The Changing Relevance of Accounting Numbers to Debt Holders over Time

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Abstract

We examine the change over time in the information content of accounting numbers from the perspective of bondholders and the causes for this change. Using proprietary longitudinal data, we find that, in contrast to the decline in the information content of accounting numbers to equity holders over time, the information content to bondholders has held steady or risen. The rise is attributable to economic factors such as an increase in risk and in the frequency of unfavorable news to which the valuation of debt is more sensitive than that of equity. There are indications, however, that reporting factors, specifically an increase in conservatism over the last four decades, is associated with this rise. The findings contribute to the scant literature on the use of financial information by bondholders and the extent to which financial reporting meets their unique information needs.

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1. Introduction

With few exceptions, studies on the value relevance of earnings have been conducted from the perspective of equity holders, using stock returns to gauge the value relevance or information content of the reported numbers. This is also true for studies that have focused on the information content of specific financial statement components such as revenues, cash flows, accruals and earnings-related information such as earnings forecasts.

As an example of the focus on equity holders, the call for the capitalization of R&D and various other intangibles often made in the recent debate about how best to account for investments in intangibles generally takes the perspective of stockholders, noting that they view such investments as assets (Lev and Sougiannis 1996; Aboody and Lev 1998). This perspective fails to consider that the capitalization of intangibles, while enhancing the information content of financial statements to equity holders, might diminish the information content for debt holders (Shi 2003). Indeed, this "equity-perspective bias" permeates capital markets research designed to assess the relative merits and capital market effects of alternative accounting principles.

Similarly, the research on the change over time in the information content of accounting numbers has taken the perspective of equity holders by correlating these numbers with stock prices or stock returns, ignoring the information content of these numbers to debt holders. However, the research findings on how the value relevance of accounting numbers for equity holders has changed over time does not necessarily extend to debt holders. Some of the most important trends in financial reporting in recent decades, such as the shift to an asset-liability focus (the so-called "balance sheet approach") from a revenue-expense focus (the "income statement" approach)and the move towards fair value accounting have different potential implications for the usefulness and relevance of accounting numbers to equity holders and debt holders.

The sensitivity of debt holders to accounting numbers is likely to differ from that of equity holders. As often noted, equity holders of a public corporation can be viewed as holders of a put option on the value of the firm. Accordingly, stock prices are expected to be less sensitive to downward risk then to upward prospects. This expectation is consistent with the findings that stock prices respond less to losses and earnings declines than they do to profits and earnings increases.[1] Debt holders, in contrast, can be viewed as having a call option on the firm's assets. Correspondingly, debt prices are expected to be less sensitive to upward prospects and more affected by downside risk.

These different features of equity and debt securities suggest that debt holders would be more concerned than equity holders with the ability of earnings and other accounting numbers to adequately and promptly convey downside risks and unfavorable information. Therefore, inferences regarding the informativeness of accounting numbers or the desirability of alternative accounting principles may differ depending on whether the perspective adopted is that of equity holders or debt holders.

The scarcity of research from the debt holders' perspective cannot be explained by the relatively low importance of debt in the capital markets since the aggregate debt and equity investments are approximately equal in size. [2,3] Nor can the fact that research has focused

[1] See Hayn (1995) and Burgstahler and Dichev (1997).

[2] Among the few studies that adopt the debt holders' perspective in evaluating the usefulness of accounting numbers are Ball et al. (2008), DeFond and Zhang (2009, 2011), Shi (2003), Easton et al. (2009), Elliott et al. (2010), Gkougkousi (2012), Khurana and Raman (2003), Plummer and Tse (1999), and Sridharan (2011).

[3] The Securities Industry and Financial Markets Association reports that the market value of the U.S. corporate bond market was $7.9 trillion at the end of 2011 (see http://www.sifma.org/research/statistics.asp). Reliable information on the size of the private debt market is not available. However, it is estimated to be about $8.5 million in a steady state (assuming an average loan term of five years and an average annual aggregate loan amount of $1.7 trillion, the dollar value of private loans issued in the year ending June 15, 2012 (as reported by Thomson One). Combined, the

primarily on equity holders be explained by the underlying objectives of financial reporting as stated by standard setters since they appear to give equal weight to creditors as users of financial information for decision-making purposes.[4]

One explanation for the research focus on equity holders is the relative difficulty in obtaining price and return data on debt as compared with equity issuances. Stock prices and stock returns have been easily obtainable since the foundation of the Center for Research in Security Prices (CRSP) in 1960. Currently, CRSP annual stock price data for companies traded on the NYSE are available from December 1925 and daily data are provided beginning in July 1962. Return data for companies listed on AMEX and NASDAQ are available from, respectively, 1962 and 1972. In contrast, bond data availability is more limited. The Mergent Fixed Income Securities Database (FISD) contains bond exchange transactions beginning in 1994 but only for U.S. insurance companies. The Trade Reporting and Compliance Engine (TRACE) Corporate Bond Database has bond prices beginning in 2002 with more comprehensive data available only from 2005.

The objective of this study is to fill this gap in the research by examining the change over time in the information content of accounting numbers to debt holders. Based on a sample of more than 10,000 corporate bond issues extending over the 34-year period from 1975 to 2008, this study demonstrates how the unique features of bonds affect the manner in which bond

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total market value of public and private debt is thus approximately $16.4 trillion. This is slightly larger than the market value of equity which was estimated to be about $15.6 trillion at the end of 2011 (based on the World Federation of Exchanges report on the aggregate market value of shares traded on the NYSE, Euronext and NASDAQ OMX (see http://www.world-exchanges.org/statistics).

[4] The FASB explicitly mentions debt holders noting that the objectives of financial statements are to provide useful information to "potential investors and creditors…in making rational investment, credit and similar decisions." (See paragraphs 34-36, *Statement of Concepts of Financial Statements No.* 1, FASB 2008.) A similar objective is expressed in the conceptual framework of the IAS (1989) – *The Conceptual Framework for Financial Reporting,* which was subsequently adopted by the IASC in 2001, It states that among the primary users of financial reporting are "lenders and other creditors" who use that information to "make decisions about buying, selling or holding … debt instruments and providing or settling loans or other forms of credit" (see ibid OB2).

valuation and bond returns respond to accounting information. Using various measures, we find that the information content of accounting numbers for bondholders has increased or stayed steady over time while, consistent with previous studies, this content has generally decreased for equity holders. Most of the increase is attributable to economic factors associated with an increase in risk and with an increased frequency of unfavorable news to which the valuation of debt is more sensitive than that of equity. However, we also find evidence consistent with the notion that 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 incentives, contributes to this trend.

The paper contributes to the literature in a number of ways. It is the first to estimate the evolvement in the value-relevance of accounting numbers for debt holders and contrast it with the change over time in the information content of these numbers for equity holders. The paper also extends prior research that confirms empirically the theoretical predictions regarding the differential response of the bond and stock markets to accounting information. Further, it shows that increased reporting conservatism provides informational benefits to bondholders, a main constituent of financial reporting. The findings have implications for accounting standard setters and regulators in emphasizing the different implications of accounting standards for different investor groups.

The paper proceeds as follows. In the next section, the difference in the valuation of earnings numbers by equity and debt holders is discussed. Section 3 contains a review of the literature on the accounting properties examined by this study. The methodology is presented in Section 4, followed by a description of the data and sample in Section 5. The results are presented and discussed in Section 6. The final section contains summary and concluding remarks.

2. Valuation of Equity and Debt as a Function of Earnings

The discussion in this section assumes without loss of generality that expected earnings correspond to expected cash flows. The relationship between reported earnings and equity values is illustrated in figure 1 (from Hayn, 1995). As the figure indicates the value of equity rises and falls with earnings. However, when earnings decline below a certain threshold that represents the level of earnings that, when capitalized, equal the exit value of the firm's equity, their persistence is likely to trigger the liquidation (put) option by the equity holders. In other words, earnings below this threshold level are not expected to perpetuate.

Figure 2 (from Fischer and Verrecchia, 2001) describes the association between reported earnings and debt values. As the figure shows, debt values are positively related to earnings. However, above a certain level of earnings, debt values become less sensitive to movements in earnings. That is, the change in the value of debt is convex in earnings at low values of earnings because debt holders, not equity holders, are the residual claimants. The value of debt is concave at higher level of earnings because of the cap on the redemption value of the debt.

