Determination of Sovereign Credit Rating Model for European Countries

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Abstract

Credit rating agencies play a key role in financial markets, as they help to reduce asymmetric information among market participants via credit ratings. The credit ratings determined by the credit rating agencies reflect the opinion of whether a country can fulfil the liability or its credit reliability at a particular time. Therefore, credit ratings are a very valuable tool, especially for investors. In addition, the issue that credit rating agencies are generally criticised is that they are unsuccessful in times of financial crisis. Credit rating methodologies of credit rating agencies have been subject to intense criticism, especially after the 2007/08 Global Financial Crisis. Some of the criticised issues are that credit rating agencies' methodologies are not transparent; they are unable to make ratings on time, and they make incorrect ratings. In order to create a more reliable credit rating methodology, the credit rating industry and the ratings determined by rating agencies need to be critically examined and further investigated in this area. For this reason, in this study credit rating model has been developed for countries. Supervisory and regulatory variables, political indicators and macroeconomic factors were used as independent variables for the sovereign credit rating model. As a result of the study, the new sovereign credit rating calculates exactly the same credit rating with Fitch Rating Agency for developed countries, but there are 1 or 2 points differences for developing countries. In order to better understand the reason for these differences, credit rating agencies need to make their methodologies more transparent and disclose them to the public.

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Introduction

The creditworthiness of a country varies according to the social, political and economic structure of that country. If a country that wants to borrow in the international market has a high credit rating, the country will have to pay low interest. The country with a low credit rating will have difficulty in selling its debt instruments, or the country will pay high interest when it wants to borrow in the international market. Thus, the borrowing cost of that country will be expensive (Ovali, 2014).

Economic and political risks are the main factors that have an impact on the country's credit rating (JCR Eurasia Rating, 2020). One of the factors that credit rating agencies consider when determining the credit rating of companies is the risk of the country where that company is located. Country credit ratings measure the country risk, that is, whether the relevant country can fulfil its external debt obligations. Whether a country can meet its external debt obligations depends on its domestic policies and international factors (Dimitrijevic and Beers, 2014).

S&P basically evaluates two different performances, which are the "political and economic profile" and the "flexibility and performance profile" of the country while determining a country's credit rating. Financial and monetary factors are used to determine the flexibility and performance profile, while economic and political factors are used to determine the political and economic profile. While its political and economic profile gives information about factors such as effective decision making, the resilience of the country's economy and the

strong structure of public institutions, its flexibility and performance profile provides information about factors such as financial balance and debt burden. These two factors are converted into a country credit rating by applying a confidential methodology (Ovali, 2014; Dimitrijevic and Beers, 2014).

Economic Factors

The ability of a country to pay its debt is calculated by using the macro and microeconomic indicators of that country. The strengths and weaknesses of countries' economies are evaluated with economic risk. According to Ovali (2014), variables such as the diversity of financial instruments that affect growth, income distribution, freedom in economic activities, efficient distribution of resources, sectoral differences, and diversity of borrowing channels should also be taken into account among economic factors. Although the economic factor variables used in-country credit rating differ according to the credit rating agency, the results of the variables give objective results because they are not open to interpretation.

JCR Eurasia credit rating agency (2020) uses variables such as GDP, balance of payments, industrial production index, manufacturing industry capacity utilisation rates, exports, inflation, consumer/producer price index, purchasing power parities, official international reserves, money supply to calculate economic risk. Moody's (2020) uses variables such as GDP growth, GDP, GDP per capita, inflation, government debt, investments, savings as economic factors. Fitch credit rating agency (2018) uses variables such as GDP growth, inflation, exchange rate, government debt, the balance of payments to calculate economic risk. S&P (2019) uses variables such as exports, borrowing, GDP, per capita GDP, GDP growth, official international reserves, the exchange rate to calculate economic risk.

The variables that are frequently used in calculating economic risk are GDP growth, GDP, GDP per capita, investments, savings, inflation, unemployment, government debt and current account balance (Afonso and Gomes, 2011; Canuto and Santos, 2019).

Politic Factors

Another important variable affecting country credit ratings is the political score. The political score has not got a relationship with any political system. A country's policies should promote economic growth while also contributing to the creation of sustainable public finances. The resistance of the implemented policies and the institutions in the country against the potential economic and political risks shows the political performance. In addition, the political score includes the reliability of institutions, their stance against potential risks, their transparency and their openness to audit (Dimitrijevic and Beers, 2014).

The political situation of the countries affects the ability of the countries to pay their debts. The political situation of a country is affected by variables such as war, occupations, internal revolts, political frictions, economic conflicts of interest, different ideological structures, regionalism, the country's commitment to its foreign obligations, its relations with its neighbours and its international security. In other words, there is a relationship between political risk and default (Iyengar, 2012). The variables calculated by the World Bank (2019) to measure the political risk of countries are government accountability, government stability, government effectiveness, the rule of law, anti-corruption and regulatory quality.

In recent years, evaluation of the effectiveness of credit ratings given by credit rating agencies has gained importance. In addition, the analysis of country credit rating determinants and the researches on their effects have gained special importance as investors take these ratings into account. Since a country's institutions and policies have very important effects on financial markets and economic development, first of all, country credit rating models need to be estimated. Since the economic situations of the countries are different, the financial sectors also differ. Therefore, credit rating agencies are needed to understand the developments and differences in the financial sector in countries and how these differences affect financial development (Kim and Wu, 2008).

Literature Review

Afonso et al. (2007) attribute the importance of investigating the accuracy of sovereign credit ratings to many reasons. First, credit ratings are a key determinant of the interest rates and borrowing costs a country will face in the international financial market. The second reason is that country credit ratings are also highly influential on ratings given to national banks or firms. The third and most important reason is that it eliminates the lack of information for investors.

