**The Changing Relevance of Accounting Information to Debt Holders over Time**

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**Abstract**

A number of studies have examined the change over time in the information content of accounting numbers to stockholders. However, the stockholders’ perspective is not necessarily identical to that of debt holders. The two groups face different risks and rewards and thus their informational needs are not the same. We examine the change in the information content of accounting numbers over time from the debt holders’ perspective and hypothesize about the economic and reporting factors likely to affect this change. Using the association between accounting numbers and bond valuation and returns, we find that the information content to debt holders has increased over time. In contrast, but consistent with prior studies, we find that the information content to equity holders has declined. The results suggest that the increased information content to debt holders is related to changes in credit risk and to reporting factors such as the increase in reporting conservatism, the shift towards fair value accounting, and the increase in the frequency of losses. The findings contribute to the scant literature on the use of accounting information by debt holders and the extent to which financial reporting meets their unique needs.

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**The Changing Relevance of Accounting Information to Debt Holders over Time**

1. **Introduction**

This study examines the change over time in the information content of accounting numbers to bond holders. Most of the previous studies on the value relevance of accounting numbers and its change over time have focused on equity holders. It is important, however, to also examine the value relevance from the perspective of debt holders for a number of reasons. First, the amount invested in debt in the U.S. markets is almost as large as that invested in equity.[[1]](#footnote-1) Second, a key objective of financial reporting is to produce information that is useful to all users of financial statements, including creditors.[[2]](#footnote-2) Third, the findings regarding the relevance of accounting numbers to the equity holders cannot be extended to debt holders because of the different characteristics of the claims held by these two investor groups.

The need to extend the value relevance research to debt holders has been recognized by Holthausen and Watts (2001) in their comprehensive review of the value relevance literature. Noting the scarcity of studies on the value relevance of accounting numbers for debt holders, they call for future research in this realm to consider non-equity investors.[[3]](#footnote-3) Our study responds to this call by examining the change over time in the relevance of accounting information to *bond* holders.

Prior research shows that the information content, or relevance, of earnings, as captured by the strength of their association with stock returns and valuation, has declined over time (see Collins, Maydew, and Weis 1997; and Lev and Zarowin 1999). Given that financial statement information is a major input for equity valuation and an important contracting device, the decline in the value relevance of financial statement information to equity holders has implications for market efficiency and resource allocations. Specifically, in the absence of alternative sources of reliable cost-effective information, the reduced usefulness of accounting numbers would be associated with additional costs of information search and production, increased information asymmetry and risk, and an increase in the cost of capital (see, for example, Lev and Zarowin 1999 and Easley and O’Hara 2004). As a result, these findings raised concerns among standard setters (e.g., the report of the AICPA Special Committee on Financial Reporting 1994; the “Jenkins Committee”) and academicians (e.g., Amir and Lev 1996; Lev and Zarowin 1999).[[4]](#footnote-4)

Similar concerns are merited if a decline occurs in the value relevance of accounting numbers for creditors. However, the finding of a decline in the information content of earnings to equity holders does not necessarily extend to debt holders. Debt holders are more concerned with the ability of accounting information to adequately and promptly convey downside risks and unfavorable information than with information that helps them assess growth opportunities, a major interest of shareholders. As a result, the sensitivity to earnings differs for equity and debt valuation. While the association of debt values with earnings is positive, the value of debt is less sensitive to earnings once they exceed a certain threshold because of the cap on the debt’s redemption value. For a detailed analysis of the effect of earnings on the valuation of claims by equity holders and creditors, see Lok and Richardson (2011).

This differing sensitivity to earnings suggests that trends in financial reporting, are likely to have different implications for equity holders and creditors. Thus, proposals to enhance the relevance of accounting information to equity holders may not be beneficial to debt holders.

We identify a number of reporting factors and develop hypotheses about their expected effect on the information content of accounting number to debt holders. One such factor is the shift by accounting standard setters to an asset-liability focus (“balance sheet approach”) from a revenue-expense focus (“income statement approach”), along with their move towards fair-value accounting. Such shifts may enhance the value of the balance sheet as an indicator of the firm’s liquidation value and increase the information content of accounting numbers to creditors. Another reporting factor that may act in the opposite direction is the accounting for intangible assets which, coupled with the increase in the intensity of investment in these assets, may diminish the usefulness of financial statements in assessing the firm’s viability and exit value. Finally, the increase in reporting conservatism, a property that has implications for the efficiency of debt contracting, may increase the relevance of the financial statements for creditors. We test for the effect of these and other reporting and economic factors on the change over time in the information content of accounting numbers to a major group of creditors, bond holders.

The scarcity of research from the debt holders’ perspective is likely due to difficulties in obtaining return and valuation data on bonds.[[5]](#footnote-5) We were able to obtain a proprietary data base from which we could construct a sample of 13,910 corporate bond-issues over the 39-year period from 1975 to 2013. Using return and valuation models for bond and equity, we find that the value relevance of accounting information has generally increased for bond holders while, consistent with previous studies, it has decreased for equity holders. We then explore the reasons for this increase, and test reporting and economic explanations for it. We find that increased credit risk, measured by the probability of default, and the increase in the frequency of losses, factors to which the valuation of debt is more sensitive than that of equity, as well as the shift in the emphasis of accounting standard setters from the determination of net income to the valuation of assets and liabilities (“the balance sheet approach”), are the primary explanations for the upward trend in the information content to bond holders. The increase in reporting conservatism over the last four decades, which likely reflects changes in accounting standards and their implementation as well as changes in management reporting incentives, also appears to have played a contributing role. Offsetting this trend, the increase in the extent of intangible investments appears to reduce the usefulness of accounting numbers to bond holders.

The paper contributes to the literature in a number of ways. It is the first to document the change in the value relevance of accounting information for debt holders and to contrast it with the change for equity holders. It also extends prior research by empirically confirming theoretical predictions regarding the differential response of the bond and stock markets to accounting information. Finally, the findings are beneficial to accounting standard setters and regulators as they demonstrate the differential impact of various financial reporting attributes on these two investor groups.

The paper proceeds as follows. The next section contains a review of the literature on the relevance of accounting numbers for equity and debt valuation. The factors hypothesized to affect the changes over time in the informativeness of accounting numbers to bond holders are discussed in section 3. The methodology is presented in section 4, followed by a description of the data and sample in section 5. The main results are provided and discussed in section 6. Section 7 contains additional tests and robustness checks. A summary and concluding remarks are provided in the last section.

**2. Literature Review**

**2.1. Value relevance of accounting information over time**

Concerns about the failure of historical accounting to properly reflect corporate performance in the “new economy” and the resulting potential decline in the value relevance of accounting information have been expressed since the early 1990s. Among the studies to document how the information content of earnings has changed over time are Ramesh and Thiagarajan (1996), Collins et al. (1997), Ely and Waymire (1999), Francis and Schipper (1999), and Lev and Zarowin (1999). While these studies use different measures to capture usefulness, their common finding is that the value relevance of earnings has declined over recent decades. A frequent explanation for this decline is the accounting treatment of intangibles and the shift towards fair values (see Dichev and Tang 2008).

**2.2. Information content of accounting numbers for debt holders**

The potential differential response of bond prices to accounting information has been the subject of several research studies. Plummer and Tse (1999) show that the association between stock returns and earnings is weaker for firms with lower bond ratings and those reporting losses. Yet, for these same firms, the association between bond returns and earnings is stronger. Datta and Dhillon (1993) find that bond returns are positively associated with the content of earnings announcements. Sridharan (2011) finds that balance sheet information is more important for bond holders than equity holders. Easton et al. (2009) analyze the trading prices of bonds around annual earnings announcements and find a positive association between bond returns and unexpected earnings. This association is found to be stronger when earnings convey bad news and when the bonds are riskier. DeFond and Zhang (2014) find that bond prices reflect negative earnings surprises on a timelier basis than positive surprises, and incorporate bad news more quickly than do stock prices. They further find that bond prices anticipate bad news conveyed in balance sheet changes while stock prices do not. Finally, Shi (2003) demonstrates the need to consider the perspectives of all users of financial information in setting the accounting standards for investment in R&D. All of these studies support the notion that in determining the information content of accounting numbers and in assessing alternative financial reporting standards, one should consider both groups of constituents.

To the best of our knowledge, the only studies that directly examine the change over time in the usefulness of accounting numbers to bond holders are Beaver et al. (2005) and Beaver et al. (2012). These papers focus only on one aspect of accounting information: its ability to predict bankruptcy. We employ broader criteria to gauge usefulness and different bond valuation and return models to assess this change to bond holders. Further, by examining a sample of bonds issued by publicly-held companies, we are able to directly compare the changes in the information content of accounting numbers to both bond and equity holders.

**3. Factors Hypothesized to Affect the Change in the Information Content of Accounting Numbers for Debt Holders**

The main economic factor that may explain the change in the value relevance of accounting information to debt holders is credit risk. Consistent with previous studies and as confirmed by the cross-sectional tests reported in this paper, bond values and returns are more strongly associated with accounting information when the firm’s credit risk is higher. We expect that this relation will also be evident in our time-series analysis and therefore hypothesize that fluctuations over time in credit risk are positively associated with the information content of accounting numbers to bond holders.

A reporting attribute that is likely to be valued by debt holders, who are more concerned with downside risk, is the degree of accounting conservatism. Conservatism is hypothesized to facilitate debt contracting and hence debt valuation (e.g., Watts and Zimmerman 1986; Ball 2001; Watts 2003a, b). A number of papers examine efficiency gains from accounting conservatism in debt contracts (e.g., Ahmed et al. 2002; Zhang 2008; Ball et al. 2008a, b; Beatty et al. 2008; Wittenberg-Moerman 2008; Vasvari 2006). This suggests a link between conservative reporting and the information content of accounting numbers for debt holders. We thus hypothesize that changes in reporting conservatism are positively associated with the relevance of accounting information to bond holders.

Another reporting attribute that may affect the informativeness of accounting numbers to bond holders is the extent to which assets and liabilities are measured at their fair market values. The gradual shift towards fair value measurement (“mark-to-market”) and the balance sheet approach may have conflicting effects on the usefulness of financial statements to creditors. On the one hand, this shift is likely to increase the relevance of the book value of equity and related financial ratios (such as debt-to-equity) for bond valuation. On the other hand, the impact of this shift on *income numbers* is less clear as fair value adjustments result in a poorer matching of revenues and expenses (see Dichev and Tang 2008). Further, the use of fair values produces unrealized gains and losses in shareholders’ equity that are of a lower degree of verifiability. Given that debt contracting parties rely on the book value of equity (or a variation of it, for example, tangible net worth) as a proxy for the liquidation value of the company, the effect of fair value adjustments may reduce its relevance in bond valuation and contracting (see Holthausen and Watts 2001; Watts 2003a, b; Kothari et al. 2010). Because of these conflicting effects, we do not offer a directional hypothesis as to how fair value reporting impacts the information content of accounting numbers for bond valuation.

Some factors cannot be clearly labeled as either ‘reporting’ or ‘economic’ as they reflect both real economic forces affecting the firm’s performance as well as how this performance is reported. One such factor is the incidence of losses, which is associated both with a firm’s real economic performance as well as its degree of reporting conservatism.[[6]](#footnote-6) Given that losses indicate some degree of financial distress, we hypothesize that changes in the frequency of losses are positively correlated with change in the information content of accounting numbers to bond holders.

Another “hybrid” factor is the intensity of investments in intangibles. This is an economic factor because such investments are characterized by a greater payoff uncertainty and therefore affect a firm’s credit risk. However, this is also a reporting factor as the value of intangible investments reported on the balance sheet differs from their fair market values either because these investments are expensed as they are incurred (e.g., R&D expenditures) or because their historical cost deviates from the current fair value (e.g., unamortized goodwill). There is evidence that the increase in intangible investments coupled with the difficulties in adequately representing them in the financial statements tend to reduce the relevance of accounting information to stockholders (Collins et al. 1997).[[7]](#footnote-7) We therefore expect investment in intangibles to be negatively associated with the usefulness of accounting information to bond holders.

**4. Methodology**

**4.1. Calculating bond returns**

Following Easton et al. (2009), Klein and Zur (2011), and Schaefer and Strebulaev (2008), we calculate the monthly raw bond return, BR as:

 BRijt = (BPijt + Cijt – BPijt-1) / BPijt-1 (1)

where BPijt is the price of bond j issued by firm i at the end of month t, calculated as the sum of the evaluated quoted price (“clean price”) plus the accrued interest at month end. Cijt is the sum of all coupon payments during month t. These data were obtained from Interactive Data Pricing and Reference Data (hereafter, Interactive Data).

Using monthly bond returns, we calculate the annual buy-and-hold raw bond return over the twelve months beginning the fourth month after the end of the firm’s fiscal year t-1 and ending the third month after the end of the fiscal year t. Because of the inability to compute their return, observations missing the bond price at either the beginning or the end of the 12-month period are eliminated.

To compute the excess bond return, we match each bond in our sample with the Treasury bond in the CRSP Monthly Treasury database that is closest in duration to that bond.[[8]](#footnote-8) Excess annual bond returns are calculated by subtracting the buy-and-hold Treasury returns compounded monthly over the above 12-month period from that of the bond return for that period. Similarly, the excess yield-to-maturity of the bonds is calculated by subtracting the yield-to-maturity of similarly matched Treasury bonds.

