Effect of corporate governance on default risk in Financial vs Non-financial firms: Canadian Evidence

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ABSTRACT

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Yajing Zhang

This paper investigates the influence of corporate governance structures on the credit risks of Canadian firms from the perspective of bondholders after the 2007-2008 financial crisis. Default probabilities calculated from Black-Scholes/ Merton Distance to Default type models are used to measure firms credit risks. Based on these measures, Canadian financial firms actually show higher risk than non-financial firms over the financial crisis. This may be explained by the high exposure of Canadian financial firms to US markets during the period of the crisis. However, in the transition to the post financial crisis period, the risk of financial firms decreases more rapidly than that of industrial firms. With the exception of board size and CEO duality, most governance mechanisms examine, including insider ownership, board independence, institutional ownership, financial transparency and compensation committee independence, have differential impacts on financial vs. non-financial firms. Finally, we find that Canadian firms headquartered in Quebec have higher credit risks than Canadian firms headquartered in other provinces.

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1. Introduction

Assessing firm risk and its underlying determinants are at the forefront of concerns of finance scholars, policymakers and practitioners, particularly since the 2007-8 global financial crisis. The Financial Stability Board of the Bank for International Settlements deems credit risk to be a pivotal factor underlying the crisis and ensuing liquidity panic. This risk has been linked to poor governance practices, although only a few studies have looked at how governance affects credit risk directly. Most of the extant evidence in this regard concerns US firms. (e.g., Aebi, Sabato, and Schmid, 2012; Erkens, Hung, Matos, 2012, Switzer and Wang, 2013a, 2013b). The latter use CDS spreads as their measure of risk, and show that the governance mechanisms have differential impacts for financial vs. non-financial firms. Only a few studies have looked at non-US firms (e.g. Beltratti and Stulz, 2012; Liu, Uchida, and Yang, 2012). This paper looks to extend our understanding of how governance affects credit risk by focusing on Canadian financial and non-financial firms. It has been a popular view that Canadian firms, especially financial firms, suffered less risk during the crisis because of the soundness of the financial system. [1] This paper seeks to quantify the actual risk exposure of financial firms vs. financial firms in Canada. In addition, the paper explores the extent to which governance mechanisms contribute to the underlying stability of Canadian firms during and after the crisis period. The study extends Switzer and Wang (2013a, 2013b), and looks at risk as measured by five years default probabilities both over the financial crisis period as well as over the post financial crisis period. The study also controls for regional and industry effects to capture both the distributional differences of economic activity across the country, as well as possible effects of differential regional regulatory regimes across the provinces.

In contrast with the US, there is no unified securities regulator in Canada. One of the concerns of The Expert Panel on Securities Regulation appointed by the Canadian Federal Government is that the current system is problematic for investors due to the different allocations to securities regulation, which results in variations in policy development, supervision, and enforcement activities across the jurisdictions. Such variations are posited to give rise to different levels of investor protection, and

[1] As Lane (2013) notes: Canada's banking system was rated "the soundest in the world" by The Banker magazine three years in a row, from 2008 to 2010. See ttp://www.bankofcanada.ca/2013/02/financial-stability-in-one-country/

in turn, risk exposure depending on where the firm is domiciled. [2] Furthermore, variations in political uncertainty across different regions of Canada may affect the riskiness of firms. For example, Tirtiroglu, Bhabra, and Lel (JBF, 2004) show that the market reacts differently to business relocations in Canada that depending on region. In particular, they provide evidence that relocations from Quebec, which has been a province with ongoing political instability, are favorable to firms' shareholders. [3]

Overall, the results of this study suggest that Canadian financial firms actually show higher risk than non-financial firms over the financial crisis. This may be explained by the high exposure of Canadian financial firms to US markets during the period of the crisis. However, in the transition to the post financial crisis period, the risk of financial firms decreases more rapidly than that of industrial firms. We find that while board size and CEO duality have similar effects across both financial and non-financial variables, most of the other governance variable examined such as board independence, institutional ownership, financial transparency and compensation committee independence, have differential impacts on financial vs. non-financial firms. We also find a non-linear convex (concave) relationship between insider ownership and default risk in non-financial (financial) firms. The concave relationship for financial firms has an inflection point of 33% for insider ownership. After considering industry effects, board size and board independence have more important effects on the default risk of the "big five" banks relative to other financial firms. Board independence, CEO duality and compensation independence serve as significant factors contributing to default risk in the mining industry. Finally, the results concerning regional effects, which may be due to political uncertainty differences and/or regulatory regime differences, are mixed. In all OLS regression models, default probabilities are not affected by provincial domicile of the firms. On the other hand, using the Fama-Macbeth model, both financial and non-financial firms that are domiciled in Quebec have higher default probabilities than their counterparts in others provinces.

The remainder of this paper is organized as follows. Section II provides a brief review of the literature. Section III introduces the hypotheses to be tested. A description of the data and the methodology are provided in Section IV. Empirical

[2] See http://www.expertpanel.ca/eng/

[3] Beaulieu, Cosset and Essaddam (2006) show that the effects of uncertainty resolution in Quebec is more important for domestic than multinational firms, based on the experience of the 1995 referendum.

results are presented in section V. The paper concludes with a summary in section VI.

2. Literature Review

When the value of a firm's assets is lower than the value of its aggregate debt, default occurs. There are a few variables that have served as proxies for default probability or cost of debt financing in the extant literature. However, there is no consensus in the literature on the best proxy available to measure firm credit risk. Credit swap spreads (CDS) are a popular measure used in a number of studies (see e.g. Berndt et al 2005, Acharya 2007, and Carlson and Lazrak 2010). The advantages to using CDS are that their prices are mainly driven by default risk and CDS spreads can effectively reflect default relevant market information, where credit default swap is a contract providing protection for company to against default and credit default swap spreads are the cost of company against default. However, credit default swap spreads include counterparty credit risk because CDS market is a dealer market, and not all companies have credit default swap, meaning that the sample automatically delete companies without having credit default swaps and there is a bias in sample selection. Furthermore, very few companies in Canada have CDS outstanding that can provide a meaningful sample size for analysis. Allowing for limits of CDS spreads, Klock, Mansi and Maxwell (2005) use the excess yield of corporate bond over risk free rate to measure the cost of debt financing. Although the theory holds that N-year CDS spread should be almost equal to the excess yield of corporate bond over its risk-free rate, some researchers state that credit swap spreads are highly different from corporate bond yield spreads and that corporate bond yields are driven by default risk and illiquidity risk (Chen, Lesmond & Wei, 2007; Hull, Predescu & White, 2004). Hence, there are some problems with using corporate bond yields to measure default risk. In contrast with bond yield spreads, and CDS spreads, default probability, calculated from Black-Scholes/ Merton Distance to Default type models is used to measure firm credit risk (Duffie, Saita & Wang, 2007; Bharath & Shumway, 2008, Switzer and Wang, 2013a). In this study, we use the Bloomberg five years default probabilities that are based by Merton distance to default model to measure firm default risk.

Driven by the separation between the ownership and control, agency costs that can increase firm default risk represent a central concern in corporate governance.

Jensen and Meckling (1976) show that there are two types of conflicts: a) the conflicts between shareholders and bondholders; and b) the conflict between managers and shareholders. One conflict between shareholders and bondholders arises because shareholders can benefit from investing riskier projects and enjoy most of profits if riskier projects are successful, while bondholders bear the consequence if riskier projects fail, resulting that bondholders demand a higher risk premium. Conflicts between managers and shareholders arise because managers may not obtain the full benefits of acting in shareholder's best interests and may transfer corporate resources to their own private benefits.

How to mitigate these conflicts is the aim of corporate governance. One solution is debt financing. On the one hand, debt financing can decrease conflicts between managers and equity holders by reducing free cash-flow of the firm. For instance, assuming that managers always want to invest all available funds even though investors prefer to be paid by cash, Jensen (1986) and Stulz (1991) argue that increases in debt will reduce the amount of free cash available for managers to do overinvestment. Also, if the high level of debt induces firm bankruptcy and managers who care about their reputation are afraid of bankruptcy, then debt can provide an incentive for managers to pursue fewer personal benefits, because this behavior reduces the probability of default (Grossman & Hart, 1982). On the other hand, increased debt financing will increase the conflicts between bondholders and shareholders. High level of debt financing not only can increase default probabilities, but also can increase the conflicts between equity holders and bondholders because shareholders can transfer more wealth from bondholders to themselves. Myers (1977) finds that equity holders are more likely to refuse to invest in value-increasing projects when firms are near bankruptcy, because once company goes bankrupt, shareholders lose the entire cost of their investments, and are unable to capture the full gains of successful investments. Hence, a higher level of debt may cause shareholders to reject value-increasing projects when a firm is in a state of financial stress. Furthermore, shareholders are likely to invest in value-decreasing projects at the expense of bondholders (Jensen and Meckling, 1976). Overall, whether debt financing alleviates these conflicts and whether reduced conflicts between managers and shareholders can offset increased conflicts between bondholders and shareholders remain as empirical matters that can be tested.