GDP, GDP growth and GDP per capita variables are the most common variables used to determine country credit ratings. Generally, credit ratings given to countries between certain years by Moody's, S&P and Fitch are used in the studies to determine country credit ratings (Butler and Fauver, 2006; Kim and Wu, 2008; Canuto and Santos, 2019). It is stated that there is a positive relationship between GDP, GDP growth and GDP per capita variables and country credit ratings. Among these three variables, it is seen that the most important variable affecting country credit ratings is GDP per capita.

The government's gross debt, external debt and inflation are other important variables used in determining country credit ratings (Panizza, 2017). A country's high inflation rate and an increase in debt cause a decrease in its credit rating. The relationship between investments and country credit ratings has been examined by Cruces (2006). In this study, it has been revealed that credit ratings eliminate asymmetric information. More frequent credit ratings are recommended to keep the credit rating up to date. Because the credit ratings given to the countries are not valid in a future time period, so the credit ratings should be re-evaluated over time.

Country credit ratings provide investors or lenders with valuable information about the level of risk in foreign countries. In Chen's et al. (2013) study, investors rely heavily on the official credit ratings published. In general, countries' credit ratings provide an independent assessment of credit risks and help investors obtain a more realistic picture. Investors tend to underestimate the level of risk in countries due to psychological factors, so an independent credit rating is very important for investors. This is supported by studies by Iyengaar (2012), Cavallo et al. (2012). According to these studies, country credit ratings support reliability and, at the same time, reduce asymmetric information in the market. As a result, it is emphasised that countries with high credit ratings generally have better macroeconomic variables than countries with low credit ratings. Major changes in macroeconomic factors cause country credit ratings to change.

Macroeconomic variables alone are not sufficient to determine country credit ratings. In addition to macroeconomic variables, political variables and supervisory and regulation variables are also explored. Country credit ratings affect capital flows and developments in the financial sector. It has been proven that a country's credit ratings increase when the rule of law is valid when corruption is successfully combated, and when political stability is achieved (Butler and Fauver, 2006; Kim and Wu, 2008). However, it was emphasised that another factor affecting country credit ratings is regional differences.

The studies of Barth (2001), Kaufmann (2009) and Kanli (2017) show that supervisory and regulatory variables, political variables and macroeconomic variables should be used for country credit rating.

The study conducted by Cantor and Packer (1996), it was tried to create a credit rating model by using mostly economic factors. Canuto and Santos (2019), on the other hand, improved Cantor and Packer's (1996) work by adding per capita income, economic growth, inflation, external debt and gross government debt. Similarly, in the study by Afonso and Gomes (2011), GDP per capita changes, GDP growth, government debt, current account balance, government efficiency, external debt and foreign reserves were used as determinants of country credit ratings.

Methodology

The data sources of this study form the basis for the creation of a suitable data set to predict country credit ratings for countries between 2010-2018. The main objective of this study is to conduct a detailed examination of country-level data and country ratings. A country credit rating model was created using these data sets. Country credit ratings were calculated through this model.

In this study, the dependent variable was estimated with more than two independent variables. In other words, in this study, there are more than two groups, and the relationship between numerical data is investigated. Therefore, ANOVA analysis is suitable for this study. Linear regression is suitable for the generalisation of the collected data. A regression model is defined as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1_{it}} + \beta_2 X_{2_{it}} + \ldots\ldots + \beta_k X_{k_{it}} + \varepsilon_{it1} \tag{1}$$

The given equation contains several cross-section units (n=1,2,3...,N) observed at different time periods (T= 1, 2, 3….,T), thus representing a panel data set. Y_{it} is the dependent variable which is the credit ratings of the countries. $X_{1_{it}}$ represents the independent variables used for credit rating of countries.

We can construct the linear regression for the country and bank credit rating prediction model as follows:

Sovereign Credit Rating Equation:

$$\text{Supervisory and Regulatory Score} = \beta_0 + \sum_{i=1}^{8} \beta_i X_i + \varepsilon_{it}, \qquad (2)$$

$$\text{Politic Score} = \beta_0 + \sum_{i=1}^{6} \beta_i Y_i + \varepsilon_{it}, \qquad (3)$$

$$\text{Macroeconomic Variables Score} = \beta_0 + \sum_{i=1}^{9} \beta_i Z_i + \varepsilon_{it}, \qquad (4)$$

X_i = Supervisory and Regulatory Variables,

Y_i = Politic Variables,

Z_i = Macroeconomic Variables,

ε_{it} = Error term,

β = Constant

Sovereign Credit Rating=

$$\frac{\textbf{Supervisory and Regulatory Score } + \textbf{ Politic Score } + \textbf{ Macroeconomic Variables Score}}{\textbf{3}}$$

Country Data Sources and Credit Ratings

The variables in our study were collected from different data sources. For the country credit rating model, country credit rating was used as the dependent variable, supervisory-regulatory, political and macroeconomic variables were used as independent variables. The ratings of the Fitch credit rating agency were used to collect the country credit ratings. The reason for choosing the Fitch credit rating agency is that it publishes credit ratings more frequently than Moody's and S&P, and data is easier to access. The World Bank Regulatory and Supervision database was used for regulatory variables, the International Monetary Fund database for various macroeconomic variables, and the World Bank databases for political variables.

Table 1 shows the credit ratings used by Fitch and its explanation.

Table 1. Credit Ratings and Its explanations by Fitch Credit Rating Agency

Fitch Credit Score	Explanation
AAA	Highest Ranked Score
AA+	High Score
AA	High Score
AA-	High Score
A+	Above Average Score
A	Above Average Score
A-	Above Average Score
BBB+	Below Average Score
BBB	Below Average Score
BBB-	Below Average Score
BB+	No Investment – Speculative
BB	No Investment – Speculative
BB-	No Investment – Speculative
B+	High Speculative
B	High Speculative
B-	High Speculative
CCC+	Significantly Risky
CCC	Extremely Risky
CCC-	Very Close to Sinking
CC	Very Close to Sinking
C	Very Close to Sinking
DDD	In the Sinking Process
DD	In the Sinking Process

Source: Fitch Credit Rating Agency, 2018.

