Sovereign Debt and Sovereign Credit Rating: Literature Review

Reza Tahmoorespour a,*, Alireza Zarei b, Mohamed Ariff c, Meysam Safari d, Shaheen Mansori e

a University Putra Malaysia
b,c Sunway University, Malaysia
d,e Malaysia University of Science and Technology

ABSTRACT

The aim of this study is to summarise the recent literature related to sovereign debt credit rating and the Credit Rating Agencies (CRA). The ratings provided by the RAs address default risk of a sovereign borrower. These ratings are used to assess the ability of sovereigns in meeting their financial obligations. Simply put, these ratings are the RAs opinions about the sovereigns’ financial strength or lack of strength. Moreover, the RA activities may lead to lower degrees of information asymmetry in financial markets being judged by the amount of sovereign information they often provide and disclose to the investors.
1. Introduction

Sovereign debt has grown sharply during the last five decades: it is 93 per cent of Gross Domestic Product (GDP) in recent years compared to 39% of GDP in 1970 (M. Ariff, 2012). Deregulation and financial innovation, e.g. securitisation, derivatives, etc., have made financial markets larger and more concentrated, thus attracting more borrowers being engaged in capital markets to raise money until, in a sort of way, when the Global Financial Crisis occurred. Debt-takers including sovereigns have started to pull back so they are taking less debt form about year 2010. Appetite of governments to borrow more in previous years has been facilitated by the simplified liquid markets ready to lend to any and sundry.

Theory suggests that obtaining financial information is costly, thus borrowers are supposed to be disciplined by rating grades given by Credit Rating Agencies (CRAs). Hence, investors prefer to outsource the process of collecting information and analysis to a third party, which is the CRA. Therefore, investors rely heavily on credit ratings from Rating Agencies (RAs). The last financial crisis in 2007-08 cast serious doubts on the quality and even the integrity of RAs since they were not able to predict the default of sovereign debts and in reality contributed to the evidence of confusion, as admitted by CEO of Standard & Poor’s.

Three major RAs are Moody’s Investors Service, Standard & Poor’s, and Fitch Ratings. These agencies often use alphabetical combinations for risk classifications. For example, rating of bonds in S&P starts with group A: Triple A (AAA), double A (AA), and single A (A); group B: Triple B (BBB), double B (BB), and single B (B); group C: Triple C (CCC), double C (CC), and single C (C); and group D: Single D (D). In general, bonds with grade BBB and higher are referred to as investment-grade bonds, which carry relatively lower default risk. Bonds with grade below BBB are called non-investment-grades, speculative-grades, or junk bonds that
have higher chances of default. Table 1 provides a description on S&P and Moody’s different rating classes.

**Table 1**
Rating Classes of Moody’s and S&P

<table>
<thead>
<tr>
<th>Moody’s</th>
<th>S&amp;P</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa</td>
<td>AAA</td>
<td>Highest rating of bonds: Ability of borrower to pay interest and principal is very strong.</td>
</tr>
<tr>
<td>Aa</td>
<td>AA</td>
<td>High-grade of bonds: Ability of borrower to pay interest and principal is strong.</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>Although the borrower has the capacity to pay interest and principal, there are some possibilities that change in economic conditions adversely affects the bonds.</td>
</tr>
<tr>
<td>Baa</td>
<td>BBB</td>
<td>Medium-grade of bonds: Borrowers has enough capacity to pay interest and principal.</td>
</tr>
<tr>
<td>Ba</td>
<td>BB</td>
<td>Investors consider these bonds as riskier compare to the higher ratings of bonds. They consider these bonds as speculative; BB has the lowest level of speculation while CC indicates the highest level.</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Caa</td>
<td>CCC</td>
<td></td>
</tr>
<tr>
<td>Ca</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>No interest in going to pay for bonds in grade C.</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>Default bond: Payment of interest and principal is in arrears.</td>
</tr>
</tbody>
</table>

In general, the ratings provided by the RAs address default risk of a sovereign borrower (just as it does in the case of corporate borrowings). These ratings are used to assess the ability of sovereigns in meeting their financial obligations. Simply put, these ratings are the RAs opinions about the sovereigns’ financial strength or lack of strength. Moreover, the RA activities may lead to lower degrees of information asymmetry in financial markets being judged by the amount of sovereign information they often provide and disclose to the investors.

The ratings are specifically important for emerging markets. S.-J. Kim and Wu (2008) have found that rating changes affect the capital flows from G7 countries to the emerging markets. Hence, investors pay close attention to sovereign rating changes in emerging markets when it comes to investment. In addition, investors consider the currency denomination of the bond issuing countries. The reason is that the ratings on domestic denominated currency are less
significant than the ones in foreign currencies, meaning that a capital flow to emerging markets is more prone to affect foreign currency rating than the local one.

When the state of an economy changes and financial markets fluctuate, the financial strength of companies will change accordingly. Hence, given the prevailing market condition, there is a strong possibility of rating changes from what was initially reported by the RAs e.g. the rating for a unit downgrades from AAA to AA. In this case, the RAs will place the unit on credit watch. In general, placing a unit on credit watch will result in further downgrade of rating. Moreover, the RAs often reveal certain statistics on the number of times these ratings change over periods. Such information is provided in a so-called “ratings transition matrix”.

When investors want to purchase any bond security, they need to know about the risk of that particular bond. The main and the most important risk is the default risk which is the likely failure of an issuer to meet ‘promised’ obligations. The ratings provided by the RAs basically address the default risk of a bond. The main difference between the United States (U.S.) Treasury bond and other non-Treasury bonds is the higher default risk. There is another risk for bond investors, which is known as the call risk. Call risk is a special type of risk associated with bonds with callable options. Callable bonds provide the right to the borrower to buy back the bonds before its maturity at a specific price that is call price. Thus, it is important for investors to know whether a bond is callable before investment. The right to call the bond is an advantage to the borrowers especially in markets having low interest rates. In order to compensate the holders, call price generally is higher than the face values (e.g. call price is $1100 for face of $1000 with 10 per cent coupon). However, what is to the advantage of the issuer is to the disadvantage to the holders. Although investors are compensated with amounts higher than the face value, the call dates might not match the investment horizon. Therefore, investors will need to reinvest the fund at lower rates, according to the market condition. This risk is known as reinvestment risk.
Several scholars and regulatory agencies questioned the accuracy of presumed predictability of RAs after the Global Financial Crisis. The U.S. Congress and the President set up the Financial Crisis Inquiry Commission (FCIC) in order to investigate the impact of financial crisis and to provide Financial Crisis Inquiry Report (FCIR). In the report, it is mentioned that “The mortgage-related securities at the heart of the crisis could not have been marketed and sold without their (RAs) seal of approval. Investors relied on them, often blindly. In some cases, they were obligated to use them, or regulatory capital standards were hinged on them. This crisis could not have happened without the RAs. Their ratings helped the market soar and their downgrades through 2007 and 2008 wreaked havoc across markets and firms” (Commission, 2011). In February 2013, several private and public entities sued the rating agencies because of their wrong information and misuse of clients’ trustiness. Few plaintiffs were investors from the state of Ohio ($457 million), California State employees ($1 billion), Bear Stearns Investment Bank ($1.12 billion), and the U.S. government sued S&P for $5 billion.