As discussed above, conflicts are more complicated for levered firms.

Shareholders of levered firms may prefer investing in riskier projects at the expense of creditors, which is the risk shifting problem introduced by Jensen and Meckling (1976). Firms can use more strict covenants to reduce the agency cost of debt financing (Smith and Warner, 1979); however, the risk-shifting problem endures even with covenants in place. Mitigating this problem is favorable to bondholders. Thus, we expect that firms with corporate governance mechanisms that favor shareholders will have higher default risk. In addition, managers can play an important role in coordinating the relationship between equity holders and bondholders. Managers of highly levered firms who care about the loss of reputation in the event of bankruptcy, can decrease default probability in some degree. In order to align managers with shareholders, shareholders may choose to transfer a fraction of the firm`s ownership to managers. When we superficially view this phenomenon, we may conclude that higher insider ownership will be associated with higher default probability because the alignment between managers and shareholders improves the cost of financing. In fact, the relationship between managerial ownership and default risk is more complex. Some papers show that there exists a non-linear relationship between insider ownership and default probability because of incentive alignment and entrenchment effects (Switzer and Wang 2013, Kim & Lu, 2011). As is shown in these papers, the governance issue is very complicated and involves many different stakeholder interests and claims.

Although different governance mechanisms may be exploited to address the conflicts described above, many scholars use an governance index, such as the Gompers, Ishii, and Metrick (2001) (GIM) index to measure good or bad governance (Bhagat & Bolton, 2008; Klock, Mansi and Maxwell, 2005); this index focuses antitakeover provisions that impede shareholder's rights and shift the balance of power between managers and shareholders. Gompers, Ishii, and Metrick (2001) use 24 antitakeover provisions to construct a governance index (GIM-index) as a proxy for levels of shareholder's rights, where higher GIM index score represents weaker shareholder rights and stronger manager's rights. Several papers explores how GIM index impact on firm performance and riskiness. Gompers et al (2001) show that GIM index is negatively related with profits and sales growth, but is positively associated with corporate acquisitions and capital expenditures. Klock, Mansi and Maxwell (2005) suggest that companies with lower GIM-index (favoring shareholder's rights) have higher cost of debt financing, which means that bondholders prefer shareholders

having lower rights. According to these papers, it is difficult for us to judge whether higher GIM-index represents good or bad corporate governance and it is also dangerous for us to only use this index as a proxy for measuring corporate quality because it presumes that corporate governance only serves shareholder's interests and ignores that bondholders and managers are also important parts of corporate governance. In addition, from the constitution of GIM index, it is easier for us to see that GIM mainly considering company's ability for antitakeover is a proxy for shareholder's rights and that many papers discuss the relationship between governance and firm aspects from shareholder's perspective.

Default probabilities are closely related with expectations of creditors such as bondholders. Our paper looks at corporate governance in Canada from the perspective of creditors. broader perspective, that not only includes shareholder's rights vs. manager's rights, but also focuses on how individual governance mechanisms, that may be substitutes or complements, as they impact on firm default probabilities.

3. Hypothesis

As mentioned above, firms with the highest GIM index score are referred to as having the weakest shareholders rights. However, this measure primarily considers antitakeover abilities of firms and ignores others the separate effects of individual corporate governance factors, such as board structure, ownership structure, committee independence, that may work independently or as substitutes or as complement. This paper considers the impact of several governance mechanisms for Canadian firms, and is closely related to Switzer and Wang (2013a). Similar to Switzer and Wang (2013), we use several proxies for governance that have been shown to impact on firm default risk in the US. However, we also look at the effects of regional differences that may capture both the differential political risk as well as regulatory jurisdiction differences that may affect the governance environment and the firm`s riskiness. As in Switzer and Wang (2013a), we use board size and board independence as a proxies for board structure. To capture the financial transparency of the firm, we look at the interaction term between audit committee independence and NYSE listing, where audit committee independence equals to one if audit committee consists entirely of independent directors, and NYSE listing is measured by a dummy variable that equals to one for the company listed on New York stock exchange. When the interaction

term equals to one, firm is expected to be more financially transparent, which will be expected to reduce default risk. Using insider ownership and institutional ownership to measure ownership structure, we also look at the effects of ownership structure on firm credit risk. In addition, the CEO of the firm plays an important role in corporate governance. CEO duality, when the CEO and chairman are the same is used as a proxy for CEO power, which is expected to increase the firm`s default risk.

Formally, using these variables as governance mechanisms, we consider the following hypotheses.

Hypothesis 1: During the financial-crisis period, default probabilities of financial firms should be higher than those of non-financial firms.

Although financial firms are supervised more strictly than non-financial firms and are more likely to use derivatives (such as credit default swap) to hedge their risk, financial institutions, especially those operated in US, suffer heavily loss in the 2007-8 global financial crisis period and the subprime crisis leads to higher decrease of credit rating for financial institutions which hold asset-backed securities[4]. Under the condition that Canadian market is highly connected with American market, if Canadian financial firms are highly exposed to American market, they are more likely to have higher credit risks. This can be supported by the fact that Accord financial corporation, a leading provider of financing solutions for small and medium sized business in Canada and the USA, holds 46% total assets operated in US.[5] Furthermore, Brookfield asset management, which is a Canadian company offering real-estate investment, structured financial products services etc, has around 66% ($134 billion) of total assets under management in US.[6] Therefore, it is reasonable to expect that financial firms will have higher credit risk over the financial crisis period.

Hypothesis 2: corporate governance variables have different effects on financial firms and non-financial firms.

Characteristics of financial firms are different from those of non-financial

[4] Ryan (2012) contends that ratings downgrades for securities holding RMBS and CDO are frequent in the 2007-08 financial crisis period.
[5] See Accord Financial Corp 2008 annual report.
[6] See https://en.wikipedia.org/wiki/Brookfield_Asset_Management

firms. For example, due to financial firms facing more strict regulatory constraints than non-financial firms, boards of bank holding companies are more independent than those of unregulated manufacturing firms and banks have more shareholders than non-financial companies (Mehran and Adams, 2003; Mehran, 2011). Also, with more and more financial innovations, such as Residential mortgage-backed securities, banks become more and more incomprehensible and complex. Morgan (2002) supports that rating agencies make more disagreement on rating of bonds issued by banks than that of bonds issued by non-financial companies. Based on these previous papers, we know that there is an obvious difference in corporate governance between financial industry and non-financial industries. Consequently, it is reasonable to conclude that corporate governance factors impose differential effects on financial industry and non-financial industries.

Hypothesis 3: Due to the political risk existed in Quebec province, credit risks of companies domiciled in Quebec province should be higher than those of Canadian firms domiciled outside of Quebec.

Since 1970, political instability of Canada has been related to the possible separation of Quebec province from the Canadian federation. Especially for 1995 Quebec referendum that the Quebec separation defeated by 50.6% to 49.4%, the outcome has a positive impact on stock market returns of Quebec firms (Beaulieu, Cosset and Essaddam, 2006). Confronting a higher political uncertainty of Quebec province, investors demand a higher rate of return from their investment in firms headquartered in Quebec province (Graham, Morrill & Morrill, 2000). Tirtiroglu, Bhabra and Lel (2004) find that viewing the announcement of business relocations from Quebec as good news, market participants have a positive reaction to financial markets. Furthermore, as Kesternich & Schnitzer (2010) note that the cost of debt of multinational firms increases with the political risk. Therefore, we expect that credit risks of firms headquartered in Quebec province will be higher than credit risks of Canadian firms headquartered outsider of Quebec province.

Hypothesis 4: For board structure in both financial and non-financial firms, board size is positively related with its default probability, and board independence presents a mixed relation with its default probability.

Owing to limited research on the relation between board and credit risk, we would like to discuss board function in firm's other aspects and then infer the correlation between board size and default probability. Using a sample of US banks from 2000 to 2010, Switzer and Jun (2013) argue that board size is negatively related with default probability because large boards are more likely to have greater expertise than small boards and it is more difficult for insiders to control large boards than small boards. However, there is no consensus on whether large size of board is good. Jensen (1993) finds that larger boards have more communication, cooperation problems, and internal conflicts. Furthermore, Eisenberg & Sundgren (1998) suggest that board size is negatively linked to firm performance. In this study, we would like to suppose that in post-financial crisis period, there is a positive connection between board size and firm credit risk.

The board plays an important role in monitoring organizational activity. Switzer and Wang (2013) find that board independence imposes different effects on the credit risks of financial firms vs non-financial firms in the US. For board effect on firm performance, there is no uniform standpoint. Director's independence has an ambiguous effect on director's monitoring performance and his agency model shows that more outside directors in board may perform worse (Kumar, 2008). Black (2001) holds that there is an ambiguous correlation between board independence and firm performance. Therefore, we judge that there is a mixed result for correlation between board independence and default probability.

Hypothesis 5: Depending on alignment effect and entrenchment effect, there is a non-linear relationship between insider ownership and firm credit risk.

