DETERMINANT FACTORS OF SOVEREIGN CREDIT RATINGS

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ABSTRACT

Using the results of credit ratings of 117 countries and territories in the period 2011-2017 provided by the Standard and Poor's, the aim of this study is to examine the determinants of the sovereign debt credit ratings, especially the impact of financial system factors on the sovereign credit ratings. By employing the random effects ordered probit regression model, the research results show that inflation rate, central government debt, trade in services, liquid reserves of banking system negatively affect sovereign credit ratings, whereas current account balance, corruption index, the size of the banking system, the market capitalization of listed companies positively influence sovereign credit ratings. Considering the effects of financial system variables on sovereign credit ratings, several governance recommendations are given for governments and for central banks to improve the credit ratings of countries and territories.

KEYWORDS: Credit ratings, sovereign debts, random effects ordered probit model, factors related to financial sector, Standard and Poor's.

JEL Classification Code: C23, C25, E44, F30, F34, G15, H63

About the author

This research is conducted by PhD Nghiem Tan Le as the sole and corresponding author. He completed his PhD in Development studies from International Institute of Social Studies, Erasmus University Rotterdam and currently serving as a lecturer in Department of Business Administration, School of Economics, Can Tho University. His research interests include Business and Management, Development Economics, Gender and Women's science, Social Work. He has authored, co-authored in international journals including: The Journal of Asian Finance, Economics, and Business, International Journal of Management, International Journal of Financial Research, International Journal of Retail and Distribution Management and Can Tho University Journal of Science. He has been teaching in the graduated program at Can Tho University.

Public interest statement

Financial liberalization and global trade bring many benefits to the economic development of a country; however, country may face several risks. The current volatile global economy has made economists and researchers raise the question whether the benefits of financial liberalization outweigh the risks associated with it. Understanding the benefits and the risks associated with financial liberalization is extremely essential for a country to better prepare for international economic integration and to promote financial liberalization. There have been very few empirical studies on the impact of financial system factors on country risk. Therefore, this study aims to investigate the effect of financial system factors as well as macroeconomic factors and institutional factors on sovereign credit ratings (SCR). It is important to address that this study employs the random effects ordered probit regression model to analyze the effects of determinant factors on SCR. More importantly, since this study aims to verify whether financial system variables still have an impact on SCR after the global financial crisis occurred in 2008, the research period of this study is from 2011 to 2017. The research results show that inflation rate, central government debt, trade in services, liquid reserves of banking system negatively affect SCR, whereas current account balance, corruption index, the size of the banking system, the market capitalization of listed companies positively influence SCR. Considering the influences of financial system variables on SCR, several governance recommendations are given for governments and for central banks to improve the credit ratings of countries and territories.

1. INTRODUCTION

Thanks to global financial liberalization, global trade is growing at the fastest rate in the last 6 years in spite of a series of risks and uncertainties such as US's tendency to withdraw from multilateral agreements and towards bilateral agreements (Nga, 2018). Thanks to global financial liberalization, businesses are expanding their operation in international markets and their investment portfolios are more diverse consisting of many securities in different stock exchanges. Financial liberalization is closely related to economic growth (Bekaert et al., 2005), which is the reason why emerging economies, particularly Vietnam, are increasingly and actively integrating in international economy through the signing of agreements, and through participation in organizations such as the World Trade Organization, the ASEAN Economic Community, the new generation of Free Trade Agreements,... Along with that integration process, countries in general and Vietnam in particular make efforts to choose for themselves financial liberalization solutions to increase competition in the financial system, thereby improving the distributive efficiency and effectively utilizing resources.

In addition to the benefits of entering the global commercial market, country may face several risks. The current volatile global economy has made economists and researchers raise the question whether the benefits of financial liberalization outweigh the risks associated with it. Understanding

the benefits and the risks associated with financial liberalization is extremely essential for the country to better prepare for international economic integration and to promote financial liberalization. As a result, there have been many empirical studies on the factors affecting country risk (Butler and Fauver, 2006; Mellios and Paget-Blanc, 2006; Afonso et al., 2007). However, previous studies did not focus on analyzing the impact of factors related to the financial sector on country risk. Therefore, this study aims to investigate the effect of financial system factors as well as macroeconomic factors and institutional factors on sovereign credit ratings (SCR), thereby proposing several recommendations for governments and for central banks to improve SCR.