In addition, after the Global Financial Crisis, large number of banks with initial high ratings from RAs were either forced to shut down or be bailed out by governments (see Ariff (2012) for detailed expose of why the banks imploded). Moreover, most sovereign ratings were downgraded in 2007 and 2008 due to the impact of the Global Financial Crisis. During 2009 and later, several of them were upgraded to higher ratings. However, the significant changes in sovereign ratings are still not statistically tested.

Thus, practitioners and scholars are unaware of how serious the bonds are deteriorated. This led to huge doubt about the accuracy of RAs. Several scholars have questioned the ability of RAs to correctly rate the banks (E. Altman & Rijken, 2004; E. I. Altman & Saunders, 1998; Amato & Furfine, 2004; Levich, Majnoni, & Rinhart, 2002; Portes, 2008). All the criticisms against the RAs since the Global Financial Crisis indicate a big issue and make it an important
topic for scholars to investigate rating agencies. Furthermore, there are several sovereign-related variables and country specific factors, which have to be jointly tested using advanced econometrics such as panel regression analysis with appropriate controls for stationarity, heterogeneity and cross-sectional dependence to establish robust findings that could be relied upon to shed light on this current worldwide problem. This research aims to investigate the simultaneous impact of sets of factors. Moreover, it aims to provide new results about the relationship between sovereign rating announcements and share issuance-cum-rating as well as stock market using economic models of announcement effects.

To the best of our knowledge, there is no study in the literature to consider the effects of Upgrade, Downgrade, and changes in credit watch or outlook as to how these events impact on the share markets of most of the G20 countries. Moreover, there are some studies about the determinants of sovereign ratings quality (Hau, Langfield, & Marques-Ibanez, 2012). Also, there is no study to examine the significance of sovereign ratings changes before and after a crisis such as the recent Global Financial Crisis just as there is no theory for measuring economic sustainability of debt. The current study aims to fill these gaps in the literature. Despite the absence of such formal published studies, participants assume that the rating changes had effects on bond (seldom studied) and share markets!

The next issue is: There are numerous factors affecting the sovereign ratings. Some scholars studied the sovereign related variables and some other researchers considered country-specific factors. There are few studies that examined the impact of both sovereign-related and country-specific variables together in a coherent manner. Neither is there a theory on how to measure economic sustainability of government debt: at what level of debt relative to the country’s resources does more debt predisposes the country to financial distress? This research aims to provide new outcomes on what factors significantly affect sovereign ratings.
In fact, governments have found it easy to borrow. Thus, the total bond issue of governments worldwide is $62 trillion (M. Ariff, Cheng, Fan Fah, Ramadili Mohd, Shamsher Mohamad, 2016). Most of the failed sovereign bonds reached high grades just before defaulting in 2008, which is a surprise to the investing public because of their reliance on credibility of rating. However, the extent of default in sovereigns is still unknown. Hence, it provides an opportunity for a higher-degree level research effort on this topic to examine (i) how sustainable is sovereign borrowing and (ii) what factors drive sovereign bonds to default. Weakness of companies can be identified by using theories such as the well-known Z-score of Altman. However, there is no significant theory for sovereign borrowers. There is no model in literature to predict the default of sovereigns similar to Z-Score of Altman for corporate. This gap in the literature offers another research problem to be studied. We hope to develop a model for sovereign ratings.

Changes of sovereign rating have economic impact on countries. Moreover, the time of rating changes plays an important role, meaning that rating changes occur during financial crisis or not. Thus, the issue that needs to be discussed is whether the rating changes that happen during financial crisis, or before and after have differential effect on the bond and share markets. This is another research issue.

Changes in a sovereign rating could precipitate major impacts on banking, corporations, and thus generally the whole economy. Although financial markets generate no more than 5% of the national income, malfunctioning financial markets can reduce economic growth by a huge amount, not to mention how much the economy goes down in a crisis when financial markets buckle. Banks and corporations cannot control sovereign ratings, but there are factors under their control such as country and bank or corporation-specific factors. After all, some banks did not fail while others did, so there are some intrinsic variables, which drive some not to fail. Hence, banks and firms in a country can manage their rating regardless of the sovereign rating
to enhance their rating, even to levels higher than the sovereign rating. Thus, this study aims to find the major factors affecting the bank and the corporate ratings as well as the role of sovereign rating in the changes to the markets. Significance of this study may be summarized: documenting the importance of changes in sovereign rating and the way market mechanism transfers the changes to the economy, the banks, and the corporations through the markets.

2. Literature Review on Sovereign Rating

Several scholars analyse the effect of sovereign rating changes beyond equity markets. These studies suggest that sovereign rating changes affect bond yields (Cantor & Packer, 1996; Larraín, Reisen, & Von Maltzan, 1997), private-sector debt ratings and interest rates (Borensztein, Cowan, & Valenzuela, 2013; Cavallo & Valenzuela, 2010), firm-level ratings (Ferri & Liu, 2002; Ferri, Liu, & Majnoni, 2001), and sovereign credit spreads in other countries (Gande & Parsley, 2005; M. a. M. A. Safari, 2014). Moreover, several studies have shown the relationship among market reactions, banks, and stock markets and conducted sound methodologies techniques ((M. Ariff & Zarei, 2016; M. Safari & TahmooresPour, 2013; Tahmoorespour & Mahdavi-Ardekani, 2012; Tahmoorespour, Mina, & Randjbaran, 2015; Tahmoorespour, Rezvani, Safari, & Randjbarand, 2015)). We note that most countries have yet been studied on this important phenomenon. So extending the study to a larger sample of unstudied countries would provide an opportunity to add new findings to the literature on bond market, this would also include Malaysia.

Sovereign rating represents assessment of the ability and willingness of governments to meet their financial obligations to lenders. It affects the dynamics of capital markets and influences the cost of capital. Brooks, Faff, Hillier, & Hillier (2004) use announcement effect models to show that sovereign rating downgrades have a strong negative impact on stock markets (so capital costs increases) but there is only limited evidence of abnormal returns linked to
upgrades. Gande & Parsley (2005) and Ferreira & Gama (2007) find that sovereign downgrades incorporate valuable information for sovereign bond spread changes and the aggregate stock market returns of connected countries, particularly in emerging economies, neighbouring countries, and during crisis periods. Upgrades have an insignificant impact. Ismailescu & Kazemi (2010) analyse whether emerging market CDS (Credit Default Swap) spreads respond to sovereign rating changes. They find that positive signals add new information to the markets, while negative news is anticipated and hence reflected in the CDS. These results are contradictory to earlier studies that find negative rating signals to have the greatest effect on CDS spreads (e.g. Norden & Weber (2004)). However, they find that negative signals significantly widen CDS spreads for investment grade issuers: positive announcements significantly narrow CDS spreads for speculative grade issuers. Note that these studies are one-dimensional ones to measure impact, but say nothing about factors that are linked to debt nor about sustainable debt.

2.1 Empirical Evidence

S.-J. Kim & Wu (2008) examine 51 emerging markets whether S&P sovereign ratings help attract international capital (international banking, foreign direct investment and portfolio flows) and thus induce domestic financial sector development. They find that sovereign rating news is an important stimulus for all three kinds of international capital flows. Moreover, they find significant domestic bond market developments after improvements in sovereign ratings.

