



UNIVERSITI PUTRA MALAYSIA

***MACROECONOMIC DETERMINANTS OF SOVEREIGN CREDIT
RATINGS AND RATING CHANGES, AND BOND YIELDS RESPOND TO
RATING CHANGES***

SOH WEI CHEE

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CHANGES**

By

SOH WEI CHEE

**Thesis Submitted to the School of Graduate Studies, University Putra Malaysia, in
Fulfilment of the Requirement for the Degree of Master of Science**

September 2014

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Abstract of thesis presented to the Senate of Universiti Putra Malaysian in fulfilment of the requirement for the degree of Master of Science

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By

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September 2014

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Sovereign credit rating closely measures a country's international creditworthiness. Previous studies showed that the sovereign credit rating change significantly impact to the domestic finance sector. However, the credit rating agencies (CRAs) only reveal the criteria focused in rating assessment, moreover, provided limited information about the variables involved. The public need an indicator in signaling the phenomenon of sovereign rating change. As far as we know, economic is one of the criteria that concerned by CRAs in rating assessments, can be quantified and predicted by the macroeconomic variables. Hence, there is a need to identify the macroeconomic factor determining the rating and rating change on a timely basis.

This study identify the determinants of the sovereign credit ratings and rating changes and determine the asymmetric respond in rating change on procyclical behavior from year 2000 to 2011. This study included 9 macroeconomics variables in analysis, and extended by using two other qualitative variables, i.e., economic development indicator and economic freedom indicator.

To identify the determinants of sovereign rating and rating change, the panel data model and ordered probit model shows similar results and this is the evidence of robustness in the analysis. From the findings, four macroeconomic variables determinants the rating: interest rate, GDP per capita, GDP deflator, and foreign exchange of countries.

The unexpected hiking in interest rate attracts hot moneys that cause financial volatility into the local financial market. The GDP per capita is a variable to measure countries' capability to repaying debts and this supported by previous researchers (Cantor and Packer, 1996; Bissoondoyal-Bheenick, 2005; and Bissoondoyal-Bheenick et al., 2006). The presence of high price level lower the purchasing power; lift up the living cost, and lower the standard of living. A country with high level of foreign reserve promotes exchange rate and financial market stability.

The result of the study has indicated that the economic development and the economic freedom of a country is a decisive factor in rating evaluation. Countries with high economic freedom indicate that local residences enjoy more freedom in economic structure transactions. Therefore, advance (developing) economy countries with high (low) GDP per capita, high (low) foreign reserve, high (low) economic freedom, low (high) interest rate, and low (high) inflation will be awarded with high (low) sovereign credit rating. Besides, developing (advance) countries with high (low) GDP per capita, high (low) foreign reserve, high (low) money supply and low (high) interest rate have higher tendency to be rating upgrade (downgrade).

Lastly, the event study provides evidence for the asymmetric responses in the bond market returns for upgrade and downgrade events. The results show that the impact of upgrade events is slower and prolonged within event window of (+3, +12). Conversely, the reaction to downgrade events is sharper and last for a short term within event window of (-3, +3).

From the findings, sovereign credit rating performs as an indicator of international creditworthiness with foundation. The Standard & Poor's tend to be open in upgrade evaluations, meanwhile behave conservative in downgrade event assessments.

Abstrak tesis yang dikemukakan kepada Snat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Sarjana Sains

**PENENTU MAKROEKONOMI BAGI PENARAFAN KREDIT BERDAULAT
DAN PERUBAHAN PENARAFAN, DAN TINDAK BALAS HASIL BON KE
ATAS PERUBAHAN PENARAFAN**

Oleh

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Penarafan kredit berdaulat mengukur kepercayaan kredit antarabangsa negara. Kajian terdahulu menunjukkan bahawa perubahan penarafan kredit berdaulat mengenakan kesanketara kepada sektor kewang domestik. Walaubagaimanapun, agensi-agensi penarafan kredit (CRAs) hanya mendedahkan kriteria di bertiup dalam penilaian penarafan, lagipun, memberikan maklumat yang terhad mengenai pemboleh ubah yang terlibat. Orang ramai memerlukan petunjuk menandakan fenomena perubahan penarafan kredit berdaulat. Setakat yang kita tahu, ekonomi adalah salah satu kriteria yang terdapat dalam penilaian penarafan, boleh diukur dan diramalkan oleh pemboleh ubah makroekonomi. Oleh itu, terdapat keperluan untuk mengenalpasti faktor ekonomi yang menentukan penarafan dan perubahan penarafan dan risemasa kesemasa.