2. LITERATURE AND HYPOTHESES DEVELOPMENT

2.1 Literature Review

Many countries in the world, from rich to poor, from underdeveloped to developed, are indebted, debtors and creditors are diverse. Public debt reflects and greatly affects the health and financial viability of an economy. According to International Monetary Fund, public debt, also known as government debt, is the portion of a country's direct or acknowledged debt obligations to the rest of the economy and to other countries. According to World Bank, public debt is all debts borrowed by the Central Government and debts guaranteed by the government. This means that government debts include the debt of the Central Government and the debt of local governments. This definition is quite similar to the definition given in the Law on Public Debt Management of Vietnam. The public debt crisis was first known after a wave of massive public lending in the 1920s caused a series of countries that issued international bonds in the period 1930–1935 to default. Since then, many studies on the nature of the public debt crisis have been conducted by researchers around the world, and there have been many different definitions of the public debt crisis. This article uses the definition of Manasse and Roubini (2009) to define the concept of public debt crisis: "A country is defined to be in a debt crisis if it is classified as being in default by Standard & Poor's or if it receives a large non concessional IMF loan defined as access in excess of 100 percent of quota".

During a crisis of public debt, a country may deal with country risk or sovereign risk, which is the risk that a government could default on its debt (sovereign debt) or other obligations (Aktug et al., 2013). Country risk can be seen as a measure of a country's level of economic, financial, and political stability. Therefore, assessing country risk, in other words, assessing whether a country's debt is safe or not becomes extremely necessary for investors as well as for the government of that country. Consequently, SCR, also known as country credit rating, is used as an independent assessment of the creditworthiness of a country, which can give insights into the level of risk associated with investing in the debt of a particular country and the ability and the activeness of governments to fully pay off their debt obligations on time (Bhatia, 2002). Based on the rating period, the rating agencies continuously give short-term (less than 1 year) and long-term (3-5 years) ratings, but usually the rating results are only valid within a maximum term of 3 years. The results of short-term ratings are often less pragmatic, and often based on pre-existing long-term ratings. In addition, rating agencies also comment on a country's credit outlook based on long-term ratings. SCR is an appropriate indicator which is used as a measure of country risk for two basic reasons. Firstly, it affects a country's borrowing costs. Countries with high ranking can access international capital at a lower cost. Secondly, sovereign yield spreads, which are used by analysts to calculate

the risk premium, and which are incorporated in cost calculations of international projects and stock valuation, are directly related to credit ratings.

Theoretical models of national debt and national debt default are divided into two main approaches. The first theory raises question about why countries still try to repay the debts that they have borrowed even if that country defaults, the creditors usually cannot force them to pay off the debt. Eaton and Gersovitz (1981) argued that borrowing countries' desire to maintain their creditworthiness and their ability to continue to borrow in the future is an incentive for them to repay their loans. The rationale behind this result is that a country decides to honor its debt obligation if the future costs of not borrowing outweigh the short-run benefits of higher consumption. In the other theory, Bulow and Rogoff (1988) argued that, under normal conditions, the decision to lend to a less developed country cannot be based on the reputation of that country to assess its ability to repay its debt. This means that providing loans to a less developed country is only possible when the creditor has sufficient legal basis or direct sanctions (economic, political) in case that the borrowing country defaults on its debt. In practice, it is rare for a country simply to default on its international financial obligations. Instead, it typically renegotiates its debts. On that basis, Bulow and Rogoff (1988) developed a model based on the threat of future sanctions, which is the restructuring of the debt or the acceptance of the default of the borrower's country is a negotiation between the borrower and the lender. The decision is then made based on the costs and benefits between restructuring the debt or defaulting on it.

Although these theories have different approaches, specifically a theory derived from the country's perspective borrowers (Eaton and Gersovitz, 1981) and a theory based on the lending or non-lending decision of the lending country (Bulow and Rogoff, 1988), both theories point out that a country has to face trade-off between the costs and benefits of paying debt or not. Then, the probability of default is an increasing function of the variables that cause a country to default and a decreasing function of the variables that increase the cost of default. Thus, the national debt credit rating is inversely correlated with the probability of default. Based on the above theoretical models, numerous studies have examined the determinant factors of SCR (Cantor and Packer, 1996; Jüttner and McCarthy, 2000; Monfort and Mulder, 2000; Bissoondoyal-Bheenick, 2005; Afonso et al., 2007; Aktug et al., 2013). The results from previous studies show that there are three main groups of factors affecting the country's credit rating, namely macroeconomic factors, institutional environment factors and financial system factors.

The study conducted by Cantor and Packer (1996) is considered as the pioneer of quantitative research in credit rating issues. This study used the OLS regression model with spatial data on a database of 49 countries assigned by Moody's Investor Services and standard and poor's in 1995. The results showed that six variables including per capita income, GDP growth, inflation, external debt, level of economic development, and default history play an important role in determining a country's credit rating. The research of Jüttner and McCarthy (2000) (which is conducted in the period 1996-1998) and the research of Monfort and Mulder (2000) (which is studied 20 emerging markets in the period 1994-1999, including the Asian crisis in 1997) also used dependent variables

in the study of Cantor and Packer (1996). These two studies demonstrated that the relationships between SCR and explanatory variables in the model are not necessarily stable over time.

