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Abstract:

This study proposes an information asymmetry hypothesis to examine why bank credit ratings vary among countries even when bank financial ratios remain constant. Countries are divided among those with low and high information asymmetry. The former include high-income countries, those in North America and West Europe regions, and those with strong institutional environment quality, whereas the latter group possess the opposite characteristics. This study hypothesizes that the influences of financial ratios on ratings are enhanced in low information asymmetry countries but reduced in countries with high information asymmetry. The sample includes the long-term credit ratings issued by Standard and Poor's from 86 countries during 2002–2008. The estimated results show that the effects of financial ratios on ratings are significantly affected by information asymmetries. Countries wishing to improve the credit ratings of their banks thus should reduce information asymmetry.

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1. Introduction

The study of how credit ratings are determined has attracted considerable attention recently. Early investigations of this area typically used financial ratios to explain and predict ratings and their changes.[1] Recent works have identified two plausible "credit rating inconsistencies". First, the same firm sometimes receives different ratings when rated by different rating agencies (Ederington 1985; Beattie and Searle 1992; Moon and Stotsky 1993; Cantor and Packer 1994). This is considered an inconsistency because given full information disclosure the same firm should receive roughly equivalent ratings regardless of rating agency.[2] The second inconsistency is that rating agencies issue different ratings for firms that have the same financial ratios but are located in different countries. That is, two firms with identical financial performance will not necessarily receive identical ratings.

This study attempts to identify the causes of the second inconsistency. As identified in previous works, both asset opaqueness and information asymmetry cause split ratings (Jewell and Livingston 1998; Livingston et al. 2006, 2007). However, a direct test of the latter is unavailable. This study examines a rich data of commercial banks from 86 countries during 2002-2008. Analyzing rating inconsistency is also of particular interest for banks and their supervisors because reliable assessment of the creditworthiness of obligors is an important precondition for the stability of a financial system as an inadequately high exposure to credit risk has been one of the leading sources for problems in financial institutions worldwide for many decades (Basel Committee on Banking Supervision 2000 and 2005). As a consequence, the analysis of the inconsistency of banks' ratings across different obligor groups has also gained importance in academic research (Carey 2001; Jacobson et al. 2006).

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[1] Horrigan (1966); West (1970); Pogue and Soldofsky (1969); Pinches and Mingo (1973, 1975); Altman and Katz (1976); Kaplan and Urwitz (1979), Cluff and Farnham (1984), and Ederington (1985); Blume et al. (1998); Estrella et al. (2000); Tabakis and Vinci (2002)

[2] For example, Morgan (2002) finds that the same banks or insurance companies have a high probability of being assigned different ratings when rated by different agencies, and states that this split rating results from opaqueness in bank assets.

This paper proposes an *information asymmetry hypothesis* to investigate why ratings differ among banks with similar financial ratios in different countries. We posit that when a bank is located in an industrialized country, or in a country with strong institutional environment quality, the financial ratios are more likely to reflect bank intrinsic value. Accordingly, little asymmetric information exists between rating agencies and banks in these countries. In contrast, these asymmetric information problems are more acute in developing economies and countries with weak institutional environment quality, making banks' financial ratios more susceptible than those in developed countries (Vives 2006). The poor financial quality of such banks leads rating agencies to doubt the credibility of financial statements and thus issue lower ratings despite identical financial ratios. Accordingly, different ratings may be issued to two banks with similar financial ratios where one is located in a country with low information asymmetry while the other is in a country with high information asymmetry.

The study makes three main contributions to the literature. First, this study demonstrates how information asymmetry influences the relationship between individual financial ratio and bank credit rating in a systematical way. Past studies, though mentioned the information asymmetry, do not examine it empirically. For example, Rojas-Suarez (2001) discussed the asymmetric information but did not proceed empirical studies. Ferri and Liu (2004) found non-financial firm ratings are explained by institutional quality but did not directly explore the information asymmetry, nor did they use banking sample. Next, our bank rating model uses the most comprehensive data set from 86 countries during 2002-2008. By contrast, previous studies use less number of sample countries and the focus is on non-financial firms (Ferri et al. 2001; Ferri and Liu 2004; Purda 2003; Poon 2003).While Poon and Firth (2005) and Poon et al. (2009) investigate banks ratings, their focus is on whether unsolicited ratings are downward bias. Third, we consider the possible influence of local and international accounting standards used by different banks. Recently, the

increasing studies have investigated the influence of different accounting standards on accounting quality. Our model takes them into account to avoid the missing third variable problem.

The remainder of this paper is organized as follows. Section 2 is literature review. Section 3 outlines and discusses the methodology. Section 4 describes data sources and descriptive statistical analysis. The results are reported in Section 5 and section 6 is the robust testing. Section 7 summarizes the conclusions.

2. Literature Review

2.1 Credit rating determinants

External credit ratings can be regarded as comprehensive measures of risk, because they incorporate all of the risk factors that are perceived to be relevant by rating agencies. Early investigations of this area typically used financial ratios to explain and predict ratings and their changes. For example, the model of Horrigan (1966), incorporating six financial variables, [3] predicted Moody's ratings with approximately 58% accuracy and S&P ratings with approximately 52% accuracy. Furthermore, West (1970) added market information, such as bond market value as the explanatory variable, improving the prediction accuracy of Moody's ratings from 58% to 62%. Also, Pinches and Mingo (1973, 1975) and Altman and Katz (1976) found that approximately two-thirds of ratings can be predicted on the basis of a small number of financial statistics. Pogue and Soldofsky (1969), Kaplan and Urwitz (1979), Cluff and Farnham (1984), and Ederington (1985) demonstrated similar results.

Recently, Blume et al. (1998) found that accounting ratios and market risk data were stronger determinants of larger corporations' ratings. Similarly, Estrella et al. (2000) examined the predictive power of capital ratios on US bank failures and found a strong connection between capital ratios and external debt ratings, such that balance sheet and size data could replicate a major part of the debt ratings from S&P.

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[3] These six financial ratios are working capital to sales, net worth to total debt, sales to net worth, net operating profit to sales, total assets, and subordinated dummy.

Tabakis and Vinci (2002) analysed ratings from S&P, Moody's, and Fitch related to 67 European banks and found that the agencies' ratings depend on balance sheet information, the country of incorporation, and the bank's specialisation. Other studies investigated the impact of corporate governance on the debt rating and on the financing cost of the debt issues (Sengupta 1998; Bhojraj and Sengupta 2003; Bradley et al. 2008).

Many methodologies have been developed in recent years which analyze the external rating process such as linear regression (Horrigan 1996; West 1970), linear discriminant analysis (Pinch and Mingo 1973, 1975), logit and probit (Altman and Katz 1976; Jackson and Boyd 1988) ordered logit and ordered probit (Kamstra et al. 2001; Altman and Rijken 2004; Amato and Furfine 2004; Alejandro and Analía 2008; Bellotti et al. 2011b), artifical intelligence techniques (Dutta and Shekhar 1988; Surkan and Singleton 1990; Kim et al. 1993; Kwon et al. 1997). Kim (2005), Huang et al. (2004) and Lee (2007) show that artificial intelligence techniques (particularly neural networks and support vector machines) do not provide superior predictions of bond ratings compared with standard ordered-choice methods.

2.2 Credit rating inconsistency

Prior literatures indicated rating inconsistency phenomenon exists. For example, Cantor and Falkenstein (2001) compared default rates for US and non-US issues that have received speculative grade ratings from Moody's. Since the one-year default rate for the US firms was 3.3%, higher than the 1.8% for the non-US firms, it implies that foreign firms received overly harsh ratings from Moody's. They explain that the data is somewhat biased because most foreign firms have been rated recently during a period of low overall default rates, whereas the US firms were rated during a period of turbulent economic conditions. Nickell et al. (2000) investigated the differences in Moody's rating transition matrices for issuers domiciled in various countries. They found that while firms from the US and the UK displayed similar rating transitions, Japanese firms with relatively low ratings exhibited considerably more consistent

ratings. Restated, the tendency of Japanese firms to change ratings was markedly less than that of their US counterparts.