Williams, Alsakka, & ap Gwilym (2013) analyse the sovereign rating actions on credit ratings of banks in 54 emerging markets by considering the three Rating Agencies such as Moody’s, Fitch, and S&P. They divide the sample into two pre-crisis and crisis periods. The pre-crisis is from 1999 until 31 December 2006 and crisis period is from 1 January 2007 to 31 December 2009. They categorized emerging markets by using the classification of World Bank. World
Bank classifies countries into four groups based on GNI per capita including Lower Income (LI), Lower Middle Income (LMI), Upper Middle Income (UMI), and High Income (HI). They considered LI, LMI, and UMI emerging countries. Banks ownership was identified in BankScope.

They used numerous explanatory variables in their study that related to the characteristics of the countries that banks are operating in: these include economic, financial, trade, fiscal, investment, monetary, and business freedom. Other explanatory variables are government spending, GDP growth, GDP per capita, inflation, etc. The macroeconomic factors in their study are economic freedom, trade freedom, inflation, etc. For rating changes, they followed the same method as Alsakka & ap Gwilym (2010). The rating changes are 20 numerical values on monthly intervals (AAA/Aaa=1, Aa1/AA+=2, Aa2/AA=3, …, Caa3/CCC-=19, Ca/CC=20).

They used ordered probit modelling to examine the impact of sovereign rating changes on bank ratings. This method identifies upgrades, downgrades, and no rating changes (when a bank rating is either put on watch status or taken off watch status). They consider the upgrade and downgrade separately since different factors affect each model (Al-Sakka & ap Gwilym, 2009; Livingston, Naranjo, & Zhou, 2008). Moreover, they measured the Marginal Effects (ME) to estimate the economic significance of each independent variable (Livingston et al., 2008).

Their model is as follows:

$$
\Delta Y_{i,a,t} = \sum_{n=0}^{2} \beta Sch_{n,1,a} + \gamma w_{i,a} + \lambda w_{i,a} + vrating_{i,a,t} + \epsilon_{i}
$$

$Y_{i,a,t}$ can take three values such as:

$$
Y_{i,a,t} = \begin{cases} 
0 & \text{if } Y_{i,a,t}^* \leq \mu_1 \text{ (no rating change)} \\
1 & \text{if } \mu_1 < Y_{i,a,t}^* \leq \mu_2 \text{ (rating upgrade/downgrade of 1 notch)} \\
2 & \text{if } \mu_2 < Y_{i,a,t}^* \leq \mu_3 \text{ (rating upgrade/downgrade of 2 or more notches)} 
\end{cases}
$$
Where $\mu_m$ is the threshold along with other variables $\beta$, $\lambda$, $\gamma$, and $\nu$, $i=1,\ldots,54$ countries, $a=$ Moody’, S&P, or Fitch, $t=1,\ldots,109$ months, and $n = 0,1,2$ or more notches in rating changes. 

$Sch_{n_i,a}$ is a dummy variable taking the value of 1 if an emerging sovereign $i$ is upgraded (downgraded) by $n$ notches by agency $a$, up to 3 months prior to month $t$, with $n = 1$ for a 1 notch upgrade (downgrade), and $n = 2$ for a 2 or more notch upgrade (downgrade); 0 otherwise. 

$\rho w_{i,a}$ is a dummy variable taking the value of 1 if sovereign $i$ was placed on positive (negative) watch by agency $a$, up to 3 months prior to month $t$; 0 otherwise. $W_{i,a}$ is a dummy variable taking the value of 1 if sovereign $i$ is on positive (negative) watch, by agency $a$, up to 3 months prior to month $t$; 0 otherwise. 

$rating_{i,a,t}$ equals to 1,2,3,….20 is the control variable to measure the economic condition of the sovereign. Each dependent variable is no more than three months later than the independent variables.

In order to examine the country related factors affect the sensitivity of bank rating, they used the *Freedom Index* in ordered probit modelling as follows:

$$CD_{b,i,a,t} = \alpha + \psi Freedom\ Index_{i,yt} + \epsilon_i$$

$CD_{b,i,a,t}$ equals to 1 if bank $b$ in country $i$ is upgraded or downgraded by agency $a$ three months prior to time $t$, 0 otherwise. *Freedom Index$_{i,yt}$* is a country level index for sovereign $i$ at time $yt$ (the year that bank rating changes). The same equation is estimated for *Economic Freedom*.

Moreover, to examine the impacts of country specific factors on the sensitivity of bank ratings to sovereign ratings, they used whether sovereign ratings were bigger, smaller, or equal to bank ratings:

$$CO_{b,i,a,t} = \theta Freedom\ Index + \epsilon_i$$
CO_{b,i,a,t} is taking value of 3 if sovereign rating > bank rating (rating change for bank \( b \) by agency \( a \) following a rating change in sovereign \( i \) three months prior to month \( t \) in same direction); equal to 2 if sovereign rating = bank rating; equal to 1 if sovereign rating < bank rating; 0 otherwise.

They find that S&P rates the banks most likely the same rate as the sovereign. However, Moody’s least likely rates are the bank rating as the same as the sovereign rating. Moreover, they observe that Moody’s most likely would assign ratings to banks lower than the sovereign, while Fitch most likely would rate the banks higher than the sovereign.

They found the same result as did Alsakka & ap Gwilym (2010) using differences in the policies of the three CRAs. About the watch status, they observed 42 (15) positive (negative) by Moody’s, 9 (18) by Fitch, and 0 (19) by S&P. Thus, unlike Moody’s that assign positive watch status most frequently, S&P assign no sovereign on positive status. However, S&P put sovereign on Negative Watch status most frequently followed by Fitch. In a nutshell, in contrast to Moody’s that tends to upgrade the sovereigns, S&P tends to downgrades them.

Furthermore, Williams, et al. (2013) find that banks are likely follow the ratings of their sovereign. From the 846 (506) bank upgrades (downgrades), only 4 (12) lead to sovereign downgrades (upgrades). This means that banks are most likely have the same credit change as the sovereigns. They identified the bank ownership by using the bank scope database into three groups namely state, foreign and local privately owned.

They find that bank upgrades and downgrades are followed by sovereign upgrades and downgrades, as expected. Although bank ratings are followed by sovereign ratings, the relationship heavily depends on country specific factors. Banks in countries with high level of freedom (economic, financial, etc.) are less likely follow the sovereign rating upgrades. On the other hand, the impact of sovereign rating downgrades on bank ratings is not affected by the
economic freedom. In addition, the higher the GDP growth in a country, the more (less) likely bank ratings follow sovereign upgrades (downgrades). Based on their result, foreign and local privately-owned banks are more likely to follow sovereign downgrades and upgrades respectively.

Furthermore, the results show that bank ratings in emerging markets are constrained by sovereign ratings. This highlights an important question whether CRAs provide accurate ratings for sovereigns in emerging markets since the bank ratings in these countries are heavily affected by the sovereign ratings.

