran et al., (2001). The bounds testing approach has several advantages: it applies irrespective of the order of integration for independent variables, I(0) or I(1); is better suited to small samples; and a dynamic error correction model (ECM) can be derived from the ARDL model through a simple linear reparametrization. The version of error correction model of ARDL approach is given by:

$$\Delta \ln RGDP_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^{p} \theta_i \Delta \ln GRE_{t-i} + \sum_{i=0}^{p} \lambda_i \Delta \ln K_{t-i}$$
$$+ \sum_{i=0}^{p} \varphi_i \Delta \ln OILREV_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta \ln SER_{t-i} + \delta_1 \ln RGDP_{t-1} + \delta_2 \ln GRE_{t-1}$$
$$+ \delta_3 \ln K_{t-1} + \delta_4 \ln OILREV_{t-1} + \delta_5 SER_{t-i} + \varepsilon_t \qquad (2)$$

Where $\phi, \theta, \lambda, \varphi\_and\ \gamma$ refer to short run and δ_1 to δ_5 to long run parameters. The null hypothesis of no cointegration is H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ against the alternative hypothesis H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$. The rejection of the null based on the F-statistic suggests cointegrating relationship. The critical bounds have been tabulated by Pesaran et al. (2001). The upper critical bound (UCB) is based on the assumption that all series are I(1). The lower bounds (LCB) applies if the series are I(0). If UCB is lower than the calculated F-statistic, the null of cointegration is sustained. If the F-statistic is less than the LCB then there is no cointegration. The decision about cointegration will be inconclusive if the F-statistic lies between UCB and

LCB. In such situation, we will have to rely on the lagged error correction term to investigate long run relationship.

The orders of the lags in the specification (2) are selected by the Schwarz Bayesian criterion (SBC). For annual data, Pesaran and Shin (1999) recommended choosing a maximum of 2 lags. From this, the lag length that minimizes SBC is selected.

If a long run relationship exists, the ARDL representation of equation (1) is formulated as follows:

$$\ln RGDP_t = \alpha_1 + \sum_{i=1}^{p+1}\phi_{1i}\ln RGDP_{t-i} + \sum_{i=0}^{p+1}\rho_{1i}\ln GRE_{t-i} + \sum_{i=0}^{p+1}\theta_{1i}\ln K_{t-i} + \sum_{i=0}^{p+1}\lambda_{1i}\ln OILREV_{t-i} + \sum_{i=1}^{p+1}\varphi_i SER_{t-i} + \varepsilon_t \quad (3)$$

The ARDL method estimate $(p+1)^k$. number of regressions in order to obtain the optimal lags for each variable, where p+1 is the maximum number of lags to be used and k is the number of variables in the equation (Shrestha and Chowdhury, 2005). The model is selected based on the Schwartz-Bayesian Criterion (SBC) that use the smallest possible lag length and is therefore described as the parsimonious model.

The ARDL specification of short run dynamics is investigated using ECM version of ARDL model of the following form:

$$\Delta\ln RGDP_t = \alpha_2 + \sum_{i=1}^{p}\phi_{2i}\Delta\ln RGDP_{t-i} + \sum_{i=1}^{p}\rho_{2i}\Delta\ln GRE_{t-i} + \sum_{i=0}^{p}\theta_{2i}\Delta\ln K_{t-i} + \sum_{i=0}^{p}\lambda_{2i}\Delta\ln OILREV_{t-i} + \sum_{i=0}^{p}\varphi_{2i}\Delta SER_{t-i} + \psi ECM_{t-1} + \varepsilon_t \quad (4)$$

The lagged residual term (ECM) in equation 4 shows the disequilibrium in long relationship (ut in equation 1). The goodness of fit for ARDL model is checked through stability tests such as cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ).

4. Empirical Results

Pesaran et al. (2001) critical values are based on the assumption that the variables are integrated of order I(0) or I(1). Unit root tests insure that none of the series is integrated of I(2) or higher. Both the augmented Dickey–Fuller (ADF) (1979) and Phillips–Perron (PP) (1988) unit-roots tests have been employed for that purpose and the results are summarized in Tables 1.Test for stationarity shows that all variables are integrated of order 1 or I(1) and thus stationary in difference.

Table 1: Unit Root Test

Variables	ADF test statistic (with trend and intercept)		PP test statistic (with trend and intercept)	
	Level	First	Level	First

		Difference		Difference
ln RGDP	-1.25	-4.12**	-1.14	-3.97**
ln GRE	-1.87	-4.29**	-1.23	-6.37***
ln K	-1.82	-4.78**	-1.39	-4.71**
ln OILREV	-1.12	-5.54***	-1.78	-10.05***
SER	-2.12	-5.56***	-1.89	-4.38***

Notes: ** and *** denote significancy at 5% 1% levels respectively.
The optimal lag structure is determined by SBC.

