

Relationship of the between Fiscal Rule, Human Development and Corruption for Selected EU Countries (An Econometric Analysis)

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Abstract

Fiscal rules which have a long history have been applied in various areas in many countries and their popularity has increased in recent years. It has been stated that in the theoretical sense fiscal rules have been initially derived from Public Choice Theory. Public Choice Theory is defending both the homoeconomicus hypothesis that assumes the existence of actors within the state that are trying to maximize their own interests and the hypothesis of gains from the exchange which suggests that the institutional framework should be chosen in such a way that all actors can benefit in the public economy. In this paper the relationship between the open rule that is among the fiscal rule applications and the human development index which is accepted as democratic development criteria and the corruption perception index have been examined in the scope of 25 European Union (EU) countries in the period of 2000-2015. In order to examine this relationship, Panel Data Analysis was applied and the most effective estimation method was chosen as a result of the tests performed. According to the results of analysis on the sample of 25 European Union countries, there is a negative and strong relationship between the open rule and the human development index, and a positive relationship has been found between the corruption perception index and the open rule for the mentioned countries.

Keywords: Fiscal Rule, Human Development Index, Corruption Perception Index, Panel Data Analysis

1. Introduction

The Public Choice Theory which introduced fiscal rules argues that various inefficiencies have emerged as a result of the public decision-making process, and examines both the positive and normative aspects of the ideal decision-making process to remove these inefficiencies. The Public Choice Theory, based on an alternative paradigm to the traditional public finance paradigm, includes tools and methods that enable to examine the issues of the public economy and they do so taking into account public decision making mechanisms.

The Neoclassical Theory of Finance argues that the government will intervene the market in the "good government" role when it slumps on the other hand the Public Choice Theory states that the government can be noneffective for various reasons as it happens in the market, and it defends that the actors constituting the state as supply (politicians and bureaucrats) and demand (interest groups and voters) are working for their own maximization. In the Public Choice Theory, it is argued that the individual is prone to maximize its own interests (homoeconomicus hypothesis) in the public economy just as he/she exploits in the private economy according to the homoeconomicus approach. Moreover, according to the Public Choice Theory individuals in the private economy have higher level of utility through the exchange of goods, that is, everyone benefits from this exchange. Similarly in the public sector institutional framework for tax, expenditure or budget (assumption of gains from exchange) needs to be selected so that all actors awarded with profit as well. It is stated that the profit of one side is equal to the loss of the other side in the Traditional Finance Theory while no profit is made from the exchange made. Fiscal rules which have been applied in certain areas in many countries recently have a long history. In the year 63 B.C, Cicero stated, "The budget should be balanced, the treasury should be refilled and the public debts should be reduced."

which proves that he discovered the importance of fiscal rules then and some ideas about the fiscal rule were put forward two thousand years ago. Since the mid-19th century, the US has set the gold standard rule, and the current budget balance rules have been applied in some cantons in Switzerland since 1920. With the emergence of inflation and balance of payments problems in the world economy at the beginning of the 1970s, many countries established regulations on monetary policies. Rule-based policies aimed at credibility with macroeconomic policy have become popular in the financial arena since 1990. The pressures created by fiscal deficits on financial policies around the world, especially in developed economies, have set the course of the fiscal rule designs of many developed countries, in particular the member countries of the European Union.

While some countries provide grounds for constitutional amendments and fiscal rules, legal grounds in some countries are established by government policies or legislation. On the other hand, international treaties constitute the legal basis for rules in the member countries of the EU and members of the CFA Frank Zone. Fiscal rules can be implemented at central, federal or local government level according to the national structure of countries. Moreover, legal sanctions are applied to fiscal rules in most countries.

