



THE EFFECT OF GLOBAL FINANCIAL CRISIS ON BUDGET DEFICITS IN EUROPEAN COUNTRIES: PANEL DATA ANALYSIS

Serdar KURT¹

Canan GÜNEŞ^{**}

Verda DAVASLIGİL^{***}

Abstract

The aim of the study is to investigate the effects of the 2008 Financial Crisis, which affected the financial variables as well as the real variables such as economic growth and unemployment, on budget deficits of countries. In the study, general government deficit or surplus, general government debt, total government expenditure, total government revenue, taxes on production and imports, government fixed investment and inflation data covering 1998-2008 periods have been used. In order to determine the effect of the crisis, the crisis dummy has been formed. The results of the study revealed that total government revenue and inflation have a positive effect on budget balance that is to say they reduce the budget deficit. On the other hand total government expenditures have a negative effect on budget balance that is to say they increase the budget deficit. In addition, the crisis variable is determined to have an increasing impact on budget deficit.

Keywords: Budget Deficit, Financial Crisis, Panel Data, Stimulus and Rescue Packages.

Jel Classification: H600, G010, C230

Özet

Çalışmanın amacı, ekonomik büyüme ve işsizlik gibi reel değişkenlerin yanı sıra finansal değişkenleri de etkileyen 2008 finansal krizin, ülkelerin bütçe açıkları üzerindeki etkilerini araştırmaktır. Çalışmada, 1998-2008 dönemini kapsayan bütçe açığı veya fazlası, kamu borcu, toplam kamu harcamaları, toplam kamu gelirleri, üretim ve ithalat vergileri, kamu sabit sermaye yatırımları ve enflasyon verileri kullanılmıştır. Krizin etkisinin belirlenmesi amacıyla kriz kuklası oluşturulmuştur. Çalışmadan elde edilen sonuçlar toplam kamu geliri ve enflasyonun bütçe dengesi üzerinde pozitif bir etkiye sahip olduğunu, yani bütçe açıklarını azalttığını göstermektedir. Toplam kamu harcamalarının ise bütçe dengesi üzerinde negatif yani bütçe açıklarını arttırıcı bir etkiye sahip olduğu ortaya koyulmuştur. Ayrıca, kriz değişkeninin de bütçe açığı üzerinde arttırıcı bir etkiye sahip olduğu belirlenmiştir.

Anahtar Kelimeler: Bütçe Açığı, Finansal Kriz, Panel Veri, Teşvik ve Kurtarma Paketleri

Jel Sınıflaması: H600, G010, C230

1 Assist.Prof.Dr., Çanakkale Onsekiz Mart Üniversitesi, Biga İİBF, Ekonometri Bölümü, Biga/Çanakkale,
Tel: 02863358738/1190, **e-mail:** serdarkurt10@gmail.com

** Res.Assist., Çanakkale Onsekiz Mart Üniversitesi, Biga İİBF, Ekonometri Bölümü, Biga/Çanakkale,
Tel: 02863358738/1195, **e-mail:** canan_gunes@yahoo.com

*** Res.Assist., Çanakkale Onsekiz Mart Üniversitesi, Biga İİBF, Ekonometri Bölümü, Biga/Çanakkale,
Tel: 02863358738/1194, **e-mail:** verdadavasligil86@gmail.com



1. INTRODUCTION

Globalization phenomenon emerged with the development of technology has been showing a strong effect in many fields particularly economic, social, political and cultural ones. Today, globalization has become so effective that impact of an economic or political event experienced by any country has soon perceived by the whole world. The global financial crisis that has emerged in sub-prime markets of U.S. in the second half of 2007 and spread to financial institutions in the second half of 2008 and throughout 2009, has taken first European countries then the whole world under its influence.

In general, the rescue and stimulus packages are operational in reassuring the private sector investments and prevent the crisis from spreading to other countries. The main objective of the rescue and stimulus packages is to prevent the crises to deepen by reducing the cost of the crisis on the economy and stabilize the financial system and economy. Rescue and stimulus packages which became an important element in crisis management for industrial countries and international institutions with the beginning of the crisis in Mexico in 1992, have been effectively used in 2008 financial crisis as well (Dooley and Verma; 2001:3).

The first country to announce stimulus package has been U.S. Titled as “Troubled Asset Relief Program” (TARP) and announced in September 2008, the package of \$ 700 has aimed to raise the deteriorating economy and save the financial sector. This package was put into effect in the fourth quarter of 2008 through the rescue plan called The Emergency Economic Stabilization Act of 2008 including the advantage of tax deductions and additional resources of \$ 150 billion. In 2009, a financial stimulus package of \$ 787 million for improvements and reinvestment was put into effect in the U.S. In addition, the Fed bought troubled securities based on Mortgage of \$ 600 billion and securities based on consumer debt of \$ 200 billion. Furthermore the Fed has distributed U.S. \$ 700 billion rescue fund to banks in 2009.