Purda (2003) attempts to explain the rating inconsistency by adding country explanatory variables. Using ratings data of six developed countries (Canada, France, Germany, Japan, the UK, and the US), he suggests the difference in ratings is reduced once national economic cycle is considered. Purda further considers the legal infrastructure of creditor protection and the rule of law of La Porta et al. (1998, LLSV) to explain the differences; but some of his results are counter-intuitive. Specifically, nations with good rule of law receive better ratings, yet so too do those with poor creditor protection. Ferri and Liu (2004) examined a sample of 563 non-financial firms from 45 countries and found that in developed countries, financial ratios can comprise almost all the information content of firm credit ratings, while in developing countries, ratings are heavily dependent on sovereign risks and financial ratios play a negligible role. They also found that the quality of institutions (proxied by the rule of law index) and of information disclosure can partly explain differences in rating behavior. Rojas-Suarez (2001) also found that regarding the explanation of credit ratings, financial ratios are more relevant in industrialized countries than emerging markets. Analyzing 265 firms from different industries in 15 countries, Poon (2003) found that rating agencies weight the same financial variables differently when assigning ratings to Japanese and non-Japanese issuers. The results indicated that S&P may assign profitability a higher degree of importance and a lower level of significance to short-term debt to total debt when determining the ratings of Japanese issuers.

Some literatures indicated that country-specific variables affect credit rating determinants but they did not show how they affect credit ratings. For example, Caporale et al. (2011) model EU countries' bank ratings using financial variables and allowing for intercept and slope heterogeneity. They found that country-specific factors (in the form of heterogeneous intercepts) are a crucial determinant of ratings.

Whilst "new" EU countries typically have lower ratings than "old" EU countries, after controlling for financial variables, all countries are found to have significantly different intercepts. Bellotti et al. (2011a) used ordered choice models and support vector machines to understand the determinants of bank ratings. They found country-specific effects affect a bank's rating. A bank in a less stable, developed, rich economy appears to have a lower rating.

2.3 Effects of information asymmetry

Previous studies separately analyzed samples from developed and less developed countries, and examined whether financial ratios can explain and predict credit ratings. For example, Ferri et al. (2001) found that the rating criteria used for firms in less-developed countries differ from those used for firms in developed countries. They also found that correlation between the changes in firm and sovereign ratings is almost non-existent for G-10 countries, but increases with decreasing national income level. Finally, they found that in less developed countries the probability of issuer rating being downgraded increases when sovereign rating is downgraded. Ammer and Packer (2000) have presented similar evidence, finding that the average one-year default rate for speculative grade non-US issuers was lower than that for US issuers between 1983 and 1998, and thus concluding that rating agencies were harsher in rating non-US issuers. Vives (2006) indicated that problems of asymmetric information are harsher in Latin America and East Asia. Moreover, Mishkin (1999) used asymmetric information analysis to explain the East Asian financial crisis. Thus, the income of a country may influence the weights of financial ratios in credit ratings.

Recent international studies investigate between countries' institutional features and financial reporting outcomes. Specifically, Ball et al. (2000), Hung (2001), and Leuz et al. (2003) highlight that a country's legal and institutional environment can affect firms' financial reporting incentives and hence influence the quality of financial information reported to outside investors. The literature also indicates that countries with stronger rule of law and higher quality of information disclosure receive better

ratings (Purda 2003; Ferri and Liu 2004). The evidence presented by Demirgüç-Kunt and Detragiache (1998) suggests that improved institutional environment quality reduces the likelihood of bank crisis when it is proxied by the law and order index. Classens et al. (2003) found that better institutional environment quality, including lower corruption, as well as enhanced law and order, legal system, and bureaucracy, is associated with lower crisis resolution costs and accelerated economic recovery. Godleski (2006) provided further support for this view using a sample of emerging market economies. Good institutional environment quality thus improves national reputation, and hence the reputation of banks.

3. Econometric Model

To conduct the econometric analysis, this study converts the long-term alphanumeric ratings issued by S&P into 17 numerical ratings,[4] i.e., AAA = 17, AA+ = 16, AA = 15,…, B– = 2 and CCC+ and CCC+ below = 1, as listed in Table 1. The term *Rating* denotes the S&P assessment of issuer creditworthiness, with a l arger number indicating a better rating. The model is as follows:

$$Rating_i = \beta_1 Profitability_i + \beta_2 Liquidity_i + \beta_3 Capital_i + \beta_4 Efficiency_i$$
$$+ \beta_5 Quality_i + \beta_6 Lnasset_i + \beta_7 SCR_i + \varepsilon_i \qquad (1)$$

To test the relations between financial ratios and credit ratings, this study uses the ordered probit model because the 17 c ategories of credit ratings indicate ordinal risk assessments. Furthermore, this study assumes

$$\beta_k = \beta_{k1} + \beta_{k2} Z \qquad (2)$$

where, i represents bank i, $k = 1,...,5$; $\beta_1,...,\beta_7$ are vectors of coefficients; and ε follows a normal distribution, with a mean of 0 and a variance of 1. The original sample comprises the long-term ratings of 3,347 bank-year observations from 86 countries during 2002 to 2008.

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[4] The reason of using 17 numerical ratings depends on our letter ratings and convergence of estimation. Jiang (2008) also use 17 numerical ratings, whereas Ashbaugh-Skaife et al. (2006) use 7 n umerical ratings.

The five financial ratios employed in this study take the form of averages over the past three years so as to minimize the business cycle effect[5]. *Profitability* denotes the average ratio of net income to total assets over the past three years, *Liquidity* denotes the average ratio of liquid assets to deposits and short-term funding, *Capital* represents the capital adequacy ratio, as defined by the Bank of International Settlement, *Efficiency* denotes the average ratio of cost to income, and *Quality* is the average ratio of loan loss provisions to net interest revenues.

For the sake of easily elucidated our testing results, we classify the financial ratios into two groups according to their impacts direction on the ratings. Ratios with higher values reflecting respective better and worse financial strengths are referred to as the "positive" and "negative" financial ratios. The former include *Profitability*, *Liquidity* and *Capital* while the latter include *Efficiency* and *Quality*. The information asymmetry hypothesis presented in this study thus proposes in countries with low information asymmetry the positive influence of positive financial ratios is enhanced, as is the negative influence of negative financial ratios, while in countries with high information asymmetry, the influences of both positive and negative financial ratios are reduced.

Lnasset and *SCR* are employed as control variables, where *Lnasset* is defined as the natural logarithm of the total assets and *SCR* denotes the S&P's sovereign credit rating. SCRs are similarly transformed from letter ratings into 17 numerical ratings. Borensztein et al. (2006) found the "sovereign ceiling effect" to be statistically highly significant, especially, in the banking industry. The year dummies and country dummies are also included to control for the effects of time and country variations. A dummy variable for each country is constructed such that it is unity for that country's observation and zero otherwise.

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[5] The reason of using three years average is as follows. When assigning credit ratings, the agencies adopt a longer-term perspective by using a process known as "rating through the cycle." This is usually implemented by considering the three-year averages of relevant financial ratios. The three-year averages of the financial ratios in 2007, 2006, and 2005 are used as the independent variables to explain the 2008 ratings.

Equation (2) further assumes that the coefficients (weights) of financial ratios $\beta_k (k = 1,\ldots,5)$ are influenced by Z, which includes two vectors for the proxies of asymmetric information.

$$Z = (INCOME, INSTITUTION)$$

The first set proxy, INCOME, is the vector of country development level. This study thus divides the sample countries into high-income countries (HIC) and middle-income countries (MIC), respectively, where the former denotes countries with low information asymmetry and the latter denotes countries with high information asymmetry. Rather than just separating countries based into HIC and MIC, this study also considers industrial (INDUSTRY) and emerging market economies (EMERGING) in conducting the robust test. We create a regional dummy, EMERGING, which includes Eastern Europe and Central Asia, East Asia and the Pacific and Latin American and the Caribbean. Rich countries, which being identified based on the definitions of *World Development Indicators* (WDI) published by the World Bank, in these three regions are excluded.[6] Thus, only middle- and low-income countries from each region are included.