Kajian ini mengenalpasti penentu penarafan kredit berdaulat dan perubahan penarafan, menentukan tindakbalas yang tidak simetri atas perubahan penarafan dari tahun 2000 hingga 2011. Kajian ini melibatkan 9 pemboleh ubah makroekonomi dalam analisis, dan dilanjutkan dengan menggunakan dua pemboleh ubah kualitatif, iaitu penunjuk pembangunan ekonomi dan penunjuk kebebasan ekonomi.

Untuk mengenalpasti penentu penarafan berdaulat dan perubahan penarafan, “panel data model” dan ordered probit model menunjukkan keputusan yang sama dan ini adalah buktiketeguhan dalam analisis. Dari hasil kajian, didapati empat pemboleh ubah makroekonomi penentu penarafan: kadar faedah, KDNK per kapita, KDNK deflator dan rizab asing negara.

Kenaikan kadar faedah yang tidak dijangka menarik wang panas yang menyebabkan ketidakstabilan pasaran kewangan tempatan. KDNK per

kapita adalah pemboleh bah untuk mengukur upaya negara untuk membayar balik hutang dan ini disokong oleh penyelidikan terdahulu (Cantor dan Packer, 1996; Bissoondoyal-Bheenick, 2005; dan Bissoondoyal-Bheenick et al, 2006.). Parasharga yang lebih tinggi melemahkan kuasa membeli; menaikkan kos hidup, serta merendahkan taraf hidup. Sebuah negara dengan tahap rizabasing yang tinggi menggalakkan kestabilan pasaran kewangan.

Hasil kajian ini telah menunjukkan bahawa pembangunan ekonomi dan kebebasan ekonomis sebuah negara adalah factor-faktor penting dalam penilaian penarafan. Negara-negara dengan kebebasan ekonomi yang tinggi menunjukkan bahawa penduduk tempatan menikmati lebih kebebasan dalam urusan niaga ekonomi. Oleh itu, negara maju (membangunkan) dengan KDNK per kapitanya tinggi (rendah), rizabasing tinggi (rendah), kebebasan ekonomi tinggi (rendah), kadar faedah rendah (tinggi), dan inflasi rendah (tinggi) akan dianugerahkan dengan penarafan kredit berdaulat yang tinggi (rendah). Selain itu, negara-negara membangun (maju) dengan KDNK per kapitanya tinggi (rendah), rizabasing tinggi (rendah), bekalan wang tinggi (rendah) dan kadar faedah rendah (tinggi) akan mempunyai kecenderungan untuk dikenakan peningkatan (penurunan) penarafan.

Akhirnya, kajian "event study" menyediakan bukti tentang tindakbalas simetri hasil bon keatas perubahan penarafan kredit Negara. Keputusan menunjukkan kesan acara penaikan penarafan adalah lambat dengan jangka masa panjang dalam lingkungan acara (+3, +12). Dalam keadaan bertentangan, reaksi tebaran bon keatas penurunan penarafan adalah tajam dengan jangka masa pendek dalam lingkungan acara (-3, +3).

Dari hasil kajian, penarafan kredit berdaulat melaksanakan sebagai petunjuk kepercayaan kredit antarabangsa dengan asas Standard & Poor bertindak terbuka dalam penilaian upgrade, sementara itu berkelakuan konservatif dalam penilaian peristiwa penurunan.

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I certify that a Thesis Examination Committee has met on 2 September 2014 to conduct the final examination of Soh Wei Chee on her thesis entitled "Macroeconomic Determinants of Sovereign Credit Ratings and Rating Changes, and Bond Yields Respond to Rating Changes" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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LIST OF ABBREVIATIONS