Global crisis has taken European countries under its influence after the U.S. Germany; the largest economy of Europe has announced a stimulus package of 470 billion Euros, which was nearly one-fifth of the country’s 2008 GDP of 2495 billion Euros, as a precaution against



crisis. In January 2009, a stimulus package of 54.3 billion Euros to be used in 2009 and 2010 has been announced. U.K. the second biggest economy of Europe, has taken measures to prevent its economy to slow further, to ensure protection of banks against large losses and guaranteeing their debt. U.K. has implemented various strategies to ensure stability of its banking system which has been deeply affected by the crisis. First, the amount of £ 400 billion package was approved, and then partial nationalization was implemented as the first phase of the intervention plan. In October 2008, England has announced the details of the stimulus package worth \$ 88 billion and performed the largest nationalization in which £ 37 billion were injected. In November, rescue plan of \$ 20 billion (£ 13.4 billion) for the troubled banks was announced and \$ 800 billion was injected to stabilize the financial system.

Some major measures taken against the crisis in European Union member countries are as follows. France supplied an aid of \$ 360 billion to the banks in difficult position. In 2009, the Czech Republic has announced a stimulus package of 73 billion crowns (U.S. \$ 3.3 billion), 40 billion crowns (U.S. \$ 8.1 billion) of which was devoted to tax cuts. Austria; has supported the banking system with a resource of 100 billion Euros, 85 billion Euros of which was formed of guarantees and 15 billion was of new funds. Italian government has allocated a resource, more than 20 billion Euros to support the banks. A rescue package of 20 billion Euros to guarantee liquidity situation of banks has been announced in Portugal. Ireland has implemented a package of 400 billion Euros to secure deposits and other liabilities of six banks within the frame of package. Switzerland has made capital grants to banks to strengthen the financial system.

Besides individual measures of the European Union member countries, they implemented some union wide rescue plans as well. Economic and financial policies of the European Union are the first and most basic skills of it. When the crisis spread to the entire financial system, member countries reacted to the crisis by broad principles (Gerard; 2008:3). In this context the European Council adopted European Economic Recovery Plan (EERP) in mid-September 2008. The plan that encouraged full capacity usage of banks and financial institutions has formed of approximately 1.5% of European Union GDP. Voluntary fiscal stimulus package by about 2% of GDP has been thrown out on the basis of EERP (European Commission, 2009:2). European Governments has announced stimulus packages of \$ 2.5



trillion in October, 2008. The same year, EU leaders approved stimulus package 200 billion Euros to revive the European economy.

Financial recovery policies have focused on increasing capital and liquidity of banks and deposit guarantees and decreasing interest rate. Central banks, primarily Fed has reduced interest rates to almost zero in the context of rescue operations. Economies of the countries have taken various measures to resolve troubled assets in the banks. Policies of the countries were to nationalize or support the banks that have invested in troubled assets. Many countries such as U.S., Britain, Iceland and Spain have followed nationalization route.

In this study, modeling the effect of financial crisis on budget deficits is aimed using data of 25 European countries covering 1998-2008 periods. In the first part of the study, the budget deficits have been focused on. Following, literature review on studies budget deficits of some countries have been dealt. Methods section cover data set and economic model and econometric models that will be used in the study and the results related to the model. In the last part, findings have been evaluated and suggestions were made in light of the findings.

2. BUDGET DEFICITS

Countries make a variety of analyses, take decisions and implement these with institutional approach, not to lose competitiveness in times of crisis. Within the framework of the 2008 Global Crisis, countries put various stimulus packages into effect to minimize impacts of the crisis on their own economies and real variables. In the context of the crisis countries approached to the crisis in strategic way and took decisions by making analyses not to let the crisis to deepen further.

In addition, some countries differentiated their policies in the crisis. U.S. which had seen market intervention as a last resort has intervened to markets with large amounts of stimulus packages. However, contrary to the spirit of the Union, European Union member countries have announced separate stimulus packages. It is thought that deviations from Maastricht criteria, which are one of the long-term strategic decisions of the Union, will be seen, due to the crisis. According to the Maastricht criteria, the public deficit ratio shouldn't



exceed 3% and public debt ratio shouldn't exceed 60% of GDP. Whereas, as the budget of stimulus packages have increased, the budget deficit of the country has also increased. In this context, Table 1 shows general government budget deficits of the EU16 and EU27 regions, changes in rates of deficits and share of deficits in GDP for the years 2005-2009.