The second set proxy is INSTITUTION, which includes law and order tradition of a country (LAWORDER), ranging from 1 to 6, the quality of bureaucracy of a country (BUREAU), ranging from 1 to 4, a country's corruption level (INTEGRITY), ranging from 1 to 6. We also include INSQUA which is the average of LAWORDER, BUREAU and INTEGRITY to proxy the whole institutional environment quality of a country. Besides, we use information disclosure quality (DISCLOSE), ranging from 0 to 10, to proxy asymmetric information. Institutional environment quality improves with increasing values.

For simplicity, countries in the HIC and INDUSTRY groups or those with higher

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[6] For example, East Asia and the Pacific excludes Japan, Hong Kong, Korea and Singapore, Eastern Europe and Central Asia excludes Slovenia and Latin American and the Caribbean excludes the Bahamas, Bermuda, and Puerto Rico.

institutional environment quality values are referred to as "low information asymmetry countries", while countries in the MIC and EMERGING group, or those with low institutional environment values are classified as "high information asymmetry countries". The information asymmetry hypothesis presented in this study indicates that, in countries with low information asymmetry, the influences of financial ratios are strengthened, whereas they are mitigated in countries with serious asymmetry. Regarding coefficients, in the case of countries with low information asymmetry, the coefficients of their interaction terms with positive and negative financial ratios are positive and negative, respectively. In contrast, for countries with serious information asymmetry, the coefficients of their interaction terms with positive and negative financial ratios are reversed, i.e., they are negative and positive, respectively.

4. Data Sources and Descriptive Statistical Analysis

4.1 Data sources

The long-term credit ratings of S&P, bank financial information, and the S&P's sovereign credit ratings are obtained from the Fitch IBCA BankScope. Meanwhile, the industrial country dummies (INDUSTRY) are obtained from the International Monetary Fund (IFS CD-ROM). The level of country's national income (HIC and MIC) and the less-developed region dummies (EMERGING) are obtained from the World Development Indicators (WDI). The institutional environment quality variables (LAWORDER, BUREAU, and INTEGRITY) are obtained primarily from the International Country Risk Guidelines (ICRG). The information disclosure quality indicator (DISCLOSE) employs data from Chan-Lee and Ahn (2001). Table 2 lists the data definitions and sources.

4.2 Descriptive statistical analysis

Table 3 illustrates the regional and country's distribution of long-term S&P credit ratings for banks from 86 countries during 2002-2008. Two countries, the U.S. and

Canada, are located in North America, where 764 and 66 banks are assigned their ratings, respectively. Next, 1,002 rated banks are identified from 22 European countries, making Europe the region containing the most banks. Third, while 640 banks are located in the Far East and Central Asia, Japan has the largest number of banks (236), where the number in parenthesis represents the number of banks receiving ratings. The remaining statistics include 306 rated banks from 18 countries in South and Central America. Additionally, the Oceania group includes Australia, New Zealand, and Papua New Guinea, with 127, 36 and 3 banks, respectively. Notably, numerous banks are located in the Middle East (116), East Europe (237) and Africa (50). Column 4 of Table 3 lists the SCR in 2008. Last, North America, Europe and Oceania commonly achieve the highest SCRs of AAA or AA, with exceptional countries being Cyprus (A), Greece (A), Ireland (A+), Italy (A+), Turkey (BB–) and Papua New Guinea (B+).

Table 4 lists the rating distribution of banks across regions. Several interesting findings are summarized below. First, the single-mode falls on A+ for North America and Europe and AA– for the Oceania. Multiple modes of the same number of banks occur in other regions, such as, rating from A– ~ BBB+ for the Far East and Central Asia, BBB– ~ BB for South and Central America, and so on. Next, despite the absence of statistical testing, the results appear to indicate that banks receiving high ratings are mostly located in affluent regions. In contrast, banks receiving low ratings are located in poor regions. For example, few banks are rated speculative grade in North America and Europe but many receive such ratings in South and Central America and Eastern Europe. Third, considerable variation of ratings exists in poor regions, including LATIN (South and Central America), EASIA (Far East and Central Asia) and East Europe. Thus, bank ratings vary markedly in some regions.

Table 5 lists the paired correlation coefficients between the information asymmetry variables. First, both the correlation coefficients between institutional environment quality and INDUSTRY and between institutional environment quality

and HIC are approximately 0.7, implying INDUSTRY and HIC have rather strong institutional environment quality. Additionally, the correlation coefficients between institutional environment quality variables and MIC and between institutional environment quality and EMERGING are all negative, indicating that countries in these countries tend to have weak institutional environment quality.

Panel A of Table 6 illustrates the average financial ratios against the corresponding credit ratings. Three financial ratios are approximately linearly related with ratings. Restated, greater *Profitability*, lower *Efficiency* and lower *Quality* typically display better ratings, though there are occasional exceptions.[7] The remaining two financial ratios, *Liquidity* and *Capital*, exhibit U-shaped patterns against ratings. To illustrate this, the lowest liquidity ratios coincide with A ratings while the highest ones coincide with the left AAA and right B and CCC ratings. *Capital* exhibits a similar U-shaped pattern. The two highest instances of *Capital* occur in AAA and CCC, while the lowest rating occurs in BBB. That CCC has the highest *Liquidity* and *Capital* ratios is counter-intuitive because banks with high liquidity and capital adequacy ratios should have a larger buffer to guard against default, and should not receive the CCC ratings. One possible reason for this phenomenon could be that the threat of a bank run on CCC rated banks leads them to provide increased liquid assets and capital. This issue is further investigated in robust testing.

Panel B lists the relationship between sovereign credit rating and bank credit ratings. Sovereign rating commonly is the ceiling for local bank ratings, with few exceptions.[8] This is especially true in cases involving strong SCRs, such as AAA, AA, A, BBB, but not those involving weak SCRs, such as BB, B and CCC.[9] Panel C

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[7] For instance, banks with AAA rating only have an average ROA of 0.64, which is smaller than banks with AA rating of ROA 1.16.

[8] Very rarely, banks ratings become higher than their sovereign ratings. In our samples, there are 50 bank-year observations exhibit this phenomenon. These cases are found in Argentina, Brazil, Bulgaria, Chile, Czech Republic, Indonesia, Italy, Jordon, Panama, Peru, Poland, and Turkey.

[9] An exception is Italy with the SCR of A. However, some of its banks ratings are higher than A.

represents the relationship between wealth and ratings. All AAA and AA rated banks are in industrial or high-income countries. Meanwhile, banks from middle-income or emerging market economies receive ratings of A or lower. Panel D lists proxies of institutional environment quality variables against ratings. Their relations clearly indicate that rating grade increases with improving institutional environment quality. However, this linear relation displays exceptions in the case of CCC ratings when institutional environment quality is proxied by LAWORDER and INTEGRITY. Banks with CCC ratings occur mainly in countries with middle rankings in terms of institutional environment quality.

5. Empirical Results

Table 7 lists the estimated results of equations (1) and (2). When only equation (1) is considered (the first column), the coefficients on t he positive financial ratios, *Profitability*, *Liquidity* and *Capital* display the expected positive signs, whereas the coefficients of negative financial ratios, *Efficiency* and *Quality*, exhibit the expected negative signs. Additionally, all coefficients are significant. Thus, a bank with higher positive financial ratio or lower negative financial ratio tends to receive higher ratings.

The next four columns present the results using HIC, INDUSTRY, MIC and EMERGING as the measure of information asymmetry. When HIC is used, the coefficients of its interaction terms with five financial ratios overwhelmingly show the expected signs, i.e., they are positive and negative for the positive and negative financial ratios, respectively. Additionally, all coefficients on the interaction terms are significant except for the *Capital*. Accordingly, this study hypothesis is fully supported. Similar results are obtained when INDUSTRY is employed as the measure of information asymmetry. In this case one additional coefficient of its interaction term with *Efficiency* becomes insignificant. The expected results imply that, in high-income or industrial countries, high quality financial ratios reflect intrinsic bank value. Rating agencies assign greater weight to their financial ratios.