Caporale, Matousek, & Stewart (2012) examine the rating provided by Fitch Rating (FR). Firstly, they investigate the relationship between key financial variables of bank and bank rating. Secondly, they examine the impact of country specific factors on bank rating. Thirdly, they consider whether bank ratings are determined by timing of rating. Finally, they assess the accuracy of their models with the ratings of Fitch with the first three banks (Glitnir, Kaupthing and Northern Rock) that affected by the financial crisis in 2007-08. They use Bank Scope to collect 681 international banks’ ratings from 2000 to 2007. They set the data in an ordinal form from 1 to 9 since Fitch ratings have 9 categories. The average rating of banks declined from 2000 to 2007 indicating that time variable should be considered in the model. FR provides four types of ratings namely legal, long-term, short-term, and individual ratings. FR rate banks into main five groups and four sub-categories. They applied ordered logit method to examine the bank ratings and the determinants:

\[ Y_{i,j}^* = \sum_{k=1}^{k} \beta_k X_{k, it-1} + \epsilon_{it} \]

Where \( Y_{i,j}^* \) is the unobserved latent variable linked to observe variable \( Y_{it} \):
\[
Y_{it} = \begin{cases} 
1 & \text{if } Y^*_{i,t} \leq \lambda_i \\
 j & \text{if } \lambda_{j-1} < Y^*_{i,t} \leq \lambda_j; j = 2, 3, \ldots, 8 \\
9 & \text{if } \lambda_8 < Y^*_{i,t} 
\end{cases}
\]

\(X_{k,i,t-1}\) is the first lag of explanatory variable \(k\) for bank \(i\). Instead of estimating marginal effects (difficult to interpret in ordered probit modelling), they used the sign of \(\beta_i\) to know whether meet their expected results. Some other studies use marginal effect for estimation (Alsakka, ap Gwilym, & Vu, 2014; Williams et al., 2013).

In order to consider the country effects, they need to use 89 dummy variables (90 countries in their sample), which is not a proper estimation since it would cause high correlation. Thus, they used a single country index adopting from Hendry (2001).

The estimation period is 2000-2005 for forecast period of 2006-2007 and another estimation period is 2000-2006 for forecast sample of 2007-2007. Split the period into estimation and forecast confines the degree of freedom which adversely affect the accuracy of model. Hence, to address this issue the nine rating categories combine into four groups such as D/E and E ratings take the value of 1, C/D or D ratings are given 2, group 3 is for bank with B/C or C rating and group 4 is for A, A/B, and B ratings. The distribution of ratings in these four groups is 56, 139, 159, and 96 for groups 1 to 4 respectively. Applying these four groups instead of nine ratings provide better estimation since the dependent variable is more evenly distributed—see Aldrich & Nelson (1984) and Stone & Rasp (1991).

For comparative purposes, they applied nine categories and 4 group data for dependent variable. They report general model results and one parsimonious which attained by using the cross sectional variant of general-to-specific methodology. In a case of more than one parsimonious result, the one with lower Schwartz’ Information Criterion (SBC) was chosen.
The time variable has negative coefficient meaning that the more recent the rating was assigned, the lower was the rating. Equity and total asset positively affect bank rating. However, operating expenses and non-performing loan adversely influence bank rating. Liquidity and net interest margin do not have significant relationship.

Based on the results, country specific factors significantly and positively affect bank ratings indicating that banks in stable and developed economy have higher ratings. For example, Canada, Norway, and Sweden have the highest country-specific ratings though Bangladesh shows the lowest.

Prediction period, Percentage of Correct Prediction (PCP), was measured. When the regressand obtains 9 categories, the PCP is 54.44% whereas for the 4 groups of dependent variables the PCP is 73.77%. The PCP is significantly higher for the models which include country-specific factors. This indicates that economy situation of a country affect the bank ratings and the studies that do not involve country variables are missing an important variable in their studies.

Based on the results, they found that the rating process depends on the quantitative information which is publicly available. However, they found that, besides quantitative data, qualitative information and views of experts (not available to public) affect rating assignments. Therefore, estimation models cannot be 100% accurate in predicting ratings since these models do not have access to unavailable information.

Banks with higher capitalisation and asset, receive higher ratings. The higher the ratio of operating expenses to operating income and the bigger the ratio of non-performing loans to total loans, the lower the ratings are. Moreover, liquidity of bank and net interest margin are not significant factors for determining the bank ratings. They also find that the more recent the rating is assigned, the lower the rating is. The country significantly affects the ratings. This means that banks in some countries assign higher ratings relative to similar banks in other
countries. Thus, the individual rating of FR is underpinned by fundamental financial analyses. This means that the ratings of FR during stable economic periods (non-crisis) are informative and accurate.

Kim & Wu (2011) examine the impact of sovereign debt rating on international bank flows from G7 countries on to emerging markets. They study 55 emerging markets in four regions (Latin America, Africa and Middle East, Emerging Europe, and Asia-Pacific) from Q1:1995 to Q4:2008. They consider the ratings of S&P which ranges from AAA to D/SD (default or selective default) including credit watch positive and negative (outlooks). They split the ratings into investment and non-investment grades which are BBB- and above, and BB+ and below respectively. In addition, they take the daily average of rating to measure the quarterly rating. They collect all the banking data from Bank for International Settlement (BIS). Moreover, they consider four groups of control variable such as Bilateral Linkage (Distance, Total Trade, etc.), Economic and Financial Development (GDP, Stock Market Capitalization, etc.), Financial Openness (FDI, Foreign and Domestic Barriers to Investment, etc.), and Governance and Institutional quality (World Bank Governance Indicators). The main explanatory variable is the sovereign debt rating that they measure separately for foreign and domestic dominated currency. They categorize their results in three groups including (i) impact of ratings changes on bank flows from G7 to emerging markets, (ii) investment and non-investment grades rating effects, and (iii) spillover effect of rating changes. Their empirical model is as follows:

$$G7BankFlows_{j,t} = \alpha + \beta_1 \Delta CR_{i,t-1} + \beta_2 \Delta Outlook_{i,t-1} + \sum_{k=3}^{p} \beta_k Bilateral _{Links}^{k}$$

$$+ \sum_{k=10}^{0} \beta_k Fin _{Devmt}^{k} + \sum_{k=16}^{x} \beta_k Fin _{Open}^{k} + \beta_{20} Gov_{i,t}$$

Where $G7BankFlows$ are the quarterly changes in foreign claims of G7 countries’ banks ($j = Canada, France, Germany, Italy, Japan, United Kingdom, and United States$) against each of the 55 emerging market countries ($i=1 to 55$) from Q1:1995 to Q4:2008. $\Delta CR_{i,t-1}$ and $\Delta Outlook_{i}$
are last quarter’s changes in long-term sovereign ratings and rating outlooks on foreign- and local-currency-denominated sovereign debt, respectively.

Based on results, changes in sovereign debt rating and outlooks positively and significantly affect the bank flows from G7 to emerging markets (with exemption of the United Kingdom and Canada). This means that increase in sovereign debt rating will result in increasing the fund flow from G7 countries to emerging markets. However, the ratings on local currency denominated are less significant than foreign currency denominated, meaning that a bank flow to emerging markets is more sensitive to improvements in the foreign currency denominated rating rather than the local one.

Based on the results, foreign and local currency denominated debts are more influential for investment and non-investment grade ratings. This means that G7 lenders to investment grade borrowers are more affected by sovereign rating on foreign currency denominated while local currency one is more influential for non-investment grade borrowers.

