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ARTICLE INFO	Mahmut Zortuk and Nevın Uzgoren (2008). The relationship between the taxation and government expenditure in Turkey - bounds test approach. *Banks and Bank Systems*, *3*(1)
RELEASED ON	Friday, 16 May 2008
JOURNAL	"Banks and Bank Systems"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
0	0	0

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The relationship between the taxation and government expenditure in Turkey – bounds test approach

Abstract

The aim of this study for Turkey, in which the observation values of real public expenditures and real tax income belonging to 1981-2004 period were used, is to search for the cointegration relation between these two variables. The results of this study, where bounds test analysis, which is a new technique in analysis of cointegration between variables, was used have shown a long-run and quite meaningful relationship between the two variables. This long-run relationship and the analysis results reached through this relationship mean that a sudden increase in public expenditures is financed with new taxes in Turkey.

Keywords: bounds test, cointegration, government expenditure, taxation.
JEL Classification: C22, C51, E62, H21.

Introduction

In order to fulfil public services it is essential for the budgets adopted by the parliaments, which make it possible to collect public revenues and pay the expenditures, to be balanced (Kesik, 2008). If it is not balanced, i.e. if the government spends more than it derives revenues a budget deficit arises.

When the developing countries, including Turkey, are compared to the developed ones budget deficits are felt to be relatively more critical and to be different in quality besides their much heavier results in developing countries. Especially in those developing countries with low financial development levels, budget deficits are deemed to result from three reasons, namely: pressure of high expenditure, inadequacy of tax incomes, and low private savings (Egeli, 2008). Because of the policies applied in Turkey, the share of the private sector in expendable incomes decreases rapidly while total consumption share keeps the same, which in turn results in a decrease in private savings that has become the most important problem of the country economy so far. As a result, in order not to face any undesirable results, the people who apply the economic policy have to cut down expenditures better or increase tax incomes. However, for those countries that have a kind of atmosphere of election possibility all the time, like Turkey, a cut down of the public expenditures seems to be rather hard, so that increasing the taxes as the most important income item becomes very crucial (Alkin, 2008).

The concept of taxation, which has a long history, is the economic asset collected by the state from the citizens on obligatory basis in order to meet the expenses of the public services. In the countries where free market conditions are in use, the tax revenues constitute 90-95% of the total public revenues. The tax revenue is the largest income resource used in Turkey for financing the public expenditures, the social and military expenditures, establishment of new public services and activation of public investments, budget and state economic enterprises' deficits (Ilhan, 2008).

For establishing prospective and effective policies it is essential to know the correlation between the public expenses and the tax revenue, which are two important factors on budget deficit. However, it is visible that there is no unique and certain hypothesis accepted in terms of economy for indication of some parameters and causality of the correlation between the two variables. In literature, there are four different hypotheses on the correlation between the public expenditure and tax revenue. They are briefly summarized as follows:

H1: No correlation exists between tax and expenditure.

H2: Tax causes expenditure. On this topic there are two approaches in the literature, namely: "the positive causality from tax to expenditure" (Friedman approach) and "the negative causality from tax to expenditure" (Buchanan & Wagner approach).

H3: Expenditure causes tax. Beneath this theory the idea that says "the state first spends than collects the tax" lies.

H4: Tax and expenses interact. This hypothesis puts forward the idea that the taxes and the expenditures change simultaneously (Sağbaş and Şen, 2003).

In spite of the large number of empirical studies all over the world searching for the causality between taxes and expenditures, the analysis results still reflect the same controversy. In other words, it is observed that the analysis results seem to be varying as for the country, the period of time chosen, or delay number. Some similar studies are given below.

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Francisco G. Carneiro (2004), in his study has performed an applied research on the long-run correlation and the causality between public expenditure and revenue in Guinea-Bissau, which is a low income African country. The study realized using the annual data for the period of 1981-2002 has given a monodirectional causality from expenditures towards taxes.

Doi (1999), on the other hand, has inquired if Japan's financing system is central or not using the causality test. As a result of the study, it was established that there is a bidirectional causality between the expenditures and the revenues besides the fact that the local financing of Japan is directed under the control of the central governments and in line with the demands of the local governments or, in other words, it is not central.