To have better understand the economic variables used in the determination of sovereign ratings and in particular to assess whether the variables have the same importance over the years and between the rating agencies, Bissoondoyal-Bheenick (2005) expanded an analysis of 95 countries for the period 1995-1999 and added the local currency ratings, foreign currency ratings, bonds and notes ratings, and bank deposit ratings into the research model. The results indicated that the relevance of specific economic variables and financial variables can vary according to the broad level of development of countries. Specifically, the economic variables do not play an important role for the high rated sample of countries, whereas GNP per capita, inflation, the current account balance and the level of foreign reserves do play an important role in the determination of sovereign ratings for the low rated countries. On the basis of previous empirical studies on analyzing the impact of macro factors, Butler and Fauver (2006) gathered data from 86 counties to examine the cross-sectional determinants of SCR. These authors found that the quality of a country's legal and political significance significantly influences these ratings, even when they controlled for obvious factors such as GDP per capita, inflation, foreign debt per GDP, previous defaults, and general development.

Unlike previous studies, Mellios and Paget-Blanc (2006), Afonso et al. (2007), and Aktug et al. (2013) employed a new quantitative model instead of the multivariate OLS regression model. Mellios and Paget-Blanc (2006) applied an ordered logistic model to examine the determinants of the SCR of 86 countries provided by the three major rating agencies: Fitch Ratings, Moody's and Standard and Poor's in the period 1998-2002. Results stressed that sovereign ratings are mostly influenced by per capita income, government income, real exchange rate changes, inflation rate and default history. Afonso et al. (2007) used panel estimation and random effects ordered probit (REOP) approaches to assess the explanatory power of several macroeconomic and public governance factors on the sovereign debt credit ratings of 130 countries using rating notations from the three main international rating agencies, for the period 1995-2005. The results pointed out that GDP per capita, real GDP growth, government debt, government effectiveness, external debt and external reserves, sovereign default indicator as well as being a member of European Union are the most important determinants of the sovereign debt ratings. Aktug et al. (2013) used ordered probit regression with year dummies rather than the REOP regression as proposed in the study of Afonso et al. (2007).The study conducted by Aktug et al. (2013) was the first paper that shows very robustly that financial sector variables are related to SCR. In addition to the impacts of macroeconomic and institutional environment factors on the sovereign debt ratings, these authors proved that banking sector characteristics such as concentration in the banking system, liquidity of bank assets, and size of financial system have strong relationship with SCR.

Through the comprehensive review of prior studies related to the research topic, many of them employed OLS regression model to investigate the determinant factors of SCR. Several papers used an ordered logistic model, REO Pregression, or ordered probit regression with year dummies. Overall, prior studies have suggested several factors influencing SCR such as per capita income,

GDP growth, inflation, external debt, level of economic development, default history, GNP per capita, the current account balance, the level of foreign reserves, the quality of a country's legal, the quality of political institutions, government income, real exchange rate changes, government effectiveness, concentration in the banking system, liquidity of bank assets, and size of financial system. It is important to address that this study employs the REOP regression model to analyze the effects of macroeconomic, institutional environment and financial system variables on SCR. More importantly, since this study aims to verify whether financial system variables still have an impact on SCR after the global financial crisis occurred in 2008, the research period of this study is from 2011 to 2017.

2.2. Hypotheses Development

2.2.1 Macroeconomic variables

Current account balance

A positive current account balance implies that a country is generating positive cash flow from exports exceeding imports, thereby having inflows of foreign currencies that can be used for sovereign debt service. Hence, current account balance is positively correlated with a country's credit rating (Monfort and Mulder, 2000; Aktug et al., 2013). These results support the following hypothesis:

H1: Current account balance positively impacts sovereign credit ratings

Inflation

Inflation rate has been proven by research to be one of the best measures of the consistency of fiscal and monetary policies and the financial, political and institutional stability of a given country. The experimental study of Aktug et al. (2013) pointed out that a higher general price level is often a sign of reduced purchasing power and more volatility in the economy, which in turn leads to a decline in reliability for an economy. When dealing with high inflation and a decline in the purchasing power of a currency, political pressure can prevent governments from raising taxes to pay off existing loans as they come due. Mellios and Paget-Blanc (2006) also found that countries with low inflation are less likely to default, and get a better rating. These results support the following hypothesis:

H2: Inflation negatively impacts sovereign credit ratings

Real effective exchange rate

The real exchange rate is the nominal rate adjusted for the correlation of domestic and foreign prices. As the real exchange rate increases (a country has a stronger currency), the purchasing power, reputation, and confidence in the economy will increase. Furthermore, a rise in the real exchange rate will make it easier for a country to repay its debts to another country with a weaker currency. Therefore, changes in the real exchange rate have a positive correlation with SCR (Mellios and Paget-Blanc, 2006).Hence, the third hypothesis is proposed as follows:

H3: Real effective exchange rate positively impacts sovereign credit ratings

Central government debt

An increase in a government's debt leads to a rise in interest payments, which can make it difficult for the government to repay its debts on time. Therefore, higher government debt negatively affects a country's debt credit rating (Borio and Packer, 2004; Afonso et al., 2007; Aktug et al., 2013). This factor is one of the important variables of such a macroeconomic model since the level of debt is directly related to the creditworthiness of an entity (Aktug et al., 2013). These results support the following hypothesis:

H4: Central government debt negatively impacts sovereign credit ratings

The development level of a country

Once a country reaches a certain level of income or development, it is less likely to default because its economy is often deeply integrated into the world economy. Besides that, the reputation of developed countries will be considerably affected if they get involved in creditors' lawsuits in case of default (Cantor and Packer, 1996; Afonso et al., 2007; Aktug et al., 2013). As a result, developed countries have a higher SCR than developing countries. Hence, the fifth hypothesis is proposed as follows:

H5: The development level of a country positively impacts sovereign credit ratings

2.2.2. Institutional variables

Trade in services

As a country develops and opens up its economy, the demand from abroad for the services of the country or the demand of the country for the services of other countries also expands. Therefore, this indicator is used to assess the diversity of an economy and its level of integration with the global markets (Aktug et al., 2013). An economy with a high level of income that is not diversified (for example, relying solely on abundant resources) tends to be less reliable and more vulnerable to economic shocks. On the other hand, a country with high level of trade in services tends to have a diversified, open economy and is better able to withstand economic shocks. Thus, a country with a high trade in services level has a better credit rating (Monfort and Mulder, 2000; Aktug et al., 2013).These results support the following hypothesis:

H6: Trade in services positively impacts sovereign credit ratings

Corruption index

A carefully designed legal system can be a catalyst for financial development and economic growth (La Porta et al., 1999). A less corrupt national environment usually accompanies with rational financial and governance mechanisms, thereby preventing the government from excessive borrowing. Corruption index published by Transparency International is used to monitor the socio-legal environment within a country. This index represents the quality or transparency of the government, as well as the effectiveness of the management system. The studies of Mellios and

Paget-Blanc (2006); Aktug et al. (2013) stated that a country with a higher corruption index, in other words, a country with less corruption environment gets a higher credit rating. These results support the following hypothesis:

H7: Corruption index positively impacts sovereign credit ratings

2.2.3. Financial system variables

Liquid reserves of banking system

Liquid reserves of banking system is defined as the ratio of domestic currency holdings, deposits of monetary authorities to that of other government agencies, non-financial public enterprises, private sector and other banking institutions. An efficient and stable financial system means that banks maintain fewer liquidity reserves as they can easily raise capital in the short term. On the other hand, in a risky and underdeveloped financial system, banks ensure a higher liquidity buffer. Therefore, the fact that banks maintain a large number of liquid assets implies that a banking system is underdeveloped and thus leads to a higher risk of bankruptcy and poorer credit ratings (Aktug et al., 2013). Thus, the hypothesis is proposed as follows:

H8: Liquid reserves of banking system negatively impacts sovereign credit ratings

Size of the banking system

Banking system plays a key role in the economy as an intermediary in the process of transferring money from those who have excess capital to those who lack capital. The size of the banking system is one of two indicators which is used to measure the size of the financial system (Aktug et al., 2013). This indicator is calculated based on deposit money bank assets to GDP. Basically, this indicator measures funding activities through domestic banking system. A large and well-developed banking system is more efficient and less vulnerable to economic events, thus, is more reliable in mitigating country risks. Therefore, the larger the size of the banking system, the higher the SCR of the country. Hence, the hypothesis is proposed as follows:

H9: Size of the banking system positively impacts sovereign credit ratings

Market capitalization of listed companies

Aktug et al. (2013) uses two indicators from the data set published by World Bank to measure the size of financial system, including the size of the banking system and the indicator related to the stock market. The second indicator is calculated based on the market capitalization of listed companies to GDP. High level of this indicator reflects the large size of the financial system. With a larger and more developed financial system, the country is rated higher in terms of credit rating. Thus, the hypothesis is proposed as follows:

H10: Market capitalization of listed companies positively impacts sovereign credit ratings

3. RESEACRCH METHODOLOGY

3.1. Sample Selection

SCR data used in the research model is unbalanced panel data. The study does not directly collect data from Standard and Poor's. Instead, data is collected from the aggregate database of the Center for Corporate and Securities Law at the University of San Diego Law School during the period 2011-2017 (a specific year's debt credit rating is collected on December 31 of that year). The research period is from 2011 to 2017 since the Center for Corporate and Securities Law did not gather SCR data before the year 2011.The explanatory variables are collected from the database of World Bank, International Monetary Fund (IMF). Only corruption index is gathered from Transparency International's data.