When MIC is used as the proxy, the results show the expected reversed signs against those found in HIC, namely, the coefficients are negative and positive for the positive and negative financial ratios, respectively, except *Efficiency*. That is, though financial ratios alone demonstrate the expected signs, their influence on ratings is mitigated in MIC. For example, while the coefficient of *Profitability* alone is 0.182, that of the interaction term of MIC×*Profitability* is −0.179, leading to the net coefficient of *Profitability* in middle-income countries being almost zero (0.182–0.179=0.003). Also, while the coefficient of *Liquidity* alone is 0.010, that of the interaction term of MIC×*Liquidity* is −0.004, leading to the net coefficient of *Liquidity* being 0.006 (0.010–0.004=0.006). About the negative financial ratio, the coefficient of *Quality* alone is −0.011, that of the interaction term of MIC×*Quality* is 0.012, leading to the net coefficient of *Quality* being almost zero (−0.011+0.012= 0.001). This zero net effect is again consistent with our hypothesis that less transparent financial ratio in middle-income countries will reduce the weights of the financial ratios. Consequently, rating agencies assessing the banks in these regions cannot do so by using financial ratios.

When using EMERGING as the proxy, the estimated results are largely consistent with our hypothesis. For example, while the coefficient of *Profitability* is significantly positive (0.179), its interaction term with EMERGING is significantly negative (−0.162), reducing the net effect of *Profitability* on rating in emerging market economies. Significantly negative coefficient of EMERGING×*Liquidity* and significantly positive coefficient of EMERGING×*Quality* are also observed, respectively, reducing the influence of financial ratios. This study hypothesis thus is supported for these two regions.

Notably, the above coefficients of interaction term between *Capital* and various proxies of information asymmetry (HIC/INDUSTRY/MIC/EMERGING) are insignificant in this study. Moreover, this situation is found to be the norm rather than an exception. That is, *Capital* appears insensitive to degree of information asymmetry,

making the coefficients of its interaction terms insignificant. We provide one plausible conjecture as follows. In both low and high information asymmetry regimes, raters consider *Capital* to be paramount to banks in guarding against default and ignoring its influence would send the incorrect signal that it is unimportant. Thus, despite values of *Capital* being opaque and substantially underestimated in serious information asymmetry regimes, raters have no alternative but to adopt a second best policy that still assigns higher ratings to banks with higher capital. The weight of *Capital* thus is insensitive to the income level of countries here.

Table 8 lists the estimated results regarding the effects of institutional environment quality of a country, i.e., LAWORDER, BUREAU, INTEGRITY, INSQUA and DISCLOSE. Strikingly, the coefficients of interaction terms overwhelmingly display the expected signs and typically three or four of our interaction terms differ significantly from zero. When we use BUREAU, INTEGRITY and INSQUA as our information asymmetry proxies, four coefficients of interaction terms display the expected signs, i.e., the coefficients of interaction terms are significantly positive and negative for the positive and negative financial ratios. Institutional environment quality of a country successfully captures information asymmetry and thus our hypothesis is supported. When using LAWORDER and DISCLOSE to illustrate information asymmetry, the coefficients of interaction terms of LAWORDER×*Liquidity* and DISCLOSE×*Liquidity* are significantly positive. The coefficients of interaction term of LAWORDER and DISCLOSE and two negative financial ratios (*Efficiency* and *Quality*) are all significantly negative and as our expectation. The exception is for the *Capital* again. Banks in nations with better institutional environment quality thus receive greater weights on their financial ratios but weights are smaller in countries with worse institutional environment quality.

Throughout all reported tables, the control variables of both *Lnasset* and *SCR* show the expected positive influences on ratings. Thus, larger bank asset sizes and

higher sovereign credit ratings boost bank credit ratings. Additionally, in most cases, the sovereign credit rating is typically the ceiling for bank credit ratings.

6. Robust Testing

6.1 Effect of accounting standards

Because different accounting standards, GAAP and IFRS, may affect the ratings in a different way, we examine the robustness of our results by taking them into account.[10] This paper creates two dummy variables, *IFRS* and *USGAAP* to proxy the respective two accounting standards. These two dummy variables are equal to unity if the banks adopt the respective accounting standards, and zero otherwise. The source of accounting standard used by each bank is obtained from BankScope, which provides the accounting rules since 2005. Thus, once these two dummy variables are added as the control variables, the sample period starts from 2005, which reduces the number of observations.

Table 9 reports the estimated results by including *IFRS* and *USGAAP* as the control variables. For brevity, this study only reports the results when INDUSTRY, EMERGING, INSQUA and DISCLOSE are used to measure information asymmetry. The results show that most of the concerned coefficients of interaction terms remain to be expected. For example, when using INDUSTRY as asymmetric information proxy, the coefficients of INDUSTRY×*Profitability* and INDUSTRY×*Liquidity* are significantly positive and the coefficient of INDUSTRY×*Efficiency* is significantly negative. Thus, our information asymmetry hypothesis is robust to the different accounting standards. Coefficients of *IFRS* and *USGAAP* are overwhelmingly insignificant, indicating that the use of different accounting standard do not alter the ratings. This result is consistent with Cuijpers and Buijink's (2005), who used implied

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[10] The aim of IFRS is to achieve the global harmonization and convergence of financial reporting rules and regulations. Most studies examine firms' voluntary decisions to provide financial reports that confirm with "high quality" international accounting standards. However, the results are mixed. For example, Leuz and Verrecchia (2000) examined German firms that adopt IAS or U.S. GAAP and found that those firms adopting IAS exhibit lower bid-ask spreads, higher turnover and decrease in spreads. Daske (2006) examined voluntary IAS adoption by German firms and found that IFRS firms even exhibit a higher cost of equity capital than local GAAP firms. Hung and Subramanyam (2007) and Cuijpers and Buijink (2005) found no difference for those firms that adopt the two accounting systems.

cost of capital estimates and did not find significant differences across local GAAP and IFRS firms in the EU.

6.2 Robust testing of *capital* role by omitting CCC rated banks

Throughout this paper, CCC rated banks are found to exhibit eccentric behavior, for example their *Capitals* are inclined to be the second highest, marginally next to the AAA rated banks. The similar condition holds for *Liquidity*. This work thus hypothesizes that CCC rated banks are aware of their fragile financial condition, or are frequently warned by the regulators of this problem. Therefore, such banks thus try to ask help for financial objections from the market or the government, improving the ratios of *Capital* and *Liquidity*.

The previous tables show that *Capital* frequently become insignificant for interaction terms with asymmetric information variables, leading us to argue that *Capital* is insensitive to asymmetric information environments. Two arguments are raised here. First, *Capital* plays the same role as other financial ratios and it is the existence of CCC rated banks that lead to insensitive coefficients. If this is the case, removing CCC rated banks would recover the significance of coefficients of interaction terms with *Capital*. Also, we could argue that the observed inconsistencies in the behavior of *Capital* result from the existence of CCC rated banks. Alternatively, if eccentric results still exist for *Capital* even we remove the CCC rated banks, then in raters' mind, *Capital* is indeed different from the other financial ratios.

Table 10 lists the estimated results. For brevity, this study only reports the results when INDUSTRY, EMERGING, INSQUA and DISCLOSE are used to measure information asymmetry. The estimated results show that the coefficient of interaction term of *Capital* with all asymmetric information proxies are still insignificant, suggesting that raters treat *Capital* considerably differently from other financial ratios. Raters assign a heavy weight to *Capital* even in countries with severe information asymmetry.

7. Conclusions

This work presents an *information asymmetry hypothesis* to examine why banks with similar financial ratios receive different ratings. We use economic development level and institutional environment quality to classify countries into low and high information asymmetry groups. The low information asymmetry countries are high-income countries, industrial countries and countries fare strongly on institutional environment quality. Banks in these countries are expected to have high quality financial statements. In contrast, serious information asymmetry countries are middle-income countries, countries in emerging market economies or countries with poor institutional environment quality. Banks in these countries are expected to have low quality financial statements.

The financial ratios are then classified into two groups, i.e., positive and negative financial ratios, for which larger and smaller values indicate better performance, respectively. The former comprise *Profitability*, *Liquidity* and *Capital* and the latter include *Efficiency* and *Quality*. The information asymmetry hypothesis considered here posits that the influence of financial ratios is higher in countries with lower information asymmetry, for both positive and negative ratios, thus strengthening the positive influence of positive financial ratios and the negative influence of negative ones. In contrast, both influences are mitigated in countries with severe information asymmetry.