Ghartey (2007) has expressed that there are five different opinions about the relationship between the expenses and the tax revenue, namely: i) Buchanan-Wagner's opinion, ii) Friedman's opinion, iii) Barro's opinion, iv) Simultaneous correlation, and v) Independent correlation. In this framework he analyzed the Jamaican economy in many aspects, using the 1960-2004 period data. As a result, it was stated that Wagner law is valid in Jamaica and thus taxes cause expenditures. Moreover, it was determined that public expenditure and tax revenues are independent in the short run, but when inflation and the population are included taxes slightly cause public expenditures in the long run.

Another study aimed at searching for the causality between the taxes and the expenditures was performed by Bradley T. Ewing and James E. Payne (1998). They have analyzed the relationship between the expenditures and revenues of five Latin American countries, namely: Chile (1954-1993), Columbia (1950-1993), Ecuador (1951-1994), Guatemala (1958-1994) and Paraguay (1958-1993), using annual data. In the study along with the Engle-Granger cointegration analyses, the Granger causality tests were applied for the five countries. In Chile and Paraguay bidirectional causality supporting the financial harmony hypothesis was found between the revenues and the expenditures. In accordance with this result it was deemed to be necessary for the financial authorities in Chile and Paraguay to cut down the expenditures and to try to increase revenues simultaneously in order to control the budget deficits. For Columbia, Ecuador and Guatemala monodirectional causality from revenues towards expenditures was determined. This means that the financial authorities should focus on tax adjustments to control the budget deficits and expenditures.

Besides, Singh and Sahni (1984), Von Furstenberg (1985), Belessiotis (1995), Manage and Marlow (1988), Blackley (1986) and also Ross and Pagne (1988) have their studies on the same topic, too (Sağbaş and Şen, 2003).

The literature study has revealed that a limited number of empirical studies were fulfilled aimed at finding out the causality of the correlation between the public expenditures and the tax revenues in Turkey. Two current studies are summarized below.

Durkaya and Ceylan (2007) in their study have searched for a kind of financial illusion by analyzing the causal relationships between the public expenditures and the subcomponents of the tax revenue. In the analysis where they used the annual time series data of the 1975-2004 period for Turkey's economy, the results revealed that there is monodirectional causality relationship from public expenditures to indirect tax revenues but between the indirect taxes and the public expenditures no causal relationship exists.

Günaydin (2004), using the quarterly data of 1987:1-2003:3, performed a study and found out that there is a long-run correlativity among public expenditures, public revenues, GNP and interest rates beside the monodirectional negative causality from tax revenues to the public expenditures.

Despite observing that the studies on the same topic have reached different findings, in this study analyses were performed under the assumption that while the other conditions are constant, the expenditures are the reason for the taxes. The most important reason for choosing this approach is that the enormous size of the unregistered economy in Turkey causes difficulties in collecting taxes over incomes. Especially the need for financing of the high public debts which rose from the economic crisis of 2001 has caused an increase in indirect taxes collected as for consumption (value added tax, private consumption tax). These problems experienced in public financing have caused in turn a change in taxation system. The study by Durkaya and Ceylan (2007) supports this idea, too. In this context, the aim of this study is to examine the bounds test approach which is a new technique in cointegration analysis under the assumption that expenditures cause new taxes. Within this framework, first the qualities of the model and the data set to be employed in analysis are listed in section 1. In section 2 the theoretical framework of the bounds test approach is explained, and in section 3 the analysis results are given.

1. Model specification and data set

1.1. Model specification. In the researches on the causality between taxes and expenditures, the factors causing increases or decreases of expenditures and taxes generally are not taken into consideration, under the assumption that 'the other variables are constant' only the way the taxes and the expenditures affect each other is taken as the research topic (Sagbas and Şen, 2003). In this study the functional form used to predict the long-run relationship between tax revenues and public expenditures can be demonstrated as follows:

$$RTAX_t = f(RGSP_t), \quad (1)$$

where t represents the time, $RTAX$ is the real tax revenues, and $RGSP$ is the real public expenditures. However, because it facilitates interpreting the flexibilities in analysis the logarithmic linear model given below is going to be used:

$$lnRTAX_t = \alpha_0 + \alpha_1 lnRGSP_t + u_t, \quad (2)$$

where u_t represents the error term supposed to supply classical assumptions, ln is natural logarithmic conversion, α_1 is the flexibility of the real public expenditures. From the correlation between tax incomes and public expenditures it is possible to expect the α_0 and α_1 flexibilities to be positive. Because an increase in public expenditures would cause the taxes to increase and even in the absence of the public expenditures the state would still collect taxes.