A.M. Best	A.M. Best Company
BBC	British Broadcasting Corporation
BLUE	Best Linear Unbiased Estimator
CBR	Case-Based Reasoning
CDF	Cumulative Distribution Function
CHF LIBOR	Swiss Franc (CHF) LIBOR interest rate
CRAs	Credit Rating Agencies
EJR	Egan-Jones Ratings Company
EMH	Efficient Market Hypothesis
EU	European Union
EURIBOR	Euro Interbank Offered Rate
FIBOR	Frankfurt Interbank Offered Rate
FX market	Foreign exchange market or Forex market
GDP	Gross Domestic Product
GNP	Gross National Product
IMF	International Monetary Fund
JCR	Japan Credit Rating Agencies
KBRA	Kroll Bond Rating Agency
LIBOR	London Interbank Offered Rate
LSDV	Least Square Dummy Variable
MLE	Maximum Likelihood Criterion
Moody's	Moody's Investors Service
Morningstar	Morningstar Credit Ratings
n.e.d	Normal Equivalent Deviate
NBSROs	National Recognized Statistical Organization
NIBOR	Norway Interbank Offered Rate
OLS	Ordinary Least Square
PIBOR	Paris Interbank Offered Rate
S&P	Standard and Poor's
SEC	Securities and Exchange Commission
SIBOR	Singapore Interbank Offered Rate
VIBOR	Vienna Interbank Offered Rate

CHAPTER 1

INTRODUCTION

1.1 Introduction

The worldwide financial market volatility was triggered by the cycle of global financial crisis throughout these timeline: Asian Financial Crisis (1997-1998), Russia Debt Default (1998), Brazilian Crisis (1998-1999 and 2002), Turkey Crisis (2000-2001), Argentina Crisis (2001), US Subprime Mortgage Crisis (2007-2008), and the recent European Sovereign-Debt Crisis (2008-2013). The history of past financial crises and discussions on volatility of financial markets reminded the public that no assets, including sovereign debt which theoretically is 'credit risk free', can be truly defined as 'risk free'.

Sovereign credit crises may have adverse effects on the global economic growth as they affect the global financial market. The falling sovereign debt of the PIIGS (Portugal, Italy, Ireland, Greece and Spain), for instance, encumbered the economic growth of Euro zone as well as the global financial market - in response to the Euro Central Bank and International Monetary Fund (IMF) bailout to secure the Euro monetary system. The IMF report (2012) stated that the European sovereign debt crisis has burdened European banks, in which the banks had to face increased sovereign risks, tardiness in growth of Euro zone, weak bond market and the urgent need to bolster their capital cushion. The perpetuating effects continued / worsen as the Eurozone sovereign debt crisis also took place during the critical period of a weak global economy.

The worst case of a sovereign debt crisis will result in a debt default. It is the worst financial scenario expected by the government when narrow foreign exchange reserve unable to fulfill with creditors' request in full repayment. The emptied foreign exchange reserve resulted sovereign debt default. This then lead to country's currency system collapses, resulting in the local currency to depreciate sharply against the U.S. dollar. Inflation rate will increase, and this puts further constraint on the public as an increase in the inflation rate means a rise in the cost of living and unemployment rate. Although the government may recourse to IMF loan, a series of austerity measures have to be implemented to repay the creditor in full. In such a case, the international business trade will be isolated from the global financial market. Hence, the sustainable effect of a sovereign debt default cannot be forecast in short term if the contagion effect comes into picture.

When the Eurozone strived to survive from a series of sovereign debt crises of the European Union (EU) members, the EU members had to contribute to secure the Eurozone monetary system. In May 2010, the IMF provided Greece with a three-year loan worth €110 billion, which is approximately \$158 billion. The members of EU countries agreed to contribute €80 billion (approximate \$115 billion) while the IMF agreed to contribute €30 billion (approximate \$43 billion). Hence, the case of Greece shows that sovereign-debt crisis experienced by a country has a significant impact on the economic growth of a region like Eurozone as well as on the global financial markets. In conjunction of these two impacts, credit rating agencies (CRAs) have become the focus of research in the past two decades, especially the three major CRAs covered by the Standard & Poor's (S&P), Moody's and Fitch.

1.2 Background Study

1.2.1 National Recognized Statistical Organization (NRSROs)

Credit ratings agencies (CRAs) were set up in the early 1900s to provide the investors with general information of tradable assets, i.e. stock and bond market at no charges. At that time, the CRAs did not take research of credit rating as an intellectual property which needed to be paid. In order to be permitted to assess the information, the investors subscribed to the publication of the respective credit rating agencies.

In conjunction with this, the expansion of capital market and the importance of individual analytic information providers like credit rating agencies brought about the establishment of the National Recognized Statistical Organization (NBSROs) in 1970. The authorization of NBSROs helped the financial institution in fulfilling the requirements set by the Securities and Exchange Commission (SEC) where the financial institutions have to allocate their capital in investment to earn a positive recognition by one or more NBSROs. From then on, the credit rating industry has grown and provided the needs of rating services, especially the NBSROs with better reputation.