Consistent with Francis and Schipper (1999), annual abnormal stock returns are computed as the annual stock return minus the annual equal-weighted market return.[[9]](#footnote-9) Both return series are calculated as the buy-and-hold returns and retrieved from the CRSP monthly returns files.

**4.2. Measuring value-relevance**

To measure the information content of accounting numbers to security (bond or stock) holders, we use the degree of association between accounting information and the security valuation and bond returns. This association is assessed by the adjusted R2 from a regression of values or returns on accounting information.

**4.2.1. Stock and bond valuation models.** The association between *stock* valuation and accounting information is estimated from the following regression:

MVPSj,t = β0.t + β1.t EPSj,t+ β2.t BVPSj,t + εj,t (2)

where MVPSj, t is the market value per share of firm j at the end of the third month following the end of fiscal year t. EPS is diluted earnings per share before extraordinary items and BVPS is the book value of the equity per share at the end of year t.[[10]](#footnote-10) All observations in the stock valuation regressions (as well as the bond valuation and return regressions presented below) are Winsorized at the 1% and 99% levels.[[11]](#footnote-11)

The association between *bond* valuation and accounting information is measured using both market-based variables (e.g., Merton’s (1974) “distance to default”) and accounting-based variables that reflect the firm’s financial risk. Both have been shown to provide incremental information in explaining credit spreads (see, for example, Das et al. 2009). The accounting variables in our model are those employed by earlier researchers (Beaver et al. 2005, Beaver et al. 2012 and Correia et al. 2012), augmented by a market-based variable, PROB, the estimated probability of default, as follows:

YSpread j,t = f {ROA j,t , (EBITDA j,t / Liab j,t -1), (Liab j,t /Assets j,t), LOSS j,t,

LOSS j,t \*ROA j,t , LOSS j,t \* (EBITDA j,t / Liab j,t -1),

LOSS j,t \*(Liab j,t /Assets j,t), PROB j,t} (3)

YSpreadj,t is the yield spread (or the “excess” yield) on firm j at the end of the third month following the end of fiscal year t. The yield spread is measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of the matched Treasury note as described in section 4.1. ROA j,t, the return on assets, is computed as firm j’s net income before interest for fiscal year t divided by total assets at the beginning of that year. EBITDA is net income before interest, taxes, depreciation and amortization. Liab and Assets are respectively total liabilities and total assets at the end of fiscal year t. LOSS is an indicator variable set equal to 1 when ROA is negative and 0 otherwise. The interactive slope variables allow for separate slope coefficients for the accounting variables of loss firm-years (see Beaver et al. 2012). PROB is estimated from the Black–Scholes–Merton option-pricing model.[[12]](#footnote-12)

 To assess the robustness of the results to the valuation model, we repeat the tests using an alternative bond valuation model based on Defond and Zhang (2014), denoted as A1 and described in Appendix A.[[13]](#footnote-13)

**4.2.2. Stock and bond return models.** We estimate the relation between stock returns and earnings through the following regression, estimated annually:

Rj,t = β0.t + β1.t NIj,t + β2.t U(NI)j,t + εj,t  (4)

where Rj,t is the buy-and-hold market-adjusted return of stock j over the 12 months ending three months following the end of fiscal year t. NIj,t is firm j’s income before extraordinary items in year t deflated by the total market value of equity at the end of year t-1. U(NI)t is unexpected net income defined as the analysts’ earnings forecast error for year t. This is computed as [FNIi,t – NIj,t] where FNIi,t is the analysts’ average consensus forecast of net income for fiscal year t outstanding at the beginning of the fourth month of fiscal year t, deflated by the market value of the equity at the beginning of the year.[[14]](#footnote-14)

The model we use to assess the association between bond returns and accounting information is based on regression (3) with the dependent variable being the buy-and-hold excess bond returns and the independent variables, except for LOSS, expressed as year-to-year changes (denoted by ∆) as follows:

RBHj,t = f {∆ROA j,t , ∆ (EBITDA j,t / Liab j,t -1), ∆ (Liab j,t /Assets j,t), LOSS j,t,

LOSS\*∆ROAj,t, LOSS\*∆(EBITDAj,t /Liabj,t -1), LOSS\*∆(Liab j,t /Assets j,t), ∆PROBj,t} (5)

RBHj,t is the buy-and-hold excess return for firm j over the 12 months ending three months following the end of fiscal year t. The excess return is defined as the difference between the bond return and the return on the duration-matched Treasury note as described in section 4.1**.** The other variables are as defined in regression (3) above.

To assess the robustness of the results to the return model, we repeat the tests using an alternative bond return model based on Defond and Zhang (2014), denoted as A2 and described in Appendix A.

**5. Data and Sample Selection**

Accurate historical data on corporate bond prices are difficult to obtain (see footnote 5). The bond coverage of exchange price data provided by the Fixed Investment Securities Database (FISD) is limited as is the bond coverage provided by Trade Reporting and Compliance Engine (TRACE) for periods before February 2005. These exchange prices primarily reflect odd-lot activities of individual investors, cover only a portion of bond issues and reflect a small fraction of the total trading activity (see Hanock and Kwast 2001). Further, neither of these sources provides long-term historical coverage. Institutional data, on the other hand, covers a larger number of bond issues. However, in many cases, bond prices relating to institutional activity are not equal to the prices obtained from actual transactions but rather are hypothetical, or “matrix-prices” (also referred to as “evaluated prices”), adjusted for prices of actively-traded securities with similar features (e.g., another issue by the same company, an issue by another company with the same maturity, or a U.S. Treasury issue). Some commercial bond pricing services provide a mix of exchange and matrix prices.

We use historical monthly bond price data obtained from Interactive Data for the years 1975, the earliest year for which data are available, to 2007.[[15]](#footnote-15) Data for the years 2008 to 2013 is obtained from TRACE. Financial institutions (SIC codes 6000-6999) are not included in our sample as many of the accounting variables and financial ratios used in our analyses do not apply to these firms. We also exclude non-zero coupon bonds that do not have coupon information. To avoid giving undue weight to firms with multiple bond issues, such firms are represented in the sample only once for that year using the average excess return (and average excess yield) of its bonds in that year.

Table 1 summarizes our sample selection procedure. The initial sample consists of 190,750 bond-year observations related to 29,751 bond issues made by 4,313 distinct firms from 1975 to 2013. Exclusions due to missing return or accounting data lead to a final sample of 64,633 bond-year observations. After representing multiple bond issues as a single observation, the final sample consists of 20,700 firm-year observations, related to 13,910 distinct bond series issued by 2,754 distinct firms.

Tables 2 and 3 provide descriptive statistics on the firm sample. Panel A of Table 2 shows the distribution of observations by year. There is a fair representation both in the number of bonds and the number of firms in each sample year. The number of observations declines after 2007 as the data source for this period is limited to TRACE.[[16]](#footnote-16) Panel B of Table 2 shows that the industry composition of our sample resembles the distribution in the population. However, as reported in Panel C of the table, the firms in our sample are larger and more highly leveraged, on average, than their industry peers.

Descriptive statistics on the characteristics of the bonds in our sample are reported in Table 3, Panel A. Some characteristics changed over time: the size of the issue and the frequency of senior bonds increased while the years-to-maturity declined. Because these characteristics (some of which relate to bond liquidity) may affect the information content of accounting numbers, we control for their effect by repeating the tests for a subsample of bonds that have similar characteristics and are of relatively high liquidity. To construct this “homogenous-liquid” subsample, we identified bonds with (1) seniority and a call option, (2) an issue size greater than $100 million (in 2013 dollars) and (3) a duration and years-to-maturity falling in the middle 80% of the respective distributions of these variables in the pooled sample of firm-years.[[17]](#footnote-17) Within this reduced sample, we eliminated observations with “extreme” values.[[18]](#footnote-18) Panel B of Table 3 provides descriptive statistics on the characteristics of this homogeneous-liquid subsample.

**6. Results**

**6.1. Association between Accounting Information and Bond Valuation and Returns**

The changes over time in the information content of accounting numbers with respect to bond valuation and returns for the full sample and the subsample of homogeneous-liquid bonds are presented in Table 4.[[19]](#footnote-19) The results of the valuation and return models are depicted in Figure 1 and Figure 2, respectively. Our statistical estimations and inferences, including those related to the trend coefficients, are based on yearly observations. However, for presentation purposes, and to highlight any trend in the results, we tabulate and plot the results for each year t as the 5-year moving average of the five years t-2 to t+2.

 Panel A of Table 4 shows the moving averages of the adjusted R2 values estimated annually from bond valuation model (3) and from the reduced form of that model which consists only of the accounting variables in the model and therefore excludes the variable PROB, which relies on market-based variables. The adjusted R2 from the reduced model is denoted R2ACCT. For comparison purposes, the final column of Table 4 shows the moving averages of the annual adjusted R2 values from stock valuation model (2) for the same sample of firms used in the bond valuation models.

 For the full sample, the adjusted R2 value for the bond valuation is slightly lower than that for the equity valuation, 41.3% and 45.8%, respectively. The association between accounting information and bond values is gauged by the collective explanatory power of the accounting-based variables in the bond valuation models, R2ACCT, which is 24.0% for the full sample pooled over all firm-years. For the homogeneous-liquid subsample, the results are similar. The adjusted R2 for the bond valuation is 35.6% over all of the years examined as compared to 41.3% for the stock valuation; R2ACCT is 21.1%.

 As can be seen from Table 4 and Figure 1, there are fluctuations in this association. Further, there are clusters of years in which there are significant deviations from the general trends. For example, there is a dramatic decline in the association for equity valuation in the late 1990s followed by a sharp increase in the subsequent period. While the analysis of these subperiods is of interest, our focus is on any long-term trend in these associations. Such a trend is apparent in the association between accounting information and bond values, which has become stronger over time while the association with stock prices displays a decline.

The results from estimating a linear trend-line in the adjusted R2ACCT over the 39 individual years are shown on the last row of Table 4, Panel A and at the bottom of Figure 1.[[20]](#footnote-20) For both the full sample and the homogenous-liquid subsample, there is a significant average annual increase in the adjusted R2 and the adjusted R2ACCT. For the homogenous-liquid subsample, the annual increase in this measure is 0.596% (t-value of 3.96) using bond valuation model (3). For the alternative bond valuation model A1, this increase (untabulated) is higher at 0.915% (t-value of 6.58). In contrast, the stock valuation model shows a significant annual decline of 0.518% (t-value of -3.32) in the adjusted R2 for the full sample and 0.334% (t-value of -1.65) for the homogenous-liquid subsample.

The findings on the association between bond and stock returns and accounting information over time are presented in Panel B of Table 4 and Figure 2. Similar to Panel A of Table 4 and Figure 1, the adjusted R2 values tabulated in Panel B and plotted in Figure 2 are the 5-year moving averages of the values of individual years. They indicate an upward trend in the association between accounting information and bond returns, similar to bond valuation. The results from the corresponding trend-line regressions are provided on the last row of the table and at the bottom of Figure 2. They are less pronounced than those obtained from the bond valuation models. For the homogenous-liquid subsample, the trend in the adjusted R2ACCT of the bond return model shows an average annual increase of 0.247% but is only marginally significant (t-value of 1.70). For the full sample, this measure is positive but not significant. The adjusted R2 for the equity return model indicates an average annual decrease of 0.333% for the full sample which is significant at the 5% level and a decrease of 0.169% for the homogenous-liquid subsample, though the latter is not statistically significant.[[21]](#footnote-21)

Accounting numbers, due to their conservative tilt, are potentially more useful to bondholders in periods of recession and financial stress, Thus, the strength of the relationship between accounting numbers and bond valuation in any period is likely affected by the default risk premium in that period. A higher (lower) default risk premium would tend to strengthen (weaken) the association between accounting numbers and bond valuation and returns. Accordingly, to the extent that the upward trend in the R2 values reported in Table 4 reflect a similar trend in the default risk premium, our interpretation of the results would be different.

To assess whether the default risk premium influences our results, we examined its time-series behavior using, as a proxy, the difference between the yields of Moody’s Aaa and Baa bonds. There is no obvious trend in this time-series over our sample period. If anything, the very small downward movement in that premium (a slope coefficient of the trend line of 0.0085%; t value of -1.41) is likely to work against finding an upward trend in the relevance of accounting numbers to bond holders.

**6.2. Economic and Reporting Explanations for the Change in the Information Content of Accounting Numbers for Bond Holders**

In section 3, we hypothesized that five factors affect changes in the informativeness of accounting numbers to bond holders: credit risk, reporting conservatism, fair value accounting, frequency of losses and the intensity of investment in intangibles. To test our hypotheses, we operationalize these factors as follows. Credit risk is assessed in three ways: (1) an estimate of the default probability (PROB) of the sample firms based on the Black–Scholes–Merton option-pricing model (see section 4.2.1. for details),[[22]](#footnote-22) (2) the frequency of negative cash flows from operations (NegCFO) which, unlike losses, is not likely to be affected by accounting conservatism, and (3) the rate of change in the GDP, a macro indicator of the state of the economy. Bond ratings, another measure of risk, are not used in our main tests as they are only available beginning in 1985. To assess the degree of reporting conservatism (CONSERV), we use a measure proposed by Ball and Shivakumar (2005) which captures the relative persistence of profits versus losses. It is represented by the coefficient 3 estimated from the following piecewise linear regression:

NIi,t = 0 + 1DNIi, t-1 + 2NIi, t-1 + 3DNIi, t-1\*NIi, t-1 +  i, t (6)

where NI is the change in firm i’s income excluding extraordinary items from fiscal year t-1 to t, scaled by the beginning of the year book value of total assets, and DNI is a dummy variable set equal to one if NI in the prior year is negative and zero otherwise. This measure, which has been employed by a number of studies (e.g., Ball and Shivakumar 2005; Katz 2009; Givoly et al. 2010), relies on the notion that deferring the recognition of gains until their related cash flows are realized causes gains to be a persistent positive component of income. The hypothesis that economic losses are recognized in a more timely fashion than gains implies that 3 < 0.[[23]](#footnote-23) Regression (6) and the measure of conservatism, 3, are estimated for year t from each firm’s time-series over the 12-year period ending with year t. For the estimation, the regression variables are Winsorized at the 1% and 99% levels of their respective distributions.

