The Effect of the Macroeconomic Determinants on Sovereign Credit Rating of Turkey

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Abstract

The effects of the main macroeconomic determinants on the sovereign credit rating of Turkey assigned by Standard & Poor's are analyzed in this paper. As the main macroeconomic determinants, inflation rate, economic growth rate, foreign direct investment, external debt, current account debt and savings are taken into account in this study. The data related to Turkey in this study covers between 1992-2016. In this study, the Granger causality test and the OLS regression model are used for that correlations of the variables.

Outcomes of the analysis show that just two in six macroeconomic determinants are effective on the sovereign credit rating. According to the results of the study, external debt and inflation rate have a statistically significant relationship with the sovereign credit rating of Turkey. The outcomes show that external debt and the inflation rate have negative effects on the sovereign credit rating of the country. The coefficient of the external debt and the inflation is negative which means that if the inflation or external debt increases the rating decreases in appropriate with the theory. On the other hand, the effects of the other four macroeconomic variables are not significant. The results of the study indicate that some factors other than the primary macroeconomic determinants are effective on the sovereign credit ratings of Turkey. The results also unveil the door for the criticism that the decisions of the credit rating agencies are biased.

Keywords: *Sovereign risk, Sovereign credit rating, Credit rating agencies, Macroeconomic determinants, Turkey.*

Jel*: E02, F30, G20, G24, G29.*

Introduction

Sovereign risk is one of the main reference instruments considered by economic agents and governments to assess this risk. Sovereign risk is generated by the credit rating agencies to each country. There are few credit rating agencies specialized in providing ratings serve internationally. These credit rating agencies are Standard & Poor's, Fitch Ratings, Moody's, DBRS, China Chengxin, Dagong, JCR. Fitch Ratings, Moody's and Standard & Poor's are the three most prominent and considerable credit rating agencies.

Sovereign credit ratings receive significant interest in international financial markets. As a concentrated evaluation, sovereign credit rating is a key indicator of government's capability and willingness to service its public debt on time and in full. In short, the sovereign credit rating of a country indicates the risk level of the investment climate of the country. At the same time, the sovereign credit rating of a country is one of the most important indicators of the country's financial system development and openness. As a form of issuer credit ratings, the sovereign credit rating of a country (Dimitrijevic, et al., 2011; Standard & Poor's, 2018) is used by investors and economic agents when looking to invest in the country. Especially, the investors employ the ratings that are assigned by the credit rating agencies as a guiding indicator that states creditworthiness of countries.

The credit rating agencies use a host of variables in their assignment of sovereign credit ratings. The sovereign credit rating criteria include a combination of several quantitative and qualitative variables (Mellios and Paget-Blanc, 2006; Chee, Fah and Nassir, 2015). In the statements of the credit rating agencies on rating criteria, they take into account many economic, social, and political determinants that underlie their sovereign credit ratings.

The Standard & Poor's points model contains ten categories; however, it can be consolidated into five main categories (Canuto, Dos Santos, and de Sá Porto, 2012). These five broad categories that form the basis of sovereign credit rating analysis of Standard & Poor's are as follows (Dimitrijevic, et al., 2011):

- Institutional effectiveness and political risks,
- Economic structure and growth prospects,
- External liquidity and international investment position,
- Fiscal performance and flexibility, and debt burden,
- Monetary flexibility.

On the other hand, Moody's has over 50 indicators and ratios available. Many of these quantitative indicators and rates are used by Moody's sovereign risk analysts in the process of assigning and monitoring sovereign creditworthiness. The data falls into four key categories: economic structure

and performance; government finance; external payments and debt; and monetary, external vulnerability and liquidity indicators (Moody's, 2016).