The purpose of this study is to examine the relationship between the open rule that is among the fiscal rule applications and the human development index which is accepted as democratic development criteria and the corruption perception index have been examined in the scope of 25 EU countries and in the period 2000-2015. Panel Data Analysis was applied to examine this relationship and the most effective estimation method was selected as a result of the tests carried out, and it is presented together with the estimation results of other alternative methods. Data for open rule is obtained from the EUROSTAT database, and human development index data is obtained from the Transparency International Organization database. Finally, corruption perception index data is obtained from the United Nations Development Program (UNDP) database.

Within this framework, the researches about the subject are mentioned in the literature section, and the applied method is explained theoretically in the method section. The applied data sources are explained and the generated model is introduced in the data and model section. The results of the tests and the estimation results are presented in the findings section. In the conclusion part, a general evaluation is made about the study.

2. Literature

Pelesai and ThankGod (2013) reviewed the relationship between annual budget deficits and inflationary for ECOWAS countries in the period 1980-2011. It is detected that in long-term the budget deficit and the inflationary relationship are positive in some ECOWAS countries while that is negative in others. It is concluded that there is a difference in tendency of budget deficit and inflation relation in both developed and underdeveloped ECOWAS countries.

Fatas and Mihov (2005) examined how budget regulations affect fiscal policy outputs for 48 states in the United States. It is found out that tight budget implementation leads to lower political volatility (less aggressive use of authority in the execution of fiscal policy) and financial constraints reduce the likelihood of fiscal policy turning into shocks.

Hagen and Wolff (2006) made an empirical study for the EU countries on the fiscal rules triggering the creative accounting. It is found out that fiscal rules trigger creative accounting, but that trigger depends on the government's cost of reputation and the cost of complying with the rules. In addition, as a fiscal rule Stability and Growth Pact (SGP) stimulate governments' stock-flow adjustments, a way of creative accounting, to conceal budget deficits. The study emphasizes that the tendency of these adjustments for budget deficits is particularly strong for the cyclical components of the budget because the cost of reducing deficits is very high during recession periods.

Using a sampling method on 15 EU member countries, Debrun and Kumar (2007) found a positive relationship between the strength of institutions and financial outputs in a study to determine the relationship between the strength of financial institutions in countries and financial outputs. The role of financial institutions in ensuring fiscal discipline is discussed along with budgetary rules. The study presents that disciplined governments are more adaptable to employ strict institutions (strict budgetary rules). It is also emphasized that a combination of complete budget transparency and strong democratic accountability may be sufficient to provide credibility. In his study according to data of 1970-2004 and 49 countries, Manasse (2006) reached the conclusion that well-designed fiscal rules for the limitation of deficits, debts or expenditures could cause linear regression especially in times of economic downturn.

Kıvılcım (2012) investigate the empirical relationship between budget deficits and inflation by means of multiple cointegration analysis for Turkey's economy, and states that the model budget deficit significantly affect Turkey's inflation. Hallerberg, Strauch and Hagen (2007) examine the effects of fiscal rules and budgetary procedures in EU countries. They comment that the centralization of budgeting procedures has limited public debt for 15 EU member countries in the period of 1985-2004. Financial contracts that require countries to set multi-year targets and strengthen these goals increase fiscal discipline in countries with ideologically dispersed coalitions and in countries where the parties have raced against each other. It is emphasized that fiscal discipline is ensured by authorizing the ministry in countries with coalition governments or single-party governments where the parties are close as a result of low political competition between them.

McDermott and Wescott (1996) examine the interaction between fiscal adjustments and economic performance for industrialized countries in the period of 1970-1995, and they point out that fiscal consolidation does not cause economic slowdown, especially in the medium term. The type of consolidation that reduces public borrowing has been found to be more successful than the tax-based consolidation.

Hagen (1991) presents empirical evidence on the effectiveness of fiscal restrictions on the US state budgets. Nonparametric tests show that financial constraints significantly affect financial choices and the likelihood of financial performance, but cannot prevent excessive consequences.

Badinger and Reuter (2017) examine the effects of financial institutions on fiscal policy outcomes for 74 countries and 1985-2012 using an index (partially ordered set theory-ORDER) which measures the strictness of fiscal rules and has recently become available in the literature. It points out that countries with tighter fiscal rules have a higher fiscal balance (lower deficits), lower government bond interest spreads and lower output volatility.