Since the credit scores in Table 1 are not numerical data, these data must first, this data must be converted into numerical data in order to be analysed. The conversion of credit ratings to numerical data is shown in Table 2.

Table 2. Converting Credit Ratings to Numerical Data

Fitch Credit Score	Numerical Data	Explanations
AAA	21	Highest Ranked Score
AA+	20	High Score
AA	19	High Score
AA-	18	High Score
A+	17	Above Average Score
A	16	Above Average Score
A-	15	Above Average Score
BBB+	14	Below Average Score
BBB	13	Below Average Score
BBB-	12	Below Average Score
BB+	11	No Investment – Speculative
BB	10	No Investment – Speculative
BB-	9	No Investment – Speculative
B+	8	High Speculative
B	7	High Speculative
B-	6	High Speculative
CCC+	5	Significantly Risky
CCC	4	Extremely Risky
CCC-	3	Very Close to Sinking
CC	2	Very Close to Sinking
C	1	Very Close to Sinking
DDD	0	In the Sinking Process
DD	0	In the Sinking Process

Source: Created by author, 2020.

According to Table 2, numerical values vary between 21 and 0 points. 21 points correspond to the highest rating, AAA credit rating. As the credit score decreases, the numerical score also decreases. The DDD/DD grade given to banks in the process of going bankrupt corresponds to 0 points. Country credit ratings will be analysed by converting them to the numerical data in Table 2.

This study focuses on 9 years of data (2010-2018). These years have been chosen in terms of accessibility to the data to be used for the credit rating model. Especially since the access to most of the data during 2007/08 Global Financial Crisis was limited, 2010 was chosen as the starting year.

Supervisory and Regulatory Variables

The regulatory and supervisory variables for this study were established using the World Bank Regulation and Supervision database (2020), based on the work of Barth et al. (2001). The supervisory and regulatory variables consist of the independent variables in Table 3. The Bank Regulation and Supervision Survey conducted by the World Bank is a unique source of comparable data on how banks are regulated and supervised around the world. The Bank Regulation and Supervision Survey have been conducting by the World Bank since 2001. Therefore, it is possible to examine the latest state of banking regulations and supervision in a wide variety of countries and to compare them with the situation during the crisis. Usually, the respondents are senior bank supervisors. The survey was generally prepared for the head of banking supervision at the central bank or the head of a separate banking supervisory agency. In some countries, responses are answered directly from the head of an audit, in others by senior staff appointed by the head of the audit.

Table 3 shows the method for calculating the supervisory and regulatory variables.

Table 3. Regulatory and Supervisory Variables and Calculation Method

Regulatory and Supervisory Variables	No of Question	Calculation Method
Capital Criteria (CaR)	8	Yes=1, No=0 - Total Score
Banking Entry Criteria (BankEnt)	8	Yes=1, No=0 - Total Score
External Audit Criteria (ExAu)	8	Yes=1, No=0 - Total Score
Internal Audit Criteria (InAu)	2	Yes=1, No=0 - Total Score
Restriction of Banking Activities (BankAct)	4	Unrestricted=1, Allowed=2, Limited=3, Prohibited=4 - Average Score
The Necessity of Increasing the Level of Accounting and Transparency (AccTr)	8	Yes=1, No=0 - Total Score
Liquidity Criteria (Liq)	13	Yes=1, No=0 - Total Score
Legal Power of the Supervisory Body (PowSu)	14	Yes=1, No=0 - Total Score

Source: World Bank, 2019.

Regulatory and supervisory scores are established by the World Bank. The creation of these scores is based on the survey method. The number of questions asked by the World Bank for each variable is shown in Table 3. Scoring is formed by giving 1 point if the answer to the questions asked is yes, and 0 points if no. At the end of the questionnaire, all scores are summed, and thus the score for each variable is obtained. However, the average score is calculated only for the variable of restriction of banking activities.

Political Variables

Kaufmann et al. (2009) define government as customs practised authority in a country. Management is very effective in the election, monitoring and change processes of governments, in the effective implementation of sound policies by governments, in ensuring respect for institutions that manage economic and social interaction, citizens and the state.

The policies implemented by a country have a significant impact on the stability of the banking system. In order to determine the impact of these indicators, political variables were included in the study by using the World Bank Management Indicators Database. These indicators have also been used by Kaufmann et al.

The World Bank has been evaluating country policies for more than 200 countries since 1996. After collecting data from more than 30 data sources, scaling is done using a statistical model known as the unobserved components model.

The calculation method of political variables is explained in Table 4.

Table 4. Political Variables and Calculation Method

Variables	Calculation Method
Accountability (Acc)	From -2.5 to +2.5 – the larger number indicates strong management.
Political Stability (PolSt)	From -2.5 to +2.5 – the larger number indicates strong management.
State Effectiveness (GovEf)	From -2.5 to +2.5 – the larger number indicates strong management.
Regulatory Quality (RegQu)	From -2.5 to +2.5 – the larger number indicates strong management.
Rule of Law (Law)	From -2.5 to +2.5 – the larger number indicates strong management.
Anti-Corruption (AnCor)	From -2.5 to +2.5 – the larger number indicates strong management.

Source: World Bank, 2019.

The scores of the political variables are calculated by the world bank. Scoring is between -2.5 and +2.5. +2.5 indicates strong management, while -2.5 indicates weak management (World Bank, 2019).

Accountability reflects perceptions of a citizen's ability to participate in general elections, freedom of expression, freedom of association d a free media.

Political stability indicates the policies implemented by the government to ensure political stability.

The effectiveness of the state measures the quality of public services, the degree of independence from political pressures, the quality of policy making and implementation, and the credibility of the government's adherence to these policies.

Regulatory quality measures the perceived ability of the government to create and enforce sound policies and regulations that enable and encourage private sector development.

