ESSAYS ON CORPORATE BOND OWNERSHIP AND THE EFFECT OF CORPORATE BOND OWNERSHIP ON CREDIT SPREADS

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Abstract:

Debt has become increasingly important as a source of capital for firms. Ninety percent of the new capital issuance is in the form of debt and leverage ratios have increased from 10 to 30 percent in the past century. However, we still do not fully understand the corporate debt market, because the data on the debt market are not as widely available as the stock market. The Gramm-Leach-Bliley Act repealed part of the Glass-Steagall Act in 1999 which allowed financial companies to become more active in financial markets as both issuers and investors in securities. One benefit of this regulatory change was the disclosure of more data regarding who issues and/or owns bonds. A comprehensive bond ownership database is eMAXX by Thomson Reuters. Unlike CRSP and COMPUTSTAT, eMAXX is underutilized by academics. The first chapter includes, first, a discussion of the importance of public debt markets. Second, different bond databases are compared and contrasted with eMAXX. Third, I analyze bond characteristics, investors, issuers, managing firms, and fund managers in turn. The last part of the first chapter includes analyses of bondholding during different corporate events such as bankruptcy and rating changes. Then, the second chapter delves into the aspect of strategic default premium and credit spreads. The previous literature examining the effects of strategic defaults on the pricing of debt contracts has focused primarily on the bargaining power of equity holders. However, in the real world the negotiation of a strategic default involves both equity and debt holders. Omitting debt holders from the analysis results in an incomplete picture of strategic default process. In my dissertation my analysis of the strategic default process includes both equity and debt holders. I find that the bargaining power of bondholders plays a significant role in determining the credit spreads of a bond. Moreover, I find the bargaining power of bondholders to be a new proxy for the decision to enter into a strategic default, a proxy that has the same predictive power of current proxies that rely on rating systems developed by credit rating agencies that report liquidity and credit default likelihood.

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CHAPTER I

An Analysis of Corporate Bond Ownership

1. Introduction

My first chapter discusses a variety of issues and problems in corporate finance, investments, and capital markets revolving around debt as a financing and/or investment vehicle. A new database, eMAXX, provides information that makes it possible to analyze questions that could not be analyzed in the past due to a lack of data. In this chapter of my dissertation, I will address and analyze some of the interesting questions that show the importance of corporate bond ownership research. The institutional corporate bond holding data are unique to eMAXX and it will also be a central theme of my dissertation. With the potential to make important contributions to finance literature in many areas, there are many interesting questions that can be addressed using this data. Some people may ask *"Why and how is corporate bond ownership important?" "Why do we care?"*. A straight forward and a little blunt answer would be because bond ownership may relate to the value of debt which, for most firms with leverage, is directly related to the firm's value. There is an extensive finance literature examining the intrinsic value of firms. For example, in the area of asset pricing, financial economists conduct research seeking to understand factors that can explain asset returns or a firms' value. In corporate finance, for instance, researchers examine how capital structure decisions impact the value of firms or how executive compensation affects firm value. One area of finance that has not been extensively analyzed, because of the lack of data, is the effect of institutional corporate bond ownership on a firm's value. This dissertation is a first step in the development of a broad research portfolio in this area.

In general, a firm's capital consists of equity and debt. The asset pricing literature has explored the determinants of the market value of equity extensively while understanding about the firm's debt is limited owing to the private nature of the data and low liquidity in the secondary market. Some of corporate debt, such as bank loans and private-placement bonds, is not revealed to the public. Moreover, for public debt such as corporate bonds, the trading volumes are very thin. This lack of volume is, partly, caused by high trading cost and large minimum trade size. Consequently, most market participants in the secondary markets of corporate bonds are large financial institutions which usually make large transactions. With eMAXX bondholding data, we are able to conduct more extensive analyses of the debt market. Still, we may not understand everything about the corporate debt, but we make a little step forward.

This chapter is organized as follows. I will first discuss the process of raising capital in the US. In this section, I will discuss the corporate decision making process that results in the creation and sale of debt contracts to investors. Then, I discuss how corporate bonds become an important source of corporate capital and how eMAXX data can help us address interesting questions in the corporate bond market. In the next section, I will give an overview of bond databases that can be used with eMAXX to analyze the public bond market in more depth. The bond databases in the overview section consist of Trade Reporting and Compliance Engine (TRACE), SDC Platinum - Corporate Securities Issuance Data, and Mergent Fixed Income Securities Database (FISD). At the end of the overview section, I provide a case study of General Electric (GE) using all four bond databases. The purpose of the GE case study is to illustrate the completeness of bond analyses when all four bond databases are examined together. Then, I discuss interesting questions that can be addressed using eMAXX database in the following order, bond characteristics, bond investors, issuers, managing firms, and fund managers. Lastly, I examine the effects of events such as bond ownership on bankruptcy, rating changes, and accounting restatements.

1.1 The Process of Raising Capital in the US

Firms or idea generators are generally capital constrained and require outside funding to fund investment. Start-up firms have limited access to external sources of capital while going concerns may have access to internal and external sources of funds. Internal sources of funds, for example, are retained earnings and idea generators' own funding. It is internal because it does not involve obtaining funding from an outside party. When firms have enough retained earnings generated from their businesses, they use the earning to supply a firms' investment needs. If the retained earnings are not enough to fund the businesses, the owners of the firms may put more money into the businesses. Both are considered internal sources of funds. On the other hand, external sources of funds involve attracting funds from outside parties. The funds could be obtained either through the issuance of debt or equity. Debt is a contract whereby a borrower promises to pay returns to a lender at a specified rate based on the principal amount borrowed. At the end of the contract, the lenders will receive the principal back. In case of debt, the borrowers have no right to the assets of the lender. The only claim that the borrowers can make is the principal amount and the promised payments from the lender. When issuing equity, a firm receives funding in exchange for a contract that extends ownership rights to the investors. In this case, a party who gives funds to the firm is called an equity holder or a shareholder. In contrast to the purchaser of debt, equity holders have residual claim on the firms' assets. Equity holders also have the right to vote for any issues raised in the shareholder meeting. This voting right is important to determine the future of the firm. To understand more why firms acquire funding using debt which is an external source of funds, it is useful to include a brief discussion of capital structure theory.

Given a need to raise funds, why would a firm's manager choose either an internal or external source of funds? Starting with a general economics optimization problem where idea generators either maximize returns on investment (ROI) given the cost of funds or minimize the cost of funds given the ROI. With either a cost or profit objective function, firms then choose either an internal or external source of funds appropriate for their objectives. In addition to the general optimization model from economics, there are some corporate finance theories that play a very important role in explaining a firm's choice of internal or external source of funds. Pecking order theory of Myers and Majluf (1984) is one of the well-known theories developed to explain why firms choose an internal over external source of funds or vice versa. It argues that firms prefer internal sources of funds because of the asymmetric information problem associated with selling contracts. This choice determines a firm's capital structure and Myers and Majluf (1984) showed that investors interpret equity issuance as a signal that the stock being offered for sale by a firm is overvalued by the market under the basis that informed managers usually issue equity when it is cheap to do so (i.e. expensive stock price). Because retained earnings have no adverse selection problem, managers prefer to use retained earnings to fund investment. If firms have to choose between debt and equity for the external source of funds, managers will choose debt because the cost of adverse selection for debt is lower. Though the external funding creates asymmetric information problems and the cost of issuance could be expensive, most firms have some degree of external financing in place. Therefore, external sources of funds are important as means of raising funds for firms. When a firm decides to acquire funding from an external source. Why does a firm choose debt over equity or vice versa? This choice determines a firm's capital structure and there are several theories explaining the capital structure decision.

1. *Irrelevancy model:* Modigliani and Miller (MM 1958) show in their work that debt or equity has no difference in terms of generating firm's value or, as we know as *MM irrelevance* theory of capital. MM uses the no-arbitrage argument with many important assumptions associated with this theory, such as no tax and transaction cost. MM shows that investing in levered firm can be replicated by

investing in unlevered firm and borrowing money. As a result, capital structure is not relevant to a firm value.

2. *Tax incentives:* When we add the element of tax in the model, debt is more tempting in this regard. Firms could reduce taxable income from tax deductible interest expenses. In this case, in order to obtain the highest value of a firm, the firm should borrow as much as it can. The firm value depends on the product of tax rate and amount of debt of the firm.

3. *Trade-off Theory:* Firms trade off cost of debt and equity and try to find an "optimal" capital ratio. The benefit of using debt is tax advantage. The cost is the higher likelihood of bankruptcy. It is true that tax incentive encourages firms to use more debt. However, higher debt increases the firm's bankruptcy probability. On the other hand, using too less debt could result in firm's lower ability to generate income. Trade-off theory shows that there is a sweet spot between using too much or too less debt. The theory emphasizes that the capital structure plays a role in determining firm value.

4. *Market timing:* Firms issue equity when their stock prices are perceived to be overvalued. One of the important objectives of the firm's managers is to find the cheapest source of funds. Baker and Wurgler (2002) empirically find that firms issue more equity than debt when their market values are high relative to book value.

The choice between debt and equity, though, depends on many factors, but we, perhaps, cannot argue that debt has become more important over time. Graham et al. (2015) show that, during 1921-1930, the average leverage ratio of industrial firms was 12.23% and leverage ratios have been rising to around 30% in 2001-2010. The data include all firms in CRSP database that are also covered either in Compustat or Moody's Industrial Manuals excluding financial firms, utilities, and railroads. The growing importance of debt as a funding source is not only true for large and mature firms which are major component in CRSP database. It also applies to new firms. A widely held view that new firms cannot access formal capital markets and mostly rely on equity funding from family and friends is challenged by Robb and Robinson (2012). Robb and Robinson (2012) demonstrate that formal debt financing, on average, is the largest source of fund for startups during their first year of operation. This formal debt financing is mainly from owner-backed bank loans, business bank loans, and business credit lines. Overall, we can see that debt financing has continued its growth and importance over time. However, we still do not have a full grasp of the debt market.

Even though the choices of external sources of funds are debt and equity, debt issuance is more complicated than equity issuance. Since the main focus of my analysis is the corporate bond issuance, I would like to demonstrate how bond issuance is more complex than equity issuance. In general, when firms need to issue a bond, they need to decide on the characteristics of the bond contract with many factors considered.

To issue bonds, firms need to make many decisions. I can illustrate the complexity of the corporate bond decision issuance by discussing some of the decisions managers must make when raising capital with debt through bond issuance. Managers must decide what type of bond to sell to investors. For example, do they issue zero-coupon or coupon bonds. For zero-coupon bonds, investors will not receive the periodic interest income as they do with coupon bonds. An investor purchases a zero-coupon bond at a discount to the face value. For example, a $100 face value bond is sold for $90. Assume that this is a one year zero-coupon bond. An investor will receive $10 or, equivalently, 11 percent of return at the end of the year without receiving interest income while holding the bond. On the other hand, coupon bond will pay interest periodically, such as every six months. Managers need to analyze which type of bonds will minimize the cost of funds. Second, the concept of bond price, yield to maturity, and face value are usually discussed together. The bond face value is a fixed amount that is usually equal to $1,000. The price of bonds could be either lower, higher, or equal to the face value. If the price of bonds is lower (higher) than the face value, the bond is sold at *discount* (*premium*) and the yield to maturity will be higher (lower) than the coupon rate. The yield to maturity will be equal to the coupon rate when the price and face value are equal. Third, the issuance amount depends on the amount of funds needed, which, usually is highly correlated with the firm's size. Larger firms tend to borrow larger amounts of funds. Fourth, the coupon rate is another important aspect that an issuer has to consider. The coupon rate is based on the credit risk of the issuer and the market interest rate. If the issuer has higher credit risk which could be indicated from the financial statements or the credit rating of the firm, the coupon rate should be higher than an issuer in the same line of business but has a higher credit rating. The choice to issue fixed or floating rate bonds is also determined by the interest rate trend. For instance, if the interest rate will increase in the future, it would be more cost efficient to issue fixed-rate bonds. Fifth, bond options and features are also complex issues. For instance, convertible bonds may be converted to equity in the future. Bonds and equity are a very different contracts. Existing shareholders may not want to share the residual income with the new shareholders who convert the bonds to equity. In addition, the decisions of a management team and the shareholder could be different as the objectives of the two parties could be different. The investment portfolios of managers are less diversified than the shareholders. Therefore, managers tend to take less risk than a shareholder. Moreover, managers weigh between the pecuniary and non-pecuniary benefits. For instance, managers are likely to shirk and spend more time on their personal businesses. The manager and shareholder conflicts make bond issuance even more complicated. The brief discussion about the bond characteristics in this section shows that issuing bond is much more complicated than issuing equity.

Choices of debt for firms are private and public debt. eMAXX data offer information on the public debt side and it will be the focus of my analysis. When firms decide on the choice between the private and public debt, they consider several factors, such as cost of issuing and monitoring degree. For instance, it could be too costly for small firms to issue a public bond. Issuing public bonds involves hiring investment companies or underwriters and the service fees could be very expensive for the small-size bonds issued. If firms have a high asymmetric information problem, they may consider borrowing from a bank which will help monitor the firms under a certain condition of loan covenant. However, either private or public debt issuance, issuers have to consider many factors that are not only appropriate for the issuers themselves, but they also consider factors from the investor's point of view. Selling bond is about creating contracts that potential investors will purchase at a "fair" price. "Fair" in the eyes of the potential buyers and "fair" in the eyes of the sellers. Therefore, one of the most important factors that issuers of the corporate bonds also need to consider is the *demand* of the lenders. Selling a bond is similar to selling other retail products. The issuers of a bond would want to sell all the bonds they are issuing. Therefore, they have to offer products (bond contracts) that buyers want. If the product is too expensive, very few buyers would want to buy. If the product is too cheap, firms leave money on the table. In the context of bond issuances, for instance, firms would not want to set the coupon rate too low so that no buyers (decision makers) would want to purchase the bond. It is relatively new to analyze the debt market from the lenders perspective. Whether lenders (or bondholders in this case) affect any aspect of public debt market is an interesting issue to further explore.

To this point, we have some idea how bond ownership could relate to firms making a decision on the characteristics of bond issued. *What about the investors?* Which bonds do they choose to purchase and why? This takes us back to a decision making theory of how a person or a firm make a decision on the investment. From the perspective of decision makers, investors are making a decision on how they will use their resources, either consuming or investing. We are talking about a general economics optimization problem in which people maximize utility given their limited amount of resources. In deciding not to consume today (or invest now), investors expect to have more resources to consume in the future. Similarly, investors invest in bonds, because they hope to consume more in the future. They want to invest in bonds with highest return given risk, because high-return investment will allow investors to consume more in the future. The question is what kind of investment generates good returns for investors. A simple answer is *"a good idea with high expected returns"*. If firms can signal that they have a good idea and can generate enough income to pay their debt obligations, investors should be willing to purchase their debt contracts. Here is the equilibrium where supply of funds (investors) meets demand of funds (firms). My focus is on the public debt market. I hope that my analysis on the public debt market, which is only part of the whole debt market, would help us understand more about the capital structure decision and firm's value and, perhaps, encourage researchers to explore this area.

1.2 Importance of the US Corporate Bond Market

Our limited knowledge of the debt market is directly related to the limited public data on bond issuers, bond investors, and trading activity in bond markets. Less than one percent of the US corporate bonds outstanding are traded in a secondary market each day[1]. Traditional bond investors have purchased bonds at issuance and hold the bonds to maturity. The buy-and-hold strategy is still true for insurance companies and pension funds because of the nature of their business. The main function of insurance companies and pension funds is to provide clients with funds to cover for contingencies. For example, life insurance companies pay out funds when an insured person dies. Pension funds provide fixed-amount of income for pensioners for a certain amount of time or for life. Therefore, both life insurance companies and pension funds have a long-term investment horizon. Unlike insurance companies and pension funds, bond mutual funds are much more active in bond trading. To achieve the total returns in excess to market returns, bond mutual funds become more aggressive in bond trading. Nevertheless, bond trading volume is still small relative to equity trading volume,

[1]Based on SIFMA report, in 2017, the corporate bond outstanding value is 8,826 billion dollars while the average daily trading volume is 30.7 billion dollars. This pattern of small trading activities is the same for other types of bond, such as MBS and municipal bonds. The largest trading volume relative to the total outstanding is treasury bonds. In 2017, the treasury bond outstanding value is 14,468 billion dollars whereas its average daily trading volume in the secondary market is 505 billion dollars

because other large bondholders still adopt the traditional strategy of buy-and-hold. As for the private debt side, private debt issuance such as borrowing from banks is not disclosed to the market. Though the information in the debt market is limited, a way to understand more about the debt market is still possible with eMAXX by Thomson Reuters. Thomson Reuters has collected data on institutional bondholding and bond issuance since 1998. eMAXX provides quarterly data on bond issuances, bondholders, and managing firms which are investment firms that manage funds for bondholders. It is natural to restate the importance of bondholding analysis here. Ultimately, most analyses in debt financing, if not all, lead to a better understand of debt value which directly impacts a firm's value given that most firms have some degree of debt in place. With eMAXX database on institutional bond ownership, we have an opportunity to understand more about the debt value and firm's value. That is we can analyze whether the bond ownership affects the debt value and/or firm's value.

In my analysis, I focus on the market for US corporate bonds. The US bond market accounts for almost 40 percent of global value of bond outstanding. One of the reasons that I focus my study on the US market is that no other country has value of bond outstanding nearly as large as the US's. From Figure 1.1, based on Bank of International Settlement (BIS) in 2017, US bond value outstanding account for 39% of the global bond market value outstanding. The second largest group are the 28 countries in the European Union (EU28) which account for 28% or, on average, 1% of bond value outstanding percentage share for each country in the EU28. As for the US debt market, from Figure 1.2, corporate bond is around a quarter of the total debt value in the US. The largest bond market in the US is the Treasury bond market. Specifically for large firms about two-thirds of their total debt is characterized as corporate bonds [Massa et al. (2011)]. Overall, we can see that the US corporate bond market is important and worth investigating more because this could lead us to understand more about the firm's value. Moreover, to my knowledge, there is no bond ownership data for international bonds available. Therefore, the analysis on bond ownership is not possible for international bond markets.

To emphasize the importance of debt financing, the decision by managers to acquire new funding through external sources is made by comparing marginal costs and benefits of using debt versus equity. From 2017 SIFMA report, Figure 1.3, ninety percent of the new corporate capital issuance is in the form of debt. Specifically, out of $2.67 trillions total corporate issuance, $2.44 trillions is debt and the rest is equity. Corporate debt includes public and private, investment grade and high yield bonds issued in the U.S. Common stock includes initial public offerings and follow-ons issued in the U.S. This is also true for other years in the past. Over time, from Figure 1.3, the gray bar is the total issuance of the US corporate from 2002 to 2016. The blue and the orange bars are debt and equity issuances, respectively. We can see that most of the US corporate issuances are in the form of debt. Therefore, understanding the dynamic of the debt market is important as it is a major channel for a firm to acquire fundings.

1.3 Gramm-Leach-Bliley Act and Bond Ownership

The Banking Act of 1933, commonly known as the Glass-Steagall Act, created separation between banking and investment banking businesses. After the Great Depression wiped out thousands of banks, the US congress responded to the Great Depression by issuing the Act to reduce the conflicts of interest between banks and customers. To reduce bank risk taking, regulators constrained activities of banks and investment banks. Banks could not deliver investment banking services and investment banks could not provide banking services. Meanwhile, banks specialized in the creation of private debt. Investment banks specialized in the issuance of public debt. Banks are heavily regulated, investment banks are not. The Securities Act of 1933 and 1934 enhanced capital market transparency and the power of regulatory authorities. The Securities Act of 1933 requires capital seekers to disclose important financial information through the registration of securities. This is to help investors make informed risk taking decisions when purchasing a security. There are certain types of securities that are not required to register with SEC to promote lower cost of offering securities to the public. This includes private offerings to a limited number of investors, intrastate offerings, small size offerings, and securities of municipal, state, and federal governments. The Securities Exchange Act of 1934 gave more power to the SEC to regulate and oversee firms issuing bonds or equities to the public. For instance, it requires firms with more than $10 million in assets whose securities are held by more than 500 investors to file annual and other periodic reports.

The Gramm-Leach-Bliley Act repealed part of the Glass-Steagall Act in 1999 to allow financial service firms to offer banking, insurance, and investment banking services. GLBA repealed parts of the Banking Act of 1933 that separated commercial banking from the securities business. GLBA also repealed parts of the Bank Holding Company Act of 1956 that separated commercial banking from the insurance business. In short, GLBA allows single holding companies to offer banking, securities, and insurance, as they had before the Great Depression [Barth et al (2000)]. In an attempt to increase transparency, GLBA required increased disclosure by financial service firms. The disclosure requirement made it possible to create eMAXX, a database on bond ownership.

The Glass-Steagall Act lasted more than six decades after several attempts to repeal it. Why was it finally repealed in 1999? First, a number of studies found that securities activities of commercial banks bore little responsibility for the Great Depression (Puri, 1996, Kroszner and Rajan, 1997). Second, many developed countries that allow banks to perform extensive activities have not shown that the permission creates problems in their economy. Last, the technological advancement and the big data era should reduce the cost of banking if banks can expand their businesses into larger portfolios. The information from one business should benefit another business in the bank's portfolio. Consequently, this should benefit the whole economy.

Major changes are also made in financial holding companies and the financial subsidiaries of national banks. The Banking Act of 1933 and the Bank Holding Company Act of 1956 greatly restricted the ability of banks to conduct the activities related to securities firms, insurance companies, merchant banks, and other financial companies. Banks as well as bank holding companies were significantly limited in their capability to enter these markets either directly or through subsidiaries of the bank. After the GLBA, financial subsidiaries of banks were allowed to conduct most financial activities. Major exceptions are that they cannot involve with insurance or annuity underwriting, insurance company portfolio investments, real estate investment and development, or certain aspects of merchant banking. However, GLBA permits formation of a holding company, the financial holding company, which can own banks as subsidiaries and also own other subsidiaries that engage in all other financial activities – including those that the financial subsidiaries of banks cannot engage directly [Barth et al (2000)].

As for the bondholder or lender side, from Schultz (2001), insurance companies hold over one-third of outstanding investment-grade bonds. GLBA changed the landscape of who can own or issue bonds. Now, financial companies can participate in this market either as a facilitator for any entity that needs to raise funds or as an issuer themselves, and also as an investor. With the current requirements of the SEC and IRS, financial companies as well as insurance companies have to submit filings showing their holdings of bonds. For example, insurance companies are required to disclose information on bond trading (schedule D). As a result, Thompson Reuters created a new database, eMAXX, that details the bondholdings of institutional investors. The eMAXX database permits analysis of both issuers of corporate bonds and investors in corporate bonds.

In 1999, see Figure 1.4, insurance companies held more than 70 percent of corporate bonds with mutual fund holdings approximately 20 percent of corporate bonds. By 2013, mutual funds held 40 percent of corporate bonds with the percentage of corporate bonds held by insurance companies falling to around 50 percent.

In my dissertation, I use the eMAXX database to analyze the corporate bond markets from the perspective of lenders and the perspective of borrowers. Overall, there are still not many publications using eMAXX data compared to other popular databases such as CRSP and COMPUSTAT. Therefore, the motivation of the first chapter is to explore interesting finance questions using the eMAXX database. This is to contribute to the finance field any undiscovered question in the bond area. In the following section I demonstrate the overview of bond databases including eMAXX. Each database has its own strength. For instance, TRACE and Mergent FISD contain transaction information. SDC Platinum (SDC) and Mergent FISD provide bond characteristics. At the end of the overview of bond database section, I provide an example of bond analysis using all four databases. I choose General Electric (GE) as my case study, because GE has issued many bonds with various maturities and features.

2. An Overview of Bond Databases

2.1 A Comparison of eMAXX and Other Bond Databases

A brief description of eMAXX database is that it contains data about institutional bondholding such as the information of bondholding by insurance companies and pension funds. eMAXX contains quarter by quarter of how much each institutional bondholder holds an issue (9-digit CUSIP). On the issuance side, eMAXX provides detailed information about the bonds issued, such as issuance amount, call feature, and number of bondholder. In addition, eMAXX also provides data on the managing firms which are the intermediary who helps the bondholders manage their investments. To have the full details of bond analyses, we can analyze corporate bond markets using eMAXX and other bond databases. This will give us more information to analyze an issue and more angle to address questions.

1. Issuer related data (corporate)

Issuer related data contain information about the issuer such as name, country, CUSIP, and ticker. eMAXX has its own entity identification for each issuer, such as public corporation and government treasury. eMAXX has very detailed information on entity identification. It has more than 100 entity identifications. However, some data in this section are not accurate. For instance, a discrepancy that I found is that on a variable named *State Code*. The description in eMAXX manual stated that it applies to *North American Municipal Issuers only*, but I found that it also applied to corporate issuers as well. Most of the states are in Delaware where many corporate bond issuers registered their headquarters. Delaware is known as one of the friendliest state for a business in the US.

2. Issue related data (corporate)

The data contain information about the characteristics of the issue such as maturity, coupon rate, collateral status. These information are similar to the FISD issue and SDC information. The information that is unique to the eMAXX data in terms of the issue information is number of bondholders, number of buyer and seller, and total dollar amount held by the institutional investors in a given quarter. These unique variables are very useful for an analysis of bond ownership effects on any concerning issue. For instance, it could help us address the issue of renegotiation friction during firm's financial distress. In other words, the number of bondholders is important for an analysis of bond's holding concentration. Large number of bondholders given the same amount of par value leads to higher cost of negotiation for a firm when it comes to renegotiation between the firm and its creditors, because the likelihood of disagreement among many creditors is high. Numbers of bond buyers and sellers are also important to analyze the dynamic of bondholdings. Since the bond market is thinly traded, numbers of bond buyers and sellers are important variable to analyze a decision making process of bond investors.

3. Corporate descriptive data

Corporate descriptive data provide information about call feature (e.g., call type, next call date), sinking fund date, and asset claim (e.g., senior, subordinated). However, SDC provides more detail on this aspect. For example, while eMAXX only provides sinking fund date, SDC also provides not only the date but other aspects such as amount retired by sinking fund per year and total amount retired by sinking fund. Also, eMAXX only provides call feature, but not other types of options, such as put option. Redemption information is important because, usually, we would want to know the current total amount of bond outstanding. With many types of redemption (e.g., call, put, repurchase), the total amount of bond outstanding will change over time after a redemption is executed.

4. Fund/sub-account data

This set of data gives information about the characteristics of bondholders such as name, type, unique ID. In eMAXX, sub-account means a holder or a portfolio. There are also interesting summary statistics such as total amount held by each holder and total numbers of individual bonds held by each holder. To understand the depth and breadth of bondholder perspectives, these aggregate summary statistics are important. For example, we might perceive that one million US dollar of a bond portfolio is large; however, if the total portfolio value is one billion. One million US dollar portfolio is only 0.1 percent of total bond portfolio and it might be considered small. Therefore, aggregate value of bondholding for a given holder is of important to analyze the full picture of each bond investment relative to the total bond portfolio of each institutional bondholder. These data are unique to eMAXX.

5. Holdings data

Holdings data show the amount of bonds held in US dollars for each issue (9-digit CUSIP) by each holder in a quarterly format. This is unique to eMAXX and perhaps one of the most valuable information in eMAXX. However, an issue concerning the ID of the holder is that the eMAXX holder ID is not common to other databases. For example, CRSP ID is PERMNO whereas COMPUSTAT ID is GVKEY. Therefore, it is quite difficult to match the eMAXX holder ID to other databases. Moreover, some types of holder stated by eMAXX may be misleading. For instance, there is a type of holder called "Hedge Fund" or HFD in short. HFD in our understanding is either a firm with intensive use of derivative or a firm with an investment strategy that is not traditional such as very high leverage or high frequency trading. However, HFD in eMAXX is mutual funds with an investment strategy similar to hedge fund. Hedge funds are not required to disclose their holdings; therefore, based on a traditional meaning of hedge funds, eMAXX does not contain information about hedge funds. Holdings data are also linked to managing firm ID which gives information about investment companies that manage bond portfolio for bondholders. Some of the bondholders manage bond portfolio themselves, but some of them hire managing firms. From my investigation, the bondholder ID in eMAXX takes into account the name changes. A prevalent example is in the mutual fund industry. Many times, a mutual fund company was bought by another mutual fund company, which usually a bigger one bought the smaller one. For example, a bondholder ID associated with a mutual fund A after it was bought and changed its name was still the same. This property makes the analysis of bondholding much easier.

6. Insurance company brokerage transaction data

Even though there are many types of institutional in eMAXX data, the brokerage transactions are only provided for insurance companies. This data give us information about who are the brokers, cost and amount transacted, and transaction date. This data are also unique to eMAXX. This set of data will be very useful for the market friction research, such as cost of trade or liquidity. The data link three counterparty together: bondholders, managing firms, and brokerage firms. Managing firms are intermediaries who manage funds for bondholders. Brokerage firms' role is to transact the trade for bondholders.

7. Managing firm data

Bondholders hire managing firms to manage their investments. Managing firm data provide information regarding total amount in US dollar a managing firm managed and total number of issues held by managing firms. In many cases, a managing firm manages funds for many bondholders. For example, BlackRock manages funds for its own mutual funds and also manages funds for other investment companies. Some bondholders invested themselves, especially large companies such as AIG and JPMorgan Chase. Usually, large companies already have the investment resources in place such as investment managers and dealers. For some small companies, it could be too costly to set up everything from scratch from a research unit to trading desk. There are a lot of research on the value of investment companies for investors. This could be another area of research that one can extend using eMAXX data on bond area since the research on the value of investment firms on the equity side has been done quite thoroughly. Managing firm information is unique to eMAXX.

8. Investment personnel data

Investment personnel data give information concerning who manage funds for holders. Again, this set of data is only provided by eMAXX. We can see that holders hire managing firms and we also know the detailed information of who are the fund managers in those managing firms. The data provide a name, job title, and their area of expertise. Similar to the managing firm data, one can apply this data to study on the performance of investment managers. The research on consistency of investment managers on equity portfolio is largely conducted, but the research on performance of fixed-income portfolio is still very limited.

2.2 Trade Reporting and Compliance Engine (TRACE)

In this section, I give a summary of Trade Reporting and Compliance Engine (TRACE) data administered by FINRA. All brokers and dealers who are the members of FINRA have to submit a report of corporate bond transactions to TRACE. The purpose is to enhance the transparency of the fixed-income trading. There are three main files in TRACE: (1) Bond trades (2) Daily trade summary (3) Master file.

1. **Bond trades:** The data give detailed information about bond trading transactions such as timing, price, and yield. A variable that is unique to TRACE is the trading party report. TRACE reports whether a transaction is bought or sold and by who. For instance, TRACE reports three letters: B, D, and S. The meaning of each letter is a dealer bought securities from a customer (B), a dealer sold to a customer (S), and an inter-dealer trade (D). Currently, the most comprehensive corporate bond transaction database is from TRACE. After its started in 2002, there have been many publications related to the bond trades in secondary markets using TRACE data. Even though TRACE provides information about the name of buyers and sellers, but those information are mostly not completed. Many of them are missing. The combination of TRACE and eMAXX would provide a more comprehensive dataset that leads to answer many more interesting questions.

2. **Daily trade summary:** For each day for a given bond, it gives the summary for the highest, lowest, closing, price and yield of a bond. One of the interesting variables in daily trade summary is the ID linked to Bloomberg data. If we need more information about the macroeconomic data and pricing of aggregate markets, we can extend the analysis using this Bloomberg ID. Merging database across many datasets through common ID gives us more power to analyze interesting questions across databases. With the TRACE-Bloomberg ID link, we have five data that we can analyze at the same time, namely eMAXX, TRACE,

Bloomberg, FISD, and SDC. Each database has its own unique information that can give us a broader and deeper perspective.

3. **Master file:** This file gives information about bond characteristics such as coupon rate, type of contract, and maturity. TRACE also gives information whether a bond traded is convertible. This convertible feature is important for further analysis because it is a hybrid feature between equity and debt securities. For example, how a convertible bond affects the value of firms through different mix of debt and equity is an interesting question and the data on convertible bonds should help us understand more about the issue. Compared to Mergent FISD and SDC Platinum, TRACE information on firm characteristics is not as detailed as the other two bonds databases.

For each file, there are types of bonds we can choose: corporate, agency, 144A[2], and securitized products. TRACE contains trading information of various types of bonds from general corporate bonds to asset-backed bonds.

Another set of data from TRACE is called *Enhanced TRACE*. Enhanced TRACE is more comprehensive than standard TRACE by providing information previously not disseminated to the public. For example, some disseminated bonds, such as non-investment grade corporate bonds, have been reported only in Enhanced TRACE. Enhanced TRACE includes all the data aged at least 18 months.

2.3 SDC Platinum – Corporate Securities Issuance Data

SDC Platinum (SDC) is the financial market data provided by Refinitiv, which is jointly owned by Thomson Reuters and Blackston Group. The data contain information about the newly issued securities, syndicated loans, mergers and acquisitions, private equity, and global financial markets. The part that I will focus on SDC is the newly issued securities information. The followings are the major datasets of SDC

[2] 144A is private placement bonds exempted from 2 years holding. It can be traded by qualified institutional investors.

concerning the new issues.

1. Date

SDC provides important dates such as offer date of issues, maturity date, date sinking fund starts, etc. These dates are similar to eMAXX. However, SDC provides more date details on other bond process, such as date filing withdrawal or postponement.

2. Issuer Information

Other than the basic characteristics of the issuer, such as name and CUSIP, interesting variables provided by SDC are immediate parent CUSIP and ultimate parent CUSIP. Immediate parent CUSIP is a company that owns the issuer or it is only one-step apart from the issuer. Ultimate parent is the real owner of the issuer. Ultimate parent could be more than one-step apart from the issuer. For example, General Electric owns GE Capital and GE Capital owns Synchrony Bank. In this case, GE Capital is an immediate parent company for Synchrony Bank and General Electric is the ultimate parent company for Synchrony Bank. If one works in an ownership area, these variables are very important as it gives a real view of total ownership for a certain firm. For an analysis of insurance companies, these variables will be very useful because an insurance company has many subsidiaries operating in different locations. Therefore, having identifications that links them together as one aggregate company is useful and convenient. However, the universe of companies covered in eMAXX and SDC is not overlapped. For instance, issuers in eMAXX may not appear as part of the issuers in SDC database.

3. Dollar Amount

Regarding the issue amount, SDC provides more information than eMAXX. For example, SDC has information about shelf-registration, thus we can see total amount issued from the start to the last issue of bonds within the same batch of shelf-registration. Interesting information in SDC is that, for a given 9-digit CUSIP (i.e., for each issue), there are different bond characteristics based on each lot of bond issuance in the same set of shelf-registration. For instance, within the same 9-digit CUSIP, there are bonds with different coupon rates, yields, maturities, etc. If it is a mortgage-backed bond, the sum of tranche amounts is also provided.

4. Pricing and Premium Information

Since SDC has information about shelf-registration, SDC can provide the ranking of the filing price in each round of issuance in the same batch. If the prices are different, we would have another interesting research question that what could be a factor that affects firms to issue different bond prices in the same shelf-registration filing? It could be related to the market rate or firm's characteristics. One of the variables that eMAXX does not provide is information about conversion rules. SDC provides detailed information about conversion rule such as conversion price and premium. Similar to eMAXX, SDC gives information about call feature such as initial call price.

5. Security Information

Rauh and Sufi (2010) show that an analysis of capital structure that ignores debt heterogeneity miss crucial capital structure variation. For example, they find that low-credit-quality firms are more likely to issue several levels of debt claimants. They lose abilities to acquire funding from the same channels; therefore, they need to expand their borrowing channels. For instance, high-credit-quality firms rely mainly on two channels: senior unsecured debt and equity, but low-credit-quality firms resort to multi channels such as senior unsecured, senior secured, and subordinated debt. Therefore, to understand more about debt financing, it is vital to take debt heterogeneity into account. For security information, SDC and eMAXX are similar in this aspect. They provide information about type of security such as subordinated note, first lien, etc. The information about the different levels of claimants from assets when a firm or borrower goes bankrupt is important. The recovery rate is definitely an element of debt pricing. Each level of claimants possesses different degree of recovery rate.

6. Managers and Fee Information

eMAXX does not provide information about managers and fee information. This information is important to study about the bond price in market friction literature. How much underwriters or distributers of bonds charge for their services is important to determine the bond price in general. SDC also provides the information about the expertise of underwriters in terms of how many times or how much value in total an underwriter has underwritten for a certain period. A convenient function in SDC is called *league table* which provides information about a ranking of underwriters or any other information that one wants to rank so long as the SDC contains the information.

In addition, another interesting question from managers and fee information is an incentive issue. In mutual fund literature, Bergstresser et al. (2009) find that there are more fund inflows to funds with higher incentive fees paid to advisors or brokers (12b-1 fee). This phenomenon could also be tested on the bond market. For example, if we group bonds, first, by the date of issuance and, then, by the issuance fees, we may find something similar to the mutual fund industry that higher-incentive-fees bonds may be able to offer lower yield for investors. A rational could be similar to Bergstresser et al. (2009) that even though the bond has lower yield, underwriters or distributors manage to successfully sell it because of the higher incentive paid to them. If we also merge the managers and fee information with bond ownership information from eMAXX, we would be able to perform a more rigorous analysis. For instance, we may address a question whether any specific type of institutional bondholders purchase a bond with high incentive fees and lower yield on average relative to other bonds issued at the same period.

7. Additional Data Items

For some other popular variables, some variables are both provided by eMAXX and SDC such as ratings of bonds. However, there are many variables that eMAXX does not provide. For instance, SDC provides IPO indicator while eMAXX does not. From eMAXX, we do not know whether the bond is IPO or seasoned offering. Another identification that is interesting and only available in SDC is high yield debt indicator. The high yield debt indicator could be very useful for the analysis of bondholding of insurance companies, because most insurance investment policies have a limit on how much they can invest in non-investment grade bonds.

2.4 Mergent Fixed Income Securities Database (FISD)

1. Issuers

Mergent FISD issuers information is similar to other databases. A variable that could be only unique to Mergent FISD in this file is bankruptcy indicator that shows whether an issuer is bankrupt or not. The rest of the information, such as CUSIP, SIC, and name of the issuers, are also available in other databases.

2. Issues

Issues file in Mergent FISD contains many interesting characteristics of bonds which are similar to SDC and certainly much more than what eMAXX provides. For example, Mergent FISD issues provide flags for bonds in the followings: Yankee, Asset Backed, fungible, MTN, make whole, pay-in-kind, 144A, 415 Shelf registration, etc. It is very easy to filter a bond with special characteristics in Mergent FISD because of these flags. For other bond data, we need to construct all the flags ourselves if they are available.

3. Ratings

As for the rating information, Mergent FISD consists of more elements than eMAXX rating which only shows what the rating for each bond is in a given quarter. Mergent FISD rating shows the date of rating, type, status, and reason. In addition, Mergent FISD also provides a credit watch variable, both positive and negative watches. It would be interesting to see how bondholding changes when rating or watch-status changes. Since eMAXX provides many types of institutional bondholding, another interesting question is whether any type of institutional bondholding has more information than others. We might find that some types of institutional bondholders may trade well in advance before the watch-status change. For instance, before the watch status of an issuer changes to negative watch, mutual fund A may already sold the bond of that issuer while others start to trade after the watch-status change. This advance trade could be related to the asymmetric information issue that one party possesses information that others do not have.

4. Redemption

Do bondholders prefer to hold puttable, callable, non-callable, make-whole bonds? We can address these questions with the combination of eMAXX and Mergent FISD. For instance, insurance companies try best to match their assets and liabilities. If insurance companies hold large amount of callable bonds, they will definitely face a problem of duration mismatch when the bonds held are called. It could be costly both in terms of searching and trading costs. When large amount of bonds held by insurance companies is called, insurance bond managers have to search for other bonds with the duration matched their liabilities and every transaction incurs trade fees. Other than the usual call characteristics (e.g., call date, call amount), Mergent FISD also contains information about maintenance/replacement fund date, sudden death par, make whole date, etc. The information about different types of redemption could help us understand more about the dynamic of the bondholding.

Another interesting question that can be addressed by redemption and bond ownership data is that the bondholders may prefer a certain type of redemption depending on the interest rate view of fund managers. For instance, when there is a period of increasing market rate, insurance companies may prefer to hold callable bonds because it offers higher yield at the lower risk to be called. On the other hand, insurance companies should prefer to hold non-callable bonds during the period of decreasing in market rate. We can see that this could link to macro variables such as economic cycle (e.g., employment, GDP, and PMI) and how it may relate to a pattern of bond ownership.

5. Transactions

One can also address a regulatory issues using this combined database. There is a decent amount of literature in mutual funds about window dressing that, before the end of a quarter, some mutual funds try to hold a certain security that is considered "winner" so that when it comes to the performance and holding report, the mutual fund companies would make the report as if the funds had held the position for a long time or since the beginning of the quarter. If we can see what happen during the quarter using both TRACE and FISD transaction data, which provide minute-by-minute and daily summary trades, and bondholding during the time from eMAXX, we would have a more complete picture of who owns bonds or who redeems the bonds. Transactions in Mergent FISD has more details than TRACE in terms of firm's characteristics. For example, it contains accrued interest and settlement price whereas TRACE only provides the settlement price. Mergent FISD and TRACE both provide data about bond transactions. However, the two data are not fully overlapped. Some issues are only available in TRACE and some are only available in Mergent FISD. As for the overlapping portion, Mergent FISD provides only summary of trade in a given day, but TRACE shows minute-by-minute trades. It would be very insightful for the dynamic of bondholding analysis to merge all three data together: TRACE, FISD, and eMAXX. eMAXX is a summary of bond held by quarter.

6. Time sales

The data show historical records of bond transactions. The records include cancelled and corrected transactions. Other characteristics of transactions are also included such as sale condition and number of days until settlement. For the time sales data, when it merges with the eMAXX bondholding, we may perform an analysis on the cancelled transactions as a tendency to buy or sell. First, we analyze cancelled and corrected transactions. Then, we may try to come up with some patterns. For instance, there might be a group of buyers or sellers that usually cancel their transactions. It could be an internal operation or investment strategy. Based on my experience, mutual fund companies sometimes received a transaction from brokers quite late because brokers also received orders from customers a little late. Occasionally, brokers can refuse to execute the transactions because it is too late, but sometimes they cannot because customers insist to have their transactions executed on that day to get the price of a desired security on the same day. In other words, customers are afraid to lose their pricing opportunity on that day. This is considered as an internal operation issue. For the investment strategy, if the pattern persistently occurs that some buyers or sellers always cancel their transactions. This could be an element of price manipulation on a security price. Price manipulation is illegal in the US and most countries around the world. Many papers such as Hart (1977) and Jarrow (1992) analyzed price manipulation in a model of asset pricing.

2.5 Summary of Bond Databases

Previous sections describe each bond database and we can see that there are some overlapped and non-overlapped parts among databases. It is complementary to analyze these databases together so that the analysis is more completed. From Table 1.1 and 1.2, they show types of data that are in common and some types of data that are unique to a database. For instance, all data contain corporate, agency, and 144A bonds. However, only SDC data provide ultimate parent CUSIP. The longest history is FISD issues which started in 1950. The shortest history is TRACE which started in 2002. Except TRACE, other databases contain redemption and rating information. The most important information contained in TRACE is the detailed transactions of bonds traded in the secondary market. Research in bond micro structure mostly rely on TRACE data. However, when it comes to the characteristics of bonds, TRACE needs help from other databases, such as Mergent FISD and SDC.

Figure 1.7 shows number of firms issued bonds in each dataset. The number of firms issued bonds is in the range of 1,000 to little over 10,000 for all four datasets. For the time line, I only scope based on the eMAXX data that cover from 1999Q1 to 2013Q2 though some data start before 1999Q2. eMAXX covers number of firms much more than other types of data. eMAXX covers a number of firms in the range of 8,000 to 10,000. Mergent FISD and SDC Platinum are very stable in terms of number of firms they covered. The range of firms covered by Mergent FISD and SDC is from 2,000 to 4,000. TRACE started the data in 2002 and sharply increased in coverage ever since and became the second largest dataset that covers number of firms issued bonds. After 2011, TRACE covers more than 4,000 issuers. The same pattern can also be observed from Figure 1.8 that Mergent FISD and SDC Platinum are very stable in their coverage in terms of the number of issue (9-digit CUSIP). eMAXX has the largest coverage following by TRACE. Again, I would like to emphasize the importance of merging different bond datasets to have a more complete information of a bond market, because each dataset contains different information and unique bonds.

2.6 GE Case Study: An Example of Four Databases Merged

I would like to show how merging the four bond databases useful by creating a case study on General Electric (GE). Assume that the CFO of GE would like to understand more about its bond buying and selling activities in case the CFO can come up with a plan to make the bond issuance process more efficient. Some interesting questions would be "Who buys our bonds and by what amount?" "Do we have many bondholders or only a few bondholders purchase our bonds?" "Can we reduce the cost of issuing bonds by selling our bonds to some specific institutional investors directly?" and so on. These questions can be addressed with the combined bond databases. The reason that I choose GE as an example is that GE has issued a variety of bonds, such as different sizes and redemption features, and has a long history of bonds issuing since 1966. First, in order to have complete information of GE about its bond issuance, I merge all four databases: TRACE (T), Mergent FISD (F), eMAXX (E), and SDC Platinum (S). Then, I subset only information about GE for further analysis.

From Table 1.3, the column "FLAG" means the bond issues (9-digit CUSIP) appear in which database. For example, if the FLAG shows a single letter such as T, it means the issues only appear in TRACE. If the FLAG shows two letters such as TE, it means the issues appear in both TRACE and eMAXX. The four-letter FTSE means the issues appear in all four databases. The data in Table 1.3 are bonds issued by GE from 1966 to 2013. The number of all bonds issued by GE is 2,648. Majority of them appears only in TRACE. In other words, 637 issues out of 2,648 only appear in TRACE database. 2.5 percent of issues appear in all four databases. We can see that there is no single database that contains all the issues from GE. This gives us an interesting conclusion that considering only one database may not be able to refer to the universe of bonds.

How many bonds offered by each database is an interesting question. Some types of database may cover more bonds. We can use GE as an example to illustrate this point. Table 1.4 shows a unique number of GE bonds available in each database. TRACE covered largest number of bonds 1,624 following by eMAXX 1,350. However, TRACE only provides data about the transactions of bonds in the secondary market. To have information about the bonds characteristics, one needs to resort to other databases, such as Mergent FISD and SDC.

Starting from TRACE, we would want to see the most important information that TRACE can offer, which is bond transaction data. Since FINRA has been encouraged transparency in the bond market in the same way as equity market, over time, we have more detailed information about the bond trading. From TRACE, Table 1.5 shows summary statistics of all GE bonds' transactions from issuance to maturity. The highest number is 150,411 which is very high when we compare to the mean and median of the bonds traded. The maximum number of transaction at 150,411 is an outlier because at percentile 99th, the number of transactions is 48,010. The maximum is three times larger than the percentile 99th. The minimum number of transaction is as low as one transaction. The mean of the number of transaction of GE bonds is 2,849. This means, on average, from issuance to maturity of a given GE bond, it was traded around 2,849 times. We would be interested in the bonds with a high number of transactions and see their characteristics. Table 1.6 shows ten highest-transaction of GE issues. The highest transaction for the GE bond is GE:AAD or the GE bond with a CUSIP 36962GYY4. To this point, we use all four databases to obtain the universe of GE bonds and use TRACE transaction data to find the bond with highest activity in the secondary market.

One of the interesting questions is to examine the market reaction before and after the offering and maturity dates, respectively. Stoll and Whaley (1990) showed in their work that at the opening of the NYSE market, the volatility is greater than when the market is closing. The cause of greater volatility could be attributed to asymmetric information in which some parties possess private information. The same idea could be applied to a bond with early opening (before offering date) and late closing (after maturity date). What could be a price or volatility pattern during these abnormal trading periods? and why do we have such special periods? With combined bond databases, especially SDC for this context, we have information about the underwriter of bonds both IPO and seasoned. Some bond underwriters may associate with a degree of asymmetric information in that they first survey the bond prices from interested investors, then underwriters suggest what could be the price of bonds or yield at issue. In this case, underwriters have an incentive to sell the bonds as much as they can in order to grow their reputation in the market. With eMAXX bondholding data, we might address a question "Does underwriter affect the type of bondholders?" Some underwriters may tailor their set price to a certain investors. For instance, if underwriters survey the potential bond price from interested investors and they know that large bondholders prefer a certain price, will they set price so that it favors those large bondholders? If underwriters can sell all bonds out successfully, they will be rehired by other firms to help issuing bonds. If underwriters do tailor their selling to a certain bondholder, what will be the reaction of the CFO after he or she finds out? The CFO could bypass the underwriter service and offer the bonds to the major bondholders directly. This could reduce the issuing cost and, perhaps, increase the returns for bondholders. If GE chooses not to increase the returns for bondholders, GE will have higher revenue because of the lower issuing cost. An interesting question that can be addressed is whether issuers with high concentration in bond ownership or issuers with only a few bondholders per issue have higher yield at issuance or higher profit margin. Consequently, we would be interested in the characteristics of the highest transaction bond GE:AAD. We can obtain the bond characteristics from Mergent FISD data. GE:AAD is a ten-year bond. The offering date of this bond is May 31, 2002. The maturity date is June 15, 2012. When we cross check with the Mergent FISD transaction data in Table 1.7 and Table 1.8, we can see that there were transactions before and after the offering date and maturity date, respectively. This emphasizes an interesting bond market mechanism whether underwriters or other market participants play a role here.

Even though the liquidity in bond markets is far less than the stock market, the volatility in bond market could be very high similar to the stock market during the crisis period. From the market maker point of view, this is very interesting. We may come up with a question "Who were the market makers during the period?" and "What was the degree of asymmetric information in the bond market during the crisis period?". Therefore, we would like to see a plot of GE:AAD transactions over time.

The graph of GE:AAD bond transactions is plotted in Figure 1.5. We can see that during the financial crisis in 2007 the bonds have extremely high trading activities. From Table 1.9, the daily average number of transaction for this bond was 60, but during the crisis the number of transaction went up as high as 1,237 transactions. If we look carefully at the graph, we will see two spikes on the graph. GE at that time were struggling to get bailout money from either government or private sector (Berkshire Hathaway was part of the deal at that time). When the news came out that GE was close to get the bailout, the market calmed down. During the normal period, the bond trading volume was very stable; however, during the crisis period, the volume was much higher and this indicated high volatility.

Then, I merged the data with eMAXX and analyzed the bondholders for this high activity bond. Figure 1.6 shows that the largest holder for this bond is life insurance (pink color) following by mutual fund (light brown color). The third largest holder is property and casualty insurance (green color). On average, life insurance held around 60 percent of total bond outstanding. Mutual fund gained its turf during 2009Q2 to 2011Q1. An interesting observation is that, in 2008Q3, the portion of government pension (GPE in dark brown color) is much higher comparing to other quarters. At the same time, the portion of life insurance is much smaller comparing to the previous quarter. This may imply an exchange in bonds between the two parties during the crisis period. Another interesting observation from Figure 1.6 is, after the 2007 crisis, mutual fund had higher proportion of holding. We may want to investigate further why mutual funds held more of this GE bond during the two-year period after the crisis. It could be that the investment policy of mutual fund and insurance is different. Mutual funds, especially active funds, can have a very flexible investment policy to invest in risky bonds as long as they can expect higher return. However, insurance companies cannot really take high risk, because their liabilities are in effect and their policies are mainly to match the duration of liabilities and assets. If the volatility of their assets are too high, they may have to find other alternatives, such as treasury bonds which have less volatility. Moreover, insurance companies are subject to capital requirement similar to banks. If their assets have higher risk, the risk-weighted asset value would be higher and they may be required to increase capital. If they do not want to increase capital, they may have to sell those assets. This is an interesting point that could relate to “fire sale” literature. Whether mutual funds exploit the fact that some institutional bondholders (e.g., insurance) are subject to a holding constraint is an interesting research question.

The pattern of bondholders whether it is more or less concentrated over time is also interesting, because the number of bondholders could affect the renegotiation process when GE is in financial distress. Bolton and Scharfstein (1996) find that it is costly for distressed firms to negotiate the debt term with many creditors who may have different decisions during the negotiation process. From Table 1.10, we can see that the number of holders for this bond was increasing until 2009Q2, then it kept decreasing, with a brief increase in 2010Q3, from the highest number of holder at 380 in 2009Q2 to 215 in 2012Q1. Similar to the number of bondholders that proxy for the holding concentration, Herfindahl Index (HFI) is another proxy for holding concentration.

$$HFI = \sum_{i=1}^{n} B_i^2 \tag{1.1}$$

B_i is the percentage holding to total bond value outstanding of the i^{th} bondholder. The maximum value of HFI is one and it means that there is only one bondholder holding the bond. The lower the number is, the less concentrated the bondholdings are. We can see from Table 1.11 that the increasing Herfindahl Index (HFI) is consistent with the decreasing number of bondholder. That means the concentration of holding is higher. From Figure 1.6, the mutual fund held less and life insurance gained more holding when the time was approaching the maturity. Usually, life insurance should have longer bondholding horizon, because the nature of its liabilities has very long period of time. Based on the data from WHO, life expectancy of people in all regions in the world has been increasing. This could lead to a longer bond investment horizon for insurance companies. In other words, the pattern of insurance holding increasing when a bond is approaching its maturity could be from the nature of long-term investment policy of insurance business.

After we understand the general ownership structure of GE:AAD bond that it had increasing in ownership concentration over time, we analyze in more details regarding the ownership by observing top five holders of the bond for each quarter. At this point, the CFO may want to know who are the top holders or largest holders of GE bonds. We may ask a question "Does holding higher share in bonds has a relationship with bond trading or performance?". From Table 1.12, AXA Equitable Life Insurance Company is the largest holder from 2006Q1 to 2008Q3, except for 2007Q1 which ING USA Annuity & Life Insurance Co took the position of the largest bondholder. From 2008Q4 to 2012Q1, John Hancock Life Insurance Co Is the largest holders and AXA Equitable Life Insurance Company was not in the top five until 2011Q4 that it came back to be number five. Among the top five over time, we can see big names in insurance and mutual funds took turns to be in the top five holders of GE:AAD bond. For example, large insurance companies such as ING and American Life were the second largest bondholder of GE:AAD in many quarters. Large mutual funds from T. Rowe Price and Vanguard also invested largely in this bond. It is useful to see the dynamic of bondholdings in terms of identifying the influence of who own the bond at a point in time. As mentioned in the beginning of the analysis, the CFO may want to know these large institutional bondholders so that GE may increase its bond issuance efficiency by understanding more what these institutional bondholders need. The uniqueness of the eMAXX data is we can see who had been purchasing the bonds over time or who had been selling. For instance, John Hancock Life Insurance (Hancock) as the third largest bondholder of GE:AAD purchased the bond since 2006Q1. In 2008, Hancock became the second largest holder and finally the largest holder since 2008Q4.

The position of large bondholders, such as Handcock in this case, may have an effect on the bond's return. There are literature about the relationship between informed investors and firm performance. Mostly, when investors have large holding in a firm, they could arrange a special meeting or visit the firm to learn more about the firm's current situation. This close relationship may result in a better performance of bond investment.

Some people may ask why bondholding is more concentrated or less concentrated over time and what could be the determinant. The previous information shows the name of top bondholders, but it is also interesting to see the percentage holding to overall bond outstanding from these top bondholders. Table 1.13 shows top five percentage holding out of total bond amount outstanding for GE:AAD bond. We can see that in the beginning the largest holder held around 6 percent of total bond outstanding. In the first quarter of 2006, top five largest holders held 27 percent of total bond outstanding. Over time, the largest holder increased the portion from around 6 percent to more than 10 percent in the last quarter of bond life. In the last quarter, the top five holders held 38 percent of bond outstanding which increased from 27 percent in the first quarter.

In conclusion, the GE case study here shows us that it is much more comprehensive when examined bondholding through the lens of combined four databases. We can see the transaction activities through TRACE and bond characteristics from both Mergent FISD and SDC Platinum. Lastly, the dynamic of bondholdings comes from the eMAXX institutional bondholding data. Even though the data on debt financing is not as prevalent as equity financing, we could understand more about the debt market, especially corporate bonds in this report, by aggregating different databases in order to have a more complete picture of the debt market. The next section describes the eMAXX data starting from bond characteristics.

3. Bond Characteristics

eMAXX data come with many different text-delimited files. These files represent information of bonds in each aspect: issuers, holders, managing firms, personnel, etc. For bond characteristics, the main file is "security master" file or SECMAST. The file provides information in the following.

1. Maturity date
2. Market sector: A=asset backed, C=corporate, G=government, M=mortgage-backed, R=Local/Regional (including, municipal issues and issues of non-us municipal issuers i.e. Hydro-Quebec, City of Berlin, Province of Nova Scotia, etc.), N=US firms investing non-domestically
3. Collateral code
4. Private placement
5. Issue amount outstanding
6. Net change: Total net change in total par amount held from previous reporting period
7. Number of holding sub-accounts [3]: Total number of sub-accounts currently holding the issue
8. Number of buying sub-accounts [4]: Total number of sub-accounts who have increased/purchased positions in the issue
9. Number of selling sub-accounts: Total number of sub-accounts who have decreased or sold-off positions in the issue

[3]Sub-accounts in eMAXX means the name of bondholders. These sub-accounts have their own unique sub-account ID that identifies each holder.

[4]This data is in quarterly format. The change in buying and selling accounts reflects the transaction in each quarter

10. Total par amount held: Total par amount held of issue by all "holding" sub-account

11. Pledge code: Type of bonds such as debenture, bond, certificate deposit, etc.

12. Rating by Moody's, S&P, and Fitch

13. Coupon rate and type

The time range of my analysis is from 1999Q3 to 2013Q2. The characteristics of issuers are analyzed in this section. For a quick summary of data, total number of observation of the aggregated SECMAST file is 2,467,413. The number of unique bond issued in this data is 199,875. This number of unique bond issued takes into account 9-digit CUSIP. Based on the number of unique bond issued in this data, eMAXX is one of the most comprehensive bond databases.

One of the interesting information from eMAXX is the identification of 144A bonds. 144A rule is a SEC rule modifying a two-year holding period restriction. For private placement bonds, the investors have to hold it for at least two years. However, 144A rule allows qualified institutional buyers to trade these bonds among themselves immediately without the two-year holding restriction. This modification of 144A has its purpose to increase the liquidity of the securities and, in turn, increase the number of new issuance in the bond market. Out of 199,875 bonds, 24,487 bonds are 144A bonds. Special characteristics of 144A bonds may result in different types of holders. Bondholders of 144A bonds may require higher liquidity. Without the two-year holding period restriction, 144A bonds would be very tempting for short-term holders. For instance, some active mutual funds which trade bonds quite frequently may find 144A bonds very interesting as they can trade the bonds at their desired time without two-year holding restriction.

For this section, I discuss eMAXX bond characteristics in the following orders: coupon structure, currency, collateral, private-placement bonds, credit ratings, maturity, and callable feature.

3.1 Coupon Structure

The first information of bond characteristics from eMAXX data that I would like to consider is coupon structure. In finance, there are many types of coupon such as fixed rate, floating, zero, etc. The question is "what is the majority of coupon type in the US bond market?" If most of the bondholders are insurance companies which need to invest in assets with certain income, we would expect that most issuers would issue fixed-rate bonds. The main strategy of the insurance companies is to match assets and liabilities or we call it *duration matching*. In order to reduce the risk of income uncertainty, insurance companies would prefer to hold fixed-rate bonds so that they know their durations of the assets precisely. From Table 1.14, 81 percent of bonds issued are fixed rate type. 15 percent are floating rate. The rest consists of zero coupon, step-up rate, stripped coupon, and inverse floating. As we expected, most of the bonds are fixed-rate bonds since the cost and benefit are easier to calculate. The floating rate bonds can be higher or lower cost and benefit depending on the interest rate trends and whether you are the borrower or lender. On the borrower side, floating rate could reduce the cost of borrowing when the market interest rate is decreasing; however, when the interest rate is increasing, it could increase the borrowing cost of a firm. These two opposite consequences and difficulty to predict the interest rate trend could be the reason for the popularity of fixed rate bonds. On the lender side, similar reasons could be considered. Investors may want to know exactly what the return of the investment is going to be. As mentioned, insurance companies perform the asset-liability duration matching. If an actuary does not know their certain bond investment returns, it could be very difficult to match liabilities with assets. Moreover, there are 10,143 bonds with changes in coupon type over time. For example, some bonds had their coupon type changed from fixed coupon to floating coupon at some point in time.

After we see the big picture of coupon type that most bonds are fixed-rate coupon, it would be also interesting to analyze coupon types by different types of bonds, such as private placement versus overall bonds issued. Different types of bonds could exploit a certain type of coupon. For example, floating-rate bonds should be issued more when the market interest rates favor the issuers. From Table 1.15, there are five types of coupon payment: fixed-rate, floating-rate, zero, step, and strip. Majority of the bonds issued is fixed-rate coupon bonds. For all types of bond filters (all data, private placement, 144A), fixed coupon payment is around 70 to 80 percent of total bond outstanding. However, for 144A bonds, the floating-rated coupon payment is significantly higher than all data and private placement bonds on average. 144A bond is a bond that is privately sold to qualified institutional investors such as large banks and investment funds. In other words, the investors for 144A bonds are more sophisticated and should understand the structure of the floating-rated bonds; hence, this could be a reason that the proportion of the floating-rated bonds issued for 144A bonds are higher. However, non-financial US 144A bonds are the only type in 144A bonds that did not exhibit higher floating-rated bonds on average.

Another possibility that could explain why the 144A bonds have higher portion of floating-rate bonds is the interest rate trend. We would expect that the bond this type should be issued when the trend of the interest rate is decreasing and this is true in this data for 144A bonds. If the logical reason described is true, a next related question is whether issuers exploit the 144A rule channel to issue bonds to capture other benefits. For example, if an issuer knows that it has a chance to be downgraded in the near future, will they quickly issue bonds to exploit the current lower borrowing cost before the downgrade? After the downgrade, definitely, the higher credit risk will be added on to the borrowing cost. As stated, Issuers use 144A bonds to quickly capture the current interest rate environment. The result of the analysis can be found in Table 1.16. When I analyze the issuance year of the 144A bonds, I find that 144A bonds usually issued in the years that interest rates were peak. For instance, from 1930 to 2013 time period, 20 percent of 144A bonds were issued in 2006 and 2007 where the federal funds rate was peak at 5 percent. After 2007, the interest rates were decreased shapely to almost zero in 2009. The reason might be that 144A is more flexible and liquid. A demand to issue floating rate bonds during the downward trend of the interest rate should be high from the perspective of issuers, because the cost of borrowing will be decreasing over time. However, predicting interest rates are difficult. It requires analyses of many aspects of economy both public and private sectors as well as international perspective. Therefore, an issuer cannot be so sure about the downward trend of the interest rate until all the economic indicators show an obvious sign of economic slowdown. Hence, issuing a type of bonds that can be quickly issued such as 144A bonds in this case may be preferred. 144A rule bonds do not require SEC registration and 2-year holding period. Exempt from these two requirements, 144A rule bonds can be distributed to bondholders faster and their liquidity is enhanced significantly.

3.2 Currency

In my analysis, I focus on the US corporate bonds. However, there are bonds issued in different currencies other than the US dollar in eMAXX database. In this section, we move on to illustrate different currencies of bonds issued. A research question here is whether issuing a bond in a certain currency would benefit the issuers in some way. Do bondholders behave differently when the currency of bonds is not the US dollar? Whether bondholders behave differently when they invest in bonds with different currencies is an interesting question that can be addressed by eMAXX. Some currencies such as USD and EURO are very liquid. Bonds denominated by a liquid currency might be preferred to a less liquid one. For instance, in terms of the repo market, some bonds with currencies that have much lower liquidity than other currencies may receive less return or have higher haircut because of the currency risk. Table 1.17 shows top 20 of the currency issued from eMAXX data. Majority of the bond issued is in USD with the proportion of roughly 77 percent. This makes sense because the data focus on the corporate bonds issued in the US. The interesting point for this data is it also contains other currencies other than the US. The second and third largest currencies are Euro and Japanese yen, respectively. Interestingly, there are 1,505 bonds with changes in currency over time. Some bonds, for example, a bond with CUSIP 00087MAA in the year 2000, the currency is USD but in 2002 the currency changed to CAD. Top-five currencies take almost 90 percent of overall currencies. However, I would expect all major currencies in the US dollar index as top currencies. Based on the US dollar index consisting of six major currencies in the world: Euro (EUR), Japanese yen (JPY), Pound sterling (GBP), Canadian dollar (CAD), Swedish krona (SEK), and Swiss franc (CHF), two currencies, SEK and CHF, did not make it to the top list here. In fact, both of them have the lowest percentage in this data at around less than 0.2 percent. On the other hand, Indian rupee (INR) and South Korean Won (KRW) have the percentage very close to CAD and GBP. It is interesting that these two currencies are quite active in the US bond market. Studies of international bonds show that the excess return of bonds in different countries, especially large countries, is highly correlated. Ilmanen (1995) finds that the same set of variables can predict the variation in long-maturity government bond returns in six countries. In the same manner, we would expect the bondholding from large institutional bondholders to trade on the same set of information. Therefore the directions of trade could be either overbought or oversold. This consistent with the herd behavior in bond market observed by Cai et al. (2019). Cai et al. (2019) actually find that the degree of herd behavior from institutional investors in corporate bonds is higher than the equity markets. Moreover, they find that the buy-side herding helps increase price discovery, but the sell-side herding results in price distortions. The section of bonds that has the highest level of herding is speculative-grade bonds.

3.3 Collateral and Type of Bond

Another interesting aspect of bond is its collateral. In asset-backed bonds, the collateral could be anything from housing loan to a personal loan. In debt literature, collateral is important when firms decide to borrow either from the public or from private entity such as bank. There are mixed theoretical predictions regarding this issue whether collateral status affects the choice of debt issuance, for example, by Johnson (1997), Cantillo and Wright (2000), Denis and Mihov (2003), and Rauh and Sufi (2010). eMAXX data also provides information about the bond collateral. From Table 1.18, almost 100 percent has collateral as general corporate obligation. Since most of the bonds in this analysis is corporate bonds, that is the reason most collateral is general corporate obligation. General corporate obligation means no specific assets assign as collateral. There are two bonds with single family mortgage loans as collateral. As with coupon structure and currency issued, there are six bonds with collateral status changed sometime before they matured.

Types of bonds could also affect the decisions of firms when they need capital from external debt. For example, short-term or long-term bond issuances depends on the cost of funding and investment horizon. This data may answer interesting questions in the aspect of type of bonds and holding. For example, why do some firms issue Medium Term Notes (MTN)? The benefit for MTN issuers is the flexibility to re-issue bonds without registering with SEC again. For the investors, the medium term duration and the fact that they can expect the MTN to be issued regularly help investors effectively plan out their investment portfolio. Similar to the property of 144A previously mentioned, both MTN and 144A have the flexibility of quickly turnaround. We might be able to test the association of MTN and the issuing period that MTN may be usually issued during the downward trend of the interest rate. Because MTN does not require SEC registration every time it is issued, issuers may want to issue series of MTN during the downward trend of interest rate. For the type of bonds or in this data eMAXX named it "pledge", from Table 1.19, 63 percent of the pledge is Note/Bond. 20 percent of the pledge is MTN. More than 80 percent of bonds are either Note/Bond or Medium Term Notes. This pledge is the type or category of debt issuance. We can see that the data consist of several types of bonds; therefore, we can address this issue using eMAXX that a certain characteristics of an issuer should be associated with a certain type of bonds issued.

3.4 Bonds Placed Privately and Bonds Issued in Public Markets

An important question is why do some firms issue private debt, such as bank loan, and some of them issued public debt? Prevalent literature are on the determinant of choice between public and private debts. For example, Johnson (1997) find that firms use more public debt when they have low information and monitoring costs, lower cost of inefficient liquidation, and low probability of taking actions that are harmful to lenders. Moreover, on the private debt side, researchers have tried to understand the determinant of choices in private debt. For instance, Ojah and Manrique (2005) find that the likelihood of using bank debt is increasing with the firm size and information availability, but decreasing with the firm credit worthiness. They explained that the positive relation between the firm size and the use of bank debt is the lower cost of information gathering for large firms. As for the negative relation between the bank debt and the firm credit worthiness, the higher the credit worthiness the firm possesses, the more firms have an access to the public debt markets. In other words, it is more optimal for creditworthy firms to issue public debt than borrowing privately from banks. Creditworthy firms have lower asymmetric problems, therefore the cost of borrowing in the public market is lower. In the public debt market, to issue a bond, most firms hire credit rating agencies to assign a rating for them. The rating is one of the main proxies for investors to judge firms' credit worthiness. If firms have a high rating, they would have a lower cost of borrowing than the lower rating firms. Therefore, it could be more efficient for firms to reduce the private bank debt and increase the public bond issuance when they have higher credit worthiness. We understand more how firms make a decision between private and public debt from debt financing literature, such as Houston and James (1996), Krishnaswami, Spindt, and Subramaniam (1999). However, none of them focus on the types of private debt, bank loan and private placement bonds, except Denis and Mihov (2003) and Kwan and

Carleton (2010). Denis and Mihov (2003) analysis is on the rule 144A bonds whereas Kwan and Carleton (2010) focus on non-rule 144A bonds. Because of a lack of data, there has been limited research on the determinant of public debt choices.