The study collects data from 117 countries and territories. Other countries and territories are not considered because these data did not meet the study period or were not available.

3.2. Definition and Measurement of Variables

3.2.1. Dependent Variable

The dependent variable is SCR. Since rating results only have good reliability within a maximum period of 3 years, the SCR of countries, in this case, are long-term ratings (3-5 years). To limit the impact of the hypothesis that the difference between any two ratings is constant and to reduce the levels of rating scale, SCR is converted to a numerical form and the conversion method is based on the research results of Afonso et al. (2007). Specifically, SCR from Standard and Poor's are classified into 20 groups (AA to CCC-), which is quantified from 1 to 17 by logistic transformation (observations with a rating below B- are classified into the same group). The reason for quantifying only 17 levels is that it is difficult to efficiently estimate the threshold points between CCC+ and CCC, as well as between CCC and CCC-, etc. The conversion value is presented in Table 1.

Table 1: Logistic Transformation of Sovereign Debt Credit Ratings Published by Standard and Poor's

Standard and Poor's ratings	Numerical ratings	Standard and Poor's ratings	Numerical ratings
AAA	17	BB+	7
AA+	16	BB	6
AA	15	BB-	5
AA-	14	B+	4
A+	13	B	3
A	12	B-	2

Standard and Poor's ratings	Numerical ratings	Standard and Poor's ratings	Numerical ratings
A-	11	CCC+	1
BBB+	10	CCC	1
BBB	9	CCC-	1
BBB-	8	SD	1

Source: Afonso et al., 2007

3.2.2. Independent Variables

Table 2 summarizes the characteristics of independent variables and control variables in the research model and the expected signs about the impact of these variables on the dependent variable.

Table 2: Summary of Independent Variables and Control Variables in the Research Model

Variables	Measurement Method	Source	Expected Signs
Control variables			
CAB	Current account balance (% of GDP)	World Bank	(+)
INF	Inflation rate (%)	World Bank	(-)
REER	Real effective exchange rate	World Bank	(+)
GDEBT	Central Government Debt (% of GDP)	World Bank	(-)
DADV	Dummy variable; 1 if Advanced country, 0 if Developing country	International Monetary Fund	(+)
Independent variables			
CORRUPT	Corruption index, 1 to 100, a country with a score of 100is corruption free	Transparency International	(+)
TRADE	The sum of service exports and imports(% GDP)	World Bank	(+)
LIQUID	Bank liquid reserves to bank assets ratio (%)	World Bank	(-)
CAP	Market capitalization of listed companies (% of GDP)	World Bank	(+)
BANKA	Deposit money bank assets (% of GDP)	World Bank	(+)

3.3. Estimation Method

This paper employs random effects ordered probit (REOP) regression model to investigate the determinant factors of SCR. The estimation equation is shown as follows:

$$SCR_{i,t} = \beta_{0,i} + \beta_1 CAB_{i,t} + \beta_2 INF_{i,t} + \beta_3 REER + \beta_4 GDEBT_{i,t} + \beta_5 DADV_{i,t} + \beta_6 LIQUID_{i,t} + \beta_7 CAP_{i,t} + \beta_8 BANKA_{i,t-1} + \beta_9 CORRUPT_{i,t} + \beta_{10} TRADE_{i,t} + u_{i,t} \tag{1}$$

This study uses the REOP method because after being logistically converted to numerical form, SCR is a discrete variable and reflects an order of default probability, so the use of ordered probit model is suitable (Afonso et al., 2007). Credit rating agencies conduct an ongoing assessment of a country's debt repayment capacity which is represented by an unobserved latent variable, R*. In addition, as the data employed in this study is unbalanced panel data, the traditional ordered probit model is not suitable due to two errors. Wooldridge (2002) proposed REOP approach, which considers two errors εi and μi as a normal distribution. Therefore, this study uses the REOP regression model to examine the determinant factors of SCR.

4. RESULTS AND DISCUSSIONS

4.1. Empirical Results

The distribution of SCR of countries and territories according to ratings over the study period are shown in Table 3. Although the total number of countries and territories rated AAA is extremely high, the figure in each year tends to decrease during the period2011-2017, from 16 countries and territories rated AAA in 2011 to only 7 in 2017. Besides that, there are just few observations in the groups from CCC+ and below.