Given that the functional relation between earnings, book values and stock returns is differs from that between earnings, book values and bond returns, the conclusions of studies on the "information content of earnings" which rely on stock returns could well be different from those using bond returns. Further, given that equity and debt investors value various points in the earnings distribution differently, various attributes of earnings quality may be weighted differently by these two groups of users of financial statements. For example, debt holders may place a higher value on conservatism and put less weight on the property of earnings persistence than do equity holders.

In this study, we use various metrics to assess the information content of accounting numbers for bond valuation and returns, examine its variation over time, and contrast this variation with that of the information content of accounting numbers from the stock holders' perspective.

3. Literature Review

3.1. Information content of accounting numbers 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 numbers have been expressed since the early 1990s. Among the earliest studies to document the change over time in the information content of earnings are Ramesh and Thiagarajan (1996), Collins et al. (1997), Lev and Zarowin (1999) and Ely and Waymire (1999). While these studies use somewhat different measures to capture usefulness, their common finding is that the information content of earnings has declined over recent decades. Collins et al. (1997) find a decline in the information content of earnings and an increase in the information content of book value over time. A similar result is reported by Francis and Schipper (1999). The most often advanced explanation for the decline in the information content of earnings is the accounting treatment of intangibles although the results vary somewhat across the studies.[5]

3.2. 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. Davis et al. (1978) examine the price behavior of 85 bond

[5] Francis and Schipper's findings do not support this explanation.

issues during the five-year period from 1968 to 1972. They find that the response of convertible bonds' prices to earnings announcements is similar to that of stock prices. However, the reaction of non-convertible bonds to earnings announcements is more muted. Using a sample of 333 firms in the 1986 to 1993 period, Plummer and Tse (1989) show that, consistent with the liquidation option hypothesis (Hayn, 1995), the association between stock returns and earnings changes is weaker for firms with lower bond ratings and those reporting losses. Yet, the association between bond returns and earnings changes for these firms is stronger. Datta and Dhillon (1993) show that, similar to stock returns, bond returns are positively associated with the content of earnings announcements.

Using a comprehensive sample of over 1,500 borrowers in the period 1994-2006, Easton et al. (2009) analyze the trading volume and prices of bonds around annual earnings announcement periods and during the reporting year as well as their association with unexpected earnings. They document a trading reaction to earnings announcements as well as a positive association between bond returns and unexpected earnings. These effects are found to be stronger when earnings convey bad news or when the bonds are riskier. DeFond and Zhang (2011) find that bond prices reflect negative earnings surprises on a timelier basis than positive surprises, and incorporate bad news on a timelier basis than do stock prices. They further find that bond prices anticipate bad news information conveyed in balance sheet changes while stock prices do not.

Finally, in a study that demonstrates the need to consider the perspectives of all users of financial information in setting accounting standards, Shi (2003) suggests that in the public debate regarding the accounting treatment of R&D expenditures, the argument that these expenditures have future benefits unduly overshadows the consideration of their riskiness. In particular, this study shows that bond values are negatively associated with the capitalized value of R&D expenditures.

All of the above-noted studies lend support to the notion that the determination of the usefulness of accounting numbers and the assessment of the relative information content of alternative financial reporting standards should consider both groups of users of financial information – stock holders and debt holders. None of these studies, however, examines the change over time in the information content of accounting numbers for debt holders.

4. Methodology

4.1. Bond Return Calculation

Following Easton et al. (2009) and Klein and Zur (2011), the monthly raw bond return, BR, is calculated as:

$$BR_{ijt} = (BP_{ijt} + C_{ijt} - BP_{ijt-1}) / BP_{ijt-1} \quad (1)$$

where BP_{ijt} is the invoice price of bond j issued by firm i for a bond price at the end of month t and C_{ijt} is the sum of all coupon payments during month t. Since Interactive Data Pricing and Reference Data (hereafter, Interactive Data), the database used to obtain this information, only provides the annual coupon rates and the last coupon payments, the amount and timing of the coupon payments are inferred from the patterns of the accrued interest payments. Invoice bond prices are computed as the evaluated price at month end reported by Interactive Data plus the accrued interest at month end.

Using the monthly bond returns, we then calculate the annual buy-and-hold raw bond return beginning in the fourth month after the end of the firm's fiscal year t-1 and ending in the third month after the end of the firm's fiscal year t. Observations are eliminated if the monthly return for either the first or last month of the annual period is missing.

The abnormal annual bond returns are calculated by subtracting the unadjusted matched annual U.S. Treasury (hereafter, Treasury) returns from the annual raw bond returns. The unadjusted matched annual Treasury returns are the buy-and-hold monthly Treasury returns calculated from the unadjusted return of the matched Treasury taken from the CRSP Monthly Treasury U.S. Database for that same annual period. Similarly, the excess yield-to-maturity of the bonds is calculated by subtracting the yield-to-maturity of similarly matched Treasury bonds.

We match each bond contained in Interactive Data with a Treasury bond in the CRSP database that (1) has the same remaining years to maturity at time t-1 (specifically, a Treasury bond that matures six months before or after the time to maturity remaining from the t-1 date) and (2) has the closest annual coupon rate. We further require that the coupon rate on the Treasury bond be within 45% (which corresponds to the 90% percentile of the distribution) of the bond's coupon rate.

Annual abnormal stock returns are computed as the annual stock return (including delisting returns) minus the annual equal-weighted market return. Both return series are calculated as the buy-and-hold returns and retrieved from the CRSP monthly returns files.

4.2. Measuring Value-Relevance

We use three measures to assess the relevance and information content of accounting numbers for bond valuation. The first two are measures of association between market valuation and accounting information: the adjusted R^2 from a regression of security returns on accounting information, and the return from an accounting-based hedge portfolio strategy (described below in section 4. 2.3). The third measure is the predictive power of accounting information with respect to the future deterioration of bond values, or the "rating drop."

The models used to describe the relationship between accounting numbers and the return and valuation of stocks or bonds are presented below.

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

$$R_{j,t} = \beta_{0.t} + \beta_{1.t} NI_{j,t} + \beta_{2.t} \Delta NI_{j,t} + \beta_{3.t} BVPS_{j,t} + \varepsilon_{j,t} \quad (2)$$

where $R_{j,t}$ is the buy-and-hold market-adjusted return on stock j over the 12 months ending three months following the end of fiscal year t, $NI_{j,t}$ is firm j's income before extraordinary items in year t deflated by total assets at the end of year t-1, $\Delta NI_{j,t}$ is the change in NI from year t-1 to year t deflated by total assets at the end of year t-1, and $BVPS_{j,t}$ is the book value per share of firm j's equity at the end of fiscal year t.[6]

Regression (2) reflects the association between accounting information and stock returns. However, it is less appropriate to model the relationship between *bond* returns and accounting information in this way since the book value of the equity, an important parameter in stock valuation, is unlikely to directly affect bond valuation. Rather, bond returns are likely to be a function of the excess of the book value over the debt level, or the "buffer" in book value that bondholders have at the time of liquidation. Another unique feature of bond returns is that they are more sensitive to bad news than to good news.

We use two alternative models to assess the association between accounting numbers and bond returns. The first relates bond returns to this book value buffer as follows:

$$R^B_{j,t} = \delta_{0.t} + \delta_{1.t} NI_{j,t} + \delta_{2.t} \Delta NI_{j,t} + \delta_{3.,t} [(BV_{j,t} - D_{j,t})/D_{j,t}] + \mu_{j,t} \quad (3)$$

where $R^B_{j,t}$ is the buy-and-hold excess return on bond 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

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[6] This return regression is the same as that used by Francis and Schipper (1999) except that they deflate NI and ΔNI by the market value of equity.

return and the return on Treasury notes matched on time to maturity and the coupon rate as described in section 4.1. $NI_{j,t}$ and $\Delta NI_{j,t}$ are income measures as defined above, $BV_{j,t}$ is the book value of firm j's equity at the end of fiscal year t, and $D_{j,t}$ is the total debt of firm j at the end of fiscal year t.[7]