The rule of law measures perceptions of trusting and obeying the rules of society, and in particular the quality of their enforcement, property rights, the police, the courts, as well as the probability of crime and violence.

The fight against corruption measures perceptions of the extent to which public power is used for private gain, including both minor and major forms of corruption, as well as the takeover of the state by elites and private profiteers.

Macro-Economic Factors

The macroeconomic indicators of this study are based on the literature and the factors used by credit rating agencies. Table 5 shows the detailed calculation method of the macroeconomic variables that will be examined in the study.

Table 5. Macroeconomic Indicators and Calculation Method

Variables	Calculation Method
Real GDP Growth (RGDP)	Annual change in the gross domestic product (at constant prices)
GDP	GDP in US dollars (current prices, national currency)
GDP Per Capita (GDPPC)	Gross domestic product per capita in US dollars (current prices, national currency)
Investments (Inv)	Gross capital formation as a percentage of GDP at market prices
Savings (Sav)	Gross national savings as a percentage of GDP
Inflation (Inf)	Annual percentage of average consumer price index
Unemployment rate (UnEmp)	Unemployment as a percentage of the total workforce
Net Debt of the State (GovDe)	General net government debt as a percentage of GDP
Current Account Balance (AccBal)	Current account balance as a percentage of GDP

Source: Created by author, 2020.

Macroeconomic variables were collected using the IMF's database.

Findings

In this section, the country credit rating model will be discussed. STATA 16 statistical software program was used to analyse country credit ratings.

Pearson Correlation Coefficients

In this section, the correlation between all variables in the country rating dataset will be discussed. Table 6 shows the Pearson correlation analysis for all countries included in our study.

Table 6. Pearson Correlation Coefficients Between Country Rating Data

	CR	CaR	AccTr	BankAct	ExtAu	BankEnt	PowSu	Liq	IntAu
CR	1	-0.153	-0.059	-0.348**	-0.417**	-0.571**	-0.449**	0.480**	0.012
CaR	-0.153	1	0.331**	0.02	0.437**	0.413**	0.636**	-0.07	-0.249**
AccTr	-0.059	0.331**	1	0.112	-0.397**	-0.074	-0.086	-0.241**	-0.490**
BankAct	-0.348**	0.02	0.112	1	-0.145	0.097	-0.136	-0.497**	-0.022
ExtAu	-0.417**	0.437**	-0.397**	-0.145	1	0.534**	0.712**	0.179	0.298**
BankEnt	-0.571**	0.413**	-0.074	0.097	0.534**	1	0.475**	-0.151	0.362**
PowSu	-0.449**	0.636**	-0.086	-0.136	0.712**	0.475**	1	0.024	0
Liq	0.480**	-0.07	-0.241**	-0.497**	0.179	-0.151	0.024	1	0.18
IntAu	0.012	-0.249**	-0.490**	-0.022	0.298**	0.362**	0	0.18	1

*. Corr. < 0.05

**. Corr. < 0.01

CR: Country Credit Rating

CaR: Capital Requirements

AccTr: Accounting and Transparency

BankAct: Banking Activity Restrictions

ExtAu: External Audit

BankEnt: Banking Entry Criteria

PowSu: Legal Power of the Supervisory Body

Liq: Liquidity Criteria

IntAu: Internal Audit

	CR	Acc	PolSt	GovEf	RegQu	Law	AnCor
CR	1	0.689**	0.615**	0.842**	0.871**	0.843**	0.867**
Acc	0.689**	1	0.930**	0.848**	0.833**	0.881**	0.819**
PolSt	0.615**	0.930**	1	0.797**	0.745**	0.814**	0.747**
GovEf	0.842**	0.848**	0.797**	1	0.936**	0.972**	0.970**
ReqQu	0.871**	0.833**	0.745**	0.936**	1	0.945**	0.940**
Law	0.843**	0.881**	0.814**	0.972**	0.945**	1	0.961**
AnCor	0.867**	0.819**	0.747**	0.970**	0.940**	0.961**	1

*. Corr. < 0.05

**. Corr. <0.01

CR: Country Credit Rating

Acc: Accountability

PolSt: Political Stability

GovEf: Government Effectiveness

ReqQu: Regulatory Quality

Law: Rule of Law

AnCor: Anti-Corruption

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	CR	**RGDP**	**GDP**	**GDPPC**	**INV**	**SAV**	**INF**	**UNEMP**	**GOVDE**	**ACCBAL**
CR	1	0.226*	0.349**	0.771**	0.379**	0.646**	-0.232*	-0.763**	-0.660**	0.547**
RGDP	0.226*	1	0.068	-0.022	0.583**	0.414**	0.353**	-0.363**	-0.524**	0.063
GDP	0.349**	0.068	1	0.063	-0.112	-0.039	-0.042	-0.214*	-0.060	0.040
GDPPC	0.771**	-0.022	0.063	1	0.206*	0.662**	-0.454**	-0.630**	-0.493**	0.712**
Inv	0.379**	0.583**	-0.112	0.206*	1	0.665**	0.510**	-0.460**	-0.761**	0.050
Sav	0.646**	0.414**	-0.039	0.662**	0.665**	1	-0.033	-0.609**	-0.791**	0.779**
Inf	-0.232*	0.353**	-0.042	-0.454**	0.510**	-0.033	1	-0.057	-0.265**	-0.475**
Unemp	-0.763**	-0.363**	-0.214*	-0.630**	-0.460**	-0.609**	-0.057	1	0.636**	-0.429**
GovDe	-0.660**	-0.524**	-0.060	-0.493**	-0.761**	-0.791**	-0.265**	0.636**	1	-0.419**
AccBal	0.547**	0.063	0.040	0.712**	0.050	0.779**	-0.475**	-0.429**	-0.419**	1

*. Corr. < 0.05

**. Corr. < 0.01

CR: Country Credit Rating

RGDP: Reel GDP

GDP: Gross National Product

GDPPC: GDP per Capita

Inv: Investment

Sav: Savings

Inf: Inflation

Unemp: Unemployment

GovDe: Government Debt

AccBal: Account Balance

Source: Created by author with SPSS, 2020.

