International Journal of Business and Management Studies,
CD-ROM. ISSN: 2158-1479 :: 2(1):119–126 (2013)

INTERNATIONAL JOURNAL of Business and Management Studies

THE EFFECT OF EXTERNAL BORROWING ON ECONOMIC GROWTH: THE CASE OF TURKEY

İ. Erem Şahin, Mehmet Mucuk and Aydan Yüceler

University of Selcuk, Turkey

Lack of national savings in developing countries and the use of external borrowing go hand in hand. These resources are targeted to increase the level of national output. However, there are different approaches in the literature about the impact of external debts on economic growth. In this study, the relationship between external debt and economic growth for Turkey's economy is analyzed by using the VAR technique. Empirical findings showed that external debt has a negative influence on economic growth in the short and long term.

Keywords: External Debt, Economic Growth, VAR

1. Introduction

External finance is meant to supplement and support developing countries' domestic resource mobilization. However, since the nineteenth century, developing countries have experienced repeated episodes of rapidly increasing external indebtedness and debt-service burdens that have brought slower growth or recession and eventually produced renegotiation and restructuring. For this reason, the Monterrey Consensus of the International Conference on Financing for Development emphasized the importance of sustainable debt levels in mobilizing resources for development (United Nations, 2005: 141).

Reasonable levels of external debt that help finance productive investment may be expected to enhance growth, but beyond certain levels additional indebtedness may reduce growth (Pattillo et al., 2002). This study aims to analyze the relation between external borrowing and economic growth by using VAR technique, cointegration test and impulse-response functions. The rest of the paper is structured as follows. Section 2 briefly discusses empirical literature and summaries the major findings. Section 3 introduces the data and the methodology used in the study. Section 4 presents the empirical results while in Section 5 the we discuss the empirical evidence. Policy implications of our empirical findings are presented in Section 5 the summary and conclusions are discussed.

2. Literature Review

A number of empirical studies have explored the relationship between external borrowing and economic growth. From a policy viewpoint, the direction of causality between these variables has important implications. However, results of the studies that have been conducted show us that there is no common opinion regarding the direction of causality. Information regarding studies that have been made for various countries have been presented in Table 1.

Table 1. Overview of Previous Studies.

Authors	Empirical method	Period	Subject	Results
Seetanah et al.(2007)	Vector Error Correction Model	1960-2004	Mauritius	Borrowing →Economic Growth
Paudel and Perera (2009)	Johansen Cointegration	1950-2006	Sri Lanka	Borrowing→Economic Growth
Hameed et al. (2008)	Granger Causality Test	1970-2003	Pakistan	Borrowing→Economic Growth
Uysal et al. (2009)	VAR Model	1965-2007	Turkey	Borrowing→Economic Growth
Bilginoğlu and Aysu (2008)	Least Square Estimation Method	1968-2005	Turkey	Borrowing→Economic Growth
Çiçek et al. (2010)	Regression Analysis	1990-2009	Turkey	Borrowing→Economic Growth
Ulusoy and Küçükkale (1996)	Granger Causality Test	1965-1994	Turkey	Borrowing→Economic Growth
Ayadi and Ayadi (2008)	Ordinary Least Squares (OLS), Generalized Least Squares (GLS)	1980-2007	Nigeria, South Africa	Borrowing→Economic Growth
Ogunmuyiwa (2011)	Vector Error Correction Model	1970-2007	Nigeria	No Causality
Karagol (2002)	Simultaneous equation estimation method	1960-1996	Turkey	Borrowing→Economic Growth
Sulaiman and Azeez (2012)	Vector Error Correction Model	1970-2010	Nigeria	Borrowing→Economic Growth

3. Data and Methodology

Data on the Turkish economy comprise yearly observations over the years 1970–2010, namely:

- Real gross domestic product (GDP)
- External borrowing (DEBT)

Relevant data for the study are collected from the Turkish Statistical Institute (TurkStat) and The Central Bank of The Republic of Turkey (CBRT).

The first step of the study is determining the relationship between external borrowing and economic growth whether the series are stationary or not. If a series< are non-stationary, then all the usual regression results suffer from spurious regression problem. For this purpose the augmented Dickey-Fuller (ADF) test of stationarity is used.