To investigate the presence of long-run relationships among the variables, testing of the bound under Pesaran, et al. (2001) procedure is used. Given a relatively small sample size (39) and the use of annual data, a lag length of 2 is used in the bounds test. The results of the bound test are given in Table 2. The critical values used in this paper are extracted from Narayan (2004). The calculated F-statistics is 6.98 while upper critical bound at significance level 1% is 5.642. This implies that there is long run relationship among GDP, government recurrent expenditure, oil revenues, capital stock and education over the period of 1970-2010 in Iran.

Table 2: Bounds Test Results

F-statistics	Lag	Significance Level	Bound Critical values	
			I(0)	I(1)
6.76	2	1%	4.324	5.642
		5%	3.116	4.094
		10%	2.596	3.474

The next stage of the procedure would be to estimate the coefficients of the long-run relations and the associated error correction model (ECM) using the ARDL approach. The optimal lags on variables were selected by the Schwartz Bayesian Criterion (SBC) and turned out to be the ARDL (1, 0, 1, 1, 1). The long-run estimated coefficients are shown in the Table 3. One percent rise in government recurrent expenditure is expected to increase GDP per capita by just 0.03 percent. Although government recurrent expenditure appears with the expected positive sign, the size of coefficient is small and insignificant. The capital stock level and the extent of oil revenues have been the main ingredients for economic growth. The quality of human capital is also reported to have been an important factor.

Table 3. Estimated long run coefficients based on ARDL approach

Regressor	Coefficient	p-value
constant	2.54	0.00
ln GRE	0.03	0.12
ln K	0.49	0.00
ln OILREV	0.19	0.00
SER	0.16	0.03

The results of error correction model, reported in Table 4. The short run coefficient are less than the long run ones. The results suggest that the short run impact of government recurrent expenditure on the economic growth is small and insignificant. The coefficients for the other explanatory variables except education have the expected sign and significance. Moreover, the coefficient of the ECM is negative and highly significant at 1% level. This corroborates the existence of a stable long-run relationship and points to a long-run co-integration relationship among variables. The ECM represents the speed of adjustment to restore equilibrium in the dynamic model following a disturbance. The coefficient of the ECM is around -0.59, implying that a deviation from the long-run equilibrium is corrected by about 50% after each year.
The diagnostic tests e.g., Lagrange Multiplier (LM) for serial correlation, ARCH effects, normality of residual terms, white heteroskedasticity and Ramsy RESET for functional form reported in Table 5 suggest that the short-run model passes all diagnostic tests. We find no evidence of serial correlation, autoregressive conditional heteroskedasticity and white heteroskedasticity. The residual terms are normally distributed and the functional form of the model appears well specified.

Table 4. Error correction representation for the selected ARDL model

Regressor	Coefficient	p-value
Δln GRE	0.03	0.18
Δln K	0.26	0.00
Δln OILREV	0.14	0.00
ΔSER	0.09	0.12
ECM	-0.59	0.00
Serial Correlation LM = 0.69 (0.58)		
ARCH Test = 0.14 (0.87)		
Normality Test = 1.28(0.47)		
Heteroscedisticity Test = 0.83 (0.61)		
Ramsey RESET Test = 1.91 (0.27)		

Notes: The probability values for the diagnostic tests are given in parenthesis

The plots of the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) stability tests as shown respectively in figures 1 and 2 indicate that all the coefficients of estimated model are stable over the study period as they fall within the critical bounds.