The study results demonstrate that first, without considering the effect of the asymmetric information variable, the five financial ratios show the expected positive and negative influences on ratings.

Second, when employing income as the measure of information asymmetry, for example, by dividing countries into industrial, emerging, high- and middle-income countries, the hypothesis is supported. In industrial or high-income countries, financial ratios have high quality, reflecting the intrinsic value of banks. Rating

agencies, thus, assign greater weight to financial ratios in such countries. In contrast, in middle-income countries and emerging market countries, the influences of financial ratios are reduced. Negative and positive coefficients of interaction terms are found using positive and negative financial ratios, respectively, reducing the influence of financial ratios.

Third, when institutional environment quality are used, i.e., LAWORDER, BUREAU, INTEGRITY, INSQUA and DISCLOSE, the hypothesis is strongly supported. Illustrate this phenomenon, financial ratios receive higher weightings in countries with better law and order tradition (LAWORDER), better bureaucratic efficiency (BUREAU), lower corruption level (INTEGRITY), higher information disclosure quality (DISCLOSE) but lower weightings in those with worse institutional environment quality. Institutional environment quality successfully captures the information asymmetry, leading raters to assign different ratings to different countries.

Finally, raters treat *Capital* considerably differently from other financial ratios. Raters assign heavy weight on *Capital* even in a country with severe information asymmetry. We speculate that this is because rating agencies consider capital to be the most important factor for banks in guarding against default. Also, the global institution, such as International Monetary Fund also considers capital to be the most important factor in building up the financial soundness indicator.[11] Ignoring capital in countries with serious information asymmetry would send the incorrect signal that capital is unimportant. Accordingly, even if the quality of capital is opaque or substantially underestimated in these countries, rating agencies cannot help but assign better ratings to banks with greater capital.

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[11] International Monetary Fund has conducted a global country survey, asking each country bank authority about the importance of bank indicators. *Capital* is overwhelmingly pointed as the most important one.

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Table 1: A Synopsis of S&P's Long-term Letter Ratings and Numerical Ratings

S&P's long-term credit ratings	Numerical	Number of bank-year observations
AAA	17	32
AA+	16	37
AA	15	206
AA−	14	424
A+	13	463
A	12	440
A−	11	434
BBB+	10	332
BBB	9	184
BBB−	8	149
BB+	7	114
BB	6	106
BB−	5	108
B+	4	111
B	3	75
B−	2	77
CCC+, CCC, CCC−, D, SD	1	55

Note:
Credit ratings are the long-term issuer credit ratings compiled by Standard & Poor's and reported on BankScope database. The ratings range from AAA (highest rating) to D (lowest rating). From ratings AA to CCC, S&P rating agency adds a plus (+) and a minus (−) to represent the strength and weakness in a grade of rating for every issuer.

Table 2: Summary of Variables, Descriptions and Data Sources

Variables	Descriptions	Sources
Dependent Variables:		
Rating	S&P's long-term ratings of commercial banks. All bank credit ratings are coded as 17 ordinal values, where AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.	BankScope
Explanatory Variables:		
Profitability	The average of the ratio of net income to total assets over the past three years	BankScope
Liquidity	The average of the ratio of liquid assets to deposits and short-term funding over the past three years	BankScope
Capital	The average of the ratio of capital adequacy ratio over the past three years	BankScope
Efficiency	The average of the ratio of cost to income over the past three years	BankScope
Quality	The average of the ratio of loan loss provisions to net interest revenues over the past three years	BankScope
Lnasset	The average of natural logarithm of total assets over the past three years	BankScope
SCR	All sovereign credit ratings are coded as 17 ordinal values, where AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.	BankScope
Proxies for Information Asymmetry:		
Country Development Level: Income		
HIC	Dummy variable, 1 if the bank is located in a high-income country, 0, otherwise	WDI
MIC	Dummy variable, 1 if the bank is located in a middle-income country, 0, otherwise	WDI
INDUSTRY	Dummy variable,1 if the bank is located in an industrial country, 0, otherwise	IFS
EMERGING	Dummy variable, 1 if the bank is located in a country from East Europe and Central Asia, East Asia and Pacific, Latin American and Caribbean region, 0, otherwise	WDI
Institutional Environment Quality		
LAWORDER	Indicative of law and order tradition, ranging from 1 to 6, the higher score representing the better a country's law and order.	ICRG
BUREAU	Indicative of quality of the bureaucracy, on a scale of 1 to 4, with higher scores representing more efficient of the bureaucracy.	ICRG
INTEGRITY	Indicative of a country's corruption level, on a scale of 1 to 6, with higher scores for lower levels of corruption.	ICRG
DISCLOSE	Indicative of a country's information quality, on a scale of 0 to10, with higher scores for higher information quality.	Chan-Lee and Ahn (2001)

Notes:
BankScope: FitchIBCA Bankscope CD-Rom (2002, 2003, 2004, 2005, 2006, 2007, 2008)
WDI: World Development Indicators Database (2006)
ICRG: International Country Risk Guidelines (2004)

Table 3: Distribution of Banks with Ratings Across Regions and Countries and SCR in 2008

Region	Country	Number of Bank-Year Observation	Sovereign Credit Rating
North America	Canada	66	AAA
	USA	764	AAA
Europe	Austria	14	AAA
	Belgium	23	AA+
	Cyprus	1	A
	Denmark	21	AAA
	Finland	20	AAA
	France	208	AAA
	Germany	66	AAA
	Greece	36	A
	Iceland	2	A+
	Ireland	85	AAA
	Italy	129	A+
	Liechtenstein	9	AAA
	Luxembourg	54	AAA
	Monaco	3	na
	Netherlands	53	AAA
	Norway	17	AAA
	Portugal	18	AA-
	Spain	56	AAA
	Switzerland	29	AAA
	Sweden	23	AAA
	Turkey	33	BB-
	United Kingdom	102	AAA
Oceania	Australia	127	AAA
	New Zealand	36	AA+
	Papua New Guinea	3	B+
Far East and Central Asia	China	29	A
	Georgia Rep of	2	B+
	Hong Kong	48	AA
	India	22	BBB-
	Indonesia	23	BB-
	Japan	236	AA
	Kazakhstan	41	BBB
	Korea	61	A
	Malaysia	26	A-
	Philippine	22	BB-
	Singapore	23	AAA
	Taiwan	66	AA-
	Thailand	42	BBB+
	Vietnam	1	BB
South and Central America	Argentina	13	B+
	Bahamas	9	A-
	Bermuda	10	AA
	Bolivia	9	B-
	Brazil	88	BB+
	Chile	33	A
	Colombia	6	BB+
	Costa Rico	3	BB
	El Salvador	17	BB+
	Guatemala	2	BB
	Jamaica	7	B
	Mexico	49	A
	Panama	17	BB
	Peru	8	BB+
	Puerto Rico	3	na
	Trinidad And Tobago	11	A-
	Uruguay	19	B+
	Venezuela	1	BB-
Middle East	Bahrain	18	A
	Israel	14	A-
	Jordan	1	BB
	Kuwait	26	A+
	Lebanon	20	B-
	Oman	4	A
	Qatar	6	AA-
	Saudi Arabia	16	AA-
	United Arab Emirates	11	AA
Eastern Europe	Bulgaria	29	BBB+
	Croatia	7	BBB
	Czech Rep.	25	A
	Estonia	1	A
	Hungary	4	A-
	Latvia	2	BBB+
	Lithuania	2	A
	Poland	5	A-
	Romania	8	BBB-
	Russian Federation	132	BBB+
	Slovakia	11	A
	Slovenia	4	AA
	Ukraine	7	BB-
Africa	Egypt	14	BB+

	Morocco	9	BB+
	Nigeria	4	BB-
	South Africa	14	BBB+
	Tunisia	9	BBB
All Regions	All Countries	3347	--