When the Regulatory and Controlling variables are examined, 5 out of 8 variables give statistically significant results. These variables are restriction of banking activities, external audit criteria, banking entry criteria, legal power of supervisory institutions and liquidity criteria. There is a negative correlation between banking entry requirements and country score. When the banking entry criteria increase by 1 unit, the country score decreases by 0.57 units. There is a positive correlation between the liquidity criteria and the country score. In this case, a 1 point increase for liquidity criteria raises the country score by 0.48 units. It is seen that there is a negative correlation between the legal strength of the supervisory institutions (-0.44), the external audit requirement (-0.41) and the restriction of banking activities (-0.34) and the country score.

Accountability, political stability, government effectiveness, regulatory quality, rule of law and anti-corruption variables used for political indicators all yielded statistically significant results. There is a positive correlation between political variables and country score. The strongest correlation with 0.87 belongs to the moderator quality variable. This shows that when countries increase the quality of the policies they will implement to encourage the private sector and increase investments by 1 unit, the country score also increases by 0.87 units. Our second important variable is the fight against corruption. A 1-unit increase by governments in their fight against corruption increases the country score by 0.86. The rule of law and a 1 unit increase in the government's efficiency will increase the country score by 0.84 units. An increase of 1 unit in accountability and political stability will increase the country score by 0.68 and 0.61 units, respectively.

When macroeconomic factors are examined, it is seen that GDP growth, GDP, GDP per capita, investments, savings, inflation, unemployment, government debt and current account variables all give statistically significant results. It has been revealed that the most important macroeconomic variable affecting the country score is GDP per capita. 1 unit increase in GDP per capita increases the country score by 0.77 units. On the other hand, when there is an increase of 1 unit in unemployment, the country score decreases by 0.76 units. At the same time, every 1 unit of increase in government debt reduces the country score by 0.66. There is a positive correlation between savings, countries' current account surplus, investments, GDP, Real GDP and country score, and each 1 unit increase increases the country score by 0.64, 0.54, 0.37, 0.34 and 0.22 units, respectively. On the other hand, every 1 unit increase in inflation reduces the country score by 0.23 units.

ANOVA Analysis

In this section, the results of ANOVA analysis for supervisory and regulatory variables, political variables and macroeconomic variables will be discussed. Table 7 shows the results of the Anova analysis for the controlling and regulatory variables.

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Table 7. ANOVA Analysis Results – Regulatory and Supervisory Variables

MODEL SUMMARY				
Model	R	R Sq.	Adj. R Sq.	St Er.
1	.895[a]	0.801	0.787	2.197

a. Predicted: (Constant), CaR,, AccTr, BankAct, ExtAu, BankEnt, PowSu, Liq,, IntAu

ANOVA[a]					
Model	Sum of Square	df	Mean Sq.	F	Sig.
1 Regression	2102.342	8	262.793	54.453	.000[b]
Residual	521.214	108	4.826		
Total	2623.556	116			

a. Dependent Variable: Country Credit
b. Predicted.: (Constant), CaR,, AccTr, BankAct, ExtAu, BankEnt, PowSu, Liq,, IntAu

COEFFICIENT[S]					
Model	Non-Standard Coefficients		Standard Coefficients	t	Sig.
	B	Std. Err.	Beta		
1 (Constant)	35.508	3.779		9.397	0.000
CaR*	2.195	0.216	0.715	10.162	0.000
AccTr*	-1.649	0.317	-0.319	-5.199	0.000
BankAct*	-2.048	0.416	-0.249	-4.920	0.000
ExtAu*	-2.428	0.376	-0.508	-6.463	0.000
BankEnt*	-1.503	0.195	-0.472	-7.711	0.000
PowSu*	-0.933	0.177	-0.386	-5.275	0.000
Liq*	0.885	0.154	0.306	5.753	0.000
IntAu*	3.029	0.600	0.295	5.048	0.000

a. Dependent Variable: Country Credit Ratings

Source: Created by author with SPSS, 2020.

Anova analysis shows that the results are statistically significant (sig. 0.000). All of the supervisory and regulatory variables we used for country credit rating gave statistically significant results. Therefore, all of hese variables should be included in the model to be created to determine the credit rating of countries. According to the results of ANOVA analysis of supervisory and regulatory variables, countries that are successful in internal auditing and have high capital and liquidity criteria will have higher country credit scores. Restriction of banking activities and increase in external audit requirement are the two most important factors that decrease the credit score of the country.

As a result, we can calculate the score of the supervisory and regulatory variable for the country credit rating model with the following equation (SRS = Supervisory and Regulatory Score):

$$SRS = 35.508 + 2.195\ CaR - 1.649\ AccTr - 2.048\ BankAct - 2.428\ ExtAu - 1.503\ BankEnt - 0.933\ PowSu + 0.885\ Liq + + 3.029\ IntAu \tag{5}$$

Table 8 shows the results of the ANOVA analysis of the political variables that will be used for the country credit rating model.