My analyses document that, on average, 70 percent of bonds are non-private placement or registered for public sale in eMAXX. In other words, most of the bond in eMAXX are offered publicly. For more details of the dynamic of bonds issued privately and publicly, from Table 1.20, the percentage of private placement of issuers out of total bond outstanding was decreasing. In 1999, the proportion of private placement bond to total bond outstanding is 40, but, at the later time, the percentage is lower to around 30 percent. The lowest percentage bonds issued privately is in 2011 and 2012 with as low as 27 percent. From the literature, the lower portion of private placement bonds compared to the public bonds should be related to a certain degree of asymmetric information problem. Smaller portion of private-placement bonds implies lower asymmetric information in the corporate bond markets. These questions can be better addressed by using the eMAXX database since we will also know a type of bondholders. The type of bondholders could imply the level of asymmetric information. For instance, passive investors such as insurance companies and pension funds may not care much about the asymmetric information, because most of the bonds they purchase are investment grade bonds. Investment-grade bonds should have lower asymmetric information problem since they should have higher corporate governance and efficiency.

The timing of private and public debt issuances should also be an interesting research topic. We would expect that the public bonds should be issued less during a financial crisis or during the capital market downturn, because investors would be very risk-averse and do not want to lend the money easily during the financial crisis period. Therefore, the chance of unsuccessful bond issuances is high. In my analysis of the private-placement bonds issuance timing, an interesting observation in Table 1.21 is that, during a crisis, bonds were mostly issued privately as expected. For instance, from 2008 to 2010, the median of public issued bonds is very small compared to other years. This might come from the fact that investors were not confident with the capital market. Consequently, there was no liquidity in the market. However, for the private placement channel, both counter parties could strike a deal that satisfy investors such as additional collateral or haircut. In other words, when the public has low confidence in the capital market and economy, it could be preferable for firms to issuer bonds privately.

3.5 Credit Ratings of the Issuers

A rating of bonds is one of the most important topics for corporate bonds. When the bond's rating changes, it could impact many things from the price of bonds to the perspective of investors on bonds. With eMAXX bondholding data, when bond's rating changes, we can see the dynamic of bondholdings during the event. Therefore, it is worthwhile to look at the rating of bonds in eMAXX database. From Table 1.22, more than half of bonds in eMAXX data have no rating or are unidentified. From Table 1.23, majority of the bonds that have a rating is investment grade (76 percent). Top three largest are Aaa, A3, Aa3, respectively. The largest portion of rating is Aaa. From Table 1.24, on average, a rating of bonds in the eMAXX data is Baa1. However, the median shows higher rating as A3. Overall, both mean and median show that the rating of bonds on average is investment grade. For the US financial companies, the average rating is higher than the data overall. The rating for the US financial firms is A2 while the overall rating is Baa1.

It is very interesting that half of the bonds is not rated. We would be interested in the characteristics of bonds without rating. These bonds could be church bonds or bonds issued by small regional companies that are not required the bonds' rating. There is a literature that examined some types of non-rated bonds. Reeve and Herring (1986) examined non-rated municipal bonds and find that the cost of borrowing was higher because of the larger par value, but not because of lower quality as prior studies indicated. One can conduct research along the line of Reeve and Herring (1986) on non-municipal and non-rated bonds to see the structure of the interest cost whether the different interest costs are from a factor that could be different from the rated bonds. We may find that the determinants of bond value for non-rated bonds could be very different from the rated bonds. Next, I discuss another specific type of bonds which are very popular as another asset for investors to enhance yields of their portfolios.

Another popular topic for both finance researcher and also for investors is the topic of "junk bond". Junk bond or high-yield bond is a bond with lower rating than investment grade or rating lower than BBB. Since junk bonds have higher risk of default according to their ratings, they should provide more return as a compensation for higher risk. A literature on high-yield bonds is generally extensive. For instance, Alexander et al. (2000) tested the agency conflict between stock holders and bondholders using an event that was associated with the agency issue. They consider the directions of returns from stocks and high-yield bonds. If the two returns had the opposite direction during an event associated with the agency conflict, it indicates that there is an agency conflict between shareholders and high-yield bondholders. With eMAXX, we could delve deeper into how high-yield bondholders react to an event that is associated with the agency conflict. Some interesting questions could be "Who is the new bondholders after the agency conflict event?" Whether the new high-yield bondholders have confidence that they can help reduce the agency conflict or whether they are just uninformed investors who do not know about the situation are interesting research questions to further explore. Therefore, it is of interesting to observe the proportion of junk bonds to overall bonds over time. From Table 1.25, from 1999 to 2004, the proportion of junk bonds is in the range of 30 to 50 percent. After 2004, the junk bond proportion is around 30 percent. From Figure 1.13, we can see that there was a decreasing in investment grade bonds from 2000 to 2002. During those time periods, the telecom industry faced a downturn and it was also aggravated by the downturn in the US economy resulted in high default rates and downgrade of bonds. On average, the default rate during this period was 9.2 percent. This number is four times higher than the average in the period of 1992 to 1999. In fact, 2002 had the record for defaults and bankruptcies. The number of default and bankruptcies decreased sharply in 2003. We can also see a drop in investment grade bond proportion in 2007, which is also a crisis year. In this case, the agency conflict between the stock holders and bondholders during a financial crisis is an interesting issue that can be addressed using eMAXX.

3.6 Maturity

Rating of bonds can give investors an idea how risky those bonds are or how much the default risk is. Other than the default risk, liquidity risk is another aspect that affects yield or price of bonds. Longer maturity bonds should result in higher yield than shorter maturity bonds, because investors should be compensated more owing to giving up more consumption for long-term bond investment. Some bond investors would prefer a certain period of maturity. For example, insurance and pension bondholders may prefer long-term bonds to short-term ones, because the structure of their liabilities tend to be long. Whether bondholdings by these long-term bondholders affect bond value is another interesting question that can be addressed using eMAXX. What are the determinants of corporate debt maturity? Researchers have made significant progress to answer the question. For example, Barclay and Smith (1995) found that larger firms issued more long-term debt whereas small firms issued short-term debt. They showed that their findings were consistent with contracting-cost hypothesis. Contracting-cost hypothesis was first mentioned by Myers (1977). Myers (1977) stated that firms with many growth opportunities tend to have less debt in their capital in order that stockholders can earn net returns high enough after the debt holders take their parts. Diamond (1993) also showed that a credit quality of a firm was associated with the debt maturity. Lower credit rating firms are likely to issue more short-term debt. On the other hand, high credit rating firms tend to issue more long-term debt. Do demands from long-term bond investors, such as life insurance, result in longer maturity bonds offered by issuers? As for the maturity of bonds in eMAXX on average, from Table 1.26, median maturity of bond issues is 7 years. The maximum is 150 years. There are 48,962 missing issue date and 4,373 missing maturity date. For bonds with the missing date, either issue or maturity date, there will be no information about maturity for those bonds. To analyze in more details about maturity of bonds in different sub-sample, Table 1.27 shows the average bond maturity for different types of data. For all data, the average maturity of bonds issued are around 13 years. The maturity for the US issuers are also around 13 years. However, US non-financial issuers issued bonds with shorter maturity at around 10 years. For US financial and insurance issuers, they issued bonds with much longer maturity at around 18 years. The range is very wide for all types of data. The shortest maturity can be from a couple days to as long as 100 years. From the univariate analysis, we can see that, on average, the maturities of bonds issued are long-term. The demand of the bondholders could be a reason for the averagely long maturity bonds.

3.7 Callable Bonds

Another important feature of bonds is a *call* feature. A callable bond is an advantage to issuers since, at an appropriate time for issuers, issuers can call back the bonds. When issuers call back the bonds from investors, the issuers pay off debt and investors receive principal back with a determined call price. The callable bond usually has higher return than non-callable bond given other aspects are the same, because investors have higher reinvestment risk. When a bond is called, investors need to find another bond to invest and the new bond may have lower returns than the called bond. The interaction between the shareholders and bondholders for bonds with and without call feature could be very different based on the literature. We can understand more about the issue of agency conflict between shareholders and bondholders and callable feature of bonds. One can test the agency cost for bondholders using corporate bond yield and bondholding changes each period between callable and non-callable bonds.

The higher corporate bond yield and abnormal bondholding movement (i.e., excessive buy or sell) may indicate the agency prospect of firms issued debt. Therefore, it is important to perform a univariate analysis on the callable bonds. From Table 1.28, the proportion of callable bonds in eMAXX data is on average more than 50 percent of overall bond outstanding from 1999 until 2005. After 2005, the proportion of callable bond is lower on average to 30 percent. Overall, we can see that first half of the data the callable bond and non-callable bond proportion is close to each other. After 2005, it is interesting to explore more why callable bond portion has been smaller. Robbins and Schatzberg (1986) explored why callable bonds became popular, which is consistent with the bonds issued before 2005 in this data. Robbins and Schatzberg (1986) associated the prevalence of callable bonds with signaling theory where good prospect firms usually issue callable bonds. If the firms perform well, they can call back the loan and enjoy the positive outcome without sharing it with bondholders. However, since the opposite is true for bonds after 2005 in this sample, the signaling theory may not be applied in this case. The decrease usage of callable bond I found here is in line with Crabbe and Helwege (1994) that agency theory explaining the increase usage of callable bonds may not applied in the later period. Crabbe and Helwege (1994) pointed to the sample of previous research that mainly focused on the bond issued before 1982. Bonds issued before 1982 were almost always callable. The argument by Chen et al (2010) states that firms issue callable bonds to hedge their investment uncertainty. When firms face risky future investment opportunities, they issue callable bonds in case the project results in Negative NPV; then, they can reduce their debt obligation by calling back their loans. This is opposite to Robbins and Schatzberg (1986) in which firms issue callable bonds because they have positive investment project.

3.8 Conclusion

Overall, for bond characteristics, we can see that eMAXX provides lots of useful information. The characteristics can be broken down to many segments, such as 144A VS non-144A, private VS public, callable VS non-callable bonds. Each segment has its own interesting research questions which will be summarized in the conclusion section. The time range of my analysis is from 1999Q1 to 2013Q2. During the period, eMAXX covers almost 200,000 bonds. Majority of the bonds in eMAXX has fixed-coupon rate. Larger portion of floating-rated bonds is observed in 144A bonds. As expected, two-thirds of the bonds is in USD currency since eMAXX focuses on the US corporate bonds. 80 percent of bonds are either general corporate bonds/notes or medium term notes. Around one-third of the bonds is issued privately. Bonds issued in eMAXX data are mostly investment grade and most of them have long maturity, roughly 10 years. Over time, the proportion of callable bonds decreased from 50 percent to 30 percent in which the turning point is after 2005. Next, we move on to the bondholder information.

4. Analyses of Bond Investors

Holder data are also from 1999Q1 to 2013Q2 with the total number of observations 500,496. Holder data provide names of the holder and classes of the holder which is called "sub-account class" (or subclass henceforth). Subclass ID or subID is associated with subaccount class. Holder information also has the information about managing firms which manage funds for bondholders. For example, Templeton is a managing firm that manages Templeton global strategy mutual beacon fund. Please see an example of the data in Table 1.29. There are 23,692 number of unique subclass IDs and 40,377 unique subclass names. The reason that the number of unique name is higher than the number of unique subclass ID is the bondholders' name can change over time. The subclass ID tracks the same entity even though the names are changed. There are 8,928 subclass IDs with name changes or the same name but different spellings. Some holders have more than one managing firms and eMAXX calls this "co-managed". There are 2,398 subclass IDs co-managed. Holder data also contain information about which sector a subclass holder has holdings, which is called "market sectors". There are six types of market sectors in the following below.

Market sectors:

1. A – Asset backed
2. C – Corporate
3. G – Government
4. M – Mortgage-Backed
5. R – Local / Regional. Includes U.S. Municipal Issues and Issues of non-U.S. Municipal Issuers. (i.e., Hydro-Quebec, City of Berlin, Province of Nova Scotia, etc.)
6. N – US firms investing non-domestically. Only applies to investment profile data (files are per job, per fund, and fund)

A mixed market sector is possible. For example, if a holder has "CGN" as market sector, that holder invests in corporate, government, and domestic firms bonds. However, for my analysis, I focus only on corporate bondholdings.

Table 1.30 shows top ten subclass information by unique subid. We can see that mutual funds are the biggest portion of overall holders. It is interesting that the data categorize mutual funds into many types that could potentially conflict each other

- Open-ended mutual fund
- Close-ended mutual fund
- Mutual fund equity
- Mutual fund balanced

- Mutual fund fund-of-fund
- Mutual fund money market

Each has only one unique subclass information in any quarter. The last four types of mutual funds should overlap with the first two. In other words, for instance, mutual fund money market should be either open-ended or close-ended fund. The next largest holders by the number of entity is insurance companies; specifically property and casualty as well as life and health insurance companies. Moreover, Annuity/Variable annuity, Pension fund-government, and health care systems also make it to the top ten of the list. The three smallest holders in this data is annuity-money market, pension fund-union, and pension fund-corporate. However, this ranking is not based on the size of the holding but based on the count of the entity. If we consider the size of the holding, the ranking of holder type could be different.

4.1 Type of Bondholders

The largest number of bondholder type is mutual fund; however, if we take into account the size of holding and rank largest bondholders by size of holding, we may have a different result. The type of largest bondholders is important when we examine the issue of renegotiation between equity holders and bondholders during bankruptcy. A determinant of the success or failure in negotiation depends on the bargaining power of each party. There are many theoretical papers incorporating the negotiation friction between equity holders and bondholders into debt pricing; however, empirically, we still lack full understanding of the bondholder's side on the negotiation process and how it affects firm's value. Theoretical credit risk models incorporating strategic default and bargaining power of bondholders are, for example, Anderson and Sundaresan (1996), Mella-Barral and Perraudin (1997), and Fan and Sundaresan (2000). Most empirical studies on the negotiation between equity holders and bondholders during financial hardship period of a firm focus on the equity holders' bargaining power. This is an interesting question that still needs to be explored further. Table 1.31 shows top 30 largest bondholders based on the dollar amount holding from 1999 to 2013. Based on the size of the holding, 24 out of 30 largest are insurance bondholders. The largest holder is PIMCO total return fund which is categorized as open-ended mutual funds. We can see that, based on the size of the holding, mutual fund companies are small portion in the top 30 rank. This means there are many small mutual fund companies in the data but on average the largest holders are insurance companies. Size of bondholding may imply the bargaining power of bondholders when firms fail and equity holders seek protection from the bankruptcy court, because large bondholders control the future of distressed firms when it comes to the voting on the firm's proposal to survive the debt obligation. In addition, usually the large bondholders are large financial institutions, such as TIAA and PIMCO, as illustrated in Table 1.31. These large financial institutions definitely have a strong legal team in place or have enough resources to acquire one. After equity holders receive the protection from the court, a long period of negotiation between equity holders and bondholders starts. Equity holders may ask for some terms that are not acceptable by bondholders such as cutting principal or interest. The outcome of the renegotiation between the two parties depends on the bargaining power of each side.

After we have a big picture of the bondholder types that are the largest bondholders, we would want to also know about the percentage bondholding in general. The percentage holding could be another proxy for bondholder's bargaining power. With eMAXX, we can test the effect of bondholder's bargaining power on the corporate bond value. Overall, institutional investors have held large portion of corporate bonds in the US. How the holdings impact corporate bond value or credit spreads is still unclear. With eMAXX data, we could test on the effect of bondholding on corporate bond value. Table 1.31 shows us the 30 largest bondholders, but we still do not know whether these largest holdings count as large portion of the total bond outstanding. In other words, PIMCO holds the largest amount of bonds value, but PIMCO could hold hundreds, if not thousands, of bonds. In this case, the total amount of bonds held by PIMCO would be distributed to many bonds. PIMCO may hold small portion of some bonds and hold a very large portion of other bonds. To analyze the proportion of bonds held by institutional bondholders in eMAXX, Table 1.32 shows amount of total par held by institutional investors out of total par amount issued. On average, institutional investors hold around 30 to 50 percent of bond amount issued. For all data, the range is between less than 0.01 percent holding and 100 percent of holding. The highest average holding is for the US non-financial issuer with the mean holding of 49 percent. The lowest average holding is the US financial issuer. The skewness and excess kurtosis show a degree of normal distribution with both statistics being close to zero. We can see that a large portion of bonds are held by the institutional investors. From the univariate analysis, we would expect that the institutional bondholders should have high bondholder's bargaining power relative to the equity holders.

4.2 Top Bondholders

After we have an overall percentage bondholding in general, next, it would be interesting to see the percentage holding by top holders. The aggregate percentage bondholding is an important information. However, we would want to know the portion of bond held by top bondholders. For example, what is the average percentage holding by top ten holders? If the portion of the top holders is high, how will it affect the characteristics of future bonds issued? To analyze more on this matter, we would want to see how much top holders for each bond issued hold bonds relative to the total bond value in percentage term. Table 1.33 provides information about the percentage of bonds held by the specified number of largest holders. For example, top-10 is the top-10 largest bondholders. For all data, the top-10 largest holders held 26 percent of the bond outstanding on average. The largest holder or top-1 held 14 percent of the bond outstanding on average. For the US issuers, top-10 percentage holding is higher than all data. Top-10 percent holding of the US issuers is 34 percent on average. For US financial issuers, the numbers are similar to the overall data. However, for the US non-financial issuers (Nonfin US), on average, the numbers for all types of top holders are larger than all data. For instance, the top-5 or five largest holders held 37 percent of total bond outstanding, which is much higher compared to 23 percent of all data. In other words, for the US non-financial issuers, the holding is more concentrated to the large holders. For the top-10 bondholders of the US non-financial issuers, the top-10 held almost 50 percent of the bond issued. This is of interesting to the debt pricing. Previously, we discussed that issuers should also consider the investor's demand. When non-financial issuers decide to acquire funding through external debt by issuing bonds to the public, they may just focus their bond characteristics to a certain group of large institutional bondholders. For instance, the ten bondholders may have an effect on an issuing yield of bonds. If an issuer can satisfy the return expectation of these top-10 bondholders in setting up issuing yield, their success in bond issuance should be very high. In other words, not only do the traditional factors that affect the debt price (e.g., market interest rate and liquidity) impact the firm's decision on the initial bond yield, the structure of bondholders may also have an impact.

4.3 Quantity of Bonds Held

After the percentage holding of top holders is demonstrated, it is also interesting to observe the number of bonds held by each type of bondholders. The heterogeneity of number of bonds held could be tested on the ground of Dass and Massa (2014). Dass and Massa (2014) find that choices of bond's maturity of each issuer matter for investors. Specifically, they find that bondholders prefer to hold bonds from issuers who issue bonds with various maturities. They explain the result by using information-collection cost. Bondholders incur a cost to collect data about an issuer. If they can focus on a few issuers that have all the maturities they desire, bondholders would want to focus on those few issuers instead of spending more time to evaluate a number of issuers. The flip side of Dass and Massa (2014) finding is whether bondholders that hold many bonds means that they cannot find an issuer issuing bonds with various maturities or whether this kind of issuers is limited and its bond sold out very quickly. If it is the case, a natural question is who got in to those bonds first and why? Are there many bondholders who hold many bonds? What is the average number of bonds held? From Table 1.35, my analysis shows average number of bonds held by an investor for a given quarter. For all data, on average number of bonds held is 65. However, the range is large from 1 to 4,151. The wide range of average number of bonds held and the average of 65 bonds held per bondholder imply that bondholders may not hold a few bonds following Dass and Massa (2014). However, this is only a univariate test. A more rigorous test is needed.

A number of bonds held could also relate to the diversification story. Why do some firms diversify their bond portfolios and some don't? Roll (1971) emphasizes the diversification motive for bondholders. Bondholders usually have short-term and long-term bonds in their portfolio, because they try to diversify their investment portfolio; hence, reduce portfolio risk. What could be a determinant of diversification degree of bondholders? If we compare between the US financial and non-financial issuers in eMAXX, the number of bonds held by the investors in the first group is much smaller. The mean is 20 compared to 46. It seems that investors of US financial bonds are less diversified based on the lesser number of bonds invested. We can see from Table 1.35 that the range of number of bonds invested by a given bondholder is very high. For example, for the US non-financial issuer, the range is from 1 to 2,408. The heterogeneity in number of bonds held by a bondholder indicates that some bondholders did not care to diversify their investment portfolio and some did very excessively following Roll (1971). There was a quote from Warren Buffett about diversification stated that *"... diversification is protection against ignorance. It makes little sense if you know what you are doing"*. In Buffett terms, he suggested investors to understand in depth about a security or industry. Then, your investment should be focusing on that security or industry only. In other words, if we understand the security inside out, we do not need to diversify. Some bondholders hold a few bonds or undiversified portfolios. This could imply Buffet ideology or it could be something else. For example, it could be about the supply shortage instead of a demand story. What if bondholders want to invest in many bonds to diversify their portfolios, but the bonds that they desire are not available in the market. For instance, for insurance bondholders, a large portion of their investment portfolios has to be in investment-grade bonds. However, at the time they want to invest, there could be only a few issuers or an issuer that can offer sufficient supply and rating requirements. Consequently, the situation forces insurance bondholders to invest in bonds only from one issuers or a few issuers. In this case, to diversify or not, investors may not have a choice because of the limited supply. This is another interesting question that we can examine using eMAXX.

Now, let's consider the average number of bonds held by types of bondholders. Previously, we analyze the number of bonds held in general. It is also interesting to see number of bonds held by types of bondholders, because the number of bondholders may also affect the debt value. Bolton and Scharfstein (1996) try to answer the question "what determines the number of creditors a company should borrow from?". They find that too many creditors result in high cost of negotiation and sometimes creditors never agree on a deal which results in costly liquidation or reorganization of the firm. That is the larger the number of bondholders is, the higher the cost of renegotiation becomes. The average number of bonds held for each type of holder is provided in Table 1.34. That is, for each type of bondholders, I identified the type of holder and counted how many bonds they held in a given quarter. Then, perform the same counting procedure for each bondholder. From Table 1.34, excluding OTH holder which is the sum of several types of small holders, the type of holders with highest number of bonds held is Unit Investment Trust (UIT) with 187 bonds held in a given quarter for all data. However, for the rest of the data (i.e., US, US financial, US non-financial, insurance), the highest number for bonds held is by fund of fund mutual fund (FOF). Bolton and Scharfstein (1996) also relate the number of creditors to strategic default in which a firm defaults because managers want to keep the residual cash. In other words, if a firm continues its operation without sufficient income, the firm's cash would be depleted over time and there will be nothing left for managers. Since it is costly to strike a deal with many creditors, the negotiation with creditors is too costly. Hence, ex ante, managers' incentive to default strategically is lower, because their payoff from strategic default would be diminished. Concerning eMAXX bondholding data, we can test whether Bolton and Scharfstein (1996) apply to a certain type of firms or industry. For example, it could be a nature of some types of issuer that always have many bondholders with no relation to the strategic default story. The optimal number of creditors or bondholders in this case might be affected by some other factors unexplored.

4.4 Country of Bondholders

Since the data in my analysis focus on the US corporate bonds, most of the holders are investors from the US. However, there are bondholders from other countries and some countries are interesting that they show up here. Another interesting question we may ask is whether bondholders from a certain country possess higher returns than other countries. If the difference in returns is related to the country of investors, what could be the determinant? It could be, for example, investment skills of personnel, size of the fund invested, or a country-specific factor. This is an interesting question that can be tested using eMAXX. From Table 1.36 top three countries of the bondholders come from the US, Canada, and Japan. An interesting country that does not make it to other categories such as issuers or managing firms is Luxembourg which is in the top-ten here. It is interesting to investigate more on Luxembourg as one of the top holders' country of the US bonds. Based on a report from PWC[5], Luxembourg offers a lot of tax credits and incentives for investors registered in the country. An interesting question that could come up is whether the bondholders from Luxembourg have more

[5]The information is retrieved from PWC, http://taxsummaries.pwc.com/ID/Luxembourg-Corporate-Tax-credits-and-incentives

investment skills or earn more returns, because they could be more sophisticated to find a way to get higher return. With eMAXX, we can test this hypothesis whether it is true or not that bondholders from a certain country gain higher returns. This is similar to the fact that most US corporates registered their headquarters in Delaware because the state provides many benefits such as ease of legal processing, tax incentives, business law protection, etc. Pirinsky and Wang (2006) wrote a paper about the relationship between corporate headquarters location and stock returns. They found that firms headquartered in the same geographic location have a very strong co-movement in stock returns. The same concept could be applied here. Bondholders headquartered in Luxembourg may exhibit a co-movement in investment returns. A reason could be that those firms may have the same goal of acquiring the best return by taking any possible way including the choice of headquarter location. Or they may receive the same suggestion from the same group of consultant or lawyer to have headquarters in Luxembourg. Moreover, this could be a "network" story. There could be an elite investment manager group in Luxembourg and those investment managers share material information within the group.

4.5 Buyers, Sellers, and the Size of Bondholder Positions

A set of information that is unique to eMAXX is a summary of the number of buyers, sellers, and portfolio holdings for each bond of each quarter. With this information, we can put together which bonds are active in the secondary market and who the participants are. One may ask whether the number of buy and sell of bonds from large institutional bondholders over time could help predict the returns or prospects of firms issued bonds. There is a large literature on how institutional investors' activities impact the investing companies' stock price and performance (e.g., Smith (1996), Nagel (2005), and Yan and Zhang (2009)). However, research on how institutional investors impact bond's performance is still very limited. Again, I would like to emphasize the potential of eMAXX data on financial economics research. Basically, we can address the same questions asked in the equity market in corporate bond market. Therefore, with eMAXX data, we can address interesting questions, for instance, "Do institutional bondholders impact the value of firms?" "Do they help in price discovery?" Table 1.37 shows three interesting summary statistics: number of portfolio holding, number of portfolio buying, and number of portfolio selling for each issue in a quarter. First, the number of portfolio holding means, for a given issue (9-digit CUSIP), how many bondholders of that bond in a given quarter. We can see that the number of holders is very varied from 1 to 1,062 in a given quarter. On average, the US non-financial issuer has highest number of portfolio holding. The average number of portfolio holding for the US non-financial issuer is 29.3 whereas the lowest average number of portfolio holding is the US financial issuer with average of 19 holders for a given issue. For the number of portfolio buying, this number shows how many portfolio buys an issue for a given quarter. The number is also varied similar to the number of portfolio holding. The number of portfolio buying ranges from 0 to 709 with an average of 6.2 per bondholder in a given quarter. Usually, the high number of portfolio buying or selling occurs during the financial crisis of 2007 or in some cases, when an issuer is in financial distress. The same pattern of wide range is also observed for the number of portfolio selling. The range of portfolio selling is from 0 to 758 for all data with an average of 4.5 and narrower when the data is for the US issuers. All three statistics exhibit the same pattern of skewness and kurtosis. Both skewness and kurtosis are positive. This means there are extreme values on the right tail for all three statistics. Since the number of portfolio buying and selling is of wide range, we may use these numbers as our monitoring signal for a crisis or bad prospect for firms issued bonds. eMAXX data contain only institutional bondholders which are deemed more sophisticated than individual investors. Some large institutional bondholders such as PIMCO and TIAA definitely have an in-house research department in place.

As I described that issuing bonds should be similar to selling a product, bond issuers should care about their investors' demands when they issue a bond. Issuers would not want to issue bonds that investors do not want to buy. For instance, if issuers issue a bond with too low yield, they have a risk of unsuccessful issuing. In other words, the sellers sell a product that buyers do not want. As in marketing, firms analyze customer choices or what the alternatives that consumers have. In case of the bond market, for example, firm A plans to sell a callable 8-year bond with a rating of AA. It would be nice to research on other firms if anyone is selling bonds with similar or the same characteristics (i.e., 8-year callable bond with rating of AA). How much they are selling those bonds for could be a reasonable benchmark in addition to the base rate from Federal Reserve. In retail banking, there is a fierce competition for deposits during the upward trend of interest rate as shown in Figure 1.40. The federal funds rate started to increase sharply in 2017. Currently (in 2018-2019), banks compete for deposits. For instance, Ally Bank advertised high saving rate at 1.8 percent in August 2018. Then, American Express also advertised 2 percent saving shortly afterwards. In February 2019, Ally Bank increased the rate to 2.2 percent and clearly showed in its website that it was higher than the American Express which is the second highest saving rate bank at the time. In the bond market, it is not clear whether issuers compete for yield or coupon rate. However, with eMAXX data, we can investigate this matter. Individual investors may not experience the competition in bond investment directly, because the high minimum transaction size which is as high as 1 million dollar lot. If bond issuers have an access to the eMAXX bondholding data, they will be able to analyze the behavior of their investors and, perhaps, come up with bonds that most investors would want to buy without setting the price too high or too low.

4.6 Investment Horizon

One of the most important factors for institutional bond investors to buy a bond is maturity. As discussed, issuers can analyze the profile of bondholders on the variety of bond maturities they hold in their portfolios with eMAXX. Then, issuers will have a big picture of bond maturities that are in high demand. Financial economics research has argued a belief that the longer investors invest in a stock market is, the better their performances become (e.g., Bodie (1995), Hodges et al (2019)). However, the association between the bond returns and investment horizons has received little attention. We may ask whether short-term or long-term bond investors are more successful in terms of the return of investment. In bond market, this question might be difficult to be addressed due to the low liquidity in the secondary market. With the combination of transaction data such as TRACE and eMAXX bondholding data, we could explore more on this matter. Many questions can be addressed using eMAXX. "Are bonds with a higher portion of short-term investors more volatile than bonds with a higher portion of long-term investors?". How the investment horizons of bondholders affect the returns and volatilities of bonds is also a very interesting question.

To answer a question from the issuer perspective, "What type of bondholders invest in my bonds?". Are they mostly long-term or short-term investors? If an issuer issues short-term bonds and there are a number of long-term investors holding the bonds, are they holding it for liquidity purpose? Why do long-term bondholders hold short-term bonds instead of long-term ones? These are interesting questions that eMAXX can help us address. Summary of the average value-weighted portfolio maturity of the bondholders for a given issue is provided in Table 1.38. The number in this table is calculated by first compute the value-weighted maturity of bond portfolio for each holder for each quarter. Then, for each issue, calculate the average value-weighted maturity of all holders for each quarter. For example, we would like to calculate the average value-weighted bondholder investment horizon of a bond issued by firm Z (bond Z). Suppose there are two bondholders holding bond Z: bondholders A and B. Assume that bondholder A, currently, invests in two bonds \$50 in each bond (50 percent value-weighted in each bond). The two bonds have maturities of 5 and 10 years. The value-weighted maturity of bond portfolio of bondholder A is 7.5 years. This is from $0.5(5) + 0.5(10) = 7.5$. Assume that the value-weighted maturity of bond portfolio of bondholder B is 5 years calculated the same way as bondholder A. Then, we can calculate the average value-weighted maturity of bondholders of bond Z by averaging the value-weighted maturity of both bondholders and result in 6.25 years [(7.5+5)/2].

This single number for each issue gives an overview about the horizon of bondholders for each issue or what types of bondholders hold the issue: long-term, medium-term, or short-term investors. The result shows that most of the issues are held by long-term investors. This is illustrated from all the means are more than 8 years. In other words, on average, the value-weighted maturity of investors' portfolio is greater than 8 years. This is also due to the fact that the majority of the holders in eMAXX database is insurance which generally has long investment horizons. The highest number is the US insurance with 13.1 years of the average value-weighted maturity of investors. The range is quite high from 0.1 (approximately 1 month) to almost 100 years. Following from the information of Table 1.38, Table 1.39 shows proportion of each type of holder: long-term (LT), medium-term (MT), and short-term (ST) investors. To identify a type of holder, I first calculate the value-weighted maturity of each holder for a given quarter as discussed previously. If the value-weighted maturity for a bond portfolio is less than one year, the holder is identified as short-term investor. If the value-weighted maturity is between one year and five years, the holder is identified as medium-term investor. The long-term investors have value-weighted maturity of their bond portfolio more than five years. For all data, the highest portion is long-term investor with 75 percent of overall type of bondholders. The group that has highest long-term investor proportion is US non-financial issuers with 85 percent of long-term investor and seven and eight percent of medium-term and short-term investors respectively. The group with the highest proportion of medium-term investor is US financial issuers.

4.7 Special Characteristics

Next, we would like to understand a bondholder that has special characteristics whether they have different behaviors than other bondholders in general. First, I will analyze bondholders that also issue bonds. This information can help answer a question, for instance, what is a difference between the contract they issued and contract they held? Do they try to match the characteristics between the portfolio bondholding and bond issuance? For example, if bondholders hold short-term bond, will they be likely to issue short-term bonds to match with their investment portfolio? This could be in line with hedging story in which the receipt of the bond investment could be used to pay the borrowing payment. With eMAXX, we can address these questions. From Table 1.40, it tells the percentage of each type of holder that is also an issuer. In other words, what percentage of each type of lender is also the borrower. 47 percent of life insurance bondholder is also the bond issuer. 21 percent of property and casualty insurance bondholder is also an issuer. We can see that large portion of bondholders also issues bonds. Therefore, it is interesting to compare and contrast their investment and borrowing portfolios.

Then I analyze the bondholders that like to invest in bonds from the same issuer. This information could help us answer another question about the choice of bonds invested by a given institutional investors. When bond investors choose which bond to invest, do they consider the whole universe of bonds or they only consider the bonds from the same issuers that they have experience investing in? Sometimes, it could be too costly for bond investors to search for all available options in the bond market. If the past investments work well, they would just invest in the same issuer. Table 1.41 tells us about the percentage of investors that invest in the same issuers. For all data, on average, a bondholder invests in bonds from the same issuance 40 percent of all the bonds issued. For example, if issuer A issues 100 different bonds, on average, the same bondholder buys 40 out of 100 different bonds by the same issuer (issuer A in this case). The reason that bondholders invest bonds from the same issuers may relate to the searching cost. Sirri and Tufano (2002) explain equity mutual fund flow on the ground of *searching cost*. Mutual fund buyers may not have time to search for all mutual funds available in the market. They may just choose based on the advertisement and past performance. It is too costly for mutual fund buyers to analyze all available funds in depth. This research about searching cost is also along the line of Jain and Wu (2002) and Hortacsu and Syverson (2004). The same concept could be applied to the bond buyers in which their choice of investment may depend on the searching cost. Surprisingly, we may find that the portfolios of bondholders are very concentrated to certain issuers. Hence, the risk of bondholders could be higher than we expected or the portfolio risk largely depends on the financial health of some large issuers. Most institutional bondholders are insurance, mutual funds, and pension funds. The success or failure of their investments widely impact the *public*. It is of interesting to analyze the tradeoff between the searching cost and the tail risk of bondholders. In other words, if an insurance A invests largely in only one bond, the insurance A saves the searching costs at the expense of the policy holders owing to undiversified risk. If the bond fails, insurance A may not be able to pay the policy holders as promised. If the decrease in searching cost results in much higher undiversifiable risk for public, regulators may have to come in and set up minimum number of issuers in the investment portfolio for large financial institutions that associate with the public, such as insurance companies or banks. Again, with eMAXX, we can address this very interesting question.

4.8 The Dynamics of Bondholdings

One of the most important information provided by eMAXX is the bondholding information. We would like to see the dynamic of bondholding for each type of bondholders over time. Who holds the largest share of the US corporate bond is an interesting question that is overviewed in this section. For example, we can ask a specific question, for the first quarter of 1999, what is the percentage bondholding by life insurance compared to overall bond market value? Figure 1.4 shows the distribution of the holder over time for a given quarter. There are 22 types of holder in this chart but only around ten of them are visible in the chart. The rest are very small proportion of overall. The largest and most obvious holder is life insurance (in green). The blue one is open-end mutual funds (MUT). Another color that is quite obvious is property and casualty insurance (in orange). Figure 1.4 is interesting in the sense that we can see the holding dynamic of all the holders at the same time. Whether the dynamic of bondholding affects a bond in any aspect over time is an interesting question. Consistent with Schultz (2001), Figure 1.4 shows that insurance companies are the largest holder of bond overall. From 1999Q1 to 2005Q3, insurance companies held around 70 percent of overall bonds. However, after 2005Q3, mutual funds started to gain more holding in bonds. At this time, the mutual fund industry is booming. Number of mutual funds grew at a very fast pace. We can see from the blue color that it started to get wider over time. After 2011, mutual funds held bonds around 40 percent of overall. However, even at the later date, insurance companies are still the biggest holder with 50 percent holding of overall bonds. From this Figure, it again emphasizes the increasing importance of the mutual fund bondholders. The nature of mutual fund and insurance bondholders is different. Usually, insurance bondholders are long-term investors and hold very large portfolio. On the other hand, mutual fund bondholders tend to be much smaller in size of holding and have a shorter investment horizon than insurance bondholders. There are many small mutual fund bondholders compared with insurance bondholders. Figure 1.9 shows average number of holder over time. The number of holders grew from 5,376 in 1999 to 12,859 in 2013. In other words, in around ten-year period, the number of holders is more than double. And this increasing number is mostly from new mutual fund investors.

If we look at the breakdown of the type of holders over time from Figure 1.10. The highest growth is open-ended mutual funds whereas the second and third largest are property and casualty insurance and life and health insurance, respectively. The number of insurance companies is quite stable over time both for life insurance (LIN) and property and casualty insurance (PIN). Though there are numbers of new insurance firms, this industry has a lot of merging and acquisition (M&A). M&A activity could be the answer of why the number of insurance companies has not increased over time as well.

Even though we see that the number of new mutual funds participating in the bond market has been sharply increasing and we might think that bond fund managers have superior skills to generate returns, a literature on the mutual fund return does not support this conjecture. Philpot et al (1998) and Detzler (1999) found that bond fund managers did not possess the skills to outperform the market. Their results show that a bond fund's past return does not predict future return. Moreover, recent literature have found that larger size mutual funds have lower returns than smaller size funds (e.g., Grinblatt and Titman (1989), Gorman (1991)), because they lose market mobility when they become too large. This could be a reason that we see high growth of number of mutual funds over years. Mutual funds may prefer to keep their sizes not too large, because they do not want to get too large and lose market mobility.

4.9 Conclusion

Bondholder information, perhaps, is the most important information and only unique to eMAXX. There are more than 23,000 holders in eMAXX in the time range of 1999Q1 to 2013Q4. Bondholder ID in eMAXX tracks the name change or merging of the bondholders. This facilitates the analysis of dynamic of bondholding tremendously. Three types of bondholders out of 22 types of bondholders have held large amount of US corporate bond over time, namely, insurance companies, mutual funds, and pension funds. The largest number of bondholders is mutual fund but the largest holder in dollar value on average is insurance companies with the exception of PIMCO. PIMCO is the largest bondholders and it is categorized as mutual fund. TIAA is the largest insurance-typed bondholders. On average, the institutional bondholders hold around

30-50 percent of total bond value. If we consider only the top bondholders, they hold significant amount of total bond value. For instance, top 10 bondholders on average hold 26 percent of bond value outstanding. The largest bondholder hold on average as high as 14 percent of total bond value. This indicates that issuers may favor or tailor their bond issuing characteristics toward these large bondholders to increase the success of bond issuing. Averagely, a bondholder holds 65 bonds in their portfolio. However, the range is very wide from 1 to 4,151. For the number of bondholders for each issuer, on average, the number of bondholders is 24, but it could go up as high as 1,000 bondholders for each issuer. With eMAXX data, issuers can analyze the bond demand and its characteristics in the same manner as a marketing department of a firm analyzes the consumer behavior. Which type of bonds institutional investors have invested and how their holding behavior changes over time could be different depending on the business cycle. For example, during a financial crisis, institutional bondholders may want to hold a certain characteristics of bonds, such as investment-grade bonds and non-callable bonds. It is also interesting to understand if there is a difference in holding behavior for special characteristics of bondholders. For instance, a holding strategy of bond investors who also issue bonds could be different from a strategy of bond investors who do not issue bonds. In sum, holding data from eMAXX give us a good overview of the demand side in bond market and many interesting questions could be addressed from this information.

5. Analyses of the Issuers of Bonds

The format of eMAXX file comes in quarterly format. Each quarter has its own text-delimited issuer file. The aggregate issuer file consists of 880,681 total observations. Total unique issuers based on 6 digit CUSIP are 55,017 issuers. However, for the unique issuer name, the number of unique issuers is 52,092. Issuer data contain 6 digit CUSIP, issuer name, sector, country, entity, state, year, and quarter. There are 115 different sectors identified by eMAXX. For some sectors, eMAXX breaks down into small subsectors. For example, there are 10 different financial sectors, such as insurance, investment, and mutual funds. Industrial has 49 different sectors, such as tobacco, pet supplies, and mining. Please see Table 1.43 for examples of the sectors available. For the issuer data during the period of 1999Q1 to 2013Q2, there are 101 different sectors out of 115 sectors created by eMAXX. It is an advantage to have a breakdown of issuer sector in details, because each sector may have its own uniqueness in terms of the characteristics of bonds issued. This granularity could help us answer some specific questions that are unable to ask in some areas of bond literature. For instance, only industrial sector alone has 49 different sectors which are enough to be analyzed separately for industrial bond market. From previous sections, we can see that non-financial issuers possess different characteristics than financial issuers. With the detailed information of issuers by eMAXX, we can address a research question for separate samples, namely, financial and non-financial sample. Next, the issuers come from 118 different countries. There are four types of entity represented in our data: Federal corporation/Agency (FC), Trust/Master Trust/Grantor Trust (MT), Public/Private corporation (PC), and Supranational (SU). From Table 1.44, 94.18 percent is corporation either public or private. The second largest issuer entity is Trust with 5.41 percent. The only one Federal corporation is Korea Development Bank (KDB). This observation is in 1999Q2.

5.1 Quantity of Issuers

A number of issuers in each quarter are illustrated to show a big picture of issuers. What is a determinant of the issuer numbers? Is it related to the macroeconomics variables or firm-specific variables? From Table 1.45, on average, there are around 15,000 firms issued bonds in each quarter for all data. The highest number of firms issued bonds are 21,725 firms. Out of 15,000 firms, two-thirds are the US firms and one-third of the firms in the US data are financial companies. Approximately three percent of the issuers in the US are insurance companies. This is opposite to the story on the lender side that insurance companies are the largest lenders to most issuers. In other words, insurance needs a place to invest their money rather than to acquire funding. For the median, the numbers are not much deviated from the mean. For all data, the number of firms issued bond is as low as 11,800 in a quarter. The skewness and kurtosis show that the distribution of the quarterly number of firms issued bonds is normally distributed with the skewness and excess kurtosis close to zero. The relationship between the number of issuers and economic condition is quite high. From Figure 1.11, this figure shows average number of issuer over years. In the beginning, the issuer number is around 8,000 issuers. In 2013, the average number is around 10,000 issuers. This indicates that more issuers come into the bond market since the number is 25 percent increase in the period of ten years. However, when we look into the graph in more details, we can see periods of the drop in number of bond issuers. There are two large drops in the graph, early 2000 and 2007. The two periods are the two important financial crises in the world history. The first one, early 2000, is the dot-com bubble. It was a period of internet adoption and many technology companies started their business during that time. Starting in 1995, there had been a speculation in the stock market until the year 2000 that the stock market crashed and many of the technology companies went out of business. The second period of the drop in number of issuers was during the subprime crisis where asset-backed security markets collapsed.

However, the story of the number of issuance and the value of bonds issued could be different. In other words, the number of issuance is pro-cyclical to the economic cycle, but the value of bonds issued could have different relation with the economic cycle. It is still unclear whether the value of bond issuances are pro-cyclical or counter-cyclical to the macroeconomic condition. This is another interesting research question that can be addressed by eMAXX. Korajczyk and Levy (2003) study about the capital structure choice during different macroeconomic conditions. They find that equity issuance follows the macroeconomic condition pro-cyclically but debt issuance varies counter-cyclically. Moreover, they also find that firms with low financial constraints do not exhibit the counter-cyclical pattern when issuing debt. It is worth mentioning the two important capital structure theories as an explanation for the finding of Korajczyk and Levy (2003). The first theory is the tradeoff model in which firms weigh between the cost and benefit of using leverage (i.e. bankruptcy cost VS tax incentives). The second theory is the pecking order in which firms prefer to use internal source of funding first then external later because of the asymmetric information problem. The tradeoff theory would predict the pro-cyclical leverage to the macroeconomic condition, because during the boom period the cost of bankruptcy is lower and the benefit of tax incentives is high. On the other hand, for pecking order theory, during the expansion, firms should enjoy high earnings and use the earnings as a primary source. Consequently, the leverage during the expansion should be lower for pecking order theory. In other words, pecking order theory predicts counter-cyclical leverage to the macroeconomic condition. Erel et al (2011) added the credit quality of the issuers into the mix. The cyclicality pattern of each security type also depends on the credit quality of the issuers. For instance, they find that equity issuers are pro-cyclical only for non-investment-grade borrowers. Overall, from the eMAXX data, the number of bond issuers is pro-cyclical to the macroeconomic condition because of the downturn that discourages new investment.

5.2 First-Time Issuers

Similarly, an interesting question could be “what is a determinant for the number of first-time issuers?”. First-time issuers are firms that issue bonds for the first time based on the data time range in my analysis. Along the same line as Table 1.45, Table 1.46 shows the first-time issuers proportion. The column “FIRST” means the issuer (6-digit CUSIP) that never issues a bond in the previous year. However, the first year is 1999. Therefore, all bonds in 1999 are the first time issuer and that is the reason we have 100 percent for the “FIRST” column in the year 1999. In 2000, 11 percent of them is the first-time issuer. The number of the first-time issuer keeps increasing until its highest in 2007, which is the financial crisis year. Then, the number of first-time issuer dropped to the low level at 12 percent in 2008. In 2010, the percentage of new issuer is highest at 23 percent, then it keeps going down again to 12 percent in 2013. The pattern of first-time issuer is consistent with the number of issuers in Table 1.45 that we see drops during early 2000 and financial crisis 2007.

5.3 Industry Effects

It is useful to examine characteristics of issuers in terms of the industry. What industry the issuers are from and what characteristics of bonds they choose to issue. For instance, do certain industries prefer to issue public bonds to private ones? For example, for private placement and 144A channels, the benefit of these two channels is a faster issuance processing, because, for private placement, issuers can bypass the registration process and directly offer the bonds to a group of investors. For 144A bonds, qualified institutional bond buyers are exempt from two-year holding period. What could be the factors for these two sectors to exploit the faster turnaround of bond issuance? Do some types of issuers mostly deal with an unexpected expenses or investment resulting in quick turnaround of bond issuance? These are interesting questions that we could address using eMAXX data. Table 1.47 shows the top 20 issuer by sector. We can see that among top five issuers, three of them are from financial sector: banking, finance, and unclassified finance. The banking-sector issuer is 13 percent of all the issuer. Top 20 issuers are counted as 73 percent out of 101 different sectors. First eight industries are counted as 50 percent of all the issuers. In other words, only 8 percent of all the industries issued more than 50 percent of the bonds overall. As mentioned in the beginning of this chapter, Gramm-Leach-Bliley Act plays an important role in the bond market. It allows financial companies to participate more in the capital market. Financial companies can issue or invest in bonds subject to a certain risk control such as capital adequacy ratio for banks. Financial companies such as banks use high leverage which is a unique characteristics of financial companies. Most banks leverage roughly 80-90 percent of their capital and this is a usual level of leverage for them. This is contrast to non-financial firms where usually less than half of their capital is leverage. Therefore, it is not surprising that the top bond issuers are in the financial sectors. This is the main reason that most financial economics papers separated financial firms and non-financial firms in their analyses. Furthermore, I group the detailed issuer industry into eight sectors shown in Table 1.48. Table 1.48 shows top three industry issuer for all data is Financial, Industrial, and Service. For the US sample (bottom panel), the pattern is the same. Supranational and education industries represented a very small portion of the issuer in eMAXX data. Financial industry such as banks and investment companies, usually, issue many bonds. Therefore, it is not unexpected that financial industry is the largest portion of the issuer. The Table 1.49 is similar to the Table 1.48 in terms of the industry proportion percentage, but Table 1.49 also groups information for private placement issuers and 144A bonds. For industrial and service industries, they have significantly higher proportion for the US private placement and 144A bonds. US private placement and 144A bond issuers have almost on average 50 percent from industrial and service issuers combined. We can see that some industries of the bond issuers resort more to a certain type of bond, such as private placement and 144A bonds in this case.

5.4 Bond Ownership Concentration

Another characteristic that we would want to know is the concentration of bondholding of each bond. Are bonds held by only a few large institutional investors? or are they held by many bondholders? One of the ways to measure the concentration of bondholding is utilizing Herfindhal index (HFI). Please find the equation and explanations to calculate HFI in the GE case study section. We can see from Table 1.50 the summary of Herfindhal index for different sets of data. Some bonds have HFI of 100 percent that means only one holder owns all the bond outstanding. The lower number of HFI indicates less concentration of holding. The highest HFI is the US non-financial issuers with 15 percent HFI. The skewness and kurtosis exhibit positive values which is expected because the outlier is on the right-side of the distribution. Most of the issuers' HFI is less than around 10 percent. However, as we can see that there are some bonds with HFI equal to 1, which means there is only one holder for that issue. It is of interesting to further explore this group of high holding-concentration bonds specifically. In terms of agency cost, these bonds may have a lower agency cost, because the large holding incentivize bondholders to monitor the issuance firms closely. Since there is no other bondholders helping with the monitoring in case of only one bondholder, the bondholder has to take more effort to make sure that the issuers are financially healthy.

5.5 Country of Issuer

As for the country of issuers, we may ask some interesting questions related to the country of issuers and the bond characteristics, for instance, how bonds issued from different countries are different from each other and why? From Table 1.51, majority of the issuers is in the US with 64 percent of overall issuers. The second largest is the UK with around 5 percent of overall issuers. Interestingly, Cayman Islands is the fourth largest issuers appear in the data. This may relate to the different tax benefit because Cayman Islands is famous for offshore financial tax haven. There are more than 100 countries represented in the eMAXX data as found in Table 1.52. For all data, on average of each quarter, the number of countries issued bond is between 64 and 106. For non-financial companies, on average, there are more countries issued bonds. However, non-financial companies could be anything from retail, large manufacture, service, etc. On the flip side, if we break down non-financial issuers into each industry and compare with financial sector, the highest number of countries will be financial sector. The skewness and kurtosis show that the distribution is quite normal. Insurance sector may exhibit a bit of negative kurtosis which means the distribution contains not much of an outlier in the tails. This quite reasonable because it might take a certain level of capital to start an insurance companies. Therefore, the number of country issued bonds for insurance companies is stable over time. As for the region perspective, Table 1.53, 70 percent of the issuers are from North America. From the country summary, most issuers are from the US, therefore the majority of issuers is in North America. The second largest issuers are from Western Europe which is roughly 14 percent. From Table 1.54, for all data, the average proportion of the US issuers are 66 percent and non-US is 34 percent. However, for non-financial and insurance issuers, the proportion of US issuers are higher at around 71 percent. For financial issuers, the proportion of US and non-US are similar. All types of data have negative kurtosis. This means the proportions of US and non-US bonds issued for different types of categorization have not much of extreme values in the tails. For insurance issuers, there are some years that 90 percent of the issuers are from the US. It is interesting to analyze the US and non-US issuers whether they have different bond characteristics. For example, given bonds with similar characteristics such as maturity and rating, they may have different yields or coupon rates because of the exchange rate differences. Based on the international interest rate of Fisher Effect, we could relate the exchange rate and domestic rate of non-US issuers to the yields or coupon rates of bonds issued in the US. If there is a difference in bonds between US and non-US bonds, the Fisher Effect might be an explanation to the difference.

5.6 Issuer Countries and Risk of Bond Issuance

Since we find that Cayman Islands appear to be one of the largest bond issuers' country, we should perform a further analysis on Cayman Islands in terms of riskiness of bonds issued from this country. Bonds issued by a certain country may have higher risk than others. We can use Cayman Islands as a case study here. Cayman Islands has a very different economic fundamental from other large countries such as the US, UK, or Japan. For instance, based on the United Nations data (UN) in 2017, Cayman

Islands was ranked 167th in terms of GDP size whereas other top issuers are among the countries in the top 10 largest GDP. In this context, I examine the riskiness of bonds issued from the downgrade and upgrade of bonds and associate it with the country of the issuers. As in price volatility, it could be upside volatility or downside volatility. Hence, I include both upgrade and downgrade of bonds' ratings. From Table 1.55, I examined the bonds with downgrade and upgrade in many-step setting from 1, 2 to 5, 6 to 10, 11 to 15, 16 to 19, and 20 steps. For example, in the first panel "up/down 1 step in rating", first I find bonds that were upgraded or downgraded one step in each quarter. Then, I grouped them by countries. In this case, there are 35,966 one-step upgrade or downgrade bonds issued by the US. The purpose of this table is that I would like to see if the rating changes associate with any country in a consistent manner. There are two sets of information in Table 1.55. The first set is the summary of rating changes by the issuer country and the second set is the summary of rating changes by the quarter. From the first column to the fourth column, the table gives information about the top 5 countries with rating upgrade or downgrade. I count the bonds with rating change (N) and calculate percentage (PCT). For the first panel, the table shows top 5 countries of issuers with up or downgrade one step. 75 percent of the bonds with one-step rating upgrade or downgrade is the US issuer. This is expected because the US has the largest number of bonds issued. United Kingdom, Canada, and Japan are also large countries in terms of GDP. The fifth country from European country is Netherlands which might be a little unexpected. We would expect Germany or France that are the two largest economies in Europe to show up on the list but instead Netherlands shows up here. However, Netherlands economic size is in the top-20 largest GDP country based on the UN data in 2017. Compared to Cayman Islands, Netherlands is still much larger in terms of GDP. Some people may ask why Germany and France are not on the list even though they are the two largest economies in Europe. It could be many possibilities from a data report to capital structure. Rajan and Zingales (1995) find that, out of all G7 countries, Germany has lower leverage ratio and they cited the reason from White (1996) and Kaiser (1993) that, in Germany, the bankruptcy code does not favor firms to reorganize debt. In other words, if we compare the Germany with the US which most distress firms filed for Chapter 11 (reorganize debt), Germany has higher likelihood to liquidate distressed firms instead of reorganizing debts. This could be a reason that German firms may use less debt as part of their capital. Consequently, the number of bonds issued could be too small to show up here. Another reason is that firms issued bonds in Germany and France are financially stable; hence, the number of upgrade or downgrade in rating is small. These are interesting questions that can be addressed using eMAXX.

However, in the second panel where the 2- to 5-step change in rating is analyzed, we see Cayman Islands shows up as the third largest country. Usually, a country that has larger economic size should issue bonds more and, intuitively, we should see large countries more in this table. However, Cayman Islands is a much smaller country compared to the US or UK. It is very interesting that Cayman Islands showed up here as one of the top five. Then, for the more steps of the rating change, Cayman Islands is in the top two with an exception for the last panel with 20-step rating change that Cayman Islands is number one. This indicates that a lot of risky bonds are issued in Cayman Islands. The other two countries that also show up in these tables and are worth mentioning are Iceland and Ireland. These two countries also issued bonds with a higher than average risk. Risk in my context here is in the sense of price or return volatility which include both upside and downside volatility, not only the downside risk. This table summarizes the change in rating for both upgraded and downgraded rating. Both upgrade and downgrade should affect the bond returns both in the short-term and long-term. Therefore, it is interesting to examine whether bonds issued from Cayman Island generated higher return than bonds issued in other countries given risk adjusted.

Another interesting information provided in Table 1.55 is a quarter that bonds were downgraded or upgraded the most. The information is in the right side of the table starting from the fifth column to the last column. Qtr is the quarter that the downgrade or upgrade occurred. For example, in the first panel "up/down 1 step in rating", six percent of the bonds that were downgraded or upgraded one step is in the fourth quarter of 2008. In addition, a similar pattern can be observed from different panels that most downgrades and upgrades were during the 2007-2008. Only the panel of 16- to 19-step rating changes, the highest number is in the third quarter of 2010. One of the largest financial crises started in 2007 and it took almost 10 years to recover the economy back to the normal stage. Therefore, it is not surprising that most rating upgrades or downgrades occurred during that time. Another time period that shows up in the top five quarters with highest number of downgrade or upgrade is during 2000 – 2003. The time range of my analysis is from 1999Q1 to 2013Q2. This period covers two large financial crises. The first one is the dot-com bubble in 2000 and the second one is the subprime crisis in 2007. However, we can see the magnitude of upgrade and downgrade for the 2007 financial crisis is much larger based on this table. For all panels, most of the top five quarters of upgrade or downgrade in ratings were during the 2007 financial crisis. However, can we tell if the financial crisis in 2007 is more severe than the dot-com crisis in 2000 from this table? The answer is "no" because this could be a joint testing between the riskiness of the firms and the accuracy of ratings assigned by rating agencies. Alternative story could be that during financial crisis in 2000, credit rating agencies may assign more timely and more accurately ratings to firms while during the financial crisis in 2007, credit rating agencies did not do a good job in assigning the ratings, because the securities were too complicated at that time. After the crisis in 2007, regulators found that some assets had too high ratings, especially securitized product. Consequently, after 2007, there were many rounds of rating downgrades.

5.7 Quantity of Bonds Issued

Next, I examine the number of contracts sold by each issuer in each quarter. Do number of bonds issued associate with the size of firms? or is it related to a certain strategy to sell the bonds? These are interesting questions, because as Dass and Massa (2014) find that bondholders prefer firms that issue various bond maturities. Therefore, higher number of bonds may not be solely associated with the size of the firms, but it could depend on the demand of the bondholders. From Table 1.56, on average, for a given issuer, the number of contract sold is around 2 to 3 contracts for all data (left panel). The number can go as high as 365 contracts for a given issuer (in 1999). The right panel of Table 1.56 shows the same information but for only the US issuers. The average number of bonds issued by an issuer is higher for the US issuers. The data cover the time range of 1999Q1 to 2013Q2. For financial issuers on the left panel of Table 1.57, they also issued bonds higher than overall data. However, for insurance issuers (right panel), the number of contract issued has been increasing. In 1999, the average of number of contract issued is 2.89. The number has been increasing over time to 4.37 contracts in 2013. In summary, for all data, the mean number of contract sold has decreased over time but financial and insurance companies exhibit the opposite. This implies that the number of contract sold by other non-financial and non-insurance sectors has decreased. From the summary, the decrease in number of contracts contradicts the finding of Dass and Massa (2014). However, the standard deviation is quite high at around 5-8 bonds. More careful analysis is needed. Moreover, the number of contract sold for a given issuer is important in the aspect of bankruptcy period. When an issuer fails, the higher the number of contract sold, the more expensive the negotiation cost is. The story is in line with the debt contract theory that incorporates the negotiation between equity holders and debt holders [e.g. Anderson and Sundaresan (1996), Mella-Barral and Perraudin (1997)].

5.8 Amount of Funds Raised

The amount of money raised should be related to the funding needs. However, there could be a timing strategy to minimize the cost of borrowing. For instance, firms or issuers may need some money right now and another portion six months from now. They may have to crunch the number whether getting all the money now or getting it once today and again in the next six months is better. In the upward interest rate trend, firms may consider getting all the money now, because the cost of funding six months from now might be much higher than getting all the money today. In other words, issuers have to weigh between the cost of getting money earlier and cost of higher interest rate in the future from waiting. Therefore, with eMAXX, we could address interesting research questions, such as "Do firms strategically time the market interest rate? Evidence from the size of bond issuance". The wide range of amount of bonds issued triggers a question "what are the determinants of bond-issuance size other than the firm's size?"

From Table 1.58, for all data, the amount of money raised from an issue on average is \$536 million and go as high as \$9,992 million. The US financial firms on average raised money more than non-financial firms. Financial firms raise on average \$420 million compared to \$324 million for non-financial US issuers. The amount of money raised has positive skewness and kurtosis for all types of data. This shows that there were some firms that issued a very large amount of bonds compared to other issuers. The amount of bonds could relate to the timing of the issuance. As in the previous section, I find that floating-rate bonds were mostly issued when the interest rates were peak. This is an evidence of issuers timing the market interest rate to minimize their borrowing costs. The same analysis could be applied here. We might find a relationship of the bond-issuance size and the market interest rates. Issuers may want to issue large amount of bonds during the economic expansion.

There could be other strategies related to different sizes of bond issued. For example, what is a determinant of issuing large size bonds compared to a smaller size bonds but issue it several times? In other words, is it different between issuing $1 million bond and ten $100,000 bonds? On one hand, larger size bond may enjoy the economies of scale such as lower underwriter and road-show fees. On the other hand, many small-size bonds may serve the different needs of an issuer more. For instance, out of the ten bonds, the first five might be non-callable bonds. The last five might be callable bonds in case the project that the firm borrows the money for fails and the firm has an option to reduce the debt obligation by calling the last five bonds back. This is consistent with Chen et al (2010) which state that firms issue callable bonds to hedge their investment risks. When firms face risky future investment opportunities, they issue callable bonds in case the project results in Negative NPV so that they can reduce their debt obligation by calling back their loans. This is opposite to Robbins and Schatzberg (1986) that firms issue callable bonds because they have positive investment project.

5.9 Recurrent Issuers

Then, I analyze the issuers who recurrently issue bonds. What are the characteristics of firms that come back to issue bond many times? How often do these firms issue bonds? What are the characteristics of the bondholder for these recurrent issuers? From Table 1.59, the total number of issues is as high as 1,140 by Barclays Bank. Total number of quarter for this data is 58 quarters. If we divide total number of issues by 58, we will have an average number of issuer per quarter. For Barclays Bank, the average number of issue per quarter is around 20. This means Barclays Bank issued bonds once or twice every week. It is also interesting that the top three highest number of issuances are not from the US. Barclays Bank is from the UK. Rabobank is from Netherlands. The third highest number of issuances is World Bank or supranational entity. The top-three US recurrent issuers are Morgan Stanley, Merrill Lynch, and Citigroup, respectively. As we expected, all the recurrent issuers are financial companies (e.g., banks or investment companies), because their main business is borrowing money and lending borrowed money out, such as personal loan or mortgage loan. Financial institutions, such as bank, have to manage their assets (lending) and liabilities (deposit) which often time they have a shortfall in their capital adequacy requirements. Consequently, they have to borrow (sometimes overnight) from the debt market frequently, either privately or publicly.

5.10 Conclusion

In sum, issuers need to decide on the specifications of the bonds issued, such as issuance amount, maturity, coupon rate, etc. Other than the basic characteristics of bonds, issuers also need to consider some special features of bonds, such as callable or convertible features. eMAXX covers more than 50,000 issuers from more than 100 sectors. The data range is from 1999Q1 to 2013Q2. Most of the issuers in eMAXX are from the financial service sectors. The number of the issuers positively associates with the economic cycle. In other words, more firms issue bonds during the economic expansion. Most issuers are from the US and other large countries, such as UK and Canada. Interestingly, a decent amount of bonds is from Cayman Islands, which is a tax-favorable country. I find that bonds issued from Cayman Islands tend to have higher risk and most bonds were upgraded or downgraded during the financial crises in 2000 and 2007. On average, firms issued three bonds or have three bonds outstanding in a given quarter. However, the range of the number is wide from 1 to 365. As for the amount of bonds issued, size of bonds issued on average is $536.4 million. Financial firms tend to raise more money than non-financial firms on average. Moreover, financial firms, especially banks, tend to come back to issue bonds more than other types of firms. Banks frequently need funding to fulfill their liquidity shortage. This might explain why banks issued bonds very often.

Lastly, there could be a definition error for "state" code variable which identified as municipal issuers. Out of 880,681 observations in the data, 16,037 are municipal bond issuers based on Table 1.60. This counting is based on the definition in the eMAXX guide stated the description for the state code is "State Domicile of Issuer (applies to North America Muni Issuers Only)". This statement is actually not accurate because among the bonds with State Code, a lot of them are not municipal bonds. For example, they are mostly corporate bonds but has a domicile in Delaware because Delaware is a friendly state for business set up. We can see that, if we still stick with the definition of state code from eMAXX, the municipal bonds from Delaware alone account for 73 percent of overall municipal bond issuances. This is actually too high for a state to be accounted for 73 percent of overall municipal bonds issued from all the US states. The second largest is municipal bonds from New York with only much lower magnitude at 3.8 percent. The rest have only around 1 percent or less in the share of municipal bond market. To my knowledge, the "state" variable should be the domicile state of the issuers with no association with the municipality status.

6. Analyses of Managing Firms

The role of managing firms is to invest in bonds on behalf of investors. For example, firm A as an institutional investor may hire firm B to manage its bond portfolio. In this case, firm A is a bondholder and firm B is a managing firm hired by firm A. Sometimes, managing firms and investors are the same entity, because they can manage funds by themselves without hiring anyone. A brief summary of managing firm file is that there are 80,411 observations with the unique ID of 3,001 and Unique name of 4,561. 1,012 IDs had name changes over time. Table 1.61 shows the example of managing firms with name changes. For instance, for managing firm ID 06627 (observations 3 and 4), original name is RMB Asset Management but the name was later changed to Momentum Asset Management because of the merging between RMB Asset Management and Metropolitan Asset Managers. I cross check many other IDs with names changed and find that the ID tracks the same identity over time though the names changed. This is convenient for further analysis if we, for example, would want to analyze an effect of a managing firm on a certain aspect, we need a unique ID that tracks the same managing firm over time.

6.1 Type of Managing Firms

In eMAXX, we can understand more about the type of managing firms whether they are general investment manager or they associate with a certain type of firms, such as mutual fund or life insurance. Whether managing firms can enhance investor returns is a very controversial topic in finance research. Blake et al (1993) find that bond funds on average performed worse than their index after taking into account the management fees. Therefore, it is useful to explore more on this issue using eMAXX. In this section, I provide an overview of different types of managing firms. From Table 1.62, it shows how managing firms identify themselves as an entity. The number one managing firm type is *investment manager*. The *investment manager* category which is counted as the largest proportion of managing firms is worth investigating more. What are the characteristics of the investment manager in this case? Are they small or large in size? What are their expertise? Another question is that are they mostly just a facilitator for bondholders or do they actively give advices to bondholders? If it is the latter case, the trading activities of bondholders may be motivated by investment managers. Mutual fund managers as well as equity managers also make it to the top-five list. This is intuitive because, from the holder information, the mutual-fund category has a highest growth in the number of bondholders. So, it is not surprising that the top-five type of managing firms have investment manager, mutual fund manager, and equity manager. In the top-five, there are also types of managing firms that are related to insurance companies. The two types of insurance companies that play a very significant role in a bond market are property and casualty insurance and life insurance companies.

Next, banks have the market share in managing fund business of around ten percent overall. We can see from number 7 and 8 on the list. The top-eight type of managing firms accounts for roughly 90 percent of the managing firms overall. Overall, we can see that the managing firms concentrate on investment manager, mutual fund, insurance, and bank. Several types can be grouped under the managers for mutual funds. For instance, mutual fund managers could be equity, bond, or balanced fund managers. The previous example analyses about the bondholding effect on different aspects of debt value (or firm value) may be first performed on these managing firms because they maybe the real mastermind behind the decisions of the bondholders. What we could do to check the effect of investment managers on the decision of bondholders to buy or sell bonds is to analyze if there is a relationship between the number of bondholders' transactions and any given investment manager. If we observe that there is an investment manager that always associated with high transaction activities of bondholders, this could lead us to the conclusion that the investment manager has strong effects on the bondholders' decision.

6.2 Top Managing Firms by Assets under Management

"Who are the largest managing firms by size of fund under management?" is another interesting question and whether the size of bondholding by large managing firms affects bond's return or bondholding behavior has never been explored. From Table 1.63, by individual firms, this table shows the top 30 largest managing firms by size of funds under management. Pacific investment management or PIMCO is the largest managing firm by size of fund managing. Financial market respects Bill Gross as a legendary fund manager who managed PIMCO bond fund to become the largest bond fund in the world. The second largest is Vanguard group which is famous for low cost mutual funds. Then the third and fourth largest managing firms are Liberty mutual insurance and Metropolitan life insurance investments (METLIFE). Even though I categorize by the size of fund under management, we still have a similar pattern to the type of holder. In other words, mutual funds and insurance companies are still influential players in the bond market in terms of fund managing business. This may come from the fact that these managing firms are also the largest holders and some of them have their own research and trading departments. Therefore, similar pattern between the holding and managing firm types are not very surprising when we find that mutual funds and insurance companies are the major types.

6.3 Decisions to Hire Managing Firms

Many interesting questions can be addressed at this point about the value of managing firms to bondholders. Why do some bondholders hire managing firms but some don't? It is true that some bondholders are large enough to set up all the research and investment departments by themselves. These large firms also enjoy economies of scale and complementary services that may come with hiring managing firms. For instance, if bondholders trade a large portfolio, they would definitely receive a brokerage or transaction fee discount or even free research. However, not all bondholders are large enough to exploit the economies of scale. Then, what could be the factor that pushes bondholders to hire or not hire managing firms? Do managing firms generate value for bondholders? For example, managing firms may give an accurate view on the market and legitimate advices for bondholders so that bondholders can make abnormal gains from those advices. Can managing firms consistently give winning advices leading to profitable portfolio for bondholders? Blake et al (1993) find that bond funds on average performed worse than their index post-management fees. Some other reasons that might encourage bondholders to hire managing firms are transaction costs, diversification ability, and customer services. (e.g., Sirri and Tufano (1992), Gruber (1996)). Bergstresser and Tufano (2009) find that buying mutual funds through brokers did not generate substantial tangible benefits. Even though there is a huge literature on the value of investment intermediary, most of them dealt with equity markets. eMAXX offers an opportunity to investigate more on this issue in bond markets.

The choice between hiring and not hiring managing firms by bondholders is worth discussing more. Table 1.64 shows percentage of bondholders who hire managing firms to manage their bond portfolios each year. On average, from 1999 to 2005, around 50 percent of bondholders hired managing firms. From 2006 to 2013, the percentage keeps increasing from 50 percent to almost 70 percent. This increasing trend of hiring more managing firms could illustrate that managing firms can generate some benefits to institutional bondholders. For example, managing firms may help generate a better return or they help investors in other aspects not related to return, such as trade facilitation.