Aligning interests of managers with those of shareholders to reduce agency conflicts, shareholders often provide some stocks for insiders. Jensen and Meckling (1976) hold that managerial ownership should be positively related with firm valuation because managerial ownership is in favor of aligning interests of managers and shareholders (alignment effect). For shareholders, they prefer to choose riskier projects with higher returns because their main purpose is to maximize their wealth even with sacrificing bondholder's benefits. Therefore, at a low level of insider ownership (using insider ownership as a proxy for managerial ownership), we can expect that there is a positive relationship between insider ownership and credit risk.

However, due to their wealth "centralization", insiders may not increase risk taking behaviors as they acquire higher levels of ownership (Jensen & Murphy, 1990; Wright and Ferris, 1997). Stulz (1988) finds that at a high level of managerial ownership (between 5% and 25%), entrenchment effect dominates and managerial ownership is negatively associated with firm valuation because managers pursue maximum personal benefit by encroaching on shareholder's rights, meaning that managers, becoming more risk-averse and considering their reputation, would give up more risky projects and choose more conservative strategies. Thus, in a high level of insider ownership, insider ownership should be negatively linked to default probability. Bagnani, Milonas and Travlous (1994) prove the evidence that in a low level of managerial ownership (5 to 25 percent), managerial ownership is positively linked to bond return premium and in a high level (above 25 percent), there is a negative relation. Also, Switzer and Jun (2013) suggest that due to alignment effect and entrenchment effect, there is a nonlinear relationship between insider ownership and credit risk. Based on these previous papers, we predict that there is a non-linear correlation between insider ownership and firm credit risk.

Hypothesis 6: Increased financial transparency is negatively related to default risk.

To improve transparency, many regulators have required that firms' audit, compensation, and nomination committees consist entirely of independent directors. [7] Indeed, Sarbanes-Oxley Act requires that committees of firms listed in US consist wholly of independent directors. Higher audit committee independence is expected to be consistent with more transparency and higher quality of financial reporting (Armstrong, Core, and Guay, 2013). Therefore, many scholars use audit committee independence as a proxy for financial transparency (Sepgupta, 1998; Switzer and Jun, 2013; Skaife, Collins, and LaFond, 2006). Firms with more financial transparency will have less information asymmetry with capital suppliers, resulting in a lower risk premium (Sepgupta, 1998). Also, Skaife, Collins, and LaFond (2006) find that firm credit ratings are positively associated with financial transparency.

In this study, as Canadian firms listed on NYSE must comply with the Sarbanes-Oxley act which requires that the audit, compensation, and nomination

[7] http://knowledge.wharton.upenn.edu/article/how-independent-directors-bridge-the-information-gap/

committees be independent, and all non-financial firms in the sample, whether listed on the US stock exchanges or not have independent audit committees, one proxy that we use for financial transparency is the interaction term between audit committee independence and NYSE listing. The reason for using Canadian firms listed on NYSE, instead of using Canadian firms listed on all US stock exchanges as a criteria for financial transparency is that NYSE takes more strict rule to define independent directors than others US stock exchanges, and in contrast with that Nasdaq-listed companies can choose whether they have independent compensation and nomination committee or not, NYSE-listed companies must have independent compensation and nomination committees.[8] Although under the heavily influence of the "SOX Act", the Canadian securities regulators require that members of audit committee of firms listed on Toronto Stock Exchange be totally independent and financially literate, the Canadian Securities Administrators does not require that compensation and nomination committees of firms listed on Canadian stock exchanges be independent.[9] Due to the Sarbanes-Oxley Act and more the strict requirement of independent committee directors in New York stock exchange, Canadian firms listed on NYSE are expected to be more financially transparent. In addition, it should be mentioned that in the sample, 9 financial firms (50 non-financial firms) are listed on New York Stock Exchange. Therefore, we hypothesize that the interaction term between audit committee independence and NYSE listing is negatively related to firm's default risk.

Hypothesis 7: CEO duality is positively related to its default probability.

We use CEO duality to represent CEO power (consistent with Pathan, 2009). In management field, there is no agreed opinion on whether higher CEO power is good or bad. Supporters of CEO duality present that it is beneficial for effective operation (Stoeberl and Sherony, 1985). Opponents of CEO duality argue that it is harmful to governance function, such as the supervision of management (Mills, 1981). By using 212 large US bank holding companies over the 1997-2004 period, Pathan (2009) find that CEO power is negatively correlated with bank risk-taking because

[8] The definition of independent directors in NYSE (Nasdaq) is that a director who made payments or received payments should not exceed 2% (5%) of the payment recipient's gross revenues is independent. See http://www.thesecuritiesedge.com/2012/07/where-to-list-nyse-or-nasdaq/

[9] The Canadian securities regulators just recommend that compensation and nomination committees be independent. See file:///C:/Users/yaj_zhan/Downloads/Responsibilities_of_Directors.pdf.

managers are more likely to be risk-averse when CEO have more power. However, Rechner and Dalton (1991) examine 141 corporations over six-year period to find that firms having higher CEO power underperform than those having independent leadership. In this paper, we predict that there is a positive relationship between CEO duality and default probability.

4. Data Description

4.1 Sample and data source

The sample consists of all Canadian firms (SIC codes from 1000 to 8711). Allowing for particularity of financial firms, we divide all firms into financial firms (SIC codes between 60 and 67) and non-financial firms. Resulting from a limited year of some governance variables checked as insider ownership, institutional ownership, financial transparency, and compensation committee independence, time periods of all regressions are mainly divided into two parts. For some regressions, the fiscal year is from 2008 to 2013 and these regressions only include board size, board independence, and CEO duality as explanatory variables. For others regressions including 7 governance variables, the fiscal year is from 2010 to 2013. In this study, the number of financial firms is 37 in two time periods. During a period from 2008 to 2013 (from 2010 to 2013), there are 141 (170) non-financial firms. Furthermore, in the sample of financial (industrial) firms, there are 9 (50) firms listed on New York Stock Exchange. In the process of collecting data, the first step is to download all Canadian firms with board size, board independence and CEO duality from Bloomberg and then delete firms that missed data. Next, we upload Cusip of these samples to Compustat database and CFMRC database to obtain accounting variables and market variables separately. Finally, we use tickers of these samples to acquire Bloomberg five years default probabilities and committee independence from Bloomberg database. For committee independence that is absent from Bloomberg, we manually collect these variables from Datastream database.

Owing to limited ownership summaries of Canadian companies that can be acquired from Thomson Reuters database, we obtain a percentage of insider ownership and of institutional ownership from Bloomberg database, as well as board size, board independence, audit and compensation committee independence obtained from Bloomberg database. CFMRC database offers market data, such as daily trading volume and daily return, for Canadian firms. Downloading daily return and daily

trading volume from CFMRC database, we then use these original data to calculate volatility and Amihud illiquidity for our samples. Accounting variables and SEC (stock exchange codes) are acquired from Compustat database.

4.2 Measuring default probability and corporate governance

The dependent variable is Bloomberg five years default probabilities calculated by Merton DD model (Merton, 1974). By viewing the equity as a call option on the firm value with the strike price equal to its liabilities, the probability of firm asset value exceeding firm debts is calculated by the following equation. Therefore, the smaller DD represents higher default risk.

$$\text{DD}=\frac{Ln\left(\frac{V_0}{D}\right)+\left(\mu-\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

Where V_0 is total Merton assets of the firm at time 0; σ is the asset volatility; μ is the asset drift; D is the debt liabilities of the firm; T is time to maturity; DD is the distance to default. Referring to V_0, it assumes that total value of a firm follows geometric Brownian motion,

$$dV = \mu V dt + \sigma_v V dW$$

Where V is the total value of the firm, μ is the mean rate of return on V, σ_v is the volatility of firm value and dW is a standard Wiener process. However, due to Merton DD model assuming that a firm can only default at the expiration date, Bloomberg incorporates the possibility that the firm defaults before the maturity of debt by treating equity as a 1-year barrier call option[10]. Furthermore, overcoming that Merton DD underestimates the true default probability over short horizon, Bloomberg creates a mapping between DD and actual default rates and employs a non-linear function of DD to express the Bloomberg default probability. The function is expressed as following, and f is a non-linear function.

Default Probability = f (distance to default)

From the econometric perspective, we transform default probabilities to LN (p/1-p), where p is Bloomberg five years default probabilities[11]. The independent variables are mainly separated into two categories, explanatory variables and control

[10] Bloomberg credit risk DRSK <GO>, Framework, Methodology & Usage.

[11] The range of default probability is from 0 to 1. By using the transformation LN (P/1-P), the range of transformed default probability can be from -∞ to +∞, consistent with a normal regression model.

variables. For the first category, governance variables, including board structure, CEO power, financial transparency, compensation committee independence and ownership structure, are explanatory variables and are mainly acquired from Bloomberg, and Datastream database as supplement. As mentioned before, we employ board size (the number of directors in a board) and board independence (the percentage of independent directors over total directors) as a proxy for board structure. CEO duality, a dummy variable that equals to one if CEO and chairman are the same person and zero otherwise, is used to represent CEO power. The interaction term, as a proxy for financial transparency equals to one when both audit committee independence and NYSE listing equal to one, where audit committee independence equals to one if all directors in that committee are independent, zero otherwise, and NYSE listing equals to one for the firm listed on New York Stock Exchange, zero otherwise. Compensation committee independence equals to one if it is comprised wholly independent directors, and zero otherwise. Insider ownership is the percentage of stock held by insiders. Institutional ownership is the percentage of stock held by institutions.