The SEC has been empowered by the Securities Exchange Act of 1934 with the authority to cover all aspects of securities with regards to the performance and cooperation among the worldwide NBSROs under specified rules and regulations. Besides, the SEC has the main responsibility to educate investors. With knowledgeable investors, the SEC is able to collect various sources of information to tighten the rules and regulations of NBSROs.

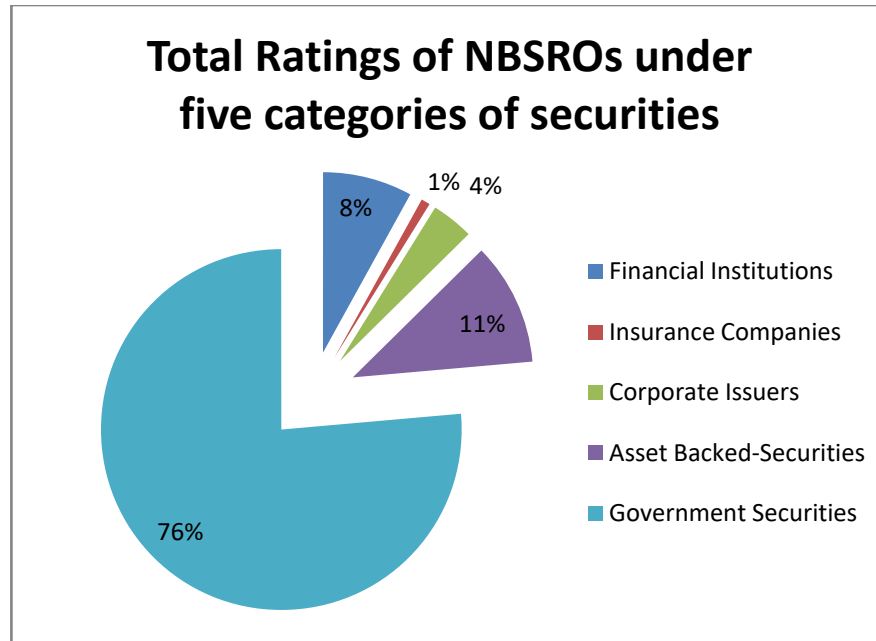


Figure 1.1: Total Ratings of NBSROs under Five Categories of Securities as at Dec 2011

(Source: Annual Report on Nationally Recognized Statistical Rating Organizations, 2012)

According to the Annual Report on Nationally Recognized Statistical Rating Organizations (2012), nine NBSROs were registered as at December 2012 – Standard & Poor’s Ratings Services (S&P), Moody’s Investors Service (Moody’s), Fitch, Japan Credit Rating Agencies (JCR), DBRS, A.M. Best Company (A.M. Best), Egan-Jones Ratings Company (EJR), Kroll Bond Rating Agency (KBRA) and Morningstar Credit Ratings (Morningstar). The five categories of securities that are opened for registration under the NBSROs are: financial institution, insurance company, company issuer, asset-backed securities and government securities. Except for CRAs of Morningstar and A.M. Best, all other seven NBSROs have registered under the five categories of securities. Government security credit rating is accounted for 76% of the total ratings and it performs as the most vital financial market product compared to the other four security categories – asset backed -securities, financial institutions, corporate issuers and insurance companies.

As at December 2011, the majority of the total ratings of 2,611,582 were covered by the top credit rating agencies, while the Standard & Poor’s (S&P) earned 1,170,600 ratings, equivalent to 44.8% of total ratings. S&P is followed by Moody’s with 998,878 ratings, equivalent to 38.2% of total ratings, and Fitch with 348,536 ratings which is equivalent to 18.6% of total ratings. The five categories of securities that are opened for registration under the NBSROs are financial institution, insurance company, company issuer, asset-

backed securities and government securities. Except for Morningstar and A.M. Best, all other seven NBSROs have registered under the five categories of securities.