Different types of bondholders may prefer a certain group of managing firms. Each type of managing firms has different expertise. For example, brokers possess huge connection with the capital markets. Banks can have multi-expertise from traditional savings and lending to investment bank services. An interesting question could be whether hiring different types of managing firms results in different outcomes (e.g., returns, turnover, etc.). Table 1.65 shows the breakdown of managing firms hired by each type of holder. Most holders who hired managing firms used the service from investment managers (IM). Especially, mutual funds mostly hire investment managers. For corporate pension funds, they mostly used bank management to manage their bond investments. In this case, firms may already tie their payrolls with a bank and, with tight relationship with the bank, firms may also adopt pension service with the bank. This could be a reason why pension funds hire banks to manage bond investment. Mostly, large banks have their own investment department that can help their client manage funds. Each bank calls this wealth management service differently, such as private wealth or wealth management. However, they perform the same function which is helping their clients invest. For union pension funds, they used broker management. Broker can perform many functions from selling financial products to facilitating trades. We can see that there is a variety of managing firm type that bondholders hire. Different types of managing firms may result in different values generating for bondholders. It may not be only the return enhancing perspective, but also the cost reduction.

6.4 Country of Managing Firms

This section examines the country that managing firms locate. We would expect to see most of the managing firms should be from the US, because bonds in my analysis is the US corporate bonds. However, we should expect to see some large countries such as Germany, France, and China as part of the top managing firms since they are large countries in terms of the GDP. Table 1.66 shows managing firms by country. Majority of the managing firms are the US firms as expected. More than 80 percent of managing firms comes from the US. The second largest is Canada; however, the number is much lower than the US managing firms. The second largest is only 6.9 percent of overall number of managing firms whereas the US controls the managing firm market share by roughly 80 percent. An interesting result here is China ranked number three in number of managing firms in the US bond market. If we go back to other aspects in the eMAXX data such as issuer and holder information. We do not see China as part of the top issuer or holder. Since China's economy has been growing rapidly for several decades, we would expect to see excess funds in China flowing out to other countries to find a higher return as well as safe assets. Another interesting point here is that among the managing firm countries that have similar percentage around 1 percent, Hong Kong and Singapore are the financial hub in Asia after Japan; therefore, their names showing up here is not very surprising. South Africa, Taiwan, and India are quite interesting as they have market share as large as Japan.

6.5 Quantity of Managing Firms

Then, I would like to explore a number of managing firms each year in order to see how much players in this market have evolved. It is interesting to explore more on the issue of bondholder managers' network, especially mutual funds. That is an investment company may manage funds for hundreds of bondholders. For instance, BlackRock has hundreds of its own mutual funds and it also manages funds for other private equity companies. How BlackRock network impacts the performance of portfolio outside the funds' family of BlackRock is interesting. Their first priority is to manage their own funds and the surplus resources will be used on funds outside BlackRock's fund family. This is another interesting question that can be addressed by eMAXX. Figure 1.12 shows average number of managing firms by year. It is interesting that the number did not change much over time. The range of number of managing firms over time is very narrow. The number of managing firms is between 1,256 and 1,499. However, we can see a jump in 2003-2004, number of managing firms increased around 20 percent in 2003. Then, the number of managing firms became stable again after the jump. Based on the information from Investment Company Institute (ICI), the mutual funds industry grew by more than $1 trillion to $7.4 trillion during the period. This is because of excellent stock and bond fund returns. This asset or wealth rising had attracted managing firms into the bond market[6]. The constant number of managing firms is opposite to the high growth of bondholder number. This may indicate that only a handful of managing firms manages very large funds for many bondholders, besides some bondholders manage funds themselves.

6.6 Conclusion

To this point, we explore both bondholders and issuers in depth. Managing firm is also a useful and interesting information to help us understand more about the US corporate bond market. Some bondholders hire managing firms to invest or take care of their bond portfolios. There are more than 3,000 managing firms in eMAXX database. Over time, the number of managing firms have not varied much. This indicates that the managing firm industry is quite stable and mature. Moreover, this could mean that few managing firms control the market share in bond investment industry. The type of managing firms is similar to the pattern of bondholders. The top five managing firms by size of asset under management consist of fund managers in mutual funds and

[6] The information from ICI, https://www.ici.org/pdf/per10-01.pdf, also stated that mutual fund assets rose 16 percent in 2003 to $7.4 trillion, just shy of the record $7.5 trillion reached in August 2000

insurance companies. However, banks are also an important player in this market. Many large banks do not only offer deposit and loan service. They also offer wealth management for wealthy and institutional clients. More than half of the bondholders hires managing firms and the trend is higher proportion of bondholders would hire managing firms. Even though the ability to generate returns for investors from these investment managers is not consistent based on a literature, still higher proportion of bondholders hires managing firms. Majority of the managing firms are from the US, Canada, and China.

7. Analyses of Fund Managers

From the first section to this section, some may ask a question who contributes to the return of bondholders. Do bondholders generate returns by themselves? Or it is managing firms that they hired help them gain more returns using superior skills in picking and trading bonds. Another piece of information we can examine is "fund managers" data or "personnel" in eMAXX term. For personnel data, there are 15,563 unique employee IDs, but only 14,742 IDs are unique. 1,845 IDs are used by several employees from the same and different firms. For my analysis, I will ignore the latter group since I cannot find a meaningful conclusion when the employee IDs are not unique. The example of non-unique employee ID can be seen in Table 1.67. For instance, from the first column Employee ID (EmpID), ID 10007 is used by several employees, and this is in the same period. However, this non-unique ID accounts for 10 percent of overall data. Majority of IDs is still unique to each employee.

7.1 Turnover of Fund Managers

An interesting question is whether the fund manager turnover affects the return of the portfolios under their management. We do not know whether the job movement is associated with the positive or negative aspect of portfolio return. Some managers may have an excellent record and many companies may buy them out. On the other hand, they may move because they have a bad track record. To understand more about the eMAXX personnel data, first, I analyze how bond fund managers move to other companies over time or what the turnover in this industry is. From Table 1.68, 87.48 percent of the bond managers did not move to other companies. This is based on the data available in this analysis from 1999Q1 to 2013Q2. Roughly 5 percent of them moved once. The maximum turnover is 13. It is interesting that most of bond fund managers did not move to other companies. We would expect the opposite because the financial market is volatile and the market environment changes very fast. Therefore, there should be a large group of bond fund managers outperforms or underperforms the market returns. Consequently, fund managers should move based on the track records.

Similar to the turnover summary, length of time a bond fund manager has managed a fund may associate with the returns. A reason could be the longer they manage a fund, the more they gain experiences. For Table 1.69, given the data from 1999Q1 to 2013Q2, I measure how long managers worked in the industry. If their names or ID showed up, this means they are still working in the industry given the unique ID of employee. The mean average is around 5 years. The 99th percentile is 14 years which is the same length as our data period. The mean average of working duration actually makes sense, because a manager needs time to prove their performance and three- to five-year ranges are appropriate durations. We can see that the median and mean is quite close. Therefore, the distribution is not skewed.

7.2 Expertise of Fund Managers

Each fund manager should have different expertise. For example, fund manager A may be very good at corporate bonds. Another fund manager is good at municipal bonds. Expertise of fund managers could have an effect on the returns of the portfolios they manage. An interesting question could be "Do fund managers with more than one area of expertise perform better than a fund manager with only one area of expertise?"

We could address this issue using eMAXX. Table 1.70 shows information about the expertise or focus area of each individual bond fund manager. The largest focus area of bond fund managers is corporate bond following by government bond. There are three areas that have similar share: asset backed, mortgage-backed, and domestic US which have roughly 25 percent of overall. The percentage does not sum to 100 percent because each individual bond manager can have more than one area of focus. For example, if the code is "ACG". This means the fund manager has three focus areas which are asset-backed, corporate, and government bonds.

7.3 Fund Managers: Who Manages the Largest Funds

eMAXX fund manager database also provides us names of fund managers. It would be interesting to see who manage the largest funds and whether they possess a superior skill to gain higher return. Whether fund flow depends on the fund manager's name is another area that eMAXX can test using the buy and sell transactions of bondholders. Will the big-name mutual fund managers affect investor's investment decision? There is a large literature on how advertising or credible name affects mutual fund flows. Jan and Wu (2002) studied a sample of mutual funds pre- and post-advertisement in Barron's or Money magazine. They chose a sample that exhibited significantly higher performance than the benchmark pre-advertisement, then measured the performance post-advertisement. They found that these funds attracted more money but did not exhibit superior performance post-advertisement. Based on Table 1.71 and Table 1.72, the fund managers who managed the largest fund from 1999 to 2010 worked in life-insurance companies. In 2010, PIMCO Total Return Fund managed by Gross surpassed all other life-insurance bond portfolios in terms of size. In the same manner as Jan and Wu (2002), investors could just anchor their confident with the big-name or celebrity such as Bill Gross of PIMCO.

7.4 Quantity of Funds under Management

In the world that all firms try to minimize cost and maximize profit, hiring a few fund managers to manage as many funds as possible could be a strategy for a firm to maximize profit. However, the quality and efficiency is a concern in the case of minimizing cost. Too much cost reduction, sometimes, results in the deteriorated quality or in this case returns of the bonds may be decreased. Some interesting questions are "Why some bond fund managers manage so many funds and why some manage so few?" "Is there a cost to investors associated with the number of funds managed by a bond fund managers?" For instance, will a bond fund manager who manages 200 bonds at the same time be too busy to monitor or review the performance of all the bonds under management? Table 1.73 and Table 1.74 show how many funds a bond manager manages at a given quarter. Based on the mean, from 1999 to 2007, the average number of funds a bond manger managed is 3. From 2008 onward, the number is around 4 funds. The maximum number of funds managed under the same fund managers could be as high as 200 funds for a given quarter. The high number of maximum number of funds under management could be explained by the fact that the data contain only high-level employees such as bond manager, CFO, etc. They all should have people work under his/her supervisions but their names do not show up here as a fund manager.

Whether mutual fund managers can beat the market is still an unclear area where two sides of the camp are still debating. We can investigate the fund managers' hot hands skill using eMAXX data. In addition, most of the papers in this area focused on equity mutual funds without giving enough attention to bond funds. Whether bond fund managers can outperform the market is a very interesting question that should be further explored. Even though there is a large literature on mutual fund performance that fund managers have not outperformed the market return (e.g., Treynor (1965), Sharpe (1966), Jensen (1968), Grinblatt and Titman (1989), and Connor and Korajczyk (1991)), there is another side of literature that found fund managers possess hot hands skill (e.g., Hendricks et al (1993) and Jagannathan et al (2010)).

7.5 Conclusion

Overall, the data about fund manager provided by eMAXX give us some insight about who manage the funds. The data even provide the name associated with the firms that fund managers work for. More than 10,000 fund managers covered by eMAXX and these fund managers spread across different firm types such as mutual funds and insurance companies. Surprisingly, most bond fund managers have not moved to other companies. Only 12 percent of fund managers have moved at least once. However, the data cover the period of 1999Q1 to 2013Q4. If some fund managers move before 1999Q1, they won't be detected in this analysis. In addition, each bond fund manager has different expertise. The top three expertise of bond fund managers are corporate, government, and mortgage-backed bonds. On average, each fund manager manages four funds; however, the range is as wide as 200 bonds.

8. Cross Information

Previous sections examine each data file in eMAXX separately (e.g., issuer, holder, managing firms). In this section, I will examine cross information of eMAXX. Specifically, I will analyze issuers and holders at the same time. It is interesting to examine how each type of bondholders diversify their investment in each industry of issuer. For example, which industry, for a given type of bondholder, do bondholders invest in and by what proportion? Overall, the holding information is useful to answer some questions related to why these holders focus on any specific type of industry at all. Do they have any criteria related to specific type of issuer industry or they only care about other characteristics such as return and duration? Moreover, for the diversification aspect, it seems that most bondholders diversified their portfolio in terms of the issuer industry well. To be more effective in analyzing the issuer industry, the industries are reduced to 17 Fama-French industries. Table 1.75 shows holding average in percentage of each type of holder. The first column shows 17 Fama-French industries of issuers. The first row shows different types of bondholder. For example, the top-three holding of life insurance (LIN) in the fourth column, on average, holds bonds issued by financial companies (32%), utilities (15.3%), and consumption (8.4%). I skip *Other* because it is a collection of many small industries. The largest industry bonds held by bondholders in this dataset is bond issued by financial companies. More than half of the holders hold almost all types of industry of issuers. Some of them are active in a very few industries of issuer. For example, for annuity-type bondholders (ANN), 100 percent of the holding is in bonds issued by financial companies. Another example is hedge fund holding. Hedge fund holds 10 industries of bonds issued out of 17 industries. Specifically, Hedge fund is active in financial, machine and equipment, and mines. Close-end mutual funds invest high proportion in Steel and Oil bonds. Again, hedge fund in eMAXX is not a typical hedge funds we understand. They are mutual funds with hedge-fund-like strategies.

Next, we may consider the question the other way around, instead from the lender perspective to issuer perspective. One may ask "Do issuers in a given industry prefer a certain type of bondholders?". I examine the profile of issuer in the Table 1.76. The first column and the first row will look the same as Table 1.75, but the interpretation of the content inside is different. In the previous table, we read table vertically for each type of bondholder in the first row. For this table, we read horizontally for each industry in the first column. For example, for Cars industry, the three largest bondholder is open-end mutual fund (56.3%), life insurance (53.2%), and property & casualty insurance (16.9%), respectively. Again, I skip OTH because it is a sum of many small bondholders. The two largest holders on average are mutual funds and insurance companies, especially, open-end mutual fund and life insurance. Property & Casualty insurance is also a very large holder of each bond industry. Interestingly, Unit Investment Trust (UIT) is very active investor in fabricated products, transportation, and machine and equipment bondholder types. In addition, Foundation/Endowment

(FEN) are the major investors in bonds issued by food and transportation companies.

9. Analyses of Bondholdings during Bankruptcy

In this section, I analyzed the bondholding during the bankruptcy period of a firm. The bankruptcy data is from UCLA-LoPucki Bankruptcy Research Database (BRD). BRD contains more than thousand large public firms that have filed bankruptcy cases since October 1, 1979 to October 31, 2018. To qualify as a "public" firm. The firm has to file an annual report (form 10-K or form 10) with the Securities and Exchange Commission (SEC) for a year ending not less than three years prior to the filing of the bankruptcy case. The data also only consider large public firms with annual report with assets of $100 million or more, evaluated using 1980 dollars (about $297 million in current dollars). The data include both Chapter 7 (liquidation) and 11 (reorganization) filings. The data are updated monthly.

From Table 1.77, 98 percent of the bankruptcy cases are chapter 11 bankruptcy. Only 2 percent is Chapter 7. Chapter 11 bankruptcy allows debtors to reorganize their debt and negotiate with creditors. Chapter 7 is a liquidation bankruptcy. If the case was dismissed before the order for relief, the case is categorized as "no order for relief". Since majority of the bankruptcy case is chapter 11, the issue of strategic default is important. Strategic default play a significant role when a firm is in distress or near bankruptcy. Firms as debtors will seek a protection from a bankruptcy court which shields them from creditors. Then, the negotiation process between the equity holders and creditors starts. From Table 1.78, the data show how many firms negotiate with creditors before filing for bankruptcy or we call it *prepackaged* bankruptcy. "Prepackaged" is when the debtor drafted the plan, submitted it to a vote of the creditors, and claimed to have obtained the approval for the draft. "Prenegotiated" bankruptcy is when there is a negotiation success with at least one major creditor but without a formally voting for the debtor-drafted plan. If the case was dismissed before the order for relief or as chapter 7 at filing, the case is identified "not applicable". "Free fall" is when the bankruptcy has no pre-negotiation. It is very interesting that one-third of the bankruptcy has some degree of negotiation with creditors. One benefit of pre-negotiation is the smaller market impact.

Many interesting questions can be addressed when we apply eMAXX bondholding data to other sources of data, such as BRD in this case. Who sell and buy bonds during the bankruptcy, how much bondholders sell or buy bonds that are near bankruptcy, etc. Hence, to perform the analysis of bondholding during bankruptcy, I merged the eMAXX institutional bondholding data with the BRD data. The issuers of 606 firms out of 1,124 bankruptcy cases are in eMAXX database. The result can be found in the Table 1.79. One of the objectives for this section is to show how eMAXX bondholding data can be useful and complement the analysis of bond research in different events, such as bankruptcy in this case.

Figure 1.14 shows average number of sell transactions of bonds for firms filed for bankruptcy. On the horizontal axis, zero means the quarter filed for bankruptcy. Numbers to the left and right of zero are number of quarters before (negative) and after (positive) the bankruptcy filing of firms in bankruptcy. We can see that the average number of sell transactions were stable until five quarters before the bankruptcy filing and peaked at the quarter when the bankruptcy was filed. After the bankruptcy filing, it took around three quarters before the transactions became stable again.

For the buy transaction, the summary can be found in Figure 1.15. The buy transaction is opposite to the sell transactions in that when it was close to the bankruptcy filing date, the number of buy transactions was decreasing. Similar to the sell transactions, roughly five quarters before the bankruptcy filing, the buy transactions started to decrease. An interesting observation is that 12 quarters or 1 year after the filing for bankruptcy, we can see some buying transactions picking up. This indicates that the bonds had higher demand after a year of bankruptcy. The higher demand could come from the fact that the reorganization plans worked well and the companies that filed for Chapter 11 came back to operate normally. Sears holdings filed for Chapter

11 bankruptcy in October 2018. Its stock price jumped almost 50 percent on January 16, 2019, after positive news that a hedge fund would buy the company to secure the firm from bankruptcy.

Moreover, it is interesting to explore a number of bondholders or portfolio holding of bonds filed for bankruptcy how the number decreased or increased over time. From Figure 1.16, it shows number of portfolio that held the bonds of the bankruptcy firms before and after it filed for bankruptcy. The number of portfolio holdings was stable until three quarters before it filed for bankruptcy. The number of portfolio holding started to decrease and became stable very quickly around two quarters after the bankruptcy filing. Similar to the buy transaction, the number of portfolio holding picked up a year after bankruptcy filing.

Figure 1.14 and Figure 1.15 show number of transactions which might spur some questions about who were selling and buying these bankruptcy bonds and by how much. The answers are possible with eMAXX data. Figure 1.17 shows the types of bondholder who sold the bankruptcy bonds by dollar value. The largest seller by value is mutual funds following by insurance companies. This is interesting because the largest holder is insurance companies. Insurance companies are on average holding bonds five to six times more than mutual funds, but when the bonds they held came to financial trouble, insurance holders were not the largest seller. The same pattern is observed in the buying transactions in Figure 1.18 that the mutual fund is the largest group of holder for the buying activity. Mutual funds bought a lot of bankruptcy-firm bonds even within one or two quarters before firms filed for bankruptcy.

The fact that we see mutual funds traded bankruptcy bonds more than insurance companies, which actually held much larger position than mutual funds, is interesting. This could be an information asymmetry issue. Mutual funds may have more information than insurance companies. We may use mutual funds as a signal if the accuracy of the trade direction is high, which requires a formal test. Alternatively, insurance companies may not be as mobile as mutual funds. Since insurance companies hold a very large bond position, their selling transactions may trigger the whole bond market to sell the bonds excessively. In other words, if they move at the same time (sell large amount of bonds at the same time), it could trigger the whole market to dump the bonds and it could get worse than not selling the bonds.

Overall, it is more informative when we combine bond ownership data with another database. In this case, the bond ownership data is combined with the bankruptcy data. Most bond issuers that were in bankruptcy filed for chapter 11 to reorganize the firms. Interestingly, one-third of the firms filed for bankruptcy are pre-negotiated. We can see that, in terms of bond transaction activities, the selling activities increased while the buying activities decreased before the bankruptcy quarter. After a year, there were increase in buying activities. This could be from the well recovery after the reorganization of bankruptcy firms. Though the largest bondholders are insurance companies, mutual funds are more active in trading these bankruptcy bonds during the bankruptcy quarter.

10. Analyses of Bondholdings during Rating Changes

For this section, I perform an analysis on bondholding during the rating changes. First, I quantify Moody's ratings into number. I assigned the numeric rating for Aaa as 21, Aa1 as 20 and so on. The lowest rating is C which I assigned the numeric rating of 1. For unavailable, withdrawn, and not rated, I assigned the value of zero. Then, I calculated the upgrade and downgrade from the numeric rating changes. If the change in numeric rating is -1, this means there is one-step downgrade. If the change is 1, there is one-step upgrade. The summary statistics of rating change from eMAXX is provided in Table 1.80. This summary time range is from 1999Q1 to 2013Q2. The summary shows the median rating change of -1. This means the middle value of all the rating change is one-step downgrade. We can see that the maximum and minimum is 20 and -20, respectively. This is of interesting that which bonds were upgraded and downgraded 20 steps.

Table 1.81 shows some of the bonds that were downgraded 20 steps. We can see that all of them were downgraded during the 2007 financial crisis. The first bond DIOGENES CDO was downgraded from Aaa to C in 2007Q4. The second bond, IMAC CDO, and the third bond, PASA FDG, were also downgraded in the same quarter. The last two columns in Table 1.81 show number of buy and sell transactions. Since we have the bondholding data eMAXX, we can understand more who buy or sell bonds during this period of rating tumble. It would be more interesting to examine such a bond with high activity as PASA FDG.

Examining bond ownership during the rating changes is important. Some bondholders may have to sell bonds because of the holding requirement. For instance, insurance companies cannot hold too much of the non-investment grade bonds because of the capital adequacy requirements. Moreover, the window-dressing in mutual fund industry is pervasive. Morey and O'Neal (2006) find that bond fund managers loaded up more government bonds during the disclosure period than the nondisclosure period. This implies window dressing to make the portfolio looked safer. Along the same line, Agarwal et al (2014) observed the same pattern for stock mutual funds in which they increased holdings on winning stock during the disclosure periods to mislead investors about their true holdings. Many more studies have shown evidence on window-dressing behaviors (e.g., Lakonishok et al. (1991), Sias and Starks (1997), He et al. (2004), Ng and Wang (2004), Meier and Schaumburg (2004)). Therefore, the story of window-dressing in mutual fund is not new and it could apply to the bondholding as well.

We would think that the high activity of buy and sell should include many types of buyer and seller but it turns out that it is only one mutual fund company that bought and sold this bond. The information about the buy and sell transactions of PASA FDG can be found from Table 1.82 to Table 1.85. The first column is the net change in $'000. The fifth and sixth columns show the order of transaction. For instance, for the first quarter in 2007, there are 11 buy transactions. This number matches the number of buy transaction column (No.Buy) in Table 1.81. It is *Fidelity* that bought and sold PASA FDG during the 2007 crisis. Many types of funds, such as balanced funds, from Fidelity bought and sold bonds. This is interesting that whether Fidelity funds did not share information among each other that the bond should be purchased or sold. This reminds us of the window dressing in mutual fund literature.

One possibility is that Fidelity tried to hedge its position by having half of the funds purchased and another half sold. If the PASA FDG bond turns out to have a profit, the funds that purchased the bond will have a good performance and opposite is true for the funds that sold the bond. However, if the PASA FDG bond turns out to be default or create huge losses, the funds that purchased the bond will write down losses and funds shorted the bond will make huge profit. Overall, Fidelity can report average profit of zero during the crisis which is actually much better than other mutual fund companies that made losses during crisis.

From Table 1.86, we can see the top ten mutual funds with large number of funds under management. Fidelity alone manages almost 500 funds which is the highest number of funds in this sample. BlackRock is the second mutual fund company that manages large number of mutual funds. Even though we have a lot of mutual funds, many of them are managed by the same parent companies. There may be a network effect on returns of mutual funds under the same parent company. These parent companies may exploit the fact that they have many mutual funds under their management and these mutual funds spread across asset types and geographic.

10.1 Ratings Downgrades

Similar to the bankruptcy analysis, rating upgrade and downgrade are analyzed in the same manner. I calculate average number of sell, buy, portfolio holdings eight quarters before and after the event, either downgrade or upgrade. We would expect to see the sell transactions increase before the rating downgrade and buy transactions decrease before the rating downgrade. Moreover, the downgrade of bonds could trigger a *fire* *sale* because of the holding requirement. After the downgrade, there should be many bondholders that sold the bonds out owing to some investment policies. There is a literature about "fire sale" that shows the received price of an asset from fire sale does not reflect the long-term potential of the asset (e.g., Shleifer and Vishny (1992, 2011)). This fire sale will cause a huge loss to the seller. Then, why do bondholders sale for a loss? The answer is some bondholder's policy investments are constrained to a set of asset. For instance, some bondholders are only allowed to invest in investment-grade bonds. When investment-grade bonds that they hold are downgraded, they have to sell them out to the market in the short period of time. This is another area where we can study more on the fire sale in bond market after the rating change.

Figure 1.19 shows average number of sell transactions eight quarters before and after rating downgrade. We can see that the average number of sell transactions starts to increase three quarters before the downgrade. This may indicate that some bondholders may possess some material information about the downgrade or there could be an element of speculation that the issuers would be downgraded very soon. Consequently, some bondholders managed to sell their bonds before the event occurred to avoid a loss of bonds value from the downgrade. The sell numbers has high jump one quarter after the downgrade, then it has decreased for a year. At the fifth quarter after the downgrade the sell numbers increase again. This may indicate that the downgraded firms did not perform better and could have another round of downgrade if the performance is worse.

It is interesting that the number of buy transactions for the downgraded bonds were increasing similar to the number of selling in the Figure 1.19. We would expect that the number of buy activities should be lower after the downgrade, because some types of bondholders did not want to incur losses when the value of the bonds drops. From Figure 1.20, the numbers of buy transactions had smoothly increased over time. This indicates that there were some institutional bondholders bought these downgraded bonds. It could be that bondholders expected some future upgrade of the bonds and captured profit on the price differences. For number of portfolio holdings for downgraded firms, interestingly, the numbers kept increasing over time. The number of portfolio holdings for downgraded firms can be found in Figure 1.21. Even though the firms were downgraded, new institutional bondholders still bought the bonds issued by these downgraded firms.

However, the rating downgrade analysis in this section does not take into account the degree of how many steps drop. For instance, the downgrade here could mean 1 step downgrade or 20 steps downgrade. The 1-step downgrade would not be as severe as the 20-step downgrade. The analysis of the finer detail of the rating change is provided in a later section.

10.2 Ratings Upgrades

Next, I examine the upgraded bonds. We would expect to see an increase in buying activities before the upgrade or right after the upgrade depending on how informed investors are. If the investors can predict that the bonds would be upgraded, they would buy the bonds before the upgrading date. On the other hand, the selling activities for upgraded bonds should be lower. For the selling activities during the upgrade, there were drops in selling activities two quarters before the rating upgrade. The summary of the selling activities is provided in Figure 1.22. However, overall the selling activities did not change much. Only two periods of drop in selling activities. The first period is five to seven quarters before the upgrade and the second period is two quarters before the upgrade as mentioned. This indicates that there could be a leak of inside information or speculation on the rating upgrade in those two periods. Therefore, some bondholders start to keep the bonds even though initially they may want to sell it. The upgrade of the bonds will increase a bond's value.

Average number of buy transactions eight quarters before and after rating upgraded is shown in Figure 1.23. We can see the activities of buy transactions were higher before the rating upgrade. This again implies that the bondholders may possess some material information about issuers; consequently, they traded against the information. Interestingly, the number of buying activities for upgraded bonds decreased after the upgrade quarter as expected, but the number of buying activities for downgraded bonds increased after the downgrade quarter.

For the number of portfolio holdings in case of the upgrade, we would expect new bondholders participate more in bonds of the upgraded issuers. From Figure 1.24, we can see slightly increase in number of portfolio holdings for the upgraded bonds, but overall the number of portfolio holding for the upgraded bonds had been constant over time. One of the explanations would be since these bonds should be financially healthy, they have the potential to be upgraded. Hence, the likelihood that someone would sell the good bond out maybe low unless the price offered is really high. Moreover, most of the bondholders are long-term bondholders such as insurance companies and pension funds. They have small incentives to actively trade bonds in their portfolio. Consequently, the number of portfolio holdings is constant because no one sells the bonds in the secondary market. Therefore, the number of the new bondholders for the financially strong issuers could be low.

10.3 Ratings Upgraded from Non-Investment to Investment Grade

Previous sections analyze the bond issuers under general upgrade and downgrade conditions. For this section, we will narrow the sample to the issuers that were upgraded from non-investment grade to investment grade. It is important to analyze the transaction activities this way because some types of bondholders have a restriction on holding a certain bond rating, especially at the threshold between non-investment grade and investment-grade. For instance, insurance companies, sometimes, are required to hold only investment-grade bonds. Some bond mutual funds with a policy to hold only investment grade bonds also in this category. The change in rating may impact the returns of bonds. A literature related to how change in rating or credit watch impacts bond's return is extensive. For example, Hand et al. (1992) showed in their work that there was a -1.39% excess bond return when the credit watch indicated that a bond issuer could be downgraded in the near future. On the other hand, when the credit watch indicated a positive probability of rating upgrade, there was a significant positive average excess bond return of 2.25%. Their results are from the daily bond trades which are considered to be more reliable than other longer frequency such as weekly or monthly bond trades (e.g., Katz (1974), Grier and Katz (1976), Brooks and Copeland (1983)). However, some literature did not find an evidence that the rating change affects the bond return surrounding the rating change announcement period. Weinstein (1977) found that there was a price effect 18 to 7 months before the announcement of the rating change, but no evidence of price change 6 month before and after the rating change announcement. Weinstein (1977) explained that there was no reason to expect that the rating change would impact bonds' returns, because the rating change is a lagged performance indicator. Rating agencies, such as S&P and Moody's, evaluate firms' rating based on the public information such as financial statement. Therefore, there should not be any new information regarding the rating change. Kliger and Sarig (2000) found that the rating changes did not affect bond's returns; however, the Moody's announcement whether bond rating is better or worse than expected has an impact on bond value. Hite and Warga (1997) found the effect of rating change on the bond performance only appears on the downgrade side and much stronger for bonds that were downgraded from investment grade to non-investment grade.

In the same manner as previous rating-change analyses, I will examine the selling and buying activities as well as the number of portfolio holdings. First, for the number of sell transactions in Figure 1.25, we can see a huge drop first quarter before and at the quarter of upgrade from non-investment grade to investment grade. This is quite intuitive. Fewer bondholders would want to sell a bond that will be upgraded from non-investment grade to investment-grade, because the value would be much higher for this type of bonds.

For the buying transactions in Figure 1.26, we can see a pattern of increase in buying activities before the upgrade; however, the volume is less one quarter before the upgrade. This indicates that the information about future upgrade reflected in the public view long before, more than two quarters, the upgrade took place. This consistent with the Weinstein (1977) findings that show the price effect occurred 18 to 7 months before the upgrade, but the effect was less when it was close to the event date. Similarly, new bondholders collected the bonds that have a prospect of upgrading from non-investment grade to investment grade more than two quarters before the upgrade. The average number of portfolio holdings in Figure 1.27 is consistent with the buying activities in Figure 1.26. The pattern implies that institutional bondholders knew it long before the upgrade occurred; therefore, they started to add the bonds into their portfolios.

Previously, we only analyze buying and selling activities in terms of average number of activities. With eMAXX bondholding data, we can see more into details who are those buyers or sellers in terms of dollar value. From Figure 1.28, the highest buying value was one quarter before the bonds were upgraded from non-investment to investment grade. The largest buyer was insurance (in red) following by mutual fund (in green). Pension fund (in purple) largest buying value was three quarters before the event quarter. With eMAXX data, we can observe not only the pattern of the transactions but we can also observe the participants in this market. For the selling value for bonds upgraded from non-investment to investment grade, the smallest value was at the event quarter. Then, we can see the selling value quickly dissipated over time after the first quarter of the upgrade. The selling value decreased because, after the bonds were upgraded, the value of these bonds increased because of the lower risk of default. Institutional bondholders would want to buy rather than sell these bonds. A reason that one wants to sell these upgrade bonds is the speculative purpose. That is a bondholder may buy the bond right before the upgrade or sometime before the upgrade in order to realize profit after the upgrade.

10.4 Ratings Downgraded from Investment to Non-Investment Grade

Unlike the upgrade from non-investment grade to investment grade bonds, the downgrade from investment grade to non-investment grade bonds shows no sign of speculation before the event occurred. From Figure 1.30, we can see that the average number of selling is highest one quarter *after* the downgrade took effect. This implies that bondholders gave lower probability than they should have to the downside but gave relatively accurate probability to the upside. If bondholders give probability to the downside correctly, we would see the increase in average number of selling before the event quarter similar to the event of upgrade from non-investment grade to investment grade that there was a huge drop in selling activities before the upgraded quarter.

For the number of buy transactions before the downgrade, we would expect a decrease in number of buying activities before the downgrade occurred. From Figure 1.31, interestingly, the average number of buy transactions is higher before the downgrade occurred. Downgrade from investment grade to non-investment grade would hurt the performance of the bond portfolio. What could be a reason to explain this phenomenon? Why institutional bondholders would want to buy a bond that has a bad prospect and is prone to the rating downgrade? One reason could be the bonds were really cheap because of the fire sale. As mentioned before, some types of bondholder can only hold investment grade bonds. When bonds that these bondholders hold were prone to downgrade, they had to sell these bonds out. This could generate opportunities for some bondholders who have less constraint in the types of asset they can hold. For instance, some bond mutual funds have an explicit objective to earn more return from non-investment grade bonds. Consistent with the buying activities, from Figure 1.32, the average number of portfolio holdings increases before the upgrade quarter. This indicates that there were new bondholders entered the bond market for this particular type of bonds. If the average number of portfolio holdings is constant and we have high number of buying and selling activities, that would imply bond exchange among the existing bondholders. In this case, the new bondholders participated in the market when the bonds were downgraded from investment grade to non-investment grade. It indicates that these bondholders were interested in the non-investment grade bonds rather than the investment grade bonds.

If we add more details about the value of buy or sell transactions, we will have more information to understand about the dynamic of bondholding during the downgrade of bonds from investment to non-investment grade. We can see from Figure 1.33 that the value of the buy transactions decreased quickly one quarter after the downgraded quarter. Interestingly, we can see huge buying value came in a quarter before the downgrade. I would like to emphasize the underestimation of downgrade versus upgrade when the bonds cross the borderline of investment and non-investment grade. We would expect that the buying value for downgraded bonds should be lower earlier before the downgraded quarter, but, here, we see the opposite. As I mentioned, another reason would be the fire sale of the bonds and some bondholders bid those undervalue bonds. From Figure 1.34, the pattern is the same as buying value in the Figure 1.33. The selling values for bonds downgraded from investment grade to non-investment grade had dissipated over time. However, the number of selling activities and value of selling activities are different in timing. For the number of selling activities, we see the peak at a quarter *after* the downgrade, but the value of selling activities peaked at a quarter *before* the downgrade. This indicates that there was a sell transaction came out before the downgrade. The highest selling values were four and six quarters before the bonds were downgraded. This implies some degree of information asymmetry that some bondholders had material information and traded on that information. If we don't have eMAXX bondholding in dollar terms, it would be impossible to see more in detail the dynamic of bondholding during the rating change. Overall, with eMAXX bondholding data, we can understand more about the bondholding during the rating upgrade or downgrade event.

11. Analyses of Bondholdings during Accounting Restatement

When there is a major difference or error in outcome or assumption in financial statement of a firm, the firm is required to update or restatement its account. We would like to see how bondholdings change during a firm restatement which is considered as a major change of a firm financial statement. The sample is the firms that restatemented during 2001 and 2002 with the total of 109 firms. Most accounting restatements are perceived as negative news. However, there were some cases that the restatement was positive, such as the upward revision of revenue related number. Since most accounting restatements are negative news, we would expect to see higher sell transactions and lower buy transactions. Figure 1.35 shows average number of sell transactions eight quarters before and after an accounting restatement. Average number of sell transactions was increasing before a firm restatemented. Eight quarters before a firm restatemented, the average number of sell transactions was around three. One quarter before the restatement, the number of sell transactions went up to six and eight during the restatement. After the restatement, the number of sell transactions was stable at around 8. This is consistent with our expectation.

Figure 1.36 shows average number of buy transactions eight quarters before and after restatement. Similar to average number of sell transactions, eight quarters before the restatement number of buy transactions was at around six transactions. Then, the buy transactions kept increasing from six to ten transactions during the restatement and were stable at that level. This is opposite to the average buy transactions from bondholders during bankruptcy. Before bankruptcy, bondholders decreased their holding until around two quarters after the quarter that bankruptcy was filed then the buying activities became stable. A possible explanation could be that the accounting restatement is not perceived as severe as bankruptcy; hence, the buy transactions did not show a decreasing trend before the restatement period.

Average number of portfolio holdings eight quarters before and after restatement is provided in Figure 1.37. Number of portfolio holdings did not show a sign of bad prospect for the firms during the restatement period, because the number of portfolio holdings was steadily increasing over time. The number of portfolio holdings and average number of buy transaction are consistent in showing that the restatement, from the bondholder point of view, may not relate to the firm's future prospect. However, there is a financial accounting literature showing negative consequences from restatement (e.g., Hribar and Jenkins (2004), Gleason et al. (2008)).

Figure 1.38 shows composition of sell value from different types of bondholders. Based on the sell value, the sell value was highest three quarters *after* the restatement. This indicates that the restatement information was not priced in until the third quarter after the restatement. This is different from the bankruptcy case where the bankruptcy quarter had the highest selling value. The largest traders for the sell transactions are insurance companies followed by mutual funds. However, unlike the total selling value of all bondholders, the highest value of selling transactions from insurance companies was right on the restatement quarter. The type of the highest selling firm is also different from the bankruptcy case. For the bankruptcy case, mutual fund is the largest seller of bonds during the bankruptcy whereas, in the case of restatement, insurance companies are the largest seller.

Composition of buying value from different types of bondholders can be found in Figure 1.39. For buying value, the highest-buy-value quarter during the restatement was one quarter after the restatement. This indicates that on the positive restatement, the information was priced in faster than the negative restatement. Similar to the selling value, insurance companies dominated the transactions.

Overall, the bondholder's activities give us more information about the issuers' situation and bondholder's reaction either they were overcoming bad times, such as bankruptcy and downgrading, or facing higher demand from positive effect, such as positive restatement. Even though the volume or liquidity of bond trading is much less than the stock markets, additional information can be gained from a certain type of large bondholders such as insurance and mutual funds. Mutual funds have more flexibility and speed to trade bonds since most of them are much smaller in size. On the other hand, insurance companies are much larger in size on average; hence, when they transact in the bond market, it could make the price of bonds change drastically. Unless insurance companies can smoothly execute their transactions, they may need to choose between getting their transactions out or not getting them out at all. We can see from the bankruptcy analysis that during the bankruptcy insurance companies traded less than mutual funds even though insurance companies held bonds much larger in size than mutual fund holders on average.

12. Conclusion

In the past decades, researchers have explored the topic of firm capital structure and we have come much farther from our starting point. We understand better why a firm makes a decision when they need more capital. However, we still need more research on a specific area of "public debt" which is a very important subject since 90% of the new capital issuance is in the form of debt. In addition, firms use more debt as part of their capital over time. However, debt is a more difficult area to conduct research compared to equity. This is concerning with the availability of the data. For private debt such as bank loan, most information or data are proprietary or, in other words, they are not disclosed to the public. Our hope to understand more about debt is on the public side in which SEC requires a disclosure. Nevertheless, some institutional investors are exempt from the public disclosure such as hedge funds. Therefore, the focus of my research is on the US corporate bonds where the data are sufficiently available. New bondholding data, eMAXX, offer financial economics research to understand more in detail about the public debt market, especially on the demand-side effects. In conjunction with other bond databases (e.g., TRACE, FISD, SDC), eMAXX complements the aspect of the corporate bond demand and activities of bondholders. eMAXX data could address a number of question that have never been asked in financial discipline, I hope that a summary of eMAXX data in this first chapter can give readers an idea how to apply eMAXX data to address interesting and impactful financial research questions.

To quickly grasp what information contains in eMAXX bondholding data, I would like to give a brief summary of the eMAXX data in different aspects. The first aspect is about the *characteristics* of bonds issued in eMAXX data. Most of the corporate bonds issued in the US (81%) are fixed-rate bonds with some special feature such as 144A rule bond that has higher portion of floating-rated bonds. There is a mix of currency of bond issued: US, Euro, and Yen. US currency is the largest portion. One-third of bonds offered in the US debt market is offered privately. This emphasizes the fact that understanding more about the debt market is difficult since, even in corporate bond market, there is a decent amount of bonds issued privately. In addition, out of all the public bonds' value, only less than one percent is traded. Two-thirds of bonds in eMAXX is investment grade. However, more than half have no rating. Maturity of bonds in eMAXX is, on average, relatively high at 10-13 years with the maximum as high as 150 years. Half of the bonds used to be callable bonds, but the proportion has changed to one-third since 2005. These are the summary of bond characteristics in eMAXX.

The second aspect is the analysis on the *issuers*. Two-third of the issuers are US firms and majority of them are from financial sector. This is the result of GLBM that allows financial companies to participate more in the financial market. An issuer issued number of contract ranged from 1 to 365 with an average amount issued of \$536M. On average, for each issue, there are 25 number of holders.

The information about *bondholders* is my third aspect. The two largest holders for US corporate bonds are insurance and mutual funds in which I find that mutual funds tend to trade more than insurance companies in several occasions. The largest bondholders on average hold 14% of total dollar bonds issued. For a holder for a given quarter, they hold roughly 65 bonds in their portfolios. Top three country of bondholders are US, Canada, and Japan, respectively. The average value-weighted portfolio maturity of bondholders is 8.8 years and hold 30-50% of total dollar issued. Even though insurance companies, especially life and property and casualty insurance, are the largest bondholders from the beginning of the sample in 1999 to 2013, the growth of bondholding by mutual fund is very high. The benefit of having more mutual fund in the bond market is to promote liquidity because mutual funds tend to trade bonds more than insurance companies in the secondary market where the volume is very thin currently.

Half of the bondholders hires an investment company to manage their funds and larger portion of bondholders hires managing firms over time. Our fourth aspect is, then, *managing firms*. The three largest managing firms by size based on this sample are PIMCO, Vanguard, and Metlife, respectively. Interestingly, managing firms can manage funds under their brand name and manage for other companies outside their brand name. For example, BlackRock manages funds for themselves and also manages funds for other private equity firms. This is another challenge of eMAXX data to match the parent company and its subsidiaries. For public firms, the subsidiary information can be found in 10K exhibit 21.

Last aspect is about *fund managers*. There are more than 10,000 bond fund managers in eMAXX database. I find that the turnover of bond fund manager is low and on average each fund manager manages three portfolios, but the number can go up as high as hundreds portfolio.

Information from eMAXX is valuable in terms of enabling us to understand more about the public debt market of firms. Endless questions can be addressed by this data. Thanks to SEC for the greater transparency in the bond markets, bondholders are required to report their bondholdings; otherwise, our understanding about bond market would be very limited.

Figure 1.1: Percentage of Bond Issued by Country

This Figure shows a breakdown of percentage bond issued by each country in 2017. The global bond market outstanding is $100.1 Trillion. The data is retrieved from SIFMA report 2018.

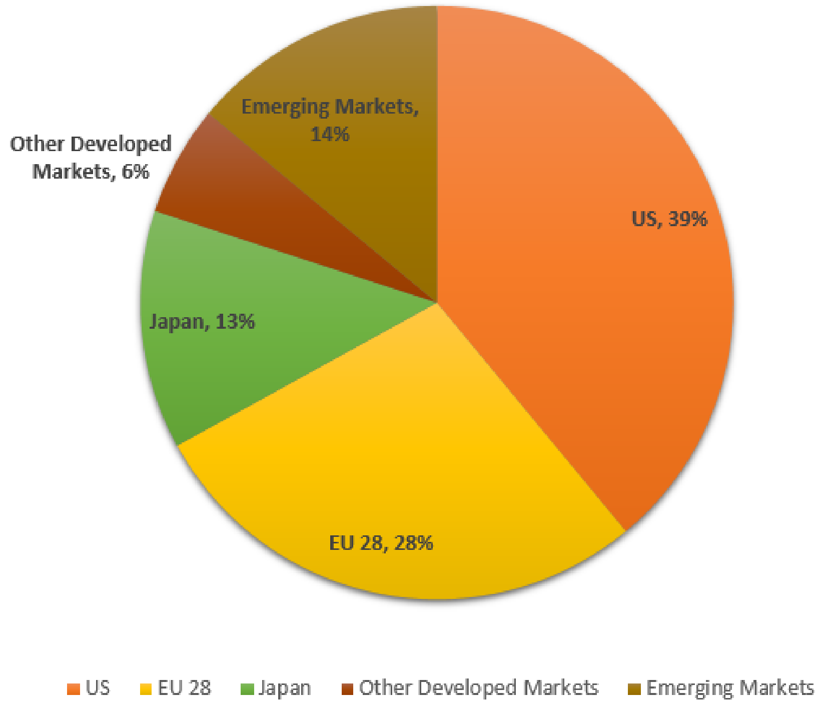

Figure 1.2: Types of Debt Issued in the US in 2017 (percentage)

This Figure shows a breakdown of percentage type of debt issued in the US in 2017. The data is retrieved from SIFMA report 2018.

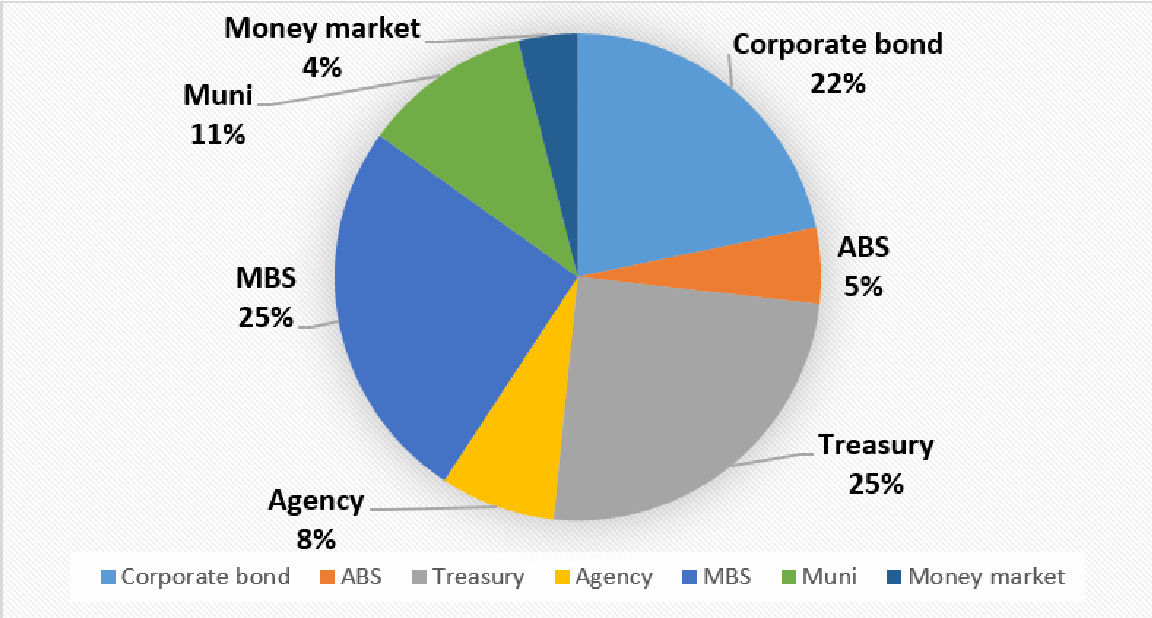

Figure 1.3: US Corporate Issuance from 2002 to 2016

The data used to create Figure 1.3 is from Securities Industry and Financial (SIFMA) 2017. SIFMA is the US industry trade group representing securities firms, banks, and asset management companies. Figure 1.3 shows the US corporate issuance in $Billions. Corporate debt includes public and private, investment grade and high yield bonds issued in the US. Common stock includes initial public offerings and follow-ons issued in the US.

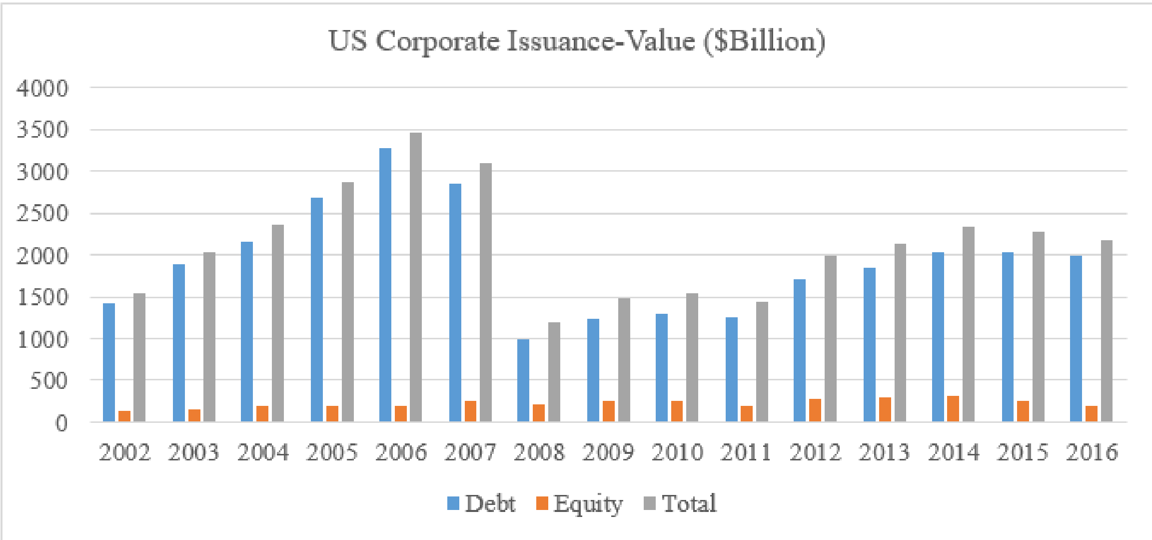

Figure 1.4: Holding by Type of Holder for Each Quarter

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

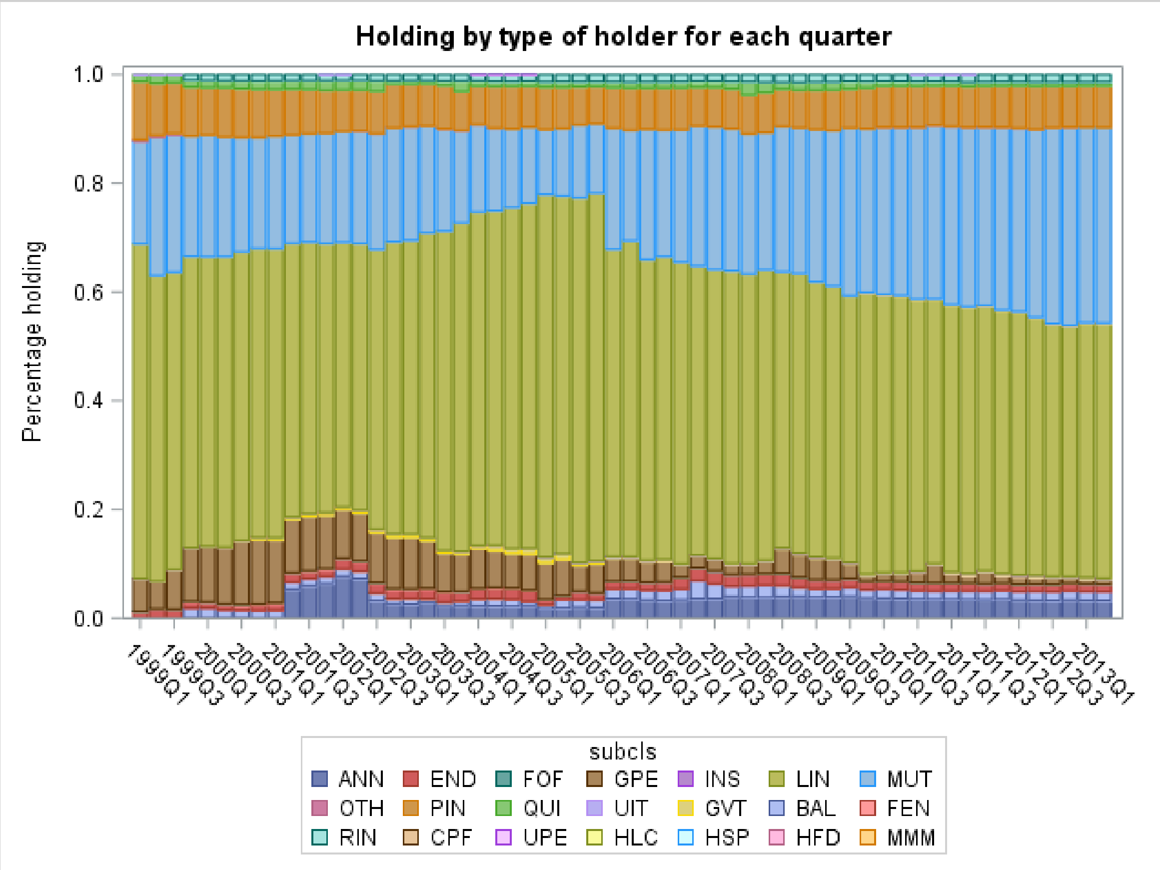

Figure 1.5: Daily Number of Bonds Transaction for GE bond, GE:AAD

Figure 1.5 shows daily number of transactions for GE:AAD bond

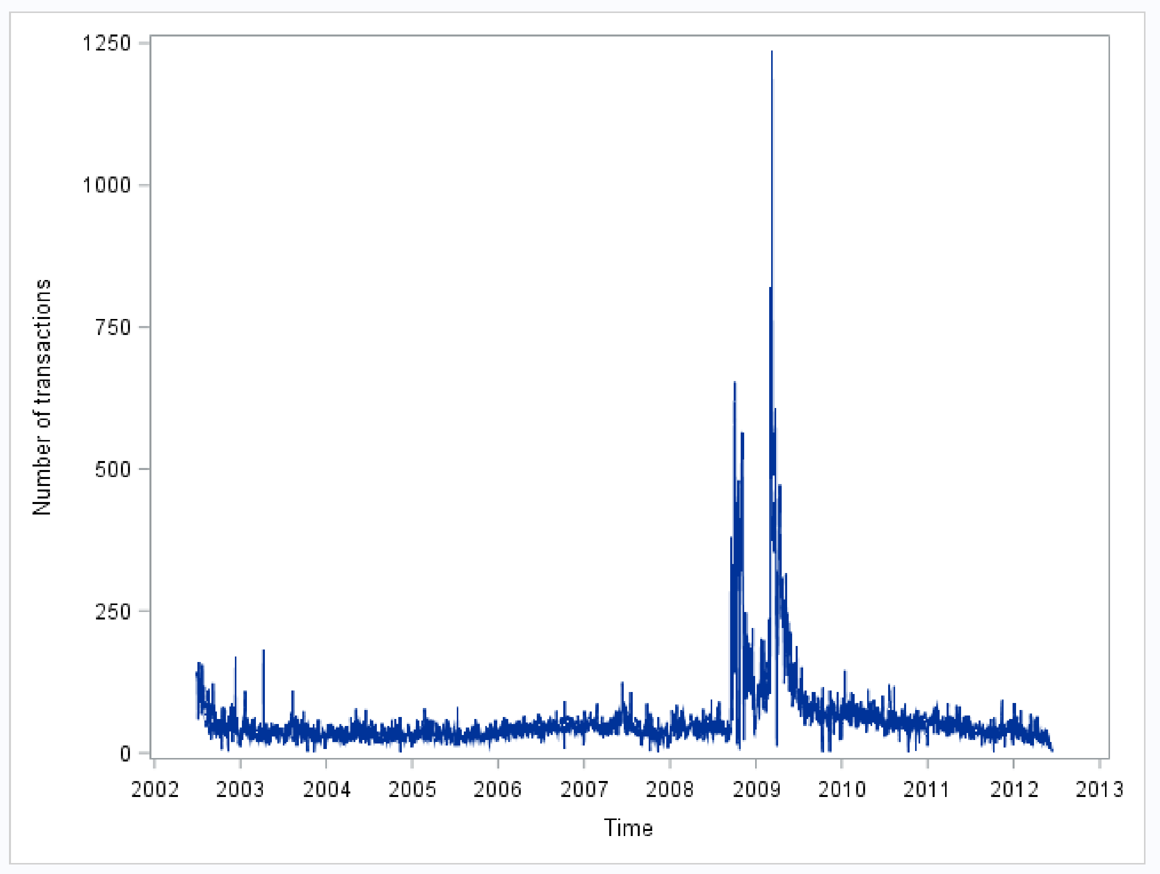

Figure 1.6: Holding by Type of Holder for Each Quarter for GE:AAD

Figure 1.6 shows proportion of different types of bondholder from 1999Q1 to 2013Q2 for GE:AAD bonds. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

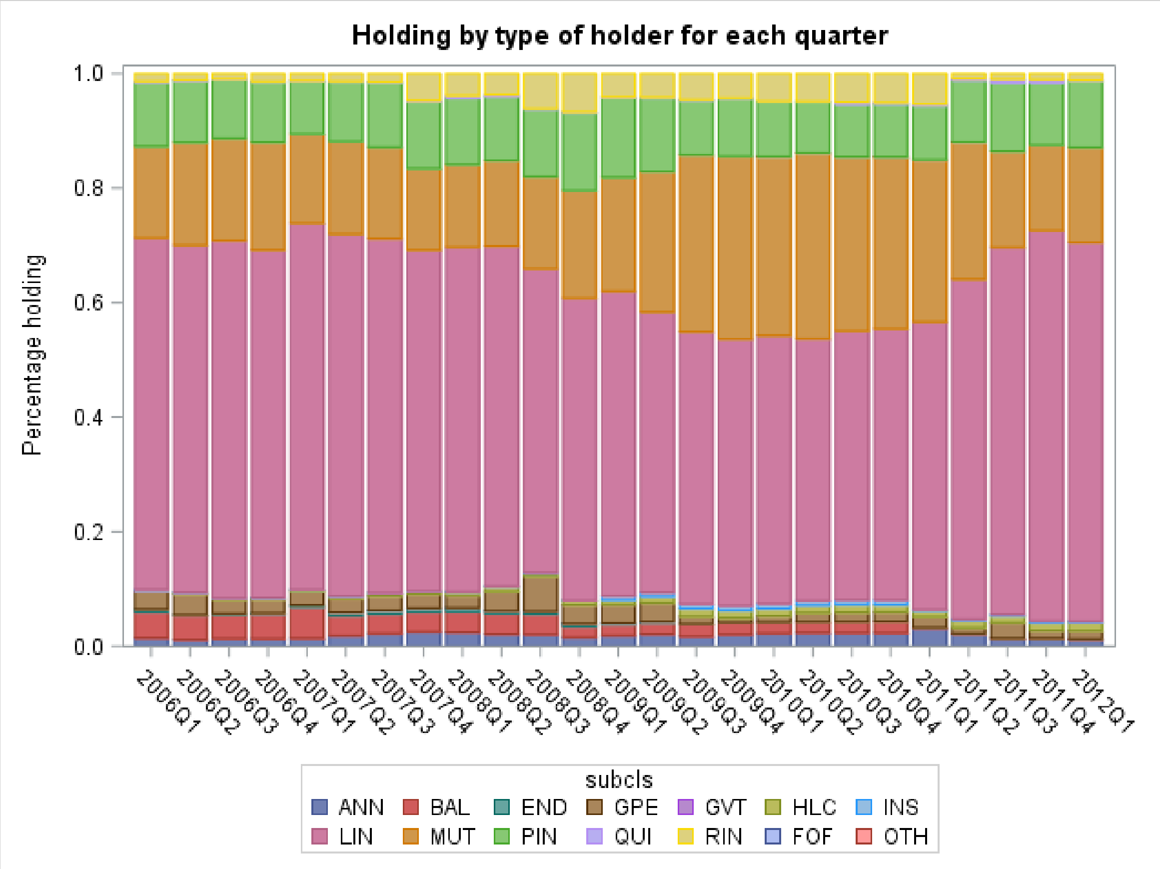

Figure 1.7: Number of Firms Issued Bonds by Quarter

This figure shows number of firms issued bonds in each quarter from four databases used: eMAXX, FISD, TRACE, and SDC Platinum

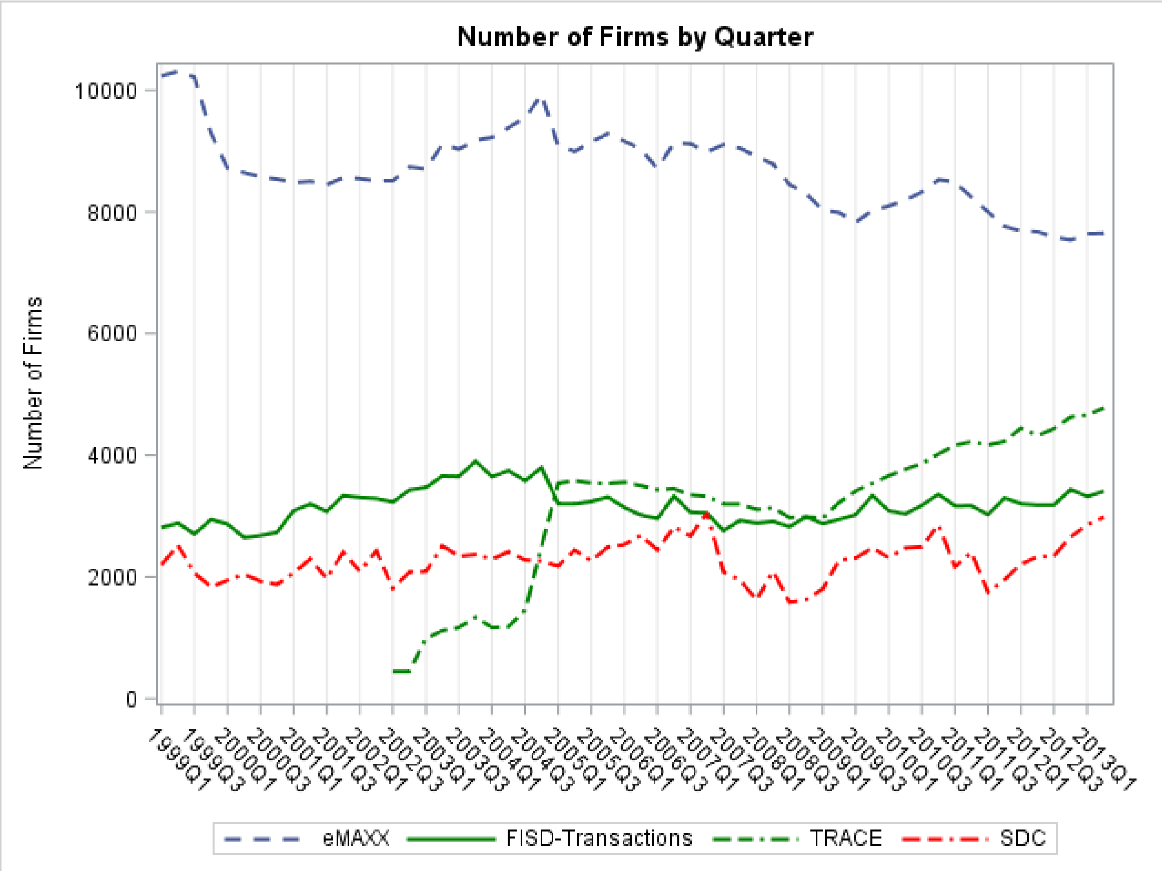

Figure 1.8: Number of Issue by Quarter

This figure shows number of issue in each quarter from four databases used: eMAXX, FISD, TRACE, and SDC Platinum

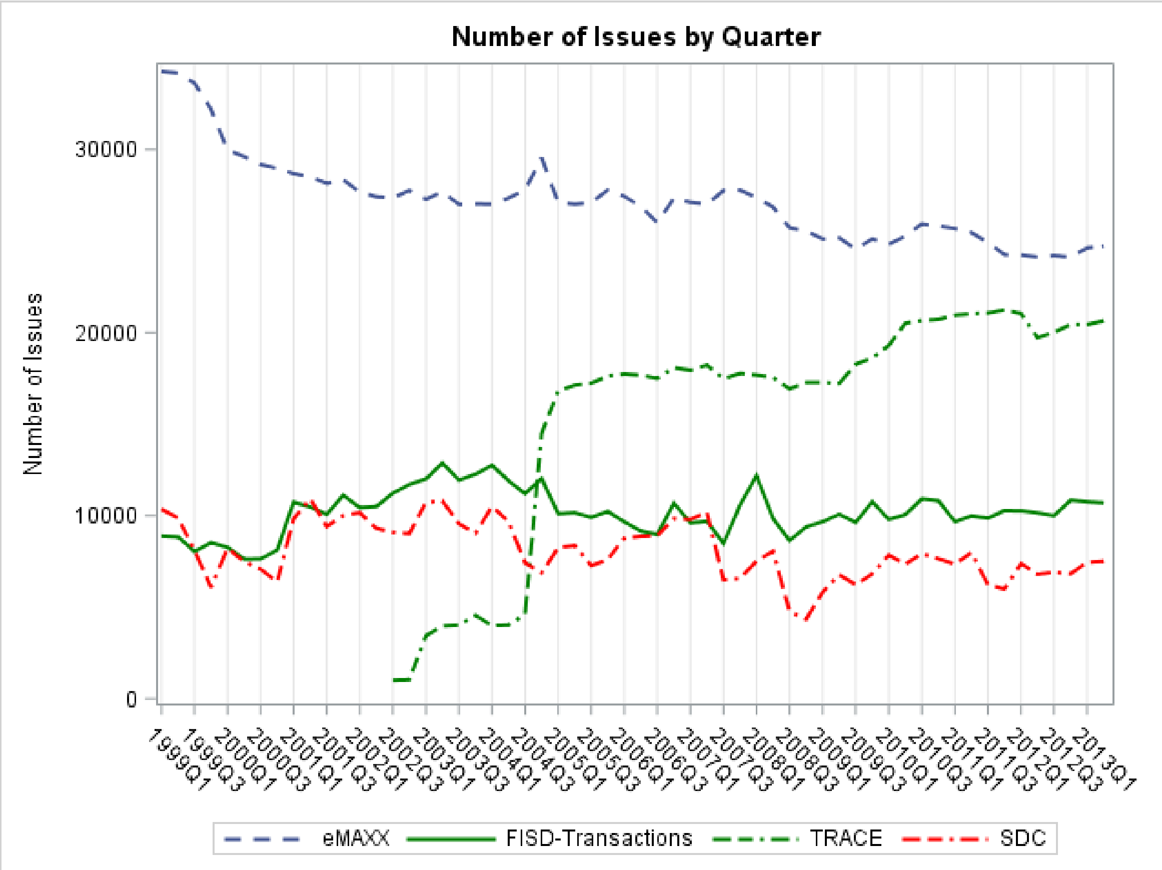

Figure 1.9: Average Number of Holder

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. This figure shows average number of holder by year. Since eMAXX data provide quarterly holding data, to output yearly data, the data is average for each quarter, then multiply the number by four to get yearly average number of holder