The various macroeconomic indicators take significant weight in the points model of credit rating agencies. The Standard & Poor's takes into consideration the following fundamental macroeconomic indicators (Bhatia, 2002): nominal gross domestic product (GDP) per capita, real GDP per capita growth, the nominal central government result/GDP ratio, general net or consolidated debt/GDP, gross expenditure on interest/gross receipts, inflation measured by consumer price index, net external debt of the public sector/balance of payments current account receipts, and net external debt of the non-financial private sector/ balance of payments current account receipts. On the other hand, according to the results of a study (Mellios and Paget-Blanc, 2006), the essential determinants of the sovereign credit ratings provided by the three major rating agencies, Fitch Ratings, Moody's and Standard & Poor's, are GDP per capita, government income, real exchange rate changes, inflation rate and default history. In general, the relatively significant macroeconomic factors, which are cited in rating agency reports as determinants of sovereign ratings, are inflation rate, economic growth, foreign direct investment, external debt, current account debt and savings, real exchange rate, fiscal balance, foreign debt, public debt.

It can be mentioned from the three essential characteristics of sovereign credit ratings (Afonso, Gomes and Roter, 2011): First, sovereign credit ratings are one of the most crucial determinants of the interest rates a country faces in the international financial market and therefore of its borrowing costs. Second, sovereign credit ratings may have a limiting influence on the ratings assigned to domestic banks or corporations. Third, some institutional investors have lower bounds for the risk they can undertake in their investments. Therefore, those institutional investors prefer their bond portfolio composition taking into account the credit risk perceived by the rating notations.

Considering the essential characteristics of sovereign credit ratings, sovereign credit ratings can influence a country's cash flows, cost of capital, equity markets, and the power of its companies to increase capital on appropriate terms (Butler and Fauver, 2006).

This paper questions that the effects of the main macroeconomic determinants on the sovereign credit rating of Turkey assigned by Standard & Poor's. In order to distinguish the effect of economic and non-economic variables on the sovereign credit rating of Turkey, only economic variables are considered in this study. On the other hand, in this study, it is focused on only one credit rating agency, Standard & Poor's, in order to not mix data sources.

There has been an excessive foreign capital inflow to Turkey in 1989 after the liberalization of capital movements. On the other hand, Turkey began to borrow from the world money markets at the beginning of the 1990s. Consequently, the process of sovereign credit rating assessment of the

credit rating agencies to Turkey began in 1991. Therefore, the data related to Turkey in this study covers the post-1991.

1. Review of the Literature

There are different studies related to the relationship between determinants and sovereign credit ratings of countries. Some of those studies specifically examine the relationship between macroeconomic determinants and sovereign credit rating. Some of these studies and their findings are as follows:

Cantor and Packer (1996) use regression analysis to measure the relative significance of eight variables that are repeatedly cited in rating agency reports as determinants of sovereign credit ratings. They assess the individual and collective significance of our eight variables in determining September 29, 1995, ratings of the forty-nine countries. They found that of a large number of criteria used by Moody's and Standard & Poor's in their assignment of sovereign ratings, six factors appear to play a critical role in identifying a country's rating: GDP per capita, GDP growth, inflation, external debt, level of economic development, and default history. However, they did not find any systematical correlation between ratings and either fiscal or current deficits.

Butler and Fauver (2006) exercise a sample of 86 counties to analyze the cross-sectional factors of sovereign credit ratings. They explored that the quality of a country's legal and political institutions plays a crucial role in determining sovereign credit ratings.

Bissoondoyal, Bheenick et al. (2006) compares two alternative modelling approaches for the modelling of the determinants of sovereign ratings: The case-based reasoning (CBR) and the ordered probit approach. The models are used to produce forecasts for 2002 and a set of unrated countries. The two alternative techniques produce similar results regarding which variables are significant and forecast accuracy. According to the results of this study GDP and inflation are significant in determining the sovereign credit rating.