1.2. Data set. In Turkey, since the year 1980, different approaches in terms of economic policies have been popular. In financing of the budget deficits, the policy of taking on debts has been preferred instead of tax policy. However, the change in the policy to this end did not create a desirable result (Kesik, 2008). Consequently, the rapid increase in the public expenditures and the tax revenue which cannot accompany has caused the public deficits grow larger. The negligence in taking adequate measures about increase and management of public revenues has caused the problem become more critical (Yalınpala, 2008). For that reason for the related analyses the annual data of 1981-2004 period, when different economy policies had been applied, were preferred. The data belonging to the concerned variables were taken from The Turkish Statistical Institute's (TÜİK) web-site of Statistical indicators and have been converted into real with the prices of 1981[1]. Table 1 reports Phillips-Perron (Phillips and Perron, 1988) and Augmented Dickey Fuller tests (Dickey and Fuller, 1981) of government spending (GSP) and taxation (TAX) based on level, log differenced. Lag lengths are determined with Schwartz Information Criteria. Series are not stationary at $I(0)$ while stationary at $I(1)$ based on both Phillips-Perron and Augmented Dickey Fuller unit root tests at the 1% and 10% significance levels.

Table 1. Unit root test results

	ADF test		PP tesr	
	Level	First difference	Level	First difference
Variables	I(0)	I(1)	I(0)	I(1)
lnRTAX	-2.237	6.235*	-2.338	-6.303*
lnRGSP	-3.209	-3.426**	3.209	-6.445*

Note: *,** denote statistical significance at the 1% level and 10% level respectively.

2. Econometric methodology

To implement the bounds test let us define a vector of two variables, z_t, where $z_t = (y_t, x_t')'$, y_t is the dependent variable, and x_t is a vector of regressors. The data generating process of z_t is a p-order vector autoregression. For cointegration analysis it is essential that Δy_t be modelled as a conditional error correction model (CECM):

$$\Delta y_t = c_0 + \pi_{yy} y_{t-1} + \pi_{yx.x} x_{t-1} + \\ + \sum_{i=1}^{p} \vartheta_i \Delta y_{t-i} + \sum_{j=0}^{q} \phi_j' \Delta x_{t-j} + \theta \omega_t + \mu_t \quad (4)$$

where π_{yy} and $\pi_{yx.x}$ are long-run multipliers, c_o is the constant, and ω_t is a vector of exogenous components, e.g. dummy variables. Lagged values of Δy_t and current and lagged values of Δx_t are used to model the short-run dynamic structure, and μ_t is error term. The bounds testing procedure for the absence of any level relationship between y_t and x_t is through exclusion of the lagged levels variables y_{t-1} and x_{t-1} in Equation (4). It follows, then, that our test for the absence of a conditional level relationship between y_t and x_t entails the following null and alternative hypotheses:

H_0: $\pi_{yy} = 0$, $\pi_{yx.x} = 0'$,
H_1: $\pi_{yy} \neq 0$, $\pi_{yx.x} \neq 0'$ or $\pi_{yy} \neq 0$,
$\pi_{yx.x} = 0'$ or $\pi_{yy} = 0$, $\pi_{yx.x} \neq 0'$.

Pesaran et al. (2001) generated two sets of critical values assuming that both regressors are I(1) and both are I(0). While the critical values are reported in Pesaran and Pesaran (1997) and Pesaran et al. (2001), they are generated for sample sizes of 500 observations and 1000 observations and 20 000 and

[1] The model is estimated using the MICROFIT program which is specifically designed for conducting the bounds test for cointegration and the ARDL estimation of the long-run and short-run elasticities.