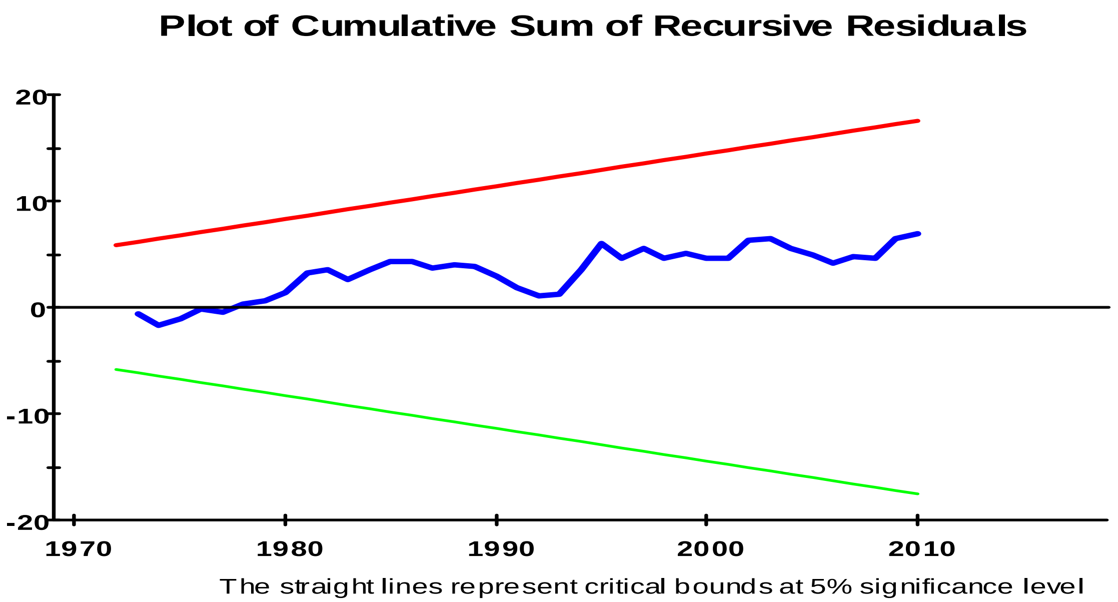

Figure 1: CUSUM Plots for Stability Tests

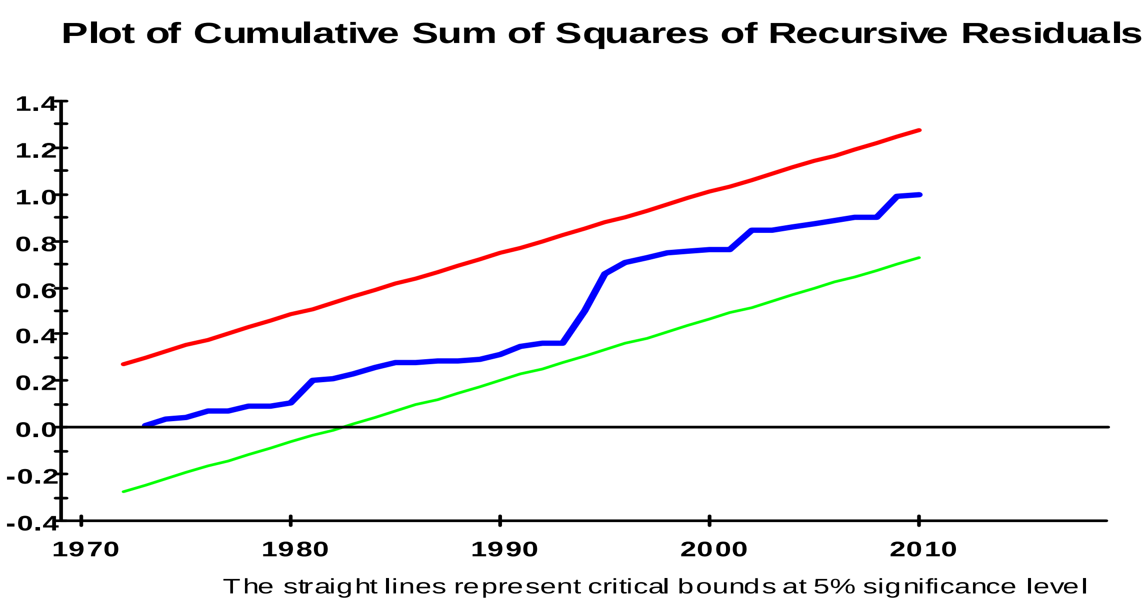

Figure 1: CUSUMSQ Plots for Stability Tests

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5. Conclusions

The paper has examined the relationship between government recurrent expenditure and economic growth in Iran over the period 1970-2010. The ARDL and bounds testing approach to cointegration was adopted to estimate the long run relationship and short run dynamic parameters of the model. The test suggests that there exists a cointegrating relationship among GDP, government recurrent expenditure, capital stock, oil revenues and the secondary enrolment ratio (as a proxy of education). The results suggest that the impact of government recurrent expenditure on output is trivial in size and statistically insignificant. In other words, government recurrent expenditure has not been contributing to the output level of the economy in both short and long run. The government should ensure that recurrent expenditures are properly managed to accelerate economic growth. Moreover, government should promote efficiency in the allocation of resources by encouraging more private sector participation to ensure productivity-intensive growth.

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