4.3 Control variables

The other part is control variables, including accounting variables and market variables. The accounting variables include total assets, leverage, ROA, market to book ratio and asset tangibility. Total asset is the log of total assets to measure firm size. We expect that bigger firms are less likely to default because larger firms usually have better reputation or credit rating than smaller firms. Leverage is the ratio of total debts to total assets (the sum of item 34 and item 9, and then divided by item 6). Although debt can offer tax benefit, the effect of leverage on default probability can offset its benefits and leverage is highly negatively related with credit rating (Molina, 2005). Therefore, we expect that companies with higher leverage will have higher default probabilities because higher leverage will expose bondholders to riskier situation and will improve firm's financial costs. ROA is return on asset. Consistent with the calculation used by Imrohoroglu A, Tüzel S (2013), ROA is net income (Compustat item 18), minus dividends on preferred (item 19, if available), plus income statement deferred taxes (item 50, if available), and then scaled by total assets

(item 6). ROA is a proxy for profitability and more profitable companies will have lower default probabilities.

For asset tangibility, although Kim and Chung (2010) predict that asset tangibility is beneficial for improving liquidity because payoff of tangible assets is easier to observe than that of intangible assets and it can reduce asymmetry information, they find that asset tangibility reduces stock liquidity. Therefore, asset tangibility might improve default probability. Based on Berger et al (1996), who find that a dollar of book value yields, on average, 72 cents in exit value for total receivables, 55 cents for inventory, and 54 cents for fixed assets, we firstly calculate tangibility and then scale tangibility by total book assets. Therefore, asset tangibility formula is presented as below (Almeida & Campello, 2007).

$$\text{Tangibility} = 0.715 \times \text{Receivables} + 0.547 \times \textit{Inventory} + 0.535 \times \textit{Capital} + \textit{CHE}$$

Where receivables are item 2 in Compustat, inventory is inventories-total (Compustat item 3), capital is Property, Plant and Equipment –Net (item 8), and CHE is cash and short-term investments (item 1). Market to book ratio is calculated by market values of assets over book values of assets. Due to a higher MB ratio representing a higher growth opportunity, we expect that firms with higher MB ratios will have lower default probabilities because higher growth opportunity is beneficial for stakeholders, as well as bondholders. In order to calculate market to book ratio, we firstly calculate market value of assets and then scale by book value of assets (item 6). The formula for calculating market value of assets is showed below (Chen and Zhao, 2006).

$$\text{MVA} = \text{PRCC}*\text{CSHPRI} + \text{DLC} + \text{DLTT} + \text{PSTKL} - \text{TXDITC}$$

Where PRCC is item 199, CSHPRI is item 54, DLC is item 34, DLTT is item 9, PSTKL is item 10 and TXDITC is item 35.

The final part is market data, which includes stock volatility and Amihud illiquidity. By obtaining daily return and daily trading volume from CFMRC database, we calculate the standard deviation of daily returns as a proxy for stock volatility. Based on previous papers (Switzer and Wang 2013, Zhang and Zhou 2009), stock volatility is positively related with default probability. Amihud (2002) uses the average ratio of absolute daily return over the trading volume as a proxy for stock illiquidity. The formula for calculating stock illiquidity is showed below.

$$ILLIQ_{iy} = \frac{1}{D_{iy}} \sum_{t=1}^{D_{iy}} |R_{ity}| / VOLM_{ity}$$

Where $ILLIQ_{iy}$ is illiquidity of stock i in year y, D_{iy} is the number of business days for stock i in year y, $|R_{iyd}|$ is the absolute value of stock i return on day t in year y, and $VOLM_{ity}$ is the dollar trading volume of stock i on day t in year y. According to Kim and Chung (2010), corporate with better governance has lower illiquidity. Ericsson and Renault (2006) point out that stock market illiquidity are positively correlated with yield spread of corporate bonds (a proxy for default credit risk). Hence, it is reasonable to assume that there is a positive relationship between Amihud illiquidity and default probability.

4.4 Descriptive statistics

Table II reports variables descriptive statistics for financial firms and industrial firms with a time period from 2008 to 2013 or from 2010 to 2013. The descriptive statistics include mean, median, standard deviation, Maximum, 75th percentile, 25th percentile and Minimum values for default probability, board size, board independence, CEO duality, volatility, Amihud illiquidity, asset tangibility, MB ratio, leverage, ROA and log of assets. The range of transformed default probability is about from -5.56895 to -0.8626. The higher transformed default probability still implies that the company is more likely to default. In the process of calculating Amihud illiquidity, we find that with a few trading volume in some days, some stocks is not very active, resulting that the standard deviation of Amihud illiquidity is very large. To reduce effects of Amihud illiquidity outliers, we winsorize Amihud illiquidity by setting the observations below the 1th and above the 99th percentile of the distribution to the values at the 1th and 99th percentiles. Except for Amihud illiquidity presented in panel B of table II, Amihud illiquidity of others panels in table II is winsorized at one percentile. Resulting from winsorization, the standard deviation of Amihud illiquidity is decreased a lot.

Comparing financial firms with non-financial firms, we find that default probabilities of financial firms are higher than those of non-financial firms. This is consistent with our hypothesis that financial firms suffer more credit crisis during the crisis period than non-financial firms and more details about comparison of default probability between financial and industrial firms are presented in Table I.

Governance and control variables of financial firms are different from those of industrial firms. For example, board size, board independence, compensation committee independence in financial firms are higher than those in industrial firms, while CEO power, insider and institutional ownership of non-financial firms are higher. This is consistent with the rule that financial firms are more strictly supervised than industrial firms. Also, the size and leverage of financial firms is bigger than non-financial firms.

In addition, considering the property of industry, we define one for the big five banks in Canada (RBC, BMO, CIBC, TD and Scotiabank) and zero for the other financial firms. In industrial firms, mining industry with uncertain exploitation usually has higher uncertainty than the other industrial firms. Therefore, we define one for the mining industry (SIC code 10-14) and zero for the other industrial firms. For industrial firms and a time period from 2008 to 2013 (from 2010 to 2013), there are 372 (296) observations of mining industry and 474 (384) observations of the other industrial firms. From Table II, most of variables in the big five banks (the mining industry) is different from variables in the other financial firms (the other industrial firms) and their difference is quiet significant. Panel A of table II shows that default probabilities of big five banks are insignificantly smaller than those of the other financial firms, while big five banks are more likely to have higher credit risks than the other financial firms after the financial crisis period, which may be explained by larger financial firms preferring riskier projects. As is shown in panel C of table II, default probability of mining industry is significantly higher than that of the other industrial firms. For Amihud illiquidity in financial industry, the big five banks are always smaller than the other financial firms, meaning that stocks for big five banks are more active traded than the other financial firms. In non-financial firms, Amihud illiquidity of mining industry is lower than others industrial firms. Furthermore, comparing with the other financial firms, big five banks have higher board size, board independence, institutional ownership, financial transparency, compensation committee independence, asset tangibility, and firm size, while they have lower CEO power, insider ownership, volatility, MB ratio and return on asset. In contrast with the other industrial firms, firms in the mining industry have lower board size, leverage, return on asset, and firm size, but have higher CEO power, financial transparency, compensation committee independence, volatility, and asset tangibility.

Table III presents the Pearson correlation coefficients among default probability, corporate governance and control variables. The bold text indicates that the significance level is at or less than 0.01. On the one hand, board size, asset tangibility and firm size are significantly and positively related with default probabilities of financial firms. On the other hand, leverage, MB ratio and ROA are significantly negatively correlated with default probabilities of financial firms. For industrial firms, there is a significantly negative correlation between board size, financial transparency, MB ratio, ROA, firm size and default probabilities, while volatility, Amihud illiquidity and asset tangibility are significantly positive linked to default probabilities. Besides the correlation between independent variables and a dependent variable, although some independent variables are mutually correlated, most of their significant coefficients are less than 0.5. Thus, it is not necessary for us to consider the multicollinearity problem. As is shown in Table III, board size presents mixed results for financial firms and industrial firms and this is not consistent with our hypothesis. Therefore, in next section, we will use some regressions to test the relationship between default probabilities and governance variables.