Mellios and Paget-Blanc (2006) investigate the determinants of the sovereign credit ratings provided by the three major credit rating agencies (Fitch Ratings, Moody's and Standard & Poor's). The data is composed of the credit ratings of 86 countries, 49 economic and political variables. In this study, a principal component analysis is used in order to identify the common factors affecting the sovereign credit ratings. The influence of the variables correlated with these factors on ratings is evaluated through linear regression modelling and ordered logistic modelling. According to the results of their study sovereign credit ratings are mainly affected by per capita income, government income, real exchange rate changes, inflation rate and default history.

Hilscher and Nosbusch (2010) examine the effects of macroeconomic fundamentals on emerging market sovereign credit spreads. They investigate the impact of country-specific fundamentals and global factors on sovereign debt prices for 31 emerging market countries between 1994-2007. Moreover, they analyze the effect of these macroeconomic variables on the probability of default, using data from 1970 to 2007. Hilscher and Nosbusch find that the volatility of terms of trade, especially, has a statistically and economically significant effect on spreads.

Afonso, Gomes and Roter (2011) study the determinants of sovereign debt ratings from the three main rating agencies (Fitch, Moody's, and Standard & Poor's) for the period 1995-2005. They use linear and ordered response models they employ a specification that allows them to distinguish between short and long-run effects, on a country's rating, of macroeconomic and fiscal variables. According to the results of their study, changes in GDP per capita, GDP growth, government debt, and government balance are important short-run determinants, whereas government effectiveness, external debt, foreign reserves and default history have a long-run impact on a country's credit rating.

Arefjevsand Brasliņš (2013) investigate the determinants of sovereign credit risk ratings of Latvia assigned by Moody's, Fitch and Standard & Poor's between 1997-2012. Conducted analysis of sovereign credit ratings, by using first, an alignment and transformation of the rating scales into values and second, ordinary least squares regression, indicates key rating determinants. They use both a linear and a logistic transformation of the rating levels. From the initial number of variables that can be used according to previous studies on the topic, GDP growth rate and unemployment are used in the model to explain the sovereign credit ratings of Latvia in that period. According to the results of the study, two macroeconomic variables, GDP growth and unemployment, have a high explanatory power on credit ratings of Latvia.

Chee, Fah and Nassir (2015) examine the determinants of sovereign credit rating. Their study includes 53 countries and covers the period of 2000-2011. They investigate the following macroeconomic variables: the ratio of external debt over export, external debt over GDP, foreign reserve over GDP, money supply over GDP, export over GDP; the growth rate of GDP deflator, real exchange rate, GDP per capita, real interest rate. In addition to nine macroeconomic variables, this study includes three additional quantitative variables: history of default, economic development and economic freedom. According to the results of the study, some macroeconomics variables are determinants of sovereign credit rating. Moreover, the economic freedom variable serves as a critical component in determining credit rating.

2. The Relationship between Macroeconomic Determinants and Sovereign Credit Rating of Turkey

2.1. Variables Used in the Model

In this study, the effect of the six macroeconomic determinants which are inflation, growth, foreign direct investment, external debt, current account debt and savings on credit note of Standard & Poor's were analyzed.

Table 1. Variables Used in The Model

Variable	Symbol of Variable
Credit Note of Standard & Poor's	SAP
Inflation	INF
Growth	GRW
Foreign Direct Investment	FDI
External Debt	EXD
Current Account Deficit	CAD
Savings	SAV

The series in the model have been selected as yearly periods from Turkish Central Bank databank, and they include the periods between the 1992 and 2016. Eviews 8.0 packet program was used for the analysis.

2.2. Stationarity of the Variables

To have significant results from the regression analysis, all the variables included in the model should be stationary. If the series are not stationary, the regression outcomes may be spurious that it cannot be accepted as statistically significant.