The second model relating bond returns to accounting numbers that we use is that proposed by DeFond and Zhang (2011):

$$
\begin{aligned}
R^B_{j,t} = \alpha + & \beta_{1.t} (BN_{j,t} \text{ x } FE_{j,t}) + \beta_{2.t} (BN_{j,t} \text{ x } \Delta Debt_{j,t}/EBITDA_{j,t}) + \\
& \beta_{3.t} (BN_{j,t} \text{ x } \Delta \text{Interest Coverage}_{j,t}) + \beta_{4.t} (BN_{j,t} \text{ x } \Delta Leverage_{j,t}) + \\
& \beta_{5.t} (BN_{j,t} \text{ x } \Delta Debt_{j,t}/\text{Tangible Net Worth}_{j,t}) + \beta_{6.t} (GN_{j,t} \text{ x } FE_{j,t}) + \\
& \beta_{7.t} (GN_{j,t} \text{ x } \Delta Debt_{j,t}/EBITDA_{j,t}) + \beta_{8.t} (GN_{j,t} \text{ x } \Delta \text{ Interest Coverage}_{j,t}) + \\
& \beta_{9.t} (GN_{j,t} \text{ x } \Delta Leverage_{j,t}) + \beta_{10.t} (GN_{j,t} \text{ x } \Delta Debt_{j,t}/\text{Tangible Net Worth}_{j,t}) + \mu_{j,t} \quad (4)
\end{aligned}
$$

where $R^B_{j,t}$ is the buy-and-hold excess return on bond j over the 12 months ending three months following the end of fiscal year t. FE is the annual earnings forecast error, defined as the actual annual diluted earnings-per-share less the consensus (average) analysts' forecast of this variable as of the beginning of the fourth month of the fiscal year, deflated by total assets.[8] The independent variables are formed using dummy variables that indicate "bad news" (BN) or "good news" (GN) events. $BN_{j,t}$ equals one for changes in financial measures that indicate an increase in default risk and zero otherwise. Specifically, $BN_{j,t}$ equals one for a negative forecast error, 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.[9] $GN_{j,t}$ equals one for changes that indicate a decrease in default risk and zero otherwise. Specifically, $GN_{j,t}$ equals one for a positive

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[7] Results are qualitatively similar if equation (2) is used for bond returns.
[8] Analyst forecasts are not available from I/B/E/S for years prior to 1976.
[9] $\Delta(Debt_{j,t}/EBITDA_{j,t})$ is the change in (total debt)/(earnings before interest, tax, and depreciation and amortization), ΔInterest $Coverage_{j,t}$ is the change in the ratio of EBITDA to the interest expense, $\Delta Leverage_{j,t}$ is the change in the ratio of (total debt)/(total assets), and $\Delta(Debt_{j,t}/\text{Tangible Net Worth}_{j,t})$ is the change in the ratio (total debt)/(tangible common equity).

earnings forecast error, a decrease in Debt/EBITDA, an increase in interest coverage, a decrease in leverage, and a decrease in Debt/Tangible Net Worth.

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

$$MVPS_{j\,t} = \beta_{0.t} + \beta_{1.t}\, NI_{j,t} + \beta_{2.t}\, BVPS_{j,t} + \varepsilon_{j,t} \tag{5}$$

where $MVPS_{j\,t}$ is the per share market value of the equity securities of firm j at the end of fiscal year t and NI and BVPS, as defined earlier are, respectively, the firm's net income deflated by total assets at the beginning of the year and the per share book value of the equity at the end of the year.[10]

In examining *bonds*, the specification in (5) has to be adjusted to better reflect the relation between *bond* valuation and accounting information. Based on the same considerations that led to our use of the two models for the relation between bond returns and accounting information as expressed in equations (3) and (4), we test the following two alternative valuation equations relating bond values to accounting information:

$$YSpread_{j,t} = \delta_{0.t} + \delta_{1.t}\, NI_{j,t} + \delta_{2.t}\, [(BV_{j,t} - D_{j,t})/D_{j,t}] + \mu_{j,t}, \tag{6}$$

and:

$$YSpread_{j,t} = \beta_{0.t} + \beta_{1.t}\, NI_{j,t} + \beta_{2.t}\, (Debt/EBITDA)_{j,t} + \beta_{3.t}\, Interest\ Coverage_{j,t} + \beta_{4.t}\, Leverage_{j,t} + \beta_{5.t}\, (Debt/Tangible\ Net\ Worth)_{j,t} \tag{7}$$

where $YSpread_{j,t}$ is the yield spread (or the "excess" yield) on bond j at the end of year t, measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of a matched Treasury note as described in section 4.1. NI and BV, Debt, EBITDA, Interest

[10] Equation (4) is similar to that used by Francis and Schipper (1999). Alternative equity valuation specifications, including a version of regression (4) in which the dependent and the independent variables are the undeflated values of, respectively, the market value and book value of the equity and one in which all of the variables are expressed on a per-share basis produced essentially the same results.

Coverage, Leverage and Tangible Net Worth are as defined above. The differential response of bonds and stocks to accounting information is assessed by comparing the explanatory power (the adjusted R^2) of regression (5) which pertains to equity securities with that of regression (6) or (7) which pertain to bonds.

4.2.3. Return from an accounting-based hedge portfolio strategy. As indicated earlier, we use two measures of association to capture the information content of accounting numbers. One is the adjusted R^2 from a regression of security returns or valuation on accounting information and the other is the return to an accounting-based hedge portfolio. The latter is based on a measure proposed by Francis and Schipper (1999) which assesses (captures?) the "abnormal" return that could be earned on a portfolio whose formation is based on foreknowledge of these numbers.

To construct this measure we rank firms each year based on their security's expected return conditional on the realized values of the accounting variables. The expected returns models are those expressed by, alternately, regressions (2), (3), and (4) above.

The expected return for year t conditional on the observed accounting values for that year are determined by applying the coefficients of these regression to the realized values for the accounting variables for year t. Firms are then ranked by the expected return of their security. Finally, a hedge portfolio is formed whereby long (short) positions are taken in firms for which the expected return is in the highest 40% (lowest 40%) of the expected return distribution. The return to this hedge portfolio strategy is based on perfect knowledge of the values of the accounting variables in the return regression. This return is denoted as *the return to perfect foresight of accounting information*.

To control for differences over time in the variation of the market return, the market-adjusted return of the accounting-based hedge portfolio is scaled by the market-adjusted return for these stocks based on a strategy that uses foreknowledge of the sign of the return over the 12-month period ending three months following the end of fiscal year t by taking long (short) positions in the security of firms with positive (negative) market-adjusted returns over that 12-month interval. This return is denoted as *the return to perfect foresight of market information*. The ratio between the return to perfect foresight of accounting information and that of perfect foresight of market information, designated "%Market," captures the proportion of all information in the security return related to accounting information.

4.2.4. The predictive power of accounting information with respect to future deterioration in bond values. The third measure used to assess the relevance of information provided by accounting numbers for bond valuation is based on the predictive value of accounting numbers with respect to future deterioration in bond values, or downgrading. This approach is used by Ball et al. (2008) to examine the extent to which accounting information, specifically the sequence of the most recent quarterly changes in earnings (adjusted for seasonality and scaled by total assets), is predictive of a rating downgrade in the following period.[11] Because we do not have bond ratings for earlier periods in our sample, we use the Ball et al. (2008) approach substituting "deterioration in value" instead of a downgrade in the rating.

Following Ball et al. (2008), we estimate the probability of deterioration ("downgrade") using the following probit model:

$$\Pr(\text{Deterioration}=1)_t = f\{\alpha_0 + \alpha_1 \Delta \text{EBITDA}_{(t-1)-(t-4)} + \alpha_2 \Delta \text{COVERAGE}_{(t-1)-(t-4)} + \alpha_3 \Delta \text{LEV}_{(t-1)-(t-4)} + \alpha_4 \Delta \text{BOOKV}_{(t-1)-(t-4)}\} \quad (8)$$

[11] Building on the Ball et al. study, Dou (2013) considers a broader set of accounting predictors.

where EBITDA is earnings from continuing operations before interest, taxes, depreciation and amortization, COVERAGE is EBITDA divided by the interest expense, LEV is the long-term debt at the end of the period, and BOOKV is the book value of the equity. The change variables are deflated by total assets at the end of the base year. Deteriorated (or “downgraded”) bonds are defined as those in the bottom decile of the distribution of bond excess returns each year.

5. Data and Sample

As indicated in the introduction, accurate historical data on corporate bond prices are difficult to obtain. The bond coverage of exchange price data provided by the Fixed Investment Securities Database (FISD) is limited as is the bond coverage by Trade Reporting and Compliance Engine (TRACE) for periods before February 2005. These exchange prices primarily reflect the odd-lot activities of individual investors, cover only a small number of bond issues, and are based on an extremely small fraction of the total trading activity (see Hanock and Kwast (2001)). Further, neither of these sources provides long term historical coverage (FISD is available only from 1994 and TRACE from 2002, with full coverage available only from 2005). Institutional data, on the other hand, covers a larger number of bond issues. In many cases, bond prices relating to institutional activity may not necessarily be 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 (such as another issue by the same company, another company’s issue 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 Pricing and Reference Data, a provider of third-party bond prices and other financial services, whose subscribers include thousands of financial institutions worldwide ranging from central banks to large investment banks.[12] In collecting bond price data, Interactive Data prioritizes its data sources, reporting transaction-based bid prices when available and using either institutionally-based matrix bid prices or dealer bid quotes (referred to as "evaluated prices") to fill in the series for periods where bond bid prices are missing (generally as a result of infrequent trading).