40 000 replications, respectively. The F Statistic that has a non-standart distiribution, depends upon: (i) whether the ARDL model contains an intercept and/or a trend, (ii) the number of regressors, (iii) whether variables included in the ARDL model are I(0) or I(1). If the calculated F statistic is higher than the upper critical value, I(1), the null hypothesis of no long-run relationship can be rejected without knowing the order of integration of the regressors. Alternatively, if calculated F statistic is smaller than the lower critical value, I(0), the null hypothesis is accepted without knowing the order of integration of the regressors. When the test statistic falls inside the upper and lower critical value, a conclusive inference cannot be made. Then, we must know the order of integration of variables, I(d), for any conclusion can be drawn.

There are different advantages of the bounds testing approach that motivates us in our work. This procedure can be applied to models irrespective of whether the variables are I(0) or I(1). This is unlike other popular cointegration techniques such as the Engle Granger (1987), Johansen and Juselius (1990) and, which require pre-testing the variables to determine their order of integration (Pesaran and Pesaran, 1997).

The other advantage of bounds testing for this work consists in the fact that the method can be applied in case when data set is of small sample sizes, such as in the present study. Narayan (2005b) shows that the bounds testing approach to cointegration is popular in small samples.

In addition to these advantages the bounds test, the Engle-Granger Method, the Unrestricted Error Correction Model do not push the short-run dynamics into the residual terms. Thus, the ARDL approach, because it draws upon the Unrestricted Error Correction Model has better statistical properties than the Engle-Granger cointegration test (Banerjee et al., 1998).

3. Empirical results

This section reports the empirical results. We begin with an account of the results on the cointegration test. The calculated *F*-statistic along with the critical values are reported in Table 2. The calculated *F*-statistic (Wald test) is necessary for testing the presence of cointegration relation among the variables of function (2). When real taxation is the dependent variable, the calculated *F*-statistic is $F_{RTAX}(RTAX|RGSP) = 9.7327$. This value is higher than the upper bound critical value of 7.84 at the 1% level. The result suggests that the null hypothesis of no long-run relationship can be rejected.

Table 2. Cointegration test results. Critical value bounds of the F-statistic: Unrested intercepts and no trends

k	90% level		95% level		99% level	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
1	4.04	4.78	4.94	5.73	6.84	7.84
Calculated F-statistic FRTAX(RTAX| RGSP) 9.7327 (Prob 0.002)						

Note: The critical values are extracted from Pesaran et al. (2001). Table CI(iii) Case III and k: the number of explanatory variables.

In this context, a significant long-run cointegration relationship was established, equation (2) was estimated using the following ARDL (*p*, *q*) specification:

$$\ln RTAX_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \ln RTAX_{t-i} + \sum_{i=0}^{q} \alpha_2 \ln RGSP_{t-i} + \mu_t \quad (5)$$

A maximum of 2 lags was used for the model. The estimated model presented here is based on the Schwarz Bayesian Criterion. The long-run and short-run results are presented in Tables 3 and 4, respectively. The results show that government spending has a positive impact on taxation in the short run and in the long run; however, this relationship is statistically significant at the 1% level. In the short run and longn run, other things be equal, a 1% increase in government spending will increase taxation by around 0.79% and 0.84%, respectively.

Table 3. Long-run results. Dependent variable: lnRTAX

Explanatory variables	Coefficient	t-statistics
$\ln RGSP_t$	0.8451*	30.129
c_t	0.7869*	3.415

Note: * denotes statistical significance at the 1% level.

Table 4. Short-run results. Dependent variable: ΔlnRTAX

Regressors	Coefficient	t-statistics
$\ln RGSP_t$	0.7971*	6.0909
c_t	0.7422*	-3.095
ECM_{t-1}	-0.9432*	-6.277

Note: * denotes statistical significance at the 1% level.