Table 2. Stationarity of The Variables

Variables	Without Trend					With Trend				
	τ	1%	5%	10%	Prob	τ	1%	5%	10%	Prob
Δ SAP	-3.86	-3.75	-3.00	-2.64	0.008	-4.40	-4.41	-3.62	-3.25	0.010
INF	-3.81	-3.81	-3.02	-2.65	0.010	-2.34	-4.50	-3.66	-3.27	0.398
Δ EXD	-4.64	-3.75	-3.00	-2.64	0.001	-4.53	-4.42	-3.62	-3.25	0.008
Δ CAD	-5.54	-3.77	-3.01	-2.64	0.000	-5.38	-4.44	-3.63	-3.25	0.001
GRW	-4.85	-3.74	-3.00	-2.64	0.001	-4.81	-4.53	-3.67	-3.28	0.006
Δ FDI	-4.29	-3.75	-3.00	-2.64	0.003	-4.19	-4.42	-3.62	-3.25	0.016
Δ SAV	-5.86	-3.75	-3.00	-2.64	0.000	-4.46	-4.57	-3.70	-3.29	0.012

Therefore, all variables were tested with Augmented Dickey-Fuller test whether they have unit root or not. 2 in 7 variables; inflation and growth are stationary at their level, but the others have unit root. According to unit root test, they are stationary at the level (I), so the first difference of them has been taken.

2.3. Correlation of the Variables

Correlation is a statistical relationship that can show whether and how close two variables are linearly related. Although it does not show the directions of the relationship between variables it verifies the existence of a relation.

Therefore, before regression analysis, the macroeconomic variables were checked whether they were correlated with the sovereign credit ratings or not.

Table 3. Correlation Between Macroeconomic Variables and The Credit Rating of Turkey

	Δ SAP	INF	GRW	Δ FDI	Δ EXD	Δ CAD	Δ SAV
Δ SAP	1	-0.56	0.53	-0.06	-0.56	-0.51	-0.004

Correlation of the macroeconomic variables with the sovereign credit rating is shown in table 2. The results show that the correlation coefficients of 4 macroeconomic variables among 6 are more than 0.50. Therefore, the direction of the relations and their significance are checked in next steps.

2.4. Granger Causality Test

Granger (1969) causality test identify whether there is causality between the variables and the direction of it. The causality between two variables such as x and y is formulated as follows;

$$y_t = a_0 + \sum_{i=1}^{n} \beta_i x_{t-i} + \sum_{i=1}^{n} a_i y_{t-i} + u_i \qquad (1)$$

$$x_t = \beta_0 + \sum_{i=1}^{n} a_i y_{t-i} + \sum_{i=1}^{n} \beta_i x_{t-i} + u_i \qquad (2)$$

α_0 and β_0 are the intercepts, α_i and β_i are the coefficients and μ is the error term in the equations.

Table 4. Pairwise Granger Causality Tests (Lag 2)

Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause SAP	23	8.11776	0.0031
SAP does not Granger Cause INF		0.0006	11.5764
GRW does not Granger Cause SAP	23	0.92529	0.4145
SAP does not Granger Cause GRW		0.8464	0.16828
FDI does not Granger Cause SAP	23	2.65249	0.0978
SAP does not Granger Cause FDI		0.1161	2.43301
EXD does not Granger Cause SAP	23	0.01932	0.9809
SAP does not Granger Cause EXD		0.7550	0.28545
CAD does not Granger Cause SAP	23	0.67754	0.5204
SAPdoes not Granger Cause CAD		0.7472	0.29618
SAV does not Granger Cause SAP	23	2.15371	0.1450
SAP does not Granger Cause SAV		0.1975	1.77707

According to Granger Causality Test, inflation has a causality on the credit note at the 0,3% level of significance level. However, there are no statistically significant relations between the credit note and the other macroeconomic variables at the 5% significance level.

2.5. Regression Model

The model used in this analysis is an ordinary least squares (OLS) which is a method for estimating the unknown parameters in a linear regression model. The OLS bases on minimizing the sum of square differences between the observed and predicted values. The OLS is formulated with p explanatory variables as follow;

$Y = \alpha_0 + \Sigma j=1..p\ \alpha jXj + \varepsilon$

Y is the dependent variable, α_0 is the intercept, X_j is an independent variable represents j'th variable (j= 1 to p), and ε is the random error.