To assess the impact of fair value accounting, we use the measure employed by Demerjian (2011) which captures the balance sheet effect of fair value adjustments. It is based on the fact that with few exceptions (most prominently, impairments), these adjustments tend not to be captured in income but rather appear in the equity section of the balance sheet in the form of “Accumulated Other Comprehensive Income” (AOCI). The sum of these adjustments in any given period can be close to zero because of offsetting adjustments and therefore cannot be used to gauge their collective importance. Instead, the measure captures the variability of the changes in the book value of equity, excluding changes due to stock issuances, stock repurchases and dividends. To control for operating variability, the measure is divided by the variability of “core” net income (net income from continuing operations, before special items and “other income”) to form what Demerjian (2011) terms the “volatility ratio” (VRatio).[[24]](#footnote-24) This variable is measured over a five-year window.

The intensity of investment in intangible assets (Intangibles) in each firm-year is gauged by the sum of intangible assets and an estimate of the unrecognized (i.e., off-the-books) R&D asset, deflated by total assets. The unrecognized R&D asset is estimated as the mean annual R&D expenditure over the most recent five years multiplied by 2.5.[[25]](#footnote-25)

**6.3. Results from the Univariate Analyses**

Table 5 provides two important statistics on each of the six factors hypothesized to affect the change in the information content of accounting numbers to bond holders. The first statistic is the association between each variable and the information content to bond holders as captured by Adj. R2ACCT from the bond valuation and return models. This association is provided separately for observations with high and low values of the variable. The second statistic is the trend of the variable over the 39-year sample period. This trend is depicted in the series of graphs in Figure 3 and measured by the slope coefficient of a linear trend-line, reported in Table 5. For descriptive purposes, we also provide these statistics for the bond rating, an alternative measure of credit risk.

As the table indicates, and consistent with the findings of Easton et al. (2009) and Defond and Zhang (2014), the association between bond yield spreads and returns, as captured by Adj. R2ACCT, is more closely associated with accounting information in firm-years with adverse information or a high likelihood of default. Due to the large samples, all of the differences reported in the table between the Adj. R2ACCT of these two groups of firm-years, which are further discussed below, are statistically significant at least at the 1% significance level.[[26]](#footnote-26) For example, the Adj. R2ACCT values of the valuationmodel for firm-years with a high (above the median) probability of default, or with a loss, are 21.5% and 14.2%, respectively. This is much higher than for firm-years with a low probability of default and a profit, 4.6% and 10.2%, respectively. Similarly, the values of Adj. R2ACCT are much higher for high yield bonds than for investment grade bonds, 19.3% vs. 3.8%.

The comparison between the Adj. R2ACCT values obtained for the High and Low subsamples of this univariate analysis also indicate that reporting conservatism (CONSERV) is, as hypothesized, positively associated with the information content of accounting numbers. Fair value adjustments (VRatio), for which we have no directional hypothesis, have a positive and significant association with the information content of accounting numbers, while investment in intangibles has a negative association.

 The second statistic provided in Table 5, the time trend in the factors expected to affect the information content, is in the form of a linear trend line of each of the factors on time (T) estimated from the 39 annual observations. The value and significance of T in these time-regressions is reported. The time pattern in the individual variables over the examined 39-year period, in the form of 5-year moving averages, is shown in Figure 3. As the table and the figure indicate, among the factors hypothesized to affect the information content of accounting numbers, the variables CONSERV, LOSS, VRatio, and Intangibles exhibit a significant upward trend, which is also fairly monotonic for the latter two variables.

**6.4. Multivariate Analysis**

In assessing the contribution of the economic and reporting factors to the usefulness of accounting information for debt holders, we begin by estimating the following regression from the 39 annual observations:

 INFO\_CONTt = f {PROBt, NegCFOt, CONSERVt, VRatiot, LOSSt, Intangiblest, GDPt} (7)

where INFO\_CONTt the information content of accounting numbers to bond holders, is captured by the adjusted R2ACCT from the bond valuation or return models estimated across firms in year t. PROBt, CONSERVt, VRatiot and Intangiblest are the mean values in year t across all of the sample firms of the probability of default, conservatism, the volatility ratio and intangible intensity, respectively. NegCFOt and LOSSt are, respectively, the frequency of negative operating cash flows and the frequency of losses. GDP is the annual growth in the gross domestic product. [[27]](#footnote-27)

The results for the two alternative valuation models (3) and (A1) are presented in columns 1 and 2 of Table 6. The results for the return models are generally consistent with those obtained for the valuation models in terms of the signs of the coefficients. We do not tabulate them because the coefficients are mostly insignificant except for those discussed below.[[28]](#footnote-28)

The results are in line with the hypothesized sign of most of the variables. In particular, PROB, NegCFO, LOSS, and GDP, all of which connote credit risk, have coefficients whose signs are consistent with the notion that accounting information is more useful in periods with greater financial distress.[[29]](#footnote-29) The degree of significance of the coefficients varies however between the two valuation models.

CONSERVt has a hypothesized positive sign, and its coefficient is significant (at about the 6% significance level) for both valuation models, consistent with conservative accounting enhancing the usefulness of accounting information to creditors. VRatiot, reflecting fair value adjustments for which we have no directional hypotheses, is found to be positively and significantly associated with the usefulness of accounting information under both valuation models as well as under return model (3) (untabulated). This finding suggests that the potential reduction in the information content of accounting numbers based on fair values due to the poor matching of revenue and expenses is more than offset by the increased usefulness of the fair value valuations of assets and liabilities. The variable Intangibles is, as hypothesized, negatively and significantly associated with the information content reflecting the difficulty in properly measuring the values of intangible assets in the financial statements. As expected, GDP is negatively and significantly associated with the information content, consistent with the notion that accounting numbers become more useful for bond holder in worse economic times.

Regression (7) explains the intertemporal variation in the information content of accounting numbers to bond holders by economic and reporting factors. We try to assess the relative contribution of each of these groups of factors to the explanatory power of this regression. In line with our discussion in section 3, we define PROB, NegCFO, and GDP as economic factors, CONSERV and VRatio as reporting factors, and Intangibles and LOSS as hybrid factors, representing a blend of economic and accounting factors. We measure the relative contribution of each group of factors using Shapley values (Shapley 1953), expressing this as the fraction of the explanatory power of regression (7) (i.e., its R2) contributed by the different groups of variables.

The results, provided in the last two rows in table 6, show that the contribution of reporting and hybrid factors to the explanatory power of regression (7) is about equal to that of the economic factors (44.6% vs. 55.4%) when information content is gauged using valuation model 3, and 58.6% vs. 41.4% when information content is measured using valuation model A1. This finding highlights the fact that accounting rules and their implementation are as important as the economic environment in affecting the relevance of accounting numbers to bond holders.

The **s**mall number of observations (39 years) limits our ability to make robust inferences. Further, some of the presumed determinants of the relevance of accounting numbers in the regression are strongly correlated, making it difficult to separate the effect of each of the independent variables.[[30]](#footnote-30) To alleviate these estimation problems, we exploit the large sample of 20,700 firm-years (see Table 1) to estimate a regression similar to (7). This estimation requires expressing the dependent and independent variables in regression (7) on the firm-year level.

Recall that the dependent variable in regression (7) is the explanatory power of the bond return and valuation models with respect to the cross-sectional variations in, respectively, bond returns and yield spreads in that year. The dependent variable that we employ for the firm-year version of this regression has the same flavor: it reflects the information content of accounting numbers to bond holders. This dependent variable for an individual firm-year is captured in two ways: by the extent to which perfect knowledge of future accounting numbers would increase the accuracy of predicting bond yields and, relatedly, by the return to an investment strategy whereby long (short) positions are held based on the sign of the expected return derived from such perfect knowledge. This ‘investment strategy’ approach was used by Alford et al. (1993), Francis and Schipper (1999) and Hanlon et al (2005) to assess the information content of accounting numbers to equity holders. The variables describing the improved accuracy and the potential return that can be gained from a perfect knowledge of accounting numbers for firm j in year t are denoted as INFO (A)j,t and INFO (B)j,t, respectively. Their construction is detailed in Appendix C.

The independent variables in the following firm-year regression represent the same factors likely to affect the explanatory power of the bond return model in regression (7) except that they are now defined for individual firm-years rather than for a year as explained below:

INFO (**∙**)j,t = f {Year fixed effects, PROBj,t, NegCFO\*j,t, CONSERVj,t, VRatio j,t, LOSS\*j,t,Intangiblesj,t}(8)

INFO (A) and (B) are as defined above. Note that INFO (B) is an indicator variable and therefore we use a logit regression version of (8) when we use it as the dependent variable. PROBj,t, CONSERVj,t, VRatioj,t, and Intangiblesj,t are defined as before but are measured for firm-years rather than as a cross-sectional average over firms for the year, as in regression (7). NegCFO\*j,t and LOSS\*j,t are indicator variables receiving the value of 1 if firm j reports a negative cash flow from operations or a loss, respectively, in year t and 0 otherwise. Note that the cross-sectional average of NegCFO\*j,t and of LOSS\*j,t is equal to the variables in regression (7), NegCFOt (the frequency of negative cash flow from operations in year t) and LOSSt (the frequency of losses in year t). One variable in regression (7), the annual growth rate in GDP, does not appear explicitly in the firm-year regression as it does not vary across firms and is mostly captured by the year-fixed effects that we introduce to regression (8).

The last two pairs of columns in Table 6 show the results of regression (8) using INFO (A) and (B), respectively as the dependent variables. INFO (A) requires the use of a yield expectation model for which we use alternately bond valuation models (3) and (A1). INFO (B) requires the use of a return expectation model for which we use alternately return expectation models (5) and (A2). The sign and significance of the coefficients reported in the table for firm-year regressions are fairly consistent with those reported for regression (7) estimated over the 39 sample years although the significance level varies. PROB is positive but significant only for INFO (B). CONSERV is positive but only marginally significant for INFO (A) under valuation model (A1).

 The coefficients on LOSS are positive and significant. Interestingly, the incidence of losses which is regarded as reducing the relevance of accounting information to stockholders (see, for example, Hayn (1995) and Collins et al. (1997)) renders accounting information more useful to bond holders. Similar to its coefficient in regression (7), the variable Intangibles in regression (8) is generally negative and significant. The coefficients on VRatio are insignificant, except for marginal significance for INFO (B) when the expected return is computed from return model 5.

As hypothesized, the collective results from regressions (7) and (8) indicate that changes in credit risk as captured by PROB are positively associated with the information content of accounting numbers to bond holders. Reporting and hybrid factors also influence the change in relevance. The results further suggest that the shift towards fair value measurement, the increase in the frequency of losses, and the increase in conservatism have made accounting information more useful for bond holders. In contrast, the increase in the intensity of investment in intangibles has reduced this usefulness.

Finally, the relative contribution of the reporting and reporting-related factors to the usefulness of accounting information to bond holders is somewhat lower when usefulness is estimated from firm-years and captured by INFO (∙), but still non-trivial. As the last two rows in Table 6 show, depending on the model, these factors contribute between 15.8% and 33.5% of the total explained variation in accounting relevance across firm-years.

**7. Additional Tests**

**7.1. Information content of accounting numbers relative to market-based variables.**

The relevance of accounting information in determining bond valuation and returns is measured in both absolute terms and relative to the relevance of non-accounting market-based variables. The *absolute* information content of accounting numbers, R2ACCT, is captured by the adjusted R2 of the applicable model when that model is estimated in a reduced form that contains only the accounting-based variables. The *relative* relevance of accounting variables, denoted as Relative R2ACCT, is the incremental explanatory power of the model contributed by the group of the accounting variables, divided by the explanatory power of the full model. The significance of the incremental explanatory power of the set of accounting-based variables to the full model is assessed by the Shapley value (Shapley 1953).

Even though the absolute explanatory power of accounting variables with respect to bond valuation and returns (R2ACCT) increased over time, the relative contribution (Relative R2ACCT) generally declined (see Table 7). This decline is observed for both valuation model (3) and return model (5). The last row in Table 7 presents the results from the trend-line regression estimated over the 39-year period from 1975 to 2013. For the homogenous-liquid subsample, the relative explanatory power of accounting information declined for bond valuation (average annual decline of 0.497%, t-value of -2.16) and for bond returns (average annual decline of 0.618%, t-value of -1.62). The untabulated results for the bond return model (A2) show a similar trend (average annual decline of 0.774%, t-value of -2.32) but for bond valuation model (A1) the trend coefficient is insignificant (average annual increase of 0.100%, t-value of 0.33).