Table 8. The Results of the ANOVA Analysis – Politic Variables

MODEL SUMMARY				
Model	R	R sq.	Adj. R sq.	Std. Err.
1	.888[a]	0.788	0.775	2.30568

a. Predicted: (Constant), Acc, PolSt, GovEf, ReqQu, Law, AnCor

ANOVA[a]					
Model	Sum of Sq.	df	Mean Sq.	F	Sig.
1 Regression	1916.168	6	319.361	60.074	.000[b]
Residual	515.668	97	5.316		
Total	2431.837	103			

a. Dependent VAriable: Country Credit Rating
b. Predicted: (Constant), Acc, PolSt, GovEf, ReqQu, Law, AnCor

COEFFICIENT[S]					
Model	Non-Standard Coefficients		Standard Coefficients	t	Sig.
	B	Std. Err	Beta		
1 (Constant)	9.290	1.361		6.828	0.000
Acc	-1.828	1.572	-0.189	-1.163	0.248
PolSt	0.008	0.932	0.001	0.009	0.993
GovEf	-0.908	2.105	-0.106	-0.432	0.667
ReqQu*	5.237	1.441	0.570	3.635	0.000
Law	0.830	1.863	0.112	0.446	0.657
AnCor*	2.914	1.325	0.480	2.199	0.030

a. Dependent Variable: Country Credit Rating

Source: Created by author with SPSS, 2020

The results of the ANOVA analysis of the political variables are statistically significant (sig. 0.000). Statistically significant variables for the country credit rating model are anti-corruption and regulatory quality. Other variables did not yield statistically significant results to explain our model. According to these results, governments that make policies that encourage the private sector and support investments and ensure the healthy functioning of these policies will have high country credit scores. However, governments must effectively fight corruption in order to increase the country's credit score.

The score of the political variable in our country credit rating model can be calculated with the following equation (PS = Political Score):

$$\textbf{PS} = 9.290 + 5.237\ RegQu + 2.914\ AnCor \tag{6}$$

Table 9 shows the results of ANOVA analysis for Macroeconomic variables.

Table 9. ANOVA Analysis Results - Macroeconomic Variables

MODEL SUMMARY				
Model	**R**	**R Sq.**	**Adj. R Sq.**	**Std. Err.**
1	.915[a]	0.837	0.824	1.99751
a. Predicted: (Constant), RDGP, GDP, GDPPC, Inv, Sav, Inf, UnEmp, GovDe, AccBal				

ANOVA[a]						
Model	**Sum of Sq.**	**df**	**Mean Sq.**	**F**	**Sig.**	
1 Regression	2196.621	9	244.069	61.170	.000[b]	
Residual	426.935	107	3.990			
Total	2623.556	116				
a. Dependent Variable: Country Credit Rating						
b. Predicted: (Constant), RDGP, GDP, GDPPC, Inv, Sav, Inf, UnEmp, GovDe, AccBal						

COEFFICIENT[A]					
Model	**Non-Standard Coefficients**		**Standard Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
1 (Constant)	16.510	2.654		6.221	0.000
RGDP	-0.061	0.102	-0.033	-0.596	0.552
GDP*	0.001	0.000	0.248	5.839	0.000
GDPPC*	0.083	0.023	0.305	3.546	0.001
Inv	1.525	1.967	1.399	0.775	0.440
Sav	-1.415	1.958	-2.080	-0.723	0.471
Inf*	-0.522	0.134	-0.271	-3.898	0.000
UnEmp*	-0.256	0.051	-0.322	-4.977	0.000
GovDe*	-0.038	0.009	-0.347	-4.129	0.000
AccBal	1.325	1.958	1.460	0.677	0.500
a. Dependent Variable: Country Credit Rating					

Source: Created by author with SPSS, 2020.

The results of the ANOVA analysis of macroeconomic variables were found to be statistically significant (sig. 0.000). According to these results, the variables found to be statistically significant are gross domestic product, gross domestic product per capita, inflation, unemployment and government debt. Countries with high gross domestic product and per capita GDP have higher credit ratings. On the other hand, in periods when government debts rise, unemployment and inflation increase, the credit scores of countries decrease.

The score of the macroeconomic variables included in the country credit rating can be calculated with the following equation (MES = Macro Economic Score):

$$\textbf{MES} = 16.510 + 0.001\ GDP + 0.083\ GDPPC - 0.522\ Inf - 0.256\ UnEmp - 0.038\ GovDe \tag{7}$$

Implementation of the Country Credit Rating Model

In this section, first, the country credit rating model will be discussed as a whole, and then the sample country credit rating score will be calculated for three countries with high, medium and low scores by Fitch. According to the results of the ANOVA analysis, the analysis results of the variables we use for country credit rating are statistically significant. This result shows that linear regression is a suitable model for country credit rating.

In our research, country credit ratings are calculated through supervisory and regulatory variables (SRS), political (PS) variables, and macroeconomic (MES) variables. According to the ANOVA analysis, the linear regression is suitable for the country credit rating model. Thus, the country credit rating equation can be written as:

$$\text{Country Credit Rating} = \frac{SRS + PS + MES}{3}$$

$$SRS = 35.508 + 2.195\,CaR - 1.649\,AccTr - 2.048\,BankAct - 2.428\,ExtAu - 1.503\,BankEnt - 0.933\,PowSu + 0.885\,Liq + 3.029\,IntAu \tag{8}$$

$$PS = 9.290 + 5.237\,RegQu + 2.914\,AnCor \tag{9}$$

$$MES = 16.510 + 0.001\,GDP + 0.083\,GDPPC - 0.522\,Inf - 0.256\,UnEmp - 0.038\,GovDe \tag{10}$$

The result of this equation will show the country credit rating score. The country credit rating score will be between 0 and 21 points. The country score and the explanation of the corresponding score are shown in table 10.

Table 10. Country Ratings and Explanation

Country Credit Score	Explanation
21	Highest Ranked Score
20	High Score
19	High Score
18	High Score
17	Above Average Score
16	Above Average Score
15	Above Average Score
14	Below Average Score
13	Below Average Score
12	Below Average Score
11	No Investment – Speculative
10	No Investment – Speculative
9	No Investment – Speculative
8	High Speculative
7	High Speculative
6	High Speculative
5	Significantly Risky
4	Extremely Risky
3	Very Close to Sinking
2	Very Close to Sinking
1	Very Close to Sinking
0	In the Sinking Process

Source: Fitch Credit Rating Agency, 2018.

When the data of 2010 in table 11 of Germany, which received the highest score, Turkey, and Greece, which received the lowest score, were calculated with the new country credit rating model, the results in table 11 emerged.