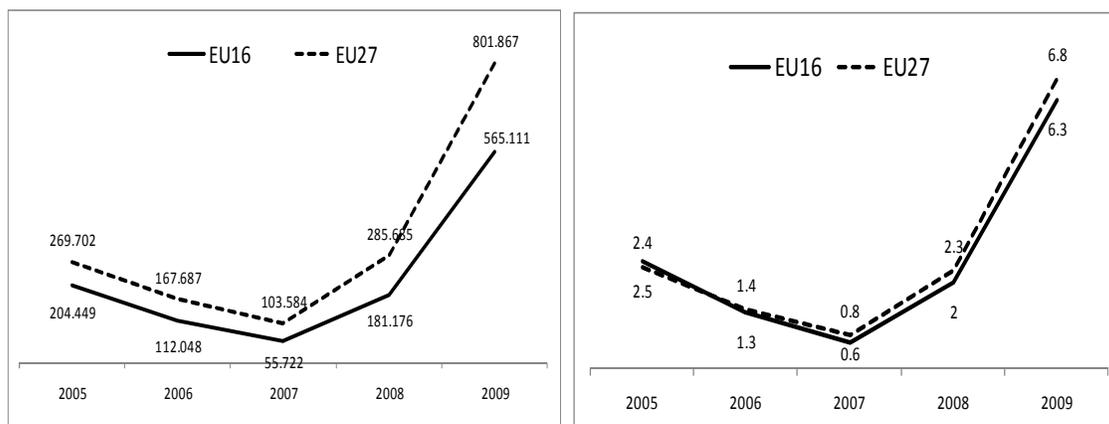
Table 1: GGD (Million Euro), Change of GGD (%) and the Share of GGD in GDP

Year	GGD		Change of GGD (%)		Share of GGD in GDP	
	EU16	EU27	EU16	EU27	EU16	EU27
2005	-204 449	-269 702	-11	-11	2.5	2.4
2006	-112 048	-167 687	-45	-38	1.3	1.4
2007	-55 722	-103 584	-50	-38	0.6	0.8
2008	-181 176	-285 685	225	176	2.0	2.3
2009	-565 111	-801 867	212	181	6.3	6.8

Source: Eurostat, (2009), <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>.

General Government Deficit (GGD) of EU16 and EU27 regions decreased 11% in 2005 compared to 2004 and this decrement lingered until 2008 in both regions. For both EU16 and EU27 regions, GGD of 2008 and 2009 showed a continuous increase. This increment was approximately 430% in total for 2007-2009 periods in EU16 region and 350% in EU27.

Graph 1: GGD and Share of GGD in GDP



Source: Eurostat, (2009), <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>.

GGD showing a distinctive decrease from 2005 to 2008 came to 55.7 billion and 103.5 billion Euros level respectively for EU16 and EU27 regions. From 2008 on, by the first signals of the global financial crisis, deficits have taken a rapid increase for the both regions and reached respectively to 565 billion and 801.8 billion in 2009. Likewise share of deficits in GDP which was approximately 3-3.4% in 2005-2008 period have rose to 6-6.8% in 2009. Of course, in this rapid increase effect of both individual and union wide stimulus and rescue packages are significant.

The share of GGD in GDP which was 2.4-2.5% in 2005 has fallen to 0.6-0.8% in 2007. The year 2008, when the stimulus packages was announced, the rate has rose to 2-2.3% and to 6.3-6.8% in 2009 when the real effects of the packages was seen.

3. LITERATURE

Darrat (1988) has examined the causality between budget deficit and trade deficit and the factors causing budget deficits in the U.S. using quarterly data for the period 1960:1-1984:4. He has revealed bi-directional causality between the budget deficit and trade deficit in the study that refereed Granger causality test. Moreover, other macro variables causing budget deficit were also examined and short-term interest rates, wage cost, monetary base, trade deficit, real output, foreign real income, inflation, exchange rate and long-term interest rate have been found to be the reason for Granger cause.



Hallerberg and Hagen (1997) modeled data of 15 European Union member states for 1981-1994 periods using pooled time series regression to examine whether the coalition governments or majority governments increased the deficits more. According to the findings, restrictions such as Maastricht criteria rather than the electoral system is a significant factor affecting the size of budget deficits. The conclusions has shown that A strong finance minister or an agreed budget constraints have had significant contribution to increase in budget deficits, but such criteria as Maastricht has been effective in keeping deficits and debts at low levels in the countries where political instability was experienced.

Metin (1998) has examined the relationship between inflation and budget deficits in Turkey for 1950-1987 period using restricted Johansen and Juselius cointegration analysis and error correction model. A long-term relationship was found between budget deficits and inflation, and it has been observed that single-equation model and scaled budget deficits affect inflation.

Egeli (1999) has evaluated budget deficits in the framework of the cross-section data of 23 developed countries with middle income level using multiple regression method and full logarithmic pattern. In the light of the findings, increases in public expenditures are found to cause rises in budget deficits and improvements in opportunities of foreign debt have positive effects on budget deficits. On the other hand, inflation has detractive effect in budget deficits. Furthermore Egeli (2000) tried to put forth main factors causing budget deficits in 17 developed countries with high income levels with 1996 data through multiple regression analysis in his another study. While budget deficit is used as dependent variable in the model, gross domestic product, inflation rates, total public spending, the total debt stock, loan interest rates and the net public debt/GDP ratio are included in the model as explanatory variables. Variables, of the exception of loan interest rate and the net public debt/GDP ratio have been found to be statistically significant. It has been concluded that public expenditure in the front, other independent variables as well have relatively increasing effect on budget deficits.