This decline in the *relative* contribution of accounting variables to bond valuation and returns (and its flip side – the increase in the relative contribution of market-based information) merits an explanation. We conjecture that Relative R2ACCT is likely to understate the weight of accounting inputs in debt valuation for at least two reasons. First, the bond valuation and return models used in this study do not incorporate every piece of information contained in the financial statements. There has been a steady increase over time in the extent of disclosures required in the 10-K and 10-Q. These disclosures are in the form of new schedules, expanded footnotes, and a more detailed MD&A section.[[31]](#footnote-31) They cover diverse aspects of a firm’s operations, including derivatives, fair values, pensions, taxes, revenue recognition, corporate governance and compensation. This additional information is not represented in the bond valuation and return models. Yet, it is used by investors or intermediaries such as analysts and bond rating agencies to supplement or adjust the reported numbers in the primary financial statements (such as net income or the book value of equity). This information may affect bond valuation directly or indirectly (e.g., through credit ratings, see Batta 2011). A second reason for the decline in the relative weight of the primary accounting numbers such as earnings or the book value of equity in explaining the cross sectional and intertemporal variation in bond yields and returns may be the expansion in voluntary non-accounting disclosures by firms. Some of this supplemental information is disclosed through press releases, social responsibility reports and internal control reporting. There has also been an expansion of information produced by advisory services that provide value-relevant information through indicators of audit quality, governance quality and social responsibility. The combined effect of these trends is to reduce the weight of reported accounting numbers in the overall set of value-relevant information available to investors.

For these reasons, the observed decline in the relative explanatory power of accounting information is not necessarily reflective of deficiencies in the current reporting system. It is more likely a result of the increasing supplemental information on a firm from internal and external sources.

**7.2. Robustness Tests**

To assess the sensitivity of the results to the specific valuation or return model, we conduct all tests using the alternative models described in Appendix A. These results (shown in Figure 1) indicate similar trends.

A factor that could affect our results is changes over time in our sample composition. Ideally, one could control for this by examining a constant sample of firms. However, due to the relatively long period of our sample, such a restriction would drastically reduce the sample size. We therefore shorten the period to a 16-year subperiod, 1990-2005, to examine a constant sample of 97 firms. We rerun the various tests on this subsample and find similar increasing trends in bond valuation and return models. In particular, the average annual increase in the adjusted R2ACCT for this constant subsample is 0.0295 (t-value of 2.09) when using bond valuation model (3). The corresponding values for bond return model (5) show an average annual increase of 0.0186 (t-value of 2.25).

We also examine whether our results are driven by the less liquid bonds by replicating the main tests with a subsample using a stricter definition of liquid bonds than that used for the homogenous-liquid subsample. For this robustness test, a liquid bond is defined as one with an issue size at the time of offering of more than $200 million (in 2013 dollars), seniority, and recency of issuance (less than three years from issuance, see Sarig and Warga 1989, and Schulz 2001). Using this subsample, we find a similar increase in the relevance of accounting information for bond holders. The average annual increase in the adjusted R2ACCT from the trend line regression for this new subsample is 0.509% (t-value of 2.02) when using bond valuation model (3). The corresponding values for bond valuation model (A1) show an average annual increase of 0.777% (t-value of 2.46). As is the case for the full sample, the results from the return models (5) and (A2) indicate an increase though this increase is less pronounced and not significant.

**8. Concluding Remarks**

This paper provides large-sample evidence that accounting information plays an increasingly useful role in bond valuation. Using several approaches, our findings show that the association between accounting information and bond valuation and returns has increased over the last 39 years. This is in contrast to the decline in that association for equity holders as documented by past research and further confirmed in this study.

We hypothesize that trends in the orientation of accounting standard-setting (such as the shift towards fair value, which reflects the increased emphasis on the balance sheet), and the implementation of standards (in the form of increased conservatism) affect the relevance of accounting numbers to debt holders. Consistent with our hypotheses, the results indicate that, along with changes in economic factors (such as changes in probability of default and rate of change in the GDP), the change over time in in the information content of accounting numbers to bond holders is affected also by reporting factors. Among the reporting factors that appear to have a significant enhancing effect on this information content are the shift towards fair value measurement, the increased conservatism, and the increased frequency of losses (which are also partly due to economic factors). The effect of these factors is partially mitigated by the increase in the intensity of intangible investments.

This paper highlights the importance of recognizing the unique information needs of debt holders, a major group of users of financial statements, in forming and evaluating the merits of accounting standards. As such, our findings have important implications for accounting standard setting, regulatory policy and research on the usefulness of financial reports.

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**Figure 1**

**Annual Association between Security Valuation and Accounting Information:**

**Adjusted R2 Using Only Accounting-Based Variables**

**(5-year moving averages of annual regressions)**

The figure is based on the results presented in table 4, Panel A for the homogenous-liquid sample.

The valuation models are provided in section 4.2.1.

Estimating a trend line regression of the form Y = a + bT + e, from the 39 annual observations where Y is the adjusted R2ACCT and adjusted R2 for bond and equity valuation models, respectively, and T is a year index, T=1, …, 39, produces the following results.

The average annual increase in the adjusted R2ACCT is:

 0.596% (t-stat of 3.96\*\*\*) using bond valuation model (3),

 0.915% (t-stat of 6.58\*\*\*) using bond valuation model (A1) and

 -0.334% (t-stat -1.65) using equity valuation model (2).

(Asterisks indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.)

**Figure 2**

**Annual Association between Security Returns and Accounting Information:**

**Adjusted R2 Using Only Accounting-Based Variables**

 **(5-year moving averages of annualregressions)**

The figure is based on the results presented in Table 4, Panel B for the homogenous-liquid sample.

The return models are provided in section 4.2.2.

Estimating a trend line regression of the form Y = a + bT + e, from the 39 annual observations where Y is the adjusted R2ACCT and adjusted R2 for bond and equity return models, respectively, and T is a year index, T=1, …, 39, produces the following results.

The average annual increase in the adjusted R2ACCT is:

 0.247% (t-stat of 1.70\*) using bond return model (5),

 0.515% (t-stat of 2.05\*\*) using bond return model (A2) and

-0.169% (t-stat -1.09) using equity return model (4).

(Asterisks indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.)

**Figure 3**

**Time-series Behavior of Individual Variables Hypothesized to Influence the Accounting Information to Bond Holders**

 **(5-year moving averages) (a)**

|  |  |
| --- | --- |
| **PROB** | **NegCFO** |
|  |  |
| **CONSERV** | **VRatio** |
|  |  |
| **LOSS** | **Intangibles**  |
|  |  |

(a) The 5-year moving average for variables PROB, CONSERV, VRatio and Intangibles is computed over the annual cross-sectional means of these variables.

***PROB*** is an estimate of the probability of default based on the Black–Scholes–Merton option-pricing model. ***NegCFO***is the frequency of negative cash flows from operations. ***CONSERV***is a measure of conservatism defined as the coefficient 3 in regression (6) estimated from the time-series of each firm-year t, from the 12-year period ending with year t. The sign of the resulting coefficient is multiplied by negative one. ***VRatio*** is the volatility ratio from Demerjian (2011), computed for year t. VRatio is defined as the ratio of Book Value Volatility to Adjusted Net Income Volatility, where volatility is measured as the variance over a window of 60 quarters (5-years). Quarterly variables are annualized by summing the current and three prior quarterly observations. Book Value Volatility is the five-year standard deviation of changes in retained earnings plus dividends. Adjusted Net Income Volatility is the five-year standard deviation of Net Income minus Special Items and Non-Operating Income and Expense. ***LOSS*** is the frequency of loses (negative income from continuing operations). ***Intangibles*** is the ratio of intangible assets on the balance sheet plus an estimate of the unrecognized R&D asset, deflated by total assets.

**Table 1**

**Sample Selection Procedure**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample Composition, 1975 – 2013 | No. of Firms | No. of Bonds | No. of Firm-years | No. ofBond-years |
| Initial Sample | 4,313 | 29,751 | 41,317 | 190,750 |
|  Minus observations that are missing: |  |  |  |  |
| * annual raw returns
 |  |  |  | (55,572) |
| * earnings data for the last two years
 |  |  |  | (7,715) |
| * annual Treasury bond matches
 |  |  |  | (4,297) |
| Total number of bond-year observations with annual excess returns | 3,535 | 22,881 | 28,503 | 123,166 |
| Minus observations that belong to private companies or are otherwise missing abnormal annual stock returns  |  |  |  | (58,533) |
| Final sample  | 2,754 | 13,910 | 20,700 | 64,633 |

**Table 2**

**Descriptive Statistics on the Firm Sample**

1. **Distribution of Sample Observations by Year**

|  |  |  |  |
| --- | --- | --- | --- |
| Year | No. of Bonds | No. of Firms | Average Number of Bonds per Firm |
| Full sample | 64,633 | 20,700 | 3.12 |
| By year: |  |  |  |
| 1975 | 857 | 200 | 4.29 |
| 1976 | 1,029 | 243 | 4.23 |
| 1977 | 1,067 | 243 | 4.39 |
| 1978 | 756 | 216 | 3.50 |
| 1979 | 801 | 221 | 3.62 |
| 1980 | 764 | 213 | 3.59 |
| 1981 | 1,522 | 480 | 3.17 |
| 1982 | 1,507 | 468 | 3.22 |
| 1983 | 1,563 | 505 | 3.10 |
| 1984 | 1,598 | 528 | 3.03 |
| 1985 | 1,478 | 499 | 2.96 |
| 1986 | 1,427 | 500 | 2.85 |
| 1987 | 1,423 | 496 | 2.87 |
| 1988 | 1,398 | 496 | 2.82 |
| 1989 | 1,418 | 496 | 2.86 |
| 1990 | 1,437 | 501 | 2.87 |
| 1991 | 1,437 | 495 | 2.90 |
| 1992 | 1,356 | 464 | 2.92 |
| 1993 | 1,332 | 477 | 2.79 |
| 1994 | 1,526 | 526 | 2.90 |
| 1995 | 1,531 | 550 | 2.78 |
| 1996 | 1,695 | 596 | 2.84 |
| 1997 | 1,903 | 639 | 2.98 |
| 1998 | 2,183 | 735 | 2.97 |
| 1999 | 2,443 | 789 | 3.10 |
| 2000 | 2,505 | 802 | 3.12 |
| 2001 | 2,387 | 758 | 3.15 |
| 2002 | 2,508 | 804 | 3.12 |
| 2003 | 2,589 | 800 | 3.24 |
| 2004 | 2,824 | 856 | 3.30 |
| 2005 | 2,771 | 875 | 3.17 |
| 2006 | 2,613 | 828 | 3.16 |
| 2007 | 2,558 | 814 | 3.14 |
| 2008 | 1,043 | 381 | 2.74 |
| 2009 | 1,142 | 383 | 2.98 |
| 2010 | 1,297 | 402 | 3.23 |
| 2011 | 1,499 | 452 | 3.32 |
| 2012 | 1,664 | 483 | 3.45 |
| 2013 | 1,782 | 486 | 3.67 |

**Table 2 (continued)**

**Descriptive Statistics on the Firm Sample**

 **B. Distribution of Sample Observations by Industry Affiliation**

|  |  |  |  |
| --- | --- | --- | --- |
| Industry (2-digit SIC code)(listed in order of frequency) | Number of Firms(a) | % of Firms in the Sample | % of Firms in these Industries(b) |
| Full sample | 2,754 | 100.00% | 100.00% |
| 28 | 205 | 7.44% | 11.53% |
| 48 | 196 | 7.12% | 4.13% |
| 73 | 185 | 6.72% | 12.65% |
| 36 | 177 | 6.43% | 9.24% |
| 49 | 176 | 6.39% | 6.09% |
| 13 | 167 | 6.06% | 4.86% |
| 35 | 155 | 5.63% | 4.92% |
| All other industries | 1,493 | 54.21% | 46.58% |

(a) Based on company’s most recent year in the sample. Financial institutions (SIC codes 6000-6999) are excluded.

(b) Based on Compustat in 2010.

 **C. Firm Characteristics in Selected Years** (in $ millions, except the Debt/Equity ratio)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | Characteristic(a) | Mean | Quartile 1 | Median  | Quartile 3 | Mean across the Medians of the Firms’ Respective Industries(b) |
| 1985(n=499) | Total Assets  | 2,530.1 | 206.4 | 729.3 | 2,528.0 | 587.0 |
| Sales | 2,830.4 | 181.2 | 795.4 | 2,854.8 | 653.7 |
| Market Value  | 1,366.0 | 94.6 | 369.0 | 1,543.8 | 301.5 |
| Debt/Equity (c) | 1.376 | 0.437 | 0.789 | 1.574 | 0.717 |
|  |   |   |   |   |   |   |
| 2005(n=875) | Total Assets  | 8,196.6 | 979.3 | 2,715.1 | 8,006.4 | 1,605.2 |
| Sales | 6,846.6 | 799.5 | 2,263.5 | 7,079.0 | 1,533.5 |
| Market Value | 8,334.9 | 905.8 | 2,476.8 | 8,371.3 | 1,799.6 |
| Debt/Equity (c) | 1.325 | 0.435 | 0.708 | 1.346 | 0.586 |

(a) The distribution of each variable (with the exception of the mean across the medians of the firm’s industry) is Winsorized at the extreme 1% percent values of the distribution. All characteristics are measured at year-end.