Table 3: Distribution of SCR of Countries and Territories according to Ratings during the Study Period

Standard and Poor's ratings	Numerical ratings	Year							Total by ratings
		2011	2012	2013	2014	2015	2016	2017	
AAA	17	16	14	13	11	10	10	7	98
AA+	16	-	3	3	3	4	3	3	35
AA	15	5	3	4	5	5	7	6	50
AA-	14	7	6	7	7	6	4	3	54
A+	13	3	4	5	8	5	4	5	47
A	12	10	7	3	4	4	7	3	50
A-	11	4	5	9	6	7	7	5	54

Standard and Poor's ratings	Numerical ratings	Year							Total by ratings
		2011	2012	2013	2014	2015	2016	2017	
BBB+	10	8	6	5	5	5	8	5	52
BBB	9	12	9	11	9	7	3	5	65
BBB-	8	11	12	14	9	10	15	8	87
BB+	7	8	5	8	9	5	8	5	55
BB	6	8	10	14	12	6	11	7	74
BB-	5	10	11	15	12	10	11	10	84
B+	4	15	14	12	10	15	13	9	92
B	3	11	13	12	13	8	11	11	82
B-	2	5	6	6	8	9	8	6	50
CCC+	1	-	-	2	3	-	1	1	8
CCC	1	-	2	1	-	1	2	2	9
CCC-	1	1	-	-	-	2	1	2	7
SD	1	-	1	-	-	1	-	-	3
Total by years		**118**	**117**	**131**	**123**	**110**	**124**	**96**	**819**

Table 4 illustrates the descriptive statistics of the independent variables used in the regression model, except for development level of a country (DADV variable) which is presented in Table 5. Since data used in this study is unbalanced panel data, the number of observations of each variable is not uniform.

Table4: Descriptive Statistics of the Independent Variables in the Regression Model

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
CAB	786	-1.81	9.15	-46.72	45.45
INF	702	4.50	12.06	-3.75	254.95
REER	495	101.53	32.32	64.67	740.60
GDEBT	227	60.84	39.83	4.61	197.04

LIQUID	539	18.73	11.89	0.31	85.35
CAP	461	57.03	52.02	0.34	333.88
BANKA	638	92.91	10.11	0.00	100.00
CORRUPT	681	49.21	19.39	15.00	92.00
TRADE	788	26.73	33.31	3.83	294.65

Among the countries and territories in the dataset, 35 of them are classified as developed group and 82 of them are classified as developing group, as shown in Table 5. The unchanged number of countries and territories in each group throughout the period 2011-2017 suggests that it takes a long time for a country or a territory to move from developing group to developed group, vice versa. This study classifies countries and territories according to the IMF classification.

Table 5: Distribution of Countries and Territories according to the Development Level

Developed countries	Developing countries	
Australia	Albania	Jordan
Austria	Angola	Kazakhstan
Belgium	Argentina	Kenya
Canada	Aruba	Kuwait
Cyprus	Azerbaijan	Lebanon
Czech Republic	Bahamas	Macedonia
Denmark	Bahrain	Malaysia
Estonia	Bangladesh	Mexico
Finland	Barbados	Mongolia
France	Belarus	Montenegro
Germany	Belize	Morocco
Greece	Benin	Mozambique
Hong Kong	Bolivia	Nicaragua
Iceland	Bosnia and Herzegovina	Nigeria
Ireland	Botswana	Oman
Israel	Brazil	Pakistan

Developed countries	Developing countries	
Italy	Bulgaria	Panama
Japan	Burkina Faso	Papua New Guinea
Korea	Cambodia	Paraguay
Latvia	Cameroon	Peru
Lithuania	Cape Verde	Philippines
Luxembourg	Chile	Poland
Malta	China	Qatar
Netherlands	Colombia	Romania
New Zealand	Costa Rica	Russia
Norway	Croatia	Rwanda
Portugal	Dominican Republic	Saudi Arabia
Singapore	Ecuador	Senegal
Slovakia	Egypt	Serbia
Slovenia	El Salvador	South Africa
Spain	Fiji	Sri Lanka
Sweden	Gabon	Suriname
Switzerland	Georgia	Thailand
United Kingdom	Ghana	Tunisia
USA	Grenada	Turkey
	Guatemala	Uganda
	Honduras	Ukraine
	Hungary	Uruguay
	India	Venezuela
	Indonesia	Vietnam
	Jamaica	Zambia

Source: IMF, 2010

Based on the results of the correlation matrix in Table 6, it can be seen that all the pairs of correlation coefficients among the variables in the model are less than 0.8 (Farrar and Glauber, 1967), except for the correlation between the development level of a country variable and the corruption index variable which has a correlation coefficient of 0.82. Hence, it can be concluded that there is no serious multicollinearity phenomenon.