3. Method

In this section, first of all, a theoretical explanation of the panel unit root tests is given, then a general information about the panel data models is presented and there is also theoretical explanation of the methods used in the study. In addition, there is a theoretical explanation of some tests showing which of the methods used is more effective. In accordance with the necessary tests made in this study, the least squares estimators with dummy variables are determined as the final model.

3.1. Panel Unit Root Test

Panel unit root tests are applied to test the stability of the used variables in the panel data models. First generation panel unit root tests are applied when there is no cross section dependency between units; however, when cross sectional dependency is found, second generation panel unit root tests are applied. For this reason, it is necessary to examine whether there is a connection between the cross-sectional units before analyzing panel unit root. Pesaran CD_{LM} Test (2004)¹ and Friedman R Test (1937)² can be applied, and these tests are cross section dependency tests used in fixed and random effect models. Acceptance of the null hypothesis denies the dependency among the units while rejection indicates that there is dependency between the cross sections. The necessary panel unit root tests can be applied depending on whether there is cross section dependency or not. Because of the cross section dependency in this study, Pesaran (2003) panel unit root test is applied to all variables, and this test is one of the second generation panel unit root tests. There are no unit roots in the null hypothesis series used for this test in other words, the series are static.

3.2. Panel Data Models

The panel data is described as handling cross-sectional observations such as countries, firms or households, together with time dimension³. Panel data analysis, which can also be called dynamic analysis in cross section data, allows analysing various facts about economic relations with a much wider range, and these facts cannot normally be revealed by only in time or only in cross data. There are many estimation methods used for panel data models. Panel data models include one-factor and two-factor fixed effect panel data models and one-factor and two-factor random effects panel data models⁴. Single factor fixed effect panel data models are explained as the effect of panel unit differences on the constant coefficients of regression.

¹Can be applied in case of $N > T$.

²Can be applied in case of $N > T$.

³Baltagi, B. (2001). *Econometric Analysis of Panel Data*. 2nd Ed., UK: John Wiley & Sons Ltd., pp.1.

⁴Ün, T. (2015). *Stata ile Panel Veri Modelleri*. Ed. Selahattin Gürüş, DER Yayınları, ss.54.

However, it may be necessary to consider the differences not only between units but also differences occurring over time in parameters. In this case, two-factor fixed effect panel data models are mentioned. Three different estimation methods are more widely used in estimation of fixed effect panel data models. The dummy variable least squares method, first difference (fixed effect) regression method and intra-group (fixed effect) methods are among the widely used fixed effect panel data estimation methods⁵. Panel data models have many advantages over time series analysis or analyzes involving one of the cross section data⁶. However, panel data models can lead to heteroscedasticity and autocorrelation problems.

3.3. Pooled Least Squares Model (POLS)

It is assumed that there is no difference between the cross-sectional data matrices in the pooled least squares model. In other words, this model predicts a common constant term for all cross sections⁷. In the pooled least squares model, all countries' datum are collected in a pool without dummy variables reflecting certain effects of each cross section, and the effects of independent variables on the dependent variable are investigated.

3.4. Least Squares with Dummy Variable Method (LSDV)

Baltagi (2005) states that fixed effect models may be appropriate if studies focus on a certain N number of companies or countries. Panel model units usually have a heterogeneous pattern. As a consequence of this heterogeneous pattern of units, the Least Squares estimators lose their coherence properties. In order to obtain consistent estimators, the existing heterogeneity of the units must be taken into account in the estimation process. One of the most recognizable ways that can be used for this purpose is to use a dummy variable in the equation. The applied dummy variable reveals the differences between the units in the fixed parameter. One unit must be excluded to avoid the dummy variable trap⁸. Dummy Variable Single Factor Fixed Effect Model can be described as follows:

$$Y_{it} = \alpha_1 D_{1t} + \alpha_2 D_{2t} + \dots + \alpha_N D_{Nt} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + u_{it}$$

i is the unit size and t is the time dimension. The explanations of the expressions in the model are described as follows:

$D_{it}=1$, i . for unit

$D_{it}=0$, in other situations

$Y_{it} \rightarrow (NT \times 1)$ dimensional dependent variable vector,

$D_N \rightarrow (NT \times N)$ dimensional dummy variable matrix,

$X_{it} \rightarrow (NT \times (K-1))$ dimensional matrix of independent variables,

$\beta_i \rightarrow ((K-1) \times 1)$ dimensional slope coefficient vector,

$\alpha_i \rightarrow (N \times 1)$ dimensional constant coefficients vector,

$u_i \rightarrow (NT \times 1)$ dimensional error terms vector

Since LSDV does not have a constant coefficient, there will be no dummy variable trapping when there are N number of dummy variables. For this reason, there are N number of dummy variables in the model. Model matrices can be described as follows:

$$Y_{it} = D_N \alpha_i + X_{it} \beta + u_{it} \quad i = 1, \dots, N \quad t = 1, \dots, T$$

LSDV can cause the degree of freedom to drop and the problem of multicollinearity due to the use of multiple dummy variables. For this reason, it is not preferred for panel data which include very large units⁹.

3.5. F Group Test

In order to determine whether there is any difference between the units in the fixed effect model and to determine the most effective model, F group significance test is required¹⁰. The following F statistic is obtained under the null hypothesis that the fixed term is the same among the units¹¹.

⁵Gürüş, S. (2015). Stata ile Panel Veri Modelleri. Ed. Selahattin Gürüş, DER Yayınları, ss.26.

⁶Baltagi, B. H.. (2005). Econometric Analysis of Panel Data. The Atrium Southern Gate Chichester: John Wiley & Sons Ltd.

⁷Asteriou, D.. (2006). Applied Econometrics: A Modern Approach Using EViews and Microfit. Palgrave Macmillan.

⁸Ün, T. (2015). Stata ile Panel Veri Modelleri. Ed. Selahattin Gürüş, DER Yayınları, ss.57.

⁹ Kennedy, P. (2006). Ekonometri Klavuzu. (Çev. Muzaffer Sarımeşeli ve Şenay Açıkgöz), 5. Baskı, Ankara: Gazi Kitabevi, s.332.

¹⁰Asteriou, D.. (2006). Applied Econometrics: A Modern Approach Using EViews and Microfit. Palgrave Macmillan.

¹¹Greene, William. H. (2003), Econometric Analysis, 5th Ed., New York: Prentice Hall, pp.289.

$$F_{(N-1, NT-N-K)} = \frac{(R_{LSDV}^2 - R_{POLS}^2)/(N-1)}{(1 - R_{LSDV}^2)/(NT - N - K)}$$

R_{LSDV}^2 is determination coefficient of LSDV model; T is the observation value of each unit; N is the number of unit (group) and K is the number of explanatory variables. If the obtained F statistic is bigger than the table value, it can be expressed that there is a group effect, in other words there is a difference between the units. In this case LSDV model would be preferred.

3.6. Random Effect Generalized Least Squares Method

The variance-covariance matrix becomes important in the use of the Generalized Least Squares Method (GLS) to predict the parameters of random effect panel data models. What is being mentioned here is the variance-covariance matrix of the error terms. If the variance-covariance matrix (V_i) of the error terms is known and this matrix is V, then the generalized OLS estimators of the randomly effective panel data models are estimated with matrices as follows:

$$\hat{\beta}_{GEKK} = (X'V^{-1}X)^{-1}(X'V^{-1}Y)$$

In this case, the variances of the predictors are also estimated with matrices as follows:

$$Var(\hat{\beta}_{GLS}) = (X'V^{-1}X)^{-1}$$

Variance-covariance matrix in estimation becomes important due to its difference according to models. It is known that the structure of the components of the error term changes when the model is an error component model or a random coefficient model, and whether the model is one or two factors also causes this change. According to the differences in models, the variance - covariance matrix also changes. Least squares estimators, which is generalized by modifying the data in error components models, can be found with the least squares method. To apply the GLS method, the variance components of error terms must be known. Swamy and Arora (1972) method is used to determine the variance components. Swamy and Arora (1972) suggest that variance components should be obtained from the intra-group and intergroup regression models¹².