OLS is formulated for this study as follow;

$$D(SAP)= \alpha_0 +\alpha_1\ INF+ \alpha_2\ \Delta\ EXD + \alpha_3\ \Delta\ CAD + \alpha_4\ GRW + \alpha_5\ \Delta\ FDI + \alpha_6\ \Delta\ SAV + DUMMY+ \varepsilon$$

At first lagged values of the variables were checked whether they were effective on the dependent variable or not, but their effects were not statistically significant, so they were not included in the model.

Also according to structural break tests, there was a structural break in the model for the year 2002, so the dummy variable was included in the model.

Table 5. Model Outcomes

Dependent Variable: D(SAP) Method: Least Squares Sample (adjusted): 1993-2016 Included observations: 24 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-0.192981	0.066103	-2.919402	0.0100
Δ EXD	-0.446325	0.198046	-2.253642	0.0386
Δ CAD	-0.093541	0.526772	-0.177575	0.8613
GRW	0.152950	0.351819	0.434739	0.6696
Δ FDI	-0.828797	1.265304	-0.655018	0.5218
Δ SAV	-0.234678	0.722220	-0.324940	0.7494
DUMMY	-9.251045	4.677131	-1.977932	0.0654
ε	11.75450	5.497516	2.138147	0.0483
R-squared	0.672844	Mean dependent var		-0.570833
Adjusted R-squared	0.529713	S.D. dependent var		5.343137
S.E. of regression	3.664189	Akaike info criterion		5.696293
Sum squared resid	214.8205	Schwarz criterion		6.088977
Log likelihood	-60.35551	Hannan-Quinn criter.		5.800472
F-statistic	4.700897	Durbin-Watson stat		2.052166
Prob(F-statistic)	0.004956			

The outcomes show that external debt and the inflation rate have negative effects on the sovereign credit rating of Turkey at 5% significance level. However, the effects of the other variables are not significant. The coefficient of the external debt and the inflation is negative which means that if the inflation or external debt increases the rating decreases in appropriate with the theory.

How close the data to the fitted regression line is shown by R-squared. The value of the R^2 for this model is 0,67 that means the model is good fitted.

Durbin Watson statistic is used to determine whether there is an autocorrelation in the residuals of the regression or not. When the value of the statistic is 2 or around, it is accepted that the residuals of the regression are not auto-correlated. Durbin Watson stat is 2,05, and the model is stable.

2.6. Residual Diagnostics

The significance of the model depends on the residual diagnostics. If the residuals of the model are not serially correlated, not under ARCH effect and normally distributed than the model is stable. That is why the residuals of the model were tested with Histogram Normality, Heteroscedasticity ARCH and Breusch-Godfrey Serial Correlation LM Tests.

Table 6. Heteroscedasticity Test: ARCH

F-statistic	0.213047	Prob. F(1,21)	0.6491
Obs*R-squared	0.230994	Prob. Chi-Square(1)	0.6308

The model should not be under ARCH effect for the model efficiency. When the squared residuals of the model exhibit autocorrelation than the model is under ARCH effect. According to ARCH test results, F statistic and its probability value reject the null hypothesis that the model is under the ARCH effect. Also, Chi-Square probability supports that the null hypothesis is rejected at the 63% significance level.

Another concern for the model efficiency is that the residuals of the model should not be serially correlated.