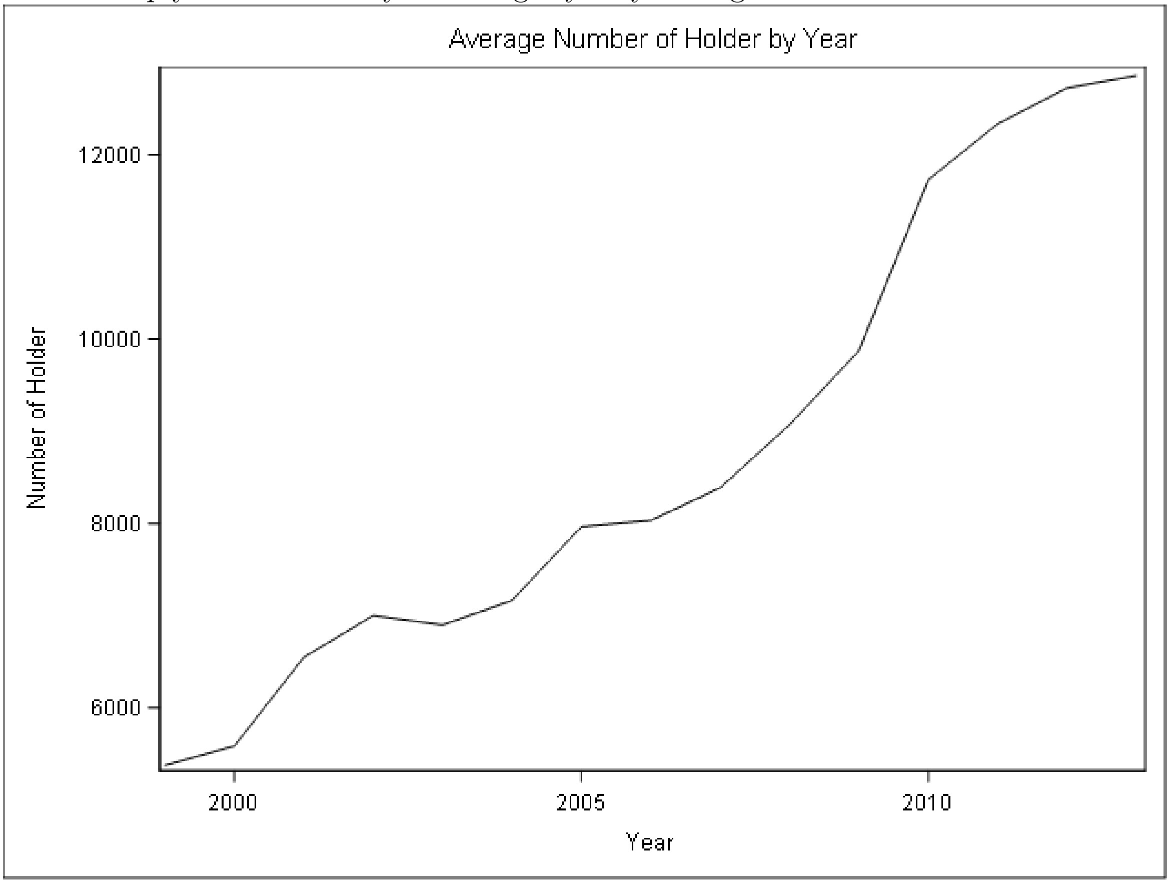

Figure 1.10: Number of Holder by Each Subclass Over Time

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

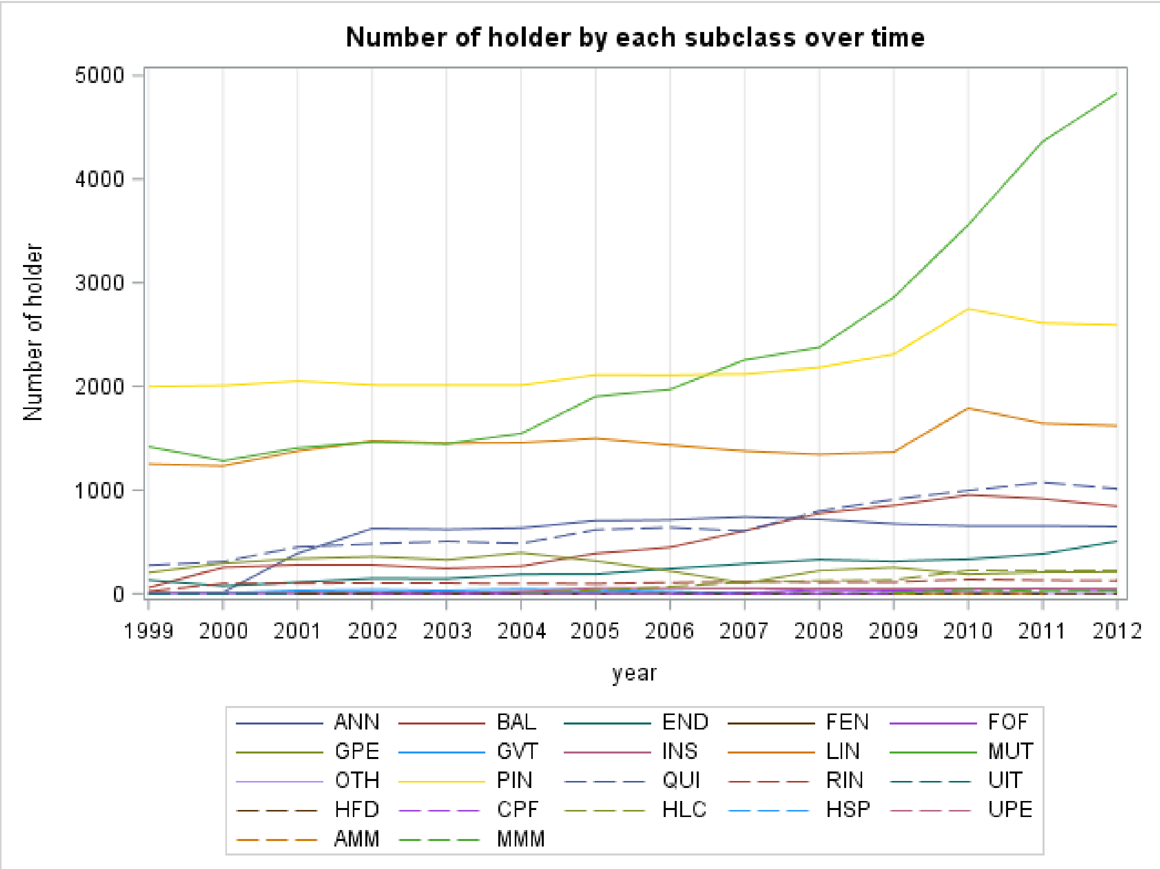

Figure 1.11: Average Number of Issuer

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. This figure shows average number of issuer by year. Since eMAXX data provide quarterly issuer data, to output yearly data, the data is average for each quarter, then multiply the number by four to get yearly average number of issuer

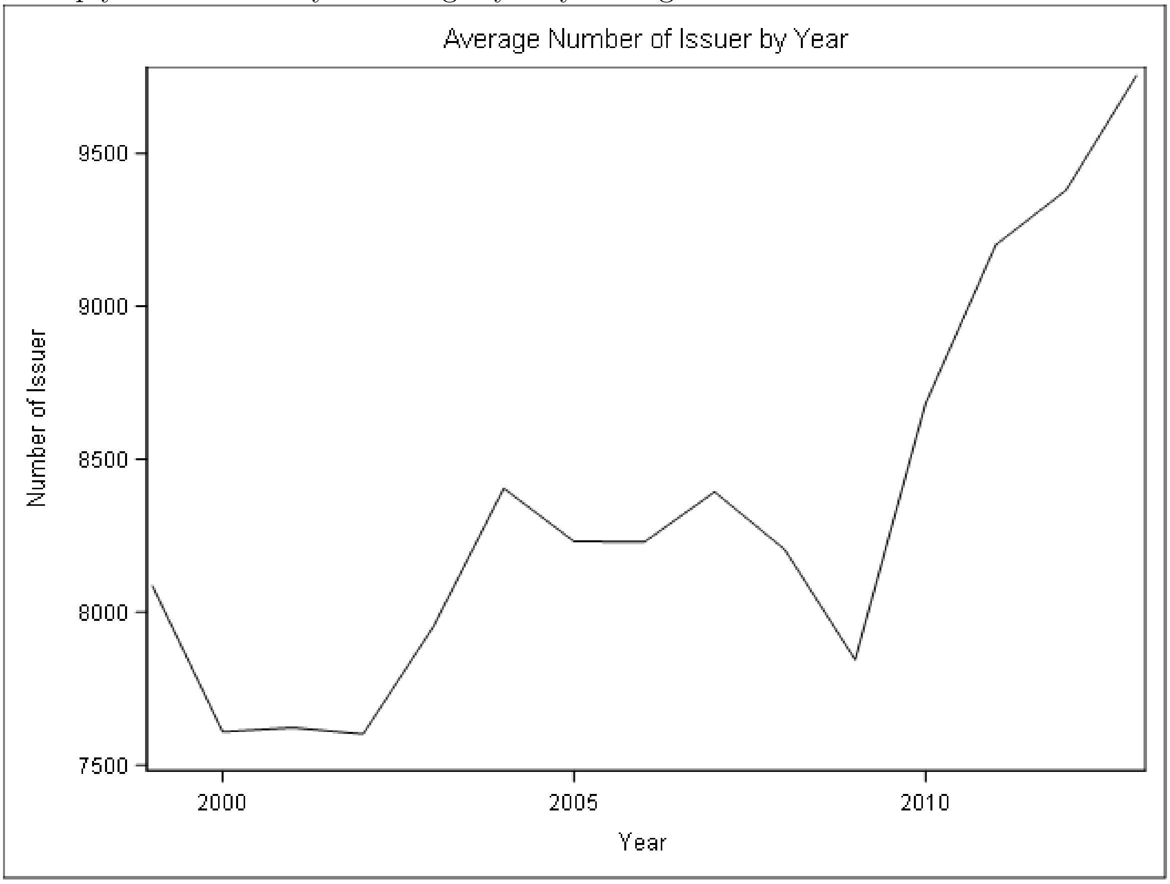

Figure 1.12: Average Number of Managing Firm

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. This figure shows average number of managing firms by year. Since eMAXX data provide quarterly issuer data, to output yearly data, the data is average for each quarter, then multiply the number by four to get yearly average number of managing firms

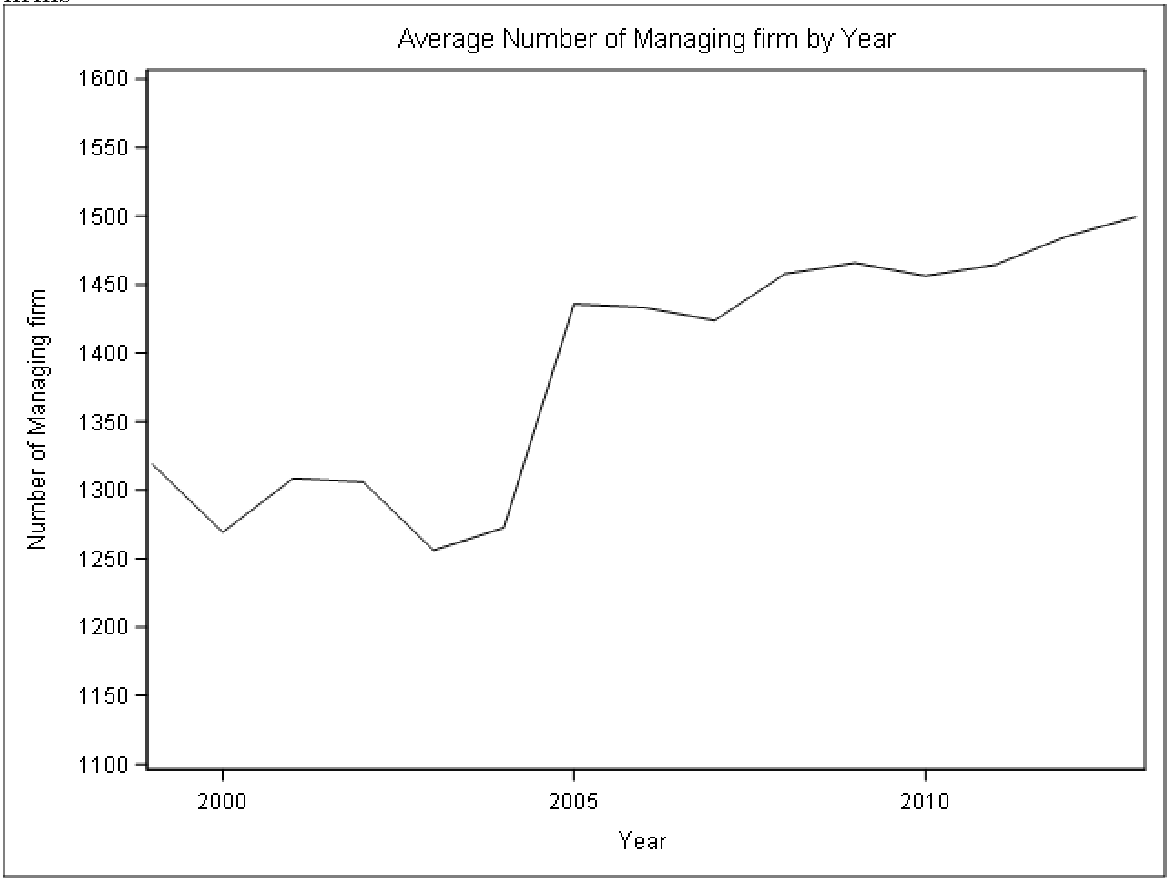

Figure 1.13: Proportion (%) Investment VS Junk Bonds Issuance Over Time

Figure 1.13 shows proportion of investment and junk bonds from 1999 to 2013

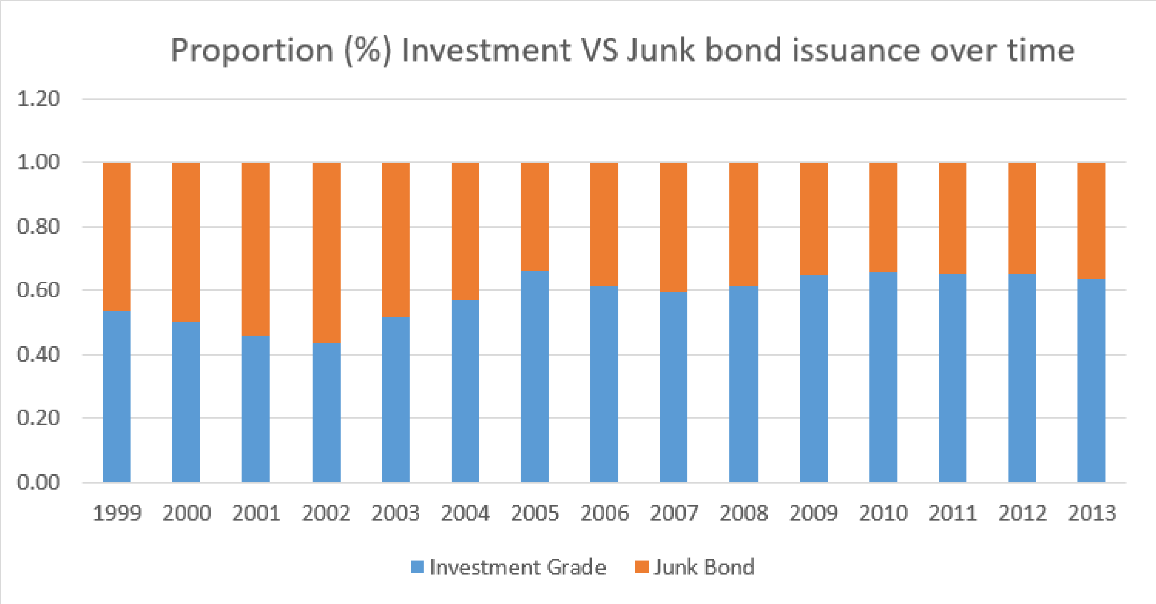

Figure 1.14: Average Number of Sell Transactions Twelve Quarters Before and After Firms Filed for Bankruptcy

Figure 1.14 shows average number of sell transactions twelve quarters before and after firms filed for bankruptcy. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the bankruptcy. Zero means the quarter that a firm filed for bankruptcy.

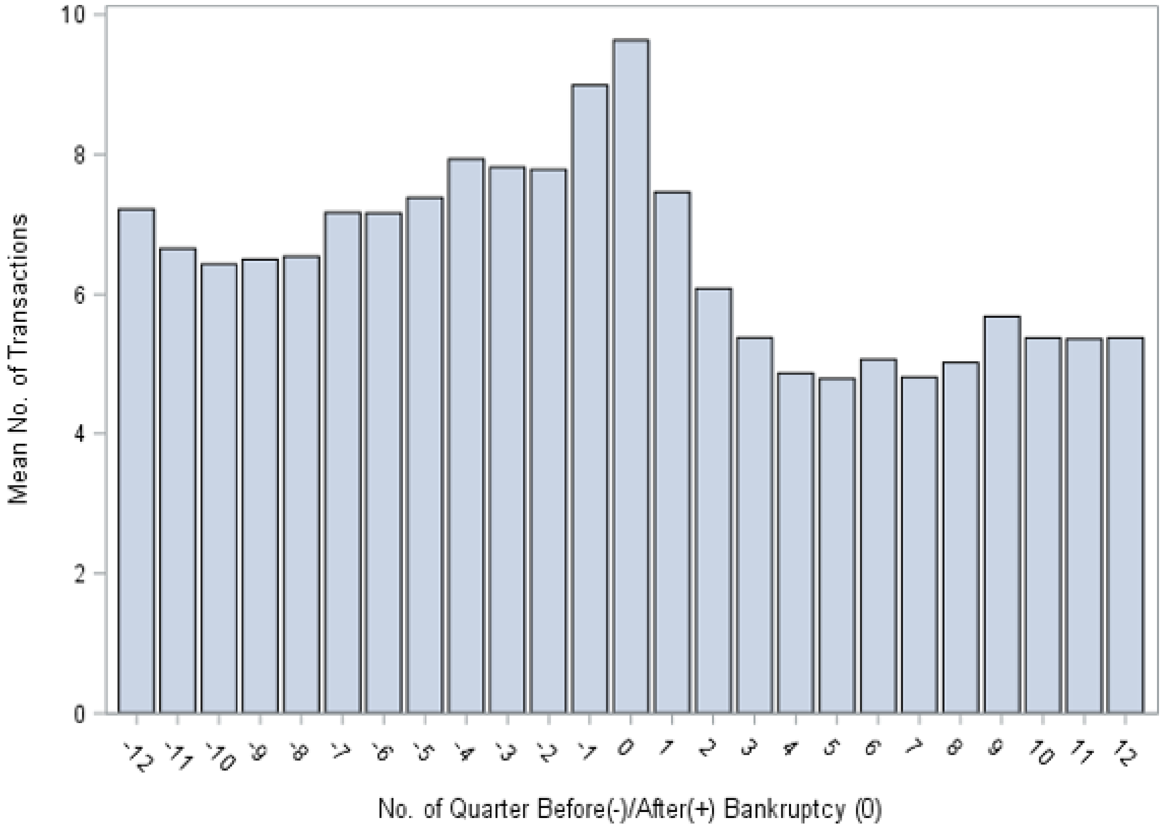

Figure 1.15: Average Number of Buy Transactions Twelve Quarters Before and After Firms Filed for Bankruptcy.

Figure 1.15 shows average number of buy transactions twelve quarters before and after firms filed for bankruptcy. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the bankruptcy. Zero means the quarter that a firm filed for bankruptcy.

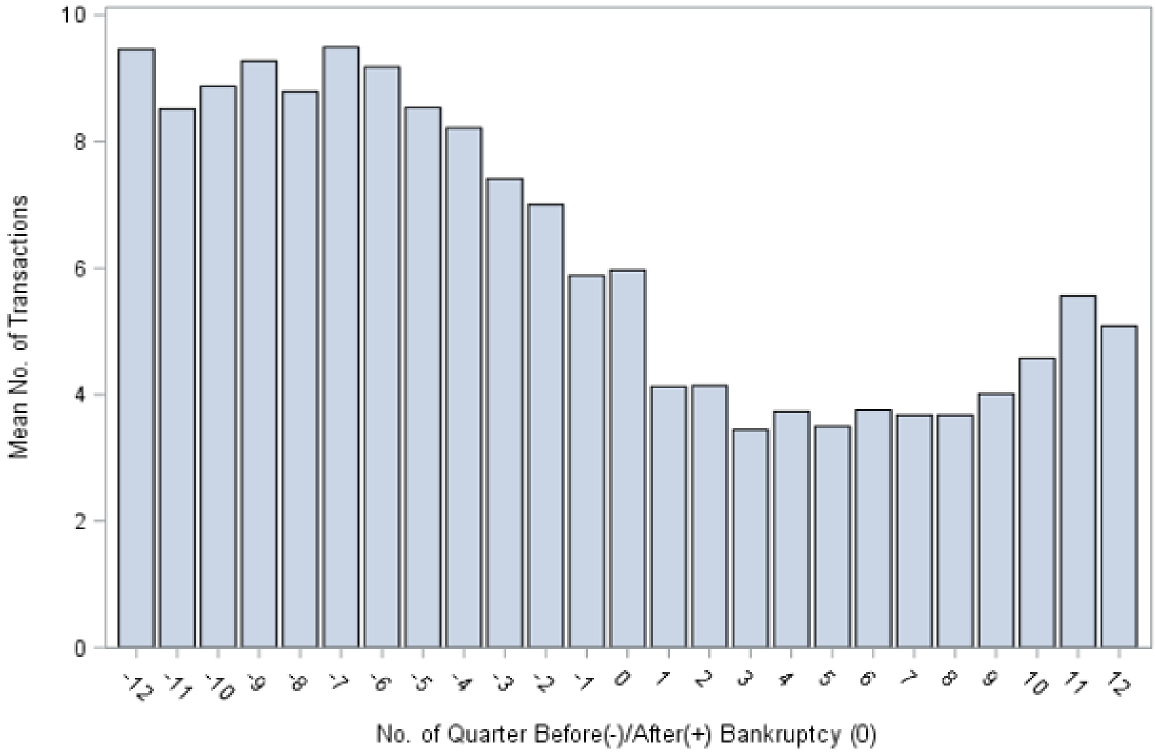

Figure 1.16: Average Number of Portfolio Holdings Twelve Quarters Before and After Firms Filed for Bankruptcy

Figure 1.16 shows average number of portfolio holdings twelve quarters before and after firms filed for bankruptcy. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the bankruptcy. Zero means the quarter that a firm filed for bankruptcy.

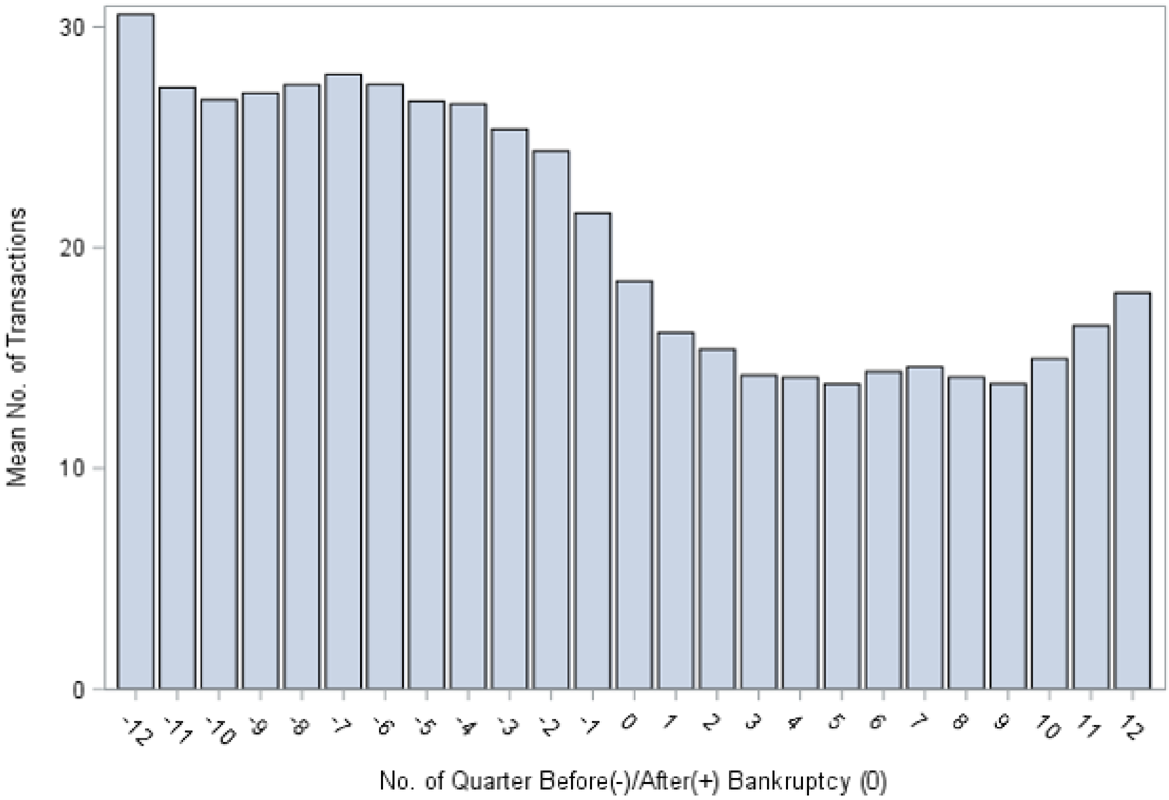

Figure 1.17: Composition of Sell Value from Different Types of Bondholder Twelve Quarters Before and After Bankruptcy Filed

Figure 1.17 shows composition of sell value from different types of bondholder

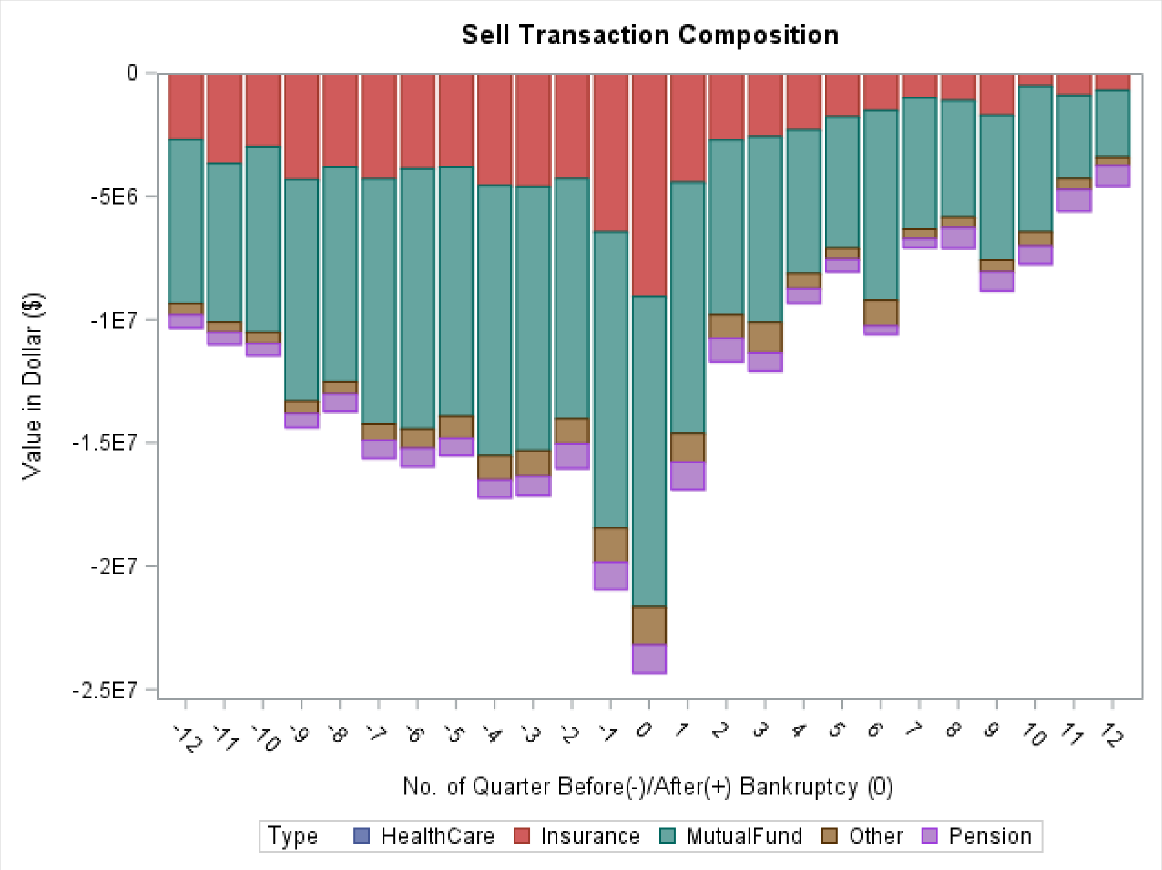

Figure 1.18: Composition of Buy Value from Different Types of Bondholder Twelve Quarters Before and After Bankruptcy Filed

Figure 1.18 shows composition of buy value from different types of bondholder

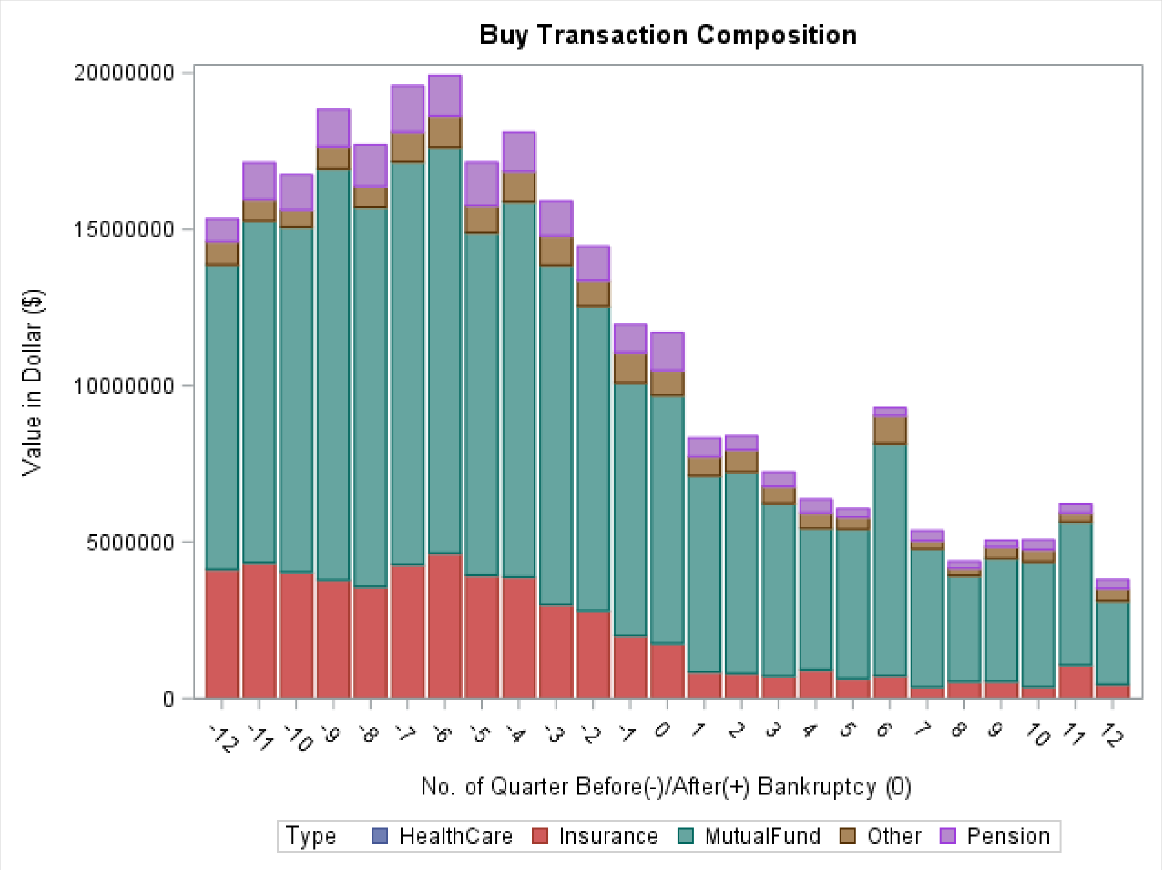

Figure 1.19: Average Number of Sell Transactions Eight Quarters Before and After Rating Downgraded

Figure 1.19 shows average number of sell transactions eight quarters before and after rating downgraded. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating downgraded. Zero means the quarter that firms were downgraded.

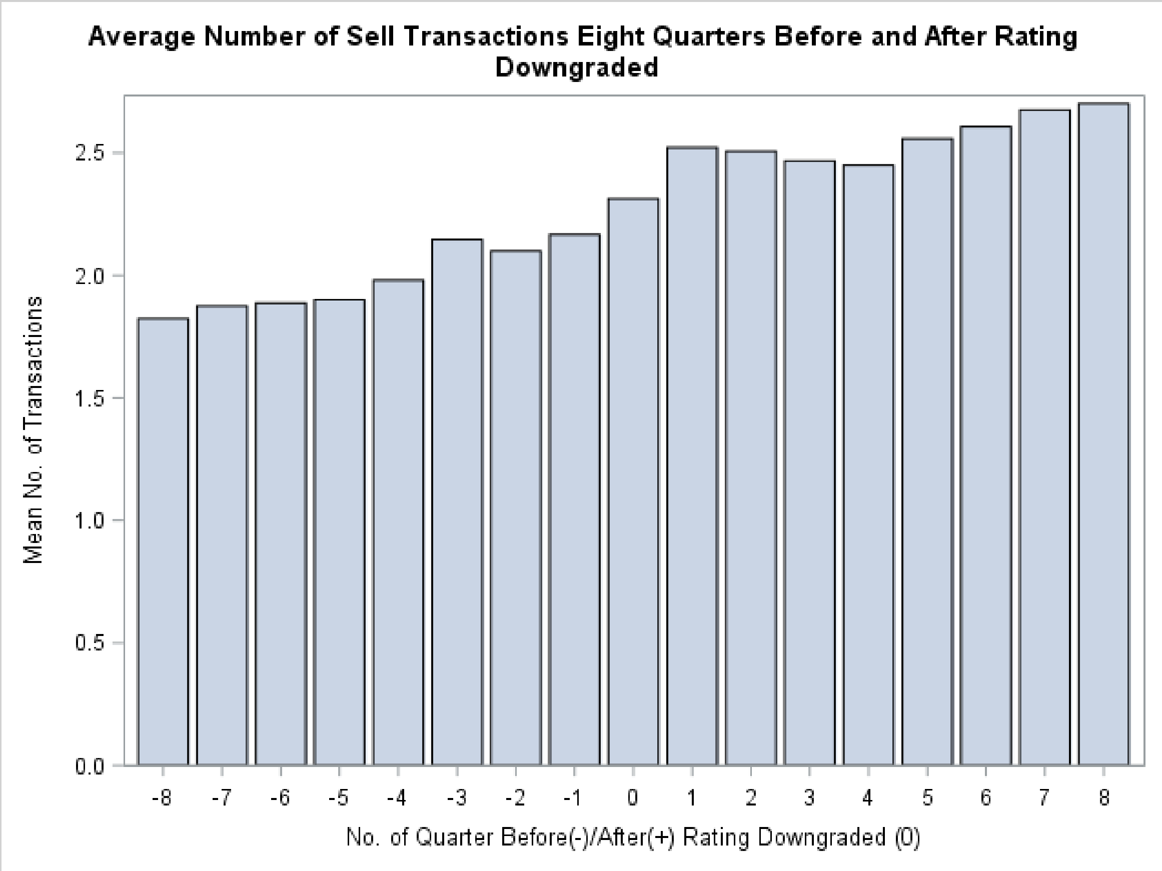

Figure 1.20: Average Number of Buy Transactions Eight Quarters Before and After Rating Downgraded

Figure 1.20 shows average number of buy transactions eight quarters before and after rating downgraded. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating downgraded. Zero means the quarter that firms were downgraded.

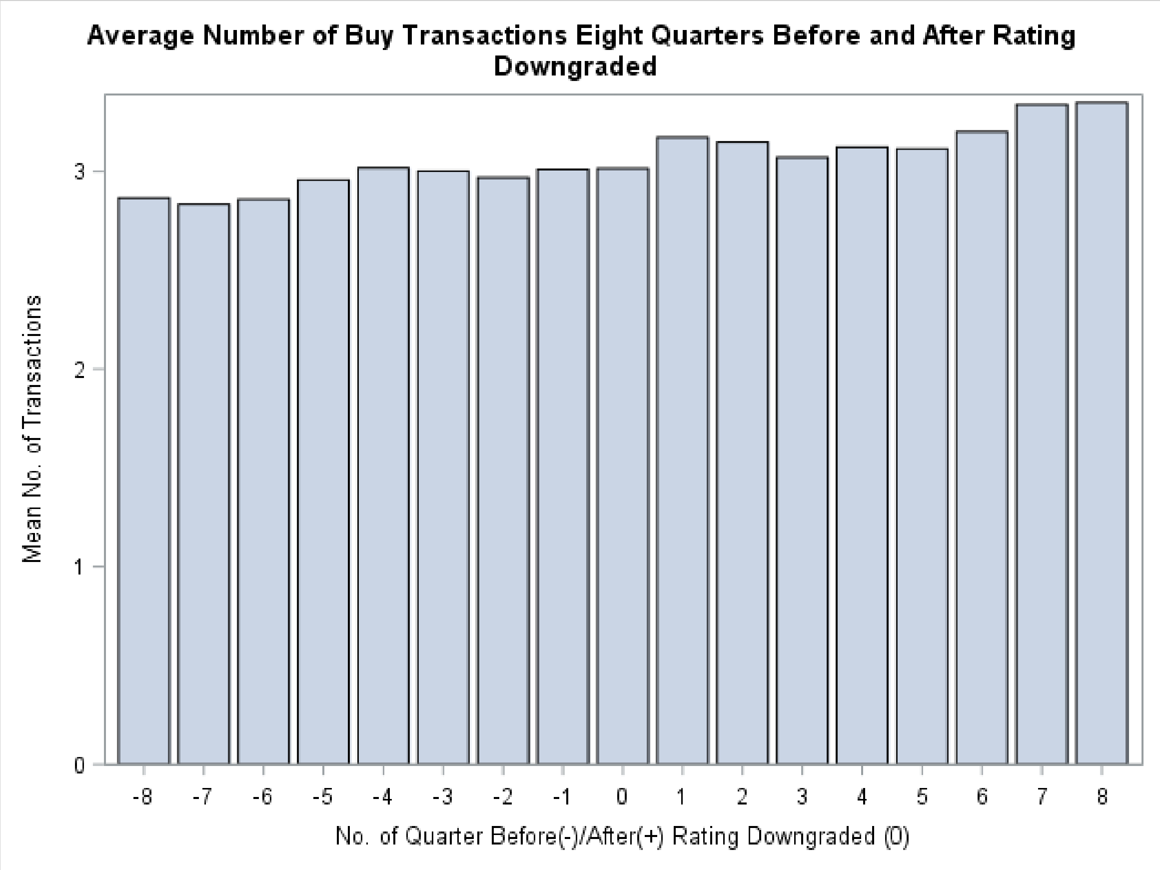

Figure 1.21: Average Number of Portfolio Holdings Eight Quarters Before and After Rating Downgraded

Figure 1.21 shows average number of portfolio holdings eight quarters before and after rating downgraded. The vertical axis shows mean number of portfolios and horizontal axis shows number of quarter before and after the rating downgraded. Zero means the quarter that firms were downgraded.

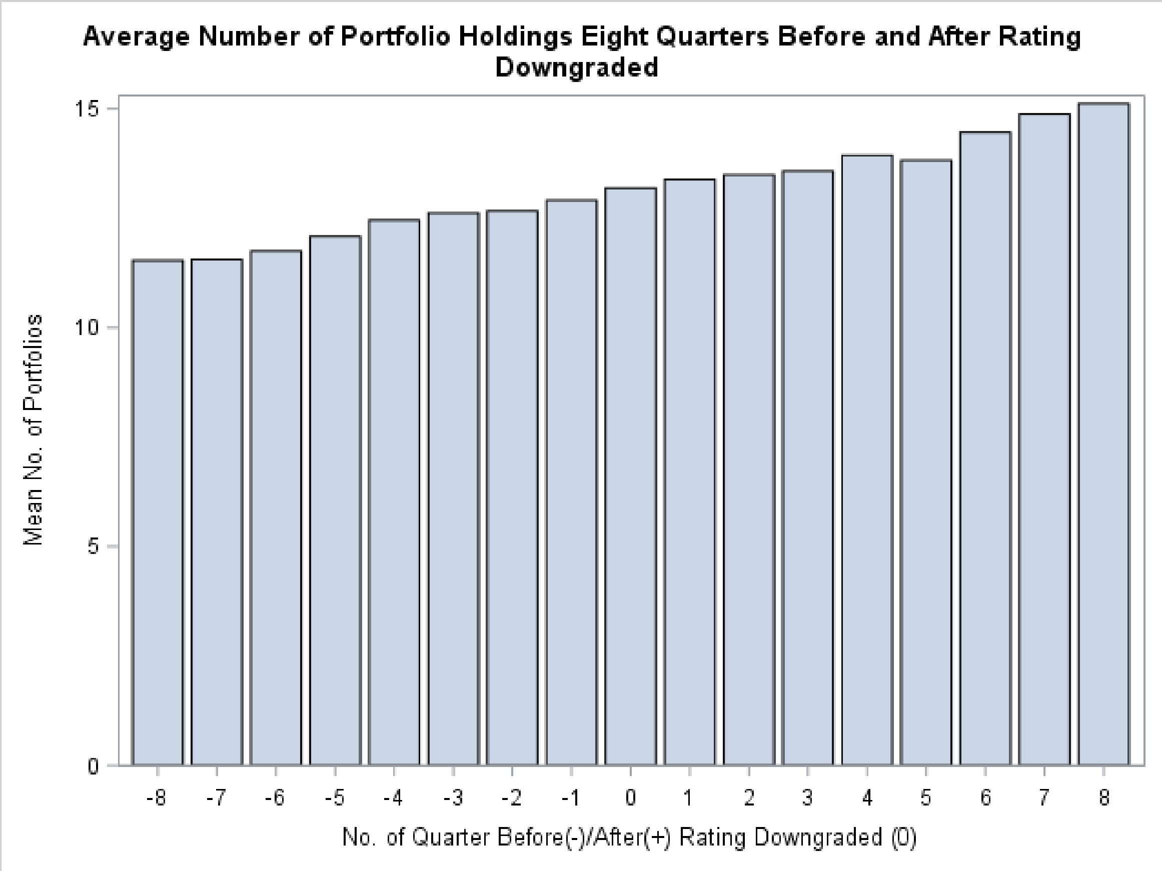

Figure 1.22: Average Number of Sell Transactions Eight Quarters Before and After Rating Upgraded

Figure 1.22 shows average number of sell transactions eight quarters before and after rating upgraded. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating upgraded. Zero means the quarter that firms were upgraded.

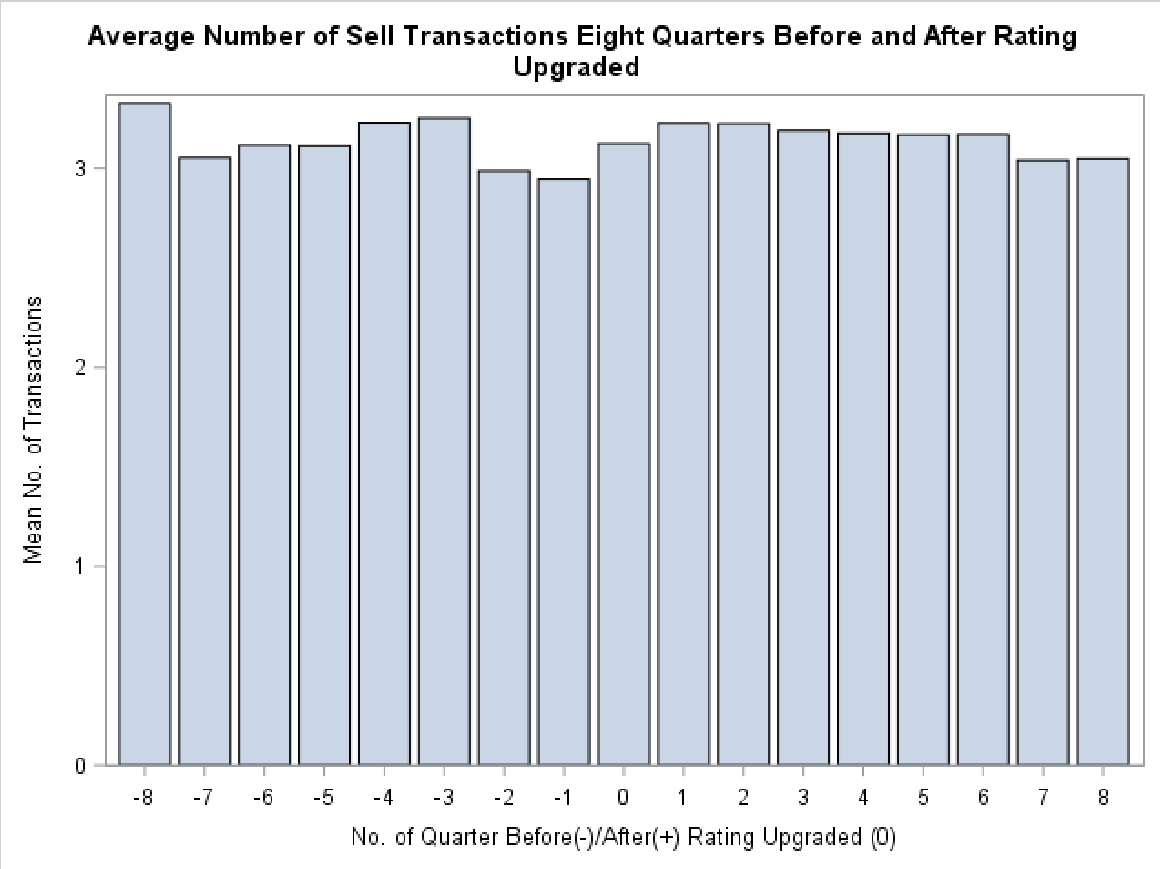

Figure 1.23: Average Number of Buy Transactions Eight Quarters Before and After Rating Upgraded

Figure 1.23 shows average number of buy transactions eight quarters before and after rating upgraded. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating upgraded. Zero means the quarter that firms were upgraded.

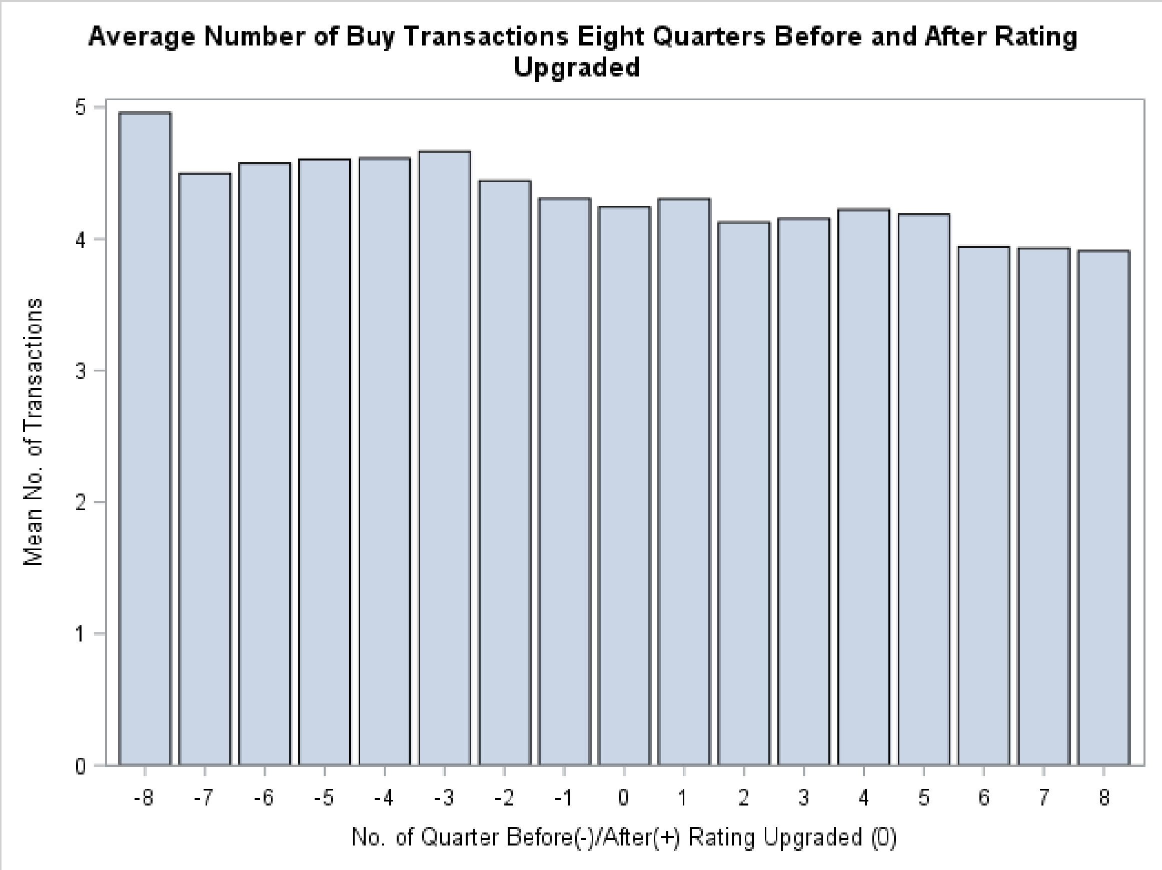

Figure 1.24: Average Number of Portfolio Holdings Eight Quarters Before and After Rating Upgraded

Figure 1.21 shows average number of portfolio holdings eight quarters before and after rating upgraded. The vertical axis shows mean number of portfolios and horizontal axis shows number of quarter before and after the rating upgraded. Zero means the quarter that firms were upgraded.

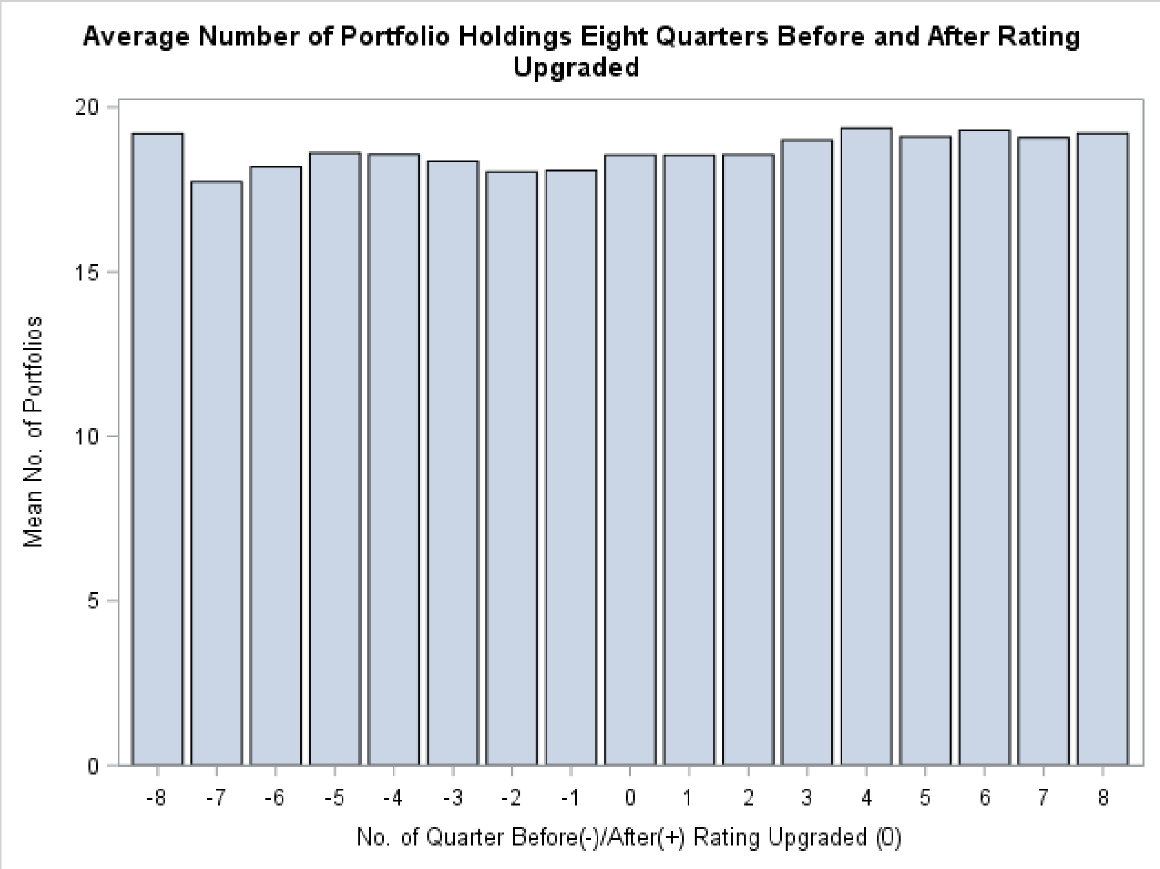

Figure 1.25: Average Number of Sell Transactions Eight Quarters Before and After Rating Upgraded from Non-Investment Grade to Investment Grade

Figure 1.25 shows average number of sell transactions eight quarters before and after rating upgraded from non-investment grade to investment grade. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating upgraded from non-investment grade to investment grade. Zero means the quarter that firms were upgraded to investment grade.

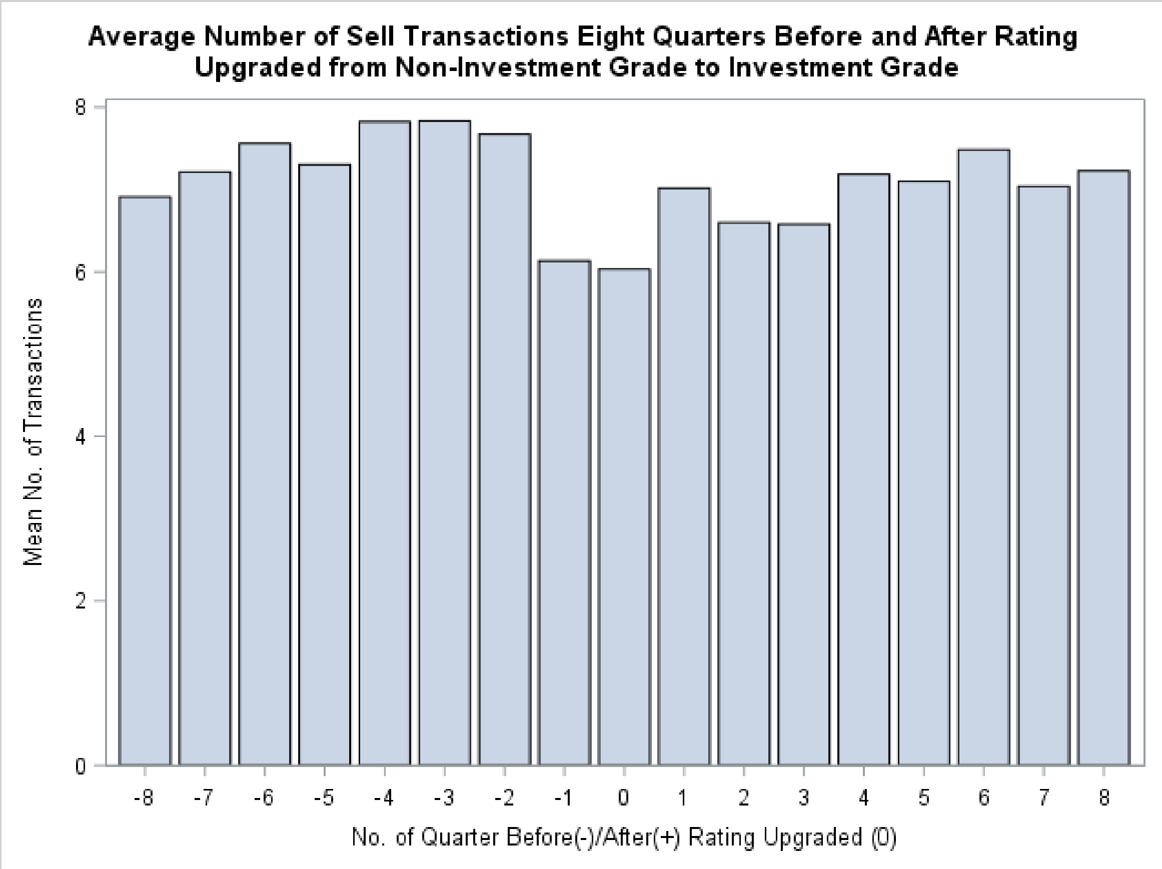

Figure 1.26: Average Number of Buy Transactions Eight Quarters Before and After Rating Upgraded from Non-Investment Grade to Investment Grade

Figure 1.26 shows average number of buy transactions eight quarters before and after rating upgraded from non-investment grade to investment grade. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating upgraded from non-investment grade to investment grade. Zero means the quarter that firms were upgraded to investment grade.

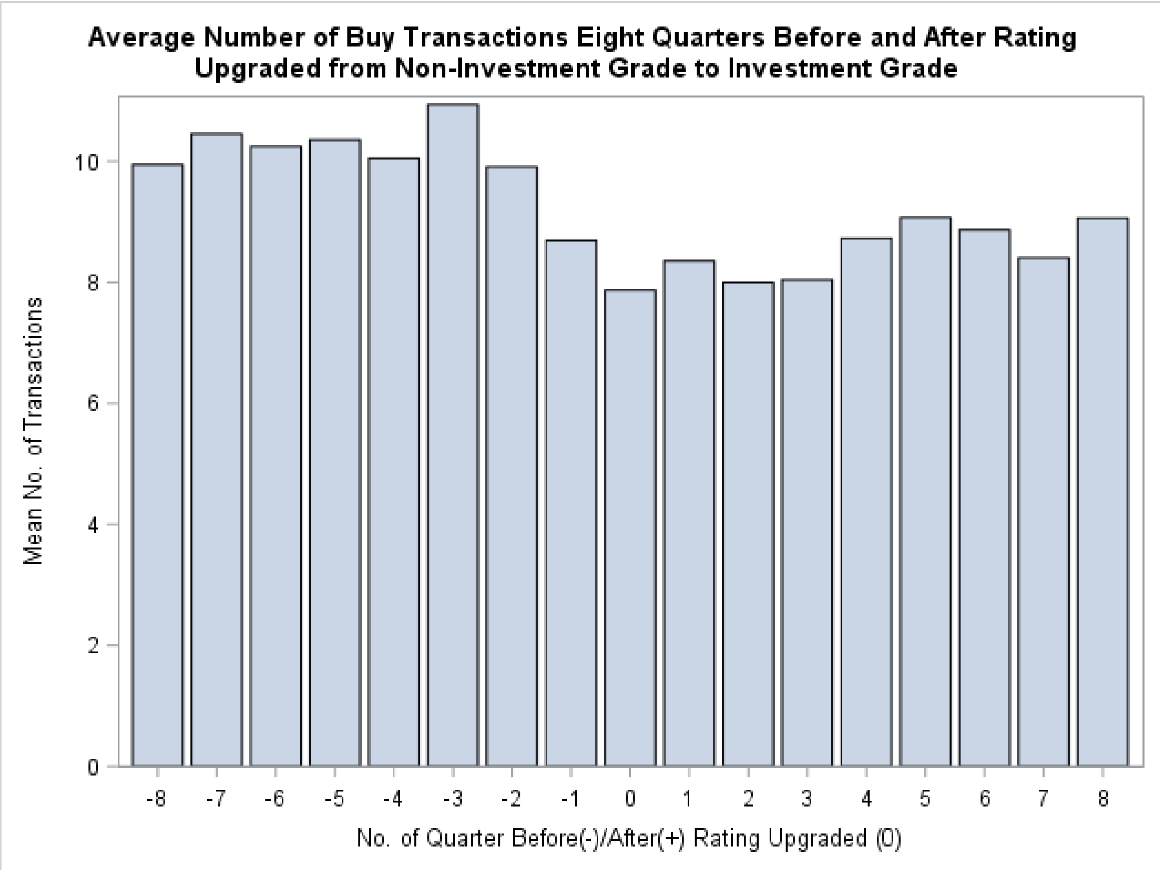

Figure 1.27: Average Number of Portfolio Holdings Eight Quarters Before and After Rating Upgraded from Non-Investment Grade to Investment Grade

Figure 1.27 shows average number of portfolio holdings eight quarters before and after rating upgraded from non-investment grade to investment grade. The vertical axis shows mean number of portfolio holdings and horizontal axis shows number of quarter before and after the rating upgraded from non-investment grade to investment grade. Zero means the quarter that firms were upgraded to investment grade.

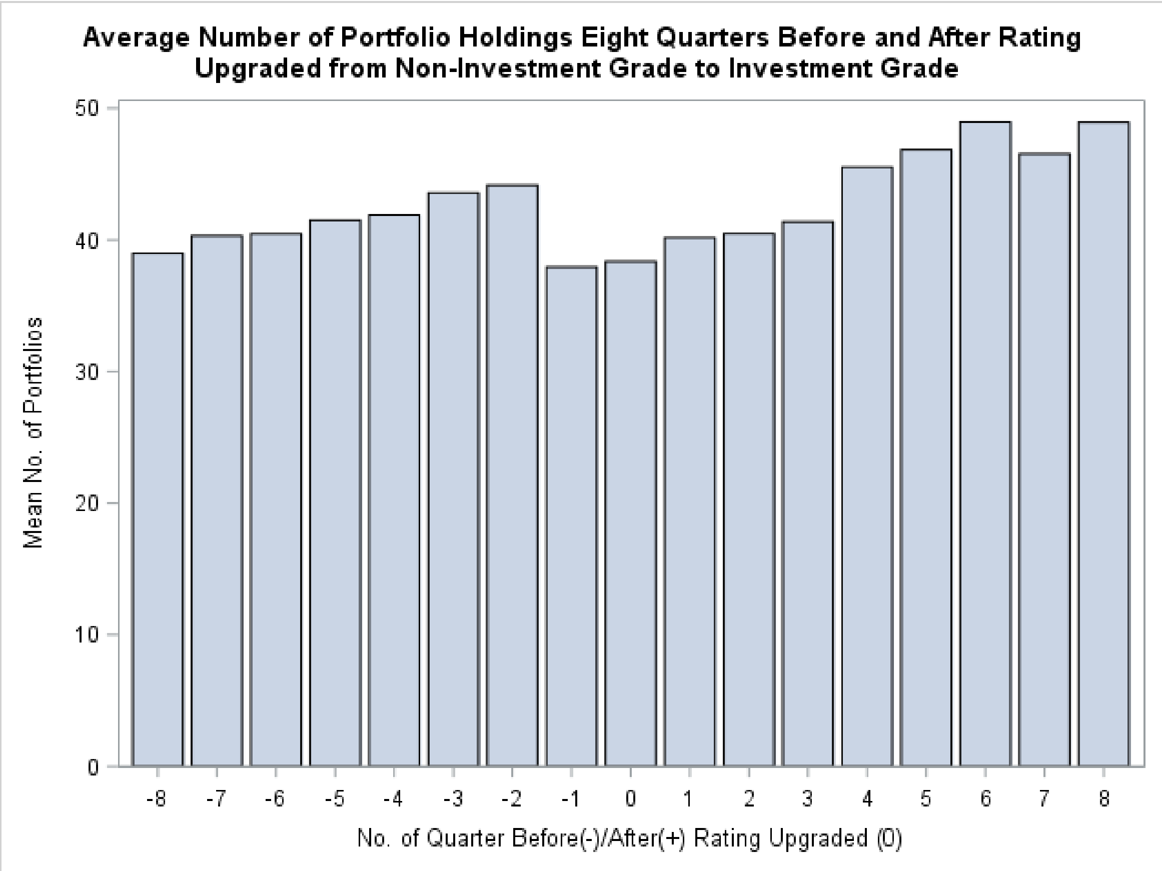

Figure 1.28: Total Value of Buy Transactions Eight Quarters Before and After Rating Upgraded from Non-Investment Grade to Investment Grade

Figure 1.28 shows total value of buy transactions eight quarters before and after rating upgraded from non-investment grade to investment grade. The vertical axis shows value in dollars and horizontal axis shows number of quarter before and after the rating upgraded from non-investment grade to investment grade. Zero means the quarter that firms were upgraded to investment grade.

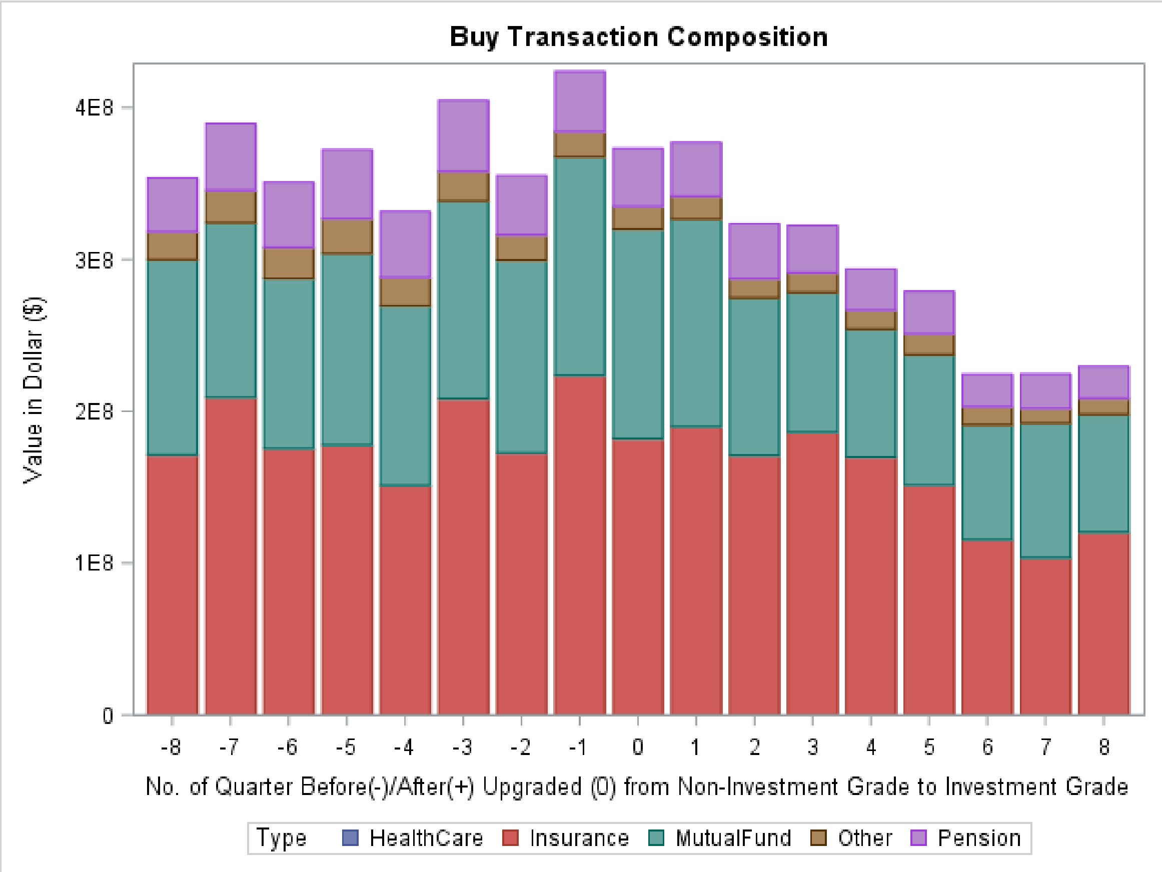

Figure 1.29: Total Value of Sell Transactions Eight Quarters Before and After Rating Upgraded from Non-Investment Grade to Investment Grade

Figure 1.29 shows total value of sell transactions eight quarters before and after rating upgraded from non-investment grade to investment grade. The vertical axis shows value in dollars and horizontal axis shows number of quarter before and after the rating upgraded from non-investment grade to investment grade. Zero means the quarter that firms were upgraded to investment grade.

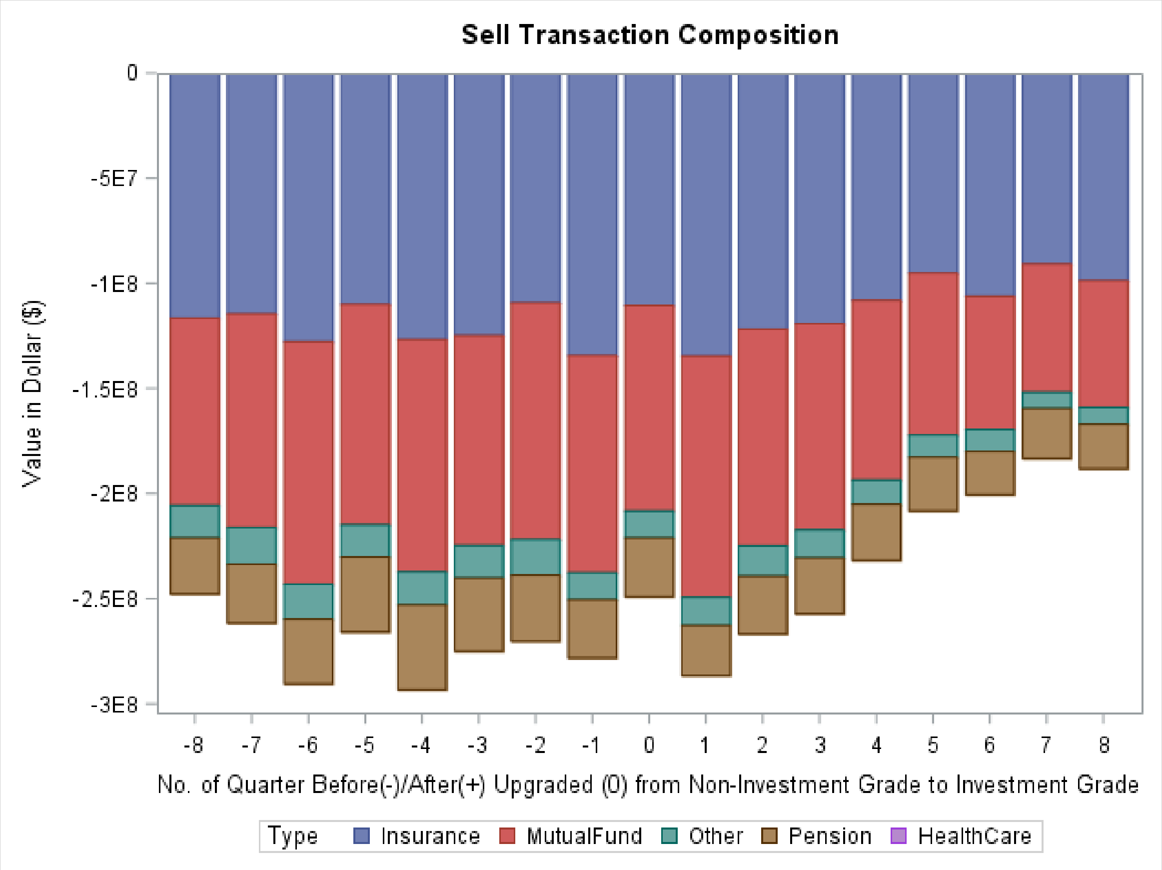

Figure 1.30: Average Number of Sell Transactions Eight Quarters Before and After Rating Downgraded from Investment Grade to Non-Investment Grade

Figure 1.30 shows average number of sell transactions eight quarters before and after rating downgraded from investment grade to non-investment grade. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating downgraded to non-investment grade. Zero means the quarter that firms were downgraded to non-investment grade.