The first year of our sample period is 1975, the earliest year for which such data are available, and the final year is 2008. We exclude financial institutions (SIC codes 6000-6999) from our sample since many of the accounting items and financial ratios used in our analyses do not apply to these firms. We also exclude bonds that do not have coupon information (with the exception of zero coupon bonds). To avoid giving undue weight to firms with multiple bond issues outstanding, each firm with more than one outstanding bond issue in any year is represented in the sample only once for that year. Specifically, if a firm's bond issues in a given year have identical characteristics (issue date, maturity date and coupon rate), we retain only one of them in the sample. However, if the bond issues of a firm have different characteristics, the bond return (and excess return on the bond) for that firm-year is computed as the average return (and average excess return) across the firm's bond issues in that year.

Table 1 summarizes our sample selection procedure. The initial sample consists of 177,153 U.S. corporate bond-year observations related to 27,293 bond issues issued by 4,174 distinct firms during the 1975 to 2008 period. As detailed in the table, exclusions due to missing return or accounting data lead to a final sample of 49,234 bond-year observations. After representing each firm year with multiple bond issues as a single bond return observation that reflects the average of the firm's outstanding issues, the final sample consists of 16,391 firm-year observations, related to 10,460 bond series issued by 2,367 distinct firms.

[12] 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).

Tables 2 and 3 provide descriptive statistics on the firm sample. Panel A of table 2 shows the distribution of the sample observations by year. There is a fair representation both in terms of the number of bonds and the number of firms in each of the sample years, except for the last year, 2008, for which we have only 70 distinct firms with 190 bond issues. The small number of observations for this year is due to the fact that our monthly bond return data ends with December 2008. Since the annual return interval for any given fiscal year concludes with the third month following the end of the fiscal year, annual return for fiscal year 2008 are available only for companies with fiscal year-ends of September 30 or earlier.

As panel B of table 2 indicates, the industry composition of the bond-issuing firms in our sample is quite representative of the distribution across industries of firms in the population (based on firms on COMPUSTAT, as shown in the last column) and does not indicate any obvious concentration. However, as panel C of the table shows, the firms in our sample are larger, on average, than the firms in their respective industries. The median total assets, sales and market value of equity at the end of 2005 of our sample firms is, respectively, $3,589.2 million, $2,935.4 million, and $2,991.5 million, as compared to the corresponding values for their 4-digit industry peers of $1,801.2 million, $1,708.8 million and $2,015.9 million, respectively. A similar relation between our sample firms and their industry peers exists at the end of 1985.

Not surprisingly, the bond sample consists of more highly leveraged firms. The median Debt-to-Equity ratio among the sample firms is 0.802 in 1985 and 0.713 in 2005, somewhat higher than the mean of the median ratios in the firms' respective 4-digit industries of 0.731 in 1985 and 0.625 in 2005.

Table 3 provides descriptive statistics on the bonds' characteristics, averaged over the sample period. The bonds' median maturity is slightly over 13 years, the median annual bond return is 8.43% and the median annual abnormal bond return (derived by subtracting from the annual raw bond return of the unadjusted matched annual Treasury return*)* is 1.02%. The table also provides stock return data on these firm-years. The median annual (abnormal) return is 8.67% (-5.11%).

6. Results

6.1. Unique Effects of Accounting Information on Bond Returns and Yields

Before describing the changing relevance of accounting numbers over time to bondholders, we provide large sample evidence that highlights the unique manner in which accounting information affects bond returns and yields as discussed in section 2. Given that bonds represent in essence a call option on the firm's assets, and in line with previous research, we expect bonds prices to be more sensitive to negative accounting information than to positive information. Accordingly, we examine the effect of accounting information for different subsets of the sample. Specifically, we partition the sample of firm-year bond observations into profits and losses, income increases and decreases, and low and high yields.

The results on the explanatory power of accounting information with respect to bond returns and valuation for each of the subsamples are presented in table 4 for the R^2 measure of association. The results for the other measure, %Market (representing the fraction of that return out of the total return derived from a strategy based on having perfect foresight of the sign of the bond return as described in section 4.2.3.) are essentially the same (untabulated). Both set of results are consistent with the notion that bond prices are more sensitive to negative information, consistent with the findings of Easton et al. (2009) and DeFond and Zhang (2011). Specifically, the results show that bond returns are more sensitive to bad earnings news than good earnings news and more strongly associated with accounting numbers when risk and uncertainty are higher (as captured by the bond yield).

Table 4 presents the association between accounting information and bond returns or bond valuation as captured by the yield spread for periods of profits and losses, earnings increases and decreases, and low and high yields-to-maturity. The results show that bond returns and yield spreads are more closely linked to accounting information for firm-years with adverse information (losses or earnings declines) or a high likelihood of default (above-the-median yield-to-maturity). The average annual adjusted R^2 values of regression (3) (regression (4)) which relates bond returns to accounting information are 3.5%, 7.7% and 3.8% (6.0%, 6.9% and 7.1%) when estimated for financially "favorable" firm-years defined as those with, respectively, successive profits, successive earnings increases, and a low yield-to-maturity of the bond. The adjusted R^2 values of the regression estimated from financially "unfavorable" firm-years defined as those with successive losses, successive earnings declines, and a high yield-to-maturity of the bond are considerably higher -- 10.6%, 15.1%, and 10.8% (26.7%, 28.2%, and 15.9%), respectively. Similar results are obtained when regressions (3) and (4) are estimated from a pooled sample of firm-years.

In terms of bond valuation, the results from estimating regression (6) (regression (7)) show a very similar pattern. Specifically, there is a higher degree of association between the bond spread and accounting information when this information is unfavorable. The average annual adjusted R^2 for the above two subsamples of "favorable news" firm-years (successive profits or successive earnings increases) are, respectively, 5.6% and 8.1% using valuation regression (6) and 10.6% and 16.6% using valuation regression (7). The corresponding values for the two subsamples of "unfavorable news" firm-years are much higher, 19.9% and 19.6% for regression

(6) and 15.9% and 35.9% for regression (7). Similar conclusions are drawn when regressions (6) and (7) are estimated from the pooled firm-years sample.

Consistent with these results, we expect that bonds with a higher likelihood of default will exhibit a greater sensitivity to accounting information. We proxy for the likelihood of default by the yield spread and define a bond at the beginning of each year as “high yield” (“low-yield”) if its yield is above (below) the median yield of the sample of bonds outstanding at that time. The results of this examination are reported in the last four columns of table 4. The association between accounting numbers and bond returns and valuation is much stronger for bonds identified as “high yield-to-maturity” than those identified as “low yield-to-maturity.” The adjusted R^2 values of the annual return regression (3) (regression (4)) for the low yield bonds is 2.0% (2.2%) as compared with 7.9% (7.8%) for the high yield bonds. Likewise, the adjusted R^2 values of the annual valuation regression (6) (regression (7)) is 1.3 % (1.0%) for the low yield bonds and considerably higher at 20.8% (20.0%) for the high yield bonds.

All of the results discussed above support the notion that bond prices are more sensitive to negative news and more responsive to accounting information when the likelihood of default is higher. Further, these results are consistent with the evidence in Easton et al. (2009) of a more pronounced association between bond returns and unexpected earnings news for negative news announcements and for riskier bonds. They are further mirror the finding by DeFond and Zhang (2011) that bond prices incorporate bad news on a timelier manner than stock prices.