The ADF unit root test states series are whether statioanry or not, can defined as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \sum_{j=2}^{q} \alpha_j \Delta Y_{t-j+1} + \varepsilon_t \qquad (1)$$

where Y_t is a macroeconomic variable at time t, ε_t is the disturbance term that is generated from a white noise process and is assumed to be independently and identically distributed with zero mean and constant variance. In other words, the first difference of Y_t is regressed against a constant, a time trend (t= 1, 2 , ..., T), the first lag of Y_t , and, if necessary, lags of ΔY_t. Sufficient lags of ΔY_t must be included to ensure no autocorrelation in the error term. Hence, the Schwarz Information Criterion (SIC) test would be utilized to confirm that autocorrelation is not present. If a unit root (non-stationarity) exists, then α_2 would not be statistically different from zero. The test for a unit root is based on the t-statistics on the coefficient of the lagged dependent variable Y_{t-1}; α_2. This has to be compared with specific calculated critical values. If the calculated value is greater than the critical value, then the null

hypothesis of a unit root is rejected, and the variable is taken to be stationary (Merza et al., 2012: 172).

Second, Johansen-Juselius cointegration test is used to examine the long-term relationship between external borrowing and economic growth. Cointegration, an econometric property of time series variable, is a precondition for the existence of a long run or equilibrium economic relationship between two or more variables having unit roots. The Johansen approach can determine the number of cointegrated vectors for any given number of non-stationary variables of the same order. Two or more random variables are said to be cointegrated if each of the series are themselves non–stationary. This test may be regarded as a long run equilibrium relationship among the variables. The purpose of the cointegration tests is to determine whether a group of non–stationary series is cointegrated or not (Ray, 2012: 195).

Following Johansen's (1988) framework, a general polynomial distributed lag model of a vector of variables X is defined as (Puah et al. 2006: 129):

$$X_t = \Pi_1 X_{t-1} + ... + \Pi_k X_{t-k} + \varepsilon_t \qquad t = 1,...,T \qquad (2)$$

where X_t is a vector of N variables of interest; Π_i are NxN coefficient matrices, and ε_t is an IID $(0, \Omega)$. Within this framework the long run or cointegrating matrix is given by:

$$\Pi = I - \Pi_1 - \Pi_2 ... \Pi_k \tag{3}$$

where is the identity matrix.

Π will therefore be an NxN matrix. The number, r, of distinct cointegrating vectors which exists between the variables of X, will be given by the rank of Π. In general, if X consists of variables which must be differenced once in order to be stationary then, at most, r must be equal to N-1, so that r ≤ N-1. Now we define two matrices α and β both of which are N x r such that:

$$\Pi = \alpha\beta' \tag{4}$$

and so the rows of β form the r distinct cointegrating vectors.

If the variables are not stationary and are integrated of the same order, say I(1), then the Johansen's cointegration causal test can be used in order to determine the number of cointegration vectors. Johansen (1988 and 1991) and Johansen and Juselius (1990) suggest two statistic tests in order to determine the number of cointegration vectors.

The Johansen and Juselius method uses two tests to determine the number of cointegrating vectors, namely the "trace test" and the "maximum eigenvalue test". The trace statistics can be expressed as:

$$\text{Trace} = -T \sum_{i=r+1}^{p} \ln(1 - \lambda_1) \tag{5}$$

where T is the number of observations and λ_1 is the smallest value eigenvectors (p-r). The null hypothesis stated that the number of cointegration vectors equal at most to (r) or less than (r), where r = 0,1,2,…,p-1,p. The second test (λ_{max}), examines the null hypothesis that there is (r) of cointegrating vectors against the alternative that (r+1) cointegrating vectors. This test is calculated as follows (Merza et al., 2012: 172; Georgantopoulos and Tsamis, 2011: 159; Adebiyi and Adeyemi, 2008: 100)

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{6}$$

The Vector Autoregression (VAR) model is used to estimate the relationship between external borrowing and economic growth. This model is one of the most successful, flexible, and easy to use models for the analysis of multivariate time series. It is a natural extension of the univariate autoregressive model to dynamic multivariate time series. The VAR model has proven to be especially useful for describing the dynamic behavior of economic and financial time series and for forecasting (Zivot and Wang, 2003: 383).