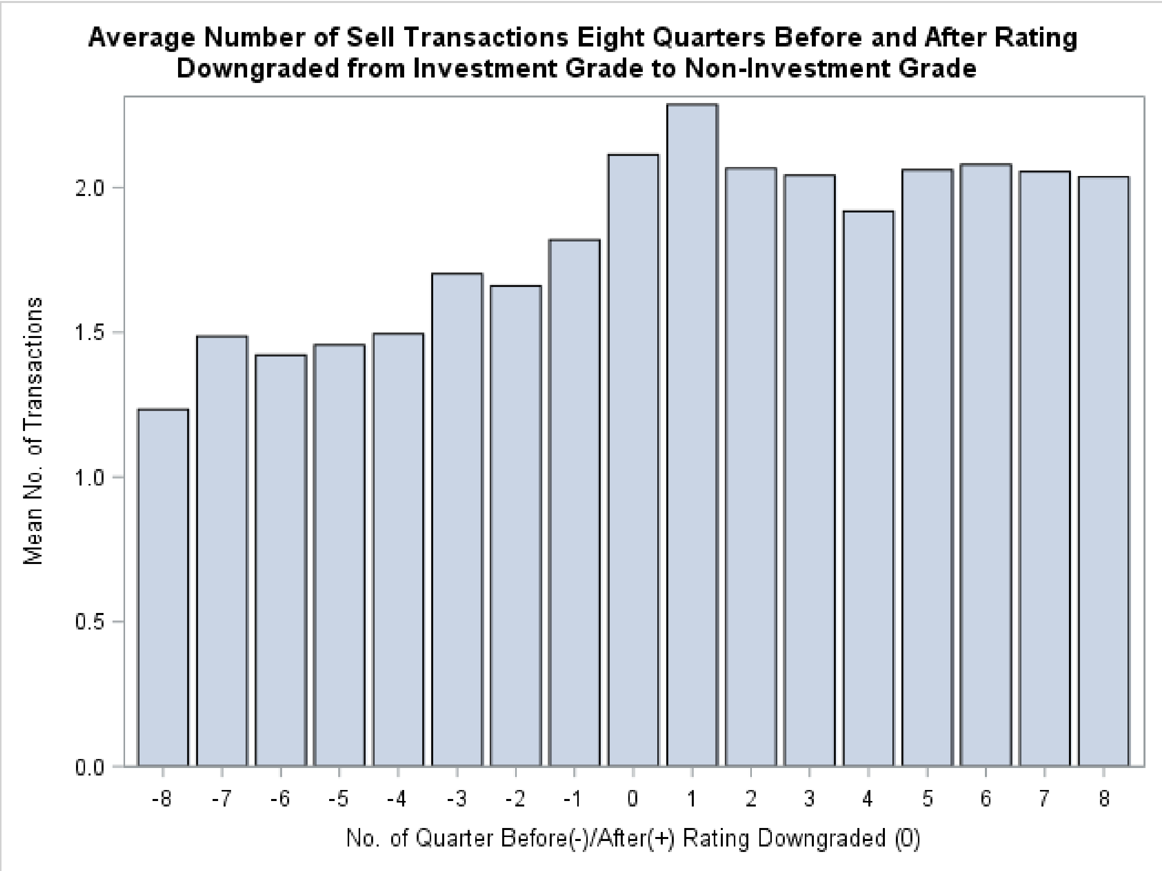

Figure 1.31: Average Number of Buy Transactions Eight Quarters Before and After Rating Downgraded from Investment Grade to Non-Investment Grade

Figure 1.31 shows average number of buy transactions eight quarters before and after rating downgraded from investment grade to non-investment grade. The vertical axis shows mean number of transactions and horizontal axis shows number of quarter before and after the rating downgraded to non-investment grade. Zero means the quarter that firms were downgraded to non-investment grade.

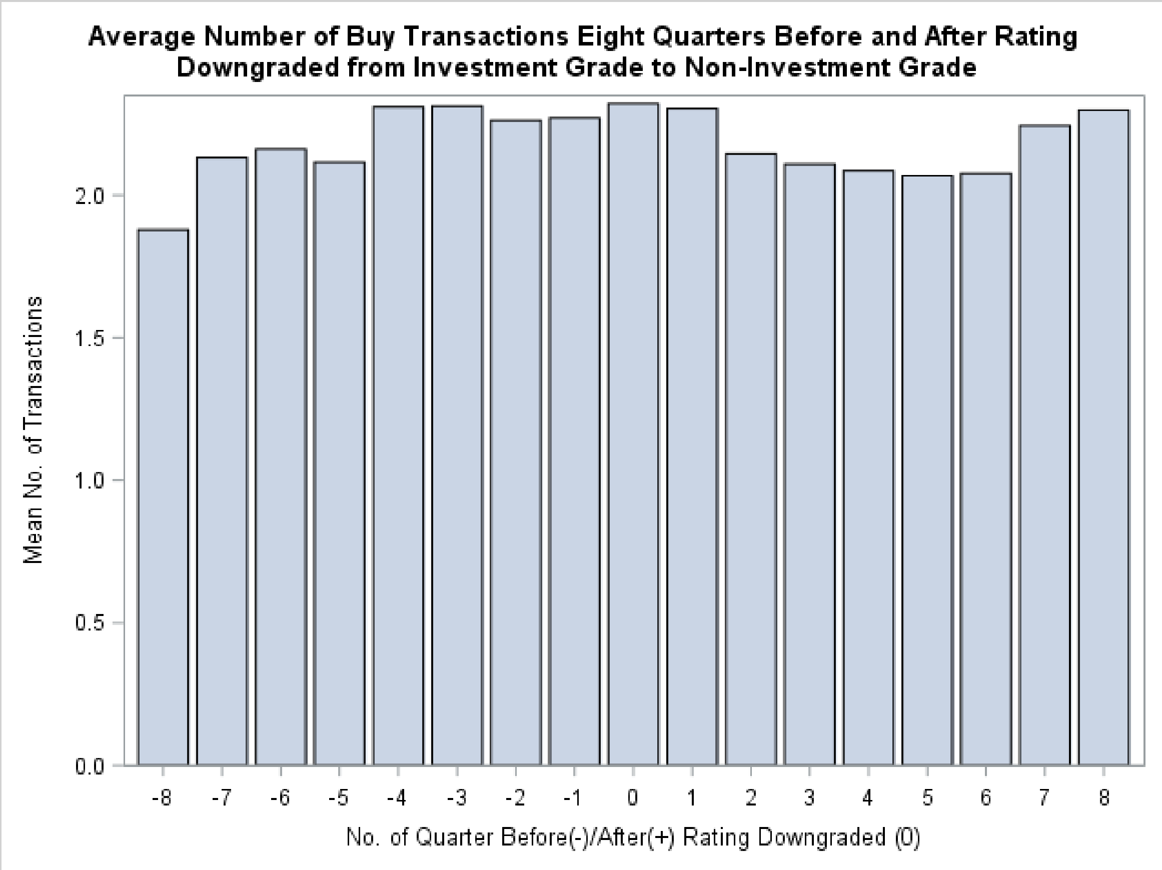

Figure 1.32: Average Number of Portfolio Holdings Eight Quarters Before and After Rating Downgraded from Investment Grade to Non-Investment Grade

Figure 1.32 shows average number of portfolio holdings eight quarters before and after rating downgraded from investment grade to non-investment grade. The vertical axis shows mean number of portfolio holdings and horizontal axis shows number of quarter before and after the rating downgraded to non-investment grade. Zero means the quarter that firms were downgraded to non-investment grade.

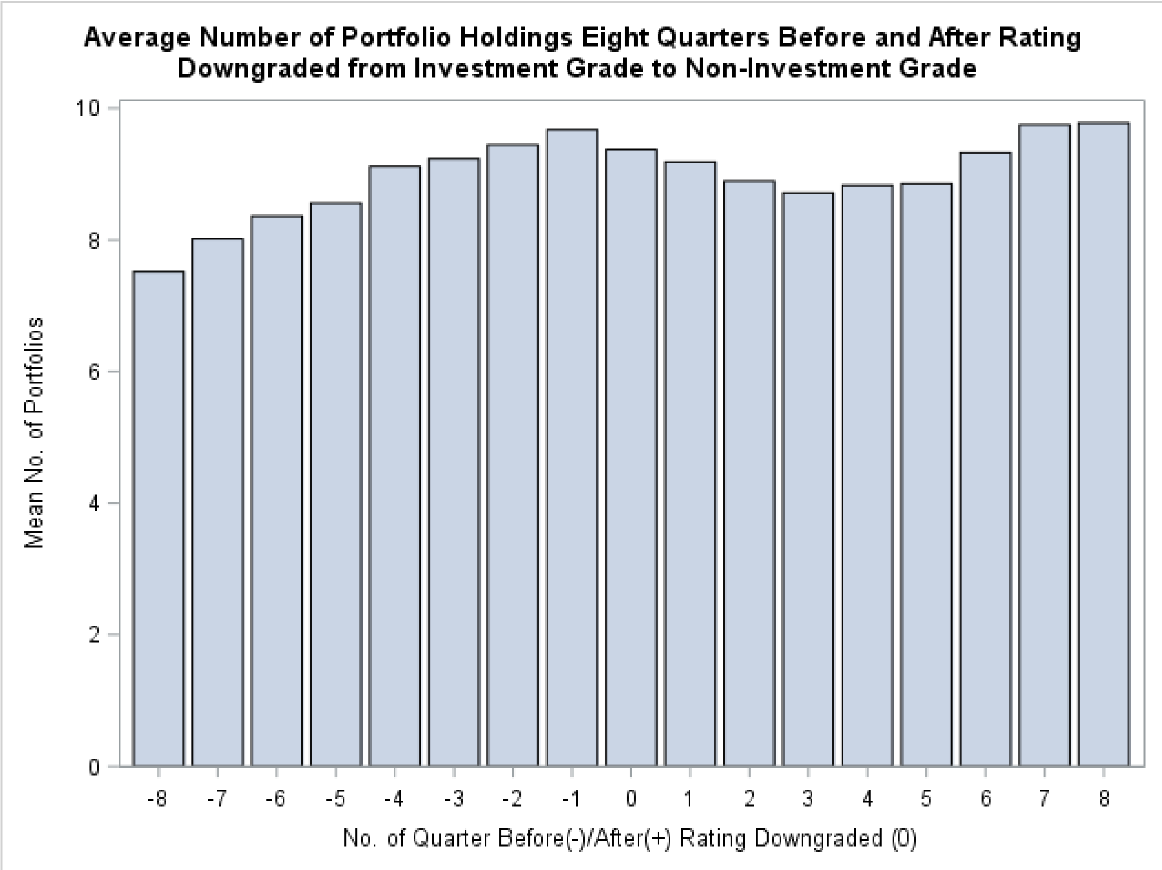

Figure 1.33: Total Value of Buy Transactions Eight Quarters Before and After Rating Downgraded from Investment Grade to Non-Investment Grade

Figure 1.33 shows total value of buy transactions eight quarters before and after rating downgraded from investment grade to non-investment grade. The vertical axis shows value in dollars and horizontal axis shows number of quarter before and after the rating downgraded from investment grade to non-investment grade. Zero means the quarter that firms were downgraded to non-investment grade.

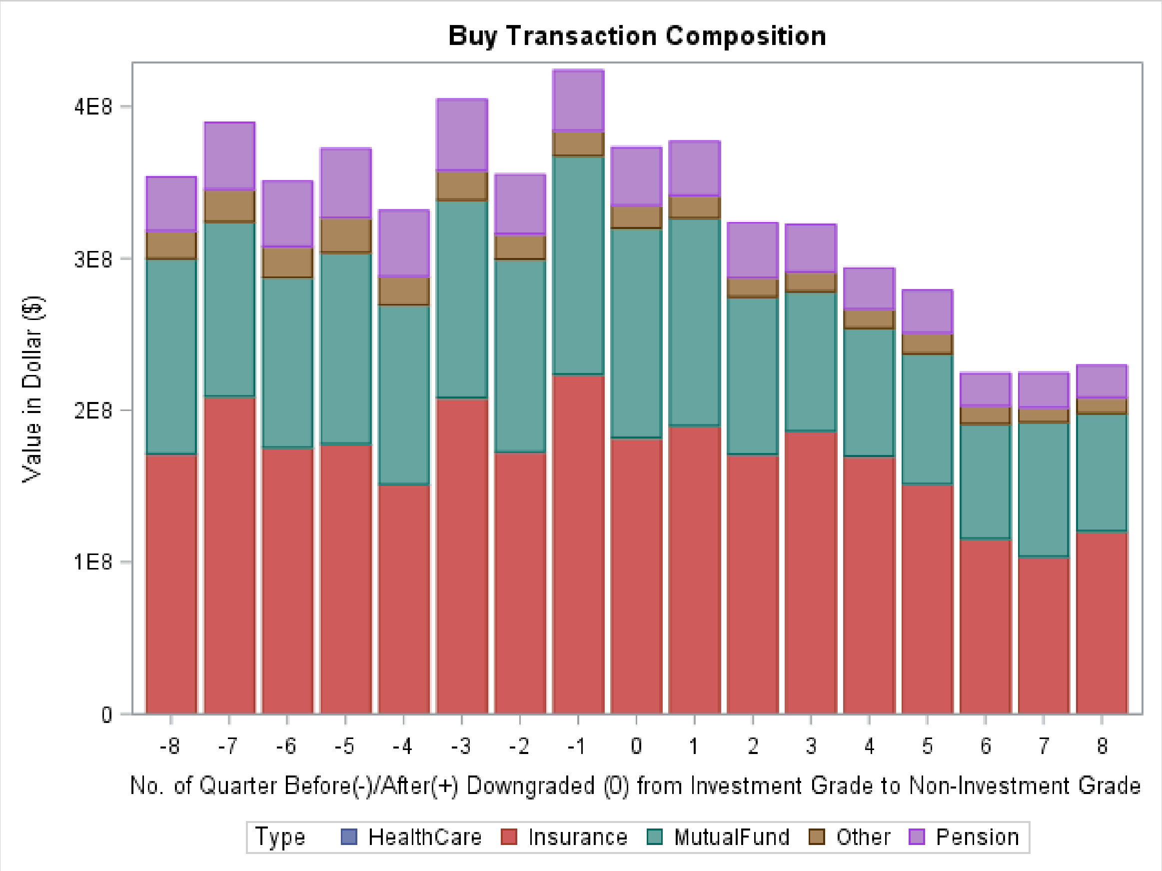

Figure 1.34: Total Value of Sell Transactions Eight Quarters Before and After Rating Downgraded from Investment Grade to Non-Investment Grade

Figure 1.34 shows total value of sell transactions eight quarters before and after rating downgraded from investment grade to non-investment grade. The vertical axis shows value in dollars and horizontal axis shows number of quarter before and after the rating downgraded from investment grade to non-investment grade. Zero means the quarter that firms were downgraded to non-investment grade.

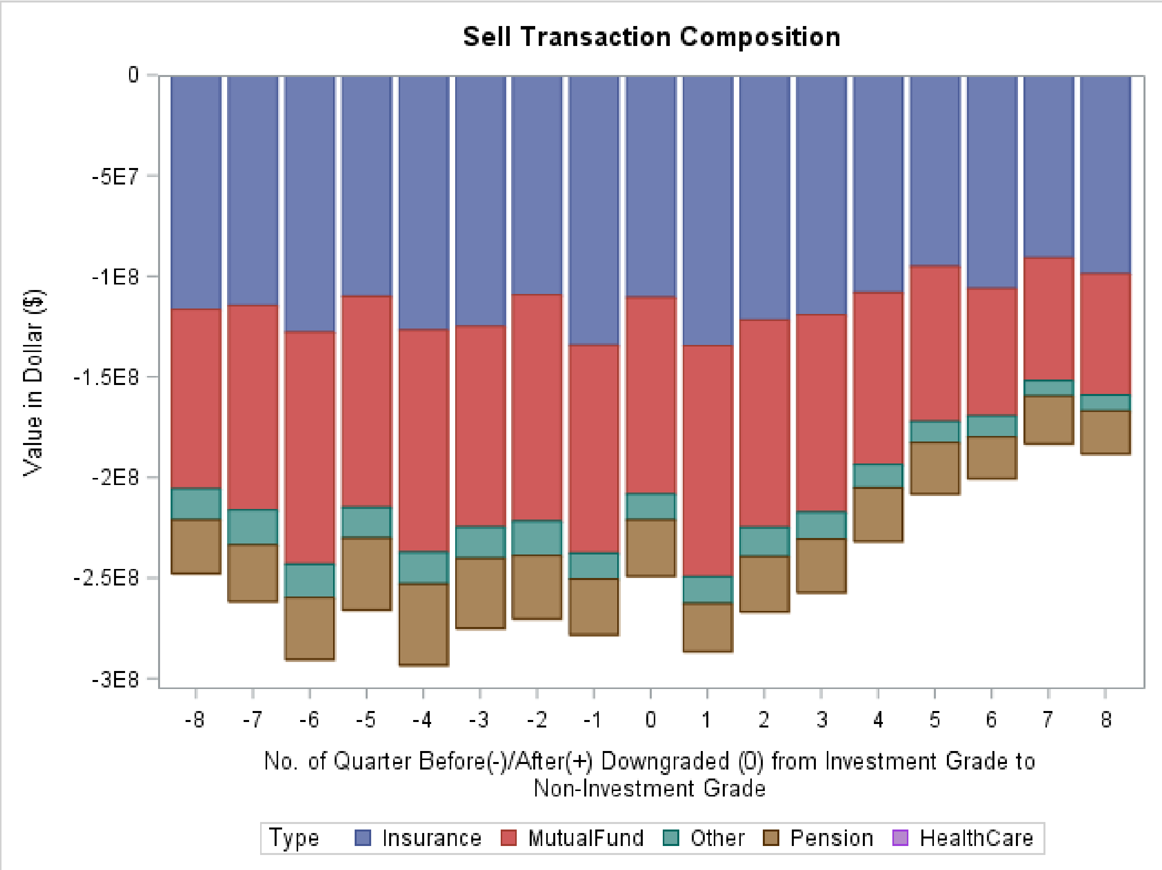

Figure 1.35: Average Number of Sell Transactions Eight Quarters Before and After Restatement

Figure 1.35 shows average number of sell transactions eight quarters before and after restatement

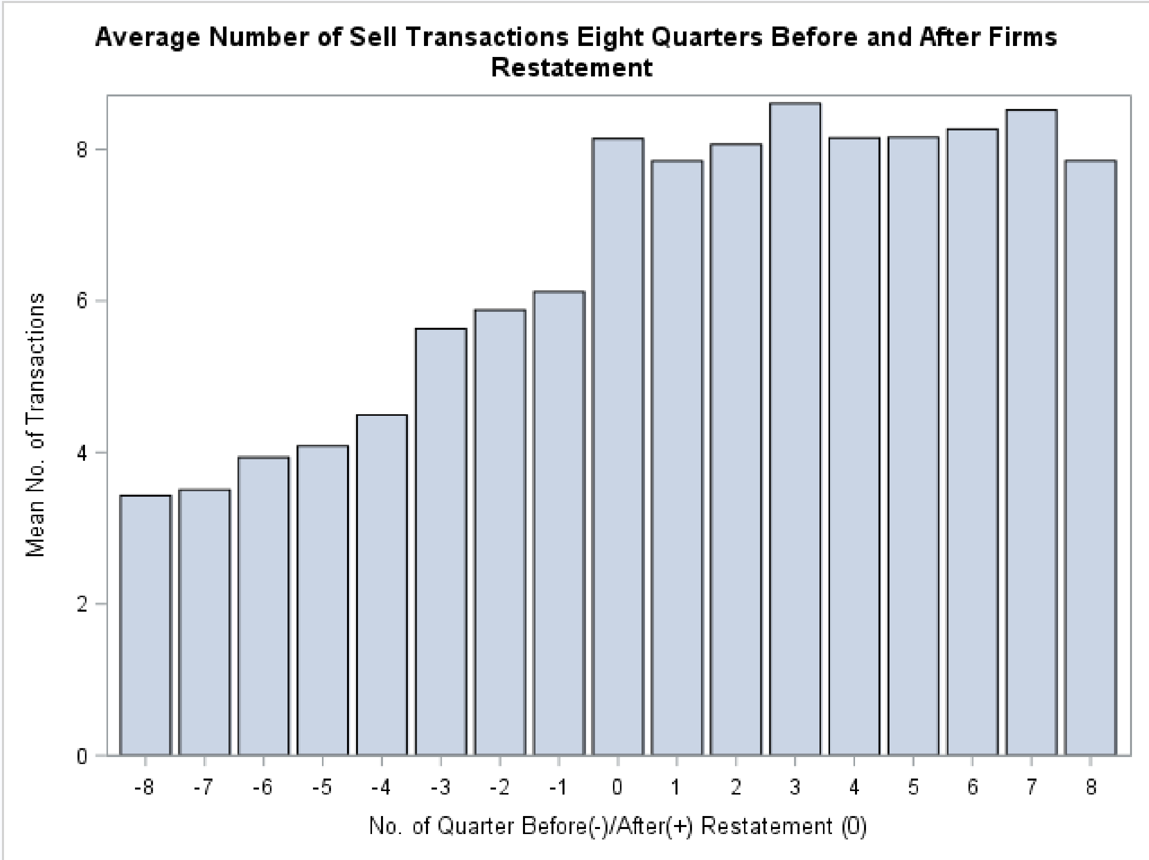

Figure 1.36: Average Number of Buy Transactions Eight Quarters Before and After Restatement

Figure 1.36 shows average number of buy transactions eight quarters before and after restatement

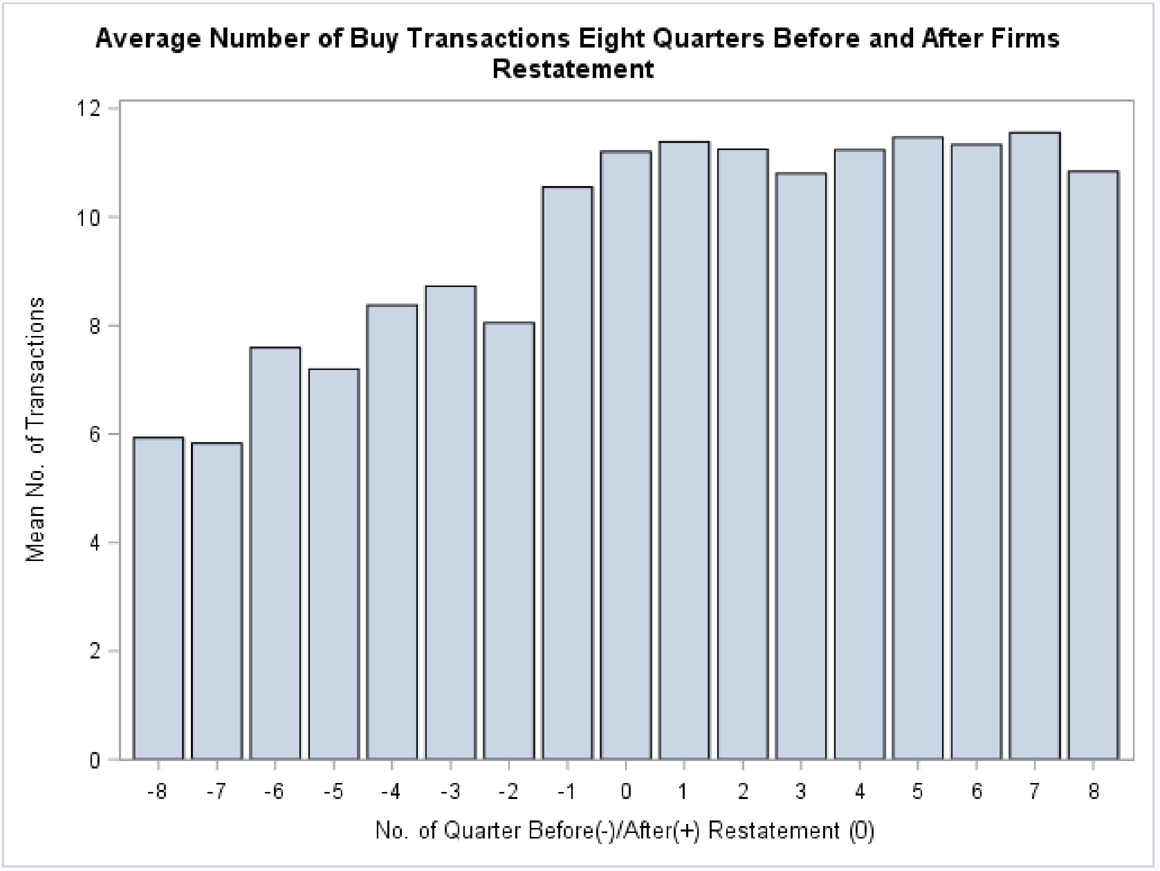

Figure 1.37: Average Number of Portfolio Holdings Eight Quarters Before and After Restatement

Figure 1.37 shows average number of portfolio holdings eight quarters before and after restatement

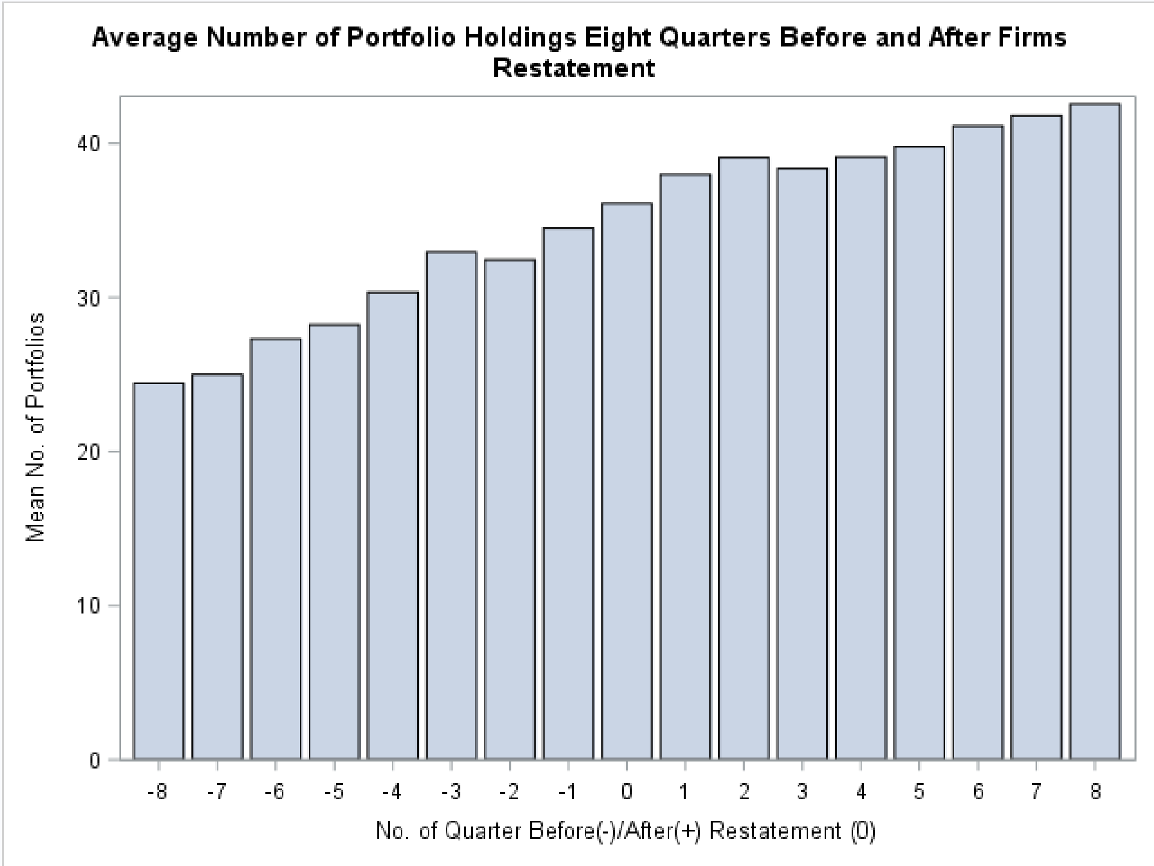

Figure 1.38: Composition of Sell Value from Different Types of Bondholder Eight Quarters Before and After Restatement

Figure 1.38 shows composition of sell value from different types of bondholder

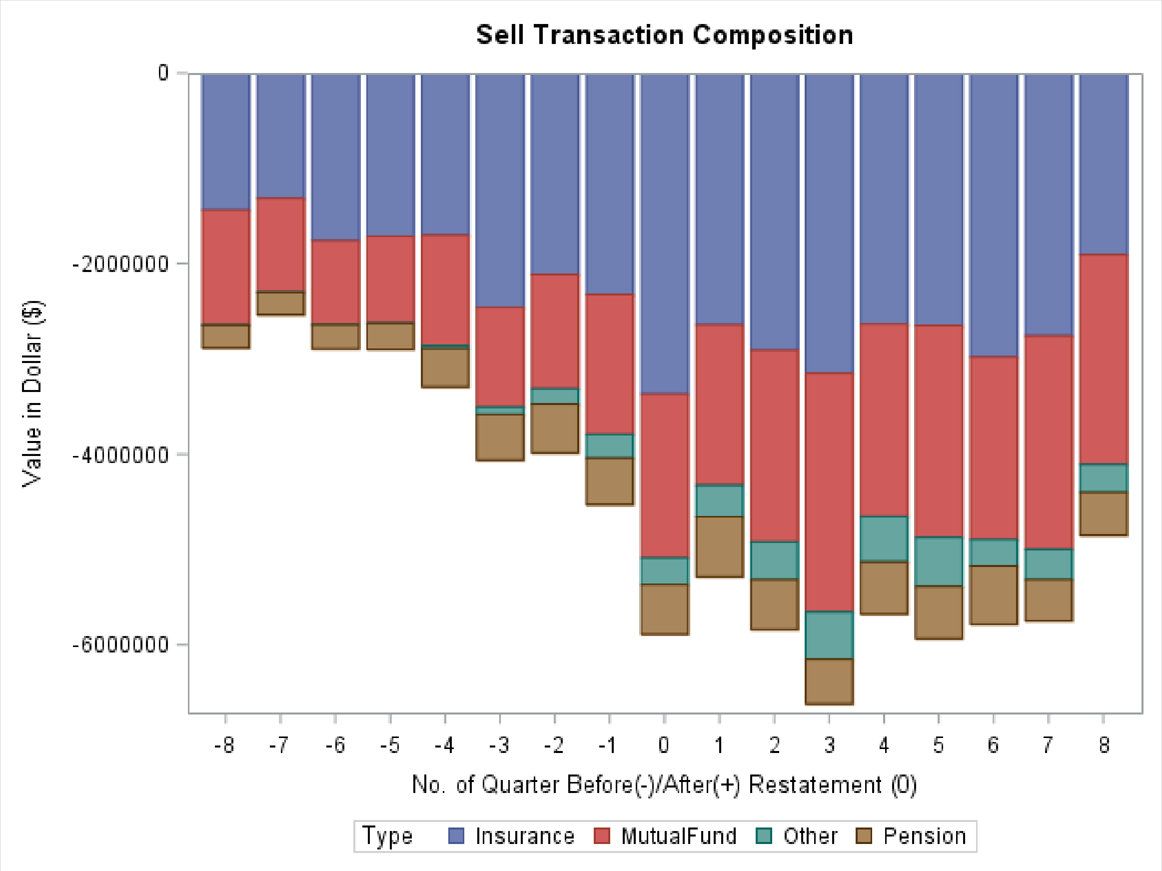

Figure 1.39: Composition of Buy Value from Different Types of Bondholder Eight Quarters Before and After Restatement

Figure 1.39 shows composition of buy value from different types of bondholder

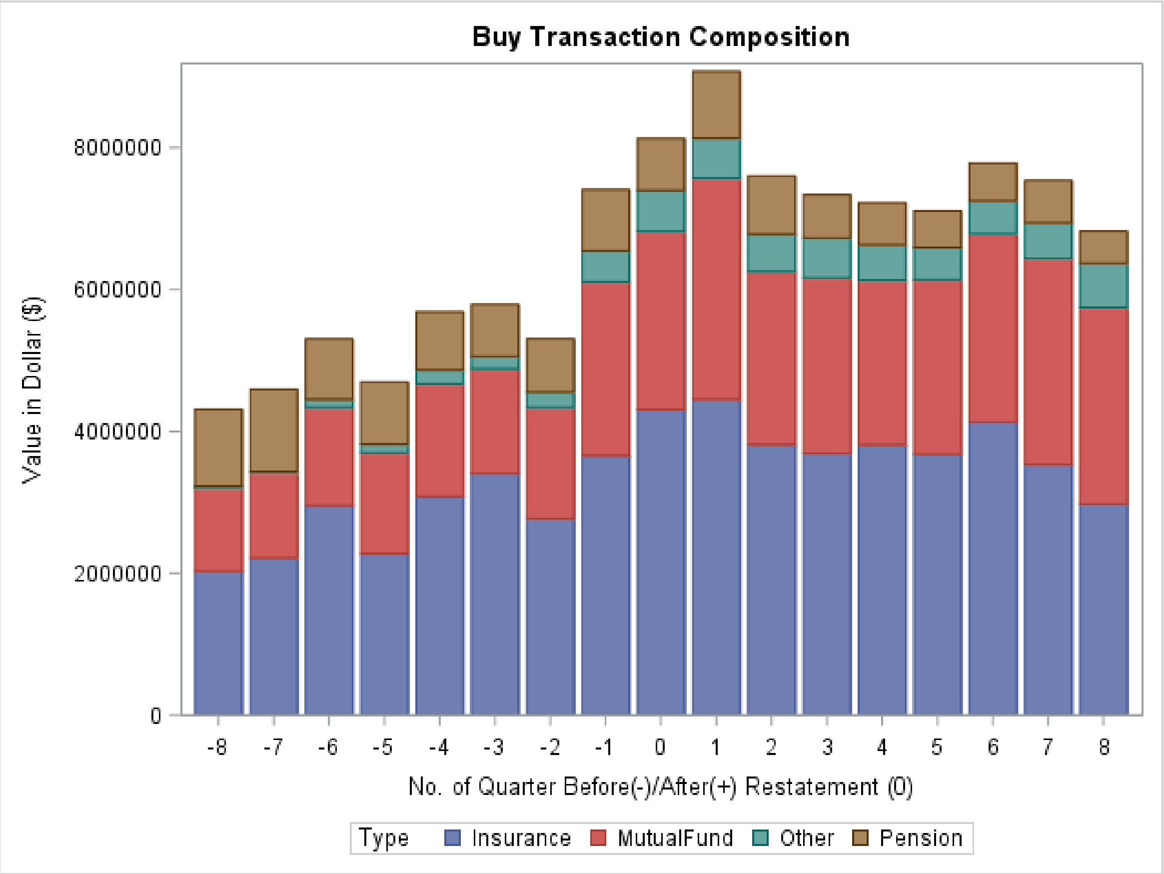

Figure 1.40: Monthly Federal Funds Rate from Jan 1, 2009 – Jan 1, 2019

Figure 1.40 shows monthly federal funds rate from Jan 1, 2009 to Jan 1, 2019. The data are retrieved from Federal Reserve Bank of St.Louis (FRED).

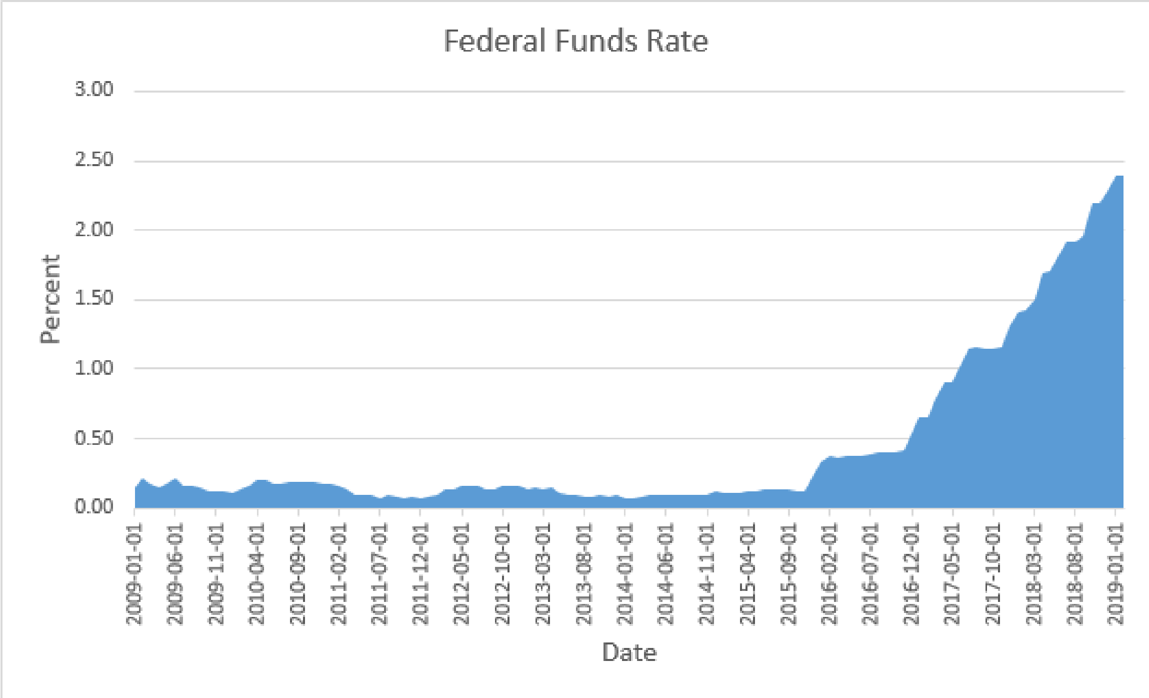

Table 1.1: A. Summary of Four Databases

	Data	Start	Transaction	Firm Characteristics	Redemption Data	Rating
1	SDC	1962/01		YES	YES	YES
2	FISDissues	1950/01		YES	YES	YES
3	FISDtransaction	1993/12	YES			
4	eMAXX	1998/01		YES	YES	YES
5	TRACE	2002/07	YES			

Table 1.2: B. Summary of Four Databases

	Data	UPcusip	no.issues	no.firms	Corporate	Agency	144A	Securitized product
1	SDC	YES	7K	3K	YES	YES	YES	YES
2	FISDissues		90k	8K	YES	YES	YES	YES
3	FISDtransaction		10k	3K	YES	YES	YES	YES
4	eMAXX		20k	6.5K	YES	YES	YES	
5	TRACE		20k	4K	YES	YES	YES	YES

Note: UPcusip = Ultimate Parent CUSIP, no.issue is for 8-digit CUSIP, no.firms is for 6-digit CUSIP

Table 1.3: Availability of General Electric Bonds Issued in Each Database and Their Overlaps

FLAG	Frequency	Percent
T	637	24.1
TFE	569	21.5
S	504	19
E	279	10.5
TE	267	10.1
FE	159	6
FTSE	66	2.5
F	65	2.5
FT	57	2.2
FTS	15	0.6
FS	10	0.4
TS	10	0.4
SE	5	0.2
TSE	3	0.1
FSE	2	0.1
Total	2648	100

Table 1.4: Availability of General Electric Bonds Issued in Each Database

Variable	N	Mean	Std Dev	Minimum	Maximum
FISDflag	943	1	0	1	1
TRACEflag	1624	1	0	1	1
SDCflag	615	1	0	1	1
emaxxflag	1350	1	0	1	1

Table 1.5: Summary Statistics of Number of Transaction of GE Bonds (8-digit CUSIP)

N	Min	Max	Mean	Median	Std Dev	25pct	75pct	95pct	99pct
1,637	1	150,411	2,849	530	10,691	169	1,376	10,786	48,010

Table 1.6: Top 10 GE Bond with Highest Transactions

	ID	Ticker	CUSIP	Issuer	No. Transactions
1	GE.AAD	GE	36962GYY4		150,411
2	GE.ADF	GE	369604AY9	GE CO	149,047
3	GE.HEE	GE	369604BC6		140,087
4	GE.HFA	GE	36962G3U6	GE MEDIUM TERM NTS BO	107,384
5	GE.WB	GE	36962GXS8		103,281
6	GE.HDM	GE	36962G3H5	GE MEDIUM TERM NTS BO	101,792
7	GE.HEH	GE	36962G3P7	GE MEDIUM TERM NTS BO	93,904
8	GNW.IS	GNW	37247DAK2		89,086
9	GNW.GD	GNW	37247DAE6		81,776
10	GE.HDS	GE	36962G3K8	GE Capital	79,589

Table 1.7: GE Transactions before the Offering Date

Transaction date	CUSIP	PRICE	Purchaser	Par ($)
20020214	36962GYY4	104.714		500,000
20020331	36962GYY4	104.815	NBC	500,000
20020530	36962GYY4	99.249		1,000,000
20020531	36962GYY4	99.249		69,500,000
20020531	36962GYY4	99.249		2,000,000

Table 1.8: GE Transactions after the Offering Date

Transaction date	CUSIP	PRICE	Purchaser	Par ($)
20120615	36962GYY4	100	MATURITY	4,000,000
20120615	36962GYY4	100	MATURITY	500,000
20120615	36962GYY4	100	MATURITY	200,000
20120626	36962GYY4	100	MATURITY	55,000
20120630	36962GYY4	100	MATURITY	150,000

Table 1.9: Summary Statistics of Daily Bonds Traded for GE:AAD

Mean	Median	Minimum	Maximum	1st Pctl	5th Pctl	75th Pctl	95th Pctl
60	43	1	1237	11	20	59	145

Table 1.10: Number of Bondholders for GE:AAD

YEAR	QTR	No. of holders
2006	1	350
2006	2	350
2006	3	332
2006	4	349
2007	1	348
2007	2	368
2007	3	360
2007	4	360
2008	1	357
2008	2	362
2008	3	379
2008	4	379
2009	1	380
2009	2	380
2009	3	345
2009	4	336
2010	1	335
2010	2	336
2010	3	342
2010	4	334
2011	1	333
2011	2	323
2011	3	261
2011	4	226
2012	1	215

Table 1.11: Herfindahl Index for GE:AAD

YEAR	QTR	HFI
2006	1	0.024
2006	2	0.022
2006	3	0.023
2006	4	0.021
2007	1	0.021
2007	2	0.023
2007	3	0.022
2007	4	0.023
2008	1	0.023
2008	2	0.023
2008	3	0.022
2008	4	0.023
2009	1	0.023
2009	2	0.023
2009	3	0.025
2009	4	0.026
2010	1	0.026
2010	2	0.026
2010	3	0.026
2010	4	0.025
2011	1	0.026
2011	2	0.033
2011	3	0.036
2011	4	0.042
2012	1	0.046

Table 1.12: Top Five Largest Bondholder for GE:AAD

Note: AXA = AXA Equitable Life Insurance Company, ING = ING USA Annuity & Life Insurance Co, Hancock = John Hancock Life Insurance Co, Jackson = Jackson National Life Insurance Co, TIAA = Teachers Insurance & Ann Assn of America, American Life = American Life Insurance Co, iShare Barclays = iShares Barclays 1-3 Year Credit Bond Fund, Woodmen = Woodmen of the World Life Insurance Society, = Fidelity Intermediate Bond Fund, T Rowe = T Rowe Price New Income Fund, Vanguard Total = Vanguard Total Bond Market Index Fund, Thrivent = Thrivent Financial for Lutherans, Transamerica = Transamerica Occidental Life Insurance Co, Munich = Munich American Reassurance Co, Vanguard ST = Vanguard Short-Term Investment-Grade Fund

YEAR	QTR	1	2	3	4	5
2006	1	AXA	Jackson	Hancock	Fidelity	Thrivent
2006	2	AXA	Jackson	Hancock	Fidelity	Transamerica
2006	3	AXA	Jackson	Hancock	Fidelity	Transamerica
2006	4	AXA	Jackson	Hancock	Fidelity	TIAA
2007	1	ING	AXA	Jackson	Hancock	TIAA
2007	2	AXA	Jackson	ING	Hancock	T Rowe
2007	3	AXA	ING	Hancock	Jackson	TIAA
2007	4	AXA	ING	Hancock	Jackson	Munich
2008	1	AXA	Hancock	ING	Jackson	American Life
2008	2	AXA	Hancock	TIAA	ING	Jackson
2008	3	AXA	Hancock	TIAA	Jackson	American Life
2008	4	Hancock	TIAA	Jackson	American Life	Woodmen
2009	1	Hancock	TIAA	Jackson	American Life	Woodmen
2009	2	Hancock	TIAA	American Life	Woodmen	Vanguard ST
2009	3	Hancock	American Life	Woodmen	TIAA	Vanguard ST
2009	4	Hancock	American Life	iShares Barclays	T Rowe	Woodmen
2010	1	Hancock	American Life	iShares Barclays	Woodmen	TIAA
2010	2	Hancock	iShares Barclays	American Life	Vanguard Total	Woodmen
2010	3	Hancock	iShares Barclays	American Life	Vanguard Total	Woodmen
2010	4	Hancock	iShares Barclays	American Life	Vanguard Total	Woodmen
2011	1	Hancock	iShares Barclays	American Life	Woodmen	TIAA
2011	2	Hancock	iShares Barclays	American Life	Woodmen	TIAA
2011	3	Hancock	American Life	Woodmen	TIAA	AXA
2011	4	Hancock	American Life	Woodmen	TIAA	AXA
2012	1	Hancock	American Life	Woodmen	TIAA	AXA

Table 1.13: Percentage Amount of Bond Held for GE:AAD by Top Five Largest Holders

YEAR	QTR	1	2	3	4	5
2006	1	0.07	0.06	0.06	0.04	0.04
2006	2	0.06	0.06	0.06	0.04	0.03
2006	3	0.06	0.06	0.06	0.04	0.03
2006	4	0.06	0.06	0.05	0.04	0.03
2007	1	0.06	0.06	0.05	0.05	0.03
2007	2	0.06	0.06	0.05	0.05	0.03
2007	3	0.06	0.06	0.06	0.04	0.03
2007	4	0.06	0.06	0.06	0.04	0.03
2008	1	0.07	0.06	0.05	0.04	0.04
2008	2	0.06	0.06	0.05	0.05	0.04
2008	3	0.07	0.06	0.05	0.04	0.04
2008	4	0.07	0.06	0.05	0.04	0.03
2009	1	0.07	0.06	0.05	0.04	0.03
2009	2	0.07	0.06	0.04	0.03	0.03
2009	3	0.07	0.05	0.04	0.04	0.04
2009	4	0.08	0.05	0.04	0.04	0.03
2010	1	0.08	0.05	0.05	0.04	0.04
2010	2	0.07	0.05	0.05	0.04	0.04
2010	3	0.08	0.05	0.05	0.04	0.04
2010	4	0.08	0.05	0.05	0.04	0.04
2011	1	0.08	0.05	0.05	0.04	0.04
2011	2	0.10	0.06	0.06	0.05	0.05
2011	3	0.11	0.07	0.05	0.05	0.05
2011	4	0.13	0.07	0.06	0.06	0.06
2012	1	0.13	0.07	0.06	0.06	0.06

Table 1.14: Coupon Structure

Obs	Coupon Structure	Count	Percent	Cumulative Percent
1	Fixed Rate	163540	81.8711	81.871
2	Floating Rate	31396	15.7174	97.589
3	Zero Coupon	4190	2.0976	99.686
4	Step-Up Rate	518	0.2593	99.945
5	Stripped Cpn (IO/PO)	108	0.0541	99.999
6	Inverse Floating	1	0.0005	100

Table 1.15: Summary of Coupon Type (%)

		FIXD	FLTG	ZERO	STEP	STRP	N/A
All	All data	79.1	15.5	3.1	0.3	0.1	1.9
	US	82.7	12.6	1.8	0.3	0.1	2.5
	Non-Fin US	87.0	8.0	1.4	0.3	0.0	3.3
	Fin US	78.4	17.3	2.3	0.3	0.1	1.7
	US insruance	85.0	11.3	0.9	0.1	0.3	2.4
Private	All data	75.8	16.8	2.1	0.3	0.0	5.0
	US	79.2	12.1	2.4	0.3	0.0	5.9
	Non-Fin US	80.7	10.7	1.7	0.3		6.6
	Fin US	76.9	14.3	3.6	0.3	0.0	4.8
	US insruance	83.3	10.4		0.1	1.2	5.0
144A	All data	68.3	28.7	1.8	0.5	0.0	0.7
	US	76.3	20.2	2.1	0.5	0.0	0.9
	Non-Fin US	89.3	6.7	2.4	0.7		0.9
	Fin US	62.8	34.2	1.8	0.2	0.0	0.9
	US insruance	80.0	19.1	0.3	0.3		0.3

Table 1.16: 144A Bond Issuance Count and Percentage by Year

Year	Freq.	Percent	Cum. Freq.	Cum. Percent
1930	1	0.0	1	0.0
1970	3	0.0	4	0.0
1971	1	0.0	5	0.0
1983	1	0.0	6	0.0
1985	1	0.0	7	0.0
1986	1	0.0	8	0.0
1990	70	0.3	78	0.4
1991	28	0.1	106	0.5
1992	21	0.1	127	0.6
1993	83	0.4	210	1.0
1994	73	0.3	283	1.3
1995	183	0.9	466	2.2
1996	333	1.6	799	3.7
1997	897	4.2	1696	7.9
1998	988	4.6	2684	12.5
1999	651	3.0	3335	15.6
2000	474	2.2	3809	17.8
2001	737	3.4	4546	21.2
2002	586	2.7	5132	24.0
2003	1102	5.1	6234	29.1
2004	1236	5.8	7470	34.9
2005	1167	5.5	8637	40.3
2006	2035	9.5	10672	49.8
2007	1939	9.1	12611	58.9
2008	591	2.8	13202	61.6
2009	982	4.6	14184	66.2
2010	1874	8.8	16058	75.0
2011	1536	7.2	17594	82.1
2012	2249	10.5	19843	92.6
2013	1581	7.4	21424	100.0

Table 1.17: Currency of Bond Issued

Obs	Currency	COUNT	PERCENT	CUM. PERCENT
1	USD	153707	76.9146	76.915
2	EUR	9974	4.991	81.906
3	JPY	8063	4.0347	85.94
4	CAD	3939	1.9711	87.911
5	GBP	3482	1.7424	89.654
6	INR	3285	1.6438	91.298
7	KRW	3019	1.5107	92.808
8	CNY	1980	0.9908	93.799
9	AUD	1796	0.8987	94.698
10	TWD	1606	0.8036	95.501
11	ZAR	1200	0.6005	96.102
12	MXN	1071	0.5359	96.638
13	HKD	781	0.3908	97.029
14	SGD	736	0.3683	97.397
15	BRL	669	0.3348	97.732
16	MYR	616	0.3082	98.04
17	CLP	512	0.2562	98.296
18	THB	399	0.1997	98.496
19	CHF	389	0.1947	98.69
20	SEK	304	0.1521	98.843

Table 1.18: Collateral

Obs	Collateral code description	COUNT	PCT	CUM SUM PCT
1	General Corporate Obligation	199869	99.997	99.997
2	Single Family Mortgage Loans	2	0.001	99.998
3	Education (Primary/Secondary)	1	0.0005	99.998
4	FHLMC Gold (Cooperative Share Mortgages)	1	0.0005	99.999
5	Non-U.S. Local Tax/User Fee	1	0.0005	99.999
6	Undefined	1	0.0005	100

Table 1.19: Pledge

Obs	Pledge code description	COUNT	PERCENT	CUM SUM PERCENT
1	Note/Bond	127184	63.6318	63.632
2	Medium Term Notes	40095	20.06	83.692
3	Certificate of Deposit	6822	3.4131	87.105
4	Convertible Bonds/Notes	6125	3.0644	90.169
5	Debenture (Senior Lien)	6114	3.0589	93.228
6	Lease/Loan	4892	2.4475	95.676
7	Mortgage (First)	2723	1.3624	97.038
8	Equipment Trust Certificates	2083	1.0422	98.08
9	Equity Linked Note	894	0.4473	98.528
10	Debenture (Sub/Junior Lien)	858	0.4293	98.957
11	Warrants	798	0.3992	99.356
12	Trust Preferred	620	0.3102	99.666
13	Derivative	387	0.1936	99.86
14	Pay-In-Kind	116	0.058	99.918
15	Commercial Paper	72	0.036	99.954
16	Dividend Rights Certificates	48	0.024	99.978
17	Mortgage (Second)	20	0.01	99.988
18	Bankers Acceptances	15	0.0075	99.995
19	Participation/Pass-Thru Certificate	3	0.0015	99.997
20	Preferred (Par Based)	2	0.001	99.998
21	Collateralized Loan Obligation	1	0.0005	99.998
22	Note - Grant Anticipation	1	0.0005	99.999
23	Note - Promissory	1	0.0005	99.999
24	Rev Bond (Subordinated/Junior Lien)	1	0.0005	100

Table 1.20: Summary of Proportion of Private Placement Over Time

YEAR	YES	NO
1999	0.41	0.59
2000	0.39	0.61
2001	0.38	0.62
2002	0.37	0.63
2003	0.35	0.65
2004	0.35	0.65
2005	0.33	0.67
2006	0.33	0.67
2007	0.34	0.66
2008	0.33	0.67
2009	0.31	0.69
2010	0.28	0.72
2011	0.27	0.73
2012	0.27	0.73
2013	0.30	0.70

Table 1.21: Mean and Median Amount Issued ($'000) for Private Placement Firms

	Private Placement			
	Yes	No	Yes	No
YEAR	Median	Median	Mean	Mean
1999	150,000	35,000	195,855	91,888
2000	154,100	54,842	233,269	131,628
2001	150,000	71,960	216,274	126,852
2002	100,000	55,167	129,424	112,542
2003	100,000	120,000	370,200	164,579
2004	.	11,384	.	97,433
2005	74,280	133,130	98,646	142,939
2006	150,000	149,732	249,981	298,168
2007	220,000	181,247	321,953	401,965
2008	280,558	36,648	425,869	321,280
2009	275,000	35,000	367,775	290,378
2010	300,000	78,006	390,169	288,527
2011	300,000	250,000	435,409	369,608
2012	400,000	250,000	492,654	403,219
2013	350,000	250,000	464,734	360,641

Table 1.22: Bond Rating Status

Rate type	Freq.	Percent	Cum Freq.	Cum Pct.
N/A	44848	22.44	44848	22.44
NR	66722	33.38	111570	55.82
Rated	88305	44.18	199875	100

Table 1.23: Bond Rating

RATING	COUNT	PERCENT	CUM˙SUM˙PERCENT
Aaa	11532	13.0605	13.06
Aa	1	0.0011	13.062
Aa1	2844	3.2209	16.283
Aa2	4287	4.8552	21.138
Aa3	7261	8.2234	29.361
A	272	0.3081	29.669
A1	7239	8.1985	37.868
A2	9144	10.356	48.224
A3	7508	8.5031	56.727
Baa	4	0.0045	56.731
Baa1	6067	6.8711	63.602
Baa2	6538	7.4046	71.007
Baa3	4539	5.1406	76.148
Ba	1	0.0011	76.149
Ba1	2278	2.5799	78.729
Ba2	2349	2.6603	81.389
Ba3	2548	2.8857	84.275
B	1	0.0011	84.276
B1	3162	3.5811	87.857
B2	3479	3.9401	91.797
B3	4731	5.3581	97.155
Caa	88	0.0997	97.255
Caa1	378	0.4281	97.683
Caa2	173	0.1959	97.879
Caa3	112	0.1268	98.006
Ca	937	1.0612	99.067
C	824	0.9332	100

Table 1.24: Summary Statistics of Ratings of Bond Issued

	Mean	Median	Minimum	Maximum	25th Pctl	75th Pctl
All data	Baa1	A3	C	Aaa	Ba1	A1
US	Baa1	Baa1	C	Aaa	Ba1	A1
Non-Fin US	Baa3	Baa2	C	Aaa	Ba3	A3
Fin US	A2	A2	C	Aaa	Baa1	Aa3
US Insurance	A3	A2	C	Aaa	Baa1	A1

Table 1.25: Junk VS Investment Grade Bond by Year

YEAR	Investment Grade	Junk Bond
1999	0.54	0.46
2000	0.50	0.50
2001	0.46	0.54
2002	0.44	0.56
2003	0.52	0.48
2004	0.57	0.43
2005	0.66	0.34
2006	0.61	0.39
2007	0.59	0.41
2008	0.62	0.38
2009	0.65	0.35
2010	0.66	0.34
2011	0.65	0.35
2012	0.65	0.35
2013	0.64	0.36

Table 1.26: Maturity of Bonds Issued (years)

N	Mean	Median	Std Dev	25th Pctl	75th Pctl	99th Pctl	Minimum	Maximum
148074	10	7	9	5	10	40	1	150

Table 1.27: Summary Statistics of Maturity in Years

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	13.54	10.01	0.01	100.10	7.01	16.97	10.22	1.66	3.99
US	13.86	10.01	0.01	100.10	7.01	20.03	10.20	1.43	3.03
Non-Fin US	10.65	9.96	0.50	100.06	7.01	10.04	6.84	2.40	9.23
Fin US	18.05	15.93	0.01	100.10	7.04	28.69	12.15	0.67	1.05
US Insurance	18.28	10.03	1.02	100.10	7.00	30.02	15.63	1.98	6.65

Table 1.28: Proportion of Callable and Non-Callable Bonds Each Year

YEAR	Callable	Noncall	No data
1999	0.46	0.45	0.09
2000	0.51	0.41	0.08
2001	0.56	0.37	0.07
2002	0.60	0.34	0.06
2003	0.61	0.32	0.06
2004	0.61	0.32	0.06
2005	0.59	0.34	0.07
2006	0.33	0.67	0.00
2007	0.36	0.64	0.00
2008	0.32	0.68	0.00
2009	0.29	0.71	0.00
2010	0.28	0.72	0.00
2011	0.30	0.70	0.00
2012	0.31	0.69	0.00
2013	0.32	0.68	0.00

Table 1.29: Example of Holder Information

Obs	subID	subclass	subname	sector	managingID	domicile
1	646	MUT	Frank Russell - Global Bond Fund (Co-managed)	ACGMNR	11043	IRL
2	646	MUT	Frank Russell Global Bond Fund (Aggrgtd)	ACG NR	CO-MANAGED	IRL
3	646	MUT	Frank Russell Global Bond Fund (Co-managed)	ACG NR	11043	IRL
4	646	MUT	RIC Global Bond Fund	ACG NR	13063	IRL
5	646	MUT	Russell IC Global Bond	ACGMNR	13063	IRL
6	1432	MUT	ML Global Currency Bond - Asian Tiger Bond Portfolio	N	11590	LUX
7	1432	MUT	ML Global Currency Bond Series-Asian Tiger Bond Portfolio	CG N	11590	LUX
8	1435	MUT	ML Global Currency Bond - Corporate Investment Grade Ptf	CG NR	11590	LUX
9	1435	MUT	ML Global Currency Bond-Corporate Investment Grade Ptf	CG N	11590	LUX
10	1438	MUT	ML Global Currency Bond - Global Currency Portfolios	C N	11590	LUX
11	1609	MUT	Schroder International Selection Fund-US Dollar Bond	CGMN	12532	LUX
12	1612	MUT	Templeton Global Strategy Sicav - Franklin Mutual Beacon Fun	N	13837	LUX
13	1612	MUT	Franklin Mutual Beacon Fund	C NR	11205	LUX
14	1612	QUI	FTIF - Franklin Mutual Beacon	C N	11205	LUX
15	1613	MUT	Templeton Global Strategy Sicav - DM Emerging Markets F/I	N	13837	LUX

Table 1.30: Top Ten Holder Subclass Information by Unique subID

Obs	HOLDER TYPE	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	Open-End Mutual Fund	14507	61.23	61.23
2	Insurance Co-Prop & Cas	3035	12.81	74.04
3	Insurance Co-Life/Health	1913	8.07	82.12
4	Annuity/Variable Annuity	1851	7.81	89.93
5	Closed-End Mutual Fund	1005	4.24	94.17
6	Pension Fund-Government	902	3.81	97.98
7	Health Care Systems	130	0.55	98.53
8	Mutual Fund-Fund of Funds	89	0.38	98.90
9	Insurance Co-Diversified	76	0.32	99.22
10	Government	68	0.29	99.51

Table 1.31: Top 30 Largest Bondholders by Size

Obs	Name	Type
1	PIMCO TOTAL RETURN FUND	Open-End Mutual Fund
2	TEACHERS INSURANCE ANNUITY AMERICA	Insurance Co-Life/Health
3	METROPOLITAN LIFE INSURANCE NEW YORK CIT	Insurance Co-Life/Health
4	NORTHWESTERN MUTUAL LIFE INSURANCE	Insurance Co-Life/Health
5	PRUDENTIAL INSURANCE COMPANY AMERIC	Insurance Co-Life/Health
6	AMERICAN FAMILY LIFE ASSURANCE COLUM	Insurance Co-Life/Health
7	VANGUARD TOTAL BOND MARKET INDEX FUND	Open-End Mutual Fund
8	CALIFORNIA PUBLIC EMPLOYEES CALPERS INTE	Pension Fund-Government
9	AMERICAN GENERAL LIFE INSURANCE	Insurance Co-Life/Health
10	PEERLESS INSURANCE	Insurance Co-Prop & Cas
11	NEW YORK LIFE INSURANCE	Insurance Co-Life/Health
12	AMERICAN LIFE INSURANCE DELAWARE	Insurance Co-Life/Health
13	NEW YORK LIFE INSURANCE ANNUITY	Insurance Co-Life/Health
14	MASSACHUSETTS MUTUAL LIFE INSURANCE	Insurance Co-Life/Health
15	VANGUARD TOTAL BOND MARKET II INDEX FUND	Open-End Mutual Fund
16	LINCOLN NATIONAL LIFE INSURANCE	Insurance Co-Life/Health
17	HARTFORD LIFE INSURANCE	Insurance Co-Life/Health
18	TEXAS MUNICIPAL RETIREMENT SYSTEM	Pension Fund-Government
19	ALLIANZ LIFE INSURANCE NORTH AMERICA	Insurance Co-Life/Health
20	LIBERTY MUTUAL INSURANCE	Insurance Co-Prop & Cas
21	TRAVELERS INSURANCE LIFE DEPARTMENT	Insurance Co-Life/Health
22	JOHN HANCOCK LIFE INSURANCE USA	Insurance Co-Life/Health
23	ALLSTATE LIFE INSURANCE	Insurance Co-Life/Health
24	TRANSAMERICA LIFE INSURANCE	Insurance Co-Life/Health
25	METROPOLITAN LIFE INSURANCE SA	Insurance Co-Life/Health
26	AMERICAN STATES INSURANCE	Insurance Co-Prop & Cas
27	GENERAL ELECTRIC CAPITAL ASSURANCE	Insurance Co-Life/Health
28	DOUBLELINE TOTAL RETURN BOND FUND	Open-End Mutual Fund
29	AIG ANNUITY INSURANCE	Insurance Co-Life/Health
30	GENERAL INSURANCE COMPANY AMERICA	Insurance Co-Prop & Cas

Table 1.32: **Total Par Holding to Total Amount Issued**

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	0.34	0.23	0.00	1.00	0.04	0.59	0.33	0.70	-0.84
US	0.41	0.38	0.00	1.00	0.06	0.69	0.34	0.35	-1.24
Non-Fin US	0.49	0.51	0.00	1.00	0.17	0.78	0.34	0.01	-1.29
Fin US	0.29	0.15	0.00	1.00	0.03	0.49	0.31	0.97	-0.28
US Insurance	0.38	0.35	0.00	1.00	0.09	0.60	0.30	0.42	-0.92

Table 1.33: **Percentage Holding of Top 10/5/3/1 Holders Over Time**

		Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	top10	0.26	0.14	0.00	1.00	0.02	0.41	0.30	1.21	0.37
	top5	0.23	0.11	0.00	1.00	0.02	0.31	0.28	1.57	1.54
	top3	0.20	0.09	0.00	1.00	0.02	0.25	0.27	1.89	2.69
	top1	0.14	0.05	0.00	1.00	0.01	0.13	0.23	2.68	6.59
US	top10	0.34	0.26	0.00	1.00	0.05	0.53	0.32	0.80	-0.55
	top5	0.30	0.20	0.00	1.00	0.05	0.42	0.31	1.15	0.20
	top3	0.26	0.15	0.00	1.00	0.05	0.34	0.30	1.44	0.94
	top1	0.18	0.08	0.00	1.00	0.03	0.19	0.26	2.14	3.58
FIN us	top10	0.23	0.11	0.00	1.00	0.02	0.35	0.27	1.44	1.22
	top5	0.20	0.09	0.00	1.00	0.02	0.28	0.26	1.80	2.61
	top3	0.18	0.08	0.00	1.00	0.02	0.22	0.24	2.12	3.98
	top1	0.12	0.05	0.00	1.00	0.01	0.12	0.21	2.94	8.54
Insurance	top10	0.32	0.27	0.00	1.00	0.09	0.46	0.27	0.90	0.19
	top5	0.27	0.21	0.00	1.00	0.09	0.37	0.25	1.40	1.65
	top3	0.23	0.17	0.00	1.00	0.07	0.30	0.24	1.83	3.18
	top1	0.15	0.09	0.00	1.00	0.04	0.17	0.21	2.77	7.73
Nonfin US	top10	0.43	0.36	0.00	1.00	0.16	0.66	0.33	0.49	-0.97
	top5	0.37	0.27	0.00	1.00	0.13	0.54	0.32	0.85	-0.51
	top3	0.33	0.21	0.00	1.00	0.10	0.44	0.32	1.13	-0.03
	top1	0.22	0.10	0.00	1.00	0.05	0.25	0.29	1.78	1.94

Table 1.34: Average Number of Bonds Invested for Each Type of Holder

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

Type	All data	US	US Fin	Insurance	US Non-Fin
AMM	2	2	2	0	0
ANN	94	80	29	6	61
BAL	51	34	13	4	30
CPF	28	25	6	2	21
END	63	59	15	4	50
FEN	21	19	7	2	14
FOF	163	161	49	11	126
GPE	66	57	21	5	41
GVT	19	17	8	3	12
HFD	32	28	9	3	21
HLC	59	52	23	4	34
HSP	12	11	9	3	6
INS	48	44	18	5	33
LIN	119	103	33	8	76
MMM	26	29	10	4	53
MUT	73	72	24	6	59
OTH	249	185	75	20	171
PIN	33	29	12	3	21
QUI	15	15	9	3	12
RIN	74	61	22	5	43
UIT	187	31	35	3	8
UPE	1	1	0	0	1

Table 1.35: Number of Bonds Invested for a Given Holder on Average 1999Q1-2013Q2

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	65.7	17.0	1.0	4151.0	4.0	61.0	157.9	8.4	113.0
US	59.5	16.0	1.0	3303.0	4.0	58.0	138.2	8.1	104.1
US fin	20.8	8.0	1.0	966.0	3.0	22.0	42.2	7.4	88.8
Insurance	5.4	2.0	1.0	181.0	1.0	5.0	10.0	6.7	67.7
US non fin	46.2	12.0	1.0	2408.0	3.0	44.0	106.4	7.7	94.2

Table 1.36: Holder Country

Obs	Name	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	United States	14485	61.1388	61.139
2	Canada	1960	8.2728	69.412
3	Japan	1245	5.2549	74.667
4	India	1132	4.778	79.445
5	South Korea	810	3.4189	82.863
6	Luxembourg	775	3.2711	86.135
7	China	692	2.9208	89.055
8	Brazil	457	1.9289	90.984
9	Mexico	394	1.663	92.647
10	Ireland	294	1.2409	93.888
11	Taiwan	255	1.0763	94.965
12	South Africa	208	0.8779	95.842
13	Israel	151	0.6373	96.48
14	Malaysia	141	0.5951	97.075
15	Singapore	99	0.4179	97.493
16	Chile	88	0.3714	97.864
17	Thailand	88	0.3714	98.236
18	Argentina	85	0.3588	98.594
19	Hong Kong	70	0.2955	98.89
20	United Kingdom	61	0.2575	99.147
21	Cayman Islands	52	0.2195	99.367
22	Channel Islands	21	0.0886	99.456
23	Australia	18	0.076	99.531
24	Bermuda	17	0.0718	99.603
25	Austria	15	0.0633	99.667
26	Germany	12	0.0507	99.717
27	Greece	12	0.0507	99.768
28	Belgium	10	0.0422	99.81
29	Malta	6	0.0253	99.835
30	Switzerland	6	0.0253	99.861
31	Hungary	4	0.0169	99.878
32	British Virgin Isl.	3	0.0127	99.89
33	Estonia	3	0.0127	99.903
34	Indonesia	3	0.0127	99.916

Table 1.37: Summary of Number of Portfolio Holding, Buying, and Selling for a Given Issue

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
				Number of portfolio holding					
All data	24.7	4	1	1062	1	22	52.5	4.5	29.3
US	25.1	4	1	1002	1	21	55.6	4.4	27.7
Non-Fin US	29.3	5	1	1002	1	29	58.2	3.9	21.5
Fin US	19.1	2	1	928	1	11	51.0	5.6	42.8
US Insurance	27.6	4	1	660	1	33	51.8	3.6	18.5
				Number of portfolio buying					
All data	6.2	1	0	709	0	5	16.8	6.9	83.2
US	5.6	0	0	709	0	3	16.7	7.3	87.4
Non-Fin US	6.7	1	0	709	0	5	17.9	6.4	69.8
Fin US	4.0	0	0	611	0	1	14.7	9.2	135.0
US Insurance	5.1	0	0	412	0	4	14.3	7.6	101.4
				Number of portfolio selling					
All data	4.5	0	0	758	0	4	11.7	7.5	130.1
US	4.2	0	0	478	0	3	11.6	6.9	87.2
Non-Fin US	5.1	1	0	478	0	4	12.6	6.2	72.0
Fin US	3.0	0	0	458	0	1	9.7	8.4	129.0
US Insurance	3.2	0	0	168	0	2	8.1	5.6	49.6

Table 1.38: Summary of the Average Value-Weighted Portfolio Maturity in Years

	Mean	Median	Max	Min	25pct	75pct	Std	Skewness	Kurtosis
All data	8.8	8.3	99.1	0.1	6.3	10.8	4.0	1.1	4.9
US	9.6	8.8	59.4	0.1	7.1	11.7	4.1	1.1	4.2
Non-Fin US	10.2	9.2	58.9	0.4	7.6	12.4	3.9	1.3	3.2
Fin US	8.4	7.8	69.7	0.1	5.4	10.6	4.6	1.4	6.1
US Insurance	13.1	12.2	94.7	0.5	7.8	17.2	7.7	1.8	8.6

Table 1.39: Average Proportion (%) of Each Type of Holder for Each Data and Industry (Long-Term(LT),Medium-Term(MT),Short-Term(ST))