Finally, they find significant adverse results for sovereign rating and interregional spillover effects, which means that improvements in rating of one region reduce the bank flows to other regions. The only exception here is from Asia Pacific to Eastern Europe.

Hau, Langfield, & Marques-Ibanez (2012) examine the quality of ratings assigned to banks by S&P, Moody’s, and Fitch. They construct a panel of data for the United States (U.S.) and EU15 banks from 1:1990 to 12:2011. They consider ratings of banks at the end of each quarter. Thus, the time series is quarterly. Among the three CRAs, S&P provides the largest number of banks, followed by Moody’s and Fitch (16,928, 2,715 and 9,110 respectively). The panel before 2000 was incomplete due to lack of Basel recommendations. They also use expected default frequencies (EDFs) from Moody’s to measure the bank distress (Longstaff & Schwartz, 1995; Merton, 1974).
In addition, Hau, et al. (2012) measure the rating error by Ordinal Rating Quality Shortfall (ORQS). The positive and negative numbers of ORQS are considered rating optimism and pessimism respectively. They applied a linear regression of ORQS as dependent variables and explanatory variables of bank characteristics, rating agency and country dummy, relationship between bank and rating agency, time and country fixed effects. Their research has main four hypotheses namely rating quality during the crisis and after the crisis; rating quality across rating agencies and countries; rating quality and conflict of interests; and rating quality and bank characteristics. The ORQS model is as follows:

$$ ORQS (a,i,t,k) = \frac{|EDF \text{ rank}(i,t+k) - Credit \text{ rank}(a,i,t)|}{N-1} $$

$ORQS$ is the absolute difference between the rank of a bank's $i$ credit rating by rating agency $a$ among all bank ratings at time $t$ and the corresponding rank of that bank’s expected default frequency ($EDF$) at time $t+k$, normalised by sample size.

Based on the results, large banks relatively receive higher ratings from RAs, especially from the RAs that the banks provide securitization business (conflict of interest). When a bank uses a particular agency to rate its assets and default probabilities, the RA gives relatively higher rating to the bank since the bank is the client of the RA. In other words, RAs interpret the phrase “too big to fail” in their ratings. One of the possible reasons is the agency conflict between the RA and the bank. One of the justifications of “too big, too fail” is that large banks receive support and guarantee from the governments.

They also find that the Basel II recommendation has no relationship with the default probabilities for the upper investment grade ratings. Based on the Basel II accord, 20% risk-weight should be given to between AAA and AA- ratings, 50% and 100% for ratings between A+ and A-; and BBB+ and BBB- accordingly.
Alsakka, ap Gwilym, & Vu (2014) investigate the impact of sovereign rating on bank rating in Euro area. They examine mainly the reaction of the top three rating agencies (S&P, Moody’s, and Fitch) to the European sovereign debt crisis. They find that there is a channel which the sovereign rating changes were transmitted to the bank rating. They examine the relationship between sovereign rating and bank rating and whether this relationship differs across rating agencies and/or countries. Moreover, they consider the bank rating for downgrade of sovereign ratings during Euro debt crisis whether credit rating agencies assign different rating to banks and/or apply different rating policies.

They consider the foreign currency ratings and watch status for sovereigns and banks for 21 European countries. They split the time into two periods: pre-crisis (2003:1-2007:12) and crisis period (2008:1-2013:12). They collect the bank ratings data from Interactive Data Credit Ratings International and sovereign ratings from the rating agencies’ publication. They select banks based on the 2011 Euro stress test and at least rated once by one of the three rating agencies. Thus, 91 banks from 21 European countries are chosen. The bank sample consists of 60% of all the European banking systems in terms of total asset. Following the literature, they use the 20 numerical scales for bank ratings. The average sovereign rating for the whole sample is 18 and 17 before and during the crisis period respectively. During the pre-crisis period, the average bank ratings by S&P and Fitch are 16 whereas it is 17 for Moody’s. During the crisis period, the average bank rating by S&P is 14 while for the Moody’s and Fitch is 15.

They apply ordered probit framework which is widely accepted in credit ratings literature since it considers the discrete, ordinal nature of credit ratings, and rating changes (Alsakka & ap Gwilym, 2010; Caporale et al., 2012; Güttler & Wahrenburg, 2007; Williams et al., 2013). Their model is as follows:
\[ BDN_{i,a,t}^* = \beta_1 SDN_{i,a,t} - \ln(w_{1a}) + \beta_2 SDN_{i,a,t} - 2n_{1a} + \beta_3 SUP_{i,a,t} - \ln(w_{1a}) + \beta_4 SUP_{i,a,t} - 2n_{1a} \\
+ \beta_5 NW_{i,a} + \beta_6 Srat_{i,a,t} + \phi Co_i + \gamma Y_t + \varepsilon_{i,a,t} ; \varepsilon_{i,a,t} : N(0,1) \]

\[ BUP_{i,a,t}^* = \beta_1 SDN_{i,a,t} - \ln(w_{1a}) + \beta_2 SDN_{i,a,t} - 2n_{1a} + \beta_3 SUP_{i,a,t} - \ln(w_{1a}) + \beta_4 SUP_{i,a,t} - 2n_{1a} \\
+ \beta_5 NW_{i,a} + \beta_6 Srat_{i,a,t} + \phi Co_i + \gamma Y_t + \varepsilon_{i,a,t} ; \varepsilon_{i,a,t} : N(0,1) \]

\[
BDN_{i,a,t} = \begin{cases} 
0 (\text{nobank rating change}) & \text{if } BDN_{i,a,t}^* \leq \mu_1 \\
1 (\text{bank rating downgrade of 1 notch}) & \text{if } \mu_1 < BDN_{i,a,t}^* \leq \mu_2 \\
2 (\text{bank rating downgrade of 2 or more notches}) & \text{if } \mu_2 < BDN_{i,a,t}^* 
\end{cases}
\]

\[
BUP_{i,a,t} = \begin{cases} 
0 (\text{nobank rating change}) & \text{if } BUP_{i,a,t}^* \leq \mu_1 \\
1 (\text{bank rating upgrade of 1 notch}) & \text{if } \mu_1 < BUP_{i,a,t}^* \leq \mu_2 \\
2 (\text{bank rating upgrade of 2 or more notches}) & \text{if } \mu_2 < BUP_{i,a,t}^* 
\end{cases}
\]

\( BDN_{i,a,t} \) and \( BUP_{i,a,t} \) are bank downgrade and upgrade respectively in country \( i \) by rating agency \( a \) at time \( t \). \( SDN_{i,a,t} \) (\( SUP_{i,a,t} \)) is a dummy variable equals to 1 if country \( i \) downgraded by 1 notch by CRA \( a \) up to 2 months prior to month \( t \) (i.e. time \( t \) and time \( t-1 \)), 0 otherwise. \( SDN_{i,a,t} \) (\( SUP_{i,a,t} \)) is a dummy variable equals to 1 if country \( i \) downgraded by more than 1 notch by CRA \( a \) up to 2 months prior to month \( t \) (i.e. time \( t \) and time \( t-1 \)), 0 otherwise. \( NW_{i,a} \) is a dummy variable equals to 1 if sovereign \( i \) put on Negative Watch by CRA \( a \) up to 3 months prior to month \( t \), 0 otherwise. \( Srat_{i,a,t} = 1, 2, 3, ..., 20 \); a numerical value indication the rating of sovereign \( i \) by CRA \( a \) at time \( t \) that rating announced. \( Co_i \) and \( Y_t \) are full set of country and year dummies.