4.5 Methodology

In order to test the relation between various governance variables and default probabilities, we run the regression as follows after controlling firm and security specification. The primary model is presented as below.

$$Lndefprob_{it} = \alpha_0 + \alpha_1(board\ size_{it}) + \alpha_2(board\ indepdence_{it})$$
$$+\alpha_3(CEO\ duality_{it}) + \alpha_4(insider\ ownership_{it})$$
$$+\alpha_5(insider\ ownership_{it})^2 + \alpha_6(institutional\ ownership_{it})$$
$$+\alpha_7(transparency\ _{it}) + \alpha_8(compensation\ independence_{it})$$
$$+\alpha_9(ind\ dummy_{it}) + \alpha_{10}(ON\ dummy_{it})$$
$$+\alpha_{11}(QC\ dummy_{it}) + \alpha_{12}(Western\ dummy_{it})$$
$$+\alpha_{13}(year\ trend) + \sum_{j=1}^{k} \beta_{ij} Y_{ijt} + \varepsilon_{ijt}$$

Where for financial firms, if the company is the big five banks, industry dummy equals to one and zero otherwise. For industrial firms, the mining industry equals to one and zero otherwise. Transparency is an interaction term measured by that audit

committee independence multiply NYSE listing. Lndefprob is defined as LN (P/1-P), where P is default probability. Allowing for different laws for regulating companies in various Canadian provinces, we insert province dummy to test whether there is a province effect on default probability. ON dummy equals to one if the company is located in Ontario province and zero otherwise, QC dummy equals to one if headquarter of the company is located in Quebec province, and Western dummy equals to one if the company is domiciled in British Columbia, Alberta, Saskatchewan and the west Manitoba province. Finally, to test whether the global financial crisis effect is decreasing with the time goes by, we use the year trend and expect that the sign should be negative. In addition, Y_{ijt} is defined as control variables including market and firm characteristic variables. Market variables include volatility and Amihud illiquidity variable, and firm characteristic variables include leverage, MB ratio, asset tangibility, ROA, and firm size.

Also, from the descriptive statistics, we know that the big five banks is different from the other financial firms and there are some differences between the mining industry and the other industrial firms. Therefore, we will consider the interaction effect between governance variables and industry dummy on default probability. To test effects of different combination between governance variable and industry dummy on default probabilities, we employ the following regression.

$$
\begin{aligned}
Lndefprob_{it} &= \alpha_0 + \alpha_1(board\ size_{it}) + \alpha_2(board\ size * ind\ dummy_{it}) \\
&+\alpha_3(board\ indepdence_{it}) + \alpha_4(board\ ind * ind\ dummy_{it}) \\
&+\alpha_5(CEO\ duality_{it}) + \alpha_6(CEO\ duality * ind\ dummy_{it}) \\
&+\alpha_7(insider\ ownership_{it}) + \alpha_8(insider\ ownership_{it})^2 \\
&+\alpha_9(institutional\ ownership_{it}) + \alpha_{10}(transparency_{it}) \\
&+\alpha_{11}(compensation\ ind_{it}) + \alpha_{12}(compensation\ ind * ind\ dummy_{it}) \\
&+\alpha_{13}(ind\ dummy_{it}) + \alpha_{14}(ON\ dummy_{it}) \\
&+\alpha_{15}(QC\ dummy_{it}) + \alpha_{16}(Western\ dummy_{it}) + \alpha_{17}(year\ trend) \\
&+\sum_{j=1}^{k} \beta_{ij} Y_{ijt} + \varepsilon_{ijt}
\end{aligned}
$$

As mentioned above, our regressions are mainly divided into two parts because of limited data for some governance variables. For the first part, the time period is from 2008 to 2013, governance variables only include board size, board independence

and CEO duality and observations of financial (industrial) firms are 222 (846). Also, the year is numbered consecutively. In the first part, year trend equals to one if the year is 2008, equals to two if the year is 2009 and equals to six until the year is 2013. For the second part, where the time period is from 2010 to 2013 and 148 observations in financial firms and 680 observations in non-financial firms, more governance variables, such as insider and institutional ownership, interaction, compensation committee independence, are included. The year trend equals to one if the year is 2010, equals to two if the year is 2011 and equals to four until the year is 2013.

5. Empirical Results

As can be seen from table II, average default probabilities of financial firms are always higher than those of industrial firms. In table I, default probabilities in financial firms are always greater than those in non-financial firms from 2008 to 2012, while the default probability difference between financial firms and industrial firms is decreasing. From 2008 to 2009, default probabilities of financial firms are significantly greater than those of non-financial firms and the difference is decreased from 0.00745 in 2008 to 0.00441 in 2009, but the result does not suggest that there is a lack of soundness of the Canadian banking system. Indeed, the higher default probabilities for financial firms is driven by insurance and real estate companies. Many of these companies have high exposure to the US real estate market, whose collapse was a harbinger of the global financial crisis. However, after 2009, the differential riskiness between financial and non-financial firms is no longer apparent. Indeed by 2013, the default probability of industrial firms exceeds that of financial firms. Given the strong performance of the Canadian banking system during the 2007-8 financial crisis (Arjani and Paulin, 2013), we separately analyze banks (SIC codes: 60-61) from other financial firms and then compare their credit risks to the credit risk of non-financial firms. We find that although default risks of banks are slightly higher than those of industrial firms during 2008-09 (0.0291 vs 0.0288), the difference is not significant.

Table IV shows the results of regression models that link transformed default probabilities to governance variables and control variables. As are shown in table IV, with the exception of firm size, control variables that are significant in both financial and industrial firms have the same sign in financial and industrial firms. For financial

firms, higher volatility, Amihud illiquidity and leverage, lower market to book ratio, higher asset tangibility, and larger firm size are associated with higher default probabilities. Except for firm size, control variables are consistent with our predicted sign. It is possible that larger financial firms are more likely to take riskier projects than smaller financial firms. In industrial firms, companies with higher volatility and leverage, lower market to book ratio, higher asset tangibility, lower ROA, and smaller size are more likely to default. All these control variables in industrial firms are consistent with our predicted sign in previous part. Larger industrial firms enjoy economies of scale and have a higher reputation, resulting in lower default probability.

Similarly, a number governance variables have differential effects for financial as opposed to industrial firms. As is shown in table IV, board independence is positively associated with default probabilities of financial firms but is insignificantly and negatively related with default probabilities of industrial firms, consistent with our hypothesis. Institutional ownership impacts negatively (positively) on the default probability of financial (non-financial) firms. The results for non-financial firms are thus consistent with scholars who assert that institutional investors tend to support shareholder's strategy to maximize firm's value and discourage corporate diversification strategies used to reduce firm risk (Hill & Snell, 1988; Brickley, Lease & Smith, 1988), meaning that with the increase of institutional ownership, firm credit risk is rising (Hansen & Hill, 1991). The results for the financial firms, on the other hand, are consistent with the contention that institutions play a monitoring role in corporate governance that reduce credit risk, and that they have a preference in lower risk companies, with higher ratings and lower default probabilities (Bhojraj & Sengupta, 2003).

Regarding the effects of insider ownership, both an alignment effect and entrenchment are observed, resulting in a non-linear relationship between insider ownership and default probability. For financial firms, at a low level of insider ownership, the alignment effect dominates and default probability increases with a rise of insider ownership, meaning that incentives of insiders are aligned with those of shareholders who are more inclined to choose more risky projects with encroaching on bondholder's benefits. As the insider ownership rises and reaches its inflection point (33% in this sample) the entrenchment effect dominates and default probability decreases. This result conforms to Wright, Ferris, and Sarin (1996), Kim and Lu (2011), and Switzer and Wang (2013a), who show that there is non-linear relationship

between CEO ownership and firms credit risks. However, as is shown in panel B of table IV, there is a convex relationship between insider ownership and default probabilities of industrial firms. At a low level of insider ownership, there is a negative relationship between insider ownership and firms default risks. With the increasing of insider ownership, it becomes a positive correlation. Although coefficients of insider ownership and of insider ownership square term are significant in models presented in panel B of table IV, they are not significant in a model that only includes insider ownership and the square term of insider ownership. Therefore, we can infer that the non-linear relationship is not stable in non-financial firms and the inflection point for industrial firms does not really exist. In table IV, compensation independence shows a different correlation with default probabilities in financial VS industrial firms. Financial transparency, as delegated by interaction term between audit committee independence and NYSE listing is shown to be negatively (positively) related to default probabilities in industrial firms (financial firms).

However, some governance variables display the same relation in both financial firms and non-financial firms. For example, consistent with our hypothesis, default probability is positively related to board size. The result is opposite with that presented in Switzer and Jun (2013). The result convinces us that larger boards are more likely to have communication problems and internal conflicts. As a proxy for CEO power, CEO duality is positively associated with firm's default, meaning that the separation of CEO and chairman is beneficial for company to reduce firm credit risk. The result is also consistent with our hypothesis.

As discussed before, after considering industries characteristics, we insert industry dummy and add interaction effects between governance variables and industry into our regression. In panel A of table IV, board size and board independence play a more important role in the big five banks than in the other financial institutions. Financial firms with larger board size and higher board independence are more inclined to default, while the big five banks with higher board size and board independence have lower firm credit risk. For non-financial firms, board independence, CEO power and compensation independence have more effects on the mining industry than the other industrial companies. Especially for CEO duality, due to the mining industry having higher risk, CEO in the mining industry might be more risk-averse than CEO in the other industry, resulting that CEO with more power in the mining industry can reduce firm credit risk. In the mining industry,

when compensation becomes more independent, firms will have less probability to default. From the coefficients of year trend in financial and non-financial regressions, default probabilities are consecutively decreasing from 2008 to 2013.