Piersanti (2000) has examined the argument that current account deficit is bound to future budget deficits expectations. In the study, optimizing general equilibrium model was used to reveal the theoretical relationship between two deficits. The econometric equation



based on forward-looking expectations model for prospects for some OECD countries with data for the period 1970-1997. In the light of the findings, a strong relation between current account deficit and expected future budget deficit has been found.

Tekin-Koru and Özmen (2003) has investigated the long-term relationship between budget deficit, inflation and monetary growth for Turkey using Johansen cointegration analysis. Two different triple systems were considered in the study to correspond narrowest and broadest monetary aggregates. As a result of analysis, it has been found that there is no direct relationship between inflation and budget deficits and financial statements in this respect are not the case for Turkey. Also any results support the hypothesis that claims that inflation is a result of the monetary policy that aims to maximize revenue seigniorage couldn't be found. Also any results supporting the fiscal theory of price level that argue that there is a direct relation between budget deficits and inflation couldn't be found either. Budget deficits externally determine Money growth. Consistent with the government regime towards financing domestic debt in commercial banking system, currency seigniorage does not cause increase of budget deficits but broad Money.

Woo (2003) has implemented panel data analysis with the data of 57 developed and developing countries for the periods of 1970-1990. In explaining cross-country differences in the public sector deficits, more than 40 economic, socio-political and institutional variables are used and it is aimed to achieve which of them is effective. As a result of the analysis financial debt, income inequality, assassinations, cabinet size and centralization of authority in budgetary decisions variables are the significant and robust arbiters of budget deficits. It is concluded that a strong negative relationship between socio-political instability, income inequality, a large size of the cabinet and lack of central authority in the fiscal decision-making process variables and public surplus.

Akinboade (2004) examined the relationship between budget deficits and interest rates of South Africa for the 1964-1999 periods using London School and Granger causality methods. Two types of interest rates were used in the study; commercial bank lending and rate on government bond. In the light of the findings it has been concluded that budget



deficits had no effect on interest rates in South Africa and budget deficits and interest rates are not Granger cause of each other.

Aghion and Marinescu (2007) analyzed cyclical dynamics of budget policies and determinants and relationship between budgetary policies, financial development and economic growth using panel with data of OECD countries for 1991-2000 periods. Cyclical level and time of budget deficits of OECD countries were defined as AR (1) method. Gaussian-Weighted OLS method was also included in the model. According to the results budget deficits were observed to increase over the time. Also against the cyclical budget policy has positive relation with financial development, openness level, adaptation of inflation-targeting regime and when financial development is low, cyclical budget deficit has positive effect on budget policy. Finally, in countries with low levels of financial sophistication, a positive and strong relationship between cyclical budget deficits and growth has been revealed.

Bayar and Smeets (2009) examined political determinants of budget deficits in 15 European Union (EU-15) member countries that signed the Maastricht Treaty for the period 1971 to 2006 using Coefficient Model. To be able to present the degree of diversity of the countries, coefficients were simultaneously estimated population-wide level and country-specific parameters. In the model fiscal deficit to GDP ratio has been taken as dependent variable and change in the unemployment rate, change in the GDP growth rate and the change in real debt servicing costs have been taken as independent variables. In addition, various political and institutional independent variables were included in the model. These have been government's ideological views, dummy that provide the election year and dummy variable for Maastricht criteria. The results reveal that there have been significant differences between the countries. At the same time, especially after the signing of the Maastricht treaty similarities were observed between the countries. Increases in budget deficits were observed in election years. As a result, the reaction of countries to the requirements introduced by the Maastricht treaty varies in terms of efforts to improve the budget situation.



4. METHODS

The economic relations are estimated using the data sets composed by bringing cross-sectional observations of countries, firms, households and so on within a certain period of time together in panel data analysis. The advantages of panel data analysis can be listed as follows (Baltagi, 2005: 4-7):

- By taking into account the specific trends and behavioral differences of cross-sectional units (firms, individuals, countries), panel data analysis provides control and measurement of these differences within the model.
- The subjects that can't be evaluated by cross-section or time-series data alone can be studied.
- By combining cross-section observations and time-series, multicollinearity between the variables is reduced.
- Cross-sectional data does not give information about dynamics. Use of the repeated cross-sectional data is more appropriate for the examination of the dynamics of variation.