	Long-Term	Medium-Term	Short-Term
All data	0.75	0.18	0.07
US	0.80	0.13	0.07
US FIN	0.69	0.26	0.05
Non FIN US	0.85	0.07	0.08
Insurance	0.79	0.17	0.04

Table 1.40: Sector of the Holders Who Are Also Issuers, Proportion (%) Quarterly Average

This figure is created from eMAXX data. The data range is from 1999Q1 to 2013Q2. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

Variable	Mean	Std Dev	Minimum	Maximum
LIN	0.47	0.05	0.40	0.55
PIN	0.23	0.02	0.19	0.26
MUT	0.11	0.02	0.07	0.15
ANN	0.08	0.01	0.05	0.10
END	0.04	0.01	0.01	0.06
HLC	0.03	0.01	0.00	0.04
BAL	0.03	0.01	0.01	0.05
QUI	0.02	0.01	0.01	0.04
RIN	0.02	0.00	0.01	0.03
INS	0.01	0.00	0.00	0.01
FOF	0.00	0.00	0.00	0.00

Table 1.41: Proportion of Investing in the Same Companies but Different Bonds

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	0.40	0.29	0.00	1.00	0.14	0.50	0.33	0.86	-0.69
Removed one issue	0.27	0.20	0.00	1.00	0.11	0.33	0.20	1.24	1.93

Table 1.42: **Subclass Code from eMAXX**

Description	Code
Annuity/VA - Money Market	AMM
Annuity/Variable Annuity	ANN
Mutual Fund - Balanced	BAL
Bank-Portfolio	BKP
Bank-Trust	BKT
Church/Religious Org	CHU
Pension Fund-Corporate	CPF
Corporation	CRP
Credit Union	CRU
MutFd-CE/Inv Tr/FCP	END
Finance Company	FCC
Foundation/Endowment	FEN
Mutual Fund-Fund of Funds	FOF
401K	FOK
Pension Fund-Government	GPE
Government	GVT
Hedge Fund	HFD
Health Care Systems	HLC
Hospital	HSP
Investment Manager	INM
Insurance Co-Diversified	INS
Insurance Co-Life/Health	LIN
Mutual Fund - Money Mkt	MMM
MutFd-OE/UnitTr/SICAV/FCP	MUT
Nuclear De-Comm Trust	NDT
Other	OTH
Insurance Co-Prop & Cas	PIN
Mutual Fund-Equity	QUI
Reinsurance Company	RIN
Small Business Invst Co	SBC
Spezial Fund	SPZ
Bank-Savings/Bldg Society	SVG
13F Filer	TTF
Unit Investment Trust	UIT
Pension Fund-Union	UPE

Table 1.43: Credit Sector Description Example

Credit sector description	Credit sector code	Market sector	Credit sector description
Correctional Facilities/Jails	COR	R	Jails/Corr Facs
Economic Development	ECD	R	Eco/Ind Dev
Education	EDU	R	Education
Environment/Pollution Control	EPC	R	Env/Poll Ctrl
Federal/Sovereign Government	SOV	G	Fed/Sov Govt
Financial - All	FXX	C	Financial/All
Financial/Banking	F01	C	Finl/Banking
Financial/Combined	F02	C	Finl/Combined
Financial/Finance	F03	C	Finl/Finance
Financial/Insurance	F05	C	Finl/Insurance
Financial/Investment	F04	C	Finl/Investment
Financial/Mutual Funds	F06	C	Finl/Mutual Fds
Financial/Real Estate	F07	C	Finl/Real Est
Financial/Securities	F08	C	Finl/Securities
Financial/Unclassified	F99	C	Finl/Uncl
Health Care (Hospitals/Nursing Homes)	HEC	R	Health Care
Housing	HSG	R	Housing
Industrial - All	IXX	C	Industrial/All
Industrial/Aerospace	I02	C	Ind/Aerospace
Industrial/Aircraft Mfg & Components	I03	C	Ind/Aircraft
Industrial/Aluminum	I04	C	Ind/Aluminum
Industrial/Apparel Products	I01	C	Ind/Apparel
Industrial/Arms & Ammunition	I05	C	Ind/Arms/Ammo
Industrial/Beverage	I06	C	Ind/Beverage
Industrial/Boat	I07	C	Ind/Boat
Industrial/Building	I09	C	Ind/Building
Industrial/Car & Truck Manufacturing	I12	C	Ind/Car/Trk Mfg
Industrial/Car Parts & Equipment	I10	C	Ind/Car Parts
Industrial/Chemical	I13	C	Ind/Chemical
Industrial/Coatings & Paint	I14	C	Ind/Coatings
Industrial/Conglomerates & Diversified	I16	C	Ind/Diversified
Industrial/Containers	I15	C	Ind/Containers
Industrial/Cosmetics & Toiletries	I17	C	Ind/Cosmetics
Industrial/Drugs	I20	C	Ind/Drugs
Industrial/Electronics	I22	C	Ind/Electronics
Industrial/Food	I24	C	Ind/Food
Industrial/Glass Products	I27	C	Ind/Glass Prods
Industrial/Home Furnishings	I30	C	Ind/Home Furn
Industrial/Household Appliances	I31	C	Ind/HH Applnces
Industrial/Household Products	I33	C	Ind/HH Products
Industrial/Housewares	I34	C	Ind/Housewares
Industrial/Jewelry	I35	C	Ind/Jewelry

Table 1.44: Issuer Types

Entity	Freq.	Percent	Cum Freq.	Cum Percent
Federal Corporation/Agency	1	0	1	0
Public/Private Corporation	829419	94.18	829420	94.18
Supranational	3574	0.41	832994	94.59
Trust/Master Trust/Grantor Trust	47687	5.41	880681	100

Table 1.45: Number of Firms Issued Bond Quarterly Summary 1999Q1-2013Q2

	Mean	Median	Min	Max	25pct	75pct	Std.	Skew.	Kurt.
All data	15,184	14,561	11,800	21,725	12,652	16,825	2,843.23	0.58	(0.73)
US	9,856	9,977	8,956	10,815	9,278	10,379	583.43	(0.20)	(1.35)
Non-Fin US	5,850	5,861	5,041	6,834	5,533	6,036	428.82	0.35	(0.19)
Fin US	3,289	3,365	2,703	3,973	2,888	3,570	353.08	(0.25)	(1.19)
US Insurance	253	253	218	288	239	268	18.19	(0.12)	(1.02)

Table 1.46: Yearly New Issue and Rebalanced Proportion (%)

YEAR	FIRST	NOTFIRST
1999	100	0
2000	11	89
2001	11	89
2002	13	87
2003	17	83
2004	16	84
2005	19	81
2006	19	81
2007	22	78
2008	12	88
2009	15	85
2010	23	77
2011	16	84
2012	16	84
2013	12	88

Table 1.47: Top 20 Issuers by Sector

Obs	Sector	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	Financial/Banking	118962	13.508	13.508
2	Structured Finance	78783	8.9457	22.454
3	Industrial/Unclassified	58359	6.6266	29.08
4	Financial/Finance	55655	6.3195	35.4
5	Financial/Unclassified	49682	5.6413	41.041
6	Service/Unclassified	33720	3.8289	44.87
7	Financial/Real Estate	30650	3.4803	48.35
8	Industrial/Oil & Gas	29167	3.3119	51.662
9	Telephone/Telecommunications	27309	3.1009	54.763
10	Utility/Electric	26769	3.0396	57.803
11	Financial/Insurance	21933	2.4905	60.293
12	Industrial/Electronics	16238	1.8438	62.137
13	Financial/Investment	14810	1.6817	63.819
14	Service/Retail Stores	13993	1.5889	65.407
15	Utility/Combined	13750	1.5613	66.969
16	Industrial/Food	13481	1.5307	68.499
17	Industrial/Chemical	13162	1.4945	69.994
18	Service/Health Care	12269	1.3931	71.387
19	Utility/Natural Gas	11153	1.2664	72.654
20	Service/Business	9980	1.1332	73.787

Table 1.48: Proportion(%) of Issuer's Industry Summary 1999Q1-2013Q2

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
					All data				
Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.53	.
Financial	0.41	0.41	0.34	0.51	0.35	0.47	0.06	0.08	-1.70
Industrial	0.30	0.30	0.23	0.35	0.26	0.33	0.04	-0.12	-1.64
Service	0.16	0.15	0.14	0.18	0.14	0.18	0.02	0.06	-1.76
Telecom	0.03	0.03	0.02	0.05	0.03	0.04	0.01	0.03	-1.41
Transportation	0.02	0.02	0.02	0.02	0.02	0.02	0.00	-0.12	-0.91
Utility	0.07	0.07	0.06	0.08	0.07	0.08	0.00	-0.27	-0.66
Supranational	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	-1.89
					US				
	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
Financial	0.36	0.37	0.31	0.42	0.32	0.39	0.03	-0.12	-1.49
Industrial	0.31	0.31	0.26	0.35	0.28	0.33	0.03	-0.15	-1.47
Service	0.20	0.20	0.18	0.21	0.19	0.21	0.01	-0.41	-1.20
Telecom	0.03	0.03	0.02	0.04	0.02	0.04	0.01	0.00	-1.44
Transportation	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.39	-1.40
Utility	0.08	0.08	0.06	0.09	0.08	0.08	0.01	-1.90	4.22
Supranational	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	-2.04

Table 1.49: Summary of Issuance by Industry (%)

industry	Alldata	US	USPrivate	US144A
Education	0.00	.	.	.
Financial	52.97	48.25	37.58	36.14
Industrial	21.92	23.31	30.68	30.67
Service	12.02	15.27	20.40	20.40
Supranational	0.01	0.01	.	.
Telecom	2.82	2.56	2.53	4.47
Transportation	2.92	2.84	1.79	2.20
Unassigned	0.51	0.30	0.51	0.37
Utility	6.82	7.47	6.51	5.75

Table 1.50: Herfindahl Index (HFI) for Each Issuer

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All	0.08	0.01	0.00	1.00	0.00	0.03	0.22	3.40	10.60
US	0.12	0.01	0.00	1.00	0.00	0.06	0.26	2.69	6.00
US fin	0.07	0.00	0.00	1.00	0.00	0.03	0.20	3.92	14.78
insurance	0.08	0.02	0.00	1.00	0.00	0.05	0.20	3.81	14.09
US non fin	0.15	0.02	0.00	1.00	0.01	0.10	0.29	2.21	3.47

Table 1.51: Issuer by Country

Obs	Country	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	United States	571667	64.9119	64.912
2	United Kingdom	44186	5.0173	69.929
3	Canada	38413	4.3617	74.291
4	Cayman Islands	32863	3.7315	78.022
5	Japan	20639	2.3435	80.366
6	Netherlands	19317	2.1934	82.559
7	Australia	13186	1.4973	84.057
8	France	12110	1.3751	85.432
9	Germany	10798	1.2261	86.658
10	Luxembourg	8018	0.9104	87.568
11	Mexico	7330	0.8323	88.401
12	South Korea	6976	0.7921	89.193
13	Taiwan	6234	0.7079	89.901
14	Ireland	5760	0.654	90.555
15	China	5712	0.6486	91.203
16	Brazil	5137	0.5833	91.786
17	Sweden	4776	0.5423	92.329
18	Singapore	4220	0.4792	92.808
19	India	4091	0.4645	93.272
20	Bermuda	3779	0.4291	93.702

Table 1.52: Number of Countries Issued Bond Quarterly Summary 1999Q1-2013Q2

	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	83	81	64	106	75	89	10.9	0.5	-0.5
Non-Fin	72	72	56	90	67	76	8.5	0.5	0.0
Fin	70	68	56	94	61	75	10.6	0.6	-0.7
Insurance	20	19	12	28	17	25	4.4	0.0	-1.0

Table 1.53: Issuer by Region

Obs	Region˙name	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	North America	613929	70.0744	70.074
2	Western Europe	124291	14.1867	84.261
3	Asia/Pacific	73803	8.4239	92.685
4	Caribbean	35611	4.0647	96.75
5	Latin America	20623	2.3539	99.104
6	Africa -Central & S.	3465	0.3955	99.499
7	Middle East	1789	0.2042	99.703
8	Eastern Europe	1768	0.2018	99.905
9	North Atlantic	701	0.08	99.985
10	Africa -North	130	0.0148	100

Table 1.54: Proportion(%) of US and Non-US Issued Bond Quarterly Summary 1999Q1-2013Q2

	Variable	Mean	Median	Min	Max	25pct	75pct	Std	Skewness	Kurtosis
All data	US	0.66	0.68	0.47	0.82	0.56	0.75	0.11	-0.19	-1.37
All data	Non-US	0.34	0.32	0.18	0.53	0.25	0.44	0.11	0.19	-1.37
Non-fin	US	0.71	0.72	0.55	0.83	0.64	0.78	0.08	-0.32	-1.14
Non-fin	Non-US	0.29	0.28	0.17	0.45	0.22	0.36	0.08	0.32	-1.14
Fin	US	0.59	0.62	0.39	0.81	0.47	0.69	0.13	-0.04	-1.42
Fin	Non-US	0.41	0.38	0.19	0.61	0.31	0.53	0.13	0.04	-1.42
Insurance	US	0.71	0.73	0.57	0.90	0.67	0.75	0.09	0.27	-0.32
Insurance	Non-US	0.29	0.27	0.10	0.43	0.25	0.33	0.09	-0.27	-0.32

Table 1.55: Top 5 Issuer Country for Step (s) in Rating Upgraded or Downgraded (left), Top 5 Quarter (Right)

up/down 1 step in rating							
No.	CTRY	N	PCT	No.	Qtr	N	PCT
1	United States	35966	75	1	2008Q4	2741	6
2	United Kingdom	2020	4	2	2003Q3	2132	4
3	Canada	1550	3	3	2007Q1	1762	4
4	Japan	1225	3	4	2012Q2	1648	3
5	Netherlands	1145	2	5	2006Q2	1575	3
up/down between 2 to 5 steps in rating							
No.	CTRY	N	PCT	No.	Qtr	N	PCT
1	United States	21588	73	1	2008Q4	2995	10
2	United Kingdom	1231	4	2	2012Q2	1858	6
3	Cayman Islands	1138	4	3	2001Q2	1452	5
4	Japan	1012	3	4	2007Q1	1172	4
5	Canada	820	3	5	2005Q3	1151	4
up/down between 6 to 10 steps in rating							
No.	CTRY	N	PCT	No.	Qtr	N	PCT
1	United States	1866	73	1	2008Q4	284	11
2	Cayman Islands	230	9	2	2009Q2	217	9
3	United Kingdom	162	6	3	2000Q4	192	8
4	Ireland	56	2	4	2007Q4	176	7
5	Canada	42	2	5	2003Q2	169	7
up/down between 11 to 15 steps in rating							
No.	CTRY	N	PCT	No.	Qtr	N	PCT
1	United States	415	67	1	2008Q3	287	47
2	Cayman Islands	88	14	2	2008Q4	62	10
3	Iceland	35	6	3	2007Q4	45	7
4	United Kingdom	32	5	4	2002Q1	29	5
5	Ireland	30	5	5	2010Q3	21	3
up/down between 16 to 19 steps in rating							
No.	CTRY	N	PCT	No.	Qtr	N	PCT
1	United States	22	48	1	2010Q3	7	15
2	Cayman Islands	18	39	2	2008Q4	6	13
3	Iceland	3	7	3	2007Q4	5	11
4	United Kingdom	2	4	4	2009Q1	4	9
5	Ireland	1	2	5	2010Q1	4	9
up/down 20 steps in rating							
No.	CTRY	N	PCT	No.	Qtr	N	PCT
1	Cayman Islands	9	90	1	2007Q4	5	50
2	Iceland	1	10	2	2010Q2	3	30
				3	2009Q1	1	10
				4	2009Q4	1	10

Table 1.56: Number of Contract Sold for a Given Seller for All Data (Left Panel) and the US Data (Right Panel)

YEAR	MIN	MAX	MEAN	STD	YEAR	MIN	MAX	MEAN	STD
		All data					US data		
1999	1	365	3.10	8.70	1999	1	365	3.35	9.61
2000	1	327	3.10	8.19	2000	1	327	3.40	9.28
2001	1	304	3.04	7.54	2001	1	304	3.33	8.57
2002	1	272	2.94	7.02	2002	1	272	3.22	8.00
2003	1	231	2.78	6.38	2003	1	231	3.05	7.32
2004	1	255	2.70	6.03	2004	1	255	2.95	6.97
2005	1	254	2.75	6.36	2005	1	254	2.99	7.29
2006	1	226	2.73	6.10	2006	1	226	3.00	7.13
2007	1	206	2.72	5.83	2007	1	206	3.02	7.06
2008	1	236	2.72	5.91	2008	1	236	3.06	7.16
2009	1	258	2.76	5.84	2009	1	258	3.19	7.23
2010	1	306	2.71	5.81	2010	1	306	3.11	7.36
2011	1	298	2.70	5.51	2011	1	298	3.08	6.98
2012	1	326	2.73	5.55	2012	1	326	3.13	7.04
2013	1	269	2.77	5.28	2013	1	269	3.21	6.68

Table 1.57: Number of Contract Sold for a Given Seller for Financial (Left Panel) and Insurance (Right panel)

YEAR	MIN	MAX	MEAN	STD	YEAR	MIN	MAX	MEAN	STD
		Financial					Insurance		
1999	1	365	3.69	11.98	1999	1	60	2.89	5.13
2000	1	269	3.88	11.79	2000	1	59	2.95	5.04
2001	1	255	3.71	10.89	2001	1	58	2.81	4.61
2002	1	237	3.49	10.32	2002	1	52	2.80	4.09
2003	1	221	3.34	9.94	2003	1	50	2.98	4.37
2004	1	255	3.27	9.90	2004	1	138	3.29	6.77
2005	1	254	3.43	10.71	2005	1	146	3.54	9.43
2006	1	226	3.45	10.25	2006	1	136	3.51	8.76
2007	1	206	3.54	10.14	2007	1	117	3.40	8.07
2008	1	236	3.62	10.41	2008	1	95	3.44	7.76
2009	1	258	3.67	10.25	2009	1	77	3.52	7.62
2010	1	306	3.55	10.54	2010	1	66	3.41	6.94
2011	1	298	3.44	9.83	2011	1	69	3.31	6.16
2012	1	326	3.47	9.87	2012	1	66	3.23	5.66
2013	1	269	3.55	8.97	2013	1	67	4.37	8.82

Table 1.58: Summary Statistics of Amount of Money Raised by Firms (Unit: $'000)

	Mean	Median	Min	Max	25pct	75pct	Std	Skew.	Kur.
All data	536,411	296,103	1	9,992,000	116,071	665,533	740,598	4	26
US	372,554	187,820	1	9,975,000	30,000	470,041	558,226	3	19
Non-Fin US	324,833	200,000	1	9,000,000	65,000	400,000	443,821	4	28
Fin US	420,051	153,978	1	9,975,000	20,000	514,000	649,165	3	13
US Insurance	367,676	250,000	9	4,408,200	55,365	500,000	422,514	3	16

Table 1.59: Recurrent Issuers

Obs	ISSUER	Total issues	Avg. issue: quarter
1	BARCLAYS BANK PLC	1140	19.6552
2	RABOBANK NEDERLAND NV, UTRECHT	596	10.2759
3	IBRD (INTL BANK FOR RECON & DEV) (WORLDBANK)	589	10.1552
4	MORGAN STANLEY	550	9.4828
5	MERRILL LYNCH & CO INC	506	8.7241
6	HSBC BANK PLC	471	8.1207
7	CITIGROUP INC	468	8.069
8	ABN AMRO BANK NV	457	7.8793
9	BANK OF AMERICA CORP	440	7.5862
10	HSBC BANK PLC, LONDON	434	7.4828
11	GENERAL ELECTRIC CAPITAL CORP (GECC)	382	6.5862
12	ROYAL BANK OF SCOTLAND PLC	371	6.3966
13	WESTPAC BANKING CORP	371	6.3966
14	SOCIETE GENERALE, PARIS	352	6.069
15	EUROPEAN INVESTMENT BANK (EIB) (BEI)	345	5.9483
16	BEAR STEARNS COMPANIES INC	342	5.8966
17	BNP PARIBAS	335	5.7759
18	JP MORGAN CHASE & CO	334	5.7586
19	UBS AG JERSEY BRANCH	333	5.7414
20	WESTPAC BANKING CORP, SYDNEY NSW	333	5.7414
21	DRESDNER BANK AG (FRANKFURT)	307	5.2931
22	AT&T CORP (AMERICAN TELEPHONE & TELEGRAPH CO)	299	5.1552
23	LEHMAN BROTHERS HOLDINGS INC	297	5.1207
24	ING BANK (INTERNATIONALE NEDERLANDEN BANK)	286	4.931
25	ROYAL BANK OF SCOTLAND PLC, EDINBURGH	283	4.8793
26	ING BANK NV	281	4.8448
27	DEUTSCHE BANK AG (LONDON)	262	4.5172
28	LLOYDS TSB BANK PLC	252	4.3448
29	GOLDMAN SACHS GROUP INC	250	4.3103
30	LEHMAN BROTHERS TREASURY BV	249	4.2931

Table 1.60: Issuer by State

Obs	State	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	Delaware	11832	73.7794	73.779
2	New York	617	3.8474	77.627
3	California	317	1.9767	79.603
4	Texas	293	1.827	81.43
5	Florida	226	1.4092	82.84
6	Nevada	199	1.2409	84.081
7	Ohio	177	1.1037	85.184
8	Pennsylvania	164	1.0226	86.207
9	Tennessee	145	0.9042	87.111
10	Indiana	139	0.8667	87.978
11	Maryland	127	0.7919	88.77
12	North Carolina	125	0.7794	89.549
13	Wisconsin	112	0.6984	90.248
14	Illinois	109	0.6797	90.927
15	Georgia	108	0.6734	91.601
16	Michigan	105	0.6547	92.255
17	New Jersey	86	0.5363	92.792
18	Virginia	85	0.53	93.322
19	Utah	84	0.5238	93.845
20	Massachusetts	83	0.5176	94.363
21	Kentucky	67	0.4178	94.781
22	Minnesota	64	0.3991	95.18
23	Louisiana	58	0.3617	95.542
24	Connecticut	55	0.343	95.885
25	Missouri	54	0.3367	96.221
26	Quebec	50	0.3118	96.533
27	Colorado	47	0.2931	96.826
28	Puerto Rico	45	0.2806	97.107
29	Arizona	42	0.2619	97.369
30	South Carolina	35	0.2182	97.587

Table 1.61: Example of Name Changed for Managing Firms

Obs	mfID	MF˙name
1	4931	Escorts Asset Management Limited
2	4931	Escorts Asset Management Ltd
3	6627	RMB Asset Management (Pty) Ltd
4	6627	Momentum Asset Management
5	10013	Aetna Services, Inc. (Portfolio Management Group)
6	10013	Aetna Inc (Portfolio Management Group)
7	10017	Aid Association for Lutherans (AAL)
8	10017	Aid Association for Lutherans/Lutheran Brotherhood (Appleton)
9	10017	Thrivent Financial for Lutherans (Appleton)
10	10019	AIM Advisors, Inc.
11	10019	AIM Advisors, Inc./AIM Capital Management, Inc.
12	10019	AIM Investments
13	10019	Invesco AIM
14	10019	Invesco Advisers Inc (Houston)
15	10022	Alfa Group
16	10022	Alfa Insurance

Table 1.62: Type of Managing Firms

Obs	Type	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	Investment Manager	978	32.6109	32.611
2	Insurance Co-Prop & Cas	539	17.9727	50.584
3	Mutual Fund Manager	379	12.6375	63.221
4	Insurance Co-Life	309	10.3034	73.525
5	Equity Manager	183	6.102	79.627
6	Insurance Co-Mgmt Div	138	4.6015	84.228
7	Bank-Management Division	122	4.068	88.296
8	Bank-Trust	97	3.2344	91.531
9	Broker/Management Sub	52	1.7339	93.264
10	Insurance Co-Diversified	44	1.4672	94.732
11	Pension Fund-Government	41	1.3671	96.099
12	Bank-Portfolio	28	0.9336	97.032
13	Government	21	0.7002	97.733
14	Hedge Fund	20	0.6669	98.399
15	Health Care Systems	7	0.2334	98.633
16	Corporation	6	0.2001	98.833
17	Pension Fund-Corporate	6	0.2001	99.033
18	Reinsurance Company	6	0.2001	99.233
19	Trust Company	6	0.2001	99.433
20	Foundation/Endowment	4	0.1334	99.567
21	Bank-Savings/Bldg Society	3	0.1	99.667
22	Credit Union	2	0.0667	99.733
23	Finance/Credit Company	2	0.0667	99.8
24	Other-General	2	0.0667	99.867
25	Pension Fund-Union	2	0.0667	99.933
26	Bank-Government	1	0.0333	99.967
27	Broker/Dealer-Fund Mgr	1	0.0333	100

Table 1.63: Thirty Largest Managing Firms by Size of Holding

Obs	Name	Type
1	PACIFIC INVESTMENT MANAGEMENT PIMCO	Investment Manager
2	VANGUARD GROUP	Mutual Fund Manager
3	LIBERTY MUTUAL INSURANCE	Insurance Co-Diversified
4	METROPOLITAN LIFE INSURANCE INVESTMENTS METLIFE	Insurance Co-Mgmt Div
5	PRUDENTIAL INVESTMENT MANAGEMENT FIXED INCOME	Investment Manager
6	FRANKLIN TEMPLETON INVESTMENTS	Investment Manager
7	TEACHERS ADVISORS TIAA CREF	Investment Manager
8	AIG GLOBAL INVESTMENT GROUP	Insurance Co-Mgmt Div
9	BLACKROCK FINANCIAL MANAGEMENT FIXED INCOME	Investment Manager
10	HARTFORD INVESTMENT MANAGEMENT HIMCO	Insurance Co-Mgmt Div
11	CAPITAL RESEARCH MANAGEMENT LOS ANGELES WEST	Investment Manager
12	BLACKROCK FUND ADVISORS	Bank-Management Division
13	FIDELITY MANAGEMENT RESEARCH FIXED INCOME DIVISION	Investment Manager
14	ALLIANCEBERNSTEIN	Investment Manager
15	WELLINGTON MANAGEMENT	Investment Manager
16	ZZZO	Other-General
17	NEW YORK LIFE INVESTMENT MANAGEMENT	Investment Manager
18	MASON STREET ADVISORS	Investment Manager
19	STATE FARM INSURANCE	Insurance Co-Mgmt Div
20	STANCORP INVESTMENT ADVISERS	Insurance Co-Mgmt Div
21	WESTERN ASSET MANAGEMENT WAMCO	Investment Manager
22	AMERICAN FAMILY LIFE AFLAC	Insurance Co-Life
23	AEGON UNITED STATES AMERICA INVESTMENT MANAGEMENT	Insurance Co-Mgmt Div
24	DELAWARE INVESTMENTS	Bank-Management Division
25	GE ASSET MANAGEMENT	Investment Manager
26	NORTHWESTERN INVESTMENT MANAGEMENT	Insurance Co-Mgmt Div
27	PINEBRIDGE INVESTMENTS	Insurance Co-Mgmt Div
28	TRAVELERS ASSET MANAGEMENT INTERNATIONAL TAMIC	Insurance Co-Mgmt Div
29	ALLSTATE INVESTMENTS LLC	Insurance Co-Prop & Cas
30	OPPENHEIMERFUNDS ROCHESTER	Mutual Fund Manager

Table 1.64: Proportion of Holders Hired Manager to Manage Their Funds (%)

YEAR	Hire	Not Hire
1999	54.9	45.1
2000	54.5	45.5
2001	57.5	42.5
2002	58.6	41.4
2003	58.1	41.9
2004	58.2	41.8
2005	55.4	44.6
2006	62.7	37.3
2007	65.4	34.6
2008	64.5	35.5
2009	66.3	33.7
2010	68.0	32.0
2011	68.0	32.0
2012	68.1	31.9
2013	69.5	30.5

Table 1.65: Types of Managing Firms Hired by Each Type of Holder

Type	Bank	Gov. Pension	Broker	Corp. Pension	Life Ins	Ins Mng.	IM	Prop & Cas Ins	MF Mnger	Foundation	Gov.
AMM											
ANN	0.02		0.00	0.00	0.01	0.09	0.35	0.00	0.10		
BAL	0.03		0.00	0.00	0.00	0.01	0.32	0.00	0.06		
CPF	0.62			0.17			0.12				
END	0.06		0.02		0.00	0.01	0.44		0.06		
FEN	0.00									0.46	0.35
FOF	0.10		0.00		0.00	0.00	0.25	0.04	0.03		
GPE	0.02	0.25	0.00		0.00	0.02	0.19		0.00	0.01	0.12
GVT	0.01		0.01				0.07				0.50
HFD							0.00		0.57		
HLC	0.03		0.00		0.03	0.02	0.18	0.00	0.00		0.01
HSP							0.01				
INS	0.07				0.27	0.00	0.19	0.03			0.00
LIN	0.01		0.00		0.09	0.29	0.16	0.02	0.01		0.00
MMM	0.01		0.00				0.26		0.01		
MUT	0.05		0.01	0.00	0.00	0.02	0.36	0.00	0.08		
OTH	0.01						0.00	0.89	0.03		
PIN	0.04		0.00	0.00	0.01	0.20	0.06	0.14	0.00	0.00	0.00
QUI	0.02		0.02	0.00	0.00	0.00	0.40	0.00	0.07		
RIN	0.03		0.00	0.00	0.00	0.24	0.12	0.01	0.01		0.00
UIT	0.00						0.31				
UPE			0.57				0.13				

NOTE: Investment Manager (IM), Mutual Fund Manager (MF Mnger). The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

Table 1.66: Country Identification of Managing Firm

Obs	Country name	COUNT	PERCENT	CUM˙SUM˙PERCENT
1	United States	2438	81.2396	81.24
2	Canada	209	6.9643	88.204
3	China	65	2.1659	90.37
4	Japan	56	1.866	92.236
5	Hong Kong	47	1.5661	93.802
6	Taiwan	45	1.4995	95.302
7	India	42	1.3995	96.701
8	South Africa	39	1.2996	98.001
9	Singapore	36	1.1996	99.2
10	Australia	13	0.4332	99.633
11	Bermuda	9	0.2999	99.933
12	Bahamas	1	0.0333	99.967
13	Cayman Islands	1	0.0333	100

Table 1.67: Example of Non-Unique Employee ID

EmpID	MfID	Prefix	First	Last	Title	year	Quarter
10007	16825	Mr.	Brendan	Bradley	Senior Vice President	2005	2
10007	13234	Mr.	Eric	Holmes	Portfolio Manager	2005	2
10007	26444	Ms.	Stacey	Navin	Director & Portfolio Manager	2005	2
10007	13234	Mr.	Daniel	O'Neill	Portfolio Manager	2005	2
10007	26444	Mr.	Manraj	Sekhorn	Director & Portfolio Manager	2005	2
10007	11073	Mr.	Matthew	Willey	Portfolio Manager	2005	2
10008	18058	Mr.	Brian	Dawson		1999	1
10008	31952	Mr.	Vladimir	de Vassal	Director of Quantitive Researc	2007	1
10008	11113	Mr.	Valadimir	deVassal	Portfolio Manager	2005	2
10008	10735	Mr.	Sean	Fitzgibbon	Vice President & Portfolio Man	2005	2
10008	11073	Ms.	Jeanna	Wong	Portfolio Manager	2005	2
10008	11113	Mr.	Peter	Zuleba III	Portfolio Manager	2005	2
10009	10782	Mr.	Drew	Demakis	Senior Portfolio Manager	2006	3
10009	11686	Ms.	Eleanor	Innes	Second Vice President	2005	2
10009	10735	Ms.	Elizabeth	Slover	Co-Director & Portfolio Manage	2005	2
10009	11686	Ms.	Marguerite	Wagner	Executive Vice President	2005	2
10009	11813	Dr.	Edward	Yardeni	Chief Investment Strategist	2006	3
10010	11205	Mr.	Philippe	Brugere-Trelat	Portfolio Manager	2005	2
10010	11205	Ms.	Anne	Gudefin	Portfolio Manager	2005	2
10010	12962	Mr.	Mark	Koenig	Portfolio Manager	2005	2
10010	11205	Mr.	Charles	Lahr	Portfolio Manager	2005	2

Table 1.68: Bond Managers Turnover

No. of time moved	Freq.	Percent	Cum. Freq.	Cum. Percent
0	12897	87.48	12897	87.48
1	724	4.91	13621	92.4
2	213	1.44	13834	93.84
3	175	1.19	14009	95.03
4	178	1.21	14187	96.24
5	153	1.04	14340	97.27
6	139	0.94	14479	98.22
7	99	0.67	14578	98.89
8	85	0.58	14663	99.46
9	59	0.4	14722	99.86
10	12	0.08	14734	99.95
11	5	0.03	14739	99.98
12	2	0.01	14741	99.99
13	1	0.01	14742	100

Table 1.69: Summary of Duration a Manager has Worked in the Industry (Years)

Mean	Minimum	Maximum	Median	25th Pctl	75th Pctl	99th Pctl
5.7	0.1	14.2	4.7	2.0	8.7	14.2

Table 1.70: Summary of Market Sector Identifying the Employee's Area of Focus

Obs	STRING CODE	TYPE OF STRING	PERCENTAGE
1	A	Asset backed	24.1018
2	C	Corporate	40.2327
3	G	Government	30.9623
4	M	Mortgage-Backed	25.8693
5	R	Local/Regional	19.4828
6	N	Domestic US	27.0609

Table 1.71: List of Fund Managers Managed the Largest Funds in Each Quarter

YEAR	QTR	Prefix	First	Last	Title	TYPE	Company	Amount Managed ($ 000's)
1999	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	91,777,338
1999	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	90,111,507
1999	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	85,551,700
1999	4	Mr.	Thomas	Lenihan	MD	LIN	Met Life	84,406,020
2000	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	83,900,011
2000	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	83,419,642
2000	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	84,618,831
2000	4	Ms.	Patricia	Cook	MD	LIN	Prudential	87,454,331
2001	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	83,454,332
2001	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	86,091,764
2001	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	86,123,160
2001	4	Ms.	Patricia	Cook	MD	LIN	Prudential	87,860,646
2002	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	88,964,237
2002	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	89,082,966
2002	3	Mr.	Michael	O'Kane	Senior MD	LIN	TIAA-CREF	91,034,448
2002	4	Mr.	Thomas	Lenihan	MD	LIN	Met Life	102,704,220
2003	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	101,269,481
2003	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	104,478,305
2003	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	102,451,867
2003	4	Mr.	Thomas	Lenihan	MD	LIN	Met Life	106,575,188
2004	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	108,478,857
2004	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	112,169,041
2004	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	130,771,263
2004	4	Mr.	Thomas	Lenihan	MD	LIN	Met Life	121,495,471
2005	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	127,643,077
2005	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	125,856,914
2005	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	133,547,032
2005	4	Mr.	Scott	Evans	CIO and EVP	LIN	TIAA-CREF	120,659,689

Table 1.72: List of Fund Managers Managed the Largest Funds in Each Quarter (Continued)

YEAR	QTR	Prefix	First	Last	Title	TYPE	Company	Amount Managed ($ 000's)
2006	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	133,197,472
2006	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	130,967,388
2006	3	Mr.	Thomas	Lenihan	MD	LIN	Met Life	127,608,485
2006	4	Mr.	Thomas	Lenihan	MD	LIN	Met Life	126,330,925
2007	1	Mr.	Thomas	Lenihan	MD	LIN	Met Life	130,810,145
2007	2	Mr.	Thomas	Lenihan	MD	LIN	Met Life	125,738,696
2007	3	Mr.	Scott	Evans	CIO and EVP	LIN	TIAA-CREF	131,766,458
2007	4	Mr.	Thomas	Lenihan	MD	LIN	Met Life	138,161,954
2008	1	Mr.	Scott	Evans	CIO and EVP	LIN	TIAA-CREF	131,690,587
2008	2	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	134,106,825
2008	3	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	130,084,226
2008	4	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	136,249,278
2009	1	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	135,921,977
2009	2	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	138,966,666
2009	3	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	136,871,014
2009	4	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	147,071,614
2010	1	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	150,559,429
2010	2	Mr.	William	Gross	MD	MUT	PIMCO	186,650,383
2010	3	Mr.	William	Gross	MD	MUT	PIMCO	199,994,471
2010	4	Mr.	William	Gross	MD	MUT	PIMCO	199,531,249
2011	1	Mr.	William	Gross	MD	MUT	PIMCO	198,062,555
2011	2	Ms.	Elizabeth	Black	MD	LIN	TIAA-CREF	165,852,866
2011	3	Mr.	William	Gross	MD	MUT	PIMCO	192,110,943
2011	4	Mr.	William	Gross	Port Mgr	MUT	PIMCO	227,089,766
2012	1	Mr.	William	Gross	Port Mgr	MUT	PIMCO	225,425,700
2012	2	Mr.	William	Gross	Port Mgr	MUT	PIMCO	250,932,239
2012	3	Mr.	William	Gross	Port Mgr	MUT	PIMCO	254,071,056
2012	4	Mr.	William	Gross	Port Mgr	MUT	PIMCO	259,707,077
2013	1	Mr.	William	Gross	Port Mgr	MUT	PIMCO	278,503,447
2013	2	Mr.	William	Gross	Port Mgr	MUT	PIMCO	278,529,928

Table 1.73: Number of Funds Under Management by Quarter

Obs	year	Qtr	Freq	Mean	Median	Min	P25	P75	P99	Max
1	1999	1	2169	2.79023	1	1	1	3	24	58
2	1999	2	2087	2.72544	1	1	1	3	25	58
3	1999	3	2055	2.75912	1	1	1	3	27	62
4	1999	4	2039	2.78568	1	1	1	3	28	62
5	2000	1	2041	2.78001	1	1	1	3	27	65
6	2000	2	1927	2.5698	1	1	1	2	24	76
7	2000	3	1995	2.59499	1	1	1	2	24	72
8	2000	4	2011	2.70612	1	1	1	2	24	83
9	2001	1	1981	2.74609	1	1	1	2	25	83
10	2001	2	2102	2.86013	1	1	1	3	26	88
11	2001	3	2143	2.85954	1	1	1	3	26	93
12	2001	4	2150	2.90651	1	1	1	3	26	94
13	2002	1	2173	2.97561	1	1	1	3	27	103
14	2002	2	2218	2.97701	1	1	1	3	27	106
15	2002	3	2220	2.95631	1	1	1	3	26	111
16	2002	4	2145	2.87506	1	1	1	3	26	109
17	2003	1	2135	2.86183	1	1	1	3	25	117
18	2003	2	2188	2.88803	1	1	1	3	26	115
19	2003	3	2125	2.83576	1	1	1	3	25	108
20	2003	4	2255	2.80798	1	1	1	3	25	114
21	2004	1	2317	2.7691	1	1	1	3	25	121
22	2004	2	2139	2.91959	1	1	1	3	25	130
23	2004	3	2154	2.90808	1	1	1	3	25	131
24	2004	4	2267	2.86061	1	1	1	3	25	134
25	2005	1	1981	3.07824	1	1	1	3	31	127
26	2005	2	2140	3.02944	1	1	1	3	32	127
27	2005	3	2331	2.9541	1	1	1	3	28	126
28	2005	4	2320	2.92629	1	1	1	3	27	127
29	2006	1	2335	2.93704	1	1	1	3	26	133
30	2006	2	2293	2.9638	1	1	1	3	29	122
31	2006	3	2329	2.97853	2	1	1	3	23	125
32	2006	4	2328	2.9768	2	1	1	3	23	121
33	2007	1	2219	3.22172	2	1	1	3	25	126
34	2007	2	2226	3.24933	2	1	1	3	26	126
35	2007	3	2157	3.35651	2	1	1	3	28	129
36	2007	4	1965	3.58728	2	1	1	4	30	126
37	2008	1	1873	3.748	2	1	1	4	33	133
38	2008	2	1866	3.78081	2	1	1	4	31	143
39	2008	3	1778	3.96625	2	1	1	4	32	152
40	2008	4	1712	4.07126	2	1	1	4	32	153

Table 1.74: **Number of Funds Under Management by Quarter (Continued)**

Obs	year	Qtr	Freq	Mean	Median	Min	P25	P75	P99	Max
41	2009	1	1678	4.15495	2	1	1	4	32	157
42	2009	2	1662	4.12034	2	1	1	4	29	152
43	2009	3	1646	4.13062	2	1	1	4	30	146
44	2009	4	1592	4.13882	2	1	1	4	28	104
45	2010	1	1539	4.81741	2	1	1	5	37	227
46	2010	2	1547	4.7117	2	1	1	5	36	202
47	2010	3	1525	4.79738	2	1	1	5	40	202
48	2010	4	1483	4.93257	2	1	1	5	42	202
49	2011	1	1471	4.95377	2	1	1	5	42	199
50	2011	2	1456	4.92514	2	1	1	5	38	197
51	2011	3	1421	4.80647	2	1	1	5	38	197
52	2011	4	1429	4.81666	2	1	1	5	38	195
53	2012	1	1423	4.83064	2	1	1	5	39	202
54	2012	2	1446	4.78838	2	1	1	5	38	199
55	2012	3	1442	4.77739	2	1	1	5	39	200
56	2012	4	1468	4.72548	2	1	1	5	38	199
57	2013	1	1416	4.76059	2	1	1	5	32	198
58	2013	2	1432	4.77514	2	1	1	5	37	197

Table 1.75: Portfolio Holding of Each Holder

The data is from eMAXX and the data range is between 1999Q1 to 2013Q2. I grouped the industries in eMAXX from more than 100 types of issuers to 17 Fama-French industries. This table gives information regarding the portfolio of each investor types. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

Industry	END	PIN	MUT	LIN	GPE	QUI	FOF	OTH	INS	UIT	ANN	GVT	RIN	BAL	FEN	CPF	UPE	HLC	HSP	HFD	MMM	AMM
Cars	1.5	1.1	1.3	1.4	1.2	0.6	2	1.6	0.9		1.1	1.3	1	1.3	1.4							
Chems	1.9	2.7	1.7	2.5	1.5	1.2	1.4	0.6	2.6	0.7	1.9		2.3	1.3				2.1		1.2	1.9	
Clths	0.3	0.1	0.2	0.1	0.1	0.2	1.3	0.2	0.1		0.1		0	0.1				0			0.1	
Cnstr	1	0.4	0.8	0.6	0.7	1.3	1	0.5	0.5	0.1	0.7		0.4	0.4				0.2			0.4	
Cnsum	5.4	9.5	5.4	8.4	5.9	5.9	2.7	2.2	9.1	2.4	5.8		10	6.2				8.3		3.5	3.8	
Durbl	0.5	0.4	0.6	0.3	0.3	1.9			0.3		0.7	0.9	0.2	0.4	0.5							
FabPr	0.4	0.2	0.2	0.2	0.1	0.1	0.1	0.7	0.2	0.6	0.1		0.1	0.1				0.1			0.1	
Finan	43.2	38.5	47	32	45.8	52.9	57	65.5	40.8	67.2	45.7		36.8	52.4				51.2		47.9	68.2	100
Food	1.3	2.4	1.1	1.8	2.8	0.9	0.4	3.2	1.3		1.2	2.1	2.1	1.1	2.5	0.4		1.8	2.7			
Machn	2.3	3.1	1.9	2.9	2.1	2.7	1.6	3.2	2.5		2.1	1.4	2.2	2.3	5.3	3.7		3.7	0.8	4.9		
Mines	0.9	0.6	0.7	0.8	0.4	0.9	0.2		1		1	0.7	0.6	0.5		0.1		0.3	0.6	3		
Oil	8.1	6.5	7	8.3	6.9	4.5	4.4	1.5	6.3	1.2	7.9		7.4	5.2				6.4		2.1	3.4	
Other	37.4	20.8	34.6	20.7	27.1	36.4	25.1	62.6	19.7		37.5	19.1	20.7	24.8	26.8	32.4	17.6	23.5	21.9	26.3		
Rtail	2.5	3.1	3.2	3.3	4.2	3.1	1.3	4	2.2		3.1	0.9	3.6	2.7	8.5	4.6		2.8	1.4	0.6		
Steel	1.7	0.6	1.6	0.8	0.6	0.6	0.4	0.8	0.5		0.9	0.2	0.6	0.4	0.4							
Trans	1.5	2	1.4	2.4	1.8	1.8	0.6		2.6		1.4		2.1	1.4		1.7		1.5		1.4	1.2	
Utils	7.2	10.9	6.6	15.3	9.3	3.8	5.3		6.4		7.5		12.4	7.2		7.3		5.7		0.7	2.7	

Table 1.76: Profile of Investors for Each Industry

The data is from eMAXX and the data range is between 1999Q1 to 2013Q2. I grouped the industries in eMAXX from more than 100 types of issuers to 17 Fama-French industries. This table gives information regarding the holder profile of each industry of issuer. The subclass full name is the following: ANN=Annuity-variable, END=Close-End mutual fund, FOF=Fund of Fund mutual fund, GPE=Pension Fund Government, INS=Insurance Co-Diversified, LIN=Life insurance, MUT=Open-end mutual fund, OTH=Others, PIN=Property and Casualty insurance, QUI=Mutual fund equity, UIT=Unit investment trust, GVT=Government, BAL=Mutual fund-Balanced, FEN=Foundation/Endowment, RIN=Reinsurance company, HFD=Hedge fund, CPF=Pension fund corporate, UPE=Pension Fund-Union, HLC=Health care system, HSP=Hospital, AMM=Annuity money market, MMM= Mutual fund money market

Industry	END	PIN	MUT	LIN	GPE	QUI	FOF	OTH	INS	UIT	ANN	GVT	RIN	BAL	FEN	CPF	UPE	HLC	HSP	HFD	MMM	AMM
Cars	15.8	16.9	56.3	53.2	8.8	9.6	0.9	20.6	3.8	3.1	9.5	6.5	4.6	13.4	4.4	1	0	0.4	0.9	11.2	8.1	0
Chems	13.4	17.7	45.9	59.1	8.4	7.4	0.7	2.6	2.4	9.3	7	3.8	4.9	8.8	9.9	9.8	1.2	1	0.1	3.7	3.5	0
Clths	15.4	12.6	54	47	11.7	9.7	1	13.2	0.7	0	11.5	9.9	2.8	5.9	0	0	0	0.7	0	0	3.6	0
Cnstr	12.9	11.3	57.2	47.3	7.3	9.2	2.1	4.4	0.8	33.9	8.4	4.1	5.7	11.3	4	1	0	0.4	0	12.4	4.4	0
Cnsum	11.5	14.7	44	55.5	8.6	10.6	1.4	1.5	0.5	23.3	7	5.4	4.4	10.8	5.7	2.4	0	0.7	0.1	14.2	3	0
Durbl	11.2	17.5	43.6	47.5	8.3	8.3	0.3	0.2	0.6	0	9.5	5.9	3	4.5	8.1	0.7	0	0.6	0.3	3.1	2	0
FabPr	12.2	11.9	55.8	50.4	12.6	7.5	1.6	7.7	0.8	41.1	9	4.1	1.3	11.5	3.5	0.2	0	0.3	0	0	9.3	0
Finan	19.7	35.3	56.1	65.5	11.1	12.1	4.9	8.4	12.4	28.6	9.5	10.7	10.4	16	10.1	2.7	0.3	8.9	4	13.1	16.7	32.9
Food	10.5	22.2	44.6	63.3	13.1	4.8	0.7	2.4	0.8	10.5	7.1	7.7	6.5	7.9	43.9	0.9	0	0.5	0.1	0	4.8	0
Machn	11.5	17.5	39.5	60.4	8.2	11.3	1	3	1.6	43.5	6.8	6.6	3.6	6.9	14.9	0.4	0	1.7	0.1	11.7	3.7	0
Mines	11.5	8.9	44.8	64.1	6.9	14.4	2	2.5	0.8	6.9	7	5.7	3.8	6.4	0	0.1	0	0.4	0.3	21.1	3.5	0
Oil	8.7	11.6	44	60.1	8.2	5.1	0.6	0.5	0.4	33.1	6.8	7	4.7	6	5.7	1.9	0	0.6	0.4	11.3	2	0
Other	12.5	15.6	53.4	51.3	10	8.4	2	5.4	1.3	27.2	9.4	5.5	6.7	9.8	4	2.8	0	0.8	0.6	13.8	3.4	0
Rtail	10.2	15.5	39.7	60.4	10.2	8.6	1.4	3.8	0.3	23.6	6.7	5.4	5.3	6.1	10.8	12.7	0	0.5	0.1	20.8	4.3	0
Steel	12.3	14.6	58.7	58	7.3	7.9	0.8	1	0.6	0	8.5	2.4	2.8	15.1	17.4	0.6	0	0.3	0.2	51	1.1	0
Trans	15.5	40.3	50.6	77.5	17.8	10	3	9.6	2.6	49.5	8.3	15.2	9.4	20.5	51.5	0.7	19.8	0.6	0.2	12.3	6.6	0
Utils	10.9	19.6	36.5	75	12	4.5	2.5	4.9	1.4	27.3	5.5	12.2	7.5	12.1	13.9	5.1	0	1	0.1	23.4	3.6	0

Table 1.77: Summary Statistics of Type of Bankruptcy Chapter

Chapter	no. of cases	Percent
11	1097	98
7	24	2

Table 1.78: Summary Statistics of Bankruptcy Prepackaging

Prepackaged	Frequency	Percent	Cum Freq	Cum Percent
free fall	755	67.17	755	67.17
not applicable	27	2.4	782	69.57
prenegotiated	217	19.31	999	88.88
prepackaged	125	11.12	1124	100

Table 1.79: Summary Statistics of Firms in Both eMAXX and BRD Database

In Both Database	Frequency	Percent	Cum Freq.	Cum. Percent.
YES	606	53.91	606	0.54
No	518	46.09	1124	1.00

Table 1.80: Rating Upgrade and Downgrade Summary

Mean	Median	Min	Max	25pct	75pct	Std Dev	Skewness	Kurtosis
-0.8	-1	-20	20	-2	1	2.5	-1.2	7.6

Table 1.81: Example of Bonds with 20-Step Downgraded

CUSIP	Issuer	YEAR	QTR	Rate	Score	Rating chge.	No.Buy	No. Sell
25454LAB	DIOGENES CDO III LTD	2007	3	Aaa	21		1	0
25454LAB	DIOGENES CDO III LTD	2007	4	C	1	-20	0	0
44967EAG	IMAC CDO 2007-2 LTD	2007	1	Aaa	21		5	0
44967EAG	IMAC CDO 2007-2 LTD	2007	2	Aaa	21	0	0	0
44967EAG	IMAC CDO 2007-2 LTD	2007	3	Aaa	21	0	0	5
44967EAG	IMAC CDO 2007-2 LTD	2007	4	C	1	-20	1	3
702177AB	PASA FDG 2007 LTD	2007	1	Aaa	21		11	0
702177AB	PASA FDG 2007 LTD	2007	2	Aaa	21	0	25	0
702177AB	PASA FDG 2007 LTD	2007	3	Aaa	21	0	18	9
702177AB	PASA FDG 2007 LTD	2007	4	C	1	-20	13	14
702177AB	PASA FDG 2007 LTD	2008	1	C	1	0	11	5
702177AB	PASA FDG 2007 LTD	2008	2	C	1	0	0	17
702177AB	PASA FDG 2007 LTD	2008	3	C	1	0	0	1

Table 1.82: **Buy and Sell Transaction of PASA FDG**

Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
9	2007	1	Fidelity Asset Manager: Growth Portfolio	1		Aaa
12	2007	1	Fidelity Asset Manager 85%	2		Aaa
18	2007	1	Fidelity Real Estate Income Fund	3		Aaa
26	2007	1	Fidelity Balanced Portfolio	4		Aaa
145	2007	1	Fidelity Asset Manager Portfolio	5		Aaa
146	2007	1	Fidelity Asset Manager 70%	6		Aaa
216	2007	1	Fidelity Asset Manager 20%	7		Aaa
267	2007	1	Fidelity Advisor Inflation-Protected Bond Fund	8		Aaa
352	2007	1	Fidelity Investment Grade Bond Portfolio	9		Aaa
720	2007	1	Fidelity Asset Manager 50%	10		Aaa
827	2007	1	Fidelity Strategic Real Return Fund	11		Aaa
Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
9	2007	2	Fidelity Asset Manager: Growth Portfolio	1		Aaa
12	2007	2	Fidelity Asset Manager 85%	2		Aaa
18	2007	2	Fidelity Real Estate Income Fund	3		Aaa
26	2007	2	Fidelity Balanced Portfolio	4		Aaa
30	2007	2	Fidelity Advisor Balanced Fund	5		Aaa
59	2007	2	Fidelity Advisor Balanced Fund	6		Aaa
105	2007	2	Fidelity Advisor Short Fixed-Income Fund	7		Aaa
145	2007	2	Fidelity Asset Manager Portfolio	8		Aaa
146	2007	2	Fidelity Asset Manager 70%	9		Aaa
216	2007	2	Fidelity Asset Manager 20%	10		Aaa
245	2007	2	Fidelity Advisor Intermediate Bond Fund	11		Aaa
257	2007	2	Fidelity Advisor Ultra-Short Bond Fund	12		Aaa
267	2007	2	Fidelity Advisor Inflation-Protected Bond Fund	13		Aaa
340	2007	2	Fidelity Puritan Fund	14		Aaa
352	2007	2	Fidelity Investment Grade Bond Portfolio	15		Aaa
364	2007	2	Fidelity Advisor Mortgage Securities Fund	16		Aaa
395	2007	2	Fidelity Balanced Fund	17		Aaa
569	2007	2	Fidelity Short-Term Bond Fund	18		Aaa
679	2007	2	Fidelity Puritan Fund	19		Aaa
720	2007	2	Fidelity Asset Manager 50%	20		Aaa
789	2007	2	Fidelity Balanced Fund	21		Aaa
820	2007	2	Fidelity US Bond Index Fund	22		Aaa
827	2007	2	Fidelity Strategic Real Return Fund	23		Aaa
1206	2007	2	Fidelity Intermediate Bond Fund	24		Aaa
2620	2007	2	Fidelity Investment Grade Bond Fund	25		Aaa

Table 1.83: Buy and Sell Transaction of PASA FDG (Continued)

Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
-180	2007	3	Fidelity Investment Grade Bond Fund		1	Aaa
-108	2007	3	Fidelity Strategic Real Return Fund		2	Aaa
-29	2007	3	Fidelity Advisor Ultra-Short Bond Fund		3	Aaa
-24	2007	3	Fidelity Investment Grade Bond Portfolio		4	Aaa
-21	2007	3	Fidelity Asset Manager Portfolio		5	Aaa
-18	2007	3	Fidelity Real Estate Income Fund		6	Aaa
-5	2007	3	Fidelity Balanced Portfolio		7	Aaa
-1	2007	3	Fidelity Advisor Mortgage Securities Fund		8	Aaa
-1	2007	3	Fidelity Asset Manager: Growth Portfolio		9	Aaa
1	2007	3	Fidelity Asset Manager 85%	1		Aaa
6	2007	3	Fidelity Asset Manager 70%	2		Aaa
10	2007	3	Fidelity Advisor Intermediate Bond Fund	3		Aaa
11	2007	3	Fidelity Asset Manager 20%	4		Aaa
22	2007	3	Fidelity Balanced Fund	5		Aaa
28	2007	3	Fidelity Advisor Short Fixed-Income Fund	6		Aaa
30	2007	3	Fidelity Advisor Balanced Fund	7		Aaa
31	2007	3	Fidelity Asset Manager 50%	8		Aaa
43	2007	3	Fidelity Balanced Fund	9		Aaa
51	2007	3	Fidelity Advisor Inflation-Protected Bond Fund	10		Aaa
59	2007	3	Fidelity Advisor Balanced Fund	11		Aaa
146	2007	3	Fidelity Short-Term Bond Fund	12		Aaa
149	2007	3	Fidelity Intermediate Bond Fund	13		Aaa
304	2007	3	Fidelity US Bond Index Fund	14		Aaa
340	2007	3	Fidelity Puritan Fund	15		Aaa
615	2007	3	Fidelity Advisor Total Bond Fund	16		Aaa
679	2007	3	Fidelity Puritan Fund (Aggrgtd)	17		Aaa
1229	2007	3	Fidelity Advisor Total Bond Fund	18		Aaa

Table 1.84: Buy and Sell Transaction of PASA FDG (Continued)

Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
-513	2007	4	Fidelity Investment Grade Bond Fund		1	C
-137	2007	4	Fidelity Intermediate Bond Fund		2	C
-107	2007	4	Fidelity US Bond Index Fund		3	C
-74	2007	4	Fidelity Asset Manager 50%		4	C
-30	2007	4	Fidelity Advisor Mortgage Securities Fund		5	C
-29	2007	4	Fidelity Asset Manager 20%		6	C
-27	2007	4	Fidelity Advisor Inflation-Protected Bond Fund		7	C
-22	2007	4	Fidelity Advisor Intermediate Bond Fund		8	C
-17	2007	4	Fidelity Asset Manager 70%		9	C
-8	2007	4	Fidelity Advisor Balanced Fund		10	C
-7	2007	4	Fidelity Advisor Ultra-Short Bond Fund		11	C
-4	2007	4	Fidelity Advisor Balanced Fund		12	C
-2	2007	4	Fidelity Asset Manager 85%		13	C
-1	2007	4	Fidelity Asset Manager: Growth Portfolio		14	C
0	2007	4	Fidelity Asset Manager 60%			C
0	2007	4	Fidelity Asset Manager 40%			C
0	2007	4	Fidelity Asset Manager 30%			C
1	2007	4	Fidelity Investment Grade Bond Portfolio	1		C
2	2007	4	Fidelity Balanced Portfolio	2		C
2	2007	4	Fidelity Asset Manager Portfolio	3		C
15	2007	4	Fidelity Advisor Short Fixed-Income Fund	4		C
20	2007	4	Fidelity Advisor Total Bond Fund	5		C
39	2007	4	Fidelity Advisor Total Bond Fund	6		C
74	2007	4	Fidelity Puritan Fund	7		C
106	2007	4	Fidelity Balanced Fund	8		C
130	2007	4	Fidelity Short-Term Bond Fund	9		C
135	2007	4	Fidelity Advisor Asset Manager 70% Fund	10		C
147	2007	4	Fidelity Puritan Fund	11		C
212	2007	4	Fidelity Balanced Fund	12		C
719	2007	4	Fidelity Strategic Real Return Fund	13		C

Table 1.85: Buy and Sell Transaction of PASA FDG (Continued)

Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
-816	2008	1	Fidelity US Bond Index Fund		1	C
-719	2008	1	Fidelity Strategic Real Return Fund		2	C
-230	2008	1	Fidelity Advisor Mortgage Securities Fund		3	C
-132	2008	1	Fidelity Advisor Inflation-Protected Bond Fund		4	C
-4	2008	1	Fidelity Investment Grade Bond Portfolio		5	C
0	2008	1	Fidelity Asset Manager 60%			C
0	2008	1	Fidelity Advisor Short Fixed-Income Fund			C
0	2008	1	Fidelity Asset Manager 30%			C
0	2008	1	Fidelity Intermediate Bond Fund			C
1	2008	1	Fidelity Asset Manager 40%	1		C
2	2008	1	Fidelity Asset Manager: Growth Portfolio	2		C
3	2008	1	Fidelity Asset Manager 85%	3		C
3	2008	1	Fidelity Advisor Asset Manager 70%	4		C
18	2008	1	Fidelity Asset Manager Portfolio	5		C
31	2008	1	Fidelity Asset Manager 70%	6		C
45	2008	1	Fidelity Advisor Intermediate Bond Fund	7		C
63	2008	1	Fidelity Asset Manager 20%	8		C
155	2008	1	Fidelity Asset Manager 50%	9		C
264	2008	1	Fidelity Short-Term Bond Fund	10		C
526	2008	1	Fidelity Investment Grade Bond Fund	11		C
Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
-2486	2008	2	Fidelity Investment Grade Bond Fund		1	C
-1323	2008	2	Fidelity Intermediate Bond Fund		2	C
-1246	2008	2	Fidelity Short-Term Bond Fund		3	C
-728	2008	2	Fidelity Asset Manager 50%		4	C
-719	2008	2	Fidelity Strategic Real Return Fund		5	C
-468	2008	2	Fidelity Investment Grade Bond Portfolio		6	C
-296	2008	2	Fidelity Asset Manager 20%		7	C
-235	2008	2	Fidelity Advisor Short Fixed-Income Fund		8	C
-211	2008	2	Fidelity Advisor Intermediate Bond Fund		9	C
-152	2008	2	Fidelity Asset Manager 70%		10	C
-125	2008	2	Fidelity Asset Manager Portfolio		11	C
-15	2008	2	Fidelity Advisor Asset Manager 70%		12	C
-14	2008	2	Fidelity Asset Manager 85%		13	C
-9	2008	2	Fidelity Asset Manager: Growth Portfolio		14	C
-3	2008	2	Fidelity Asset Manager 30%		15	C
-2	2008	2	Fidelity Asset Manager 40%		16	C
-1	2008	2	Fidelity Asset Manager 60%		17	C
Net Chg ($'000)	YR	QTR	NAME	Buy	Sell	Rating
-719	2008	3	Fidelity Strategic Real Return Fund		1	C

Table 1.86: Mutual Fund Networks

Obs	COUNT	PERCENT	Name
1	488	2.47	Fidelity Management & Research Company
2	236	1.19	BlackRock Financial Management Inc
3	216	1.09	Mitsubishi UFJ Asset Management Co Ltd
4	214	1.08	Pacific Investment Management Co LLC (PIMCO)
5	212	1.07	Legg Mason Partners Fund Advisor LLC (New York)
6	205	1.04	J.P. Morgan Investment Management, Inc. (U.S.A.)
7	202	1.02	Templeton Global Bond Managers, Inc.
8	189	0.96	Invesco Canada Ltd
9	166	0.84	Nomura Asset Management Co Ltd
10	163	0.82	HSBC Investments (USA), Inc.

CHAPTER II

Strategic Default Premium and Credit Spreads

1. Introduction

To examine a determinant of bond value, there are two approaches to perform the analysis. We can either analyze the bond *price* or *yield*. However, the common practice in bond literature is to perform the analysis using bond yield. Usually, we subtract the risk-free rate from the bond yield and the output is called "credit spreads". The risk-free rate used should have the characteristics similar to the bond analyzed. These credit spreads are the focus of the research in finding the determinant of bond value. So far, academic researchers have found that the credit spreads reflect risk premiums, such as liquidity risk and default risk. However, the issue of the bond credit spreads still has a lot of room to explore. A regular credit risk and liquidity factor cannot explain all of the variations in the credit spreads of bonds. *Strategic default* is another potential area that may help explain the variation in credit spreads of firms. Hart and Moore (1994, 1998) define the difference between liquidity and strategic default as that liquidity default is when borrowers cannot pay their loan back as promised because they do not have enough resources to do so. Strategic default is when borrowers do not pay back the loan even though they have enough resources. They just default strategically.

Such regular risk factors as leverage and volatility are common in literatures when analyzing bond pricing. Large unexplained portion of credit spreads could be understood more if we add strategic risk factors. Davydenko and Strebulaev (2007) identify strategic factors based on three categories: liquidation cost, bargaining power of equity, and renegotiation friction. However, Davydenko and Strebulaev (2007) as well as most literature on bond pricing have not ventured deep enough into bondholder's bargaining power effect on credit spreads. Most studies focus on equity holders bargaining power. I fill in the gap of corporate bond pricing and strategic default literature by examining the relationship between credit spreads of firms and bondholders' bargaining power through the strategic default mechanism. Another reason that bondholder's bargaining power has not been considered much might be concerning data availability. Just until recently, eMAXX data from Thomson Reuters provides detailed holding of institutional investors. For instance, for each bond CUSIP, eMAXX provides data regarding the dollar value of bond held by different institutional investors. Following the model of Fan and Sundaresan (2000), my main hypothesis is the higher the percentage bondholding by a bondholder the lower the credit spreads or vice versa (please see Appendix for theoretical motivation). This negative relationship is because the lower chance of strategic default by equity holders. Equity holders have less incentive to default strategically if they know that they will not be able to steer the company toward their desired direction in case of bankruptcy. With high bargaining power of bondholders, equity holders will have a hard time to control the game and may result in small surplus for them at the end of renegotiation process. Therefore, ex ante, bondholders demand less premium on lower strategic default likelihood when they have high bargaining power.

Theoretical credit risk models incorporating strategic default and bargaining power of bondholders are becoming more common (e.g. Anderson and Sundaresan (1996), Mella-Barral and Perraudin (1997), Fan and Sundaresan (2000)), but, again, we still lack empirical side of it.

To test whether bondholder's bargaining power is an important explanatory variable for a firm credit spreads, I perform pooled regression with year and industry fixed effect. The regression also takes care of heteroscedasticity with robust standard errors.

Important independent variables both strategic and non-strategic variables in credit risk literature are included as control variables.

Regarding my results, first, the main result shows consistency with my main hypothesis that the higher the bondholders' bargaining power the lower the credit spreads. The reason could be due to the lower strategic default likelihood. Second, when I break down the issuer into different industries, I find that the insurance company is the top holder of all types of issuer by the margin of $40 - 50$ percent of overall bond issuance amount. We would expect that the holding by insurance companies should have significant explanatory power on the credit spreads of all the industries. I find the results consistent with the conjecture; however, the only one industry that its credit spreads cannot be explained by the holding of insurance companies is construction companies. The result may be prone to small sample since construction represents only 0.73 percent of overall sample. Third, when bondholders' bargaining power and equity holder bargaining power interact, bondholders require higher credit spreads to hold a bond. This result could be explained by the fact that the decision to default strategically is solely based on equity holders and, based on strategic default model, equity holders always receive higher benefit from strategic default than bondholders. Therefore, with one to one increase in each bargaining power, bondholders require higher premium to compensate for strategic default prospect. Fourth, I consider the event that could affect the likelihood of strategic default: Dodd-Frank Act, Sarbanes-Oxley Act (SOX), and financial crisis 2007. I find that after Dodd-Frank Act and SOX took effect, the strategic default likelihood is lower based on the premium required by bondholders. This implies that the two acts help reduce the overall risk including strategic default risk. For financial crisis, I find that strategic default plays much more important role during the crisis. This makes sense since overall systematic risk is higher during the crisis and firms have higher likelihood to go out of business. Lastly, some characteristics of issuers result in different degree of strategic default. I find that strategic default plays more important role in firms with low rating and low fixed-assets.

Since the data is bond transaction data, the problem of large-firm transaction's domination may arise. I address this issue by allowing only one transaction per firm per period and perform the same regression analysis as in the main test. In other words, I randomly pick one transaction per firm per month. Then perform the regression analysis. I repeat this procedure 100 times and the results are consistent with the main finding. As for the endogeneity issue, lower credit spreads may result in higher bondholding. I take care of this issue by using two-stage GMM. The results still show consistency to my main hypothesis after using GMM even though the significant level is reduced by half but the overall significance is still high at one percent significant level.

However, some people might argue that the significant negative association between bondholder's bargaining power and credit spreads may capture something else other than the implicit strategic default factor, because strategic default is likely to occur when a firm is in distress. But, the main test is during the normal stage of firms. To ensure that the results can be generalized, I also test the relationship on different likelihoods of bankruptcy using two models from Campbell et al (2008) and Acharya et al (2007). And I find that the results still hold.

One of the main contributions is to show that bondholder's bargaining power is important when we study determinants of credit spreads or corporate bond pricing, specifically through strategic default. The second contribution is to propose to a regulator a way that could help reduce the strategic default risk by making the bondholding information of each issuer more transparent and more publicly available. Currently, regulators and financial industry have done a good job of publicizing the shareholder information of firms. For instance, information about institutional shareholders and free float of public companies are more publicly available. However, we have less information regarding a bondholder structure of a public company. Based on the result of this paper, bondholder's bargaining power is a good proxy for strategic default likelihood. That is a bond with major bondholder may have lower chance of strategic default from equity holders. Therefore, to gauge the strategic default incentive, we need this information so that individual investors who cannot handle high risk could avoid investing in firms with high likelihood of strategic default. This is also to make the bond investment has higher symmetric information. Note that I do not mean bonds with no major bondholders are wrong or should not exist, but retail investors should be informed whether the bonds they invest in have a major bondholder (low strategic default risk) or dispersed bondholders (high strategic default risk). If retail investors know that a company they tend to invest in its bond has high likelihood of strategic default (i.e. dispersed bondholder structure) and they still invest because they expect higher compensation or can handle high risk without compensation, this will create no problem. However, the real world leans more toward asymmetric information and is full of risk-averse investors. Therefore, it might be better for retail investors to have a major bondholder in order to help reduce strategic default risk in a bond that they invest in. At the same time, regulators and the government should offer some incentives for institutional bondholders to hold bonds with yet no major bondholders.

The rest of this paper proceeds as follows. Section 2 is literature review which discusses about related bond pricing models and models that allow for renegotiations. For Section 3, hypotheses are developed. Section 4 discusses data source and data preparation. Section 5 describes in detail the variable construction. The methodology is provided in section 6. Section 7 provides results. Section 8 and 9 address robustness concerns. Lastly, section 10 concludes.

2. Literature Review

Davydenko and Strebulaev (2007) perform an empirical analysis on the relationship between corporate debt prices and firm characteristics that impact strategic decisions concerning default and distressed renegotiations. Though ex post there may be efficiency gains from renegotiation, they find that the possibility of strategic default increases corporate debt credit spreads. The effect of strategic actions on credit spreads is even larger for corporations whose creditors are more vulnerable to the threat of strategic default, such as firms with low tangible assets. While the topic of pricing of corporate bonds has been done for a long time, the credit spreads still remain largely unexplained.