Note:
Data obtained from FitchIBCA Bankscope CD-Rom

Table 4: Distribution of Credit Ratings for Banks across Regions

S&P long-term credit rating	North America	Europe	Oceania	Far East and Central Asia	South and Central America	Middle East	Eastern Europe	Africa	Number of bank-year observation
Investment Grade									
AAA	12	20							32
AA+	16	20	1						37
AA	59	111	32	4					206
AA–	162	185	64	11	2				424
A+	201	198	5	52	2	4	1		463
A	138	181	14	66	11	24	6		440
A–	91	160	7	119	19	26	12		434
BBB+	84	61	15	119	9	26	12	6	332
BBB	42	18	16	67	17	6	14	4	184
BBB–	13	6	9	40	45	10	20	6	149
Speculative Grade									
BB+	3	1		49	26		16	19	114
BB	2	4		29	47		16	8	106
BB–	2	24		17	40		18	7	108
B+	5	6	1	30	40		29		111
B		1	2	24	20	3	25		75
B–		5		12	12	17	31		77
CCC+		1			2		17		20
CCC				1			16		17
CCC–							3		3
D					4		1		5
SD					10				10
	830	1002	166	640	306	116	237	50	3347

Note:
Data obtained from FitchIBCA Bankscope CD-Rom

Table 5: Correlation Matrices of Information Asymmetry Variables

	HIC	MIC	INDUSTRY	EMERGING	LAWORDER	BUREAU	INTEGRITY
HIC							
MIC	-0.978						
INDUSTRY	0.780	-0.764					
EMERGING	-0.807	0.821	-0.716				
LAWORDER	0.681	-0.674	0.611	-0.654			
BUREAU	0.742	-0.740	0.755	-0.636	0.681		
INTEGRITY	0.688	-0.673	0.719	-0.578	0.678	0.841	
DISCLOSE	0.668	-0.650	0.631	-0.592	0.524	0.783	0.742

Note:

Two set variables are included to examine whether asymmetric information can affect the relationship between financial ratios and credit ratings. The first set is the development level of a country, including HIC, MIC, INDUSTRY and EMERGING. HIC is an indicator variable taking on the value of 1 if the country stems from high-income countries and 0 otherwise. MIC is an indicator variable taking on the value of 1 if the country stems from middle-income countries. INDUSTRY is an indicator variable taking on the value of 1 if the bank is located in an industrial country and 0 otherwise. EMERGING is an indicator variable taking on the value of 1 if the bank is located in emerging market economies and 0 otherwise. The second set is the institutional environment quality of a country, including LAWORDER, BUREAU, INTEGRITY and DISCLOSE. LAWORDER is a country's law and order index, ranging from1 to 6, the higher score representing the better a country's law and order. BUREAU is an index of a country's quality of bureaucracy, ranging from 1 to 4, with higher scores representing more efficient of the bureaucracy. INTEGRITY is an index of corruption, ranging from 1 to 6, with higher scores for lower levels of corruption. DISCLOSE is a country's information quality, on a scale of 0 to10, with higher scores for higher information quality

Table 6: Basic Statistics of Financial Ratios and Information Asymmetry for Each Grade of Rating

Variables	Rating						
	AAA	AA	A	BBB	BB	B	CCC
Panel A FINANCIAL INFORMATION							
Profitability	0.64	1.16	0.98	0.99	1.26	1.55	-0.24
Liquidity	25.13	23.38	21.77	27.58	32.26	37.65	51.67
Capital	24.33	13.24	15.18	14.01	15.37	19.59	31.84
Efficiency	45.23	58.11	59.37	60.00	60.33	70.14	61.80
Quality	12.86	13.43	16.32	26.87	39.79	21.05	12.87
Lnasset	8.59	7.65	7.32	7.09	6.81	6.22	5.84
Panel B SOVEREIGN RATING							
AAA	1.00	0.84	0.63	0.30	0.03	0.03	0.00
AA	0.00	0.14	0.25	0.25	0.05	0.00	0.00
A	0.00	0.01	0.12	0.25	0.05	0.00	0.00
BBB	0.00	0.00	0.00	0.17	0.31	0.33	0.38
BB	0.00	0.00	0.00	0.03	0.54	0.25	0.22
B	0.00	0.00	0.00	0.00	0.02	0.38	0.15
CCC	0.00	0.00	0.00	0.00	0.00	0.01	0.25
Panel C ECONOMIC DEVELOPMENT							
INDUSTRY	1.00	0.96	0.83	0.53	0.07	0.03	0.00
HIC	1.00	1.00	0.96	0.72	0.14	0.05	0.00
MIC	0.00	0.00	0.04	0.27	0.81	0.95	1.00
EMERGING	0.00	0.00	0.06	0.28	0.62	0.75	0.98
Panel D INSTITUTIONAL ENVIRONMENT QUALITY							
LAWORDER	5.53	5.35	5.02	4.52	3.54	3.32	3.58
BUREAU	3.91	3.79	3.60	3.24	2.26	1.89	1.56
INTEGRITY	4.75	4.37	3.88	3.30	2.30	1.96	2.13
DISCLOSE	7.16	7.70	7.18	6.36	3.36	2.22	1.31
Number of banks	32	667	1337	665	328	263	55

Notes:
1. The sample year is from 2002 to 2008 across 86 countries. The financial ratios employed here are the average of the past three years to minimize the business cycle effect. The term *Profitability* is the average ratio of net income to total assets, *Liquidity* stands for the average ratio of liquid assets to customer and short-term funding, *Capital* is the average ratio of required capital to risky assets. *Efficiency* denotes the average ratio of cost to income, and *Quality* is the average ratio of loan loss provisions to net interest revenues. *Lnasset* is defined as the average ratio of natural logarithm of total assets.
2. In Panel B, we present sovereign credit ratings across different bank credit ratings. The sovereign credit ratings are categorized into AAA, AA, A, BBB, BB, B, and CCC.
3. In Panel C, the set is the development level of a country, including HIC, MIC, INDUSTRY and EMERGING. HIC is an indicator variable taking on the value of 1 if the country stems from high-income countries and 0 otherwise. MIC is an indicator variable taking on the value of 1 if the country stems from middle-income countries. INDUSTRY is an indicator variable taking on the value of 1 if the bank is located in an industrial country and 0 otherwise. EMERGING is an indicator variable taking on the value of 1 if the bank is located in emerging market economies and 0 otherwise.
4. In Panel D, the set is the institutional environment quality of a country, including LAWORDER, BUREAU, INTEGRITY and DISCLOSE. LAWORDER is a country's law and order index, ranging from1 to 6, the higher score representing the better a country's law and order. BUREAU is an index of a country's quality of bureaucracy, ranging from 1 to 4, with higher scores representing more efficient of the bureaucracy. INTEGRITY is an index of corruption, ranging from 1 to 6, with higher scores for lower levels of corruption. DISCLOSE is a country's information quality, on a scale of 0 to10, with higher scores for higher information quality.

Table 7: Credit Ratings Determinants—Information Asymmetry Variables: INCOME

Explanatory Variables	Ordered-Logit Model				
	(A)	(B)	(C)	(D)	(E)
Profitability	0.121***	0.020	0.037	0.182***	0.179***
	(3.93)	(0.50)	(0.91)	(3.81)	(3.46)
Liquidity	0.006***	0.006***	0.006***	0.010***	0.010***
	(7.45)	(5.72)	(5.78)	(4.62)	(4.58)
Capital	0.026***	0.032***	0.028***	0.022***	0.022***
	(6.32)	(4.32)	(3.61)	(4.58)	(4.54)
Efficiency	-0.006**	-0.007**	-0.005	-0.005*	-0.007**
	(-2.53)	(-2.02)	(-1.54)	(-1.67)	(-2.32)
Quality	-0.006***	0.000	-0.003*	-0.011***	-0.012***
	(-4.60)	(0.24)	(-1.72)	(-5.81)	(-6.29)
HIC×*Profitability*		0.158**			
		(2.39)			
HIC×*Liquidity*		0.005*			
		(1.88)			
HIC×*Capital*		0.000			
		(0.03)			
HIC×*Efficiency*		-0.011*			
		(-1.66)			
HIC×*Quality*		-0.013***			
		(-4.88)			
INDUSTRY×*Profitability*			0.183**		
			(2.49)		
INDUSTRY×*Liquidity*			0.004*		
			(1.77)		
INDUSTRY×*Capital*			0.005		
			(0.51)		
INDUSTRY×*Efficiency*			-0.002		
			(-0.53)		
INDUSTRY×*Quality*			-0.008***		
			(-2.91)		
MIC×*Profitability*				-0.179***	
				(-2.74)	
MIC×*Liquidity*				-0.004*	
				(-1.85)	
MIC×*Capital*				-0.006	
				(-0.68)	
MIC×*Efficiency*				-0.007	
				(-1.30)	
MIC×*Quality*				0.012***	
				(4.35)	
EMERGING×*Profitability*					-0.162**
					(-2.47)
EMERGING×*Liquidity*					-0.004*
					(-1.71)
EMERGING×*Capital*					0.012
					(1.33)
EMERGING×*Efficiency*					-0.000
					(-0.07)
EMERGING×*Quality*					0.013***
					(4.87)
Lnasset	1.790***	1.822***	1.825***	1.812***	1.825***
	(23.77)	(24.13)	(24.02)	(24.05)	(24.16)
SCR	0.749***	0.778***	0.784***	0.769***	0.776***
	(10.21)	(10.60)	(10.69)	(10.44)	(10.57)
Year Dummies	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES
R-Squared	0.296	0.299	0.297	0.298	0.299
Observation	2615	2615	2615	2615	2615
Log likelihood	-4509.4241	-4490.7416	-4497.8554	-4493.8814	-4490.9404