Table 7. Breusch-Godfrey Serial Correlation LM Test:

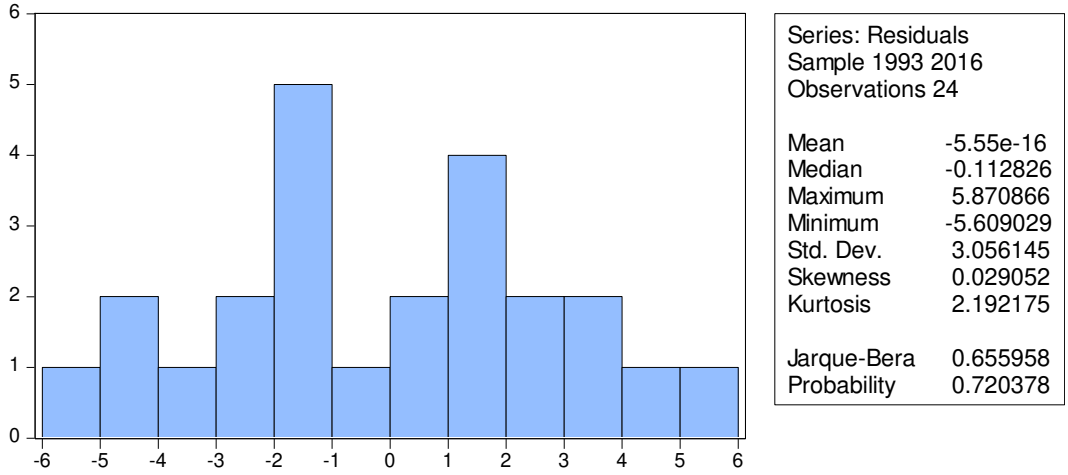
F-statistic	0.411935	Prob. F(2,14)	0.6701
Obs*R-squared	1.333854	Prob. Chi-Square(2)	0.5133

Breusch-Godfrey Serial Correlation LM Test results shown in Table 7 prove that the residuals of the model are not serially correlated. With its 51% significance level, Chi-Square probability supports the null hypothesis that the residuals of the model are not serially correlated.

2.7. Histogram Normality Test

Histogram Normality Test is used to check whether the residuals of the model are normally distributed or not.

Graph 1: Histogram Normality Test



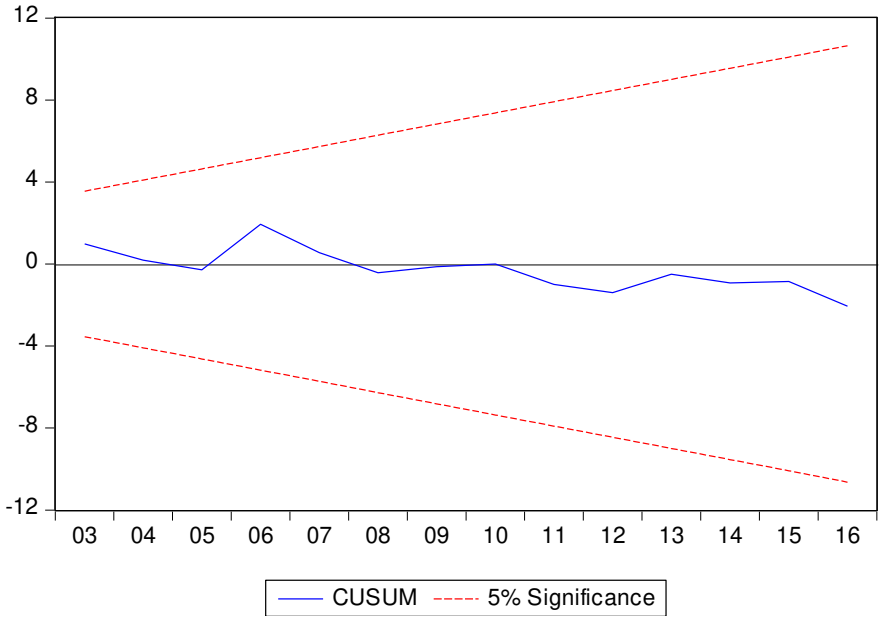
The null hypothesis claims that the residuals of the model are normally distributed. According to histogram normality test results shown in the graph 1, the null hypothesis is not rejected. Jarque-Bera statistic and the corresponding probability value verify the null hypothesis at the 72% level of significance.