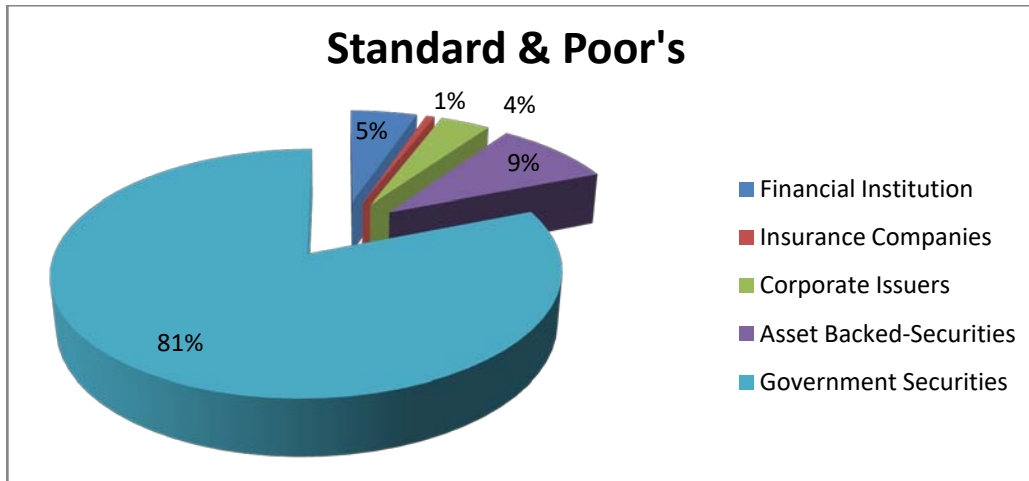


Figure 1.2: Categories of Securities Rated by Standard & Poor's (S&P) as at Dec 2011

(Source: Annual Report on Nationally Recognized Statistical Rating Organizations, 2012)

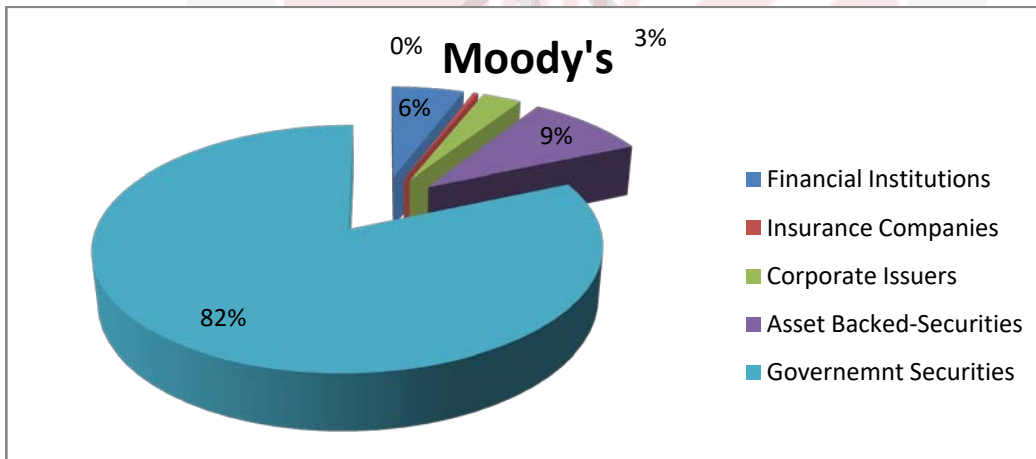


Figure 1.3: Categories of Securities Rated by Moody's as at Dec 2011

(Source: Annual Report on Nationally Recognized Statistical Rating Organizations, 2012)

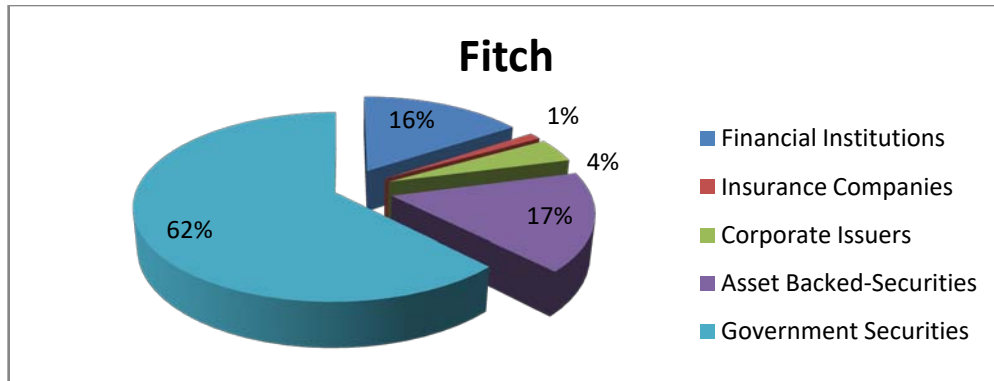


Figure 1.4: Categories of Securities Rated by Fitch as at Dec 2011
 (Source: Annual Report on Nationally Recognized Statistical Rating Organizations, 2012)

Figure above show that the government securities credit rating announcements have occupied 81% of total rating of the S&P, 82% of the Moody's and 62% of the Fitch. The category of securities focused by the three CRAs that follow the government securities are the asset backed-securities and financial institutions.