In general, panel data model can be defined with the general model with k variables given below:

$$Y_{it} = \beta_{1it} + \beta_{2it} X_{2it} + \dots + \beta_{kit} X_{kit} + \varepsilon_{it} \quad (1)$$

Here displays $i = 1, 2, \dots, N$ cross-sectional unit, $t = 1, 2, \dots, T$ is the time period. ε_{it} is assumed to be independent in all time periods and for all individuals also distributed normally with 0 mean and constant variance. Coefficients for different units could have different values in different time periods in general model.

In the study, variables of 25 European countries have been considered. The variable general government deficit or surplus as proxy of budget deficit (BD), other variables are general government debt (GD), total government expenditure (GE), total government revenue (GR), taxes on production and imports (TAX), government fixed investment (GFI) and inflation (INF) data covering 1998-2008 periods have been used. All variables have been



obtained from Eurostat database. Moreover, dummy variable CRISIS representing crisis period has been formed by taking the value for 2007 and 2008 period are 1 and the other periods are 0. Δ shows that the first difference of variables have been taken.

In the study, the functional relationships between BD and the other variables can demonstrate;

$$BD = f(GD, GE, GR, TAX, INF, GFI, CRISIS) \quad (2)$$

And this functional relationship can test in econometric equation (3), where β_1 is intercept, $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ are coefficients of variables, i and t are respectively cross-sections and periods, ε_{it} is error term.

$$BD_{it} = \beta_1 + \beta_2 GD_{it} + \beta_3 GE_{it} + \beta_4 GR_{it} + \beta_5 TAX_{it} + \beta_6 INF_{it} + \beta_7 GFI_{it} + \beta_8 CRISIS_{it} + \varepsilon_{it} \quad (3)$$

To investigate the impact of the global financial crisis on budget deficit of 25 European countries different panel data methods have been used. Firstly, it must take into account stationary of variables. Non-stationary series may produce spurious estimates or relationships between variables. The stationary determined with unit root tests by Levin, Lin and Chu (2002) (LLC) and Im, Pesaran and Shin (2003) (IPS). LLC assumes a common unit root process in series and IPS test assumes individual unit root process in series. IPS and LLC tests are performed with individual intercept model. Results of unit roots tests show that except GFI, all other variables are stationary in level. Variable GFI is stationary when it's used in first difference.

Table 2: IPS and LLC Tests (Individual Intercept)

Variables	IPS	LLC
BD	-2.01 ^b	-2.65 ^a
GD	1.15	-2.82 ^a
GE	-2.40 ^a	-4.94 ^a
GR	-1.37 ^c	-2.86 ^a
TAX	-2.52 ^a	-4.51 ^a
INF	-2.09 ^b	-4.30 ^a
GFI	6.53	3.69
ΔGFI	-7.04 ^a	-11.78 ^a

a, b, and c significant in respectively 1%, 5% and 10%. It is used optimum Akaike information criteria determined all variables in lags 1, Newey-West bandwidth selection using Bartlett Kernel.

After the stationary of the variables was examined in the study, cross-section and period effects were tested and it was determined if these effects are constant or random. In addition, the presence of autocorrelation and heteroscedasticity problems were investigated. According to the results of the tests the model was estimated with the appropriate estimation method.

4.1. The Fixed Effects Model

In fixed effects model, the differences caused by individual behaviours or period are tried to be presented by the differences in constant term and slope coefficients are assumed to be constant. The fixed effects model is defined as follows:

$$Y_{it} = \bar{\beta}_1 + \alpha_{it} + \beta_{2it} X_{2it} + \dots + \beta_{kit} X_{kit} + \varepsilon_{it} \quad (4)$$

β_{1it} given in equation (1) can be decomposed as $\beta_{1it} = \bar{\beta}_1 + \alpha_{it}$. Here, $\bar{\beta}_1$ displays the average constant term and i being the cross-section and t the time period, α_{it} displays difference from the fixed term. Each cross-section and period has its own constant term in fixed effects model.



4.2. Random Effects Model

Assuming that the unobservable differences in the cross-section or period is formed by the realization of a random process and not to be related variables discussed, the model is a random effects model (Greene, 2003:293). Random effects model is modelled as follows.

$$\begin{aligned} Y_{it} &= \bar{\beta}_1 + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \varepsilon_{it} + \alpha_{it} \\ &= \bar{\beta}_1 + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + u_{it} \end{aligned} \quad (5)$$

$u_{it} = \varepsilon_{it} + \alpha_{it}$ is composite error term. α_{it} refers to error term specific to cross-sections and period and ε_{it} refers to panel error term. Both error terms have a normal distribution. The error terms specific to the cross-section and period are not associated among themselves and with the panel error term.

4.3. Testing Models

First cross-section or period effect should be determined. Specification tests are applied for this.

Redundant Fixed Effect Test (F Test)

It is used to determine significance of cross-section specific or period-specific effects in the model. Here, the null hypothesis is pooled OLS when the alternative hypothesis is fixed effects model. F statistic is used for this test can be defined as follows:

$$F(N-1, NT-N-K) = \frac{(R_{FE}^2 - R_{Pooled}^2)/(N-1)}{(1 - R_{FE}^2)/(NT-N-K)} \quad (6)$$

FE shows fixed effects model and *Pooled* shows pooled or restricted model. N shows the number of cross-section, T is the period and K is the number of coefficients.