2.8. Stability Diagnostics

Stability of the model was checked using the Chow breakpoint test, CUSUM and CUSUM Square tests. According to Chow breakpoint test, there was a structural break in 2002 at the 7% level of significance. CUSUM and CUSUM square tests supported the result. So dummy variable added to the model.

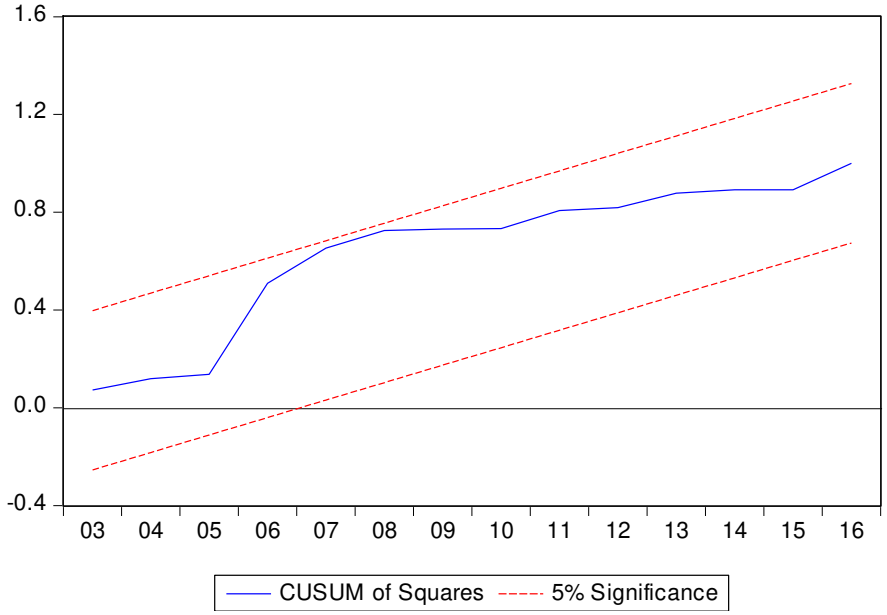
The model became stable after including the dummy variable in it.

Graph 2: CUSUM Test



CUSUM test is used to test the stability of model coefficients based on the cumulative sum of error terms. The blue line in the graph shows the CUSUM of the error terms and red lines are the thresholds. If the CUSUM line cross over the thresholds that there is a structural break in the model. CUSUM test results are shown in graph two display that the model is stable.

Graph 3: CUSUM Square Test



CUSUM Q test is another stability test to check how stable the model coefficients. It is based on the cumulative sum of squared residuals. In Graph 3, the blue line represents CUSUM of Squares,

and the red lines represent the thresholds. If the CUSUM of Squares cross over the thresholds than there is a structural break. According to CUSUM Q test results, CUSUM of Squares are inside of the threshold lines, so the model is stable.

Conclusion

There are many arguments on the decisions of the credit rating agencies when they are evaluating the economy of countries. Most of the critics are focused on that the sovereign credit ratings are politically biased and the macroeconomic determinants are not considered as good as rating agencies said.

In the Turkish case, the outcomes of the analysis show that the two macroeconomic determinants among six are effective on the sovereign credit ratings. According to the results of the study, external debt and inflation rate have a statistically significant relationship with the sovereign credit rating of Turkey. The outcomes show that external debt and the inflation rate have negative effects on the sovereign credit rating of the country. The coefficient of the external debt and the inflation is negative which means that if the inflation or external debt increases the rating decreases in appropriate with the theory. However, the remaining four macroeconomic variables are not statistically significant.

The results of the study indicate that other factors than the main macroeconomic determinants have an impact on the sovereign credit rating of Turkey.

The results, on the other hand, also open space to criticism that the decisions of the credit rating agencies are biased. Of course, there is a need for new studies to conclude that about the effects of non-macroeconomic indicators on sovereign credit ratings and whether the credit rating agencies are biased.

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