Notes:
1. *t*-statistics are in parenthesis and White-consistent heteroscedasticity is used.
2. *, ** and *** denote the significance at the 10%, 5% and 1% level, respectively.
3. Dependent variables, *Rating*, are S&P long-term issuer ratings of commercial banks. We convert S&P long-term alphanumeric ratings into 17 numerical ratings, i.e., we let AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.
4. The financial ratios employed here are the average of the past three years to minimize the business

cycle effect. The term *Profitability* is the average ratio of net income to total assets, *Liquidity* stands for the average ratio of liquid assets to customer and short-term funding, *Capital* is the average ratio of required capital to risky assets. *Efficiency* denotes the average ratio of cost to income, and *Quality* is the average ratio of loan loss provisions to net interest revenues. *Lnasset* is defined as the average ratio of natural logarithm of total assets. *SCR* are sovereign credit ratings coded as 17 ordinal values, where AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.

5. The set of information asymmetry proxy is the development level of a country, including HIC, MIC, INDUSTRY and EMERGING. HIC is an indicator variable taking on the value of 1 if the country stems from high-income countries and 0 otherwise. MIC is an indicator variable taking on the value of 1 if the country stems from middle-income countries and 0 otherwise. INDUSTRY is an indicator variable taking on the value of 1 if the bank is located in an industrial country and 0 otherwise. EMERGING is an indicator variable taking on the value of 1 if the bank is located in emerging market economies and 0 otherwise.

Table 8: Credit Ratings Determinants—Information Asymmetry Variables: INSTITUTION

Explanatory Variables	Ordered-Logit Model				
	(A)	(B)	(C)	(D)	(E)
Profitability	-0.001	-0.195***	-0.046	-0.095*	0.107***
	(-0.01)	(-3.00)	(-0.68)	(-1.73)	(3.43)
Liquidity	-0.003	0.002	-0.003	0.004**	0.007***
	(-0.50)	(0.64)	(-1.27)	(2.08)	(6.66)
Capital	0.029	0.011	0.034**	0.018	-0.001
	(0.69)	(0.59)	(2.45)	(1.38)	(-0.06)
Efficiency	-0.043***	-0.028**	0.010*	0.006	0.003
	(-3.69)	(-2.84)	(1.67)	(0.62)	(0.76)
Quality	0.010**	0.012***	0.002	0.008**	0.001
	(2.07)	(2.71)	(0.62)	(2.45)	(0.38)
LAWORDER×*Profitability*	0.025				
	(0.83)				
LAWORDER×*Liquidity*	0.002*				
	(1.67)				
LAWORDER×*Capital*	0.001				
	(0.10)				
LAWORDER×*Efficiency*	-0.008*				
	(-1.94)				
LAWORDER×*Quality*	-0.004***				
	(-3.33)				
BUREAU×*Profitability*		0.120***			
		(4.40)			
BUREAU×*Liquidity*		0.002*			
		(1.68)			
BUREAU×*Capital*		0.003			
		(0.70)			
BUREAU×*Efficiency*		-0.004*			
		(-1.77)			
BUREAU×*Quality*		-0.006***			
		(-3.92)			
INTEGRITY×*Profitability*			0.051**		
			(2.31)		
INTEGRITY×*Liquidity*			0.002**		
			(2.22)		
INTEGRITY×*Capital*			0.003		
			(0.74)		
INTEGRITY×*Efficiency*			-0.004***		
			(-2.83)		
INTEGRITY×*Quality*			-0.003***		
			(-2.76)		
INSQUA×*Profitability*				0.060***	
				(3.57)	
INSQUA×*Liquidity*				0.001*	
				(1.76)	
INSQUA×*Capital*				0.001	
				(0.48)	
INSQUA×*Efficiency*				-0.002*	
				(-1.72)	
INSQUA×*Quality*				-0.004***	
				(-4.30)	
DISCLOSE×*Profitability*					0.009
					(0.39)
DISCLOSE×*Liquidity*					0.001*
					(1.65)
DISCLOSE×*Capital*					0.004***
					(2.85)
DISCLOSE×*Efficiency*					-0.002***
					(-3.15)
DISCLOSE×*Quality*					-0.002***
					(-3.35)
Lnasset	1.802***	1.821***	1.804***	1.824***	1.814***
	(23.85)	(24.08)	(23.91)	(24.11)	(24.00)
SCR	0.742***	0.753***	0.788***	0.779***	0.753***
	(9.95)	(10.21)	(10.76)	(10.71)	(10.27)
Year Dummies	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES
R-Squared	0.297	0.299	0.298	0.299	0.299
Observation	2615	2615	2615	2603	2615
Log likelihood	-4498.9094	-4485.7155	-4495.5678	-4470.5115	-4489.1748

Notes:
1. *t*-statistics are in parenthesis and White-consistent heteroscedasticity is used.
2. *, ** and *** denote the significance at the 10%, 5% and 1% level, respectively.
3. Dependent variables, *Rating*, are S&P long-term issuer ratings of commercial banks. We convert S&P long-term alphanumeric ratings into 17 numerical ratings, i.e., we let AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.
4. The financial ratios employed here are the average of the past three years to minimize the business cycle effect. The term *Profitability* is the average ratio of net income to total assets, *Liquidity* stands for the average ratio of liquid assets to customer and short-term funding, *Capital* is the average ratio of required capital to risky assets. *Efficiency* denotes the average ratio of cost to income, and *Quality* is the average ratio of loan loss provisions to net interest revenues. *Lnasset* is defined as the average ratio of natural logarithm of total assets. *SCR* are sovereign credit ratings coded as 17 ordinal values, where AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.
5. The set of information asymmetry proxy is institutional environment quality of a country, including LAWORDER, BUREAU, INTEGRITY, INSQUA and DISCLOSE. LAWORDER is a country's law and order index, ranging from1 to 6, the higher score representing the better a country's law and order. BUREAU is an index of a country's quality of bureaucracy, ranging from 1 to 4, with higher scores representing more efficient of the bureaucracy. INTEGRITY is an index of corruption, ranging from 1 t o 6, with higher scores for lower levels of corruption. INSQUA is the average ratio of LAWORDER, BUREAU and INTEGRITY to proxy the whole institutional environment quality of a country. DISCLOSE is a country's information quality, on a scale of 0 to10, with higher scores for higher information quality.