To control for firm fixed effects and year effects, we use Fama-Macbeth regressions as a robustness tests of these relationships. In column 3 of Panel A table IV, except that board independence becomes positively associated with default, coefficients of board size and CEO duality still keep the same sign in Fama-Macbeth model as in original model. Interestingly, we find that in Fama-Macbeth regression, financial firms in Ontario and Quebec have higher default probabilities and financial firms credit risks in western provinces are lower than those in others Canadian provinces and. In column 10 of Panel A table IV, although there is no concave relationship between insider ownership and firm default, some governance variables still impact on default in the Fama-Macbeth regressions as in OLS models. For non-financial firms and as is shown in column 11 of panel B table IV, insider ownership still displays a convex relationship with default risk. In addition, as is shown in column 3 of panel B table IV, although the significance level is low, industrial firms defaults are higher in Quebec than others Canadian provinces. Thus, we conclude that credit risks of firms domiciled in Quebec province are higher than those of Canadian firms domiciled outside of Quebec.

To summarize, board size and CEO power have the same effects on default probabilities of financial firms and non-financial firms, while some factors, such as board independence, institutional ownership, financial transparency, as well as compensation independence, affecting firm credit risk considerably differ between financial and non-financial firms. Contrary to a concave relationship between insider ownership and default probabilities of financial firms, a convex relationship is shown in industrial firms. Financial transparency has a negatively (positively) effect on default probabilities in industrial firms (financial firms). Finally, because of political uncertainty in Quebec, firms default risks are higher in Quebec than others Canadian provinces.

6. Conclusions

Our empirical results shed light on effects of several factors that affect the default risk of financial and non-financial firms in Canada. As hypothesized, firms

with higher volatility, higher leverage, lower market to book ratio, and higher asset tangibility experience larger default probabilities. We also find that several governance mechanisms play a role in affecting default risk.

During the global financial crisis, financial firms experienced higher default risk than non-financial firms. Since the end of the crisis period, the default risk of financial firms has fallen at a more rapid pace. This may reflect increased conservatism of financial institutions or more stringent supervisory constraints, such as required compliance with Dodd Frank legislation for Canadian firms with US operations. A number of governance mechanisms have differential effects between financial firms and non-financial firms. For example, we observe negative (positive) relationships between compensation committee independence, institutional ownership and default risk are observed for financial (non-financial) firms. Financial transparency is positively (negatively) related to the credit risk of financial (non-financial) firms. Board independence have a positive effect on credit risks of financial firms, while board independence does not affect default risks of non-financial firms. However, for all firms in our sample, consistent with our hypotheses, increased board size, and higher CEO power are associated with higher default probabilities. Exploring why some mechanisms are not as effective, or have differential impacts between financial and non-financial firms remains a topic for future research.

Finally, our study also suggests that the effects of differential political risk combined with regulatory differences across the regions of Canada may have substantive effects on firm riskiness. In particular, in some of the Fama-Macbeth regression models, firms domiciled in Quebec are shown to have higher credit risks than firms domiciled in others Canadian provinces.

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Tables

Table I : difference in each year default probability between financial and non-financial firms			
Panel A: 2008			
Default	N	Mean	Std
Financial firms	35	0.0408	0.0206
Non-financial firms	141	0.0334	0.0321
Difference		0.00745	0.0302
P-value		0.0945*	
Panel B: 2009			
Default	N	Mean	Std
Financial firms	36	0.0287	0.0125
Non-financial firms	141	0.0242	0.0171
Difference		0.00441	0.0163
P-value		0.086*	
Panel C: 2010			
Default	N	Mean	Std
Financial firms	37	0.0186	0.0112
Non-financial firms	170	0.0158	0.0122
Difference		0.00282	0.012
P-value		0.1778	
Panel D: 2011			
Default	N	Mean	Std
Financial firms	37	0.0204	0.0105
Non-financial firms	170	0.0188	0.0146
Difference		0.00156	0.014
P-value		0.4509	
Panel E:2012			
Default	N	Mean	Std
Financial firms	37	0.0175	0.00957
Non-financial firms	170	0.0174	0.0152
Difference		0.000092	0.0144
P-value		0.9627	
Panel F: 2013			
Default	N	Mean	Std
Financial firms	37	0.0156	0.00776
Non-financial firms	170	0.0174	0.0176
Difference		-0.00177	0.0163
P-value		0.343	

Table II: Descriptive Statistics

Panel A: Financial Firms 2008-2013

	N	Mean	Median	Std.Dev	Max	75th Percentile	25th Percentile	Min	Industry=1	Industry=0	T-test (P-value)
Ln default	222	-3.90785	-3.82756	0.64995	-2.14499	-3.49692	-4.30660	-5.56895	-3.7871	-3.7097	0.1061
Default	222	0.02371	0.02130	0.01536	0.1048	0.0294	0.0133	0.0038	0.0223	0.0239	0.1789
Lnboard	222	2.36332	2.35024	0.37036	3.09104	2.70805	2.07944	1.38629	2.7392	2.3046	<.0001***
Board Independence	222	0.80262	0.83333	0.12627	0.95454	0.92310	0.71430	0.42860	0.9224	0.7839	<.0001***
CEO Duality	222	0.10360	0	0.30543	1	0	0	0	0	0.1198	<.0001***
Volaility	222	0.01808	0.01371	0.01025	0.08762	0.02454	0.01075	0.00636	0.0153	0.0185	0.0663*
Amihud Illiquidity	222	0.20889	0.04876	0.88053	7.18800	0.11762	0.01516	0.00265	0.0050	0.2407	0.0007***
Asset Tangibility	222	0.30537	0.20365	0.24895	0.77531	0.53532	0.20365	0.00210	0.5412	0.2685	<.0001***
MB	222	0.67511	0.51797	0.54981	3.27900	1.01500	0.51800	-0.04708	0.2383	0.7434	<.0001***
Leverage	222	0.29317	0.20186	0.25194	0.97360	0.50530	0.20190	0.00000	0.1442	0.3165	<.0001***
ROA	222	0.02300	0.01051	0.03467	0.16555	0.03562	0.01051	-0.10942	0.0067	0.0256	<.0001***
Logsize	222	4.25763	3.99872	0.94557	5.90000	5.20000	4.00000	2.00000	5.7377	4.0264	<.0001***

Panel B: Financial Firms 2010-2013

	N	Mean	Median	Std.Dev	Max	75th Percentile	25th Percentile	Min	Industry=1	Industry=0	T-test(p-value)
Ln default	148	-4.14815	-4.0164	0.57887	-2.56689	-3.76469	-4.58009	-5.56895	-3.8189	-4.1996	<.0001***
Default	148	0.01800946	0.0177	0.00989	0.0713	0.02265	0.01015	0.0038	0.0216	0.0175	0.0001***
Lnboard	148	2.370019	2.397895	0.37084	3.04452	2.70805	2.07944	1.38629	2.7267	2.3143	<.0001***
Board Independence	148	0.807359	0.83333	0.12412	0.9474	0.9231	0.7143	0.4286	0.9271	0.7886	<.0001***
CEO Duality	148	0.114865	0	0.31994	1	0	0	0	0	0.1328	<.0001***
Insider	148	0.039594	0.01039	0.09081	0.67611	0.033845	0.00423	0.00024	0.00312	0.0453	<.0001***
Institutional	148	0.420835	0.38684	0.17733	0.91545	0.54673	0.279035	0.06016	0.5845	0.3953	<.0001***
Transparency	148	0.243	0	0.43	1	0	0	0	1	0.125	<.0001***
Compensation	148	0.972973	1	0.16271	1	1	1	0	1	0.9688	0.0451**
Volaility	148	0.013093	0.011805	0.00753	0.0876154	0.01382845	0.00963795	0.0063586	0.00976	0.0136	<.0001***
Amihud Illiquidity	148	0.070213	0.039851	0.09562	0.551	0.08163742	0.01381763	0.00249518	0.00397	0.0806	<.0001***
Asset Tangibility	148	0.293586	0.192007	0.24998	0.7753145	0.52903734	0.04407369	0.00209903	0.554	0.2529	<.0001***
MB	148	0.687065	0.53105	0.57248	3.2791844	0.9759821	0.2212137	-0.0470772	0.2433	0.7564	<.0001***
Leverage	148	0.278705	0.20186	0.23414	0.9736183	0.4752421	0.0525497	0	0.1448	0.2996	<.0001***
ROA	148	0.02606	0.01051	0.03632	0.1655524	0.03996842	0.00661176	-0.05367838	0.00816	0.0289	<.0001***
Logsize	148	4.341254	4.094199	0.89694	5.93578	5.28732	3.54296	3.09986	5.7637	4.119	<.0001***

If the company is big five banks, the industry equals to 1, 0 otherwise.