6.2. The Change in the Information Content of Accounting Numbers over Time

6.2.1. R^2 values between market valuation and accounting information. The association between accounting information and the valuation of bonds and stocks is presented in table 5 and figure 3. The table shows the adjusted R^2 values over time from the valuation equations for bonds and stocks estimated annually. These equations are provided by regressions (6) and (7) for bonds and by regression (5) for stocks as described in section 4.2.2.[13]

The level of the adjusted R^2 values is markedly higher for the equity valuation than for the bond valuation (a yearly average of 55.9% as compared with19.7% (using bond valuation (6)) or 24.0% (using bond valuation (7)). However, this difference is due in large part to the fact that firm size affects both sides of the equity valuation equation, serving to inflate the R^2 values.[14] The *trend* in the association between accounting numbers and bond and stock values, as illustrated in figure 3, shows that the association with bond values has become stronger over time while the association with stock prices has become somewhat weaker. The results from a trend line regression (not tabulated) over the 34-year period of the sample, 1975-2008, show a significant average annual increase of 0.66% in the adjusted R^2 value of the bond valuation equation (6) (0.71% using bond valuation equation (7)) and a significant annual decline of 0.81% in the adjusted R^2 for stocks.[15]

Table 6 and figure 4 provide association results in the form of adjusted R^2 values from the return equations for bonds and stocks, provided by regressions (3) and (4) for bonds and (2) for stocks, as described in section 4.2.1. The level of the adjusted R^2 values is higher for the equity valuation than for the bond valuation (a yearly average of 14.1% vs. 8.6%, using bond return model (3) or 10.3% using bond return model (4)). The trend in the association between accounting numbers and bond values, as illustrated in figure 4, is very similar to the trend

[13] Following Francis and Schipper (1999), each of the (5) and (6) regressions is estimated from data in which all variables are truncated at the extreme ends of the distribution (1% and 99%) and after removal of observations that the Belsley, Kuh and Welsch (1980) diagnostic analysis indicates are influential (i.e., a Studentized residual greater than 3.0 or a Cook's D statistic greater than 1.0).

[14] Indeed, when we use alternative equity valuation equations incorporating the total market value and book value of the equity instead of the per-share values, the adjusted R^2 values are considerably higher.

[15] In particular, following Francis and Schipper (1999), we conduct the following regressions: Adj. $R^2 = \beta_0 + \beta_1 t + v_t$, where t= 1-34 corresponds to the 34 sample years (1975-2008), and report the coefficient β_1. As a robustness check, we further conduct a rank regression replacing the values of the dependent and independent variables with their ranks. All results are qualitatively similar to those reported.

exhibited for the valuation equation shown in figure 3. Specifically, the association between accounting information and bond values has become stronger over time. The results from a trend line regression (not tabulated) over the 34-year period, 1975-2008, show a significant average annual increase of 0.40% in the adjusted R^2 value of the bond return equation for bond return model (3)) and an average annual increase of 0.48% using bond return model (4), yet no significant change in the adjusted R^2 values for stocks.

6.2.2. Return from an accounting-based hedged portfolio strategy. The excess returns from a strategy based on having perfect knowledge of accounting information and the fraction of this excess return gained from a strategy based on having foreknowledge of the sign of the excess return, denoted %Market, are presented in table 7 and figure 5. The results are based on a sample of firms that have the required data for both bonds and stocks.

In general, stock returns appear to be more affected by accounting information than bond returns. When computed over the pooled sample of firm-years, the mean excess return from an accounting-based strategy is 14.4% for stocks and only 4.0% for bonds based on regression (3) and 3.3% based on regression (4) (see the second line of the table). This finding is undoubtedly due to the greater variability of stock prices as compared with bond prices. More telling about the role of accounting information in these two markets is that these excess returns represent a higher %Market (i.e., a higher fraction of the excess return that could be obtained from having perfect knowledge of the direction of the security price) for stocks than bonds, 42.7% vs. 37.3% based on regression (3) and 32.1% based on regression (4). In fact, only in seven of the 34 years examined do bonds exhibit a higher %Market value than do stocks. These results suggest that accounting information plays a prominent role in the valuation of both types of securities albeit a somewhat reduced one in the bond market.

The time-series results show that while the values of %Market fluctuate from year to year, there is a distinct upward trend in the information content of accounting numbers for bondholders. A trend line regression (not tabulated) over the 34-year period, 1975-2008, shows no significant change in %Market for stocks. However, there is a significant average annual increase of 0.56% in %Market for bonds when using bond return model (3).[16] This pattern is also apparent in figure 5 which shows the 5-year moving averages for the %Market time-series of bonds and stocks. The moving average of %Market for bonds, using bond return model (3) increases over the period, from 15.9% for the 5-year period centered on 1977 to 34.4% for the 5-years centered on 2006. In contrast, the corresponding values for %Market for stocks are 42.1% and 37.9%, indicating a slight downward trend. It should be noted, however, that the increase in %Market for bonds when using bond return model (4) is confined to the years 1975 to 1992. In fact, using this model, there is a pattern of decline since the early 2000s.

6.2.3. Changes in sample composition.

The composition of the sample in terms of firms changes over time. Ideally, one could control for this effect by maintaining a constant sample of firms. However, because of the relatively long period of our sample, such a restriction would result in a drastic decrease in the sample size. However, for a 15-year sub-period, 1990-2004, we identify a constant sample of about 100 firms that are represented in each year and conduct for this sample the same tests described in sections 6.2.1 and 6.2.2 above. The changes over time observed in this constant sample (untabulated) are very similar and not significantly different from those observed for the full (non-constant) sample.

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[16] In particular, following Francis and Schipper (1999) we conduct the following regressions: $\%Market = \beta_0 + \beta_1 t + v_t$, where t= 1-34 corresponds to the 34 sample years (1975-2008), and report the coefficient β_1. As a robustness check, we further conduct a rank regression replacing the values of the dependent and independent variables with their ranks, and also estimate the following nonlinear regression: $\%Market = \beta_0 + \beta_1 t + \beta_2 t^2 + v_t$. The results of these two analyses are qualitatively similar to those reported.

6.2.4. Predictive power of accounting information with respect to rating downgrades. The results concerning the change over time in the predictive ability of accounting numbers with respect to future rating downgrades, our third measure of information content, are provided in table 8 and figure 6. As explained in section 4.2.4, given the scarcity of rated bonds in our sample, we define "downgraded" bonds each year as those in the bottom decile of the distribution of bond excess returns in that year.[17]

The table provides values of Somers' D statistic (Somers, 1962) which is a measure of association that captures the predictive power of the model with respect to downgrades.[18] While the D statistics fluctuate from year to year, there is an upward trend over time which is also evident in figure 6. The trend is statistically significant when estimated from a non-linear trend function (see footnote 16 for the specification of this trend function).

6.2.5. Source of the increased information content of accounting numbers for bondholders. To explore the causes of the increase over time in the information content of accounting numbers for bondholders, we first conduct a univariate analysis in which we examine the association between the *variation over time* of that content and each of the factors that have been shown to affect its *cross-sectional* variation, namely, the yield spread, the frequency of losses and the frequency of earning declines (see section 6.1 and table 4).

An additional factor that may affect the information content of accounting numbers to bondholders is the extent of conservatism inherent in these numbers. The potentially important

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[17] We also use an alternative definition of "downgraded" bond, those in the bottom *quartile* of the distribution of bond excess returns for the year. This definition, which obviously resulted in a larger number of "downgrades," produces results that are very similar to those using the original definition.

[18] The Somers' D statistic is closely related to the Kendall' tau rank correlation coefficient. It is calculated as (Nc–Nd)/N, where N is the total number of paired observations with opposing outcomes in the sample (downgrade versus no downgrade), Nc is the number of pairs in which the model's estimated likelihood of a downgrade for the realized downgrade member of the pair is higher than that probability for the member of the pair without a downgrade (a "concordant" pair), and Nd is the number of pairs in which the model's estimated likelihood of a downgrade for the realized downgrade member of the pair is lower than that probability for the member of the pair with no downgrade (a "discordant" pair).

role played by conservative accounting in facilitating debt contracting and hence debt valuation is well recognized by the literature (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), suggesting a link between conservative reporting and the information content of accounting numbers for debt holders.

To better separate the economic factors from the reporting causes of the upward trend in the information content of accounting numbers to bondholders, we also examine the behavior over time of another economic measure, percentage of cases with negative cash flows from operations (CFO) which, unlike the percentage of losses, is less likely to be influenced by accounting conservatism.[19]

The main measure of conservatism that we use captures the relative persistence of losses and gains. This measure, suggested by Ball and Shivakumar (2005), is estimated as coefficient α_3 from the following piecewise linear regression:

$$\Delta NI_{i,t} = \alpha_0 + \alpha_1 D\Delta NI_{i,\,t-1} + \alpha_2 \Delta NI_{i,\,t-1} + \alpha_3 D\Delta NI_{i,\,t-1} * \Delta NI_{i,\,t-1} + \varepsilon_{i,\,t} \qquad (9)$$

where ΔNI is the change in income excluding extraordinary items from fiscal year t-1 to t, scaled by the beginning book value of total assets and $D\Delta NI$ is a dummy variable set equal to one if ΔNI in the prior year is negative and zero otherwise. To obtain a less noisy estimate of the trend in conservatism over time, regression (9) is estimated each year (t=0) from firm-years pooled over moving, overlapping 5-year intervals beginning two years prior to the observation year (i.e., years t-2 to t+2). This measure, which has been employed by a number of studies (e.g., Ball and

[19] The frequency of losses and earnings declines could mirror the effect of both economic factors (such as greater business uncertainty or greater competition) and 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), properties that induce losses and earnings declines.