(b) The firms’ respective 4-digit industries are used to compute the values in this column.

(c) Firms with negative equity values are not included in the computation of this ratio, reducing the number of observations to 488 in 1985 and 822 in 2005.

**Table 3**

**Bond Characteristics by Year**

**A. Full Sample** (20,700 firm-years)

|  |  |
| --- | --- |
| Year | Mean Over the Years(a) |
| No. of Firms (b) | Issue Size($ mil.)(c) | Years to Maturity | Duration (years) | Yield to Maturity(d) | Frequency of: (b) |
| Senior Bonds | Call Feature |
| All Years  | 531 | 278 | 10.1 | 6.0 | 9.5% | 61.8% | 82.3% |
| By intervals(a) |  |  |  |  |  |  |  |
| 1975-1982 | 286 | 161 | 10.8 | 6.2 | 11.7% | 49.7% | 93.4% |
| 1983-1990 | 503 | 186 | 12.2 | 6.2 | 11.9% | 51.3% | 87.7% |
| 1991-1998 | 560 | 235 | 10.5 | 6.1 | 9.0% | 57.4% | 62.1% |
| 1999-2006 | 814 | 336 | 8.7 | 5.7 | 8.6% | 67.0% | 76.2% |
|  2007-2013(a) | 486 | 499 | 7.9 | 5.5 | 5.7% | 86.9% | 93.6% |

(a) All intervals contain 8 years except the most recent one which contains seven years.

**B. Homogenous-Liquid Sample (**6,536 firm-years**;** All bonds are senior and callable - see section 5.)

|  |  |
| --- | --- |
|  | Mean Over the Years(a) |
| Year | No. of Firms (b) | Issue Size($ mil.)(c) | Years to Maturity | Duration (years) | Yield to Maturity(d) |
|
| All Years  | 168 | 244 | 7.4 | 5.3 | 9.3% |
| By intervals:(e) |  |  |  |  |  |
| 1975-1982 | 130 | 167 | 7.7 | 5.4 | 12.2% |
| 1983-1990 | 149 | 219 | 8.2 | 5.5 | 10.8% |
| 1991-1998 | 115 | 271 | 7.7 | 5.4 | 9.0% |
| 1999-2006 | 260 | 265 | 7.0 | 5.3 | 7.9% |
|  2007-2013 | 188 | 305 | 6.3 | 5.2 | 6.0% |
|  |  |  |  |  |  |

(a) Mean values are computed across years. Firm-year observations are Winsorized each year at the extreme 1% values of the annual distribution.

(b) When a firm has multiple bond issues outstanding in a given year, these are averaged before computing the reported values. The results for issuance size and frequencies of senior debt and call feature are based on 17,928 and 5,643 firm-years in Panels A and B, respectively.

(c) Issue size is in 2013 dollars (CPI adjusted).

(d) Yield-to-maturity is the annual yield to maturity as of the end of the third month after the end of the firm’s fiscal year t as reported by Interactive Data.

(e) All intervals contain 8 years except the most recent one which contains seven years.

**Table 4**

1. **Association between Security *Valuation* and Accounting Information**

|  |  |  |
| --- | --- | --- |
| Years Examined | **Full Sample** | **Subsample of Homogeneous-Liquid Bonds(a)** |
| N | Bond Valuation (b)  | Stock Valuation (c) | N | Bond Valuation (b) | Stock Valuation (c) |
| Adj. R2 | R2ACCT (d) | Adj. R2 | Adj. R2 | R2ACCT (d) | Adj. R2 |
| All firm-years | 19,732(f) | 41.3% | 24.0% | 45.8 % | 6,414 | 35.6% | 21.1% | 41.3% |
| Mean over years | 39 | 33.5% | 25.7% | 58.5% | 39 | 33.8% | 25.7% | 52.5% |
| 1975 | 195 | 12.8% | 11.1% | 67.3% | 119 | 11.4% | 10.5% | 64.3% |
| 1976 | 237 | 13.3% | 11.6% | 68.9% | 154 | 12.5% | 11.3% | 66.1% |
| 1977 | 230 | 14.1% | 12.8% | 68.7% | 155 | 12.0% | 11.1% | 67.2% |
| 1978 | 205 | 11.9% | 11.7% | 68.3% | 149 | 8.8% | 8.6% | 68.6% |
| 1979 | 213 | 10.8% | 10.2% | 67.3% | 170 | 14.7% | 13.8% | 65.9% |
| 1980 | 200 | 13.9% | 13.5% | 65.5% | 159 | 20.9% | 18.3% | 58.5% |
| 1981 | 457 | 13.2% | 12.9% | 64.4% | 50 | 19.1% | 16.9% | 54.9% |
| 1982 | 441 | 15.7% | 14.9% | 65.8% | 60 | 20.7% | 17.3% | 53.5% |
| 1983 | 475 | 19.9% | 17.0% | 67.0% | 98 | 23.3% | 19.6% | 49.2% |
| 1984 | 502 | 30.0% | 26.8% | 68.7% | 127 | 20.8% | 17.7% | 51.6% |
| 1985 | 471 | 37.1% | 31.6% | 69.6% | 133 | 20.0% | 17.2% | 59.6% |
| 1986 | 464 | 42.2% | 35.4% | 70.1% | 147 | 30.8% | 21.9% | 61.1% |
| 1987 | 481 | 45.9% | 37.1% | 69.2% | 163 | 32.7% | 24.3% | 58.7% |
| 1988 | 479 | 50.4% | 40.2% | 69.2% | 178 | 36.8% | 24.7% | 60.0% |
| 1989 | 488 | 51.0% | 37.7% | 66.5% | 173 | 35.7% | 22.3% | 54.1% |
| 1990 | 495 | 50.6% | 34.7% | 65.9% | 160 | 35.7% | 21.6% | 52.2% |
| 1991 | 491 | 48.5% | 33.3% | 63.3% | 139 | 26.3% | 18.5% | 50.5% |
| 1992 | 450 | 47.9% | 31.4% | 61.8% | 99 | 34.4% | 24.3% | 51.4% |
| 1993 | 454 | 44.4% | 29.4% | 59.0% | 79 | 35.0% | 28.8% | 49.4% |
| 1994 | 505 | 41.3% | 27.5% | 58.5% | 85 | 36.9% | 31.3% | 53.9% |
| 1995 | 527 | 40.2% | 28.3% | 55.0% | 87 | 38.5% | 34.8% | 49.9% |
| 1996 | 573 | 43.9% | 29.1% | 49.5% | 99 | 43.1% | 37.7% | 43.3% |
| 1997 | 602 | 44.0% | 28.5% | 41.2% | 123 | 39.6% | 33.9% | 33.2% |
| 1998 | 685 | 46.2% | 30.0% | 36.5% | 179 | 42.7% | 32.2% | 31.5% |
| 1999 | 744 | 44.8% | 28.7% | 32.9% | 255 | 49.0% | 37.5% | 26.7% |
| 2000 | 759 | 43.4% | 28.6% | 33.7% | 237 | 49.8% | 36.5% | 27.1% |
| 2001 | 730 | 41.2% | 28.8% | 38.6% | 227 | 49.7% | 37.4% | 35.5% |
| 2002 | 773 | 38.3% | 28.6% | 45.7% | 234 | 50.9% | 37.9% | 46.6% |
| 2003 | 765 | 32.0% | 23.8% | 51.2% | 270 | 44.1% | 32.8% | 51.7% |
| 2004 | 802 | 27.2% | 20.8% | 55.3% | 272 | 37.7% | 26.4% | 55.8% |
| 2005 | 813 | 25.9% | 19.8% | 57.9% | 271 | 38.4% | 28.0% | 59.8% |
| 2006 | 751 | 31.3% | 23.6% | 55.4% | 260 | 44.6% | 27.8% | 55.2% |
| 2007 | 759 | 32.4% | 25.6% | 55.4% | 272 | 40.6% | 26.3% | 53.5% |
| 2008 | 379 | 32.4% | 27.0% | 56.6% | 144 | 40.1% | 28.4% | 54.5% |
| 2009 | 368 | 34.6% | 29.1% | 56.0% | 135 | 43.7% | 31.2% | 53.5% |
| 2010 | 390 | 35.3% | 30.3% | 55.5% | 155 | 46.7% | 31.5% | 53.1% |
| 2011 | 433 | 30.5% | 27.8% | 59.5% | 179 | 40.3% | 31.2% | 56.5% |
| 2012 | 471 | 28.9% | 26.6% | 60.3% | 206 | 41.2% | 31.7% | 57.3% |
| 2013 | 475 | 32.8% | 29.6% | 59.3% | 212 | 47.0% | 35.5% | 55.0% |
| Trend coefficient (t-stat) from trend-line regression of R2 over time (e) | 0.438%(2.01)\* | 0.313%(2.01)\* | -0.518%(-3.32)\*\*\* |  | 0.915%(4.45)\*\*\* | 0.596%(3.96)\*\*\* | -0.334%(-1.65) |

(a) Homogenous-liquid bonds are defined in section 5. (b) Estimated using bond valuation model (3). (c) Estimated using stock valuation model (2). (d) Adj. R2 values each year are the moving average of the annual adjusted R2 over five years centered on that year (except for the two years at each edge of the time-series). R2ACCT is the adjusted R2 from the return regression estimated from accounting variables only. (e) Results are from estimation of a trend-line regression Adj.R2 (%) = a + bT+ e, estimated from the 39 annual observations where T is a year index, T=1, , 39. Asterisks indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test. . (f) The number of observations is smaller than the full sample (20,700) and homogenous-liquid sample (6,536) due to missing data on independent variables.

**Table 4 (Continued)**

**B. Association between Security *Returns* and Accounting Information**

|  |  |  |
| --- | --- | --- |
| Years Examined | **Full Sample** | **Subsample of Homogeneous-Liquid Bonds(a)** |
| N | Bond Returns (b)  | Stock Returns (c) | N | Bonds Returns(b) | Stock Returns (c) |
| Adj. R2 | R2ACCT (b) | Adj. R2 | Adj. R2 | R2ACCT (b) | Adj. R2 |
| All firm-years | 19,658(f) | 17.7% | 6.1% | 8.3% | 6,271 | 19.7% | 4.4% | 6.4% |
| Mean over years | 39 | 17.2% | 10.4% | 14.0% | 39 | 24.2% | 14.0% | 14.4% |
| 1975 | 192 | 12.3% | 8.5% | N.A | 115 | 18.2% | 13.6% | N.A |
| 1976 | 238 | 13.5% | 8.2% | 32.4% | 153 | 18.5% | 12.2% | 29.3% |
| 1977 | 232 | 9.6% | 6.6% | 28.9% | 151 | 15.1% | 11.6% | 25.2% |
| 1978 | 207 | 8.4% | 7.0% | 25.1% | 146 | 12.1% | 11.8% | 20.7% |
| 1979 | 210 | 8.9% | 7.6% | 22.0% | 164 | 11.8% | 12.3% | 18.4% |
| 1980 | 209 | 6.7% | 5.7% | 18.8% | 157 | 13.9% | 10.4% | 14.8% |
| 1981 | 456 | 6.1% | 4.7% | 13.9% | 49 | 12.1% | 8.2% | 8.5% |
| 1982 | 455 | 8.6% | 7.0% | 16.1% | 59 | 14.0% | 9.8% | 11.2% |
| 1983 | 487 | 9.6% | 7.8% | 17.7% | 98 | 12.0% | 7.8% | 15.7% |
| 1984 | 507 | 11.7% | 9.2% | 13.4% | 126 | 15.9% | 8.9% | 11.8% |
| 1985 | 480 | 13.7% | 10.3% | 14.6% | 133 | 14.0% | 9.7% | 12.6% |
| 1986 | 471 | 17.3% | 11.2% | 16.2% | 145 | 14.1% | 9.0% | 15.5% |
| 1987 | 463 | 21.4% | 14.1% | 14.4% | 160 | 13.5% | 8.2% | 13.6% |
| 1988 | 474 | 24.3% | 15.9% | 14.4% | 178 | 17.6% | 8.2% | 12.2% |
| 1989 | 480 | 25.1% | 14.7% | 13.2% | 172 | 23.5% | 7.5% | 11.2% |
| 1990 | 493 | 24.1% | 14.2% | 12.8% | 160 | 21.0% | 3.0% | 10.8% |
| 1991 | 483 | 21.1% | 13.3% | 11.4% | 139 | 22.3% | 5.8% | 12.8% |
| 1992 | 451 | 18.3% | 10.5% | 8.7% | 96 | 31.2% | 13.1% | 14.1% |
| 1993 | 445 | 14.2% | 8.6% | 7.1% | 78 | 35.5% | 21.0% | 10.8% |
| 1994 | 476 | 13.0% | 8.9% | 9.7% | 80 | 29.2% | 22.3% | 15.4% |
| 1995 | 513 | 14.5% | 10.1% | 9.2% | 79 | 33.9% | 28.9% | 16.7% |
| 1996 | 557 | 17.2% | 12.1% | 10.5% | 95 | 42.8% | 30.1% | 14.6% |
| 1997 | 589 | 16.2% | 11.6% | 9.8% | 109 | 36.0% | 22.9% | 12.2% |
| 1998 | 668 | 19.3% | 12.5% | 11.6% | 172 | 36.7% | 20.2% | 16.3% |
| 1999 | 720 | 20.1% | 11.5% | 9.3% | 239 | 34.6% | 17.1% | 13.4% |
| 2000 | 742 | 20.5% | 9.9% | 12.5% | 230 | 34.3% | 13.7% | 16.7% |
| 2001 | 718 | 21.8% | 11.0% | 10.5% | 218 | 26.7% | 12.7% | 14.1% |
| 2002 | 762 | 21.8% | 10.9% | 13.7% | 232 | 26.7% | 14.6% | 16.8% |
| 2003 | 764 | 17.8% | 8.8% | 11.3% | 265 | 22.4% | 12.9% | 14.9% |
| 2004 | 807 | 14.7% | 8.1% | 12.0% | 267 | 22.5% | 15.5% | 15.7% |
| 2005 | 833 | 13.4% | 8.7% | 10.5% | 266 | 20.6% | 16.9% | 13.8% |
| 2006 | 791 | 16.8% | 8.9% | 12.4% | 257 | 27.4% | 15.7% | 15.1% |
| 2007 | 771 | 25.7% | 11.9% | 10.1% | 268 | 35.2% | 16.4% | 10.2% |
| 2008 | 369 | 26.5% | 13.0% | 11.1% | 140 | 33.6% | 16.0% | 9.4% |
| 2009 | 373 | 28.6% | 14.4% | 11.5% | 134 | 36.9% | 17.7% | 8.0% |
| 2010 | 393 | 30.7% | 15.4% | 13.8% | 154 | 38.0% | 17.6% | 11.1% |
| 2011 | 438 | 23.7% | 13.2% | 12.0% | 177 | 28.7% | 17.2% | 11.1% |
| 2012 | 465 | 15.5% | 10.9% | 13.4% | 198 | 21.4% | 16.3% | 13.6% |
| 2013 | 476 | 16.2% | 10.4% | 13.8% | 212 | 23.4% | 16.8% | 15.1% |
| Trend coefficient (t-stat) from trend-line regression of R2 over time (c) | 0.376%(2.21)\*\* | 0.121%(1.45) | -0.333%(-2.46)\*\* |  | 0.520%(2.34)\*\* | 0.247%(1.70)\* | -0.169%(-1.09) |