Table 6: Correlation Matrix among the Variables in the Model

Variables	CAB	INF	REER	GDEBT	CORRUPT	DADV	TRADE	LIQUID	CAP	BANKA
CAB	1.00									
INF	-0.01	1.00								
REER	0.26	-0.25	1.00							
GDEBT	0.04	-0.43	-0.40	1.00						
CORRUPT	-0.13	-0.53	0.02	0.54	1.00					
DADV	0.07	-0.47	0.26	0.41	0.82	1.00				
TRADE	0.23	-0.26	0.11	-0.04	0.02	-0.23	1.00			
LIQUID	0.19	0.09	-0.14	0.17	-0.20	-0.41	0.16	1.00		
CAP	0.21	-0.47	0.16	0.19	0.47	0.52	-0.13	-0.20	1.00	
BANKA	0.21	0.06	0.21	-0.53	-0.40	-0.35	0.38	-0.33	-0.24	1.00

Besides that, according to the results of Wooldridge test for autocorrelation, since Prob > F equals 0.0210, the null hypothesis of no serial correlation is rejected at the 5 percent level of significance. Therefore, the model has serial correlation problems.

To investigate the influence of determinant factors on SCR, the study applies REOP regression model, and then estimates with robust standard errors to recalculate the standard errors in order to fix the model errors. Table 7 presents the estimation results by using robust standard errors method.

Table7: Estimated results of the random effects ordered probit regression model using Robust standard errors method (Obs. = 819)

Variables	Estimated Coefficients
CAB	0.2170487*** (0.0660492)
INF	-0.2465673***(0.0845901)
REER	-0.0244419 (0.0277127)
GDEBT	-0.0306224***(0.0081581)
DADV	0.6704518 (0.9184561)
LIQUID	-0.0774117***(0.0282123)
CAP	0.0379028***(0.0071826)
BANKA	0.0783492***(0.0249239)
CORRUPT	0.2496964***(0.0390785)
TRADE	-0.2434031***(0.0393481)
Waldchi2(10)= 251.57	
Prob (chi2)= 0.0000	

Note: The values in parentheses () are Robust standard errors, *** indicates statistical significance at the 1 percent level.

4.2. Discussions

The results from Table 7 show that current account balance (CAB), inflation rate (INF), central government debt (GDEBT), corruption index (CORRUPT), trade in services (TRADE), liquid reserves of banking system (LIQUID), market capitalization of listed companies (CAP), size of the banking system (BANKA) have statistically significant effects on SCR at the significance level of 1 percent. The impacts of these eight independent variables on SCR can be explained as follows:

As expected, the positive relationship between current account balance and SCR exists. This is clearly shown through the research results in Table 7 that the estimated coefficient is positive ($\beta1 = 0.2170487$) at the significance level of 1 percent. This empirical finding is in accordance with previous studies conducted by Monfort and Mulder(2000); Aktug et al. (2013). This positive relationship indicates that when a country has a current account surplus, in other words, this country has more exports than imports of goods and services, government will have inflows of foreign currencies that can be used for sovereign debt service. This may lead to a rise in SCR.

From the estimated results in Table 7, it is clearly shown that inflation rate has a negative correlation with SCR with the estimated coefficient ($\beta2 = -0.2465673$) at the significance level of 1

percent. This result is in line with the original assumptions and prior studies such as Aktug et al. (2013); Mellios and Paget-Blanc (2006).This result implies that a higher general price level is often a sign of reduced purchasing power and more volatility in the economy, which in turn leads to a decline in reliability for an economy. Thus, a country experiencing high inflation rate is more likely to default, so it receives a lower rating.

The estimated result in Table 7 shows that government debt negatively influences the SCR of a country or a territory with the negative estimated coefficient ($\beta 4 = -0.0306224$) at the significance level of 1 percent. This finding is completely consistent with the fourth hypothesis and the studies of Borio and Packer (2004); Afonso et al. (2007); Aktug et al. (2013). This finding implies that an increase in government debt results in higher interest payments, which can make it difficult for government to fully pay off its debt on time.

Based on the results in Table 7, liquid reserves of banking system negatively affects SCR with the negative estimated coefficient ($\beta 6 = -0.0774117$) at the significance level of 1 percent. This finding conforms with the author's expectation and the research results of Aktug et al. (2013). In fact, liquidity reserves reflect the efficiency of the banking system as well as the confidence of the economic system. In a simple financial system, financial resources flow slowly because each transaction requires confirmation. In contrast, in a sophisticated and transparent financial system, liquidity reserves can be maintained at a lower level.