Table II : Continued

Panel C: Non-Financial Firms 2008-2013

	N	Mean	Median	Std.Dev	Max	75th Percentile	25th Percentile	Min	Industry=1	Industry=0	T-test(p-value)
Ln default	846	-4.11463	-4.21203	0.63447	-0.86258	-3.78521	-4.56526	-5.54287	-4.0069	-4.1992	<.0001***
Default	846	0.02013073	0.0146	0.01924559	0.2968	0.0222	0.0103	0.0039	0.0231	0.0178	0.0002***
Lnboard	846	2.226325	2.197225	0.2720611	2.89037	2.3979	2.07944	1.38629	2.1211	2.3089	<.0001***
Board Independence	846	0.781393	0.8	0.11764	1	0.8889	0.7	0.33333	0.7719	0.7888	0.0351**
CEO Duality	846	0.141844	0	0.3491	1	0	0	0	0.1667	0.1224	0.0712*
Volaility	846	0.02624	0.02300	0.01454	0.11457	0.03281	0.01534	0.00559	0.032	0.0217	<.0001***
Amihud Illiquidity	846	0.141959	0.053	0.292	2.12938	0.1335	0.02143	0.00335	0.1017	0.1735	0.0002***
Asset Tangibility	846	0.47994	0.51047	0.13163	0.88238	0.55249	0.42693	0.01222	0.5418	0.4314	<.0001***
MB	846	1.20338	1.01825	0.77617	6.57661	1.42430	0.73321	0.08924	1.2803	1.143	0.0153**
Leverage	846	0.22623	0.21534	0.14976	0.63820	0.32902	0.11449	0.00000	0.1554	0.2818	<.0001***
ROA	846	0.02908	0.04132	0.09322	0.34906	0.07244	0.00368	-0.91738	0.0111	0.0432	<.0001***
Logsize	846	3.49550	3.44867	0.58162	4.89384	3.92209	3.10402	1.38712	3.3338	3.6224	<.0001***

Panel D: Non-Financial Firms 2010-2013

	N	Mean	Median	Std.Dev	Max	75th Percentile	25th Percentile	Min	Industry=1	Industry=0	T-test(p-value)
Ln default	680	-4.25476	-4.35337	0.61364	-1.87816	-4.00206	-4.67385	-5.54287	-4.212	-4.2877	0.11
Default	680	0.017335	0.0127	0.01504	0.1326	0.01795	0.00925	0.0039	0.0183	0.0166	0.1522
Lnboard	680	2.201405	2.197225	0.27447	2.89037	2.3979	2.079	1.38629	2.0965	2.2822	<.0001***
Board Independence	680	0.773083	0.78571	0.11823	1	0.881945	0.6667	0.4	0.7703	0.7752	0.5874
CEO Duality	680	0.144118	0	0	1	0	0	0	0.1723	0.122	0.0715*
Insider	680	0.041329	0.012805	0.08362	0.77277	0.03751	0.00393	0	0.0381	0.0438	0.3385
Institutional	680	0.49274	0.47440	0.23835	1.25813	0.66989	0.30427	0.02194	0.4966	0.4898	0.7017
Transparency	680	0.294	0	0.456	1	1	0	0	0.3649	0.2396	0.0005***
Compensation	680	0.930882	1	0.25384	1	1	1	0	0.9527	0.9141	0.0415**
Volaility	680	0.02188	0.01930	0.01045	0.06737	0.02750	0.01383	0.00631	0.0251	0.0194	<.0001***
Amihud Illiquidity	680	0.47056	0.05339	2.49307	21.17167	0.14744	0.02201	0.00353	0.17	0.7022	0.002***
Asset Tangibility	680	0.489637	0.516704	0.12755	0.8824	0.562	0.434	0.04722	0.5405	0.4504	<.0001***
MB	680	1.360169	1.077658	1.06529	12.484	1.587	0.755	-0.048143	1.3998	1.3296	0.3859
Leverage	680	0.21695	0.209003	0.15291	0.6595	0.326	0.099	0	0.1563	0.2637	<.0001***
ROA	680	0.030936	0.043154	0.10301	0.40181	0.074	0.008	-0.91738	0.012	0.0455	<.0001***
Logsize	680	3.40534	3.36308	0.61586	4.9	3.800	3.000	1.5	3.2948	3.4905	<.0001***

If the company is mining industry, the industry equals to 1, 0 otherwise.

Table III: Pearson correlation

Panel A: Financial firms 2010-2013

	Lndef	Lnboard	Board Independence	CEO Duality	Insider	Instit	Transparency	Compen	Vol	Amihud	Leverage	MB_ratio	Asset Tangibility	ROA	Logsize
Lndef	1														
Lnboard	**0.32431**	1													
Board Independence	0.20514	**0.26668**	1												
CEO_Duality	0.14257	**-0.2535**	**-0.28016**	1											
Insider	0.10614	0.15382	**-0.39656**	0.02611	1										
Instit	-0.1652	0.17315	**0.32115**	-0.05212	-0.12668	1									
Transparency	0.20136	**0.42331**	**0.4218**	-0.20424	-0.14151	**0.59868**	1								
Compen	-0.01508	0.11344	0.06291	-0.07063	0.01469	-0.07201	0.09449	1							
Vol	0.121	-0.05069	-0.10243	0.01573	0.10424	-0.01673	-0.02444	0.04204	1						
Amihud	0.2105	**-0.388**	-0.08817	**0.37281**	0.10514	-0.13482	**-0.3658**	-0.0107	0.18649	1					
Leverage	**-0.254**	**-0.5215**	**-0.26058**	-0.07298	-0.19607	-0.15121	**-0.3518**	-0.02412	-0.02248	-0.06111	1				
MB_ratio	**-0.616**	**-0.4924**	**-0.23293**	-0.07854	-0.07821	**0.22939**	**-0.2918**	-0.01371	0.02498	-0.01963	**0.57572**	1			
Asset Tangibility	**0.40037**	**0.29119**	**0.39143**	-0.05397	-0.02908	0.2002	**0.38091**	0.1721	0.02197	0.18458	**-0.3361**	**-0.2827**	1		
ROA	**-0.4218**	**-0.313**	**-0.22913**	-0.05533	-0.10775	0.11082	**-0.2623**	**-0.2318**	**-0.225**	-0.08651	**0.27632**	**0.52975**	**-0.29488**	1	
Logsize	**0.3706**	**0.70947**	**0.40691**	-0.0523	0.00122	0.19657	**0.64713**	0.04984	**-0.2131**	**-0.3546**	**-0.5285**	**-0.6549**	**0.24703**	**-0.3495**	1

The bold text indicates the significance level is less than 0.01.

Table III: Continued

Panel B: Non-Financial firms 2010-2013

	Lndef	Lnboard	Board Independence	CEO Duality	Insider	Insti	Transparency	Comp	Vol	Amihud	Leverage	MB_ratio	Asset Tangibility	ROA	Logsize
Lndef	1														
Lnboard	**-0.1352**	1													
Board Independence	-0.08196	**0.14983**	1												
CEO Duality	0.07717	**-0.1784**	**-0.11693**	1											
Insider	0.06857	**-0.1675**	**-0.25672**	**0.11205**	1										
Insti	-0.02213	**0.15927**	**0.17183**	**-0.1533**	**-0.2357**	1									
Transparency	**-0.193**	**0.29524**	**0.3204**	-0.09027	**-0.1823**	**0.40972**	1								
Comp	**0.10975**	0.08141	**0.29538**	**-0.1358**	**-0.1151**	**0.18646**	**0.11227**	1							
Vol	**0.43217**	**-0.3139**	**-0.14005**	0.06112	-0.00588	0.0882	-0.06762	0.03687	1						
Amihud	**0.15856**	**-0.1885**	-0.05175	-0.00309	0.00274	-0.02335	**-0.1029**	-0.01729	**0.1466**	1					
Leverage	0.08445	**0.21941**	0.01929	-0.02975	**0.09906**	**-0.2397**	-0.07436	-0.04789	**-0.323**	**-0.1133**	1				
MB_ratio	**-0.2344**	**-0.1234**	-0.05975	-0.03414	-0.028	**0.11643**	0.00757	-0.02752	0.0831	-0.00745	**-0.2198**	1			
Asset Tangibility	**0.1368**	**-0.2759**	-0.01906	0.05292	0.03925	0.04149	-0.04071	-0.04196	**0.29567**	0.08923	**-0.3438**	**0.18173**	1		
ROA	**-0.4963**	**0.12309**	-0.06684	-0.05847	0.01331	0.09155	0.02922	-0.027	**-0.1982**	**-0.1164**	-0.06065	**0.27962**	-0.08033	1	
Logsize	**-0.2743**	**0.61897**	**0.19937**	-0.0762	**-0.1792**	0.09368	**0.41239**	-0.05259	**-0.367**	**-0.301**	**0.32951**	**-0.3072**	**-0.30564**	**0.12959**	1

The bold text indicates the significance level is less than 0.01.