Hausman Test

Specification test developed by Hausman (1978) is used to test orthogonality between random effects and explanatory variables. According to Hausman test, the null hypothesis suggests that random effects are in question and random effects model should be preferred. Hausman test shows Chi-square distribution with k-1 (k=number of explanatory variables) degrees of freedom. Chi-square test based on Wald criterions is expressed as follows:

$$W = (\hat{\beta}_{FE} - \hat{\beta}_{RE})'[Var(\hat{\beta}_{FE}) - Var(\hat{\beta}_{RE})]^{-1}(\hat{\beta}_{FE} - \hat{\beta}_{RE}) \quad (7)$$

Here, W is the test statistic, $\hat{\beta}_{FE}$ is the coefficient matrix obtained by a fixed effects model, $\hat{\beta}_{RE}$ is the coefficient matrix obtained by random effects model, $Var(\hat{\beta}_{FE})$ the variance-covariance matrix obtained by a fixed effects model and $Var(\hat{\beta}_{RE})$ the variance-covariance matrix obtained by a random effects model. As a result of the test if H_0 can't be rejected, random effects model, if it is rejected fixed effects model will be used.

Table 3: RFE and Hausman Tests for Period Effect

	Random vs Fixed	Pooled OLS vs Fixed
RFE Test	-----	1.39 (10;255)
Hausman Test	13.19 (6) ^b	-----
a and b significant in respectively 1% and 5%, degrees of freedoms of F distribution for RFE Test and degrees of freedom of χ^2 distribution for Hausman Test are in parentheses.		

RFE and Hausman tests were applied for period effect and cross section effect in the study. The results of RFE and Hausman tests were given in Table 3 for period effect. Hausman test shows that the hypothesis H_0 should be rejected, thus when a choice between random and fixed effects need to be made fixed effect should be preferred. However, the test result of RFE shows that H_0 could not be rejected, thus pooled OLS model should be used between pooled OLS and fixed effect models. As a result, it has been identified that period fixed effect shouldn't be used in equations.

Table 4: RFE and Hausman Tests for Cross Section Effect

	Random vs Fixed	Pooled OLS vs Fixed
RFE Test	-----	12.54 (24;240) ^a
Hausman Test	12.41 (6) ^b	-----
a and b significant in respectively 1% and 5%, degrees of freedoms of F distribution for RFE Test and degrees of freedom of χ^2 distribution for Hausman Test are in parentheses.		

Table 4 shows that H_0 is rejected for cross section effect in both Hausman and RFE tests. RFE test emphasizes that fixed effect should be preferred between pooled OLS and fixed effect models. According to the Hausman test fixed effect model is preferable when random and fixed effects are compared. Model test results show that cross section effect is available in the model and cross section fixed effect model should be preferred.

Autocorrelation Tests

Just as the time series, in panel data analysis, the autocorrelation is a major problem. One of the basic assumption of regression analysis is that correlation doesn't occur between the error terms for different observations. If the error terms associated with each other, this situation is called autocorrelation or serial correlation. In linear panel data models, serial correlation leads standard errors to be biased and the outcomes to be less efficient.

Bhargava et al. (1982) has shown in their studies that Durbin-Watson (DW) test result could be used in examining autocorrelation when fixed effects are in question. DW statistic can be written as follows:

$$DW = \frac{\sum_{i=1}^N \sum_{t=2}^T (\hat{\epsilon}_{it} - \hat{\epsilon}_{it-1})^2}{\sum_{i=1}^N \sum_{t=1}^T \epsilon_{it}^2} \tag{8}$$

The result of DW test from equation 8 is shown in Table 5. In this study, it is determined T=11, N=25, and n=7.

Table 5: DW Tests for Cross Section Fixed Effect Model

Autocorrelation Test	Cross Section Fixed Effect Model
DW Test	0.87

In their studies, Bhargava et al. (1982) arranged upper and lower bounds of DW statistic as a table. According to this table, while the lower bound is 1.8258, the upper bound is 1.8851 for T=10, N=50, and k=7. If T and N are increase, the lower and the upper bounds are growth. The obtained DW statistic is to be 0.87 considerably remained below the lower limit so there is autocorrelation.