(a) Homogenous-liquid bonds are defined in section 5. (b) Estimated using bond returns model (5). (c) Estimated using stock returns model (4). (c) The Adj. R2 value for each year is the moving average of the annual adjusted R2 over five years centered on that year (except for the two years at each edge of the time-series). R2ACCT is the adjusted R2 from the return regression estimated from the accounting variables only. (e) Results are from estimation of a trend-line regression Adj.R2 (%) = a + bT+ e, estimated from the 39 annual observations where T is a year index, T=1, , 39. Asterisks next to t-statistics indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test. (f) The number of observations is smaller than the full sample (20,700) and homogenous-liquid sample (6,536) due to missing data on independent variables.

**Table 5**

**Impact of Individual Variables on Relevance for Bond Holders:**

**Adjusted R2ACCT from a Single-Variable Regression over a Pooled Firm-Years Sample(a),(b)**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | All firm-years | Credit Risk assessed by: |
| PROB | NegCFO | Bond Ratings |
| Low | High | No | Yes | Investment Grade | High Yield |
|  |  | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT |
|  | Bond Valuation(c) | 19,732(f)  | 24.0% | 9,824 | 4.6% | 9,908 | 21.5% | 8,449 | 14.7% | 2,675 | 18.0% | 8,449 | 1. 8%
 | 6,210 | 19.3% |
|  | Bond Returns (d) | 19,658(f) | 6.1% | 9,959 | 3.5% | 9,699 | 7.7% | 8,455 | 4.6% | 2,614 | 7.4% | 8,455 | 2.0% | 6,085 | 8.0% |
|   | Trend Slope Coefficient (e) x 100 (t-stat) | 39 |  | 0.044(1.24) | 0.062(0.86)  | 0.216(2.23)\*\*  |
|  |  |  |  |  |  |
|  | CONSERV | VRatio (Fair value adjustments) | LOSS | Intangibles |
|  | Low | High | Low | High | No | Yes | Low | High |
|  | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT | N | Adj. R2ACCT(g) | N | Adj. R2ACCT | N | Adj. R2ACCT |
| Bond Valuation(c)  | 6,968 | 20.3% | 7,032 | 23.0% | 4,313 | 19.5% | 4,308 | 28.1% | 17,131 | 10.2% | 2,601 | 14.2% | 9,874 | 25.9% | 9,858 | 23.5% |
| Bond Returns (d) | 7,068 | 5.5% | 7,088 | 6.9% | 4,405 | 5.2% | 4,357 | 7.2% | 17,120 | 4.4% | 2,538 | 6.9% | 9,796 | 6.6% | 9,862 | 6.0% |
| Trend Slope Coefficient (e) x100 (t-stat) | 0.338(3.38)\*\*\* | 3.452(10.19)\*\*\* | 0.345(3.07)\*\*\* | 0.694(21.60)\*\*\* |

(a) R2ACCT values measure the association of bond valuation or bond returns, with accounting numbers.

 (b) ***High and Low*** values are above or below/equal to the median value each year. ***PROB*** is an estimate of the probability of default based on the Black–Scholes–Merton option-pricing model. ***CONSERV***is a measure of conservatism defined as the coefficient 3 in regression (6) estimated from the time-series of each firm-year t, from the 12-year period ending with year t. The sign of the resulting coefficient is multiplied by negative one. ***VRatio*** is the volatility ratio from Demerjian (2011), computed for year t. It is defined as the ratio of Book Value Volatility to Adjusted Net Income Volatility, where volatility is measured as the variance over a window of 60 quarters (5-years). Quarterly variables are annualized by summing the current and three prior quarterly observations. Book Value Volatility is the five-year standard deviation of changes in retained earnings plus dividends. Adjusted Net Income Volatility is the five-year standard deviation of Net Income minus Special Items and Non-Operating Income and Expense. ***LOSS*** is negative income from continuing operations. ***NegCFO***is negative cash flows from operating activities. ***Intangibles*** is the ratio of intangible assets on the balance sheet plus an estimate of the unrecognized R&D asset, deflated by total assets. ***Bond Ratings***are the S&P rating available on Compustat since 1985. **High Yield (Investment Grade)** is defined as an S&P rating of BB or lower (above BB).

 (c) Bond valuations are derived from valuation model (3) estimated from the accounting variables only. See section 4.2.1 for a description of this regression.

(d) Bond returns are derived from return model (5) estimated from the accounting variables only. See section 4.2.2 for a description of this regression.

(e) Results are from estimation of a trend line regression of PROB, NegCFO, CONSERV, VRatio, LOSS or Intangibles on a + bT + e,, estimated from the 39 annual observations where T is a year index, T=1,…, 39 (29 annual observations for Bond Rating). Asterisks next to t-statistics indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.

(f) The number of observations is smaller than the full sample (20,700) due to missing data on independent variables. (g) In estimating bond valuation model (3) and bond return model (5), the variable *Loss* (defined above) and the variables interacting with it are omitted.

 **Table 6**

**Association between the Information Content of Accounting Numbers for**

**Bond holders and Its Potential Determinants**

Summary Results from Estimating:

INFO\_CONTt = f {PROBt, NegCFOt, CONSERVt, VRatiot, LOSS, Intangiblest, GDPt} (7)

|  |  |  |
| --- | --- | --- |
| Dependent Variable (Hypothesized sign) | **Regression (7)** **Annual Observations (a), (b)**  | **Regression (8)** **Firm-Year Observations (a), (c), (d)** |
| **INFO\_CONT (R2ACCT)****from valuation model:** | **INFO (A)****The accuracy in predicting yield based on foreknowledge of accounting numbers.****Expected yield is obtained from model:** |  **INFO (B)****The return from a hedged portfolio based on sign of expected return using foreknowledge.****Expected return is obtained from model:** |
| (1) | (2) | (3) | (4) | (5) | (6) |
| **Model (3)** | **Model (A1)** | **Model (3)** | **Model (A1)** | **Model (5)** | **Model (A2)** |
| Intercept  | -0.070 | -0.030 |  0.535 | 0.527 | -0.079 | 0.041 |
| (-0.45) | (-0.18) | (26.28)\*\*\* | (24.82)\*\*\* | (-0.99) | (0.35) |
| PROB (+) | -0.246 | 2.014 | 0.029 | 0.029  | 2.530 | 3.319 |
| (-0.32) | (2.48)\*\* | (0.51) | (0.42) | (4.63)\*\*\* | (4.59)\*\*\* |
| NegCFO (c) (+) | 0.874 | 0.078 | -0.013 | -0.020 | 0.114 | 0.163 |
| (1.86)\* | (0.16) | (-0.90) | (-1.28) | (1.14) | (1.43) |
| CONSERV (+) | 0.225 | 0.238 | 0.001 | 0.001 | 0.014 | 0.010 |
| (1.96)\* | (1.98)\* | (1.31) | (1.88)\* | (0.71) | (0.59) |
| VRatio (?) | 0.123 | 0.103 | 0.000 | -0.001 | 0.027 | 0.013 |
| (2.19)\*\* | (1.75)\* | (0.27) | (-0.53) | (1.73)\* | (0.78) |
| LOSS (c) (+) | 0.225 | 1.194 | 0.045 | 0.072 | 0.277 | 0.407 |
| (0.83) | (4.22)\*\*\* | (3.72)\*\*\* | (5.59)\*\*\* | (3.21)\*\*\* | (4.31)\*\*\* |
| Intangibles (-) | -0.720 | -0.623 | -0.064 | -0.038 | 0.242 | -0.335 |
| (-2.30)\*\* | (-1.89)\* | (-2.99)\*\*\* | (-1.68)\* | (1.50) | (-2.04)\*\* |
| GDP (-) | -0.017 | -0.023 |  |  |  |  |
| (-2.19)\*\* | (-2.90)\*\*\* |  |  |  |  |
| Fixed Year Effects |  |  | Yes | Yes | Yes | Yes |
| Adj. R2 (d) | 49.0% | 65.1% | 6.0% | 5.6% | 40.8% | 14.9% |
| Number of Obs. | 39 | 39 | 6,517 | 5,994 | 4,806 | 4,463 |
|  |  |  |  |  |  |  |
| Weight of Factors: (e) |  |  |  |  |  |  |
| Reporting and Hybrid Factors | 44.6% | 58.6% | 15.8% | 29.9% | 30.1% | 33.5% |
| Economic Factors  | 55.4% | 41.4% | 82.2% | 70.1% | 69.9% | 66.5% |

INFO (.) j,t = f {Year fixed effects, PROBj,t, NegCFO\*j,t, CONSERVj,t-1,VRatio j,t , LOSS\*j,t, Intangiblesj,t} (8)

(a) All variables in the regression are Winsorized at the 1% and 99% of the variable’s distribution.

(b) For columns (1) to (2), the value of ***PROB****,* ***CONSERV***, ***VRatio*** and ***Intangibles*** is the mean across firms of that variable in year t.

(c) **NegCFO** and **LOSS** are substituted in Regression (8) by, respectively, ***NegCFO\**** and ***LOSS\****.

(d) Pseudo R2 in columns 5-6 due to the fact regression (8) when estimated with INFO (B) has a binary dependent variable.

(e) The weights are the relative explanatory power, based on Shapley values of the groups of reporting and hybrid factors (**CONSERV**, **VRatio**, **LOSS**, ***Intangibles***) and economic factors (***PROB***, ***NegCFO***, **GDP**).

***INFO\_CONTt*** is the Adj. R2ACCT from the bond valuation models (3) and (A1), estimated for year t. ***INFO (A)*** is the forecast error between expected yield produce by the model and actual yield. ***INFO (B)*** is a dummy variable that receives the value of 1 if the expected return produced by models (5) and (A2) and actual return have the same sign, and 0 otherwise. (For more details see Appendix C.) ***PROBt*** is an estimate of the probability of default in year t based on the Black–Scholes–Merton option-pricing model. **NegCFOt** is the frequency of negative cash flow from operations. ***NegCFO\*j,*t** is a dummy variable that receives the value of 1 if the cash flow from operations of firm j in year t is negative and 0 otherwise. ***CONSERV*t** is a measure of conservatism defined as the coefficient 3 in regression (6) estimated from the time-series of each firm-year t, from the 12-year period ending with year t.The sign of the resulting coefficient is multiplied by negative one. ***VRatio*t** is the mean volatility ratio from Demerjian (2011), computed for year t. VR is defined as the ratio of Book Value Volatility to Adjusted Net Income Volatility. Variables are based on quarterly values obtained from Compustat. All quarterly variables are annualized by summing the current and three prior quarterly observations. Book Value Volatility is the five-year standard deviation of changes in retained earnings plus dividends. Adjusted Net Income Volatility is the five-year standard deviation of Net Income minus Special Items and Non-Operating Income and Expense. ***LOSSt*** is the frequency of losses (negative income from continuing operations) in year t. ***LOSS\*j,*t** is a dummy variable that receives the value of 1 if firm j report a loss in year t and 0 otherwise. ***Intangibles*t**is the ratio in year t of intangible assets plus an estimate of unrecognized R&D asset, deflated by total assets at the beginning of the year. ***GDPt*** is the annual growth rate in GDP in year t. Asterisks next to t-statistics indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.