Table IV: Summary of OLS and Fama-Macbeth Regression Results with five-year default probability as dependent variable

Defprobit is estimated as default probabilities for firm i at time t, and the transformation for default is LN(p/1-p). Logsize is the Log of total asset. ROA is the return on asset. Asset-tangibility is calculated by the formula presented by Almeida & Campello (2007). MB is defined as market value to book value. Leverage is estimated as total debt to total asset. Amihud illiquidity is the average ratio of absolute daily return over the trading volume. Volatility is the standard deviation of daily stock returns. Board size is the total number of directors on a board. Board independence is defined as the number of independent directors over number of total directors. CEO duality equals to one if CEO and chairman are the same person, 0 otherwise. Insid is the percent of outstanding shares held by top management and directors. Insidtwo is square term of insider holding. Institit is the estimated percentage of outstanding shares held by institutions. Transparency is proxied by the interaction term between audit committee independence and NYSE listing, where audit committee independence equals to one if audit committee consist entirely of independent directors, 0 otherwise, and NYSE listing equals to 1 if the company is listed on New York stock exchange, 0 otherwise. Compen equals to one if compensation committee is wholly comprised of independent directors, 0 otherwise. Ind dummy equals to 1 if it is big five banks in Canada, 0 otherwise. ON dummy (QC dummy) equals to 1 if the company is headquartered in Ontario province (Quebec province), 0 otherwise. Western dummy equals to 1 if the company is domiciled in AB, BC, MB west and SK province, 0 otherwise. P-values are reported below the variable coefficient. ***,**,* denote statistical significance at the 1%, 5%, and 10% level.

Panel A: Financial Firms

Board size	0.38365***	0.3996***	0.347**	0.09789				0.4383***	0.469***	0.2637
Board size*dummy				-0.107**					-0.665	
Board independence	0.33447	0.39153	0.46**		-0.0296			1.858***	1.896***	2.005***
independ*dummy					-0.326**				-3.463	
CEO duality	0.41482***	0.4264***	0.453***					0.441***	0.4565***	0.423
CEO*dummy										
insid						0.052***		0.073***	0.072***	0.07*
insidtwo						-0.08***		-0.10007***	-0.098***	-0.102
institit						-0.459*		-1.27***	-1.267***	-0.8738*
Transparency							0.029	0.429**	0.409**	0.248
compen							-0.298	-0.4559**	-0.45996**	-0.375
compen*dummy							-0.10985		5.076	
Ind dummy		-0.2575*	-0.203			0.029		0.028		0.074
ON dummy		0.12887	0.153**			0.14675		0.0096	0.15482	0.052
QC dummy		0.0111	0.133**			0.053		-0.015	0.09597	0.086
Western dummy		-0.06694	-0.126**			0.02286		-0.217	-0.09249	-0.254
Year Trend		-0.104***		-0.105***	-0.106***	-0.048	-0.0511	-0.0426	-0.047*	
vol	0.29103***	0.1635***	0.4743**	0.167***	0.168***	0.071	0.0821	0.059	0.06031	0.3496
amihud	0.14212***	0.6822***	0.425**	0.166***	0.1675***	0.991**	1.225***	1.157**	1.142**	0.818**
leverage	0.72285***	0.6822***	0.286	0.523***	0.495***	0.832***	0.6806***	1.1197***	1.128***	1.141**
mb ratio	-0.5245***	-0.4818***	-0.0696	-0.4565***	-0.447***	-0.538***	-0.5667***	-0.4942***	-0.495***	-0.53*
asset-tangibility	0.3215**	0.456***	0.5138**	0.472***	0.4876***	0.593***	0.6185***	0.3089*	0.315*	0.366*
roa	0.1842	0.11003	0.072	-0.61692	-0.70758	0.27059	-0.52	1.781	1.827	2.21
logsize	-0.02699	0.04909	0.141**	0.11463	0.144**	0.22***	0.132*	-0.0066	-0.0065	0.0539
Intercept	-5.527***	-5.438***	-6.865***	-4.52895	-4.398***	-5.238***	-4.458***	-6.166***	-6.391	-6.842***
Adj R-sq	0.5158	0.5554	N	0.5342	0.5324	0.5553	0.4935	0.6361	0.6363	N
Num	222	222	N	222	222	148	148	148	148	N
Fama-Macbeth	N	N	Y	N	N	N	N	N	N	Y

Table IV: Summary of OLS and Fama-Macbeth Regression Results with five-year default probability as dependent variable

Defprobit is estimated as default probabilities for firm i at time t, and the transformation for default is LN(p/1-p). Logsize is the Log of total asset. ROA is the return on asset. Asset-tangibility is calculated by the formula presented by Almeida & Campello (2007). MB is defined as market value to book value. Leverage is estimated as total debt to total asset. Amihud illiquidity is the average ratio of absolute daily return over the trading volume. Volatility is the standard deviation of daily stock returns. Board size is the total number of directors on a board. Board independence is defined as the number of independent directors over number of total directors. CEO duality equals to one if CEO and chairman are the same person, 0 otherwise. Insid is the percent of outstanding shares held by top management and directors. Insidtwo is square term of insider holding. Instit is the estimated percentage of outstanding shares held by institutions. Transparency is proxied by the interaction term between audit committee independence and NYSE listing, where audit committee independence equals to one if audit committee consist entirely of independent directors, 0 otherwise, and NYSE listing equals to 1 if the company is listed on New York stock exchange, 0 otherwise. Compen equals to one if compensation committee is wholly comprised of independent directors, 0 otherwise. Ind dummy equals to 1 if the firm is in mining industry, 0 otherwise. ON dummy (QC dummy) equals to 1 if the company is headquartered in Ontario province (Quebec province), 0 otherwise. Western dummy equals to 1 if the company is domiciled in AB, BC, MB west and SK province, 0 otherwise. P-values are reported below the variable coefficient. ***,**,* denote statistical significance at the 1%, 5%, and 10% level.

Panel B: Non- Financial Firms

Board size	0.377***	0.335***	0.327***	0.355***				0.2508***	0.253**	0.233*
Board size*dummy				-0.05836					-0.0097	
Board independence	-0.12177	-0.12073	-0.138		0.08805			-0.233	0.03506	-0.285
independ*dummy					-0.561**				-0.715**	
CEO duality	0.03881	0.01704	0.0289			0.123**		0.096*	0.2003***	0.1085*
CEO*dummy						-0.2477***			-0.217**	
insid							-0.00851*	-0.972**	-0.959**	-0.015**
insidtwo							0.022**	0.0246***	0.0255***	0.0476*
instit							0.218***	0.2797***	0.27***	0.252**
Transparency								-0.101**	-0.1429***	-0.13***	-0.1387**
compen								0.272***	0.2218***	0.21**	0.217**
compen*dummy								-0.079*		-0.025	
Ind dummy		0.05674	0.00155	0.18608	0.466**	0.06431	-0.00541		0.02293	0.658*	-0.007
ON dummy		-0.0304	0.0187	-0.01281	-0.03763	-0.03015	-0.03887		0.00378	0.005	0.0126
QC dummy		0.1046	0.119*	0.11516	0.10176	0.11902	0.07591		0.07019	0.062	0.0598
Western dummy		-0.00525	0.0426	0.00638	-0.04754	-0.02761	-0.09382		-0.03659	-0.0567	-0.0197
Year Trend		-0.066		-0.067***	-0.07***	-0.07***	-0.0525***	-0.047***	-0.0536***	-0.055***	
vol	0.247***	0.203***	0.2399**	0.2047***	0.201***	0.205***	0.21***	0.218***	0.2086***	0.2115***	0.2377**
amihud	-0.012	-0.0072	0.0138	-0.005	-0.013	-0.01099	0.00548	0.005	0.0085	0.011	0.0089
leverage	0.941***	0.893***	0.9325***	0.888***	0.866***	0.912***	1.039***	0.823***	1.015***	0.997***	0.972***
mb ratio	-0.145***	-0.1428***	-0.1735**	-0.145***	-0.1336***	-0.135***	-0.117***	-0.111***	-0.1117***	-0.1099***	-0.126*
asset-tangibility	0.193	0.282**	0.2396	0.28**	0.3376**	0.335**	0.3738**	0.3557**	0.3936**	0.3786**	0.313**
roa	-1.704***	-1.925***	-1.99***	-1.91***	-1.957***	-1.92***	-2.03***	-2.055***	-2.073***	-2.074***	-2.22***
logsize	-0.196***	-0.185***	-0.16*	-0.185***	-0.08**	-0.09388***	-0.237***	-0.1563***	-0.232***	-0.222***	-0.207*
Intercept	-4.9087***	-4.56***	-4.89***	-4.715***	-4.318***	-4.251***	-4.003***	-4.413***	-4.659***	-4.897***	-4.748***
Adj R-sq	0.54	0.5667	N	0.5668	0.5577	0.5595	0.468	0.4643	0.4877	0.4916	N
Num	846	846	N	846	846	846	680	680	680	680	N
Fama-Macbeth	N	N	Y	N	N	N	N	N	N	N	Y