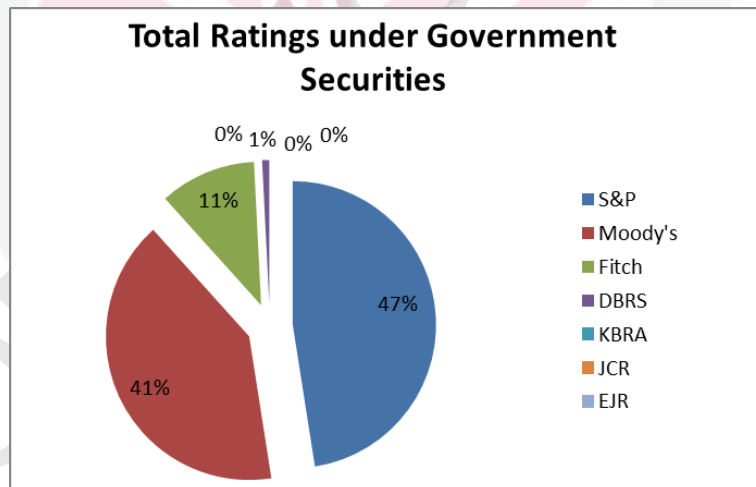


Figure 1.5: The Total Ratings of NBSROs under Government Securities as at Dec 2011
 (Source: Annual Report on Nationally Recognized Statistical Rating Organizations, 2012)

Among the nine CRAs registered as NBSROs, S&P has published 47% of credit re-rating announcement, and it acts as the top big player in the sovereign credit rating announcement. The second is Moody's with 41% of contribution and the third is Fitch with 11% of merits in the analysis of the sovereign credit announcement.

Table 1.1: Rating Grade Description of Standard & Poor's, Moody's and Fitch

Description	Standard & Poor's	Moody's	Fitch	
Investment Grade	Minimal credit risk	AAA	AAA	
	Very low credit risk	AA+	Aa1	AA+
		AA	Aa2	AA
		AA-	Aa3	AA-
	Low credit risk	A+	A1	A+
A		A2	A	
A-		A3	A-	
Moderate credit risk	BBB+	Baa1	BBB+	
	BBB	Baa2	BBB	
	BBB-	Baa3	BBB-	
Speculative Grade	Substantial credit risk	BB+	Ba1	BB+
		BB	Ba2	BB
		BB-	Ba3	BB-
	High credit risk	B+	B1	B+
		B	B2	B
B-		B3	B-	
Very high credit risk	CCC+	Caa1	CCC+	
	CCC	Caa2	CCC	
	CCC-	Caa3	CCC-	
Near default	CC	Ca	CC C	
Default	SD/D	C	DDD DD D	

From Table 1.1, the rating is different in the category of near default and default where Fitch separates into more rating compared to Standard & Poor's and Moody's.

1.3 Problem Statements

Sovereign bond is the terminology referring to the debt securities that are denominated in a foreign currency issued by the government, hold by creditor countries. Unlike the sovereign bond, the local currency bonds are meant to be issued to creditor investors. The sovereign bond interest rate often serves as an indicator for the possibility of default. Hiking sovereign interest rates indicate a rising likelihood of the sovereign debt to be default. The CRAs will consider to downgrade a country when the hiking sovereign interest rate pairs with deteriorating domestic economic condition.

Sovereign credit rating downgrade will not impact the individual investors directly as the sovereign bonds are held by the creditor countries. However, the sovereign credit rating downgrade that signals lower sovereign creditworthiness may raise the fear of sovereign default. Also, countries with weakened domestic economy may adopt inflationary financing and large tax increases, struggle not to fall into sovereign default. Hence, the rating downgrade may spread its influence to the private sector by three channels like domino effect.