The VAR Model was developed by Sims (1980), and here the variables are modeled purely as dynamic process, except for the deterministic variables such as trend, intercept and dummy variables. In the VAR model, each variable is a linear function of the lagged values of all variables in the system. The VAR model treats all the variables as endogenous, and doesn't rely on the assumption that all the explanatory variables need to be exogenous as in the case of the single equation models. The general VAR (*p*) model can be written as:

$$Y_t = \sum_{i=1}^{p} A_i Y_{t-i} + BZ_t + U_t \quad (7)$$

where, Y_t is a k vector of variables included in the system; Z_t is a vector of deterministic variables; U_t is a vector of regression errors that are assumed to be contemporaneously correlated or not autocorrelated; A_i and B are matrices of parameters to be estimated (Peng et al., 2012: 80). Moreover, the VAR model allows us to study the "Impulse Response Function" for the variables (Datta and Mukhopadhyay, 2011: 416).

Impulse-response functions that enable us to analyze the dynamic relation between variables reflects the present and future effect of standard error shock in one of the random error terms on endogenous variable. The usage of impulse-response functions enable us to observe the dynamic reactions that any variable show in case of a standard error shock happened at any of the variables. Average moving vector's (VMA) showing, in Sims (l980) method, the effects of shocks on variables that exist in VAR system enables us to draw the time road. In two-variable VAR matris form of impulse-response function,

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \quad (8)$$

Active average presentation for $\{ y_t \}$ and $\{ z_t \}$series,

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{pmatrix} \Phi_{11(i)} & \Phi_{12(i)} \\ \Phi_{21(i)} & \Phi_{22(i)} \end{pmatrix} \begin{bmatrix} \varepsilon_{yt-1} \\ \varepsilon_{zt-1} \end{bmatrix} \quad (9)$$

This active average presentation is an effective tool especially to examine the interaction between yt and z_t series. Coefficients of ϕ_i' $\{ \varepsilon_{yt} \}$ and $\{ \varepsilon_{zt} \}$ its shocks can be used to reveal the effects of y_t and z_t series on whole time road. The four elements here $\phi_{jk}(0)$ are effect factors. For instance, the effect of one unit change in $\phi_{12}(0)$ $\{ \varepsilon_{zt} \}$, on yt is sudden. In the same way $\phi_{11}(1)$, $\phi_{12}(1)$ are consecutively the effects of unit changes $\{ \varepsilon_{yt}\text{-}1 \}$ and $\{ \varepsilon_{zt}\text{-}1 \}$ on y_t for one term. These coefficient groups consisting of four terms $\phi_{11}(i)$, $\phi_{12}(i)$, $\phi_{21}(i)$, $\phi_{22}(i)$ are called as impulse-reaction functions. Diagrammatically impulse- reaction functions can be drawn as reactions of $\{y_t\}$ and $\{z_t\}$ series againts different shocks (Barışık and Kesikoğlu, 2006: 70).

4. Empirical Results

In general, since many economic time series have non-stationary characteristics, the variables must be tested for stationary process. The problem with non-stationary data is that the Ordinary Least Squares (OLS) regression procedures can easily result in incorrect conclusions. Therefore, in order to avoid the spurious regression, the Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1981), whose null hypothesis is that there is a unit root, is adopted (Ito, 2008: 69).

Table 2 shows the results of the ADF unit root test.

Table 2. Results of ADF Unit Root Test.

Variables	ADF Test Statistic		MacKinnon Critical Values			
	Level	First Difference	Level		First Difference	
DEBT	0.754849 (0.8178)	-5.282794 (0.0002)	1% level	-3.661661	1% level	-3.670170
			5% level	-2.960411	5% level	-2.963972
GDP	0.030052 (0.9544)	-5.484810 (0.0001)	10% level	-2.619160	10% level	-2.621007

The results of unit root tests indicate that the null hypothesis of a unit root cannot be rejected and the two variables are not stationary at the level, while the first differences of the variables are stationary. The variables are integrated of the same order.

The statistical output of lag length criteria test is presented in the Table 3.

Table 3**.** Summary of Lag Length Selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-19.77574	NA	0.016240	1.555410	1.650567	1.584501
1	57.33005	137.6889*	8.78e-05	-3.666432	-3.380960*	-3.579160*
2	61.47185	6.804391	8.74e-05*	-3.676561*	-3.200774	-3.531108
3	63.33136	2.789259	0.000103	-3.523668	-2.857566	-3.320034
4	66.08725	3.740134	0.000116	-3.434803	-2.578386	-3.172988

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

According to lag length criteria test, the Hannan-Quinn information criteria (HQ) and Schwarz information criteria (SC) show the lowest value when the model includes one lag.