The above-mentioned two equations estimated for two samples: (1) pre-crisis period, and (2) crisis period. Instead of using data of each CRA separately for each equation, they used all the data from the three CRAs. Hence, they used two dummy variables \( D-Moody \) and \( D-Fitch \) in order to control the independency of CRAs.
Moreover, they examined whether rating of one agency affect the decision of other agencies to change their ratings. Thus, they applied probit modelling to address this question:

\[
\begin{align*}
\Delta BR^B_{k,t} &= \sum_{h=1}^{3} \beta_h D_{-BDN}^{B_{k,h}} + \varphi C_{t} + \gamma Y_{t} + \epsilon_{k,t} + \epsilon'_{k,t} : N(0,1) \\
\Delta BR^A_{k,t} &= \sum_{h=1}^{3} \beta_h D_{-BDN}^{A_{k,h}} + \varphi C_{t} + \gamma Y_{t} + \epsilon_{k,t} + \epsilon'_{k,t} : N(0,1)
\end{align*}
\]

\(\Delta BR^A_{k,t}\) is an unobserved latent variable linked to the observed ordinal \(\Delta BR_{k,t}\) that refers to change in bank rating by CRA A or B for bank k at month t. \(D_{-BDN}^{B_{k,h}}\) is a dummy variable equals to 1 if bank k downgrades during the first month (i.e. \(h=1\)), during 2 to 6 month (i.e. \(h=2\)), and from month 7 to 12 (i.e. \(h=3\)), zero otherwise. \(C_{t}\) and \(Y_{t}\) are full set of country and year dummies.

\[
\begin{align*}
\Delta BR_{k,t} &= \begin{cases} 
-2 \text{ (bank rating downgrade by more than one notch)} & \text{if } \Delta BR^*_{k,t} \leq \mu_1 \\
-1 \text{ (bank rating downgrade by one notch)} & \text{if } \mu_1 < \Delta BR^*_{k,t} \leq \mu_2 \\
1 \text{ (bank rating upgrade)} & \text{if } \mu_2 < \Delta BR^*_{k,t}
\end{cases}
\end{align*}
\]

In order to have a better result, they consider sovereign upgrade and downgrade ratings separately because different factors are involved. Since there are three rating agencies in their study, they measure two dummy variables to control for differences among the rating agencies. They expect that the relationship between sovereign rating and bank rating should be positive since sovereign rating changes are expected to affect bank rating in the same direction. Based on their result, the average bank rating is lower than the average of sovereign rating by 2 notches.

About the rating agencies, they find that the most generous and conservative agency in assigning ratings are Moody’s and S&P respectively. They find that there is no channel of
changes transmission from sovereign ratings to bank ratings before the crisis. However, there is a strong evidence of channel existence during crisis period. There are evidences of difference in rating policy among the three rating agencies. Based on the result, multiple-notch sovereign rating downgrades have the strongest influence on bank ratings by S&P, followed by Moody’s and Fitch. Although Negative Watch actions by rating agencies adversely affect the bank ratings, the actual sovereign ratings downgrade affect bank ratings stronger. Banks in PIIGS countries (Portugal, Italy, Ireland, Greece, and Spain) are more affected by sovereign rating changes since banks in Greece, Portugal, Italy, and Spain expose to the sovereign debt of their own country.

Moreover, they found that before the Euro debt crisis, three rating agencies assign ratings independently. However, during the crisis, there is evidence of dependent rating among the rating agencies. This finding is in line with finding of Bar-Isaac and Shapiro (2013), Manso (2013) and Opp, Opp, & Harris (2013). Once a bank receives a downgrade from a rating agency, the probability of receiving harsher downgrades from other rating agencies increases. S&P is the first mover in bank rating downgrades meaning that S&P is more independent in bank rating. Moody’s is more conservative in rating assignments. In general, Moody’s rating grade indicates more stable rating compared to other rating agencies.

Hence, in order estimate a bank rating, one can monitor the previous actions from other rating agencies as well as the sovereign rating changes for the home country of the bank. About Fitch ratings and its relative independence, they propose that the reason might be dual headquarters of Fitch in Euro and a European ownership of the organization.

Borensztein, et al. (2013) studied the impacts of sovereign rating on corporate ratings in advance and emerging countries. There was a policy that corporate ratings cannot be higher than a sovereign one (sovereign ceiling). However, in 1997 S&P removed this policy and so
after corporates could receive ratings above the ceiling. They consider the ratings of S&P to examine whether the corporate ratings free to move above the ceiling or the sovereign rating still put pressure on corporate ratings.

They consider corporate and sovereign ratings and accounting data for all the non-financial company with S&P foreign-currency rating from 1995 to 2009. The whole sample is 478 corporates in 29 countries (14 developed and 15 emerging countries). The regressand in their study is the foreign-currency corporate rating and regressors are sovereign rating, EBIT to asset, Equity to capital, size, etc. The sovereign and credit ratings translate to numerical values from 1 to 21 which is from lowest to highest (Cantor & Packer, 1996; Reinhart, 2002). They also consider extra two variables to capture the exact sovereign role in corporate rating. They measure capital (financial) account openness by using the KAOPEN index from Chinn & Ito (2008). In addition, they measure the political risk by using the Political Risk Rating from the International Country Risk Guide (ICRG). Their regression of credit rating \( R_{t,scit} \) of firm \( i \) belonging to industry \( s \) in country \( c \) during period \( t \) is given by:

\[
R_{t,scit} = \alpha + A_s + B_c + C_t + \lambda X_{it} + \gamma Z_{ct} + \delta \text{Sov}_c R_{t,scit} + \mu_{t,scit}
\]

Where the subscript ‘‘isct’’ refers to firm \( i \), industry \( s \), country \( c \), and time \( t \). \( A_s, B_c, \) and \( C_t \) are vectors of industry, country, and year dummy variables, respectively, that account for industry, country, and year fixed effects. \( X_{it} \) are firm-level determinants of idiosyncratic risk, \( Z_{ct} \) are country-level macroeconomic variables that affect the risk level of all firms in the economy, and \( \text{Sov}_c R_{t,scit} \) is the sovereign credit rating. The parameter of interest in this estimation is \( \delta \).

Based on their results, sovereign ratings significantly affect corporate ratings though the policy had been changed in 1997 by S&P. Although sovereign ratings do not confine the corporate ratings completely, corporate ratings are significantly limited by sovereign ratings. Moreover,
the pressure from sovereign ratings on corporate ratings become more significant in countries where political risk is high and capital account restriction is still practice. The main reason for sovereign ceiling is that governments under financial problems set policy of account restriction on private sector to get access to foreign currency financial sources. As a result, all of the corporate and the whole private sector will be limited to the sovereign credit rating.