**Table 7**

**Relative Contribution of Accounting Variables to the Adjusted R2 (Shapley Values)**

|  |  |  |
| --- | --- | --- |
|  | **Bond Valuation(a)**  | **Bond Returns(b)** |
| Year Examined | Full Sample | Subsample of Homogeneous-Liquid Bonds(c) | Full Sample | Subsample of Homogeneous-Liquid Bonds(c) |
|  | N | Relative R2 ACCT(d) | N | Relative R2 ACCT(d) | N | Relative R2 ACCT(d) | N | Relative R2 ACCT(d) |
| All firm-years | 19,732 | 40.3% | 6,338 | 42.1% | 19,658 | 25.1% | 6,271 | 15.7% |
| Mean over years | 39 | 64.2% | 39 | 65.3% | 39 | 60.2% | 39 | 62.9% |
| 1975 | 195 | 66.7% | 116 | 70.8% | 192 | 79.5% | 115 | 78.6% |
| 1976 | 237 | 70.8% | 147 | 72.3% | 238 | 72.8% | 153 | 71.9% |
| 1977 | 230 | 73.5% | 149 | 75.4% | 232 | 78.9% | 151 | 82.2% |
| 1978 | 205 | 80.4% | 146 | 80.0% | 207 | 83.3% | 146 | 92.1% |
| 1979 | 213 | 80.6% | 155 | 81.6% | 210 | 82.5% | 164 | 96.4% |
| 1980 | 200 | 84.8% | 157 | 78.1% | 209 | 84.8% | 157 | 86.3% |
| 1981 | 457 | 84.2% | 50 | 79.7% | 456 | 79.3% | 49 | 82.0% |
| 1982 | 441 | 82.3% | 60 | 71.5% | 455 | 80.5% | 59 | 76.0% |
| 1983 | 475 | 73.9% | 98 | 68.7% | 487 | 78.0% | 98 | 75.7% |
| 1984 | 502 | 72.6% | 127 | 65.4% | 507 | 74.2% | 126 | 66.8% |
| 1985 | 471 | 64.4% | 133 | 66.1% | 480 | 66.0% | 133 | 72.3% |
| 1986 | 464 | 60.2% | 147 | 59.1% | 471 | 58.7% | 145 | 65.1% |
| 1987 | 481 | 56.4% | 163 | 65.5% | 463 | 55.0% | 160 | 68.5% |
| 1988 | 479 | 54.9% | 178 | 60.4% | 474 | 52.8% | 178 | 53.0% |
| 1989 | 488 | 49.1% | 173 | 60.2% | 480 | 45.3% | 172 | 46.9% |
| 1990 | 495 | 45.9% | 160 | 58.1% | 493 | 47.0% | 160 | 37.4% |
| 1991 | 491 | 49.1% | 139 | 66.2% | 483 | 50.4% | 139 | 48.6% |
| 1992 | 450 | 46.7% | 99 | 61.7% | 451 | 47.5% | 96 | 44.7% |
| 1993 | 454 | 50.3% | 79 | 73.0% | 445 | 57.4% | 78 | 59.0% |
| 1994 | 505 | 52.8% | 85 | 76.2% | 476 | 63.0% | 80 | 71.5% |
| 1995 | 527 | 55.9% | 87 | 83.3% | 513 | 64.0% | 79 | 78.8% |
| 1996 | 573 | 50.1% | 98 | 78.2% | 557 | 63.7% | 95 | 64.2% |
| 1997 | 602 | 49.1% | 122 | 77.7% | 589 | 65.6% | 109 | 58.5% |
| 1998 | 685 | 47.0% | 178 | 66.0% | 668 | 56.2% | 172 | 49.6% |
| 1999 | 744 | 47.0% | 251 | 62.3% | 720 | 48.9% | 239 | 37.9% |
| 2000 | 759 | 49.3% | 234 | 53.8% | 742 | 38.5% | 230 | 32.3% |
| 2001 | 730 | 55.0% | 222 | 56.5% | 718 | 39.6% | 218 | 39.2% |
| 2002 | 773 | 59.9% | 226 | 54.6% | 762 | 40.8% | 232 | 49.5% |
| 2003 | 765 | 60.8% | 267 | 54.5% | 764 | 45.9% | 265 | 54.6% |
| 2004 | 802 | 65.5% | 271 | 53.8% | 807 | 50.7% | 267 | 70.8% |
| 2005 | 813 | 65.7% | 271 | 58.2% | 833 | 57.6% | 266 | 76.8% |
| 2006 | 751 | 60.6% | 259 | 48.9% | 791 | 52.0% | 257 | 68.4% |
| 2007 | 759 | 65.1% | 270 | 55.9% | 771 | 43.5% | 268 | 56.1% |
| 2008 | 379 | 74.5% | 142 | 64.0% | 369 | 47.9% | 140 | 58.3% |
| 2009 | 368 | 75.2% | 133 | 61.3% | 373 | 50.5% | 134 | 47.9% |
| 2010 | 390 | 77.9% | 154 | 56.8% | 393 | 49.9% | 154 | 46.6% |
| 2011 | 433 | 84.8% | 177 | 63.2% | 438 | 62.1% | 177 | 60.4% |
| 2012 | 471 | 84.8% | 204 | 59.3% | 465 | 72.0% | 198 | 69.3% |
| 2013 | 475 | 80.1% | 211 | 53.0% | 476 | 65.5% | 212 | 64.7% |
| Trend Coefficient (t-stat) from a Trend-line Regression of Relative R2 ACCTover time (e) | -0.044%(-0.18) |  | -0.497%(-2.16)\*\* |  | -0.821%(-2.33)\*\* |  | -0.618%(-1.62) |

(a) Estimated using bond valuation model (3). (b) Estimated using bond returns model (5). (c) Homogenous-liquid bonds as defined in section 5.

(d) Computed as the ratio of the Shapley value of the set of accounting-based variables in the model relative to the R2 of the full model. The ratio value reported for each year is the moving average of the annual ratio over five years centered on that year (except for the two years at the each edge of the time-series). (e) The results are from the estimation of a trend line regression of the form Relative R2 ACCT (%) = a + bT, estimated from the 39 annual observations where T is a year index, T=1, …, 39. Asterisks next to t-statistics indicate significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.

**Appendix A**

**Alternative Bond Valuation and Return Models**

To test the robustness of the results, we employ an alternative bond valuation model based on that proposed by Defond and Zhang (2014). We augment their model to include a market-based estimate of the probability of default, PROB, as follows:

YSpread j,t = f {NIj ,t*,* (Debt/EBITDA)j,tInterest Coveragej,t, Leveragej,t *,*

(Debt/Tangible Net Worth) j,t, PROB j,t} (A1)

As defined in more detail in section 4.2, model (3), YSpread j,t is the yield spread on firm j at the end of the third month following the end of fiscal year t. The yield spread is measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of the matched Treasury note. EBITDA is net income before interest, taxes, depreciation and amortization. PROB is estimated from the Black-Scholes-Merton option-pricing model. The other variables are defined as follows: NIj,t is firm j’s income before extraordinary items in fiscal year t deflated by total market of equity at the end of year t-1. Debt is total debt at year end. Interest Coverage is the ratio of EBITDA to interest expense. Leverage is the ratio of total debt to total assets. Debt/Tangible Net Worth is the ratio of total debt to the value of tangible common equity.

The alternative model we use to examine the relation between bond returns and accounting numbers follows DeFond and Zhang (2014), augmented by the market-based PROB, as follows:

RBHj,t = f {(BNj,t x U(NI)j,t), (BNj,t x ΔDebtj,t/EBITDAj,t), (BN j,t x ΔInterest Coveragej,t),

(BN j,t x ΔLeveragej,t), (BNj,t x ΔDebtj,t/Tangible Net Worthj,t),

(GNj,t x U(NI)j,t), (GNj,t x ΔDebtj,t/EBITDAj,t), (GNj,t x Δ Interest Coveragej,t),

(GN j,t x ΔLeveragej,t), (GNj,t x ΔDebtj,t/Tangible Net Worthj,t), ∆PROBj,t } (A2)

where RBH is as defined in model (5) in section 4.2. The independent variables are formed using dummy variables that indicate “bad news” (BN) or “good news” (GN) events. BNj,t equals one for changes in financial measures that indicate an increase in default risk and zero otherwise. Specifically, BNj,tequals one for a negative U(NI), an increase in the ratio of Debt/EBITDA, a decrease in interest coverage, an increase in leverage and an increase in Debt/Tangible Net Worth. GNj,t equals one for changes that indicate a decrease in default risk and zero otherwise. Specifically, GNj,tequals one for a positive U(NI), a decrease in Debt/EBITDA, an increase in interest coverage, a decrease in leverage and a decrease in Debt/Tangible Net Worth.

**Appendix B**

**Summary Results from Estimating Regressions (3) and (5)**

1. **Summary Results from Estimating Regression (3):**

YSpread j,t = f {ROA j,t , (EBITDA j,t / Liab j,t -1), (Liab j,t /Assets j,t), LOSS j,t,

LOSS j,t \*ROA j,t , LOSS j,t \* (EBITDA j,t / Liab j,t -1), LOSS j,t \*(Liab j,t /Assets j,t), PROB j,t}

|  |  |  |
| --- | --- | --- |
|   | **Full Sample** | **Homogenous-Liquid Subsample** |
| Intercept  | 0.346 | -0.262 | 2.576 | 1.223 | 1.010 | 2.511 |
|  | (1.95)\* | (-1.30) | (74.18)\*\*\* | (5.90)\*\*\* | (4.41)\*\*\* | (66.12)\*\*\* |
| ROA j,t  | -3.21 | -6.640 |  | -4.342 | -5.816 |  |
|  | (-4.18)\*\*\* | (-7.61)\*\*\* |  | (-3.85)\*\*\* | (-4.67)\*\*\* |  |
| (EBITDA j,t / Liab j,t -1) | -1.790(-6.55)\*\*\* | -1.655(-5.33)\*\*\* |  | -0.917(-2.53)\*\*\* | -1.132(-2.82)\*\*\* |  |
| (Liab j,t /Assets j,t) | 4.072(18.16)\*\*\* | 5.931(23.99)\*\*\* |  | 2.628(9.94)\*\*\* | 3.497(12.00)\*\*\* |  |
| LOSS j,t | -0.169(-0.63) | -1.456(-4.77)\*\*\* |  | 0.328(0.81) | 0.281(0.63) |  |
| LOSS j,t \*ROA j,t | -0.284(-0.74) | -1.161(-2.67)\*\*\* |  | -0.891(-0.61) | -3.257(-2.03)\*\* |  |
| LOSS j,t \*(EBITDA j,t / Liab j,t -1) | -1.243(-3.83)\*\*\* | -1.718(-4.66)\*\*\* |  | -0.522(-0.96) | -1.070(-1.78)\* |  |
| LOSS j,t \*(Liab j,t /Assets j,t) | 3.672(10.91)\*\*\* | 6.763(17.79)\*\*\* |  | 1.656(3.15)\*\*\* | 2.706(4.65)\*\*\* |  |
| PROB j,t | 28.295 |  | 35.746 | 21.925 |  | 27.863 |
| (76.2)\*\*\* |  | (96.4)\*\*\* | (37.95)\*\*\* |  | (48.34)\*\*\* |
|  |  |  |  |  |  |  |
| Adj. R2 | 41.27% | 23.98% | 32.02% | 35.57% | 21.09% | 26.70% |
| Number of Obs. | 19,732 | 19,732 | 19,732 | 6,414 | 6,414 | 6,414 |

T-statistics are provided in parentheses with asterisks indicating significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.

**Appendix B (continued)**

**Summary Results from Estimating Regressions (3) and (5)**

1. **Summary Results from Estimating Regression (5):**

RBH,j,t = f {∆ROA j,t , ∆ (EBITDA j,t / Liab j,t -1), ∆ (Liab j,t /Assets j,t), LOSS j,t,

LOSS\*∆ROA j,t , LOSS \* ∆ (EBITDA j,t / Liab j,t -1), LOSS\* ∆ (Liab j,t /Assets j,t), ∆PROBj,t}

|  |  |  |
| --- | --- | --- |
|   | **Full Sample** | **Homogenous-liquid Subsample** |
| Intercept  | 0.025 | 0.023 | 0.024 | 0.023 | 0.022 | 0.025 |
| (21.22)\*\*\* | (18.71)\*\*\* | (22.19)\*\*\* | (16.25)\*\*\* | (14.63)\*\*\* | (18.97)\*\*\* |
| ∆ROA j,t  | 0.194 | 0.275 |  | 0.178 | 0.266 |  |
| (10.10)\*\*\* | (13.43)\*\*\* |  | (5.75)\*\*\* | (7.90)\*\*\* |  |
| ∆(EBITDA j,t / Liab j,t -1) | 0.096(10.20)\*\*\* | 0.099(9.80)\*\*\* |  | 0.031(2.13)\*\* | 0.025(1.60) |  |
| ∆(Liab j,t /Assets j,t) | -0.191(-10.68)\*\*\* | -0.234(-12.59)\*\*\* |  | -0.137(-5.53)\*\*\* | -0.183(-6.80)\*\*\* |  |
| LOSS j,t | 0.018(4.83)\*\*\* | 0.014(3.42)\*\*\* |  | 0.035(6.67)\*\*\* | 0.027(4.70)\*\*\* |  |
| LOSS j,t \*∆ROA j,t | -0.037(-2.92)\*\*\* | -0.010(-0.76) |  | -0.036(-0.82) | 0.003(0.07) |  |
| LOSS j,t \* ∆(EBITDA j,t / Liab j,t -1) | -0.015(-2.19)\*\* | -0.009(-1.14) |  | 0.001(0.05) | 0.007(0.37) |  |
| LOSS j,t \*∆(Liab j,t /Assets j,t) | -0.017(-0.97) | -0.109(-5.76)\*\*\* |  | -0.011(-0.32) | -0.077(-1.99)\*\* |  |
| ∆PROB j,t | -0.757 |  | -0.829 | -0.771 |  | -0.805 |
|  | (-52.69)\*\*\* |  | (-58.80)\*\*\* | (-34.65)\*\*\* |  | (-36.97)\*\*\* |
|  |  |  |  |  |  |  |
| Adj. R2 | 17.74% | 6.12% | 14.96% | 19.73% | 4.35% | 17.89% |
| Number of Obs. | 19,658 | 19,658 | 19,658 | 6,271 | 6,271 | 6,271 |

T-statistics are provided in parentheses with asterisks indicating significance at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) levels, respectively, using a two-tailed test.