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 accounting income that tends not to reverse. The hypothesis that economic losses are recognized in a more timely fashion than gains implies that $\alpha_3 < 0$.[20]

The time-series behavior of these variables is depicted in figure 7a and 7b. Figure 7a shows the behavior over time of the factors presumed to affect the information content of accounting numbers to bondholders and figure 7b depicts the corresponding trend over time for several of our measures of information content. As the figures show, both the factors affecting that information content (represented by the yield spread, percentage of earning declines, percentage of losses, percentage of negative cash flows, and accounting conservatism captured by the reversed-signed value of the coefficient α_3 from regression (9)) and the measures of information content to bondholders (the adjusted R^2 values from the bond return regression (3) and valuation regression (4), as well as %Market based on regression (3)) are all increasing over time. This positive association is quite strong and, for the most part, statistically significant. For example, the Spearman correlation coefficients between the annual values of R^2 from the return regression (3) on one hand and the annual yield spread, percentage of losses, percentage of earnings declines, and percentage of negative CFO cases on the other hand (not tabulated), are 0.428 (1.2% significance level), 0.436 (1.0% significance level), 0.297 (8.8% significance level), and 0.368 (3.2% significance level). The correlation coefficients of these four factors and the information content to bondholders measured by %Market rather than by the adjusted R^2 values are 0.316 (6.9% significance level),0.570 (0.04% significance level), 0.487 (0.4% significance level), and 0.504 (0.2% significance level). We further observe a positive correlation over time

[20] Estimating regression (9) using a measure of NI that includes extraordinary items produces similar results.

between the degree of conservatism and the information content measures. For example, the Spearman correlation coefficient between conservatism and the annual values of R^2 from the return regression (3) and %Market are 0.452 (1.4% significance level) and 0.288 (13.0% significance level), respectively.

The implications of the above results for accounting standard setting depend on whether the documented increase over time in the information content is caused primarily by changes in economic factors or changes in the reporting regime. To separate between the effects of reporting and economic factors on the change over time in the information content of accounting numbers for bondholders, we next conduct a multivariate test in which we estimate the following regression of an index of the information content measures considered by the study (INFO_Index) on the economic and reporting factors described above that are presumed to affect this content. Specifically, we estimate the following time-series regression of the annual observations:

$$INFO\_Index_t = \beta_0 + \beta_1(YSpread)_t + \beta_2(Loss)_t + \beta 3(Neg\ CFO)_t + \beta_4 Conservatism_{t-1} + \upsilon_t \quad (10)$$

where $INFO\_Index_t$ is a composite measure of information content as described below and $YSpread_t$ is the mean yield spread (or the "excess" yield) at the end of year t computed across all bonds. The yield spread is measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of a matched Treasury note as described in section 4.1. $Loss_t$ and $NegCFO_t$ are the percentage of firms with, respectively, negative earnings and a negative cash flows from operations at the end of year t. $Conservatism_{t-1}$ is an estimate of the firm-year conservatism measure (i.e., the negative of the signed value of coefficient α_3 in regression (9)). We use the lagged value of Conservatism since the level of conservatism for the current year is unobservable to investors.[21]

INFO_Index for each year is obtained by ranking the individual years by each of the three cross-sectional measures of information content, namely, the adjusted R^2 from the valuation regression (6), the adjusted R^2 from the return regression (3), and %Market from the return regression (3).[22] We then divide the years into deciles according to the distribution of the 34 yearly values of the measure, with the years with the highest (lowest) value of the measure assigned to decile 9 (0). The value of INFO_Index for year t is obtained by summing the ranks of the three measures for that year and dividing it by 27 so that the standardized range lies between 0 and 1.

To exploit the full information contained in the individual firm-years, we also estimate a regression similar to (10) from the sample of firm-year observations pooled over years as follows:

$$DR_{j,t} = \beta_0 + \beta_1(YSpread)_{j,t} + \beta_2 SignE_{j,t} + \beta 3 SignCFO_{j,t} + \beta_4 C^* Score_{j,t-1} + \upsilon_{j,t} \quad (11)$$

where $DR_{j,t}$ is a measure of the information content for individual firm j in year t. DR, which is similar in spirit to the cross-sectional measure %Market, is a dummy variable that equals 1 if the return from an investment strategy based on perfect foresight of accounting numbers (as described in section 4.2.3) has the same sign as the realized return and 0 otherwise. $Yspread_{j,t}$ is the yield spread as defined earlier. $SignE_{j,t}$ and $SignCFO_{j,t}$ are dummy variables that receive the

[21] Strictly speaking, the other determinants of the information content of accounting numbers for bondholders, namely the current year's yield spread and the current year's signs of earnings and cash flows are also unknown in the current year. However, these parameters can be fairly reliably assessed by investors through interim reports and other publicly available information.

[22] The results are qualitatively similar if an index based on the adjusted R^2 from the valuation regression (7), and the adjusted R^2 and %Market from the return regression (4) are used.

value of 1 if, respectively, net income and cash flows from operations is negative and 0 otherwise.

To obtain the firm-year estimate of $\alpha_{3,}$ we follow the approach used by Khan and Watts (2009) to estimate a "C score," the firm-year estimate of Basu's (1997) main measure of conservatism. Specifically, we augment regression (9) with interaction terms between the independent variables and a linear function of the firm's attributes that are likely to affect the relative timeliness of reporting good versus bad news. These attributes are the firm's size, its market-to-book ratio and leverage. Specifically, we estimate the following annual cross-sectional regression:

$$\Delta NI_{i,t} = \beta_1 + \beta_2 D\Delta NI_{i,t-1} + \Delta NI_{i,t-1}(\mu_1 + \mu_2 Size_{i,t} + \mu_3 M/B_{i,t} + \mu_4 Lev_{i,t}) + D\Delta NI_{i,\,t-1} * \Delta NI_{i,t-1}(\delta_1 + \delta_2 Size_{i,t} + \delta_3 M/B_{i,t} + \delta_4 Lev_{i,t}) + (\lambda_1 Size_{i,t} + \lambda_2 M/B_{i,t} + \lambda_3 Lev_{i,t} + \lambda_4 D\Delta NI_{i,\,t-1} Size_{i,t} + \lambda_5 D\Delta NI_{i,t-1} M/B_{i,t} + \lambda_6 D\Delta NI_{i,\,t-1} Lev_{i,t}) + \varepsilon_{i,t} \quad (12)$$

The estimates obtained from the augmented regression (12) are then used to estimate a "modified" C Score which we denote as C^* Score for each firm year as a linear function of firm-specific characteristics as follows:

$$C^{*}\text{Score (the firm-year}_{i,t}\ \alpha_3) = \delta_{1,t} + \delta_{2,t} SIZE_{i,t} + \delta_{3,t} M/B_{i,t} + \delta_{4,t} Lev_{i,t} \quad (13)$$

where this linear function is estimated from regression (12) in which it serves as the coefficient of $D\Delta NI_{j,\,t-1} * \Delta NI_{i,t-1}$.[23] For ease of interpretation, in regression (11) we use the flipped sign of the estimated C^* Score, multiplying the actual estimate by negative one.

The results from regressions (10) and (11) are presented in tables 9 and 10, respectively. Table 9 shows that the strong and significance associations between the composite measure of information content and firm-specific factors that are hypothesized to affect it are weakened or

[23] See section 2.2 of Khan and Watts (2005) for details of the derivation.

eliminated in a multivariate setting. In particular, the percentage of losses is no longer a significant explanatory variable once we introduce either the % of negative cash flows variable or conservatism. This finding reinforces the notion that the percentage of losses is a reflection of both economic factors (captured by the behavior of cash flows) and reporting factors (captured by conservatism).

Two factors that are significant throughout the multivariate tests are the yield spread and conservatism. In the regression with the full set of variables (reported in the last column of the table), the yield spread has a positive coefficient (t-statistic of 3.17) and conservatism has a positive coefficient (t-statistic of 2.61).