To determine if there is a long-term relationship between external borrowing and economic growth, co-integration test should be made. To test it, maximum eigen and trace statistics are used. Johansen cointegration test results are in Table 3.

Table 3**.** Results of Cointegration Test.

	Trace Statistic	0.1 Critical Value	Prob.	Max-Eigen Statistic	0.1 Critical Value	Prob.
None	20.01924	23.34234	0.2249	14.70981	17.23410	0.2099
At most 1	5.309431	10.66637	0.5526	5.309431	10.66637	0.5526

In the cointegration tables, both trace statistic and maximum Eigenvalue statistic indicated no cointegration at the 10 percent level of significance, suggesting that there is no cointegrating (or long run) relationship between external borrowing and economic growth. Since the null hypothesis was accepted, there is no need to further subject the variables to error correction test which has lead us to examine the causality between external borrowing and economic growth.

Impulse-response functions that are obtained from the predicted model were given in Figure 1. According to impulse-response functions, shocks to the external borrowing have a negative impact on economic growth.

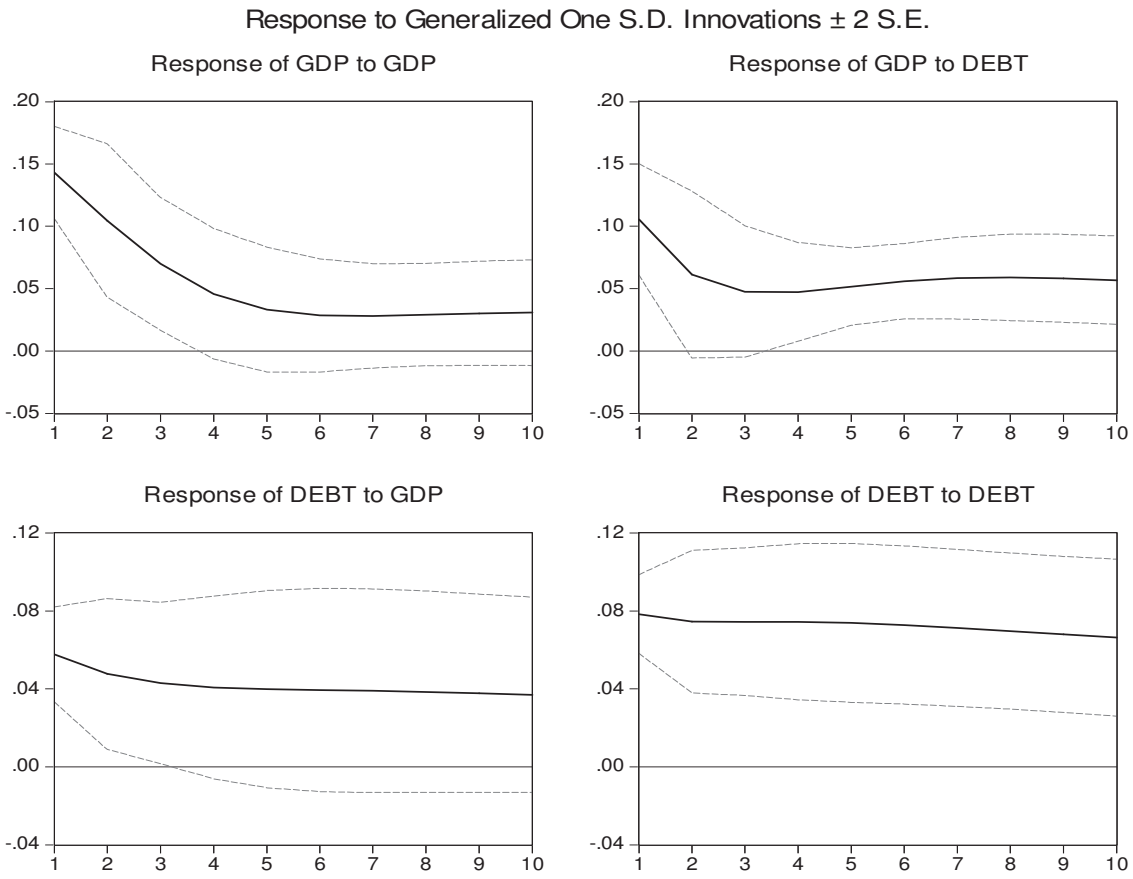

Figure 1. Impulse-Response Functions.