**Appendix C**

**Construction of the Variable INFO in Regression (8)**

The variable INFO captures the information content of accounting numbers to bond investors in terms of the benefits that could be obtained from having a perfect knowledge of these numbers. We use two forms of such benefits – accuracy in predicting bond yield and the return generated from the perfect knowledge of accounting numbers. We capture these two forms of benefits by two measures of information content, denoted ***INFO (A)*** and ***INFO (B)***.

Construction of ***INFO (A)***

This measure captures the accuracy gained from a perfect knowledge of accounting numbers in predicting future bond yield and bond return. To construct this measure, we estimate each year t cross-sectionally the bond return models (regressions (5) and (A2)) and bond valuation models (regressions (3) and (A1)) based on the realized values of the accounting variables in year t. We use the estimated coefficients from these regressions and the *realized* values *of the accounting numbers in year t+1* to “predict” the return for year t+1 for the 12-month period ending with the third month of the following fiscal year, and to “predict” the bond yield at the end of that period. We then compute the forecast errors (FE) for each firm-year j, t as:

*FEreturn* =Absolute value of (predicted –actual) / Absolute value of mean of (predicted, actual).

*FEyiled* =Absolute value of (predicted –actual) / Mean of (predicted, actual).

We winsorize *FEreturn* and *FEyiled* at 1.0.

***INFOt (A)*** = 1 – *FE.*

Construction of ***INFO (B)***

This measure, which is similar to that used by studies that assess the information content of accounting numbers for equity holders,[[32]](#footnote-32) captures the profitability of an investment strategy based on a foreknowledge of accounting numbers. The strategy calls for the formation of a hedge portfolio in which long (short) positions are held each year in bonds for which next year’s expected return (based on a foresight of the relevant accounting numbers for that year) is “high” (“low”). The following procedure, borrowed from these studies, is as followed:

1. The bond return models (regressions (5) and (A2)) are estimated each year t cross-sectionally, using the realized values of the accounting variables for that year.
2. The “expected bond return” for year t+1 using perfect knowledge of the accounting variables for that year is obtained by applying the regression coefficients from the estimation described in (1) above to the *realized* values of the accounting variables in year t+1.
3. Bonds are ranked each year t+1 according to their expected returns and a long (short) position is taken in the bond for that year if the expected bond return is in the extreme highest 40% (lowest 40%) of the expected bond return distribution that year.[[33]](#footnote-33)
4. The position is held for the 12-month period beginning with the fourth month of the fiscal year.
5. INFO (B) = 1 if the position yields a positive return and 0 otherwise.
1. At the end of 2014, the U.S. corporate bond market value was $7.8 trillion (Securities Industry and Financial Markets Association; see <http://www.sifma.org/research/statistics.aspx>) and the private debt market was estimated at $11 trillion (Thomson One). Combined, the total market value of debt is thus approximately $18.8 trillion, more than 70% of the market value of equity which was estimated to be $26.3 trillion (see the World Federation of Exchanges report on the aggregate market value of shares traded on the NYSE and NASDAQ OMX; see <http://www.world-exchanges.org/statistics>). [↑](#footnote-ref-1)
2. See FASB *Statement of Financial Accounting Concepts No. 8* 2010, paragraph OB2. A similar objective is expressed in the conceptual framework of the IAS (1989) – *The Conceptual Framework for Financial Reporting.* [↑](#footnote-ref-2)
3. Among the few studies that adopt the debt holders’ perspective are Plummer and Tse (1999), Shi (2003), Ball et al. (2008a), Easton et al. (2009), Elliott et al. (2010), Sridharan (2011), Gkougkousi (2012) and DeFond and Zhang (2014). [↑](#footnote-ref-3)
4. For a summary of these concerns see Francis and Schipper (1999). [↑](#footnote-ref-4)
5. Stock data has been easy to obtain since the advent of the Center for Research in Security Prices (CRSP) in 1960, with return data available for years as early as 1925 (for NYSE firms). Bond data availability is more limited. The Mergent Fixed Income Securities Database (FISD) contains bond exchange transactions beginning in 1994 but only for insurance companies. The Trade Reporting and Compliance Engine’s (TRACE) Corporate Bond Database provides bond prices beginning in 2002 with more comprehensive data available beginning only in 2005. [↑](#footnote-ref-5)
6. The frequency of losses and earnings declines could mirror reporting factors. In particular, accounting conservatism in the form of a more timely recognition of losses has been shown to affect earnings variability and skewness (see Givoly and Hayn 2000). [↑](#footnote-ref-6)
7. Uncertainty of the intangible investments’ value exists regardless of whether they are capitalized or not. If capitalized, their cost is unlikely to represent their fair value except, perhaps, immediately following their acquisition or recognition of their impairment. Whether capitalization is beneficial to creditors is an open question. There is some evidence that capitalization of intangibles may reduce the rate of false predictions of bankruptcy (see Franzen et al. 2007). Yet, Shi’s (2003) findings suggest that the added risk conveyed by capitalized R&D overshadows the benefits to bond holders. [↑](#footnote-ref-7)
8. Matching by coupon rate and years-to-maturity as done by Easton et al. (2009) leads to very similar results. [↑](#footnote-ref-8)
9. An alternative derivation whereby the expected return is measured from the market model yields similar inferences. [↑](#footnote-ref-9)
10. Equation (2) is similar to that used by Francis and Schipper (1999). Alternative equity valuation specifications used in the literature (including those in which the variables are deflated by the market value of equity) produce similar results. [↑](#footnote-ref-10)
11. Extreme observations are handled using two alternative approaches (see Francis and Schipper, 1999). In one, each of the stock regressions is estimated from data in which all variables are truncated at the tails of the distributions (at 1% and 99%). Alternatively, observations identified as influential by the Belsley, Kuh and Welsch (1980) diagnostic analysis (i.e., a Studentized residual greater than 3 or a Cook’s D Statistic greater than 1) are removed. Both approaches produce similar results. [↑](#footnote-ref-11)
12. To estimate PROB, we follow the procedure developed by Hillegeist et al. (2004) and used by Vassalou and Xing (2004). The primary variables in the estimation of PROB are the market value of equity, the standard deviation of equity returns and total debt. [↑](#footnote-ref-12)
13. Other research that uses models with similar accounting variables includes Ball et al. (2008a), Dou (2014) and Kovner and Wei (2012). [↑](#footnote-ref-13)
14. This return regression is similar to that used by Francis and Schipper (1999) except that we measure unexpected earnings using analyst forecasts rather than a mechanical model and do not include the book value of equity as an explanatory variable. Inclusion of this variable in our regression does not affect the results. [↑](#footnote-ref-14)
15. Interactive Data provides third-party bond prices and other financial services. Its subscribers include thousands of financial institutions worldwide ranging from central banks to large investment banks. Other research using this database includes Hancock and Kwast (2001), Hand et al. (1992), Hemler (1990), Dudney and Geppert (2008), Cooper and Shulman (1994), Shulman, and Bayless (1993) and Gay and Manaster (1991). [↑](#footnote-ref-15)
16. The decline in the number of bond issues in 2007 is also likely due to the shift of issuers towards (high yield) bonds through private placement (144A offerings). These bonds are not included in our sample. [↑](#footnote-ref-16)
17. These cut-off points reflect the tradeoff between the need for a minimum sample size each year and the objective of having a sample of bonds that have similar characteristics and are of relatively high liquidity. [↑](#footnote-ref-17)
18. Additional cutoff points were applied to those years in which the mean or median value of one or more of the bond characteristics deviated considerably from other years as follows: the issue size for years after 1999 was limited to a maximum value of $450 million (in 2013 dollars) and the values of duration and maturity were capped at the 20% extreme values of the respective distributions for years before 1984 and 1988, respectively. The results are similar to those obtained without these restrictions (see discussion in the robustness test in section 7.2). [↑](#footnote-ref-18)
19. The estimated parameters of the bond valuation and return models are presented in Appendix B. [↑](#footnote-ref-19)
20. This trend line regression is similar to Francis and Schipper (1999). It is estimated as β1 in the regression:

Adj. R2 = β0 + β1t + vt, with t= 1 to 39 (corresponding to the 39 sample years 1975-2013). As a robustness check, we estimate a rank regression replacing the values of the dependent and independent variables with their ranks. The results from the two specifications are qualitatively similar. [↑](#footnote-ref-20)
21. Similar to past research on the change over time in the informativeness of accounting numbers, the above analyses are based on annual observations. The results obtained from the use of quarterly data for the full sample (not tabulated) are essentially the same. In particular, using a trend line over the 156 quarters we find a significant upward trend over the time-series of quarters in the association of accounting information with bond valuation and returns, and a significant decline with equity valuation and returns. However, the level of association between accounting information and bond valuation and returns in any given period tends to be somewhat lower when estimated from quarterly data as compared with annual data. [↑](#footnote-ref-21)
22. Similar results are obtained using an alternative measure of default, Moody’s annual aggregated default rates. [↑](#footnote-ref-22)
23. Estimating regression (6) using a measure of NI that includes extraordinary items produces similar results. [↑](#footnote-ref-23)
24. Following Demerjian (2011), VRatio is defined as the ratio between Book Value Volatility and Adjusted Net Income Volatility. Book Value Volatility is the five-year standard deviation of changes in retained earnings plus dividends. Adjusted Net Income Volatility is the five-year standard deviation of net income minus special items and non-operating income and expenses. Assuming independence between the changes in core income and changes in AOCI, VRatio equals 1+ (variance of adjustments/variance of core net income). [↑](#footnote-ref-24)
25. This estimate assumes a steady state and straight-line amortization over a five-year period. The resulting multiplier, 2.5, is based on the benefit period of R&D expenditures documented by Lev and Sougiannis (1996). [↑](#footnote-ref-25)
26. Cramer’s (1987) Z statistic is used to test the significance of the differences, with the standard deviation of the difference being estimated based on its large sample approximation, as developed by Olkin and Finn (1995). These statistics are also used by Harris et al. (1994) and Van der Muelen et al. (2007), among others. [↑](#footnote-ref-26)
27. As explained in section 6.1, the default risk premium, a factor that does not appear in regression (7), could affect the relevance of accounting numbers to bond holders. When added as an independent variable to regression (7), the default risk premium (measured as the difference between the yields on Moody’s Baa and Aaa corporate bonds) has an insignificant coefficient and a minor effect on the slope coefficients of the other variables, and no effect on the statistical inferences. [↑](#footnote-ref-27)
28. The insignificant results from using the return models are likely related to the lower descriptive power of the bond return models as compared with the bond valuation models. The Adj, R2ACCT values for return models (5) and (A2) are only 6.1% and 5.2%, respectively, as compared with Adj. R2 values of 24.0% and 30.1%, respectively, for valuation models (3) and (A1). The low explanatory power of the return models suggests that important variables are omitted from these models. To the extent that these omitted variables are correlated with factors hypothesized to affect the information content of accounting numbers, the error in measuring the effects of these factors may be large. [↑](#footnote-ref-28)
29. The only exception is PROB, which has a negative (but insignificant) negative coefficient for model (3). [↑](#footnote-ref-29)
30. For example, the pairwise correlation coefficients computed over the 39 years between variables such as LOSS, NegCFO, and PROB range from 0.57 to 0.76. [↑](#footnote-ref-30)
31. The clearest manifestation of these increased disclosures is the expanded length of the 10-K over the examined period. A recent article in the WSJ (“The 109,894-Word Annual Report,” June 1, 2015) notes that the average number of words in a 10-K increased by 40% from 1997 to 2014. To illustrate, the size of the General Motors’ 10-K file on the CAPITAL IQ database rose during that period from 0.5 MB to 46 MB. Similar findings on the steady increase in the length of the 10K and, in particular, the MD&A and the notes sections is provided by Li (2008). [↑](#footnote-ref-31)
32. See Alford et al. (1993), Francis and Schipper (1999), and Hanlon et al. (2005). [↑](#footnote-ref-32)
33. We use only 80% of the observations (the extreme 40% at either side of the expected return distribution) to render the results comparable to the previous studies that use this approach to assess the information content of accounting numbers to equity holders. Use of the entire sample of firm-year observations leads to essentially the same results. [↑](#footnote-ref-33)