Table 10 shows the results from estimating regression (11). As explained above, this regression is estimated from individual firm-years with the dependent variable being a measure of information content based on a variation of the %Market construct. The results from this regression are somewhat different from those obtained from regression (10). In particular, the occurrence of negative cash flows from operations becomes significant (t-statistic of 1.75) and the occurrence of a loss replaces conservatism as the second significant variable in addition to yield spread. Conservatism continues to be positively related to the information content and it borders on being significant at the 10% level (two-sided). Note, however, the limitations of the findings based on this regression relative to those based on regression (10). First, the measure of information content is based on a single measure (a variation of %Market) rather than the composite measure used in regression (10). Second, the conservatism measure used in regression (11), the "modified" C*Score, is based on a series of estimates and assumptions, a likely source of additional measurement error. [24]

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[24] For example, the assumptions regarding the factors affecting conservatism and their linear and cross-sectionally constant relationship with conservatism may not hold in all situations.

7. Concluding Remarks

This paper provides large-sample evidence on the role that accounting information plays in bond valuation. The findings indicate that both the valuation of bonds and their returns are more sensitive to adverse accounting information and more responsive to accounting information in situations in which the likelihood of default is higher. Using several approaches for capturing and measuring the "information content," the results show that the information content of accounting information from the debt holders' perspective has increased over the last 34 years. This is in contrast to the information content of accounting numbers for shareholders which, as has been documented by past research and further confirmed on this sample, has stayed at the same level or even declined slightly.

The paper also finds that the increase in accounting conservatism (previously documented by Basu 1997 and Givoly and Hayn 2002 and reconfirmed by this study) is associated with the increase in the information content of accounting numbers for bondholders. The results from the cross-sectional tests, although only marginally significant (possibly because of difficulties in measuring conservatism for individual firm-years) are also consistent with the notion that conservatism is positively related to the information content of accounting numbers for bondholders. The finding of a link between accounting conservatism and the information content of accounting numbers is yet another demonstration of the economic consequences of conservatism.

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

References

Ahmed, A., B. Billings, R. Morton, and M. Stanford-Harris, 2002. "The Role of Accounting Conservatism in Mitigating Bondholder-Shareholder Conflicts over Dividend Policy and in Reducing Debt Costs," *The Accounting Review*, 77 (4): 867-890.

Aboody, D., and B. Lev, 1998. "The Value Relevance of Intangibles: The Case of Software Capitalization," *Journal of Accounting Research,* 36: 161-191.

Baker, M., R. Greenwood, and J. Wurgler, 2003. "The Maturity of Debt Issues and Predictable Variation in Bond Returns," *Journal of Financial Economics*, 70: 261-291.

Ball, R., 2001. "Infrastructure Requirements for an Economically Efficient System of Public Financial Reporting and Disclosure," Brookings-Wharton Papers on Financial Services, pp.127–169.

Ball, R., R.M. Bushman, and F.P. Vasvari, 2008a. "The Debt-Contracting Value of Accounting Information and Loan Syndicate Structure," *Journal of Accounting Research*, 46 (2): 247-287.

Ball, R., A. Robin, and G. Sadka, 2008b. "Is Financial Reporting Shaped by Equity markets or by Debt Markets" An International Study of Timeliness and Conservatism," *The Review of Accounting Studies*, 13 (2-3): 168-205.

Ball, R., and L. Shivakumar, 2005. "Earnings Quality in UK Private Firms: Comparative Loss Recognition Timeliness," *Journal of Accounting and Economics,* 39 (1): 83–128.

Basu, S., 1997. "The Conservatism Principle and Asymmetric Timeliness of Earnings," *Journal of Accounting and Economics* 24 (1): 3–37.

Beatty, A.L., J.P. Weber, and J.J. Yu, 2008. "Conservatism and Debt," *Journal of Accounting and Economics* 48 (2-3): 154-174.

Belsley, D., E. Kuh, and R. Welsch. *Regression Diagnostics*. New York: Wiley, 1980.

Burgstahler, D., and I. Dichev. 1997. "Earnings Management to Avoid Earnings Decreases and Losses." *Journal of Accounting and Economics*, 24 (1): 99–126.

Collins, D., E. Maydew, and I. Weiss, 1997. "Change in the Value-relevance of Earnings and Book Values over the Past Forty Years," *Journal of Accounting & Economics* 34: 43-64.

Cooper, R. A., and J.M. Shulman, 1994. "The Year-End Effect in Junk Bond Prices," *Financial Analysts Journal*, Sep/Oct, 50 (5): 61-65.

Datta, S., and U.S. Dhillon, 1993. "Bond and Stock Market Response to Unexpected Earnings Announcements," *The Journal of Financial and Quantitative Analysis* 28 (4): 565-577.

Davis, D. W., J. R. Boatsman, and E. F. Baskin, 1978. "On Generalizing Stock Market Research to a Broader Class of Markets," *The Accounting Review,*53 (1): 1-10.

DeFond, M., and J. Zhang, 2009. "The Asymmetric Magnitude and Timeliness of the Bond Market Reaction to Quarterly Earnings Announcements," Working Paper, University of Southern California.

DeFond, M., and J. Zhang,, 2011. "The Timeliness of the Bond Market Reaction to Bad News Earnings Surprises," Working Paper, University of Southern California.

Dou, Y., 2013. "The Debt-Contracting Value of Accounting Numbers, Renegotiation, and Investment Efficiency," Working Paper, New York University.

Dudney, D., and J. Geppert, 2008. "Do Tax-Exempt Yields Adjust Slowly to Substantial Changes in Taxable Yields?" *Journal of Futures Markets,* 28 (8): 763-789

Easton, P. D., S, J. Monhahn, and F. P. Vavai, 2009. "Initial Evidence on the Role of Accounting Earnings in the Bond Market," *Journal of Accounting Research*, 47 (3): 721- 766.

Elliott, J.A., A. Ghosh, and D. Moon, 2010. "Asymmetric Valuation of Sustained Growth by Bond- and Equity-holders," *Review of Accounting Studies*, 15: 833-878.

Ely, K., and G. Waymire, 1999. "Accounting Standard-setting Organizations and Earnings Relevance: Longitudinal Evidence from NYSE Common Stock, 1927-93," *Journal of Accounting Research*, 37: 293-318.

Fischer, P.E., and R.E. Verrecchia, 1997. "The Effect of Limited Liability on the Market Response to Disclosure," *Contemporary Accounting Research*, 14 (3): 515-541.

Francis J., and K. Schipper, 1999. "Have Financial Statements Lost their Relevance?" *Journal of Accounting Research*, 37: 319-352.

Gay, G. D., and S. Manaster, 1991. "Equilibrium Treasury Bond Futures Pricing in the Presence of Implicit Delivery Options," *Journal of Futures Markets*, 11 (5): 623-645.

Givoly, D., and C. Hayn, 2000. "The Changing Time-Sseries Properties of Earnings, Cash Flows and Accruals: Has Financial Reporting Become More Conservative?," *Journal of Accounting and Economics* 29: 287–320.

Givoly, D., C. Hayn, and S. Katz, 2010. "Does Public Ownership of Equity Improve Earnings Quality?," *The Accounting Review*, 85 (1): 195-225.

Gkougkousi, X., 2012. "Aggregate Earnings and Corporate Bond Markets," Working Paper, Erasmus University.

Hancock, D., and M.L. Kwast, 2001. "Using Subordinated Debt to Monitor Bank Holding Companies: Is it Feasible?" *Journal of Financial Services Research*, 20 (2/3): 147-187.

Hand, J. R.M., R.W. Holthausen, and R.W. Leftwich, 1992. "The Effect of Bond Rating Agency Announcements on Bond and Stock Prices," *The Journal of Finance*, 47 (2): 733-752.

Hayn, C., 1995. "The Information Content of Losses." *Journal of Accounting and Economics*, 20: 125-153.

Hemler, M. L., 1990. "The Quality Delivery Option in Treasury Bond Futures Contracts," *Journal of Finance*, 45 (5): 1565-1586.

Katz, S., 2009. "Earnings Quality and Ownership Structure: The Role of Private Equity Sponsors," *The Accounting Review* 84 (3): 623–658.

Khan, M., and R. Watts, 2009. "Estimation and Empirical Properties of a Firm-Year Measure of Accounting Conservatism," *Journal of Accounting and Economics*, 48: 132-150.

Khurana, I., and K. Raman, 2003. "Are Fundamentals Priced in the Bond Market?," *Contemporary Accounting Research,* 20 (3): 465-494.

Klein A., and E. Zur, 2011. "The Impact of Hedge Fund Activism on the Target Firm's Existing Bondholders," *Review of Financial Studies*, 22: 1735-1771.