Table 11. Country Data for 2010

Değişken	Germany	Turkey	Greece
CaR	5	8	4
AccTr	7	6	6
ExtAu	2	3	2
BankAct	6	8	8
BankEnt	3	8	6
PowSu	6	8	8
Liq	11	9	10
IntAu	2	2	2
RegQu	1.57	0.30	0.64
AnCor	1.78	0.03	-0.06
GDP	3423.466	772.290	299.919
GDPPC	42.641	10.476	26.972
Inf	1.16	8.57	4.70
UnEmp	6.93	11.13	12.73
GovDe	60.90	34.90	148.33

Source: Created by author, 2020.

Germany:

$$SRS = 35.508 + 2.195\ CaR – 1.649\ AccTr – 2.048\ BankAct – 2.428\ ExtAu - 1.503\ BankEnt - 0.933\ PowSu + +0.885\ Liq + 3.029\ IntAu \qquad (11)$$

$$DDP = 35.508 + 2.195\ x\ 5 – 1.649\ x\ 7 – 2.048\ x\ 6 – 2.428\ x\ 2 - 1.503\ x\ 3 - 0.933\ x\ 6 + 0.885\ x\ 11 + 3.029\ x\ 2 = \mathbf{22} \qquad (12)$$

$$PS = 9.290 + 5.237\ RegQu + 2.914\ AnCor \qquad (13)$$

$$P = 9.290 + 5.237\ x\ 1.57 + 2.914\ x\ 1.78 = \mathbf{23} \qquad (14)$$

$$MES = 16.510 + 0.001\ GDP + 0.083\ GDPPC – 0.522\ Inf – 0.256\ UnEmp - 0.038\ GovDe \qquad (15)$$

$$ME = 16.510 + 0.001\ x\ 3423.466 + 0.083\ x\ 42.641 – 0.522\ x\ 1.16 – 0.256\ x\ 6.93 - 0.038\ x\ 60.90 = \mathbf{19} \qquad (16)$$

Country Credit Rating for Germany $= \frac{DD+P+ME}{3} = \frac{22+23+19}{3} = \mathbf{21\ (AAA)}$

Turkey:

$$SRS = 35.508 + 2.195\ CaR – 1.649\ AccTr – 2.048\ BankAct – 2.428\ ExtAu - 1.503\ BankEnt - 0.933\ PowSu + +0.885\ Liq + 3.029\ IntAu \qquad (17)$$

$$DDP = 35.508 + 2.195\ x\ 8 – 1.649\ x\ 6 – 2.048\ x\ 8 – 2.428\ x\ 3 - 1.503\ x\ 8 - 0.933\ x\ 8 + 0.885\ x\ 9 + 3.029\ x\ 2 = \mathbf{12} \qquad (18)$$

$$PS = 9.290 + 5.237\ RegQu + 2.914\ AnCor \qquad (19)$$

$$P = 9.290 + 5.237\ x\ 0.30 + 2.914\ x\ 0.03 = \mathbf{11} \qquad (20)$$

$$MES = 16.510 + 0.001\ GDP + 0.083\ GDPPC – 0.522\ Inf – 0.256\ UnEmp - 0.038\ GovDe \qquad (21)$$

$$ME = 16.510 + 0.001\ x\ 772.290 + 0.083\ x\ 10.476 – 0.522\ x\ 8.57 – 0.256\ x\ 11.13 - 0.038\ x\ 34.90 = \mathbf{10} \qquad (22)$$

Country Credit Rating for Turkey $= \frac{DD+YC+ME}{3} = \frac{22+11+10}{3} = \mathbf{11\ (BB)}$

Greece:

$$SRS = 35.508 + 2.195\ CaR – 1.649\ AccTr – 2.048\ BankAct – 2.428\ ExtAu - 1.503\ BankEnt - 0.933\ PowSu + +0.885\ Liq + 3.029\ IntAu \qquad (23)$$

$$DDP = 35.508 + 2.195\ x\ 4 – 1.649\ x\ 6 – 2.048\ x\ 8 – 2.428\ x\ 2 - 1.503\ x\ 6 - 0.933\ x\ 8 + 0.885\ x\ 10 + 3.029\ x\ 2 = \mathbf{9} \qquad (24)$$

$$PS = 9.290 + 5.237\ RegQu + 2.914\ AnCor \qquad (25)$$

$$P = 9.290 + 5.237\ x\ 0.64 + 2.914\ x\ (-0.06) = \mathbf{12} \qquad (26)$$

$$MES = 16.510 + 0.001\ GDP + 0.083\ GDPPC – 0.522\ Inf – 0.256\ UnEmp - 0.038\ GovDe \qquad (27)$$

$$ME = 16.510 + 0.001\ x\ 299.919 + 0.083\ x\ 26.972 – 0.522\ x\ 4.70 – 0.256\ x\ 12.73 - 0.038\ x\ 148.33 = \mathbf{8} \qquad (28)$$

Country Credit Rating for Greece $= \frac{DD+P+ME}{3} = \frac{9+12+8}{3} = \mathbf{10\ (BB)}$

Table 12. Country Credit Ratings 2010

	Germany	Turkey	Greece
Regulatory and Supervisory Score (DD)	22	12	9
Politic Score (PP)	23	11	12
Makroeconomic Score (ME)	19	10	8
FITCH	21 (AAA)	11 (BB)	12 (BBB-)
NEW MODEL	**21 (AAA)**	**11 (BB)**	**10 (BB)**

Source: Created by author, 2020.

The credit ratings calculated with the newly developed country credit rating model and the credit ratings calculated by Fitch gave similar results. However, in Table 12, as in the example of Greece, 1 or 2 point differences emerge in the scoring of some countries. This shows that credit rating agencies are biased in their scoring. One of the main causes of the 2007/08 Global Financial Crisis was biased ratings by credit rating

agencies. Therefore, the methodologies of credit rating agencies have become the focus of criticism. With this new model developed, it is aimed to evaluate countries more healthily and more transparently.