One possibility that there is still a large portion of unexplained credit spreads is that studies have been focusing only on the risk factors such as leverage and volatility. Other characteristics that are not related to risk factors should be given more attention. For instance, US bankruptcy code's Chapter 11 results in making renegotiation an important factor in distressed reorganizations both formal bankruptcy and in out-of-court renegotiations. Empirical works show that factors affecting bargaining positions of different parties in negotiations, including debt recovery rates, deviations from absolute priority, formal and informal reorganizations, asset tangibility, managerial share ownership, complexity of debt structure. Most models show that credit spreads vary based on the expected default probability. However, some models allow for recovery rate factor which gives room to negotiation (e.g., Longstaff and Schwartz (1995)).

The extent of whether and when equity holders will decide to default is another important aspect of bankruptcy process. Hart and Moore (1994, 1998) give a definition of the difference between the liquidity default and strategic default. Liquidity default is when the firm's cash flows are not enough to pay the promised debt whereas strategic default is when firms have enough cash to pay off their debts but they choose to default strategically. When a firm goes to default, the value of the firm decreases relative to going concern. So, some of the creditors are willing to forgive some debt for the firm to survive. This is an incentive for the equity holders to default strategically because they can enjoy the debt concession. Therefore, considering only liquidity default may understate the true probability of default and results in large unexplained portion of bond credit spreads.

Bond pricing models that allow for the renegotiation such as Anderson and Sundaresan (1996) and Mella-Barral and Perraudin (1997) suggest that when lenders have small bargaining power, a large portion of the credit spreads may be due to the risk of strategic default. Many recent models on corporate bond pricing incorporate the possibility of strategic renegotiation. I extend this part of the literature in that large and small bargaining powers of creditors should have an effect on the credit spreads through the strategic default channel differently. Small bargaining power of creditors or bondholders may demand higher credit spreads because of strategic default prospect. On the other hand, large bargaining power of creditors may require lower credit spreads because of lower chance to face the strategic default. Equity holders have higher chance to default strategically if most of the bargaining power belong to them because they know that there is a high chance that bondholders will temporarily give up debt to survive the firms. However, if the bondholders are not dispersed or some of the bondholders are big enough. Equity holders will have less incentive to fight with this influential group of bondholders.

Davydenko and Strebulaev (2007) use aggregate measure for renegotiation frictions. Those aggregate measures are number of bond issues and Herfindhal index. High number of bond issues reflects high renegotiation friction. High Herfindhal index shows concentration of the bondholder based on the face value of bonds issued, thus high Herfindhal index represents low renegotiation friction. I use eMAXX data that provides bondholders' details both institutional and individual holders to delve down into more details about bondholders' bargaining power. Fan and Sundaresan (2000) show in their models that the strategic action effect on credit spreads depends on bargaining power in renegotiations.

Overall, most of the empirical papers on strategic default still do not test on bondholders' bargaining power directly. Favara et al. (2012) examined whether strategic default by shareholders can explain differences in firm's equity risk across countries. On the debt holder side, they look at the characteristics of the bankruptcy code (Djankov et al. (2008)). They find that equity risk is lower in countries where insolvency procedure favors debt renegotiation, not liquidation.

Djankov et al. (2008) quantify the level of debt enforcement of each country from the survey completed by attorney and judges who are registered in section J of the International Bar Association (IBA). Section J's members are practitioners in the areas of insolvency, restructuring and creditors' rights. Djankov et al. (2008) touch on the creditor bargaining power, but their proxy is still very limited. First, the proxy used is a survey which, usually, is prone to the design of the survey and judgement of a person who completes the survey. Second, the proxy used is institutional level which is used in different context, such as country-level analysis. For the firm-level effect, we would need a firm specific variable. Aslan and Kumar (2012) examined the bargaining power of equity on cost of debt and they found positive relationship between the two. To conclude on the empirical aspect of previous literature, most of them focus on the equity holders' bargaining power. Some literature that considered bondholders bargaining power used indirect proxy such as characteristics of bonds and country level debt enforcement.

3. Hypotheses

Table 2.1 shows types of issuers based on the first two SIC industry code. The largest issuer in this sample is manufacturing with 50.16 percent of the sample, following by transportation which is the second largest issuer with 19.49 percent of overall issues. Table 2.2 shows different portion of bondholding by each type of bondholder. This difference in portion of bonds held can be translated to different bargaining power of bondholders. In this paper, bondholders' bargaining power is proxied by the portion of the bonds held by institutional investors. If they hold large part of the bond amount outstanding, this implies they have high bargaining power because they have a say in renegotiation process. A type of bondholders should also be related to the bondholder's bargaining power. As in activist investors in equity literature, in many cases, shareholders do not need to hold large share of firm's equity to pressure the management of the firm. They can use some other resources to pressure the firm, such as proxy fight. Based on Fan and Sundaresan (2000) model, different bargaining power of bondholders should result in different effect on credit spreads. Specifically, we should expect negative relationship between size of bondholding and credit spreads conditional on the type of bondholders. In other words, the larger the bonds held by a bondholder (higher bargaining power), the lower the strategic default premium they require (please see Appendix for the numerical example of the negative relationship between credit spreads and bondholders' bargaining power). Therefore, the first and most important hypothesis that we have to test is whether there is a significant relationship between credit spreads and bondholder's bargaining power.

H1: Proxied by portion of bonds held, higher bargaining power of bondholders should result in lower credit spreads

Table 2.11 shows the breakdown of quarterly average percentage holding of each bondholder for different types of issuers. For example, on average, largest bondholders of construction companies are insurance and mutual funds with the holding size of 46 and 7 percent respectively. Insurance are the top holders of all industries in Table 2.11. Mutual fund is the second largest holder next to insurance, except for mining and transportation that pension holding is higher. Moreover, we can see from the range of top three bondholders, which are insurance, mutual fund, and pension, is from 1 to 52 percent whereas the range of the rest is much lower at around less than one percent. Overall, insurance holding is the largest and quite larger than the second largest holding of any issuer types. Therefore, we should expect to see insurance holdings as significant explanatory variables for credit spreads for all types of issuer.

H2: Insurance, as the largest bondholders of all issuers, should have significant explanatory power on credit spreads of all types of issuers

Since the decision to default strategically depends solely on the equity holder, we should expect positive relationship between the interaction term of equity and bondholder's bargaining power and credit spreads of a bond. In other words, in terms of strategic default, equity holders have positive relationship with credit spreads and bondholders have negative relationship with credit spreads. With one to one increase in bargaining power of both sides, equity holders should have stronger bargaining power because of the right to go bankrupt strategically. Fan and Sundaresan (2000) also shows that in renegotiation equity holders always receive higher compensation than bondholders. This implies that, in terms of benefit and cost, it is costlier for bondholders in renegotiation game. If there are equity holders in the mix or in this case interaction term, bondholders should require higher premium from holding the bond. Shareholders will choose the timing that they will benefit the most from strategic default.

H3: Interaction between equity holders and bondholders should be positively related to the credit spreads

Moreover, I would like to test whether bondholders will demand higher strategic default premium on credit spreads from firms that are more vulnerable to strategic default. One proxy for high and low strategic default prospect could be through low and high fixed assets, respectively. Following Alderson and Betker (1996) and Davydenko and Strebulaev (2007), companies with high fixed assets have lower probability to face strategic default from equity holders because they have lower liquidation costs for bondholders and lower benefit for equity holders. In other words, fixed assets are easy to sell, so bondholders will know quite certain what would be the impact when it comes to default. Moreover, based on priority rule, equity holders will only receive residuals after creditors take all their claims. In this case, bondholders will not give up debt easily to survive a firm when equity holders threat to default strategically. On the other hand, if firms have large amount of non-fixed assets which are difficult to sell and also difficult to know the value of the final liquidation value, bondholders will feel uncertain and have a higher chance to give up debt to survive the firms when equity holders threat to default strategically. Therefore, I expect that strategic default risk should be lower for firms with high fixed assets and higher for firms with low fixed assets.

H4: For lower prospect of strategic default as proxied by high fixed assets, strategic default should play less important role in bond pricing

The rating of a firm should play a role in strategic default likelihood. High rating firms, such as AAA, should have better corporate governance control; hence, lower risk of strategic default. On the other hand, low-rated firms should have less efficiency in management system and we would expect higher strategic default likelihood. In addition, Huang and Huang (2012) found low-rated firms have higher default risk. Therefore, we should expect higher premium from bondholders for low-rated firms to compensate for higher strategic default likelihood.

H5: Strategic default should play more important role in low-rated firms

Sarbanes-Oxley Act of 2002 or SOX is the act that increases the corporate governance of a firm. After Enron and Worldcom scandals, the US congress passed this law in 2002 to protect investors by improving the accuracy and reliability of corporate disclosure. The act issued new standard requirement for all U.S. public company boards, management and public accounting firms. To see how SOX relates to the reduction of strategic default likelihood, first, the link between corporate governance and performance should be clearly explained. Gompers, Ishii, and Metrick (GIM, 2003) examine the effect of corporate governance on firm performance during the 1990s. GIM (2003) find a positive relation between corporate governance and firm performance. Consequently, when the performance of a firm is better, the likelihood of filing for bankruptcy strategically is lower. Therefore, the act should reduce the strategic default risk after its implementation. If strategic default risk is lower, bondholders should require lower premium to hold the bond after SOX.

H6: After Sarbanes-Oxley Act (SOX) was implemented, strategic default likelihood should be lower

In 1999, Gramm-Leach-Bliley Act (GLBA) repealed part of the Glass-Steagall Act of 1933 by allowing financial companies to participate in investment banking and insurance businesses. Many people said that this permission by GLBA led the world economy to financial crisis in 2007. After the crisis, Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) was passed by Obama administration in 2010. One of the Dodd-Frank proposals or some people call it "Volcker Rule" (Title VI of the Act) is to restrain financial companies from speculative business. Volcker Rule is, essentially, the same rule as the Glass-Steagall Act that tries to prevent financial crisis in the first place. This should reduce the overall risk in the financial market including strategic default likelihood. Moreover, in Dodd-Frank Act, there are new rules that apply to specific types of financial institutions in my sample. For example, Title V Subtitle A of Dodd-Frank Act increases the transparency of insurance industry by giving more power to authority to monitor the industry. Overall, we should see lower risk of strategic default because of Dodd-Frank Act. Since Dodd-Frank Act took place in 2010, I separate sample into before and after 2010 to test the effect of Dodd-

Frank Act on strategic default likelihood. To be more specific in stating hypothesis, we expect to see bondholders require lower premium from strategic default after the Dodd-Frank Act was implemented.

H7: After the Dodd-Frank Act, strategic default likelihood should be lower or larger negative relationship between bondholder's bargaining power and credit spreads after the act

Since the bankruptcy likelihood is higher during a financial crisis, strategic default likelihood by equity holders should also be higher during a crisis. Equity holders have less to lose when the financial economy is bad because the value of the assets will be lower overall when economy is in crisis. This is also related to hypothesis four that companies with high fixed assets have lower chance of strategic default. For instance, overall real estate price tumbled during the financial crisis in 2007. This lowers the value of fixed assets of a company; consequently, the firm face higher likelihood of strategic default. Hence, bondholders should require higher strategic default premium during a crisis. On the other hand, bondholders should require lower premium during non-crisis because of the lower risk of strategic default. Therefore, we should expect to see larger negative coefficient during the non-crisis period implying bondholders require lower premium to hold the bond. My sample is from 1999 to 2013 which covers financial crisis in 2007. I separate sample into during crisis (2007-2009) and non-crisis (1999-2006 and 2010-2013).

H8: During crisis periods, strategic default should play more important role than non-crisis periods.

4. Data

4.1 Data Sources and Sample Selection

I use corporate bond price data for the years 1999 to 2013. The bond transaction data is from Mergent FISD provided details of all fixed income transactions. The transaction data provides details about bond transactions such as accrued interest, either the transaction type is buy or sell, flat price, and date of transactions. These transactions are actual transactions and not dealer quotes or matrix prices. The detail of the issuer also comes from the FISD. Bond ratings from FISD using data from Moody's. I use daily yield of constant maturity US Treasury from FRED to estimate the corporate credit spreads over the equivalent risk-free US Treasury yield. Then, I merge the bond data with both financial statement information (Compustat) and equity prices (CRSP). I use ExecuComp data on executive stock and option holdings, also some CEO characteristics, and institutional equity ownership data from Thomson Financial Ownership data.

For the period 1999 to 2013, the total transactions are 3,864,361 transactions. Following Davydenko and Strebulaev (2007), I include only U.S. corporate bonds. I then exclude all non-fixed coupon bonds, asset backed issues, and bonds with embedded options, such as, puttable, callable, exchangeable, convertible bonds, and bonds with sinking fund provisions because these embedded options are factors that affect the credit spreads, but in a different context of what I will analyze. I look at the effect of bondholder's bargaining power on the credit spreads after strategic and non-strategic default factors are taken into account. Moreover, if there are several trades occurred in one bond on the same day with the same prices and volumes, I retain only one transaction to avoid double counting.

I consider only bonds with remaining time to maturity at the trade date between 1 and 30 years, because risk-free rates from FRED that I use to estimate credit spreads have maturities lower than 30 years and, for maturity less than one year, small measurement error results in large yield differences. This will make the credit spreads estimation noisy. As with other papers on bond pricing, I exclude bonds issued by financial companies (SIC codes 6000-6999) since they have different characteristics and regulation than other types of company. Then, I exclude observations with missing total debt in the fiscal year immediately preceding the trading date, and I require that data on equity returns be available for at least 120 business days preceding the trading date. For the bondholding characteristics, I use a new dataset from Thomson Reuters eMAXX; known as the market intelligence for fixed income. eMAXX provides comprehensive information on institutional investors of all sizes and types including such as mutual fund, pension fund, and insurance companies. eMAXX also provides information on bond characteristics such as CUSIP/ISIN, coupon type, maturity, and ratings. On the aggregate level of holders, I combine sub holders in the same category in the following. Insurance includes life, property and casualty, reinsurance, and diversified insurances. Mutual fund includes both closed- and open-end, balanced, money market, fund of fund, and equity. Both corporate and government pensions are in Pension. Other consists of annuity, foundation/endowment, and other categorized by eMAXX. Health are hospital and health care system.

The period of the data is from 1999Q1 to 2013Q2, so we have 14 years and two quarters of data. Lastly, I merge the samples with eMAXX data for bondholding variable. Final sample consists of 31,296 trades for 944 unique bond issues from 311 unique issuers.

5. Variable Construction

5.1 Bargaining Power of Bondholder

eMAXX data provides information regarding how much dollar value a bondholder holds a bond out of the total dollar bond issued in each quarter. Then, I sum up the firms with the same category. For instance, Insurance A holds \$100 and Insurance B holds \$200 of bond C. Then, I sum up insurance companies and set up new variable called “Insurance (INS)” with the total holding of the bond of firm C \$300 for each quarter. I do the same for each bondholder category such as mutual fund (MUT). Suppose firm C issues a bond with the total face value of \$900. I calculate percentage holding of insurance for this particular bond (9 digit CUSIP) in this particular quarter by 300/900 which is 33 percent of this bond issued by firm C. Then, I create a variable called “*Top holder*”. *Top holder* is a categorical variable based on the highest percentage holding of a bond. If the highest bondholder category is 10 percent to 19 percent, top holder is assigned the value of one. If the highest bondholder is 20 percent to 29 percent, top holder is assigned the value of two. The maximum value of *Top holder* is nine which means the highest percentage holding is 90 to 100 percent. We can see that the higher the number of *Top holder*, the more concentrated the bondholder on any category is. To be more illustrative, if insurance holds 93 percent of a bond, this bond is assigned the *Top holder* value of 9. In this case, other bondholder categories holding adds up to 7 percent. So, the total holding of this bond adds up to 100 percent (93+7).

Based on the methodology to construct the variable described above, *Top holder* captures two important aspects of bondholder's bargaining power. The first aspect is the percentage holding of the bond and the second aspect is the type of the holder. The percentage holding measures the bargaining power of bondholders similar to the percentage stock ownership proxied for the equity holder's bargaining power[1]. The type of the bondholder is also an important aspect of bondholder's bargaining power similar to the equity holder's bargaining power. An extensive literature on the type of equity ownership shows that the type of ownership plays an important role in decision making process of a firm. The importance of type of equity ownership implies that it does not take large percentage of ownership stake to pressure a firm's management. For instance, an influential hedge fund, such as Icahn and Pershing Square Capital, could

[1] Percentage equity holding has become very common as a proxy for equity holder's bargaining power. For example, Betker (1995) examines the relationship between CEO shareholdings and absolute priority deviation. In addition, other papers that measure equity holder's bargaining power along the same line are Davydenko and Strabulaev (2007) and Valta (2016)

convince other stockholders to join their side and becomes very influential without initial large holding of equity ownership[2]. Therefore, it is important to create an aggregate variable for bondholder's bargaining power that can capture both aspects of percentage holding and type of bondholders.

The purpose of this essay is to test the importance of bondholder's bargaining power. Therefore, in order to have a clean test of bondholder's bargaining power on the credit spreads, the *Top holder* or the aggregate variable for bondholder's bargaining power that can capture both important aspects of bargaining power is vital. For future research, how different types of bondholders, such as mutual fund and insurance, affect the credit spreads is a very interesting question and it could be done separately for each type of holder because each type of holder has different holding characteristics and objectives.

5.2 Investor Horizons

To identify the horizon of investors, I first calculate the value-weighted maturity of bondholder's portfolio in a given quarter from eMAXX institutional bondholding data. The short-term investors have average maturity less than one year. The medium-term investors have maturity between one to five years and, lastly, the long-term investors have maturity more than five years. Then, we calculate a portion of each type of holder for each bond based on 8-digit CUSIP.

5.3 Dependent Variable: Bond Credit Spreads

Credit spreads are the difference between yield to maturity of a bond and the replicated portfolio of risk free bonds. In this case, I use constant maturity Treasury bond rates from FRED. To calculate credit spreads, first, I calculate yield to maturity for each bond trade in the sample using promised future coupon payments and the invoice price recorded from the transaction data. The invoice price is flat price plus accrued

[2]Some examples of hedge fund activism paper showing the importance of the "type" of investor are Brav et al. (2008), Greenwood and Schor (2009) and Brav et al. (2015)

interest. Second, I obtain the yield to maturity of a risk-free portfolio bonds that replicate the promised stream of cash flows from the corporate bonds using constant maturity rate from FRED. For each cash flow, I calculate the constant maturity yield using linear approximation and use the resulting yield to discount the promised cash flows to the present and find invoice price. Then, find the yield to maturity in the same way as the first stage. Finally, I subtract the matched risk-free yield from the corporate bond yield to have the corporate bond credit spreads.

5.4 Control Variables

Strategic Factor Variables

Choices of strategic factor variables are motivated by existing papers in corporate reorganizations and capital structure. The main factor for the costs of liquidation is nonfixed assets. Additional proxies are market-to-book asset ratio, R&D investment, and the utility industry dummy. Variables used to proxy for the bargaining power of equity in potential renegotiations are proportion of equity owned by the firm's CEO, institutional investors, and the CEO's tenure with the firm. Lastly, to capture the renegotiation frictions, I use the number of outstanding public bond issues, Herfindahl index of the bonds, the number of shareholders, and the ratio of short-term debt to total debt. Panel A of Table 2.4 presents a summary of these variables. The detail discussion is provided below.

Cost of Liquidation

A renegotiation between borrowers and lenders takes place to avoid possible costs that would be incurred if the original contract were to be maintained, such as decreasing value in asset in case of liquidation. The liquidation costs are proxied by the ratio of non-fixed assets, defined as one minus the ratio of net property, plant, and equipment to total assets, by the market-to-book asset ratio, which is the sum of book debt and market equity divided by the sum of book debt and equity, and by the ratio of R&D expenditures to total investments. These liquidation cost proxies are motivated by large body of literature in capital structure and distressed reorganizations. Alderson and Betker (1996) show how to estimate the liquidation costs for a sample of bankrupt firms and conclude that fixed assets, market-to-book ratio, and R&D expenses are the best variables to use to proxy for liquidation costs. Following Davydenko and Strebulaev (2007), I also use the nonutility industry dummy, which equals to one if a firm is non-utility and zero otherwise. In bankruptcy, utility firms have tangible assets that could be sold easily. Acharya, Bharatch, and Srinivasan (2007) find that creditors of utility firms enjoy higher recovery rate because of these valuable tangible assets.

Relative Equity Bargaining Power

Shareholders' bargaining power plays an important role in renegotiation surplus which reflected the deviations from the absolute priority rule (APR). The primary independent variable for bargaining power is CEO shareholding, which is the percentage holding of CEO share to total share outstanding. Betker (1995) found that 10% increase in CEO shareholdings increases deviation in equity from Chapter 11 APR by around 1.2 % of the firm value. In addition, following LoPucki and Whitford (1990), they find that the APR deviation of equity occurs only when shareholders are aggressively represented. Another appropriate proxy for relative bargaining power is institutional shareholding, which is the proportion of equity held by institutional investors. Based on Baird and Jackson (1988), how long the CEO stays in the company is also part of the relative bargaining power. I use CEO's tenure which defines as the time period since the CEO's appointment as another proxy for equity holder bargaining power.

Renegotiation Frictions

Renegotiation frictions measure how difficult to negotiate company's debt. It could be a costly bankruptcy if the renegotiation friction is high. Gertner and Scharfstein (1991) and Bolton and Scharfstein (1996) show that renegotiations are difficult when there are many parties involved with diverse interest. With different interests of bondholders, successful debt renegotiation may not be reached.

Most literature on strategic default use such aggregate proxy as number of outstanding bond issues. Moreover, Herfindahl index of outstanding bond issues is also another popular variable for renegotiation frictions.

$$Herfindahlindex_i = \sum_j B_{ij}^2 / (\sum_j B_{ij})^2 \tag{2.1}$$

B_{ij} is the face value at offering of the j^{th} bond of firm i. The index will equal one if there is only one bond in the capital structure, and become very small if there are many bonds with similar face values. Betker (1995) finds that the higher the HFI index, the larger the equity deviations from absolute priority. Following Davydenko and Strebulaev (2007), I use 1- HFI, which is positively related to the renegotiation frictions.

Moreover, secondary proxies for renegotiation frictions are also used: normalized number of shareholders and short-term debt. Similar to the dispersion of bondholders, the dispersion of equity holders could also create a problem of coordination when it comes to bankruptcy. So, the number of institutional shareholders is used to proxy the equity holder dispersion. The number of institutional shareholders is defined as the logarithm of the number of different institutional shareholders divided by the logarithm of the market value of the firm's equity. Gertner and Scharfstein (1991) and Berglof and von Thadden (1994) show that firms do not want to negotiate debt with short term creditors because those creditors will not give up their debt easily due to subordinate property of short term debt to long term one.

Since data on bondholding for firms are difficult to obtain, most empirical studies tend to use the number of outstanding bond issues as a proxy as described. I extend this part of the strategic default on credit spreads literature in that I use the bondholding data from eMAXX to find the relationship between each type of bondholders on credit spreads and also the concentration of bondholders on credit spreads. Table 2.3 shows that life insurance, government pension fund, and open-end mutual fund are the top three holders of bonds on average with the percentage holding on average for each bond of 34.1, 6.7, and 6.5 percent, respectively. The three lowest holders are other, hospital, and hedge fund with less than 0.1 percent on average for all three. In the same manner as previous literature, if we look at the number of bonds held by each type of bondholders. The top three are life insurance, property & casualty insurance, and open-end mutual fund with the number of bonds held 31226, 29816, and 28145 respectively. And the three lowest holders by number of bonds are hedge fund, hospital, and pension fund-corporate with the number of bonds held 72, 127, and 485.

Risk Factors Unrelated to Renegotiation

The risk factors that are not related to strategic functions are presented in Panel B of Table 2.4. Contingent claim models predict that leverage and asset volatility affect the probability of financial distress. The leverage is estimated as the ratio of the book value of total debt at the end of the previous fiscal year to the sum of the book value of debt and the closing market value of equity on the trade date. Following Schaefer and Strebulaev (2008), asset volatility is estimated as a leverage-weighted average of the firm's one-year historic equity volatility and average bond volatility for the same rating. To calculate equity volatility, I use monthly return from CRSP and calculate one-year volatility for each month rolling. Then, I calculate bond's return by using invoice price. At this point, I winsorize bond returns below one percentile and above 99 percentile, because there are some outliers for some bond returns. For example, normal invoice price is close to \$1000 which is the face value, but there are some abnormally low invoice prices which produce very huge returns. Asset volatility is calculated as follows.

$$\hat{\sigma}^2_{A_{j,t}} = (1 - L_{j,t})^2 \sigma^2_{E_{j,t}} + L^2_{j,t} \sigma^2_{Dj,t} + 2L_{j,t}(1 - L_{j,t}) \sigma_{ED_{j,t}} \tag{2.2}$$

The equity volatility, σ_E, is computed as mentioned, where L is the leverage. The last term shows relationship between equity and debt for firm j at time t. $\sigma_{Dj,t}$ is the time t volatility of firm j's debt and $\sigma_{ED_{j,t}}$ is the time t covariance between returns on firm j's debt and equity. To calculate the volatility of returns on firm j's debt, first, I calculate the firm j mean volatility of debt returns by credit rating. For instance, for rating AAA and firm j, I take the returns on firm j's debt for all transactions that the debt was rated AAA. Then, I calculate volatility return of firm j from all those transactions. Averaging these volatilities over all corporates with the same rating and same date, I obtain the average volatility for AAA debt. The volatility of firm j's debt is then set equal to the average volatility of the rating category of firm j. The covariance between equity and debt returns, $\sigma_{ED_{j,t}}$, is calculated as $\rho_{ED_{j,t}} \sigma_{D_{j,t}} \sigma_{E_{j,t}}$ where $\rho_{ED_{j,t}}$ is a correlation between the equity and debt returns on each bond in the same rating category.

In addition, I also control for the size of the firm by using logarithm of total assets. To control for the term premium, I also use time to maturity as of the day of trade to control for the term premium. Variation in the risk-free rate may affect credit spreads so I control it by using the 5-year constant maturity Treasury rate to control for this variation following Davydenko and Strebulaev (2007).

5.5 Sample Statistics

Table 2.5 shows statistics on corporate bond credit spreads for the whole sample and for different rating groups and maturity. The mean of credit spreads is 383 basis points, and the median is 272 basis points. The mean of credit spreads is quite high because, from Table 2.13, during the financial crisis in 2001 and 2007, on average the invoice price is low. In 2002, the invoice price is as low as \$160 for \$1000 face value. Maximum yield to maturity is as high as 99%. In addition, FED reduced the FED fund rate to a low level in a very short time during those periods. As a result, some of the credit spreads are very high. Generally, in Table 2.5, the lower the rating of the bonds the higher the credit spreads. An interesting observation is that there is a jump in credit spreads between B and CCC spreads (e.g., for all maturities, 687 VS 1170 basis points).This large difference may not only reflect higher default probability but also the lower liquidity of low-graded bonds.

Table 2.6 shows summary statistics for non-strategic proxies. For the leverage, the average leverage for AAA rated firms is 35.87 percent. The lower the rating, the higher the leverage. Firms with CC rating have the mean leverage almost 100 percent. The asset volatility of high-rated bonds, in general, has lower volatility. On average, AAA-rated bonds have 25 percent asset volatility whereas B-rated bonds have 40 percent asset volatility. Most of the issuers issue bonds with maturity around 8 to 10 years. For the size of the asset, we can see that high-rated companies have much larger in asset size. AAA-rated companies are around 342 billion dollars in asset size while B-rated companies are around 19 billion dollars.

Table 2.7 presents the summary statistics for all control variables. On average, 65 percent of their assets are non-fixed assets. Average asset size of companies is 67 billion dollars. Because of the large firm size, CEO shareholding is small, around 0.46 percent on average. However, institutional shareholding is quite large with the mean around 64 percent of total share outstanding. The range of institutional shareholding is from 0 percent to 94 percent. Recently, the issue of institutional investors on firms' value is becoming more and more important. We have experienced and seen a lot of news about institutional investors trying to intervene or being part of the firms' decision process. Therefore, including institutional shareholding as one of the control variables is crucial in analyzing credit spreads.

6. Methodology

I run pooled regression for all bond transactions [3]. Important control variables are included in the regressions both strategic and non-strategic proxies to make sure that all aspects of credit spreads factors are controlled for. The year and industry fixed effects are included to control for the year specific and industry specific that could potentially affect the credit spreads of firms. To handle the fact that large firms may over represent the sample, I also control the results using firm specific ID. Following Davydenko and Strebulaev (2007) there are nine specifications for the regressions. Each specification selects one of the proxies from three categories: liquidation cost, bargaining power, and renegotiation frictions. All of the nine specifications for strategic default variables are also controlled for non-strategic default variables.

For the first hypothesis, to test the bondholder's bargaining power, I use *Top holder* as my focus variable with other control variables both strategic and non-strategic variables denoted here as *"X"*. There are n control variables and each control variable j is associated with credit spreads through β_j.

$$Spread_{it} = \beta_1 + \beta_2 Topholder_{it} + \sum_{j=3}^{n} \beta_j X_{itj} + \epsilon_{it} \tag{2.3}$$

The dependent variable is the credit spreads of firm i at time t. The top holder is the categorical variable showed the highest percentage of bonds held by any bondholders.

For second hypothesis, I break down the bondholders into six groups of bondholders: mutual fund, insurance, pension fund, government, health care, and other. I state

[3] Previous literature use Fama-Macbeth to incorporate the fact that large firms' transactions are overrepresented both in terms of issuer id and liquidity. However, in this sample, the large firms and number of transactions are scattered. The maximum transaction by firm ID and transaction are not over 2-3 percent.

it in the equation below as "Holder".

$$Spread_{it} = \beta_1 + \sum_{j=2}^{7} \beta_j Holder_{itj} + \sum_{j=8}^{n} \beta_j X_{itj} + \epsilon_{it} \tag{2.4}$$

The third hypothesis, to test the interaction between bargaining power of equity holders and bondholders, I interact the proxy for equity holder bargaining power and bondholder's bargaining power. The two proxies for equity holder bargaining power is percentage of equity owned by CEO and institutional investors. I interact the two with the variable Top holder and renamed them *Top*CEO* and *Top*Institutional*.

$$Spread_{it} = \beta_1 + \beta_2 Top * CEO_{it} + \beta_3 Top * Institutional_{it} + \sum_{j=4}^{n} \beta_j X_{itj} + \epsilon_{it} \tag{2.5}$$

For the rest of the hypothesis, I use equation 2.3 to test the degree of strategic default from different characteristics of an issuer and different important events. For hypothesis 4, I divided firms into high and low non-fixed assets based on the median value. High non-fixed assets is the same thing as low-fixed assets which in this case is vulnerable to strategic default. For hypothesis 5, similar to non-fixed asset case, I divided firms into high and low rated group based on the median value of rating which is "A" in this case.

As mentioned in hypothesis development, different regulations or periods may result in different degree of strategic default. For hypothesis six, before and after Sarbanes-Oxley act (SOX), I divided firms into before and after SOX implemented in 2002. In other words, the first group is before 2002 and the second group is after 2002. Then, I perform equation 2.3 to see the different effects between the two periods. The same manners are performed for Dodd-Frank Act and crisis period. For Dodd-Frank Act, as seventh hypothesis, I divided firms into before and after 2010 which was the year the Dodd-Frank Act was implemented. For the last hypothesis, during the financial crisis is the sample falling between 2007 and 2010. The rest of the sample in other years are non-financial crisis sample.

7. Empirical Results

7.1 Non-Strategic Default Factor Results

Table 2.8 shows the results of regressing non-strategic variables on credit spreads. As we expected, the higher the leverage the higher the credit spreads. Investors require more premium to hold risky debts. High leverage makes a firm to have higher default probability. Based on specification (3), a one-standard deviation increase in market leverage increases credit spreads by 233 basis points. The longer the time to maturity the higher the credit spreads because of the term premium. All else equal, the longer time to maturity bonds should have higher yield for investors; otherwise, investors would want to hold shorter term bonds. Again, based on specification (3), one standard deviation increase of time to maturity results in credit spreads 23 basis points higher. Credit spreads also have a negative correlation with size. This could be because of the information and liquidity of the large company. In other words, large companies are well known and produce better information for the public. With higher quality information, investors demand less premium for holding bonds of large companies. Therefore, the larger the firms, the lower the credit spreads. Besides the information quality, this also reflects lower risk of large firms, because larger firms have more certain stream of cash flows.

7.2 Credit Spreads and Bondholders' Bargaining Power

As in hypothesis one, proxied by portion of bond held, higher bargaining power of bondholders should result in lower credit spreads. Table 2.9 shows the relationship between Top holder along with all control variables both strategic and non-strategic variables and credit spreads. As expected, the results show highly significant negative relationship between Top holder and credit spreads. The results imply that, roughly, every ten percent increase in bondholders' bargaining power results in 20 basis points lower credit spreads on average. The lower credit spreads mean bondholders are willing to accept less premium because of lower strategic default likelihood when they have higher bargaining power over equity holders. Table 2.10 shows the breakdown of each bondholder category result. We can see that mutual fund and insurance are the two holders that have consistent significant power to explain credit spreads.

7.3 Credit Spreads and Insurance Bondholdings

Insurance, as the largest bondholders of all issuers, should have significant explanatory power on credit credit spreads of all types of issuers following the second hypothesis. From Table 2.11, insurance holds highest portion of all types of issuers. For instance, insurance holds more than 50 percent of overall bonds issued by mining and wholesale trade. Therefore, we expect to see insurance bondholdings to have explanatory power on credit spreads through strategic default for all types of issuers. Based on the result in Table 2.12, almost all types of issuers' credit spreads can be explained by the insurance-type holder, except construction. However, bonds issued by construction companies is the lowest number in our sample. It is only 0.73 percent of bonds issued in this sample. The results may be prone to small sample bias. For overall results, insurance-type bondholder can explain most of the issuers' credit spreads. However, for mining and services, the sign of the coefficients is positive. Positive relationship between the bargaining power and credit spreads implies higher premium required to hold more bonds in a particular bond. The reason may be that in these two industries, though bondholders are becoming a dominant holder of the bonds, the bargaining power through strategic default framework is not higher. In other words, the bargaining power mostly is still with the equity holders.

7.4 Shareholder and Bondholder Bargaining Power

As stated, for hypothesis three, interaction between equity holders and bondholders should be positively related to the credit spreads. Table 2.14 shows the result of hypothesis three. The bargaining power interactions between bondholders and equity holders are shown as *Top holder*CEO* and *Top holder*Institutional*. *Top holder*CEO* is the interaction term between top holder and CEO percentage shareholding in firm's equity whereas *Top holder*Institutional* is the interaction term between top holder and institutional percentage shareholding of equity. The results show significant positive relationship between the interaction and the credit spreads as expected for both CEO and institutional shareholding. Since the decision to default strategically is solely based on equity holders, the friction between the two bargaining power should render in higher premium required by the bondholders. Another interesting point here is that, the effect from the CEO interaction is stronger than the effect of institutional interaction. For example, for specification (1) the effect of CEO interaction is 1.97 whereas the effect of institutional interaction is 0.26. The stronger effect of the CEO interaction may imply that the real power to do the strategic default might be based on the CEO. CEO works at the company every day and knows the company inside out. CEO should be the most influential person when it comes to decide whether the firm should default strategically.

7.5 Strategic Default by Issuers with High Level of Fixed Assets

For lower prospect of strategic default as proxied by high fixed assets, strategic default should play less important role in bond pricing as stated in hypothesis four. For lower prospect of strategic default as proxied by high fixed assets, strategic default should play less important role in bond pricing. To test this hypothesis, I separate sample into high and low fixed asset by using the median of non-fixed asset as a cutoff. If a company has non-fixed asset less than the median of non-fixed asset's value, the company is in the high fixed asset group and vice versa. Companies with high fixed asset have low chance of strategic default from equity holders, because, unlike non-fixed assets, fixed assets are easy to sell. If creditors know clearly what they will earn if the firm has to be liquidated, they will not give up debt for equity holders easily. Moreover, by priority rule, equity holder will receive their part in case of bankruptcy after creditors receive all of their claims. Sometimes, equity holders may not earn anything at the end. Therefore, the likelihood of equity holders to default strategically is lower for firms with high fixed assets. On the other hand, if most of the firm's assets are non-fixed assets. Equity holders have an incentive to default strategically if they have a chance, because non-fixed assets are difficult to sell and there is no clear liquidation value for creditors. In this case, creditors may give up debt temporarily for equity holders to survive the firms. Hence, I expect that strategic default should play less important role for firms with high fixed assets than firms with low fixed assets. In Table 2.15 of specification (9) and (10), high non-fixed asset (or low fixed-assets) firms have highly significant relationship between bondholder's bargaining power and credit spreads whereas low non-fixed assets (or high fixed-assets) firms has no significant relationship. This implies that strategic default risk plays less important role in firms with high-fixed assets.

7.6 The Effects of Credit Ratings on Strategic Default Decisions

The testable hypothesis five is that strategic default should play more important role in low-rated firms. From Table 2.15 of specification (7) and (8), for high-rated firms, the relationship between bondholders' bargaining power and credit spreads is not significant, but for low-rated firms, it is highly significant. This implies that strategic default risk is high in low-rated firms. As I mentioned in the hypothesis section, high-rated firms have better corporate governance system and more stable cash flow streams. Therefore, strategic default should not play an important role for high-rated firms. The insignificant effect between bondholders' bargaining power and credit spreads for high-rated firms is consistent with the hypothesis.

7.7 The Effects of the Sarbanes-Oxley Act on Strategic Default Decisions

The sixth hypothesis is the larger negative relationship between bondholders' bargaining power and credit spreads after SOX. From Table 2.15, we can see that after SOX implemented, strategic default risk is lower based on the lower credit spreads required from the bondholders. Pre-SOX, every ten percent increase in bargaining power of bondholder associates with 18.44 basis points less credit spreads required whereas, post-SOX, the credit spreads are lower when bondholders have higher bargaining power at 21.53 basis points. The more negative value post-SOX implies less strategic default likelihood and results in lower premium required by bondholders.

7.8 The Effects of the Dodd-Frank Act on Strategic Default Decisions

Hypothesis seven stated that after Dodd-Frank Act, strategic default likelihood should be lower or larger negative relationship between bondholder's bargaining power and credit spreads. After Dodd-Frank Act, strategic default likelihood should be lower, because the Dodd-Frank Act reduces overall risk of financial industry. We should see more negative of association between size of bondholding and credit spreads. Table 2.15 shows the results for the regression of size of bondholding on credit spreads before and after Dodd-Frank Act. Dodd-Frank Act was passed by Obama administration in 2010, thus I use the sample from 1999 to 2009 as the period before the rule. The period after the rule is from 2010 to 2013. After Dodd-Frank Act took an effect in 2010, bondholders require less premium to hold bonds. The required premium to hold bonds post Dodd-Frank Act is twice as low as pre Dodd-Frank Act. Specifically, every ten percent higher of major bondholders, bondholders accept 13.91 (39.07) basis points lower during pre (post) Dodd-Frank Act.

7.9 The Effects of the Financial Crisis 2007 on Strategic Default Decisions

Bondholders should require more strategic default premium during a crisis. The results that we expect to see for hypothesis eight is stronger effect of bondholder's bargaining power and credit spreads during a crisis. My sample is the time period from 1999 to 2013 which covers the 2007 financial crisis. I use the period from 2007 to 2009 as a crisis period. Non-crisis period is the sample combining 1999-2006 and 2010-2013. From Table 2.15, during the crisis, the bargaining power of bondholder is highly significant but during non-crisis, the effect is not significant. This implies that strategic default is not important during non-crisis. The insignificant effect shows that bondholders are not worried about strategic default during non-crisis; therefore, the changes in bondholding cannot explain the change in credit spreads.

7.10 Industry Effects

To this point, the results so far have shown that bondholder's bargaining power is important to determine the credit spreads. Next, question is which type of holder is the most important or is there a type of holder that is more important than another. To understand which type of holder is important to determine debt price, I break down the *Top holder* variable into five types of holder: insurance, mutual fund, pension fund, government, health care, and other. Then, I ran the tests similar to the main section of *Top holder*. The result is that insurance company is the only holder that consistently show significant explanatory power on credit spreads. Mutual fund holding is significant in most of the tests but failed to pass GMM endogeneity test. Table 2.32 shows the GMM test. Insurance holdings are the largest holder of most of the bonds on average. From Table 2.2, the insurance company type is the largest holder of bonds issued on average. Health care holdings are also significant with expected sign in the GMM test but they failed to pass in other robustness tests. The result is quite interesting because if we look at the trading transactions, mutual funds traded much more than insurance companies but, in the end, insurance holdings are a better determinant than mutual fund holdings. Fidelity example in the first chapter might be one of the reasons of this finding. Some mutual funds might be better than another in terms of trading bonds. However, the funds with bad performance may average out the good performance and result in no effect on credit spreads from the overall mutual fund holdings. Table 2.33 shows the main regression result with all control variables for insurance holdings.

8. Bondholder's Bargaining Power and the Probability of Bankruptcy

To this point, the results are highly consistent with our hypothesis that the bondholder's bargaining power is an important variable to explain credit spreads of a firm. However, some people might argue that the significant negative association between bondholder's bargaining power (i.e. *Top holder*) and credit spreads may capture something else other than the implicit strategic default factor, because strategic default is likely to happen when a firm is in distress. But, the tests so far are during the normal stage of the firms. To ensure that the results can be generalized, it is necessary to test the association specifically during the time of financial distress. One of the ways to do this is to find a model that helps predict the bankruptcy probability of a firm. Then, test the *Top holder* variable on different levels of bankruptcy probability. If the result is consistent with the general case for firms with high bankruptcy probability, we have more confidence to say that the main results can be generalized. I came up with two ways to test this: Campbell et al (2008) bankruptcy probability measure and Acharya et al (2007) industry distress. Each measure reflects different perspective of default probability. Campbell et al (2008) focuses on individual firm bankruptcy probability both short-term and long-term predictions. Acharya et al (2007) concentrate on the industry distress.

The reason that we need to analyze industry distress along with individual distress is that, occasionally, the prediction of a firm distress probability may be low at a given time while a bad prospect is looming over the majority of the firms in the industry. For instance, if JP Morgan Chase announces bad previous quarter earnings, it is very likely that all banking stocks on that day would be tumble. Investors would predict that if JP Morgan Chase, which is one of the largest bank, is struggle, the rest should also be struggle under the same environment even though other banks still have not yet announced their earnings.

8.1 The Campbell et al (2008) Model

First, I will start with Campbell measure. Campbell et al (2008) came up with a new way to find bankruptcy probability of a firm. The reason that I chose this measure over "distance to default" (DD) of Merton (1974), one of the most popular probability of default models, because Campbell measure has higher explanatory power than DD. Campbell et al (2008) estimate a dynamic panel model by using logit model. This method followed Shumway (2001), Chava and Jarrow (2008), and others. Moreover, Campbell et al (2008) extended the previous literature by considering broader range of independent variables.

To create explanatory variables at the individual firm level, following Campbell et al (2008). I use the quarterly accounting data from COMPUSTAT and monthly as well as daily equity market data from CRSP. From COMPUSTAT, I create standard measure of profitability: net income to total assets. Previous authors used book value for total assets; however, following Campbell et al (2008), I use market equity plus book liabilities and call this variable Net Income to Market-valued Total Assets (NIMTA). The original one with the book equity is Net Income to Total Assets (NITA). The reason for the market equity instead of book equity is it has higher explanatory power than book equity when it is used to predict the bankruptcy of a firm. This might result from the fact that market prices more rapidly incorporate new information about the firm's prospects or more accurately reflect intangible assets of the firm. COMPUSTAT is also used to construct a measure of leverage: total liabilities relative to total assets.

Again, the market-valued version of this has higher explanatory power. The leverage with the market equity is TLMTA while the original one with book equity is TLTA. Besides the profitability and leverage measure, the measure of liquidity is also included. It is the ratio of a company's cash and short-term assets to the market value of its assets (CASHMTA). I also calculate each firm's market-to-book ratio (MB).

Following Cohen, Polk, and Vuolteenaho (2003), I adjust the book value of assets to eliminate outliers. That is, I add 10% of the gap between market and book equity to the book value of total assets. This results in increasing book values that are extremely small and likely mismeasured. Without the adjustment, the outliers may impact the result of the model. The book value of equity is also adjusted in a similar manner. In my sample, under 1.3% of firm-months still have negative values for book equity even after the adjustment, I replace these negative values with small value of $1 to ensure that the market-to-book ratios for these firms are in the right tail, not the left tail, of the distribution. To better cope with the outliers, I winsorize the market to book ratio and all other variables in the model at the 5th and 95th percentiles.

Moreover, I add several market-based variables as another set of explanatory variables. I calculate the monthly log excess return on each firm's equity relative to the S&P 500 index (EXRET), the standard deviation of each firm's daily stock return over the past 3 months (SIGMA), and the relative size of each firm measured as the log ratio of its market capitalization to that of the S&P500 index (RSIZE). Lastly, I add the firm's log price per share, truncated above at $15 (PRICE). This PRICE variable is to capture the likelihood that distressed firms are traded at low prices per share. A more detail explanation can be found below.

$$
\begin{aligned}
RSIZE_{i,t} &= log(\frac{FirmMarketEquity_{i,t}}{TotalS\&P500MarketValue_t}) \\
EXRET_{i,t} &= log(1 + R_{i,t}) - log(1 + R_{S\&P500,t}) \\
NITA_{i,t} &= \frac{NetIncome_{i,t}}{TotalAssets(adjusted)_{i,t}} \\
TLTA_{i,t} &= \frac{TotalLiabilities_{i,t}}{TotalAssets(adjusted)_{i,t}} \\
NIMTA_{i,t} &= \frac{NetIncome_{i,t}}{FirmMarketEquity_{i,t} + TotalLiabilities_{i,t}} \\
TLMTA_{i,t} &= \frac{TotalLiabilities_{i,t}}{FirmMarketEquity_{i,t} + TotalLiabilities_{i,t}} \\
CASHMTA_{i,t} &= \frac{Cash\&ShortTermInvestments_{i,t}}{FirmMarketEquity_{i,t} + TotalLiabilities_{i,t}}
\end{aligned} \tag{2.6}
$$

I correct both NITA and TLTA by taking the difference between market equity (ME) and book equity (BE) to adjust the value of total assets:

$$TotalAssets(adjusted)_{i,t} = TA_{i,t} + 0.1(ME_{i,t} - BE_{i,t}) \tag{2.7}$$

The volatility of a firm's stock returns is

$$SIGMA_{i,t-1,t-3} = (252 * \frac{1}{N-1} \sum_{k\epsilon[t-1,t-2,t-3]} r_{i,k}^2)^{1/2} \tag{2.8}$$

Instead of using volatility from rolling 3-month mean, following Campbell et al (2008), I use volatility centered around zero for daily variation of returns calculated as an annualized 3-month rolling sample standard deviation. For some firms with few observations, I set them as missing if there are fewer than five nonzero observations over the 3 months used in the rolling window. In addition, to estimate regressions, I replace missing SIGMA observations with the cross-sectional mean of SIGMA. The similar method is also applied to NIMTA and EXRET in creating the moving average variables NIMTAAVG and EXRETAVG.

From Table 2.19, the overall sample has 0.5% NIMTA per quarter or 2% at an annual rate. We can see that mean and median of NITA are both higher than NIMTA. The difference between the two calculations is the market equity. The lower NIMTA relative to NITA is the reflection of market equity is on average larger than book equity. The average value of EXRET is 0.7% per month. The average value of the annualized firm-level volatility SIGMA is 38%

Model to predict bankruptcy

Following Shumway (2001) and Chava and Jarrow (2008), I use the logit model to estimate the probabilities of bankruptcy over the next period.

Assume that the marginal probability of bankruptcy over the next period follows a logistic distribution and is given by

$$P_{t-1}(Y_{it} = 1) = \frac{1}{1 + exp(-\alpha - \beta x_{i,t-1})} \tag{2.9}$$

Where

Y_{it} = the value is one if the firm goes bankrupt or fails in month t

$x_{i,t-1}$ = a vector of independent variables

If $\alpha + \beta x_{i,t-1}$ is high, it implies a higher probability of bankruptcy.

In Campbell et al (2008), there are two models and each has three different time periods. I chose the model with highest R-squared which is Model 2 with Failure prediction of the period 1963-2003.

Model 1 follows Shumway (2001) and Chava and Jarrow (2008) with five standard variables: NITA, TLTA, EXRET, SIGMA, and RSIZE. For the second model, the traditional NITA and TLTA are replaced by NIMTA and TLMTA, respectively. The difference between the original and the two new variables are the original model uses book equity whereas the latter uses market equity. Second adjustment from Model 1 is the added lagged information about profitability and excess stock returns. Campbell et al (2008) shows that a long history of losses or a sustained decline in stock market value are better predictors than the one large losses in a period. Therefore, they construct geometrically declining weights on these lags

$$
\begin{aligned}
NIMTAAVG_{t-1,t-12} &= \frac{1-\phi^3}{1-\phi^{12}}(NIMTA_{t-1,t-3} + ... + \phi^9 NIMTA_{t-10,t-12}) \\
EXRETAVG_{t-1,t-12} &= \frac{1-\phi}{1-\phi^{12}}(EXRET_{t-1} + ... + \phi^{11} EXRET_{t-12})
\end{aligned}
\tag{2.10}
$$

Where $\phi = 2^{-\frac{1}{3}}$, this implies that the weight is halved each quarter. The third variable added is CASHMTA to capture the liquidity of the firm. A firm with high CASHMTA has available liquid assets to pay for their promised interest. Hence, the bankruptcy maybe further away in the future given high CASHMTA. The fourth variable added to Model 1 is market to book or MB which captures the value of firm's equity in view of accountants. Since the profitability and leverage ratio use market equity, if book equity is still important, MB could be a correction factor in the model. Bankruptcy firms maybe overvalue so positive relationship between MB and bankruptcy could be expected. Finally, the log price per share of the firm or PRICE is also part of the Model 2. Previous literature suggested that price per share is relevant below \$15, and so I winsorize price per share at this level before taking the log.

The regression model used to predict the bankruptcy score (BRC) in Campbell et al (2008) has different prediction horizons. I chose to do the short-term and long-term prediction which are 1 month and 36 months respectively. This is to ensure that the result is not because of the horizon chosen. 36-month is the longest horizon in Campbell model. The regression model I used to predict the bankruptcy probability for the short-term horizon is

$$BRC_{ST} = -9.08 - 29.67(NIMTAAVG) + 3.36(TLMTA) - 7.35(EXRETAVG)$$
$$+1.48(SIGMA) + 0.08(RSIZE) - 2.4(CASHMTA) + 0.054(MB) - 0.937(PRICE) \quad (2.11)$$

The model for the long term prediction is

$$BRC_{LT} = -10.53 - 14.06(NIMTAAVG) + 0.643(TLMTA) - 2.56(EXRETAVG)$$
$$+1.33(SIGMA) - 0.18(RSIZE) - 1.41(CASHMTA) + 0.125(MB) + 0.279(PRICE) \quad (2.12)$$

After we have the BRC scores then we find the bankruptcy probability by input in the logit equation to output the probability of bankruptcy. Then I separate the probability into three quantiles.

From Table 2.20, Panel A shows the mean probability of default of firms for short-term horizon. The third quantile has highest probability of bankruptcy with 0.07 percent chance. The lowest quantile for short-term bankruptcy prediction has the probability almost zero percent chance. One interesting point for the third quantile is the much higher standard deviation than the first two quantiles. This implies that there is high variation in the third quantile. Some of them have really high probability of bankruptcy for the third quantile.

For the long-term prediction of bankruptcy probability in Table 2.20 Panel B, overall the probability is higher for all three quantiles comparing to short-term prediction. This implies the financial situation of a firm today does not imply the same probability of bankruptcy in the future. Firms may make a mistake along the way if not today.

Then for each quantile both short-term and long-term prediction, I run regression to see the variable Top holder whether the variable still has the same sign and significant as the general case. If the result is the same, that means variable *Top holder* is a good proxy for the bondholders' bargaining power for strategic default case. In other words, *Top holder* does not capture something else other than what it is supposed to capture which is the bargaining power of bondholder through strategic default mechanism.

Table 2.21, 2.22, and 2.23 show the regression results for the short-term bankruptcy prediction ordering from lowest probability of default to the highest one. We can see that for the lowest probability of default, Table 2.21, the coefficients are not significant in any of the nine specification. The second quantile where the probability of bankruptcy is medium, the coefficient is significant. Finally, for highest probability of default, Table 2.23, the sign is negative the same as the general case and all coefficients for all specifications are highly significant. This consistent with the main idea of the general case that the variable *Top holder* is capturing the bondholder's bargaining power.

From Table 2.24 to Table 2.26, the regression results are for the case of long-term prediction of default. In this case, the horizon is 36-months prediction. The results tell the same story as short-term prediction. The highest probability of bankruptcy group has negative coefficient and is highly significant in Table 2.26. This makes the case of *Top holder* proxied for the bondholders' bargaining power in the strategic default framework stronger.

Next, I introduce the second method to test on the bankruptcy likelihood, because the results might only work for the Campbell et al (2008) bankruptcy measure. The second candidate to check for the consistency of *Top holder* variable is based on Acharya et al. (2007) industry distress.

8.2 The Acharya et al (2007) Industry Distress Model

The Acharya et al (2007) bankruptcy proxy is different from Campbell et al (2008) in that the former is industry wide distress while the latter one is individual firm distress.

The two measures are complement to see the effect of bankruptcy and consistency of *Top holder* variable in both perspective: industry and individual. In Acharya et al (2007), there are three types of distress with the meaning of each one as follow

Distress1 (D1): a dummy variable that takes the value one if the median stock return of all the firms in the three-digit SIC code of the firm is less than -30%, and zero otherwise

Distress2 (D2): a dummy variable that takes on the value one if Distress1 is one and if the median sales growth of all the firms in the three-digit SIC code of the firm is negative in any of the two years before the bond transaction date

Distress3 (D3): a dummy variable that takes on the value one if the average credit rating of other firms in the three-digit SIC code of the firm is below investment grade, and zero otherwise

The idea to test *Top holder* variable is I interact each dummy of distress with *Top holder* and see if the results are still consistent with the general case. If the result is the same, it will give us more evidence that *Top holder* is one of valid variables to use as strategic default proxy for creditors.

Based on the results of Table 2.27, 2.28, and 2.29, we can see that the sign is the same as the general cases and the significance is still there for all three types of distress. Except D2, the explanatory power to explain the credit spreads is high at 1 percent significance. For D2, for some specifications, the significant drops to 5 and 10 percent significant level. One explanation could be that D2 measure is based on the sale growth which could mislead the firm's financial situation. Sale might still be high though the firm is in distress. Moreover, sale number does not take into account the cost of the operation or cost of capital. If we use operating profit or net income, we may have different outcome.

To conclude this part, both models of bankruptcy prediction give us a strong evidence that the main results could be generalized, because the same results can be found in the case when strategic default likelihood is the highest.

9. Robustness Checks

9.1 Trading Frequency Bias

Since I use real bond transaction data, the issue of overrepresentation of sample by large firms is possible. Large firms tend to issue more bonds and their bonds are traded more frequently owing to high liquidity. These facts may bias the results toward large firms. However, from Table 2.16, this issue may not be a concern. Table 2.16 shows the top ten sample both by bonds or 9 digit CUSIP and by issuer or 6 digit CUSIP. For Panel A, the highest transaction by complete CUSIP is only 1.64 percent or 514 transactions out of 31,296 transactions. For Panel B, the highest transaction by issuer is only 3.39 percent. However, 3.39 percent is a relative sense. If we compare with the lowest transaction group (bottom ten lowest) which each contributes to only less than 0.5 percent of the sample, some might say that 3.39 percent is large. To reduce the concern, I create a robustness check by allowing only one transaction for each firm in each period. Specifically, I randomly select one transaction of each firm for each month. Then, I perform the analysis to see the relationship between *Top holder* and credit spreads with control variables following specification (2), (5), (6), and (8). The analysis is repeated for 100 times for each specification. The results can be found in Table 2.17. The average observations are reduced to around 6,000 observations for each analysis because of the new rule of permission of one transaction per firm. We can see that the result is consistent with the previous finding that *Top holder* is still significantly negatively related to credit spreads. This implies the same conclusion that the higher the bargaining power of bondholders, the lower the credit spreads through the strategic default mechanism.

9.2 Endogeneity

The model specification could create endogeneity. The dependent variable is the credit spreads of bonds and the focus explanatory variable is bondholders' bargaining power or *Top holder*. There might be an argument that if the credit spreads reduce, this might attract bondholders to buy the bond because they may want to buy less risky bonds or vice versa. This has nothing to do with the story of bondholders' bargaining power and credit spreads. I handle the endogeneity using two-step GMM. Two-step GMM obtains parameter estimates from the initial matrix, computes a new weight matrix based on those estimates, and then estimates the parameters again based on that weight matrix. I use the lag of all bondholders as instrumental variables. The result after GMM is still consistent with my main finding that bondholders' bargaining power has significant negative relation with the credit spreads. The results can be found in Table 2.18. The significant negative relationship between the bondholder's bargaining power and credit spreads is still maintained.

9.3 Liquidity Concerns

Liquidity-control variables are added to the model. The theoretical motivation is from Ericsson and Renault (2006) that show a good amount of credit spreads is explained by liquidity of the bonds traded. Houweling et al. (2005) compared nine different proxies for corporate bond liquidity from previous literature (*issued amount, listed, euro, on-the-run, age, missing prices, yield volatility, number of contributors and yield dispersion*) and illustrated that the *issued amount* and *yield dispersion* are the most two important factors. I put the two variables in the model and the bondholders' bargaining power still has significant explanatory power on the credit spreads. The two variables are significant and show expected sign consistent with the literature. *Issued amount* and *yield dispersion* have negative and positive sign, respectively.

A complete result is in Table 2.30. With liquidity controls, *Top holder* for all specifications is still highly significant and exhibits a consistent negative sign as in the main result. In other words, higher bondholder's bargaining power still plays an important role on the credit spreads after taking into account the liquidity aspect. Liquidity control variables are also significant with expected sign. *Issued amount* (or AmountIssue) was first suggested by Fisher (1959). Fisher (1959) showed that large issues should trade more often. We would expect to see higher *issued amount* resulting in lower credit spreads because of lower liquidity premium. For *yield dispersion*, it reflects the agreement of market participants on the value of a bond. Tychon and Vannetelbosch (2002) derived a model showing that when there is a heterogeneity in investors' belief, the liquidity premium is higher. Following Houweling et al. (2005), the *yield dispersion* of bond b on day t is defined as the standard deviation of percentage yield differences relative to the mean:

$$Dispersion_{bt} = \sqrt{\frac{1}{n_{bt}-1}\sum_{s=1}^{n_{bt}}(\frac{y_{bts}-\bar{y}_{bt}}{\bar{y}_{bt}})^2} \tag{2.13}$$

where y_{bts} is the quoted yield by party s, $\bar{y}_{bt}$ is the average yield and n_{bt} is the number of contributors. The yield dispersion can only be calculated if we have at least two quotes for a bond in a given day.

For the *yield dispersion*, we expect to see positive relation with the credit spreads. Based on Table 2.30, the result shows consistent outcome as we have significant positive relation between *yield dispersion* and credit spreads of bonds.

9.4 The Effect of Invesment Horizons

Further analysis on the second chapter is to analyze how holding horizons, such as long-term VS short-term, affect credit spreads and which type of holders are more important to determine credit spreads of bonds. The main analysis of the second chapter is how bondholders' bargaining power affects the bond credit spreads. The proxy for bondholders' bargaining power is *Top holder* which is a categorical variable from 0 to 9 where 9 represents highest bargaining power. *Top holder* captured both percentage holding and types of holder (e.g., insurance, mutual fund, etc.). However, another interesting aspect lies in the *period* of bondholding. Three types of investor are considered: Long-Term (LT), Medium-Term (MT), and Short-Term (ST) investors. To identify the type of holder, I first calculated the average maturity of bond portfolio using value-weighted in a given quarter. Then, if the average holding is less than one year, the investor is categorized as short-term investor. If the average holding is between one year and five years, the investor is categorized as medium-term investor. For long-term investor, the average holding exceeds five years.

We would expect that LT investors should exert more influence on the credit spreads of corporate bonds, because they incur higher risk than MT and ST investors from investing their funds in those bonds longer. The result is consistent with our conjecture that LT investors are more important than MT and ST investors in terms of commanding the credit spreads of bonds. From Table 2.31, LT investors show negative significant relation with credit spreads of bonds whereas MT and ST investors are much less important statistically. The negative sign of LT investors on credit spreads is also consistent with *Top holder* variable in the main result.

10. Conclusion

Following the main hypothesis, bondholders' bargaining power exhibits negative relationship with the credit spreads. This implies that the higher the bondholders' bargaining power, the lower premium required to compensate for strategic default likelihood. Since strategic default renegotiation is between equity holders and debt holders, leaving out debt holder's bargaining power when examining strategic default framework results in an incomplete picture of strategic default on credit risk. Based on my results, the bondholders bargaining power is an important factor used to explain credit spreads of a bond. In renegotiation, if bondholders and equity holders interact, bondholders will require more premium to hold bonds. In addition, bondholders require more premium when they interact with CEO. This implies that CEO might be the real mastermind behind the strategic default decision since CEO works in the company every day and knows the company inside out. For different events and regulations, if the likelihood of strategic default is lower, bondholders required lower credit spread premium. Similarly, some characteristics of issuer render in lower chance of strategic default. I find that firms with high fixed assets and high rating have lower strategic default likelihood as indicated by lower premium required by bondholders.

Understanding the relationship between the bargaining power of bondholders and equity holders on strategic default prospect is important for investors both individual and institutions, because, if some patterns persist, retail investors can avoid unnecessary strategic bankruptcy by not buying bonds from firms with high prospect of strategic default. High bargaining power by top holders such as insurance and mutual fund helps public screen companies with high or low strategic default prospect. Currently, our financial system has done a good job of publicizing information regarding top shareholders of firms. For instance, the information about the percentage of institutional holding for a company or free float of a company can be found easily. However, the information about top bondholders in a firm is very difficult to find. We would want to know whether the bondholders are quite concentrate or dispersed so that we know the likelihood of strategic default. Other than making bondholder information accessible, regulators or related parties should provide more incentives for institutional to hold bonds that have yet no major bondholders. This should help balance the equity bargaining power and results in the lower likelihood of strategic default. In other words, institutional bondholders act as a cushion for retail bondholders; otherwise, the threat of strategic default by equity holders will loom over the investment in bonds.

Table 2.1: Summary Statistics of Bond Issuer

This table shows summary statistics of bond transactions by types of institutions. Bond transactions are from Mergent FISD. Types of institutions are based on SIC industry code (first two digit).

Industry	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Manufacturing	15697	50.16	15925	50.89
Transportation	6100	19.49	30818	98.47
Retail trade	4232	13.52	21397	68.37
Services	3321	10.61	24718	78.98
Mining	1240	3.96	17165	54.85
Wholesale trade	478	1.53	31296	100
Construction	228	0.73	228	0.73

Table 2.2: Percentage of Bond Held by Types of Bondholders

This table shows average percentage bondholding by each holder. Insurance includes life, property & casualty, reinsurance, and diversified insurances. Mutual fund includes both closed- and open-end, balanced, money market, fund of fund, and equity mutual fund. Both corporate and government pensions are in Pension. Other consists of annuity, foundation/endowment, and other categorized by eMAXX. Health are hospital and health care system.

Variable	N	Mean	Median	Mode	Maximum	Minimum
Insurance	31296	40.6436141	40.0712727	0	100	0
Mutual	31296	7.1074916	3.9136	0	76.4086111	0
Pension	31296	5.3012755	1.1166667	0	56	0
Other	31296	1.1132148	0.0975	0	100	0
Government	31296	0.3111004	0	0	31.5	0
Health	31296	0.0276657	0	0	4.04	0

Table 2.3: Summary Statistics of Bondholders

This table shows two important things. First, the number of bonds (N) held by a particular type of holder. Second, Mean, the average percentage holding of a bond. For instance, Life insurance held 31,226 bonds and for each bond it held around 34.07% of the total amount dollars of bond outstanding on average. The unit below is in decimal percentage

Variable	N	Mean	Median	Maximum	Minimum
Insurance Co-Life/Health	31226	0.3407	0.3199	1.0000	0
Pension Fund-Government	24754	0.0670	0.0252	0.5600	0
Open-End Mutual Fund	28145	0.0645	0.0331	0.7197	0
Insurance Co-Prop & Cas	29816	0.0613	0.0441	0.9911	0
Foundation/Endowment	1183	0.0303	0.0136	1.0000	0
Government	4411	0.0221	0.0167	0.3150	0
Annuity/Variable Annuity	17909	0.0175	0.0070	0.2845	0
Mutual Fund-Balanced	18631	0.0138	0.0036	0.3100	0
Reinsurance Company	18868	0.0130	0.0067	0.3000	0
Closed-End Mutual Fund	8464	0.0105	0.0046	0.1821	0
Mutual Fund-Equity	8926	0.0069	0.0014	0.5739	0
Pension Fund-Corporate	485	0.0027	0.0010	0.0400	0
Mutual Fund-Money Mkt	491	0.0015	0.0003	0.0371	0
Health Care Systems	5707	0.0015	0.0008	0.0404	0
Insurance Co-Diversified	5754	0.0014	0.0006	0.0328	0
Mutual Fund-Fund of Funds	1461	0.0006	0.0001	0.0448	0
Hedge Fund	72	0.0004	0.0001	0.0016	0
Hospital	127	0.0003	0.0002	0.0012	0
Other	688	0.0000	0.0000	0.0006	0
Pension Fund-Union	0	0.0000	0.0000	0.0000	0
Unit Investment Trust	0	0.0000	0.0000	0.0000	0
Annuity/Money Market	0	0.0000	0.0000	0.0000	0

Table 2.4: Control Variables

The table describes the explanatory variables used in the model to analyze credit spreads. I use several sources of data from WRDS: Compustat, CRSP, ExecuComp, Thomson Financial Ownership Data (TFOD), and Mergent FISD. This table follows Davydenko and Strebulaev (2007).

Variable	Factor	Description	Source
		Panel A: Proxies for Strategic Factors	
Nonfixed assets	Liquidation costs	1-Net PPE/Book total assets Compustat	Compustat
Market-to-book	Liquidation costs	(Market equity+Book debt)/Book total assets	CRSP and Compustat
R&D	Liquidation costs	Research & development expenses divided by total investment	Compustat
Nonutility	Liquidation costs	1-Utility industry dummy	Compustat
CEO shareholding	Equity's bargain. Power	Percentage of total equity owned by the CEO	ExecuComp
Institutional shareholding	Equity's bargain. Power	Percentage of total equity owned by institutional investors	TFOD
CEO tenure	Equity's bargain. Power	(Trade date – Date current CEO appointed)/365	ExecuComp
Norm. no. of issues	Renegotiation frictions	Log(Number of outstanding bond issues)/Log(Total debt)	FISD and Compustat
1 – Herfindahl index	Renegotiation frictions	$1 - \frac{\sum_j B_j^2}{(\sum_j B_j)^2}$, where B_j is the face value of bond j	FISD
Short-term debt	Renegotiation frictions	Short-term debt divided by total debt	Compustat
Norm. no. of shareholders	Renegotiation frictions	Log(Number of institutional shareholders)/Log(Market equity)	TFOD and CRSP
		Panel B: Nonstrategic Variables	
Leverage	Credit risk	Book debt/(Book debt + Market equity on trade date)	CRSP and Compustat
Asset volatility	Credit risk	Constructed using equity vol. and data on debt vol. by rating	CRSP and Compustat
Assets	Liquidity, Information	Book value of total assets	Compustat
Time to maturity	Term yield	Remaining time to maturity as of trade date	FISD
Risk-free rate	Systematic factor	5-year constant maturity Treasury rate	FRED

Table 2.5: Summary Statistics on Credit Spreads

This table shows summary statistics of credit spreads for fixed-coupon bonds during the period 1999-2013, by remaining time to maturity and rating. The benchmark risk-free yield is the yield on a cash flow matched portfolios of constant maturity Treasury from FRED. The Treasury yields are observed as of the trade date, and are linearly approximated for dates between the maturity dates of two Treasury rates. The credit spreads are shown in annualized term and in basis points. NR is non-rated firms. na is no data point available.

	All	AAA	AA	A	BBB	BB	B	CCC	CC	C
Panel A: Credit spreads for All Maturities										
Mean	383	195	228	270	344	553	687	1170	3813	4881
Median	272	174	216	227	272	399	518	714	3126	5659
Std	574	121	144	301	430	741	787	1232	2311	2033
P5	40	25	29	32	40	72	130	219	792	331
P95	880	427	465	556	726	1408	1678	4333	8762	6945
N	30712	1295	3063	9104	11172	2890	2322	754	103	9
Panel B: Credit spreads for Maturity 1-7 Years										
Mean	400	194	219	275	356	533	713	1169	4774	4890
Median	291	174	200	242	287	399	522	771	4673	5810
Std	574	121	152	256	394	612	807	1143	2524	2584
P5	35	28	21	26	34	70	121	188	133	331
P95	996	416	461	588	822	1435	1888	3676	9303	6757
N	16680	625	1901	4462	5832	1765	1658	381	51	5
Panel C: Credit spreads for Maturity 7-15 Years										
Mean	329	198	245	230	275	498	649	1207	3388	5816
Median	243	194	249	206	221	359	556	668	3484	5816
Std	471	110	127	147	310	646	700	1402	1146	1597
P5	38	19	52	32	33	73	116	275	2145	4687
P95	716	352	492	488	576	1318	1562	4614	4544	6945
N	6442	346	646	1985	2217	693	372	176	5	2
Panel D: Credit spreads for Maturity 15-30 Years										
Mean	390	195	241	290	369	721	594	1138	2816	3925
Median	265	160	225	226	276	434	455	690	2669	3925
Std	647	131	130	427	548	1200	773	1240	1655	470
P5	56	35	35	56	55	85	161	273	831	3592
P95	751	459	464	529	678	3486	1386	4685	6069	4257
N	7590	324	516	2657	3123	432	292	197	47	2

Table 2.6: Summary Statistics on Credit Risk Variables

This table reports summary statistics of non-strategic risk factors for fixed-coupon bonds during 1999-2013, by rating. Leverage is the ratio of the book value of debt to the book value of debt plus the market value of equity on the trade date. Asset volatility is in decimal percentage where 0.01 is 1 percent. Time to maturity is the remaining time to maturity on the trade date in year. Leverage in percentage points. Book total assets are in billion dollars. NR is non-rated firms. Dots show no transaction available.