3.7. Hausman Test

The fixed effect model included in the panel data analysis is a model that is frequently used and has the desired features in terms of its statistical properties. However, if the random effects model gives more effective results than the fixed effects model, then the random effects model should be used as the estimation method. Therefore, it is necessary to identify the more effective of the two models, both of which are consistent but different in effectiveness. The Hausman test (1978) fitting the k-degree of freedom ki-square distribution is used to select between the fixed effect model and the random effects model¹³. In the Hausman test, rejecting the null hypothesis that the coefficients obtained from the random effects model and the coefficients obtained from the fixed effects model are the same shows that the fixed effect model gives more effective results. On the other hand, acceptance of the null hypothesis exhibits that the random effects model gives more effective results.

4. Data and Model

In this study, it is aimed to examine the relationship between democratic development and the open rule of the Masstricht Criteria applied to the countries within the European Union. For this purpose, Panel Data Model is applied on annual data of selected 25 EU member countries for 2000-2015 period. In the model, the ratio of the central government's deficit/surplus to the GDP (Central Government surplus/deficit-Percentage of Gross Domestic Product-Net Lending(+) Net Borrowing(-)) (GOV/GDP) is used as a dependent variable. The Human Development Index (HDI) and the Corruption Perception Index (CPI), which are considered to be measures of democratic development, are considered as explanatory variables of the model.

HDI has values ranging from 0 to 1, with 0 representing the worst human development and 1 representing the best human development. CPI has values ranging from 1 to 10, with 1 being the highest corruption perception and 10 being the least corruption perception. In the model used in this study generally expressed as follows:

$$GOV/GDP = f\{HDI, CPI\}$$

The data sources of the variables in the model are given in Table 1. The countries in the sample are selected from the EU member countries listed by EUROSTAT. Selected countries are Belgium, Czechia, Denmark, Germany,

¹²Baltagi, B. (2001). *Econometric Analysis of Panel Data*. 2nd Ed., UK: John Wiley&Sons Ltd., pp.17.

¹³Baltagi, B. (2001). *Econometric Analysis of Panel Data*. 2nd Ed., UK: John Wiley&Sons Ltd., pp.20.

Estonia, Ireland, Greece, Spain, France, Italy, Southern Cyprus, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Slovakia, Finland, Sweden and England.

Variables	Explanation	Sources
(GOV/GDP)	Central Government deficit/surplus (%GDP)	EUROSTAT
HDI	Human Development Index	United Nations Development Programme
CPI	Corruption Perception Index	Transparency International Organization

EU member countries such as Bulgaria, Romania and Croatia have been removed from the sample because of the multicollinearity for the Least Squares with Dummy Variables Models, and estimates have been made for the 25 countries listed above.

5. Findings

First of all, the panel unit root test results are presented, then the estimation results of the tests and methods are given in this section.

5.1. Results of the Panel Unit Root Test

As a result of Pesaran (2003) panel unit root analysis, it is determined that the HDI and (GOV / (GDP)) variables are stationary at the level and they do not contain unit roots. However, the first difference is taken since the CPI variable contains a unit root when it is fixed ($z(t\bar{a}) = -0.870$). Therefore, as a result of unit root analysis, GOV / GDP, HDI and dCPI variables are stationary at constant or trend and so do not contain unit root. Table 2 shows the Pesaran Unit Root Test Results.