In Table 13, country credit rating scores are calculated using the data of Portugal, Netherlands and Spain in 2017. These calculated scores were compared with the ratings of the Fitch credit rating agency.

Table 13. Country credit rating 2017

	Portugal	**Holland**	**Spain**
Regulatory and Supervisory Score (DD)	12	20	15
Politic Score (PP)	17	25	16
Macroeconomic Score (ME)	11	18	12
FITCH	13 (BBB)	21 (AAA)	14 (BBB+)
NEW MODEL	**13 (BBB)**	**21 (AAA)**	**14 (BBB+)**

Source: Created by author, 2020.

In 2017, Portugal's credit rating was BBB, Netherlands' credit rating was AAA and Spain's credit rating was BBB+ by Fitch. When we calculate the credit ratings of these countries with our newly developed country credit rating model, the same credit rating is calculated as the ratings given by the Fitch credit rating agency.

Conclusion

In order to create the credit rating model of countries, the collected data were tested with ANOVA analysis. While country credit rating scores depend on supervisory and regulatory variables, political indicators and macroeconomic factors.

The supervisory and regulatory variables are the necessity to increase the level of accounting and transparency, the restriction of banking activities, the external audit criterion, the banking entry criterion, the legal strength of the supervisory institutions, the liquidity criterion and the internal audit criterion.

Country scores increase when countries increase their internal audit quality, liquidity and amount of capital. The increase in external audit power, the restriction of banking activities, the implementation of strict rules in banking are the factors that lower the credit rating of countries. After the 2007/08 Global Financial Crisis, internal audit has been focused on with Basel III reforms. External audit should be used for support (Basel III, 2018).

Of the political indicators, only the independent variables of regulatory quality and anti-corruption yielded statistically significant results. Credit scores increase when governments fight corruption effectively. At the same time, country credit scores will increase when governments regulate and fairly implement policies that will encourage the private sector and foreign investors to invest.

There is a statistically significant result between country credit scores and macroeconomic variables. GDP, GDP per capita, inflation, unemployment and government debt are factors that affect a country's credit score. When the GDP, and therefore the per capita GDP, increases, the country's credit scores also increase. Countries with high inflation rates will have a lower credit rating. At the same time, rising unemployment and government debt are other factors that lower credit ratings. In general, emerging economies with weaker financial systems may have lower credit ratings, even if they are growing faster than countries with stronger financial systems.

References

1. Afonso, A. and Gomes, P. (2011). Do Fiscal Imbalances Deteriorate Sovereign Debt Ratings? *Revue Economique*, *62*(6), 1123-1134. [Google Scholar]

2. Barth, J. R., Caprio, G., Levine, R. (2001). The Regulation and Supervision of Banks Around the World: A New Database, W*orld Bank Policy Research Working Paper, 2588*. [Google Scholar]

3. Basel Committee on Banking Supervision. (2018). Capital floors: The Design of Framework Based on Standardised Approaches, Bank for International Settlements, Basel, Consultation Document, 1–12. [Link]

4. Butler, A.W., Fauver, L. (2006). Institutional Environment and Sovereign Credit Ratings, *Financial Management*, *35*(3), 53-79. [Google Scholar]

5. Cantor, R., Packer, F. (1996). Determinants and Impact of Sovereign Credit Ratings, *Economic Policy Review*, *2*(2), 37-54. [Google Scholar]

6. Cavallo, E., Powell, A., Rigobon, R. (2012). Do Credit Rating Agencies Add Value? Evidence From The Sovereign Rating Business, *International Journal of Finance and Economics*, *18*(3), 240-265. [CrossRef]

7. Chen Sheng-Syan, Hsien-Yi Chen, Chong-Chuo Chang and Shu-Ling Yang. (2013). How Do Sovereign Credit Rating Changes Affect Private İnvestment? *Journal of Banking & Finance*, *37*(12), 4820-4833. [Link]

8. Crues, J. (2006). Statistical Properties of Country Credit Ratings. *Emerging Markets Review*, 7, 27-51. [Google Scholar]

9. Dimitrijevic, A., Beers, D. T. (2011). Sovereign Government Rating Methodology and A ssumptions, *RatingsDirect on the Global Credit Portal*, 10. [Link]

10. Fitch Rating Agency. (2018). Credit Rating Definition. [Link]

11. Iyengar, S. (2012). Are They Reliable? A Study of Sovereign Ratings, *The Journal of decision Makers, 37*(1), 69-82. [CrossRef]

12. JCR Eurasia Rating. (2020). Ülke Kredi Derecelendirme Metodolojisi [Link]

13. Kanli N. K. (2017). Ulke Risk Faktorlerinin Dogrudan Yabanci Yatirimlar Uzerindeki Belirleyici Etkisi, *Ege Akademik Bakis* [The Decisive Effect of Country Risk Factors on Foreign Direct Investments, Aegean Academic Perspective], *17*(2), 179. [Google Scholar]

14. Kaufmann, D., Aart, K., Mastruzzi, M. (2009). Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008, *World Bank Policy Research Working Paper Series (4978)*. [Link]

15. Moody's. (2020). Rating Scale and Definitions. [Link]

16. Ovalı, S. (2014). Turkey in Terms of Country Credit Rating Evaluation Criteria: A Comparative Analysis with the EU, *International Journal of Management, Economics and Business*, *10*(23), 53-80. [Link]

17. Panizza, Uga, (2017). The Use of Corruption Indicators in Sovereign Ratings, *Institutions for Development Sector*. [Link]

18. Suk-Joong, K. Wu, El. (2008). Sovereign Credit Ratings, Capital Flows and Financial Sector Development in Emerging Markets, *Emerging Markets Review*, *9*(1), 17-39. [Link]

19. Standard and Poor's. (2019). S&P Global Ratings   Definitions. [Link]

20. World Bank Governance Indicator. (2019). [Link]