As expected, the market capitalization of listed companies has a positive relationship with SCR with the positive estimated coefficient ($\beta 7 = 0.0379028$) at the significance level of 1 percent. Demirguc-Kunt and Levine (2004) proved that banks, other financial intermediaries, stock markets, and bond markets are generally larger, more dynamic, and more efficient in wealthier countries. When stock market and banking system co-exist, the structure of the financial system will gradually shift to a more market-oriented form as the economy develops. Hence, a rise in the market capitalization of listed companies may lead to an increase in SCR.

Similar to the impact of the market capitalization of listed companies on SCR, size of the banking system positively influences SCR. This is clearly presented through the research results in Table 7 that the estimated coefficient is positive ($\beta 8 = 0.0783492$) at the significance level of 1 percent. This positive relationship means that the greater the value of deposit money bank assets to GDP, the higher the country's rating. This empirical finding is in accordance with original hypothesis and prior study conducted by Aktug et al. (2013).

It can be seen from the results in Table 7 that corruption index have a positive impact on SCR with the estimated coefficient ($\beta 9 = 0.2496964$) at the significance level of 0.01. It is true that corruption reduces growth by limiting the growth of small and medium-sized enterprises and by causing a severe impact on a country's public finances. Additionally, corruption prevents foreign investment as well as distorts prices. More importantly, corruption undermines legal and judicial systems which have a strong relationship with financial development and economic growth (La Porta et al.,

1999). Therefore, a country with a severe corruption environment, in other words, a country with low corruption index gets a low credit rating. This empirical finding is in accordance with the original assumptions and previous studies such as Mellios and Paget-Blanc (2006); Aktug et al. (2013).

The estimated results in Table 7 also point out that trade in services has a negative correlation with SCR with the estimated coefficient ($\beta10 = -0.2434031$) at the significance level of 1 percent, which is contrary to the original assumption. This negative relationship may occur when a developing country has high sovereign debt credit rating (Canuto et al., 2012). The sum of service exports and imports tends to be low in developed countries such as US, Japan, Mexico, China, etc. because the numerator of this indicator (the total value of exports and imports of goods and services) are measured in USD, whereas the denominator (GDP) includes a large number of non-tradable goods whose value may be underestimated in the national accounting system. Furthermore, this indicator may be overestimated in countries where the value of inputs in exporting sector depends heavily on imports, such as Mexico and China. Aktug et al. (2013) also claimed that developed countries often have higher wages than developing countries. Therefore, if a developed country has a service economy, it will face a cost disadvantage compared to developing countries.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study applies the REOP regression model and then Robust standard errors method to analyze the impact of macroeconomic factors (as control variables), institutional environment factors, and financial system factors on SCR provided by Standard and Poor's during the period 2011-2017.The research results show that three out of five macroeconomic factors, all three institutional environment factors, and all three financial system factors have statistically significant effects on SCR at the significance level of 1 percent. More specifically, inflation rate, central government debt, trade in services, liquid reserves of banking system negatively affect sovereign debt credit ratings, whereas current account balance, corruption index, the size of the banking system, the market capitalization of listed companies positively influence sovereign debt credit ratings.

It is important to stress that this study has proved the strong impacts of financial system factors on SCR throughout the study period. Additionally, it is worth noting that the impact direction of trade in services on SCR is different from the initial expectation. The explanation for this result is based on wage level. Basically, developed countries have higher wages than developing countries. Thus, if a developed country has a service economy, it may face a cost disadvantage compared to developing countries.

Although the study has provided empirical evidence of the determinant factors of the SCR of a country or a territory, it still has some limitations that may provide further development opportunities for more in-depth research. In specific, the number of observations in this study is fewer than that in previous studies due to the lack of access to historical data on the SCR of credit rating agencies. Therefore, it is not possible to divide the sampled countries by continent in order to

more accurately assess the factors affecting SCR in each region. Hence, further studies can run a regression model for each region based on larger dataset, thereby proposing appropriate policy suggestions in order to improve sovereign debt credit ratings for each region.

5.2. Recommendations

Considering the effects of financial system variables on SCR, several governance recommendations are proposed for governments and for central banks to improve the credit ratings of their countries or territories. Firstly, central banks should reduce the liquid reserve ratio of the banking system to increase the money supply to the economy. Although high required reserve ratio helps banking system to mitigate the negative impacts caused by financial crises, this high ratio may hinder the ability of commercial banks to use their capital efficiently. In addition, lowering high required reserve ratio helps central banks to reduce the interest payment on required reserve deposits. Secondly, central banks as well as governments should ensure fairness, openness, and transparency in the implementation of policies; create favorable conditions to encourage banks to develop and businesses to operate effectively. The formation of a strong banking system plays a crucial role in the formation of a developed financial market and in mitigating country risks.

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