Variables	constant z (t bar) test statistic	constant and Trend z (t bar) test statistic
(GOV/GDP)	-2.370***	-2.121**
HDI	-3.432***	-1.682**
dCPI	-4.383***	-1.545*
*** %1 **%5 *%10 level of significance		

5.2. Estimation Results

Three alternative estimators (Pooled OLS, LSDV and GLS) are used in the study, and the F-group significance test and the Hausman test are performed in order to determine which predictor has superior features. First, the F-group significance test is used to test whether there are differences between units in fixed effect models (for Pooled OLS and LSDV) or not. The F statistic value (8.52) calculated as a result of the applied F test is found to be significant at 0.01 level, and the null hypothesis inferring that group differences do not exist is rejected. According to this result, it is determined that there is a difference between the units and the Least Squares Dummy Variable (LSDV) estimator, which is one of the single factor fixed effect models, is effective. In other words, it is determined that the open rule indicated by the ratio of (GOV/ GDP) is either a difference between countries in terms of the determinants of democratic development or a group effect. However, the group effect can be either fixed or random. For this reason, the Hausman test was applied for LSDV and GLS in order to test whether the group effect is coincidental. According to Hausman test result, the chi2 test statistic, resulted as 10.39 at 0.01 level, is significant, and group effect is fixed; however, the null hypothesis assuming that the group effect is random is rejected. Therefore, it turns out that the most effective estimation method is the Least Squares Dummy Variable Method (LSDV). The estimation results of the three different methods used in the study are shown in Table 3.

Variables	POLS	LSDV	GLS
HDI	11.93*** (4.38)	-22.37*** (7.67)	-7.99 (6.37)
dCPI	4.45*** (1.48)	3.12** (1.24)	3.33*** (1.25)
R²	0.04	0.40	0.03
The level of significance is shown as 0.10* 0.05**0.01*** Standard errors are given in parentheses.			

According to the findings obtained, HDI taken as a measure of democratic development is statistically significant at 1% and CPI at 5% level. A negative and strong relationship has been identified for the 25 EU countries used between *GOV/GDP* and HDI. The 1% increase in the HDI variable reduces the *GOV / GDP* variable by 22%. In other words, the increase in the index of human development is effective in reducing the share of central government deficit in GDP, which is used as a fiscal rule instrument. This relationship also seems to be in line with expectations. A positive correlation has been found between *GOV / GDP* and CPI for 25 EU countries. The 1% increase (recovery in corruption) in the CPI variable increases the *GOV / GDP* variable by 3%. In other words, the improvement in corruption perceptions (1 for worst level and 10 for best level) has an increasing influence on the share of the central government in the GDP, which is used as a fiscal rule instrument. This relationship seems to be in the contrary to expectation. This is not surprising because the corruption perception indices of the countries in the sample are not very different, and the *GOV / GDP* variable have similar values in countries where this index is high or low. It is thought that this index will give meaningful results in the samples where the index value of the Corruption Perception Index (CPI) variable is at a higher level.

Conclusion

The statements about the fiscal rules, which is originated from Public Choice Theory, are first seen in B.C. period. Throughout history, different forms of fiscal rules have emerged because of different circumstances that arisen in each period. Fiscal rules were implemented as a result of inflation and balance of payments problems in 1970s. They were implemented gradually to increase the credibility of macroeconomic policy after 1990s, which made them increasingly popular. In this paper the relationship between the open rule that is among the fiscal rule applications and the human development index which is accepted as democratic development criteria and the corruption perception index have been examined in the scope of 25 European Union (EU) countries in the period of 2000-2015. According to the results of analysis on the sample of 25 European Union countries, there is a negative and strong relationship between the open rule and the human development index. This finding overlaps expectations. However, a positive relationship has been found between the corruption perception index and the open rule for the 25 EU member countries investigated. This relationship is in the contrary to expectation. This is not surprising because the corruption perception indices of the countries in the sample are not very different, and the *GOV / GDP* variable have similar values in countries where this index is high or low. It is thought that this index will give meaningful results in the samples where the index value of the Corruption Perception Index (CPI) variable is at a higher level.

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