The error correction model was also estimated within the ARDL framework. The results for the 1981-2004 period show that the error correction term ECM_{t-1} is negative, indicating that the feedback mechanism is very effective in Turkey in stabilizing

Turkey's external imbalances. In other words, convergence to long-run equilibrium after a shock to government spending is instantaneous for taxation in Turkey. The ECM_{t-1} is strong over the 1981-2004 period, taking the value of -0.94, suggesting that a deviation from the long-run equilibrium level of tax in one year is corrected by about 94 percent in the next year.

Table 5. Diagnostics test results

R^{-2}	0.6409
σ	0.0829
χ^2_{Auto} (2)	0.4578 (Prob: 0.49)
χ^2_{Norm} (2)	1.2773 (Prob: 0.528)
χ^2_{ARCH} (2)	1.5391 (Prob: 0.215)
χ^2_{RESET} (2)	0.2448 (Prob: 0.62)

Table 5 was subjected to a number of diagnostic tests, including test of autocorrelation, normality and heteroskedasticity in the error stability term. We found no evidence of autocorrelation in the disturbance of the error term. The estimated model passes the Jarque-Berra normality tests, suggesting that the errors are normally distributed and the Ramsey-Reset test indicates that the model is correctly specified while according to the ARCH test, there is no problem of heteroskedasticity.

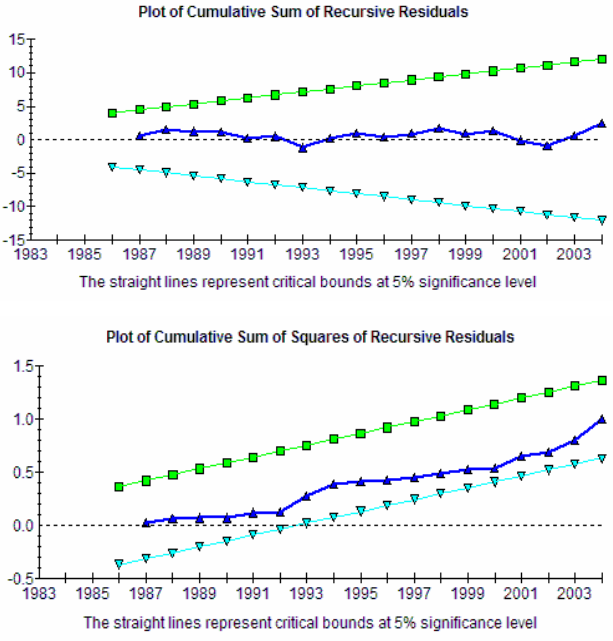

Fig. 1. Plots of Cusum Cusum of Squares tests for the estimated CECM

On the other hand, the test for parameter stability is crucial in the case of Turkey, because Turkey has experienced several domestic shocks, such as coups in 1994 and 2001 devaluations. Cusum and Cusum of Squares tests proposed by Brown et al. (1975) are used in testing for constancy of the long-run parameters. As seen from Figure 1, Cusum and Cusum of Squares tests statistics are inside the 95% confidence interval. This result shows that applied Cusum and Cusum of Squares tests clearly indicate stability of the estimated parameters of the CECM during the sample period.

Conclusions

In this research paper, we used the bounds testing approach to cointegration to investigate the relationship between government spending and taxation for Turkey, by using data from Turkish economy for the 1981-2004 period.

The results indicate that there is a long-run equilibrium relationship between the variables. Our main findings are as follows: In the short run and long run, other things be equal, a 1% increase in government spending will increase taxation by around 0.79% and 0.84%, respectively. The short-run and long-run government spending has a positive impact on taxation, however, this relationship is statistically significant at the 1% level. These results reveal that Turkey, as a developing country, finances the increases in its public expenditures with new taxes, which complies with economic theory. The fact that the constant term has been found to be statistically meaningful and with a positive value, means that on long-run and short-run bases while the other variables are stationary even though there is no increase in the public expenses by around 0.78% and 0.74% respectively, increase for the taxes would occur. In this case it is clear that this situation stems from the taxes collected by the state in order to fulfil its obligatory activities, which is observed to be in line with the theory, too. In addition, the ECM_{t-1} is strong over the 1981-2004 period, taking the value of -0.94, suggesting that a deviation from the long-run equilibrium level of tax in one year is corrected by about 94 percent in the next year.

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