5. Summary and conclusions

Lack of national savings in developing countries, the use of external borrowing is becoming inevitable. These resources are targeted to increase the level of national output. This study examines the relationship between external borrowing and economic growth in Turkey using VAR analysis. The empirical findings of the study don't confirm the existence of a long run equilibrium between external borrowing and economic growth. According to impulse-response function a shock in the external borrowing has negative effects on economic growth. This result shows that external borrowing isn't used efficiently in Turkey.

References

1. Adebiyi M. A., Adeyemi, S. B., 2008. Inflation targeting in developing economies: the case of Nigeria. New Econometric Modelling Research, ed: W. N. Toggins, New York.

2. Ayadi F. S., Ayadi, F. O., 2008. The impact of external debt on economic growth: a comparative study of Nigeria and South Africa. Journal of Sustainable Development in Africa 10(3), 234-264.
3. Bilginoğlu M. A., Aysu, A., 2008. Dış borçların ekonomik büyüme üzerindeki etkisi: Türkiye örneği. Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 31, 1-23.
4. Çiçek H., Gözegir, S., Çevik, E., 2010. Bir maliye politikası aracı olarak borçlanma ve ekonomik büyüme ilişkisi: Türkiye örneği (1990-2009). Cumhuriyet Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 11(1), 141-156.
5. Datta K., Mukhopadhyay, C. K., 2011. Relationship between inflation and economic growth in Malaysia - an econometric review. 2011 International Conference on Economics and Finance Research IPEDR 4, 415-419.
6. Georgantopoulos A. G., Tsamis, A. D., 2011. The macroeconomic effects of budget deficits in Greece: a VAR-VECM approach. International Research Journal of Finance and Economics 79, 156-166.
7. Hameed A., Ashraf, H., Chaudhary, M. A., 2008. External debt and its impact on economic and business growth in Pakistan. International Research Journal of Finance and Economics 20, 132-140.
8. Karagol E., 2002. The causality analysis of external debt service and GNP: the case of Turkey, Central Bank Review 2(1), 39-64.
9. Merza E., Alawin, M., Bashayreh, A., 2012. The relationship between current account and government budget balance: the case of Kuwait. International Journal of Humanities and Social Science 2(7), 168-177.
10. Ogunmuyiwa M. S., 2011. Does external debt promote economic growth in Nigeria. Current Research Journal of Economic Theory 3(1), 29-35.
11. Paudel R. C., Perera, N., 2009. Foreign debt, trade openness, labor force and economic growth: evidence from Sri Lanka. The Icfai University Journal of Applied Economics VIII(1), 57-64.
12. Peng, G. B., Song, H., Witt, S. F., 2012. Demand modeling and forecasting. Handbook of Research Methods in Tourism Quantitative and Qualitative Approaches. Ed: Dwyer et al., Edward Elgar Publishing Limited, Massachusetts.
13. Puah C., Lau, E., Tan, K. L., 2006. Budget-current account deficits nexus in Malaysia. The Journal of Global Business Management 2(2). 126-135.
14. Ray S., 2012. Impact of foreign direct investment on economic growth in India: a co integration analysis. Advances Information Technology and Management (AITM) 2(1), 187-201.
15. Seetanah B., Padachi, K., Durbarry, R., 2007. External debt and economic growth: a vector error correction approach. International Journal of Business Research VII(5), 200-206.
16. Sulaiman L. A., Azeez, B. A., 2012. Effect of external debt on economic growth of Nigeria. Journal of Economics and Sustainable Development 3(8), 71-79.
17. Ulusoy A., Küçükkale, Y., 1996. Türkiye'de dış borçların iktisadi büyüme ve enflasyon üzerine etkisi: Granger nedensellik testi. Ekonomik Yaklaşım 7(21), 13-25.
18. United Nations, 2005. World economic and social survey 2005 financing for development. United Nations Department of Economic and Social Affairs, New York.
19. Uysal D., Özer, H., Mucuk, M., 2009. Dış borçlanma ve ekonomik büyüme ilişkisi: Türkiye örneği. Atatürk Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 23(4), 161-178.
20. Zivot E., Wang, J., 2003. Modeling Financial Time Series with S-Plus. Springer, New York.