Table 9: Robust Testing: Considering Different Accounting Standard

Explanatory Variables	Ordered-Logit Model			
	(A)	(B)	(C)	(D)
Profitability	-0.017	0.180***	-0.277***	-0.091*
	(-0.69)	(3.93)	(-2.70)	(-1.81)
Liquidity	0.001	0.011***	0.001	-0.007
	(1.64)	(3.27)	(0.16)	(-1.05)
Capital	0.010**	0.015**	-0.026	-0.001
	(2.01)	(2.44)	(-1.02)	(-0.06)
Efficiency	0.003*	0.002	0.039***	0.011**
	(1.85)	(0.78)	(5.45)	(2.06)
Quality	-0.004*	-0.008***	-0.019*	-0.012
	(-1.79)	(-3.94)	(-1.89)	(-1.59)
INDUSTRY×*Profitability*	0.083***			
	(2.63)			
INDUSTRY×*Liquidity*	0.005**			
	(2.24)			
INDUSTRY×*Capital*	0.001			
	(0.16)			
INDUSTRY×*Efficiency*	-0.004**			
	(-2.07)			
INDUSTRY×*Quality*	-0.001			
	(-0.25)			
EMERGING×*Profitability*		-0.296***		
		(-4.73)		
EMERGING×*Liquidity*		-0.008**		
		(-2.38)		
EMERGING×*Capital*		0.009		
		(0.80)		
EMERGING×*Efficiency*		0.001		
		(0.25)		
EMERGING×*Quality*		0.003*		
		(1.65)		
INSQUA×*Profitability*			0.093***	
			(3.17)	
INSQUA×*Liquidity*			0.001*	
			(1.76)	
INSQUA×*Capital*			0.012*	
			(1.93)	
INSQUA×*Efficiency*			-0.010***	
			(-5.54)	
INSQUA×*Quality*			0.003	
			(1.01)	
DISCLOSE×*Profitability*				0.030***
				(3.33)
DISCLOSE×*Liquidity*				0.003**
				(2.50)
DISCLOSE×*Capital*				0.003
				(1.47)
DISCLOSE×*Efficiency*				-0.002**
				(-2.16)
DISCLOSE×*Quality*				0.001
				(0.53)
Lnasset	0.905***	1.653***	1.716***	1.659***
	(21.10)	(20.25)	(21.06)	(19.06)
SCR	0.338***	0.589***	0.656***	0.578***
	(25.99)	(26.88)	(22.93)	(19.08)
IFRS	0.069	0.116	0.143	0.198
	(1.14)	(1.14)	(1.38)	(1.57)
USGAAP	-0.235	-0.400	-0.164	-0.309
	(-0.95)	(-0.79)	(-0.28)	(-0.52)
Year Dummies	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES
R-Squared	0.242	0.249	0.250	0.224
Observation	1531	1575	1567	1405

Note:
1. *t*-statistics are in parenthesis and White-consistent heteroscedasticity is used.
2. *, ** and *** denote the significance at the 10%, 5% and 1% level, respectively.
3. Dependent variables, *Rating*, are S&P long-term issuer ratings of commercial banks. We convert S&P long-term alphanumeric ratings into 17 numerical ratings, i.e., we let AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB−

=5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.

4. The financial ratios employed here are the average of the past three years to minimize the business cycle effect. The term *Profitability* is the average ratio of net income to total assets, *Liquidity* stands for the average ratio of liquid assets to customer and short-term funding, *Capital* is the average ratio of required capital to risky assets. *Efficiency* denotes the average ratio of cost to income, and *Quality* is the average ratio of loan loss provisions to net interest revenues. *Lnasset* is defined as the average ratio of natural logarithm of total assets. SCR are sovereign credit ratings coded as 17 ordinal values, where AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.

5. The information asymmetry proxy include INDUSTRY, EMERGING, INSQUA and DISCLOSE. INDUSTRY is an indicator variable taking on the value of 1 if the bank is located in an industrial country and 0 otherwise. EMERGING is an indicator variable taking on the value of 1 if the bank is located in emerging market economies and 0 otherwise. INSQUA is the average ratio of LAWORDER, BUREAU and INTEGRITY to proxy the whole institutional environment quality of a country. DISCLOSE is a country's information quality, on a scale of 0 to 10, with higher scores for higher information quality.

Table 10: Robust Testing: Omitting CCC Rated Banks

Explanatory Variables	Ordered-Logit Model			
	(A)	(B)	(C)	(D)
Profitability	0.008	0.114***	-0.134***	-0.061**
	(0.39)	(6.16)	(-2.77)	(-2.36)
Liquidity	0.001*	0.003***	-0.001	-0.004*
	(1.80)	(4.35)	(-0.44)	(-1.70)
Capital	0.014***	0.010***	0.007	0.012**
	(4.23)	(5.15)	(0.82)	(2.43)
Efficiency	0.001	-0.001	0.009***	0.006***
	(0.61)	(-0.58)	(3.05)	(2.74)
Quality	-0.003***	-0.006***	0.002	-0.0005
	(-3.18)	(-7.32)	(0.84)	(-0.24)
INDUSTRY×*Profitability*	0.082***			
	(3.05)			
INDUSTRY×*Liquidity*	0.003***			
	(3.04)			
INDUSTRY×*Capital*	-0.004			
	(-1.20)			
INDUSTRY×*Efficiency*	-0.002**			
	(-2.08)			
INDUSTRY×*Quality*	-0.004***			
	(-3.12)			
EMERGING×*Profitability*		-0.151***		
		(-5.42)		
EMERGING×*Liquidity*		-0.002**		
		(-2.24)		
EMERGING×*Capital*		0.006		
		(1.48)		
EMERGING×*Efficiency*		-0.001		
		(-1.00)		
EMERGING×*Quality*		0.004***		
		(3.22)		
INSQUA×*Profitability*			0.053***	
			(4.13)	
INSQUA×*Liquidity*			0.001*	
			(1.79)	
INSQUA×*Capital*			0.001	
			(0.45)	
INSQUA×*Efficiency*			-0.002***	
			(-3.51)	
INSQUA×*Quality*			-0.002***	
			(-3.04)	
DISCLOSE×*Profitability*				0.021***
				(5.52)
DISCLOSE×*Liquidity*				0.001***
				(3.24)
DISCLOSE×*Capital*				-0.0004
				(-0.06)
DISCLOSE×*Efficiency*				-0.001***
				(-3.58)
DISCLOSE×*Quality*				-0.001**
				(-2.41)
Lnasset	0.800***	0.809***	0.811***	0.787***
	(24.50)	(24.82)	(25.03)	(19.06)
SCR	0.358***	0.342***	0.367***	0.353***
	(37.29)	(36.13)	(30.80)	(28.57)
Year Dummies	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES
R-Squared	0.230	0.231	0.231	0.200
Observation	2521	2590	2578	2339

Note:
1. *t*-statistics are in parenthesis and White-consistent heteroscedasticity is used.
2. *, ** and *** denote the significance at the 10%, 5% and 1% level, respectively.
3. Dependent variables, *Rating*, are S&P long-term issuer ratings of commercial banks. We convert S&P long-term alphanumeric ratings into 17 numerical ratings, i.e., we let AAA=17, AA+ =16, AA=15, AA− =14, A+ =13, A=12, A− =11, BBB+ =10, BBB=9, BBB− =8, BB+ =7, BB=6 BB− =5, B+ =4, B=3, B− =2 and CCC+ or CCC+ below=1.
4. The financial ratios employed here are the average of the past three years to minimize the business cycle effect. The term *Profitability* is the average ratio of net income to total assets, *Liquidity*

stands for the average ratio of liquid assets to customer and short-term funding, *Capital* is the average ratio of required capital to risky assets. *Efficiency* denotes the average ratio of cost to income, and *Quality* is the average ratio of loan loss provisions to net interest revenues. *Lnasset* is defined as the average ratio of natural logarithm of total assets. SCR are sovereign credit ratings coded as 17 ordinal values, where AAA=17, AA+ =16, AA=15, AA– =14, A+ =13, A=12, A– =11, BBB+ =10, BBB=9, BBB– =8, BB+ =7, BB=6 BB– =5, B+ =4, B=3, B– =2 and CCC+ or CCC+ below=1.

5. The information asymmetry proxy include INDUSTRY, EMERGING, INSQUA and DISCLOSE. INDUSTRY is an indicator variable taking on the value of 1 if the bank is located in an industrial country and 0 otherwise. EMERGING is an indicator variable taking on the value of 1 if the bank is located in emerging market economies and 0 otherwise. INSQUA is the average ratio of LAWORDER, BUREAU and INTEGRITY to proxy the whole institutional environment quality of a country. DISCLOSE is a country's information quality, on a scale of 0 to 10, with higher scores for higher information quality.

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