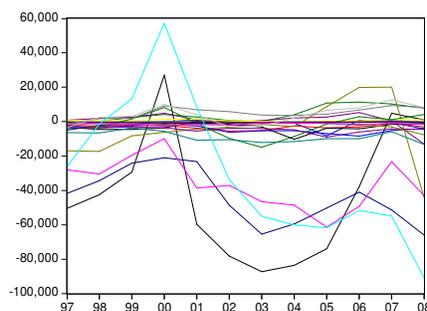
Heteroscedasticity Test

The homoscedasticity assumption is one of the basic assumptions in panel data analysis. Therefore homoscedasticity assumption must absolutely be tested in panel data analysis. Modified Wald test is one of the tests used to test heteroscedasticity. Despite zero-hypothesis saying homoscedasticity assumption is provided; the alternative hypothesis saying heteroscedasticity exists is being tested. Modified Wald statistic can be formulated as follows:

$$W = \sum_{i=1}^N \frac{(\hat{\sigma}_i^2 - \hat{\sigma}^2)^2}{\frac{1}{T} \frac{1}{T-1} \sum_{t=1}^T (\varepsilon_{it}^2 - \hat{\sigma}_i^2)^2} \quad (9)$$

W statistic shows χ_N^2 distribution.

Graph 2: Variables BD of 25 Countries





When BD variables of the 25 countries examined collectively, BD values of some countries significantly differ from the others. When BD's being dependent variable, these differences can give rise to the problem of heteroscedasticity. Therefore, if there are problems of heteroscedasticity in equations need to be explored.

Table 6: Modified Wald Test for Cross Section Fixed Effect Model

Diagnostic Tests	Cross Section Fixed Effect Model
Modified Wald Test	400000 (25) ^a
a and b significant in respectively 1% and 5%, degrees of freedom of χ^2 distribution is in parentheses.	

According to the results of Modified Wald test given in Table 6, heteroscedasticity is in question in the equation.

Estimates obtained by OLS are not efficient in fixed effects models in that heteroscedasticity is in question. Therefore, in order to overcome the autocorrelation and heteroscedasticity problem, robust standart errors and covariances by White Correction method was used in the study.

Table 7: Equation of Budget Deficit

Independent Variable	Dependent Variable: BD
GD	-18.76 (-0.27)
GE	-3392.53 ^a (-13.93)
GR	2840.40 ^a (3.36)
TAX	882.22 (0.83)
INF	170.27 ^a (3.64)
Δ GFI	0.49



	(0.75)
CRISIS	-3434.56 ^b (-2.18)
Constant	10712.89 (0.58)
Country	25
n	272
R ²	0.66
a and b significant in respectively 1% and 5%, White corrected standart errors and covariance. t statistics in parentheses, probability in brackets.	

As seen in Table 7, variables GE, GR, INF, and CRISIS are statistically significant. Total government revenue and inflation have a positive effect on the budget balance as expected in other words; they have a reducing effect on budget deficits. Being a revenue item, total government revenue has a reducing effect on the budget deficits. Because of inflation tax and rising inflation from year to year, inflation is expected to have a positive impact on the budget. Taxes on production and imports are items of tax. Although sign of TAX variable on budget balance is positive and it reduces budget deficit, this variable is not found statistically significant. The sign of Δ GFI variable expressing the change in government fixed investment has been found positive but insignificant. Considering productivity-enhancing effects of investment expenditures, it can be regarded fair that the positive effects of investment expenditures are small and not net.

When the other variables in the model have been inspected, their negative effect on the balance of the budget can be obtained. They also increase the budget deficit. Because general government debt and total government expenditure are debt and expenditure items, their sign can be said to be as expected, but general government debt is found insignificant. Also, it has been assessed that crisis dummy variable has negative and statistically significant effect on budget balance. And this shows that the period of crisis has an increasing effect on budget deficits in other words has a negative effect on budget balance.



5. CONCLUSION

The Global Financial Crisis effected economy of many countries in Europe. Countries have put various stimulus and rescue packages in practice in order to improve their economic conditions. These packages have become very useful in reducing the effects of the Crisis. On the other hand, they have caused national budget deficits or increased the current budget deficits. In the study the impact of the global financial crisis on budget deficit of 25 European countries for period of 1998-2008 was analyzed. Furthermore, dummy variables used for 2008 Global Financial Crisis.

Stationary of variables was investigated with Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) unit root tests. All variables used stationary in estimated equation. After the stationarity of the variables was provided, cross-section and period effects were investigated. In this context, according to the results obtained from RFE and Hausman tests it was determined that Cross-Sectional Fixed Effects Model should be chosen.

Panel data models have two major problems to be considered. The first of these is autocorrelation and the other is the problem of heteroscedasticity. DW tests were applied to determine whether the equations include autocorrelation and in line with the obtained results, the model is determined to have first-order autocorrelation. To investigate whether the heteroscedasticity exist in the model, Modified Wald test was applied and it has been seen that heteroscedasticity exists.

The results of the study display that variables GE, GR, INF, and CRISIS are statistically significant. Total government revenue and inflation have a positive effect on the budget balance as expected in other words; they have a reducing effect on budget deficits. Being a revenue item, total government revenue has a reducing effect on the budget deficits. Because of inflation tax and rising inflation from year to year, inflation is expected to have a positive impact on the budget. Taxes on production and imports are items of tax. Although sign of TAX variable on budget balance is positive and it reduces budget deficit, this variable is not found statistically significant. The sign of Δ GFI variable expressing the change in government fixed investment has been found positive but insignificant. Considering



productivity-enhancing effects of investment expenditures, it can be regarded fair that the positive effects of investment expenditures are small and not net.