Literature on the link between government and stock market consists of two groups. First, there are researches that examine the relationship between sovereign credit rating on all the companies or on stock indices. For example, G. Kaminsky & Schmukler (2002) and Brooks, et al. (2004) study the impacts of sovereign rating changes on stock market. Martell (2005) examine the link between sovereign ratings on individual stocks and Lee, Sapriz, & Wu (2010) investigate the impact of country-specific factors on the relationship between sovereign rating changes and stock market. Second strand in literature refers to research about government fiscal problems and its impacts on bank performance.

Regarding the role of government for banking, Correa, Lee, Sapriz, & Suarez (2014) examine the government support for banks and the relationship between sovereign ratings and bank stock returns. They consider 37 countries (developed and emerging) from 1995 to 2011. The total number of events is 314 from S&P Rating Services. Data for 259 banks collect from Datastream and Moody’s Investors Services. Regarding the bank ratings, they use Moody’s data. The reason is that Moody’s provide two ratings for each bank. One rating is the bank as a standalone entity and another rating is with the possible external support to bank. Therefore, in order to capture the government support the difference between the rating with possible external support and the stand alone rating were considered (Schich & Lindh, 2012). They study the relationship between governments and banks by considering events such as sovereign rating changes. When the windows are tighter, probably many confounding factors are excluded from the result that may affect the relationship. Demirgüç-Kunt & Huizinga (2013)
considered only one factor of the government support for banks, which is the size of the institution and find that equity market valuation is lower for the banks that have tighter relationship with the government and economy. In order to have complementary result with Demirgüç-Kunt & Huizinga (2013), Correa, et al. (2014) capture more factors of government support for banks.

Global financial crisis and European debt crisis confirmed the close link between sovereign credit rating and banking sector. There are many channels that sovereign credit risk could influence banks. However, based on the results of Correa, et al. (2014), there are three most common transmission channels. First, the financial condition of the government could heavily affect the banking sector. Sovereign rating downgrade could lead to higher cost of debt for the government. Hence, the government may cut the public expenditures, or increase taxes, etc. All of these actions negatively affect the banking system.

Second, most of the banks around the world hold significant domestic government debt. As a result, sovereign rating downgrade leads banks into financial problem since they are holding risky bonds. The reason banks buy government bonds is that they use the bonds as collateral in their operations so that market participants consider a government bond a liquid asset. Bolton & Jeanne (2011) mention that domestic banks in Euro and Japan hold 15% and 50%, respectively, of domestic government bonds in 2009. Consistent with the transmission channel from government to banking sector, Gennaioli, Martin, & Rossi (2014) find that reduction in credit supply lead to the financial distress for government especially when banks hold substantial amount of government bond.

Third, governments usually support banks or any big institution, percieved as “too big too fail”, which is important for economy. A sovereign rating downgrade would cause doubts about the support and guarantee from the government so that market practitioners concern about the
financial situation of the banks. In the case of financial distress, governments bail out banks since bank defaults are extremely costly in terms of output (Dell’Ariccia, Detragiache, & Rajan, 2008; G. L. Kaminsky & Reinhart, 1999).

Correa, et al. (2014) collect the data of sovereign rating changes from 1995 to 2011 for the S&P rating agency. They use S&P ratings since they are unlikely to forecast by the market and announce changes ahead of other rating agencies (Brooks et al., 2004; Gande & Parsley, 2005). They use the same method of Gande & Parsley (2014) to transform the changes of ratings and outlooks into numerical values. In order to capture the government support to banks, Correa, et al. (2014) use Bank Financial Strength Ratings (BFSRs) and banks’ deposit ratings by Moody’s rating agency. According to Moody’s BFSR represents “Moody’s opinion of a bank’s intrinsic safety and soundness”. It is important to note that BFSR does not include any external support to banks from other financial institutions or central government. Bank rating is the measurement of a bank ability to pay its financial obligation punctually. Thus, the difference between bank deposit rating and BFSR is the measurement for government support to banks. Large values of BFSR indicate that the government more likely support banks in distress time.

About the methodology, they use regression analysis to capture the support from government toward bank as regressand. Regressors are bank liabilities to GDP, budget deficit to GDP, and other fixed effects variables:

\[
\text{Support}_{ijt} = \alpha + \beta_1 \text{Liabilities}_{ijt} / \text{GDP}_{jt} + \beta_2 \text{Deficit}_{ijt} / \text{GDP}_{jt} + \lambda_i + \mu_t + \epsilon_{ijt}
\]

Where \( \text{Support}_{ijt} \) is the average over year \( t \) of the ratings-based measure of government support for bank \( i \), which is headquartered in country \( j \).
The main methodology in their study is event study (Brown & Warner, 1985) to examine the effects of sovereign rating changes on bank stock returns at different levels of government support. In order to calculate the excess return for event study, Karolyi & Stulz (2003) introduce two measurements. The first method uses domestic market index to calculate $\alpha$ and $\beta$, and the second one use the world market index. These models are domestic CAPM and world CAPM, respectively. Better measurement depends on whether investors access to foreign assets. If investors have access to foreign assets, world CAPM should be used, otherwise domestic CAPM is reliable. However, investors easily can have access to foreign assets due to market liberalization (Bekaert & Harvey, 2002). Thus, world CAPM sounds better to use in the event study (Correa et al., 2014; Lee et al., 2010; Martell, 2005). The main specification in their study is as follows:

$$r_{ijt} = \alpha + \beta_1 \text{Positive event}_{ijt} + \beta_1 \text{Negative event}_{ijt} + \beta_1 \text{Support}_{ijt} + \beta_1 \text{Positive event}_{ijt} \times \text{Support}_{ijt} + \beta_1 \text{Negative event}_{ijt} \times \text{Support}_{ijt} + \delta X_{ijt-1} + \gamma Z_{jt-1} + \phi_j + \mu_t + \epsilon_{ijt}$$

Where bank $i$ located in country $j$ in period $t$. The vector $X_{ijt-1}$ represents a set of bank-specific controls: the lagged log value of the bank’s market capitalization in U.S. dollars, the lagged log value of the book-to-market ratio, a measure for the volatility of the bank’s stock return, and indicator variables for the lagged level of a bank’s BFSR. $Z_{jt-1}$ is a vector of indicator variables for the lagged level of a country’s sovereign debt rating. Finally, $\theta_j$ and $\mu_t$ are country and time fixed effects.

Based on the results, bank stock prices do drop when sovereign rating is downgraded. However, sovereign rating upgrades lead to a little bit increase in bank stock returns. They find that the relationship between sovereign rating changes and bank stock return can be explained by a group of factors such as economic condition of the country, expectation of investors about the
support of government to banks, and government debt hold by banks. They find that banks that are expected to receive any support from the government, experience negative excess returns after sovereign rating downgrades. The results are more robust in advanced economies since banks receive more support from governments.

Results support the transmission channel of government support to banks. Thus, the results are complementary to Demirgüç-Kunt & Huizinga (2013) that link the fiscal soundness of governments to banks. The results also indicate that government support to banks not only help banks debt holders, but also their equity holders. Government support to banks reduces the cost of debt funding for banks and as a result enhance the shareholder value and decline the risk of default (Ejsing & Lemke, 2011; Panetta et al., 2011).

Finally, results from European financial crisis indicate that a number of government support and bailouts for banks in return increase the government debt and lead to sovereign credit rating downgrade.