		AAA	AA	A	BBB	BB	B	CCC	CC	C
Leverage	Mean	35.87	34.87	39.53	53.33	63.05	74.68	78.85	93.03	.
	Median	19.27	30.19	39.43	54.5	65.1	78.05	77.92	95.62	.
	Std	25.68	22.55	15.08	16.09	16.36	14.34	11.42	4.89	.
	P5	12.64	10.42	16.06	25.55	30.8	50.83	60.69	85.49	.
	P95	80.05	80.11	63.46	77.68	89.19	94.28	95.32	97.63	.
	N	1236	2618	6885	9007	2211	1436	696	46	0
Asset Volatility	Mean	0.25	0.29	0.4	0.31	0.46	0.4	0.68	2.28	.
	Median	0.18	0.15	0.27	0.2	0.28	0.3	0.57	2.13	.
	Std	0.22	0.35	0.43	0.37	0.69	0.34	0.54	0.97	.
	P5	0.04	0.06	0.08	0.08	0.11	0.09	0.14	1.84	.
	P95	0.71	1.14	1.09	0.85	1.25	0.96	1.59	3.7	.
	N	1236	2616	6885	9002	2195	1426	691	42	0
Time to Maturity	Mean	11.08	8.13	10.23	9.95	7.82	6.7	10.36	11.66	8.85
	Median	7.22	5.22	7.21	6.46	5.54	4.73	6.71	9.03	4.13
	Std	8.74	7.45	7.74	7.84	6.14	5.92	8.22	8.52	7.14
	P5	2.68	1.53	1.59	1.44	1.54	1.46	1.84	2.09	3.55
	P95	29.1	24.95	24.47	24.73	20.54	21.14	24.71	22.36	23.95
	N	1295	3063	9104	11172	2890	2322	754	103	9
Book Total Assets	Mean	342.75	213.48	34.32	28.51	25.09	19	50.52	154.77	.
	Median	108.7	111.15	18.67	21.76	13.16	8.93	7.91	194.85	.
	Std	331.99	265.04	44.86	42.06	48.47	50.57	94.15	78.22	.
	P5	53.32	14.69	3.25	1.76	1.91	0.73	2.71	7.36	.
	P95	797.77	781.82	109.18	65.5	164.69	27.26	279.26	194.85	.
	N	1236	2618	6885	9007	2212	1436	696	46	0

Table 2.7: Summary Statistics on Control Variables

This table reports summary statistics on independent variables by trade. Non-fixed assets are one minus the ratio of net property, plant, and equipment to total assets. Market-to-book is the ratio of the quasi-market value of assets to their book value. R&D is the ratio of research and development expenses to total investment expenditure. CEO and Institutional shareholding are the percentages of common equity owned by the CEO and institutional investors. No. of issues is the number of bond issues outstanding on the trade date. CEO tenure is the number of years since the CEO's appointment as of the date of trade. Herfindahl is the Herfindahl index of public issues outstanding. Short-term debt is the ratio of debt in current liabilities to total debt. Asset volatility is the leverage-weighted average of the firm's 1 year historic equity volatility and average bond volatility for the same rating. Time to maturity is the remaining time to maturity at the trade date. Risk-free rate is the 5 year constant maturity Treasury rate. Book total assets are in billions of dollars.

Variable	Mean	Median	Std Dev	5th Pctl	95thPctl	N
Nonfixed assets (%)	64.768	69.922	22.578	17.067	91.186	24607
Market-to-book-ratio	1.662	1.366	0.892	0.924	3.465	24671
R&D (%)	3.112	0.361	6.081	0.000	18.213	24672
CEO shareholding (%)	0.466	0.090	2.494	0.002	1.347	24392
Institutional shareholding (%)	64.823	71.350	24.288	0.004	94.265	26678
CEO tenure	6.053	4.422	6.573	0.299	16.099	25958
No. of issues	28.435	25.000	19.040	6.000	67.000	30712
1-Herfindahl index	93.206	95.240	6.872	79.688	98.266	30712
Short-term debt (%)	7.404	4.555	7.865	0.041	24.689	24672
No. of inst. shareholders	771.512	648.000	531.683	2.000	1845.000	26678
Leverage (%)	49.532	49.835	20.951	15.969	84.810	24671
Asset volatility	0.363	0.233	0.438	0.073	1.053	24093
Book total assets	67.484	21.901	151.626	2.477	278.554	24672
Time to maturity	9.509	6.318	7.620	1.526	24.477	31296
Risk-free rate (%)	3.907	4.140	1.487	1.110	6.420	31296

Table 2.8: Non-Strategic Determinants of Credit Spreads

This table shows the output of regression analysis of credit spreads on non-strategic proxies, for the whole sample. The dependent variable is the annualized credit spreads in basis points. Leverage is calculated as the book value of total debt divided by the sum of the book value of debt and the market value of equity on the observation date. Log (Assets) is the logarithm of the total book assets of the issuing firm in billions of dollars. Risk-free rate is the 5-year constant maturity Treasury rate.

VARIABLES	(1)	(2)	(3)
Leverage	10.60***	10.66***	9.95***
	(27.14)	(27.21)	(22.65)
Asset volatility	175.84***	176.84***	162.65***
	(9.01)	(9.05)	(8.53)
Time to maturity		3.01***	3.20***
		(7.49)	(7.71)
Book total assets			-0.53**
			(-2.43)
Risk-free rate	29.93***	32.02***	31.62***
	(5.39)	(5.74)	(5.71)
Rating			27.59***
			(2.65)
Constant	-181.31	-226.71	-192.16
	(-0.00)	(-0.00)	(-0.00)
Observations	24,093	24,093	24,093
Adjusted R-squared	0.4077	0.4091	0.4109
Industry FE	YES	YES	YES
Year FE	YES	YES	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.9: Top Holders and Credit Spreads

The dependent variable is the annualized credit spreads in basis points. Top holder is the proxy for bondholder's bargaining power. It is a categorical variable assigned number 1 to 9. 9 means the range of largest bondholders is from 90 to 100 percent. Nonfixed assets are one minus the ratio of net property, plant, and equipment to total assets. Market-to-book is the ratio of the quasi-market value of assets to their book value. R&D is the ratio of research and development expenses to total investment expenditure. CEO shareholding and Institutional shareholding are the percentages of common equity owned by the CEO and institutional investors. CEO tenure is the number of years since the CEO's appointment as of the date of trade. Norm. no. of issues is the ratio of the logarithm of the number of bond issues outstanding on the trade date to the logarithm of total debt. Herfindahl is the Herfindahl index of outstanding public bond issues. Short-term debt is the ratio of debt in current liabilities to total debt. Norm. no. of shareholders is the ratio of the logarithm of the number of institutional shareholders to the logarithm of total market value of equity. Non-strategic default variables are also included as control variables.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-20.98***	-19.06***	-20.20***	-20.16***	-20.92***	-22.34***	-19.81***	-19.80***	-19.31***
	(-10.19)	(-9.26)	(-9.68)	(-9.83)	(-10.51)	(-10.86)	(-9.58)	(-9.87)	(-9.34)
Nonfixed assets	-1.50***				-2.18***	-2.23***	-1.44***	-1.39***	-1.24***
	(-5.38)				(-6.98)	(-7.10)	(-5.19)	(-5.05)	(-4.12)
CEO shareholding	-0.89	-1.13	-1.04	-1.05			-0.82	-1.03	-0.94
	(-1.08)	(-1.38)	(-1.29)	(-1.29)			(-1.00)	(-1.23)	(-1.16)
No. of issues	-2.29***	-2.22***	-2.24***	-2.24***	-2.47***	-2.31***			
	(-4.89)	(-4.81)	(-4.79)	(-4.80)	(-5.52)	(-4.99)			
Market-to-book-ratio		52.08***							
		(8.35)							
R&D			-0.31						
			(-0.32)						
Institutional shareholding					-0.10				
					(-0.48)				
CEO tenure						0.83*			
						(1.96)			
1-Herfindahl index							-0.04		
							(-0.05)		
Short-term debt								-2.50***	
								(-4.45)	
No. of inst. shareholders									0.05**
									(2.46)
Constant	300.88***	-661.58***	-495.55***	-496.24***	328.66***	-423.27***	257.32**	-625.76***	-514.42***
	(4.20)	(-8.62)	(-6.80)	(-6.82)	(4.32)	(-6.00)	(2.26)	(-9.16)	(-6.81)
Observations	23,137	23,202	23,202	23,202	23,951	23,644	23,137	23,137	23,060
Adjusted R-squared	0.4106	0.4119	0.4101	0.4102	0.4157	0.4122	0.4098	0.4102	0.4101
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2.10: Bondholders by Group and Credit Spreads

This table shows the regression results of size of bondholding on credit spreads. Each specification is the same as specification in Table 2.9. For instance, control variables in specification (1) are non-fixed assets, CEO shareholding, and number of bond issue. Values in the table are in basis points where size of bondholding is in percentage.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	spread	spread	spread	spread	spread	spread	spread	spread	spread
Mutual	-11.71***	-11.98***	-11.74***	-11.62***	-10.23***	-11.53***	-11.54***	-11.20***	-11.51***
	(-14.74)	(-15.06)	(-14.73)	(-14.64)	(-13.02)	(-14.71)	(-14.49)	(-14.12)	(-14.53)
Insurance	-1.34***	-1.62***	-1.63***	-1.55***	-1.72***	-1.66***	-1.27***	-1.13***	-1.16***
	(-8.14)	(-10.03)	(-9.61)	(-9.53)	(-10.88)	(-9.81)	(-7.88)	(-7.08)	(-7.22)
Pension	0.13	-0.43	-0.04	-0.02	-0.51*	-0.20	0.14	0.08	0.48*
	(0.45)	(-1.48)	(-0.14)	(-0.07)	(-1.73)	(-0.65)	(0.46)	(0.27)	(1.73)
Government	-2.94*	-2.02	-2.45	-2.37	-2.42	-2.60	-3.25*	-3.50**	-2.32
	(-1.78)	(-1.26)	(-1.49)	(-1.44)	(-1.48)	(-1.57)	(-1.93)	(-2.09)	(-1.37)
Health	-26.71***	-28.79***	-25.84***	-27.44***	-18.45**	-19.46**	-29.31***	-32.46***	-18.13**
	(-3.09)	(-3.19)	(-3.00)	(-3.13)	(-2.21)	(-2.32)	(-3.39)	(-3.76)	(-2.13)
Other	-4.57***	-4.46***	-4.11***	-4.32***	-6.27***	-5.23***	-4.22***	-4.66***	-4.82***
	(-3.29)	(-3.24)	(-2.95)	(-3.10)	(-4.44)	(-3.72)	(-3.03)	(-3.38)	(-3.50)
Constant	386.44	411.60***	704.27***	702.05***	782.83***	427.71	482.31	368.27***	217.59***
	(0.00)	(7.99)	(14.00)	(13.96)	(13.39)	(0.00)	(.)	(8.92)	(4.56)
Observations	23,333	23,397	23,398	23,398	24,156	23,842	23,333	23,866	23,789
Adjusted R-squared	0.3904	0.3949	0.3895	0.3893	0.3871	0.3897	0.3846	0.3872	0.3895
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2.11: Percentage Holding of Each Bondholders by Types of Issuer

This table shows summary statistics on percentage bondholding of each issuer type by different bondholders. I group issuers into seven different industries based on the first two digit of SIC. The column shows types of bondholder and the row shows types of issuer. For instance, insurance holders hold 45.98 percent of bonds issued by construction companies.

	Construction	Manufacturing	Mining	Retail trade	Services	Transportation	Wholesale trade
Insurance	45.98	42.14	52.72	34.32	21.58	48.15	50.22
Mutual	7.21	6.13	3.42	9.27	14.52	4.98	5.13
Pension	1.01	5.63	7.36	4.3	2.16	6.66	4.59
Government	0	0.32	0.29	0.32	0.07	0.43	0.14
Health	0.01	0.03	0.01	0.03	0.06	0.01	0
Other	0.73	0.82	0.53	1.92	1.68	1.21	0.24

Table 2.12: Bondholders and Credit Spreads by Issuer

This table shows the regression results of bondholding size on credit spreads. Other control variables are non-fixed assets CEO shareholding, number of bond issue, and institutional shareholding. I group issuers into seven different industries based on the first two digit of SIC. Values in the table are in basis points.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Mining	Construction	Manufacturing	Transportation	Wholesale trade	Retail trade	Services
Mutual	-5.56***	-15.82**	-3.37***	0.50	-2.81	3.94***	11.54***
	(-5.33)	(-2.34)	(-4.21)	(0.68)	(-1.02)	(3.92)	(6.95)
Insurance	0.51**	-0.75	-7.00***	-3.65***	-1.75***	-3.45***	2.98***
	(2.12)	(-0.13)	(-16.35)	(-9.55)	(-3.36)	(-8.71)	(5.14)
Pension	-0.00	19.82	-5.71***	1.24	2.86***	-1.73**	-10.78
	(-0.01)	(0.92)	(-12.36)	(1.59)	(3.13)	(-2.54)	(-1.60)
Government	38.71***		-11.85***	0.12	128.71***	18.11***	21.75
	(4.68)		(-5.94)	(0.04)	(9.79)	(3.30)	(1.21)
Health	-30.86	995.73	-141.35***	-94.52		-18.79	-411.65***
	(-0.33)	(0.47)	(-6.34)	(-1.23)		(-1.13)	(-8.41)
Other	-5.65**	-3.46	-10.34***	-15.66***	39.59*	6.26**	-5.65
	(-2.19)	(-0.62)	(-6.82)	(-5.03)	(1.84)	(2.50)	(-1.46)
Constant	282.56***	713,155.67	930.87***	242.87***	97.33	382.00***	-240.28*
	(5.78)	(0.50)	(9.69)	(2.88)	(0.77)	(4.29)	(-1.71)
Observations	790	140	13,826	2,806	360	3,376	1,958
Adjusted R-squared	0.3273	-0.0677	0.0825	0.1403	0.4738	0.2406	0.3368
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.13: Summary Statistics of Invoice Price and Yield to Maturity by Year

This table shows mean, min, and max for invoice price of the bonds traded and their yield to maturity calculating for each bond invoice price. Yield to maturity is in decimal percentage. 0.01 is 1 percent.

		Invoice		Yield to Maturity		
Year	Mean	Min	Max	Mean	Min	Max
1999	1047.09	957.08	1181.14	0.07	0.06	0.08
2000	982.6	210	1336.52	0.09	0.05	0.68
2001	1009.24	164.33	1339.67	0.09	0.03	0.99
2002	1042.37	160	1401.34	0.08	0.02	0.95
2003	1100.5	197.45	1508.6	0.07	0.01	0.63
2004	1125.75	230	1459.98	0.07	0.02	0.49
2005	1119.7	152.5	1504.88	0.07	0.03	0.82
2006	1049.42	232.5	1651.4	0.07	0.03	0.72
2007	1053.56	347.92	1395.11	0.07	0.03	0.59
2008	1016.41	256.5	1381.82	0.07	0.03	0.9
2009	1016.3	207.5	1373.16	0.07	0.01	0.85
2010	1089.7	621.59	1505.43	0.05	0.01	0.45
2011	1091.19	878	1493.38	0.05	0	0.48
2012	1130.6	498.43	1581.04	0.05	0	0.45
2013	1133.97	674.03	1552.55	0.05	0	0.55

Table 2.14: Bondholder and Equity Holder Bargaining Power

Regression results of interaction terms between bondholder and equity holders proxied by either CEO or institutional percentage equity ownership. Top holder*CEO is the interaction term between Top holder and CEO percentage of share owned. Top holder*Institutional is the interaction term with institutional investors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	spread	spread	spread	spread	spread	spread	spread	spread	spread
Top holder	-35.39***	-37.86***	-34.59***	-34.50***	-36.43***	-34.58***	-42.33***	-40.47***	-46.60***
	(-9.69)	(-10.53)	(-9.47)	(-9.44)	(-8.27)	(-9.57)	(-11.56)	(-10.68)	(-12.28)
Top holder*CEO	1.97***	1.98***	1.87***	1.94***	0.50***	0.46***	1.44**	2.03***	1.67***
	(3.29)	(3.30)	(3.10)	(3.22)	(3.55)	(3.37)	(2.35)	(3.46)	(2.80)
Top holder*Institutional	0.26***	0.27***	0.22***	0.23***	0.28***	0.25***	0.38***	0.37***	0.45***
	(6.52)	(7.10)	(5.68)	(5.79)	(5.30)	(6.30)	(10.17)	(9.65)	(12.01)
Nonfixed assets	1.61***				1.59***	1.46***	1.83***	1.99***	1.46***
	(7.22)				(6.61)	(6.29)	(8.03)	(8.72)	(5.99)
CEO shareholding	-9.70***	-10.21***	-8.86**	-9.30**			-5.90	-10.03***	-7.52**
	(-2.65)	(-2.73)	(-2.41)	(-2.53)			(-1.57)	(-2.82)	(-2.06)
No. of issues	-5.19***	-5.08***	-5.31***	-5.31***	-5.21***	-5.22***			
	(-9.16)	(-9.18)	(-9.36)	(-9.35)	(-9.22)	(-9.21)			
Market-to-book-ratio		-58.66***							
		(-19.18)							
R&D			-2.95***						
			(-2.96)						
Institutional shareholding					-0.16				
					(-0.56)				
CEO tenure						2.11***			
						(4.60)			
1-Herfindahl index							-3.27***		
							(-3.37)		
Short-term debt								-3.11***	
								(-5.98)	
No. of inst. shareholders									-0.14***
									(-5.66)
Constant	411.41	913.38***	336.31***	334.36***	426.51	431.42	547.37	262.06***	247.87***
	(.)	(23.31)	(8.33)	(8.29)	(0.00)	(.)	(0.00)	(6.46)	(6.25)
Observations	23,256	23,320	23,321	23,321	23,256	23,256	23,256	23,789	23,789
Adjusted R-squared	0.3690	0.3729	0.3685	0.3684	0.3690	0.3693	0.3645	0.3679	0.3696
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.15: Strategic Default Risks for Different Periods Firms' Characteristics

This table shows the relationship between bondholder's bargaining power and credit spreads for different period. The periods considered are pre- and post- SOX, pre- and post- Dodd-Frank Act, and during crisis VS non-crisis periods. Specification (7) and (8) shows firms with high-rated and low-rated firms respectively. (9) and (10) shows the results for firms with high non-fixed assets (or low fixed assets) and low non-fixed assets (or high fixed assets).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Pre SOX	Post SOX	Pre Dodd-Frank Act	Post Dodd-Frank Act	Crisis	Non-Crisis	High rate	Low rate	High NOFA	Low NOFA
Top holder	-18.44***	-21.53***	-13.91***	-39.07***	-54.78***	-0.23	1.02	-123.42***	-34.76***	-1.75
	(-2.93)	(-8.18)	(-5.43)	(-4.51)	(-8.29)	(-0.10)	(0.71)	(-9.58)	(-7.05)	(-1.18)
Nonfixed assets	5.40	-0.91**	-0.48	-11.47**	1.75	-3.13***	-0.47*	-11.89***	-2.69**	0.77***
	(1.09)	(-2.47)	(-1.55)	(-2.30)	(1.16)	(-8.53)	(-1.90)	(-3.56)	(-2.24)	(2.64)
Market-to-book-ratio	-39.72***	-46.84***	-51.64***	-47.76*	-37.68***	-94.66***	-24.59***	-462.52***	-82.04***	-43.35***
	(-5.27)	(-9.68)	(-11.97)	(-1.80)	(-3.87)	(-16.34)	(-9.26)	(-7.89)	(-11.99)	(-7.80)
R&D	-51.94***	3.95***	-3.41***	8.61	5.01	-0.86	3.68***	34.64	-0.21	18.24**
	(-3.33)	(2.73)	(-2.65)	(0.73)	(1.26)	(-0.60)	(3.99)	(1.22)	(-0.13)	(1.98)
CEO shareholding	794.66*	0.12	0.40	-35.43***	-55.30**	0.96	0.36	102.48**	-36.94***	2.02***
	(1.90)	(0.15)	(0.65)	(-3.23)	(-2.29)	(1.43)	(0.56)	(2.07)	(-4.15)	(2.71)
Institutional shareholding	0.10	-0.23	-0.35	-3.94	-2.33	-1.03***	-0.35	5.67**	11.71***	0.74***
	(0.24)	(-0.88)	(-1.32)	(-1.00)	(-0.97)	(-3.82)	(-1.50)	(1.99)	(4.61)	(2.88)
CEO tenure	-16.82***	3.09***	4.76***	-1.36	-0.53	1.53**	-2.02***	13.82***	10.29***	-2.40***
	(-3.10)	(6.66)	(9.12)	(-0.24)	(-0.20)	(2.26)	(-4.67)	(7.71)	(10.33)	(-5.79)
No. of issues	-1.84	-0.92	8.76***	19.91***	-7.32**	3.75**	-0.52	-20.59*	8.50**	-0.35
	(-0.20)	(-0.91)	(7.77)	(3.25)	(-2.07)	(2.54)	(-0.64)	(-1.71)	(2.56)	(-0.50)
1-Herfindahl index	-7.57	-25.33***	-20.92***	-0.94	-2.81	-1.41	-0.26	-18.97***	6.66***	-23.32***
	(-1.19)	(-9.27)	(-6.90)	(-0.20)	(-1.35)	(-1.49)	(-0.40)	(-5.63)	(3.65)	(-8.33)
Short-term debt	-2.46	-1.24	-2.46***	7.17**	-2.28	-3.62***	-3.58***	16.29***	-3.24***	-2.66***
	(-0.19)	(-1.52)	(-3.63)	(2.16)	(-1.39)	(-4.37)	(-7.40)	(4.17)	(-2.63)	(-4.74)
No. of inst. shareholders	-0.00	0.07***	0.10***	-0.42**	-0.29**	0.13***	0.09***	1.79***	-0.45***	-0.43***
	(-0.21)	(3.81)	(5.91)	(-2.12)	(-2.11)	(7.44)	(5.77)	(4.89)	(-3.76)	(-7.86)
Constant	620.92	2,795.37***	2,694.67***	1,042.79	965.79***	667.21***	426.98***	3,375.25***	-52.08	2,684.61***
	(0.79)	(10.95)	(10.25)	(1.52)	(3.74)	(8.87)	(6.32)	(9.41)	(-0.16)	(10.10)
Observations	3,197	20,058	20,149	3,106	6,828	16,427	19,352	3,903	11,583	11,672
Adjusted R-squared	0.5567	0.3878	0.4077	0.2762	0.4099	0.3890	0.3643	0.3901	0.3726	0.4600
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Issuer FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.16: Top Ten Sample by Bond and Issuer

Panel A shows top ten sample by bond. Complete CUSIP is based on 9 digit CUSIP. No. of transactions are the total transactions represented in the sample. Percent of overall transactions are out of 31,296 transactions. Panel B shows top ten sample by issuer or 6 digit CUSIP.

Panel A: Top ten sample by bond			
Obs.	Complete Cusip	No. of Transactions	Percent of Overall Transactions
1	369604BC6	514	1.64
2	369604AY9	490	1.57
3	254687AM8	270	0.86
4	539830AE9	254	0.81
5	655844AH1	245	0.78
6	345370CA6	233	0.74
7	713448BH0	231	0.74
8	039483AJ1	218	0.70
9	708160BQ8	213	0.68
10	126408BL6	211	0.67

Panel B: Top ten sample by issuer			
Obs.	Issuer ID	No. of Transactions	Percent of Overall Transactions
1	3250	1062	3.39
2	2232	1048	3.35
3	4447	1040	3.32
4	1769	1004	3.21
5	268	999	3.19
6	4533	878	2.81
7	662	743	2.37
8	6229	679	2.17
9	1662	666	2.13
10	4268	586	1.87

Table 2.17: Robustness Check on Large Firms Dominated Transactions

To reduce the influence from large firm transactions, a firm is allowed only one transaction per month. The transaction sample is randomly selected for each firm in each month. Then, run the regression of all the selected sample for 100 times for each specification. Sampling # is the number of time we perform the routine. Avg Obs is the number of average observation for each routine.

Variable	(2)	(5)	(6)	(8)
Top holder	-31.345***	-36.281***	-37.432***	-34.970***
	(-10.70)	(-12.23)	(-12.89)	(-12.17)
Market-to-book	105.257***			
	-10.83			
CEO shareholding	-4.865***			-3.171*
	(-2.94)			(-1.91)
CEO tenure			-4.124***	
			(-4.65)	
Nonfixed assets		0.720***	0.623**	0.640**
		(-2.75)	(-2.43)	(-2.52)
No. bond issue	-1.517***	-1.220***	-1.118***	
	(-4.10)	(-3.24)	(-2.98)	
Institutional shareholding		-0.479*		
		(-1.92)		
Short-term debt				4.921***
				(-6.16)
Intercept	-601.23***	-297.02***	-305.64***	-362.13***
	(-14.78)	(-7.97)	(-8.76)	(-11.59)
Sampling #	100	100	100	100
Avg Obs	6188.9	6367.66	6303.51	6168.75
R-squared (%)	25.52	24.95	24.6	24.58

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.18: GMM

Two-step GMM obtains parameter estimates from the initial matrix, computes a new weight matrix based on those estimates, and then estimates the parameters again based on that weight matrix. Instrumental variables are all bondholder lags. The weight matrix specification is based on the asset size of the firms issued bond. The cluster weight matrix accounts for arbitrary correlation among observations within clusters.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top holder	-31.39 ***	-38.16 ***	-34.46 ***	-29.14 ***	-32.53 ***	-30.29 ***	-24.92 ***	-39.3 ***
	(-3.37)	(-3.86)	(-3.77)	(-3.27)	(-3.51)	(-3.49)	(-3.29)	(-4.91)
Nonfixed asset	0.32			0.17	0.1	0.56	0.38	1.15 ***
	(-0.72)			(0.36)	(0.23)	(1.38)	(0.9)	(3.37)
CEO holding	0.21	-0.2	0.68			0.4	2.68	-0.64
	(0.1)	(-0.12)	(0.39)			(0.18)	(1.41)	(-0.42)
Number of bond	-2.06 **	-1.74 **	-2.36 ***	-3.02 ***	-2.38 **			
	(-2.15)	(-1.97)	(-2.73)	(-3.14)	(-2.47)			
Market to book		-92.22 ***						
		(-5.53)						
R&D			-4.12 ***					
			(-3.16)					
Institutional holding				-1.41 ***				
				(-2.92)				
CEO tenure					-1.12			
					(-0.33)			
HFI-1						-5.65 ***		
						(-2.57)		
Short term debt							6.1 *	
							(1.84)	
Number of institutional investors								-0.17 ***
								(-7.68)
Constant	495.87 ***	683.08 ***	548.18 ***	623.687 ***	528.73 ***	945.42 ***	366.04 ***	548.76 ***
	(6.9)	(8.61)	(9.39)	(7.78)	(6.34)	(4.18)	(9.58)	(11.88)
Observations	22597	22662	22662	23390	23092	22597	23050	22973
Instruments	5	5	5	5	5	5	5	5
No. of Clusters	1160	1163	1163	1193	1182	1160	1167	1156
Identification	Exact	Exact	Exact	Exact	Exact	Exact	Exact	Exact
No. parameters	5	5	5	5	5	5	5	5
No. of moments	5	5	5	5	5	5	5	5
Step1 iteration	2	2	2	2	2	2	2	2
Step2 iteration	1	1	1	1	1	1	1	1

Table 2.19: Summary Statistics of Campbell Variables

This table shows the summary statistics of these variables: net income over book value of total assets (NITA), net income over market value of total assets (NIMTA), total liabilities over book value of total assets (TLTA), total liabilities over market value of total assets (TLMTA), log of gross excess return over value-weighted S&P500 return (EXRET), log of firm's market equity over the total valuation of S&P500 (RSIZE), square root of the sum of squared firm stock returns over a 3-month period (SIGMA) annualized, stock of cash and short-term investments over the market value of total assets (CASHMTA), market-to-book ratio of the firm (MB) and log of price per share winsorized above $15 (PRICE). Market value of total asset is calculated by adding the market value of firm equity to its total liabilities.

	NITA	NIMTA	TLTA	TLMTA	EXRET	RSIZE	SIGMA	CASHMTA	MB	PRICE	NIMTAAVG	EXRETAVG
Mean	0.008	0.005	0.639	0.491	0.007	-7.946	0.381	0.044	2.298	2.608	0.011	0.004
Median	0.009	0.007	0.637	0.494	0.007	-7.619	0.333	0.025	1.991	2.708	0.015	0.006
Std	0.02	0.013	0.148	0.209	0.089	0.693	0.204	0.048	1.214	0.316	0.023	0.036
Min	-0.112	-0.07	0.168	0.046	-0.238	-14.186	0.136	0.003	0.487	0.336	-0.163	-0.182
Max	0.041	0.029	0.928	0.932	0.208	-7.619	1.448	0.351	4.858	2.708	0.064	0.143
N	24904	24904	24904	24904	24904	24904	24904	24901	24904	24904	24718	24720

Table 2.20: Summary Statistics of Bankruptcy Probability

Panel A shows the summary statistics of short-term bankruptcy probability for each quantile. As for Panel B, the summary is for long-term prediction of default likelihood. Quantile 1 is the lowest probability of default.

Panel A: Short-term default probability			
Quantile	Mean	Std Dev	Freq
1	0.00087566	0.00029915	8,246
2	0.00270153	0.00089185	8,244
3	0.07446869	0.19271611	8,239
Total	0.02600346	0.1163929	24,729
Panel B: Long-term default probability			
Quantile	Mean	Std Dev	Freq
1	0.03402049	0.0053678	8,245
2	0.05055644	0.0054353	8,243
3	0.12924796	.12739005	8,241
Total	0.07126726	0.08457558	24,729

Table 2.21: Regression Results of Bondholder's Bargaining Power for Short-Term Bankruptcy Prediction (First Quantile = Lowest Default Probability)

This table shows the regression results of the *Top holder* along with important control variables on the credit spreads for firms with low short-term default probability. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-0.91	-1.05	-0.13	-0.73	-1.00	-0.49	-0.50	-0.01	0.11
	(-0.71)	(-0.80)	(-0.10)	(-0.57)	(-0.82)	(-0.40)	(-0.38)	(-0.01)	(0.09)
Nonfixed assets	0.78**				0.10	0.18	0.03	0.12	-0.10
	(2.16)				(0.29)	(0.54)	(0.09)	(0.35)	(-0.30)
CEO shareholding	-5.96	-3.92	-6.60	-4.35			-5.28	-12.27*	-13.00*
	(-0.80)	(-0.53)	(-0.91)	(-0.59)			(-0.55)	(-1.72)	(-1.84)
No. of issues	-2.41***	-2.30***	-2.12***	-2.24***	-2.41***	-2.35***			
	(-7.09)	(-6.90)	(-6.42)	(-6.77)	(-7.16)	(-6.99)			
Market-to-book-ratio		-5.75*							
		(-1.84)							
R&D			2.09***						
			(3.49)						
Institutional shareholding					0.62***				
					(3.13)				
CEO tenure						-1.26***			
						(-3.99)			
1-Herfindahl index							-0.56		
							(-0.92)		
Short-term debt								-1.84***	
								(-5.94)	
No. of inst. shareholders									0.03***
									(2.84)
Constant	65.04	272.64**	281.72**	253.22**	102.59***	57.43	79.54	32.25	293.41***
	(1.58)	(2.42)	(2.56)	(2.27)	(3.17)	(1.22)	(1.00)	(0.81)	(2.73)
Observations	7,539	7,571	7,571	7,571	7,879	7,854	7,539	7,539	7,521
Adjusted R-squared	0.2705	0.2718	0.2726	0.2716	0.2647	0.2653	0.2654	0.2679	0.2645
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2.22: Regression Results of Bondholder's Bargaining Power for Short-Term Bankruptcy Prediction (Second Quantile = Medium Default Probability)

This table shows the regression results of the *Top holder* along with important control variables on the credit spreads for firms with medium short-term default probability. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-4.76***	-4.67***	-3.87**	-4.67***	-4.09**	-4.66***	-5.00***	-5.48***	-4.37**
	(-2.66)	(-2.65)	(-2.19)	(-2.65)	(-2.30)	(-2.65)	(-2.79)	(-2.93)	(-2.42)
Nonfixed assets	-0.10				0.25	0.18	-0.03	-0.15	0.38*
	(-0.48)				(1.12)	(0.80)	(-0.14)	(-0.71)	(1.65)
CEO shareholding	3.86	3.40	3.88	3.65			2.87	2.02	3.42
	(1.29)	(1.14)	(1.31)	(1.23)			(0.98)	(0.69)	(1.14)
No. of issues	-1.02***	-1.07***	-0.93***	-1.02***	-0.77***	-0.94***			
	(-3.55)	(-3.80)	(-3.30)	(-3.60)	(-2.61)	(-3.33)			
Market-to-book-ratio		14.01							
		(1.55)							
R&D			9.95***						
			(6.34)						
Institutional shareholding					0.30**				
					(2.12)				
CEO tenure						-1.77***			
						(-3.34)			
1-Herfindahl index							-3.13***		
							(-3.45)		
Short-term debt								-2.94***	
								(-3.74)	
No. of inst. shareholders									0.05***
									(4.61)
Constant	-332.76***	-397.58***	-365.95***	-342.17***	700.38***	-17.74	6.95	521.49***	-177.47***
	(-7.64)	(-7.30)	(-8.78)	(-8.48)	(14.66)	(-0.30)	(0.10)	(9.19)	(-2.66)
Observations	7,568	7,601	7,601	7,601	7,669	7,703	7,568	7,568	7,520
Adjusted R-squared	0.4426	0.4428	0.4442	0.4428	0.4414	0.4399	0.4426	0.4437	0.4441
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.23: Regression Results of Bondholder's Bargaining Power for Short-Term Bankruptcy Prediction (Third Quantile = High Default Probability)

This table shows the regression results of the *Top holder* along with important control variables on the credit spreads for firms with high short-term default probability. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-62.34***	-65.22***	-60.62***	-60.62***	-59.20***	-62.99***	-61.72***	-64.13***	-61.57***
	(-10.14)	(-10.36)	(-9.93)	(-9.94)	(-9.57)	(-9.98)	(-10.03)	(-10.26)	(-10.04)
Nonfixed assets	-7.51***				-6.74***	-7.80***	-5.96***	-6.35***	-6.10***
	(-6.27)				(-6.09)	(-6.46)	(-5.79)	(-6.36)	(-5.75)
CEO shareholding	-0.91	-1.49	-0.98	-0.95			-0.91	-0.90	-0.94
	(-0.86)	(-1.38)	(-0.94)	(-0.91)			(-0.87)	(-0.87)	(-0.90)
No. of issues	-6.23***	-2.76***	-2.59**	-2.78***	-3.55***	-6.19***			
	(-4.46)	(-2.66)	(-2.44)	(-2.70)	(-3.10)	(-4.43)			
Market-to-book-ratio		292.06***							
		(5.47)							
R&D			-17.91						
			(-1.57)						
Institutional shareholding					1.25**				
					(2.53)				
CEO tenure						0.50			
						(0.27)			
1-Herfindahl index							0.06		
							(0.03)		
Short-term debt								7.61***	
								(3.80)	
No. of inst. shareholders									-0.07
									(-0.92)
Constant	11.17	-1,501.20***	-1,127.87***	-686.71***	-1,093.52***	-996.27***	-297.16	-1,186.84***	-1,035.40***
	(0.05)	(-6.14)	(-5.08)	(-3.05)	(-4.88)	(-4.47)	(-0.89)	(-4.93)	(-4.64)
Observations	7,549	7,549	7,549	7,549	7,888	7,606	7,549	7,549	7,538
Adjusted R-squared	0.4002	0.3992	0.3973	0.3972	0.4124	0.4111	0.3991	0.4001	0.3992
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.24: Regression Results of Bondholder's Bargaining Power for Long-Term Bankruptcy Prediction (First Quantile = Lowest Default Probability)

This table shows the regression results of the *Top holder* along with important control variables on the credit spreads for firms with low long-term default probability. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-1.58	-1.49	-1.67	-1.64	-1.61	-1.51	-2.29	-1.95	-1.38
	(-1.07)	(-0.99)	(-1.13)	(-1.11)	(-1.12)	(-1.06)	(-1.51)	(-1.30)	(-0.92)
Nonfixed assets	0.90*				0.37	0.50	0.77*	0.66	0.72
	(1.94)				(0.80)	(1.11)	(1.65)	(1.42)	(1.55)
CEO shareholding	-38.18***	-38.70***	-43.52***	-38.13***			-36.89***	-33.60***	-43.56***
	(-4.23)	(-4.28)	(-4.77)	(-4.19)			(-4.05)	(-3.62)	(-4.69)
No. of issues	-2.22***	-2.24***	-1.96***	-2.22***	-2.20***	-1.92***			
	(-5.77)	(-5.85)	(-5.17)	(-5.77)	(-5.89)	(-5.03)			
Market-to-book-ratio		4.57							
		(0.85)							
R&D			4.53***						
			(4.31)						
Institutional shareholding					-0.24				
					(-0.98)				
CEO tenure						-2.44***			
						(-5.98)			
1-Herfindahl index							-3.52***		
							(-3.69)		
Short-term debt								-2.21***	
								(-4.80)	
No. of inst. shareholders									0.04*
									(1.92)
Constant	93.11	36.37	-181.52***	50.42	67.50	-32.55	224.79**	74.63	19.83
	(1.22)	(0.62)	(-2.87)	(0.87)	(1.24)	(-0.48)	(2.40)	(1.01)	(0.26)
Observations	7,599	7,632	7,632	7,632	7,943	7,934	7,599	7,599	7,585
Adjusted R-squared	0.2127	0.2122	0.2134	0.2123	0.2076	0.2091	0.2115	0.2118	0.2105
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.25: Regression Results of Bondholder's Bargaining Power for Long-Term Bankruptcy Prediction (Second Quantile = Medium Default Probability)

This table shows the regression results of the *Top holder* along with important control variables on the credit spreads for firms with medium long-term default probability. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-34.39***	-33.65***	-34.56***	-33.73***	-33.57***	-33.61***	-33.98***	-34.16***	-33.01***
	(-9.05)	(-9.02)	(-9.04)	(-9.07)	(-8.95)	(-8.92)	(-8.66)	(-9.19)	(-8.71)
Nonfixed assets	-0.96*				-0.61	-1.03*	-0.83*	-0.87*	-0.39
	(-1.70)				(-1.11)	(-1.72)	(-1.66)	(-1.79)	(-0.77)
CEO shareholding	-9.70*	-12.34**	-11.95**	-12.04**			-10.85*	-9.74*	-13.62**
	(-1.75)	(-2.05)	(-2.01)	(-2.03)			(-1.65)	(-1.75)	(-2.41)
No. of issues	-0.47	-0.09	-0.10	-0.13	0.62	-0.34			
	(-0.77)	(-0.17)	(-0.18)	(-0.24)	(1.13)	(-0.54)			
Market-to-book-ratio		11.53							
		(1.34)							
R&D			-3.44***						
			(-3.20)						
Institutional shareholding					1.21***				
					(5.41)				
CEO tenure						0.98*			
						(1.70)			
1-Herfindahl index							0.38		
							(0.38)		
Short-term debt								0.55	
								(0.71)	
No. of inst. shareholders									0.10***
									(5.41)
Constant	-55.62	-477.43***	-423.17**	-435.10**	-304.24***	-333.83**	-87.19	-69.41	-110.62
	(-0.48)	(-2.61)	(-2.45)	(-2.52)	(-2.59)	(-2.00)	(-0.61)	(-0.63)	(-1.01)
Observations	7,752	7,784	7,784	7,784	7,842	7,866	7,752	7,752	7,707
Adjusted R-squared	0.4307	0.4307	0.4308	0.4307	0.4294	0.4289	0.4306	0.4307	0.4317
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2.26: Regression Results of Bondholder's Bargaining Power for Long-Term Bankruptcy Prediction (Third Quantile = High Default Probability)

This table shows the regression results of the *Top holder* along with important control variables on the credit spreads for firms with high long-term default probability. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder	-36.31***	-34.41***	-33.23***	-33.23***	-31.77***	-38.80***	-34.37***	-34.25***	-34.21***
	(-6.94)	(-6.73)	(-6.45)	(-6.47)	(-6.23)	(-7.33)	(-6.66)	(-6.58)	(-6.64)
Nonfixed assets	-4.77***				-6.17***	-6.37***	-4.27***	-4.24***	-4.60***
	(-5.96)				(-7.40)	(-7.28)	(-5.62)	(-5.57)	(-5.44)
CEO shareholding	0.68	0.30	0.66	0.67			0.58	0.61	0.62
	(0.56)	(0.28)	(0.56)	(0.56)			(0.50)	(0.53)	(0.53)
No. of issues	-4.04***	-3.17***	-3.44***	-3.44***	-2.57**	-4.11***			
	(-3.52)	(-3.01)	(-3.12)	(-3.13)	(-2.55)	(-3.63)			
Market-to-book-ratio		158.06***							
		(8.96)							
R&D			-0.28						
			(-0.06)						
Institutional shareholding					-0.73*				
					(-1.65)				
CEO tenure						-6.24***			
						(-4.17)			
1-Herfindahl index							-0.74		
							(-0.36)		
Short-term debt								0.34	
								(0.21)	
No. of inst. shareholders									-0.07
									(-1.33)
Constant	-227.95	-1,136.52***	-528.37**	-528.65**	-105.46	-36.57	-354.22	-265.39	-347.14
	(-1.05)	(-5.02)	(-2.50)	(-2.50)	(-0.46)	(-0.16)	(-1.13)	(-1.21)	(-1.63)
Observations	7,305	7,305	7,305	7,305	7,651	7,363	7,305	7,305	7,287
Adjusted R-squared	0.4048	0.4101	0.4025	0.4026	0.4149	0.4136	0.4032	0.4032	0.4034
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.27: The Regression Result with the Focus Variable on Interaction between Top Holder and D1. This table shows the regression results of the *Top holder* and D1 interaction along with important control variables on the credit spreads. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power. D1 is a dummy variable that takes the value one if the median stock return of all the firms in the three-digit SIC code of the firm is less than -30%, and zero otherwise.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder*D1	-16.80***	-16.34***	-17.39***	-17.26***	-17.66***	-17.80***	-17.53***	-14.62**	-14.86**
	(-2.79)	(-2.70)	(-2.87)	(-2.86)	(-2.92)	(-2.95)	(-2.94)	(-2.43)	(-2.48)
Top holder	-15.44***	-16.96***	-16.98***	-16.61***	-17.11***	-17.61***	-13.71***	-12.81***	-13.45***
	(-8.07)	(-9.09)	(-8.99)	(-8.89)	(-9.33)	(-9.17)	(-7.12)	(-6.71)	(-7.01)
D1	159.55***	144.66***	159.26***	159.32***	154.78***	156.97***	159.23***	153.90***	152.08***
	(6.43)	(5.77)	(6.37)	(6.37)	(6.24)	(6.36)	(6.40)	(6.16)	(6.15)
Nonfixed assets	1.48***				0.57**	0.76***	1.61***	1.73***	1.26***
	(6.68)				(2.15)	(3.02)	(7.07)	(7.60)	(5.05)
CEO shareholding	2.01**	1.59**	2.24***	2.25***			2.69***	2.13***	2.45***
	(2.56)	(1.96)	(2.72)	(2.74)			(3.26)	(2.67)	(3.01)
No. of issues	-5.55***	-5.46***	-5.62***	-5.62***	-6.59***	-5.74***			
	(-10.34)	(-10.35)	(-10.44)	(-10.43)	(-13.37)	(-10.91)			
Market-to-book-ratio		-51.94***							
		(-17.08)							
R&D			-3.01***						
			(-3.03)						
Institutional shareholding					-0.75***				
					(-3.51)				
CEO tenure						1.30***			
						(2.74)			
1-Herfindahl index							-3.12***		
							(-3.39)		
Short-term debt								-3.15***	
								(-5.99)	
No. of inst. shareholders									-0.11***
									(-4.61)
Constant	223.76***	922.78***	297.17	278.34	683.46	266.57***	361.32***	760.29***	454.52***
	(5.21)	(24.40)	(0.00)	(.)	(0.00)	(6.09)	(5.55)	(18.76)	(13.17)
Observations	23,275	23,339	23,340	23,340	24,097	23,783	23,275	23,275	23,198
Adjusted R-squared	0.3709	0.3738	0.3703	0.3703	0.3703	0.3694	0.3654	0.3655	0.3665
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.28: The Regression Result with the Focus Variable on Interaction between Top Holder and D2. This table shows the regression results of the *Top holder* and D2 interaction along with important control variables on the credit spreads. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power. D2 is a dummy variable that takes on the value one if Distress1 is one and if the median sales growth of all the firms in the three-digit SIC code of the firm is negative in any of the two years before the bond transaction date.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder*D2	-19.42*	-20.65**	-19.95*	-19.99*	-22.58**	-22.18**	-19.83*	-18.92*	-19.75*
	(-1.86)	(-1.98)	(-1.90)	(-1.90)	(-2.16)	(-2.13)	(-1.93)	(-1.80)	(-1.88)
Top holder	-19.79***	-17.63***	-18.83***	-18.77***	-19.69***	-21.09***	-18.58***	-18.56***	-18.11***
	(-9.85)	(-8.84)	(-9.35)	(-9.46)	(-10.13)	(-10.51)	(-9.04)	(-9.45)	(-9.00)
D2	119.34***	130.92***	122.97***	123.11***	122.64***	123.72***	120.17***	117.45***	120.77***
	(3.05)	(3.29)	(3.10)	(3.10)	(3.13)	(3.18)	(3.09)	(2.99)	(3.06)
Nonfixed assets	-1.59***				-2.27***	-2.31***	-1.53***	-1.52***	-1.33***
	(-5.84)				(-7.44)	(-7.54)	(-5.66)	(-5.64)	(-4.51)
CEO shareholding	-0.86	-1.10	-1.01	-1.02			-0.79	-0.96	-0.91
	(-1.05)	(-1.36)	(-1.26)	(-1.26)			(-0.96)	(-1.14)	(-1.13)
No. of issues	-2.31***	-2.24***	-2.26***	-2.26***	-2.49***	-2.32***			
	(-4.97)	(-4.89)	(-4.88)	(-4.89)	(-5.61)	(-5.06)			
Market-to-book-ratio		54.36***							
		(8.87)							
R&D			-0.44						
			(-0.48)						
Institutional shareholding					-0.09				
					(-0.47)				
CEO tenure						0.93**			
						(2.20)			
1-Herfindahl index							-0.04		
							(-0.05)		
Short-term debt								-2.09***	
								(-3.78)	
No. of inst. shareholders									0.05**
									(2.51)
Constant	-420.33***	-550.87	-336.81	-341.87	325.82***	-241.50	255.41**	-627.21***	-318.65
	(-5.85)	(-0.00)	(.)	(.)	(4.30)	(.)	(2.25)	(-9.10)	(-0.00)
Observations	23,295	23,360	23,360	23,360	24,113	23,802	23,295	23,295	23,218
Adjusted R-squared	0.4112	0.4125	0.4106	0.4106	0.4162	0.4127	0.4103	0.4106	0.4106
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.29: The Regression Result with the Focus Variable on Interaction between Top Holder and D3.
This table shows the regression results of the *Top holder* and D3 interaction along with important control variables on the credit spreads. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power. D3 is a dummy variable that takes on the value one if the average credit rating of other firms in the three-digit SIC code of the firm is below investment grade, and zero otherwise.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top holder*D3	-60.36***	-64.31***	-60.63***	-60.54***	-54.30***	-58.98***	-60.19***	-60.50***	-59.79***
	(-7.94)	(-8.39)	(-7.93)	(-7.95)	(-7.79)	(-8.05)	(-7.92)	(-7.96)	(-7.85)
Top holder	-6.06***	-2.54	-4.73**	-4.84**	-5.57***	-6.42***	-4.51**	-4.44**	-4.28**
	(-3.06)	(-1.28)	(-2.31)	(-2.45)	(-2.87)	(-3.27)	(-2.40)	(-2.36)	(-2.18)
D3	235.01***	248.12***	233.05***	232.79***	207.21***	220.64***	223.95***	226.11***	217.07***
	(6.02)	(6.33)	(5.97)	(5.97)	(5.70)	(5.90)	(5.69)	(5.76)	(5.56)
Nonfixed assets	-1.99***				-2.34***	-2.58***	-1.82***	-1.81***	-1.61***
	(-6.84)				(-7.69)	(-8.23)	(-6.39)	(-6.40)	(-5.14)
CEO shareholding	-0.04	-0.39	-0.30	-0.30			0.00	-0.11	-0.08
	(-0.06)	(-0.58)	(-0.44)	(-0.44)			(0.00)	(-0.16)	(-0.13)
No. of issues	-2.82***	-2.57***	-2.65***	-2.66***	-2.72***	-2.79***			
	(-5.60)	(-5.26)	(-5.33)	(-5.35)	(-5.63)	(-5.56)			
Market-to-book-ratio		72.43***							
		(10.67)							
R&D			0.65						
			(0.64)						
Institutional shareholding					0.14				
					(0.78)				
CEO tenure						1.85***			
						(4.12)			
1-Herfindahl index							0.19		
							(0.22)		
Short-term debt								-2.35***	
								(-4.21)	
No. of inst. shareholders									0.05**
									(2.42)
Constant	-480.27***	-52.09	-582.17***	186.82**	-509.57***	-510.36***	-550.24***	351.06***	184.59**
	(-6.51)	(-0.68)	(-7.79)	(2.57)	(-6.69)	(-7.03)	(-5.70)	(4.68)	(2.33)
Observations	21,560	21,625	21,625	21,625	22,287	21,976	21,560	21,560	21,483
Adjusted R-squared	0.4141	0.4163	0.4132	0.4133	0.4201	0.4174	0.4128	0.4132	0.4131
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.30: Bondholder's Bargaining Power Effect with Liquidity Control Variables

This table shows the regression results of the *Top holder* and liquidity control variables along with important control variables on the credit spreads. Top holder is proxied for bondholder's bargaining power. It is a categorical variable from 0 to 9. The higher the number, the higher the bondholder's bargaining power. Liquidity control variables are issue amount (AmountIssue), Yield Dispersion, and On the Run.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top holder	-41.97***	-39.69***	-39.81***	-40.01***	-42.67***	-40.18***	-41.91***	-41.09***
	(-20.56)	(-19.81)	(-19.67)	(-20.44)	(-21.07)	(-19.86)	(-20.64)	(-19.99)
Nonfixed assets	-3.14***			-3.07***	-3.57***	-3.07***	-3.10***	-3.04***
	(-10.99)			(-10.44)	(-11.36)	(-10.72)	(-10.84)	(-10.28)
CEO shareholding	0.70	0.42	0.45			0.73	0.74	0.72
	(1.48)	(0.90)	(0.97)			(1.58)	(1.59)	(1.54)
No. of issues	-4.37***	-4.35***	-4.35***	-3.74***	-4.05***			
	(-8.06)	(-8.00)	(-8.00)	(-7.82)	(-7.57)			
AmountIssue	-0.46***	-0.46***	-0.46***	-0.46***	-0.46***	-0.47***	-0.46***	-0.47***
	(-33.00)	(-32.83)	(-32.98)	(-32.84)	(-32.91)	(-33.17)	(-32.95)	(-33.24)
Yield Dispersion	55.27***	55.17***	55.18***	53.89***	56.38***	55.37***	54.20***	55.21***
	(3.19)	(3.14)	(3.14)	(3.20)	(3.26)	(3.20)	(3.13)	(3.19)
On the Run	-11.54	-14.92	-14.01	-31.93*	-35.48**	-13.97	-13.29	-10.83
	(-0.77)	(-1.00)	(-0.94)	(-1.86)	(-2.07)	(-0.95)	(-0.91)	(-0.73)
Market-to-book-ratio		28.76***						
		(4.75)						
R&D			3.55***					
			(3.56)					
Institutional shareholding				1.24***				
				(5.87)				
CEO tenure					3.33***			
					(8.82)			
1-Herfindahl index						3.25***		
						(2.81)		
Short-term debt							-6.05***	
							(-10.91)	
No. of inst. shareholders								0.04
								(1.45)
Constant	-17.14	-204.69***	-395.91***	-454.65***	-116.35	-450.67	-56.40	-35.51
	(-0.00)	(-3.46)	(-4.93)	(-5.83)	(.)	(-0.00)	(-0.00)	(-0.53)
Observations	28,824	28,856	28,856	30,060	29,590	28,824	28,824	28,724
Adjusted R-squared	0.5481	0.5472	0.5470	0.5460	0.5467	0.5468	0.5480	0.5467
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.31: Effects of Investor Horizon on Credit Spreads

This table shows the regression results of the different investor horizons along with important control variables on the credit spreads. Short-term investors are the investors that have average holding of bond portfolio less than one year. Medium-term investors have an average holding of between one year and five years. Long-term investors have an average holding of more than five years.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Short-Term Holders	-17.92	-16.44	-18.44	-17.94	-15.05	-16.08	-15.01	-15.46	-14.69
	(-0.88)	(-0.80)	(-0.91)	(-0.88)	(-0.78)	(-0.83)	(-0.74)	(-0.76)	(-0.72)
Medium-Term Holders	0.22*	0.22*	0.21*	0.22*	0.22*	0.22*	0.21*	0.24**	0.16
	(1.82)	(1.88)	(1.78)	(1.87)	(1.9)	(1.82)	(1.73)	(2.05)	(1.34)
Long-Term Holders	-2.51***	-2.48***	-2.51***	-2.51***	-2.49***	-2.49***	-2.54***	-2.52***	-2.59***
	(-15.72)	(-15.55)	(-15.78)	(-15.77)	(-15.66)	(-15.68)	(-15.80)	(-15.75)	(-16.16)
Nonfixed assets	-0.04				-0.76**	-0.70**	0	0.03	0.47*
	(-0.16)				(-2.50)	(-2.34)	0	(0.11)	(1.67)
CEO shareholding	-0.01	-0.13	-0.04	-0.01			-0.3	-0.15	-0.24
	(-0.01)	(-0.16)	(-0.05)	(-0.02)			(-0.40)	(-0.19)	(-0.32)
No. of issues	-1.01**	-1.03**	-1.01**	-1.01**	-1.36***	-1.03**			
	(-2.24)	(-2.29)	(-2.23)	(-2.24)	(-3.10)	(-2.28)			
Market-to-book-ratio		47.24***							
		(8.01)							
R&D			3.44***						
			(3.47)						
Institutional shareholding					0				
					(0.02)				
CEO tenure						0.53			
						(1.32)			
1-Herfindahl index							3.13***		
							(3.48)		
Short-term debt								-1.96***	
								(-3.54)	
No. of inst. shareholders									0.13***
									(6.34)
Constant	-673.43***	-99.79	42.94	50.76	-682.74***	65.11	-877.12***	112.91	-390.26
	(-9.63)	(-1.38)	(0.61)	(0.72)	(-9.33)	(0.94)	(-9.27)	(1.51)	(-0.00)
Observations	22,888	22,953	22,953	22,953	23,702	23,395	22,888	22,888	22,811
Adjusted R-squared	0.4398	0.4412	0.4399	0.4397	0.4434	0.4399	0.4401	0.4399	0.4415
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.32: Endogeneity Test Using GMM for Different Types of Holder

Two-step GMM obtains parameter estimates from the initial matrix, computes a new weight matrix based on those estimates, and then estimates the parameters again based on that weight matrix. Instrumental variables are all bondholder lags. This Table shows the effect of each type of bondholder along with important control variables on credit spreads.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Insurance	-2.26 ***	-3.15 ***	-2.58 ***	-1.93 ***	-2.48 ***	-2.11 ***	-1.31 ***	-3.29 ***
	(-6.96)	(-10.1)	(-8.44)	(-5.7)	(-7.62)	(-6.82)	(-4.5)	(-10.07)
Mutual Fund	1.97 **	0.12	1.57 **	3.3 ***	1.96 **	2.31 ***	3.22 ***	0.42
	(2.54)	(0.16)	(2.04)	(4.29)	(2.55)	(3.04)	(4.31)	(0.54)
Pension Fund	-0.21	-0.79 *	-0.23	0.11	-0.3	-0.49	0.04	-0.72 *
	(-0.53)	(-1.94)	(-0.59)	(0.27)	(-0.73)	(-1.18)	(0.13)	(-1.82)
Government	-0.25	-2.19	-1.13	0.48	0.34	-0.62	-0.66	-4.39 **
	(-0.13)	(-1.14)	(-0.6)	(0.23)	(0.16)	(-0.33)	(-0.35)	(-2.39)
Healthcare	-241.31 ***	-250.18 ***	-240.45 ***	-235.06 ***	-249.79 ***	-227.78 ***	-221.45 ***	-181.12 ***
	(-6.85)	(-6.94)	(-6.98)	(-6.82)	(-7.08)	(-6.56)	(-6.46)	(-5.75)
Other	2.23	1.59	1.93	-0.75	0.18	2.72	3.3	-1.97
	(1.01)	(0.73)	(0.87)	(-0.34)	(0.08)	(1.24)	(1.51)	(-0.9)
Nonfixed asset	0.29 **			0.27 **	0.04	0.47 ***	0.18	1.03 ***
	(2.36)			(1.97)	(0.32)	(4.08)	(1.63)	(10.2)
CEO holding	-1.49 *	-1.48 *	-0.73			-1.37	1.49 *	-1.78 **
	(-1.75)	(-1.86)	(-0.9)			(-1.59)	(1.87)	(-2.31)
Number of bond	-1.71 ***	-1.27 ***	-1.95 ***	-2.21 ***	-2.06 ***			
	(-8.72)	(-7.73)	(-11.46)	(-10.56)	(-9.85)			
Market to book		-86.77 ***						
		(-24.71)						
R&D			-3.27 ***					
			(-10.5)					
Institutional holding				-1.14 ***				
				(-7.94)				
CEO tenure					-3.68 ***			
					(-5.62)			
HFI-1						-4.69 ***		
						(-6.29)		
Short term debt							6.46 ***	
							(9.3)	
Number of institutional investors								-0.16 ***
								(-28.36)
Constant	483.95 ***	696.51 ***	538.47 ***	550.85 ***	542.32 ***	851.65 ***	336.51 ***	583.49 ***
	(16.13)	(25.58)	(22.89)	(17.71)	(16.63)	(10.63)	(22.24)	(21.97)
Observations	20329	20393	20394	20934	23684	20329	23708	23631
Instruments	10	10	10	10	10	10	10	10
No. parameters	10	10	10	10	10	10	10	10
No. of moments	10	10	10	10	10	10	10	10

Table 2.33: Insurance Holdings and Credit Spreads

The dependent variable is the annualized credit spreads in basis points. Insurance holding is a percentage holding of a bond by insurance companies. Nonfixed assets are one minus the ratio of net property, plant, and equipment to total assets. Market-to-book is the ratio of the quasi-market value of assets to their book value. R&D is the ratio of research and development expenses to total investment expenditure. CEO shareholding and Institutional shareholding are the percentages of common equity owned by the CEO and institutional investors. CEO tenure is the number of years since the CEO's appointment as of the date of trade. Norm. no. of issues is the ratio of the logarithm of the number of bond issues outstanding on the trade date to the logarithm of total debt. Herfindahl is the Herfindahl index of outstanding public bond issues. Short-term debt is the ratio of debt in current liabilities to total debt. Norm. no. of shareholders is the ratio of the logarithm of the number of institutional shareholders to the logarithm of total market value of equity. Non-strategic default variables are also included as control variables.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Insurance holding	-0.77***	-0.64***	-0.71***	-0.71***	-0.83***	-0.94***	-0.76***	-0.74***	-0.77***
	(-4.33)	(-3.58)	(-3.95)	(-3.97)	(-4.78)	(-5.32)	(-4.32)	(-4.16)	(-4.32)
Nonfixed assets	-3.05***				-2.87***	-3.00***	-2.98***	-3.03***	-2.88***
	(-7.75)				(-6.90)	(-7.37)	(-8.14)	(-8.13)	(-7.74)
CEO shareholding	0.83	0.78	0.75	0.75			0.81	0.82	0.80
	(1.19)	(1.12)	(1.07)	(1.07)			(1.15)	(1.16)	(1.14)
No. of issues	0.63	-1.54**	-0.96	-0.97	0.61	0.90			
	(0.77)	(-2.08)	(-1.28)	(-1.30)	(0.75)	(1.10)			
Market-to-book-ratio		39.24***							
		(6.18)							
R&D			0.93						
			(0.59)						
Institutional shareholding					-0.37				
					(-1.38)				
CEO tenure						1.15**			
						(2.47)			
1-Herfindahl index							-0.26		
							(-0.21)		
Short-term debt								-1.32**	
								(-2.04)	
No. of inst. shareholders									0.02
									(1.18)
Constant	165.88*	-171.24**	-54.33	-53.29	169.96*	159.94*	-712.33***	221.53**	143.88
	(1.90)	(-1.97)	(-0.64)	(-0.62)	(1.89)	(1.88)	(-6.72)	(2.30)	(1.64)
Observations	23,137	23,202	23,202	23,202	23,951	23,644	23,137	23,137	23,060
Adjusted R-squared	0.4547	0.4546	0.4539	0.4539	0.4630	0.4623	0.4547	0.4548	0.4547
Other Holders Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

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Appendix A

Strategic Default Service Model

Strategic default service model [Fan and Sundaresan (2000)]

The model is continuous-time model with the following assumptions

1. A firm has equity and single perpetual debt with coupon rate c per unit time

2. We focus on default risk, and assume flat default-free term structure. The risk free rate is r per unit time.

3. The firm has a tax benefit of $(0 \leq \tau < 1)$. For this model, this is the only motive for issuing debt. The firm will lose tax benefits during the default period.

4. There is a cost for liquidation. The fixed cost is k $(k \geq 0)$ and the proportional cost is α $(0 \leq \alpha \leq 1)$. Assume strict absolute priority upon bankruptcy. When the value of the firm reaches $\tilde{V_s}$, the bankruptcy trigger point, outsiders will come to take a cost of $min(\tilde{V_s}, \alpha\tilde{V_s} + k)$ debt holders receive the remaining $max[0, (1-\alpha)\tilde{V_s} - k)]$; but equity holders receive nothing. At equilibrium, based on the model, creditors will receive less than the contractual coupon and still let equity holders run the firm. This results in deviations from absolute priority.

5. The asset value of the firm devoted by V, Follows the lognormal diffusion process

$$dV = (\mu - \beta)V dt + \sigma V dB_t$$

   where μ is the continuous time expected rate of return on the firm gross of all payout, σ^2 is the instantaneous variance of the return on the firm and B_t is a standard Brownian motion. β is the firm's cash payout ratio. Without tax, firm's asset value, V, and the firm's value, $v(V)$, are the same

The situation is that when the determined trigger point is reached, debtors accept reduced level of debt service. This will be temporary until the cash flow situation is better. Assume trigger point for strategic debt service $\tilde{V_s}$, both equity and debt holders will bargain the total value of the firm, devoted by $v(V)$. Note that the total value of the firm $v(V)$ is always larger than the asset value of the firm V. In other words, the negotiating value that both parties bargain over is larger.

For any $V \leq \tilde{V_s}$

$$\tilde{E}(V) = \tilde{\theta}v(V), \quad \tilde{D}(V) = (1 - \tilde{\theta})v(V)$$

Where $E(\cdot)$ and $D(\cdot)$ are the values of equity and debt, respectively. $\tilde{\theta}$ is a parameter indicating the sharing rule for the residual assets between equity and debt holders. In this model, θ is variable between 0 and $\alpha + \dfrac{k}{v(V)}$

Denote η as the equity holders' bargaining power, and $1 - \eta$ is the debt holders' bargaining power. We solve for Nash solution θ^* in the following manner: the value for equity holder by continuing as opposed to liquidation is $\tilde{\theta}v(V) - 0$

The incremental value for debt holders if accept strategic debt service instead of forcing liquidating is $[(1 - \tilde{\theta})v(V) - max(1 - \alpha)V - k, 0]$

The Nash solution to the bargaining game can be characterized as

$$\tilde{\theta^*} = argmax\{\tilde{\theta}v(V) - 0\}^{\eta}\{(1 - \tilde{\theta})v(V) - max[(1 - \alpha)V - K, 0]\}^{1-\eta}$$

$$= min[\eta - \frac{\eta(1 - \alpha)V - K}{v(V)}, \eta]$$

where

$$v(V) = V + \frac{-\lambda_-}{\lambda_+ - \lambda_-} \frac{\tau c}{r} (\frac{V}{\tilde{V_s}})^{\lambda^+}$$

$$\tilde{V_s} = (\frac{c(1 - \tau + \eta\tau)}{r}) - \frac{\lambda_-}{1 - \lambda_-} \frac{1}{1 - \eta\alpha}$$

$$\lambda_- = [0.5 - \frac{r - \beta}{\sigma^2}] - \sqrt{[\frac{r - \beta}{\sigma^2} - 0.5]^2 + \frac{2r}{\sigma^2}}$$

$$\lambda_+ = [0.5 - \frac{r - \beta}{\sigma^2}] + \sqrt{[\frac{r - \beta}{\sigma^2} - 0.5]^2 + \frac{2r}{\sigma^2}}$$

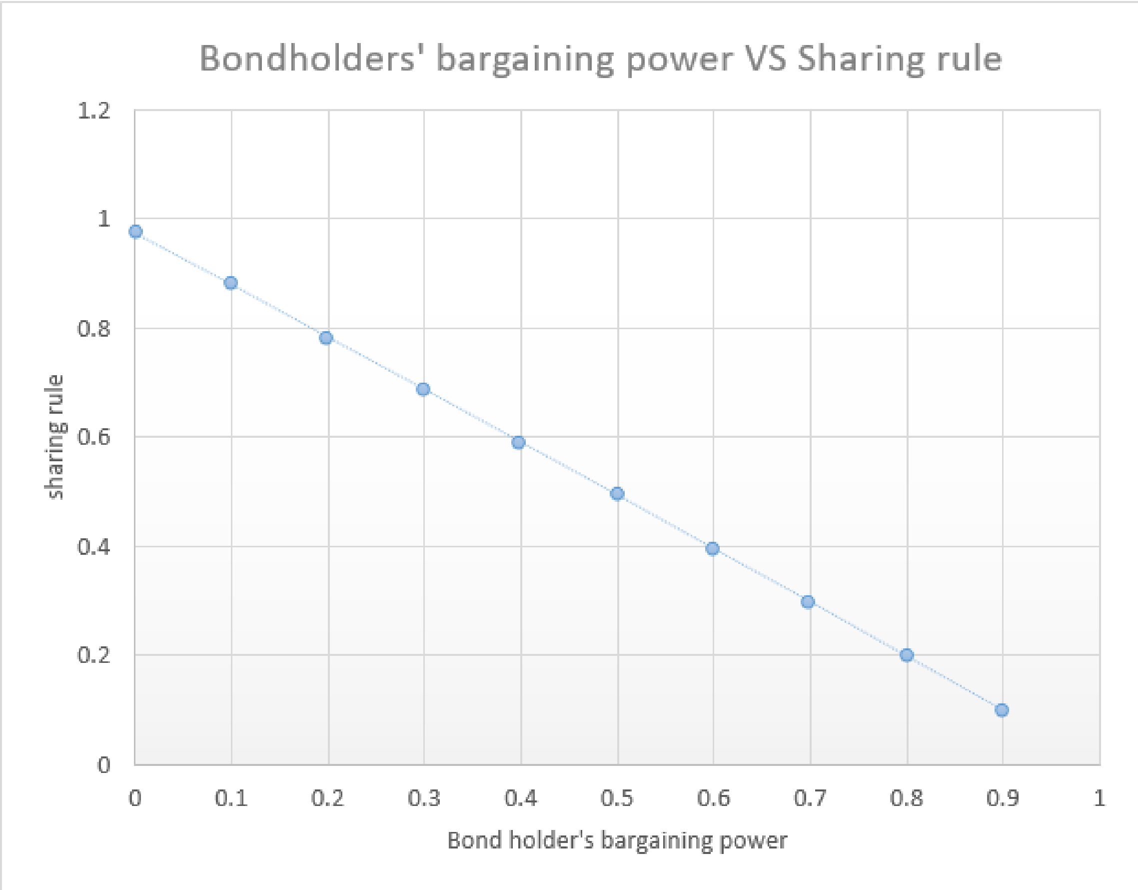
λ = elasticity of the probability of default with respect to the value of the assets of the firm

$\tilde{\theta}^*$ = sharing rule

Here we assume the following numbers for each parameter following Fan and Sundaresan (2000).

$$\alpha = 0.2, V = 100, K = 10, r = 7.5\%, \beta = 7\%, \sigma^2 = 3\%, \tau = 35\%, c = 5\%$$

Figure A.1: Numerical Represent of the Relationship between Bondholders' Bargaining Power and the Sharing Rule.



We can see that after some reasonable parameters, the result shows negative relationship between the bondholders' bargaining power $(1-\eta)$ and the sharing rule (θ). Assume that the bondholder's bargaining power is higher, so we have lower value of sharing rule. Consequently, the value of debt $D(\tilde{V})$ increases and this will render in lower credit spreads. From this sequence, we have negative relationship between bondholders' bargaining power and credit spreads. The parameters used are from Fan and Sundaresan (2000).

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