Firstly, substantial sovereign credit rating downgrade may damage the domestic financial system that triggers a local banking crisis that results in the fall of local output. The second channel, downgrade rating undermines the financial strength of the domestic private sector broadly. This is because local corporates with riskier government will be relatively riskier in impression of lower creditworthiness. On average, this lowers the competitiveness of local corporates in international markets or the local corporates lose access to trade credit facilities. Third, the government's unstable financial condition, or even, the insolvency caused by debt default, transmitting to the private sector by spillover effects. As consequences, lower subsidy, higher tax and higher price level increase the living cost of the country that results in higher inflation.

Announcement of sovereign default often "shock" the private sector without many clues or signals. This will trigger the local small and middle enterprise's (SME) cash flow problem because unable to respond immediately to the bad economic, resulting in local industry contraction. An example can be seen in the case of Greece sovereign credit rating downgraded in 2010. On 23 April 2010, the government of Greece requested a €45 billion loan from the Euro Central Bank and International Monetary Fund (IMF) in order to finance its expenses on the second half of the year 2010 (BBC news, 23 April 2010). After analysis, the Standard & Poor's (S&P) downgraded credit rating of the Greece sovereign into junk status (BB+) four days later.

Due to the sovereign debt default, the euro currency depreciated against the U.S. dollar. The Euro dollar depreciated against the US dollar since the downgrade of the sovereign credit rating by Standard & Poor's on 23 April 2010.¹ At the same time, the Greece stock market capitalization responsively goes on a downturn² and the Euro-zone Dow Jones Eurostoxx index has slumped³. During that year, conservative estimated 85,400 Greece local corporates went bankrupt.

The public need an indicator in signaling the phenomenon of sovereign rating change. Economic is one of the criteria that heavily concerned by CRAs in rating assessments, can be quantified and predicted with the macroeconomic variables. From here, the factors determining sovereign credit rating and rating change are crucial in the role as a signal for government, private sector and investors to manage finance more efficiently.

1.4 Objectives

The main aims of this study are:

- i. To identify the determinants of the sovereign credit rating and rating change events within the year 2000 to 2011.
- ii. To determine the asymmetries respond in sovereign credit rating change on pro-cyclical behaviour, i.e. how different the credit rating downgrade events impact the sovereign bond yield compared to the upgrade events.

¹Source from European Central Bank (ECB).

²Source from Eurostat.

³Source from **European** Central Bank (ECB).

1.5 Significance Of The Study

A lot of research had been done in the past decades to identify the determinants of the sovereign credit rating change events. It is important to study the sovereign credit rating change events along the period as two critical global financial crises had taken place: The U.S. subprime mortgage crisis (2007 - 2008) and the Eurozone sovereign debt crisis (2008 - 2012). The determinants that measured in sovereign credit re-rating assessments may vary during those years. In addition, financial crisis that created tension in the global financial market had necessitated a review on the percentage allocated in CRAs' assessments.

The recent studies focused more on the impact of sovereign credit rating in financial market, instead of examine the determinants of sovereign credit rating. For example, Christophera et.al (2012) investigated the effect of sovereign credit rating on stock-bond market correlations of 19 countries; whereas Alsakka and Gwilym (2012) studied the foreign exchange spot market reaction to sovereign credit news.

Most crucially, previous research computed the sovereign bond yield premium by taking the U.S Treasury bond as the benchmark of risk free sovereign bond. Since 2007, the U.S. subprime mortgage crisis has caused a hiking unemployment rate and the weak economy had triggered an officially downgraded rating by Standard & Poor's (S&P) on 5 August 2011. The recent study of Afanso et.al (2012) mainly study the 24 EU countries' bond yield spread respond to sovereign rating change from 1995 to 2010 by using U.S Treasury bill rate as risk free benchmark. In order to extend the study period to year 2011, it is necessary to appoint an appropriate risk free benchmark other than U.S Treasury bill rate. The basket of risk-free rate in this paper computed by using interbank offered rate of the countries that (1) holds AAA sovereign credit rating and (2) do not experience any rating change events throughout the study period. A basket of interbank offered rate may not be the theoretically risk-free interest rate, but it is a relatively good proxy in measuring the fluctuation of one asset against the risk-free benchmark.

1.6 Organization Of The Thesis

The rest of the thesis is organized as follows. Section 2 describes the literature review. Section 3 discusses the data description and model designation according to the objectives of the study. Section 4 shows the empirical results. Section 5 highlights the concluding remarks and policy implications.



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