Huang and Shen (2015) investigate the effect of sovereign credit ratings on bank credit ratings, known as the sovereign effect. Their study differs from the literature in three respects. First, they examine whether bank ratings below, at, or above the sovereign ceiling impact the sovereign effect. They find that the sovereign effect holds in all cases. Next, they consider the asymmetric impact of the sovereign effect on bank ratings with or without the ceiling effect. They find that a downgrade exhibits a stronger sovereign effect than an upgrade. Third, they examine whether the asset deterioration or the stable foreign fund hypotheses are possible explanations for the sovereign effect. Their results support both hypotheses.

Caselli, Gandolfi, and Soana (2016) examine the spillover effect of Eurozone sovereign rating changes announced by Standard and Poor's, Moody's, and Fitch on domestic bank share prices in the period 2002–2012. This spillover effect appears negative in the case of downgrades, but
insignificant for upgrades. Surprisingly, announcement of sovereign negative credit watches results in increased bank stock returns. Bank share price losses following sovereign downgrades increase as bank leverage, efficiency, and equity performance increase, and they decrease as bank systematic risk and payout ratio increase. On the contrary, bank share prices rise following sovereign negative credit watches, as leverage and bank size decrease and as bank systematic risk increases.

The SEC implemented Regulation Fair Disclosure (Reg FD) in 2000. Reg FD requires firms to release material information to everyone simultaneously, thereby reducing information asymmetry between favoured stock analysts and others. Bond rating agencies were exempt from Reg FD in order to continue receiving the private firm information necessary for accurate credit default assessments. The exemption, if valuable to the bond market, should have resulted in an increase in the relative importance of bond rating changes on bond yield premia when Reg FD was implemented. In the first empirical study on the impact of Reg FD on the bond markets, Poon and Evans (2013) explore this hypothesis by measuring bond yield premia reactions to bond rating changes around the implementation of Reg FD.

For downgrades, they find the impact of Reg FD is related to firm size. The smallest firms experienced a significantly weaker bond yield premia response. The evidence for the relevance of Reg FD for upgrades is weak. Contrary to concerns from the Bond Market Association, it appears Reg FD lessened the impact of downgrades on the smallest firms, and did not affect speculative-grade bonds or bonds with higher debt levels.

Hu, Prokop, and Trautwein (2016) analyse two-way spillover effects between sovereign ratings and bank ratings across 17 Eurozone countries for the period 2002-2013. They show that sovereign rating actions including watchlist placements and outlooks have a significant impact on bank ratings. During the financial crisis, downgrade spillovers from sovereigns to
systematically important financial institutions (SIFIs) are stronger than spillovers to non-SIFIs. Moreover, they provide evidence on the existence of a bank-to-sovereign rating transmission channel. Downgrades of SIFIs increase the probability of multiple-notch downgrades of sovereign ratings. Dividing the sample into PIIGS and non-PIIGS subsets, they find bank-to-sovereign spillovers to exist only in the PIIGS subsample.

Wengner, Burghof, and Schneider (2015) examine the impact of S&P rating events on the credit default swap (CDS) spread of firms and the spillover effect on competitors for the period 2004–2011. Wengner et al. (2015) find that both credit downgrades and upgrades have an impact on the CDS spread of event and non-event firms on the event date. Downgrades are more anticipated than upgrades. Overall, the market reaction differs in extent and significance across industries and has been more pronounced since the beginning of the 2007 financial crisis.

Klusak, Alsakka, and Ap Gwilym (2017) integrate three themes on regulation, unsolicited credit ratings, and the sovereign-bank rating ceiling. They reveal an unintended consequence of the EU rating agency disclosure rules upon rating changes, using data for S&P-rated banks in 42 countries between 2006 and 2013. The disclosure of sovereign rating solicitation status for 13 countries in February 2011 has an adverse effect on the ratings of intermediaries operating in these countries. Conversion to unsolicited sovereign rating status transmits risk to banks via the rating channel. The results suggest that banks bear a penalty if their host sovereign does not solicit its ratings.

Sensoy (2016) aims to determine if long-term foreign currency sovereign rating assessments (from S&P, Moody’s and Fitch) for the advanced emerging Latin American countries (Brazil, Mexico and Chile) have any significant effect on the correlation between their stock market returns in the last decade. With that purpose in mind, they obtain the time-varying correlation
by cDCC modeling using ARX-APARCH filtered returns. The analysis shows that the rating changes do not have a significant effect on the correlations in general. After testing for robustness, they reveal that an upgrade to an investment grade level for a country is more likely to positively diversify it from others in the region instead of creating a common positive regional investment environment. Results have important implications for investors and policymakers.

The severity and complexity of the recent financial crisis has motivated the need for understanding the relationships between sovereign ratings and bank credit ratings. Poon, Shen, and Burnett (2017) are the first to examine the impact of the “international” spillover of sovereign risk to bank credit risk through both a ratings channel and an asset holdings channel. In the first case, the downgrade of sovereign ratings in GIIPS (Greece, Italy, Ireland, Portugal, and Spain) countries leads to rating downgrades of banks in the peripheral countries. The second channel indicates that larger asset holdings of GIIPS debt increases the credit risk of cross-border banks, and hence, the probabilities of downgrade.

Motivated by the European debt crisis and the new European Union regulatory regime for the credit rating industry, Alsakka, ap Gwilym, and Vu (2017) analyse differences of opinion in sovereign credit signals and their influence on European stock markets. Rating disagreements have a significant connection with subsequent negative credit actions by each agency. However, links among Moody’s/Fitch actions and their rating disagreements with other agencies have weakened in the post-regulation period. They also find that only S&P’s negative credit signals affect the own-country stock market and spill over to other European markets, but this is concentrated in the pre-regulation period. Stronger stock market reactions occur when S&P has already assigned a lower rating than Moody’s/Fitch prior to taking a further negative action.
Salvador (2017) analyses the effect of rating signals on banks’ stock market returns during the period 2004–2012. The results obtained show that investors respond to rating announcements. Specifically, it is found that before the financial crisis, positive rating signals issued by Standard and Poor's and Moody's, and negative ratings signals issued by Fitch and Standard and Poor's, have a significant effect on the return on banks’ shares. Conversely, in a context in which the banks experienced a significant worsening of their financial situation and the rating agencies were in the spotlight, investors reacted not only to rating downgrades as expected, but also to rating upgrades. Furthermore, the results suggest that investors do not react with the same intensity to the ratings signals issued by the rating agencies. Analysis of the causal relationship between rating signals and returns on banks’ shares indicates that the policies of the rating agencies are not totally independent of changes occurring in the financial markets.

In summary, scholars have found various results regarding changes in sovereign ratings and their impacts on economy especially on the banking sector. Generally, rating downgrades affect the economy harshly than the upgrades. There are mainly two streams in the literature. One is about the relationship between changes in sovereign ratings and the bank (or corporate) rating. Second approach is to apply country specific factors in a regression analysis to come out with the factors that appear to affect the bank or corporate ratings: few use stock price reactions as well. In most of the studies, researchers used ordered probit modelling or simple regression. However, it might be useful to apply event study in order to know the timing of the influence on the market. This is the inspiration in the next section on methodology.
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