Looking at other variables in the model, it has been seen that they have a negative effect on the balance of the budget and the increases in these variables is seen to increase the budget deficit. Because general government debt and total government expenditure are debt and expenditure items, their sign can be said to be as expected, but general government debt is found insignificant. It was determined that dummy variable crisis has negative effect on budget balance, increasing effect on budget deficit.

The study concluded that the periods of crises increased budget deficits. The countries release stimulus and rescue packages to in order to prevent financial problems created by the crisis. These packages also cause budget deficits. Countries may bear budget deficits in times of crisis to overcome the financial problems however it should be considered that these deficits shouldn't arrive serious proportions.

REFERENCES

Aghion, P. and Marinescu, I. (2007), "Cyclical Budgetary Policy and Economic Growth: What do We Learn from OECD Panel Data?", **Chicago Journals**, 22, pp. 251-293.

Akinboade, O.A. (2004), "The Relationship between Budget Deficit and Interest Rates in South Africa: Some Econometric Results", **Development Southern Africa**, 21(2), pp. 289-302.

Baltagi, B.H. (2005), *Econometric Analysis of Panel Data*. Third Edition, John Wiley & Sons, LTD., Chichester.

Bayar, A. and Smeets, B. (2009), "Economic and Political Determinants of Budget Deficits in the European Union: A Dynamic Random Coefficient Approach", **CESifo Working Paper**, No: 2546.

Bhargava, A., Franzini, L. and Narendranathan, W. (1982), "Serial Correlation and the Fixed Effects Model", **Review of Economic Studies**, 49, pp. 533-549.

Darrat, A.F. (1988), "Have Large Budget Deficits Caused Rising Trade Deficits?", **Southern Economic Journal**, 54(4), pp. 879-887.



Dooley, M. and Verma, S. (2001), “Rescue Packages and Output Losses Following Crises”, **NBER Working Paper**, No: 8315.

Egeli, H. (1999), “Gelişmekte Olan Ülkelerde Bütçe Açıkları”, **Süleyman Demirel Üniversitesi İİBF Dergisi**, 4(2), pp. 293-303.

Egeli, H. (2000), “Gelişmiş Ülkelerde Bütçe Açıkları”, **Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi**, 2(4), pp. 62-78.

European Commission. (2009), Economic Crisis in Europe: Causes Consequences and Responses, http://ec.europa.eu/economy_finance/publications/publication15887_en.pdf, Accessed: 02.04.2010.

Eurostat, (2009), <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>, Accessed: 23.04.2010

Gerard, D. (2008), “Managing the Financial Crisis in Europe: Why Competition Laws is Part of the Solution, Not of the Problem”, **The Online Magazine for Global Competition Policy Release**,1, pp. 2-14.

Greene, W.H. (2003), *Econometric Analysis*. Fifth Edition, Prentice Hall, ABD.

Hallerberg, M. and Hagen, J. (1997), “Electoral Institutions, Cabinet Negotiations, and Budget Deficits in the European Union”, **NBER Working Paper**, No: 6341.

Hausman, J.A. (1978), “Specification Tests in Econometrics”, **Econometrica**, 46 (6), pp. 1251–1271.

Im, K.S., Pesaran, M. H. and Shin, Y. (2003), “Testing for Unit Roots in Heterogeneous Panels”, **Journal of Econometrics**, 115, pp. 53–74.

Levin, A., Lin, C.F. and Chu, C. (2002) “Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties”, **Journal of Econometrics**, 108, pp. 1-24.

Metin, K. (1998), “The Relationship between Inflation and the Budget Deficit in Turkey”, **Journal of Business&Economic Statistics**, 16(4), pp. 412-422.

Piersanti, G. (2000), “Current Account Dynamics and Expected Future Budget Deficits: Some International Evidence”, **Journal of International Money and Finance**, 19, pp. 255–271.

Tekin-Koru, A. and Özmen, E. (2003), “Budget Deficits, Money Growth and Inflation: The Turkish Evidence”, **Applied Economics. Taylor and Francis Journals**, 35(5), pp. 591-596.



Woo, J. (2003), “Economic, Political, and Institutional Determinants of Public Deficits”, **Journal of Public Economics**, 87, pp. 387–426.

COUNTRIES (25)	
Austria	Lithuania
Belgium	Luxembourg
Cyprus	Malta
Czech Republic	Netherlands
Denmark	Poland
Estonia	Portugal
Finland	Romania
France	Slovakia
Germany	Slovenia
Hungary	Spain
Ireland	Sweden
Italy	United Kingdom
Latvia	