Lev, B., and T. Sougiannis, 1996."The Capitalization, Amortization and Value Relevance of R&D," *Journal of Accounting and Economics*, 21: 107-138.

Lev, B., and P. Zarowin, 1999. "The Boundaries of Financial Reporting and How to Extend Them," *Journal of Accounting Research*, 37: 354-385.

Plummer, E. C., and S. Y. Tse, 1999. "The Effect of Limited Liability on the Informativeness of Earnings: Evidence from the Stock and Bond Markets," *Contemporary Accounting Research*, 16 (3): 541-574.

Ramesh, K., and R. Thiagarajan, 1996. "Inter-temporal Decline in Earnings Response Bondholders' Perspective," *Journal of Accounting and Economics*, 35 (2): 227-254.

Shi, C. 2003. "On the Trade-off Between the Future Benefits and Riskiness of R&D: A Bondholders' Perspective." *Journal of Accounting and Economics* 35 (2): pp. 227-254.

Shulman, J., and M. Bayless, 1993. "Marketability and Default Influences on the Yield Premia of Speculative-Grade Debt," *The Journal of the Financial Management Association*, 22 (3): 132-141.

Sridharan, S. A., 2011. "The Valuation Role of the Balance Sheet Information in the Corporate Bond Market," Working Paper, Stanford University.

Somers, R.H., 1962. "A New Asymmetric Measure of Association for Ordinal Variables," *American Sociological Review*, 27 (6): 799-811.

Vasvari, F., 2006, "Managerial Incentive Structures, Conservatism and the Pricing of syndicated loans," Working Paper, London Business School.

Watts, R., 2003a. "Conservatism in Accounting, Part I: Explanations and Implications," *Accounting Horizons*, 17: 207–21.

Watts, R., 2003b. "Conservatism in Accounting, Part II: Evidence and Research Opportunities," *Accounting Horizons*, 17: 287–301.

Watts, R., and J. Zimmerman. 1986. *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice-Hall Inc.

Whittenberg-Noerman, R., 2008. "The Role of Information Asymmetry and Financial Reporting Quality in Debt Contracting: Evidence from the Secondary Loan Market," *Journal of Accounting and Economics*, 46 (2-3): 240-260.

Zhang, J., 2008. "The Contracting Benefits of Accounting Conservatism to Lenders and Borrowers," *Journal of Accounting and Economics*, 45: 27-54.

Figure 1

Association between the Firm's Operating Performance and Equity Value

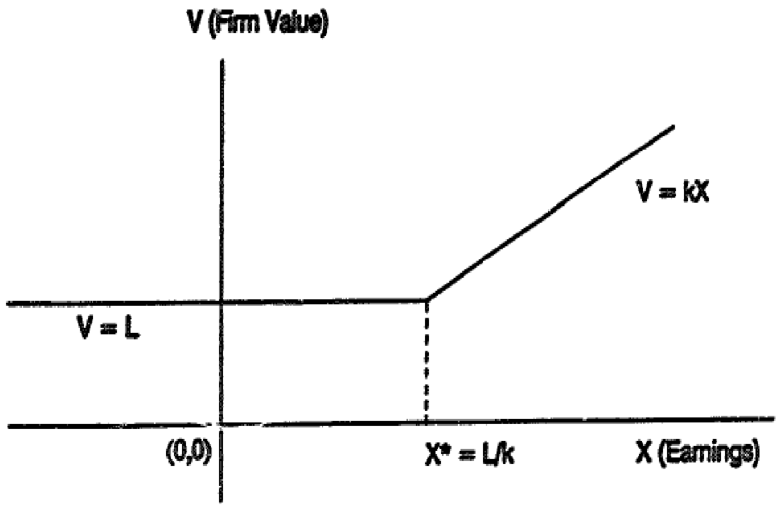
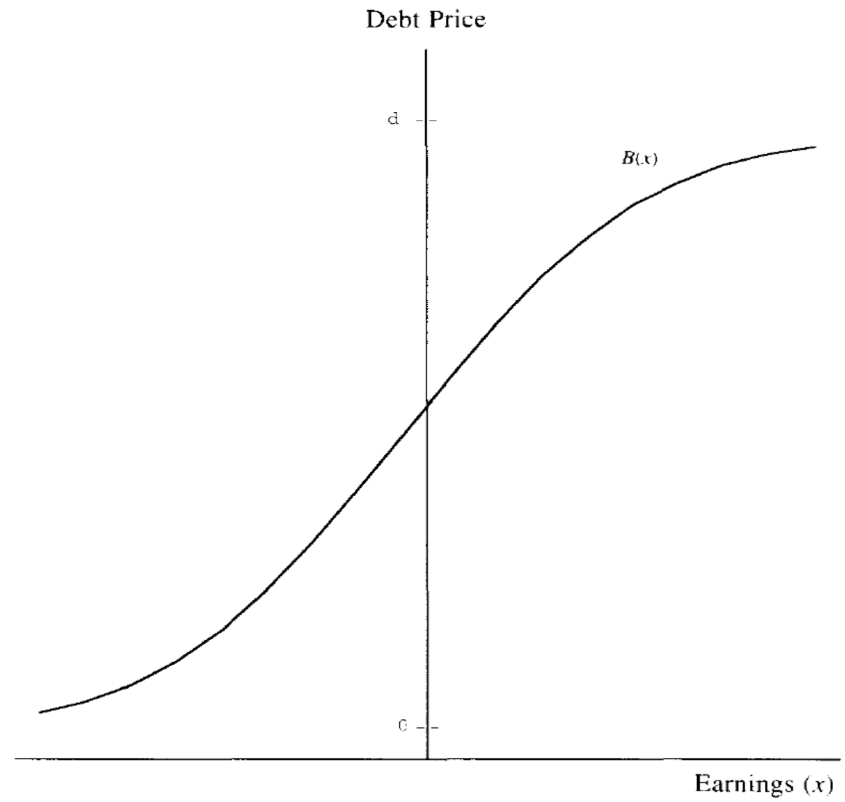


Fig. 2. Relation between firm value and earnings in the presence of a liquidation option. L is the liquidation value of the firm, k is the earnings multiplier, and X^* is the level of earnings that would make liquidation preferable to perpetuation of that earnings level.

Source: Hayn (1995, page 133).

Figure 2

Association between Debt Value and Expected Earnings under Limited Liability

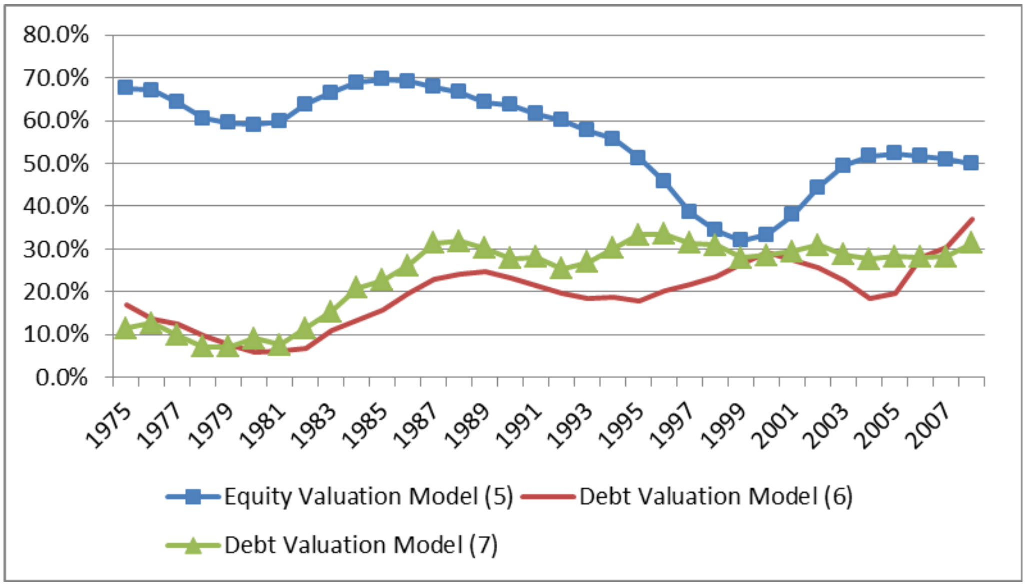


* This figure depicts nonconvertible-debt prices as a function of earnings, x, when liability is limited. d is the face value of the debt.

Source: Fischer and Verrecchia (1997, page 528)

Figure 3

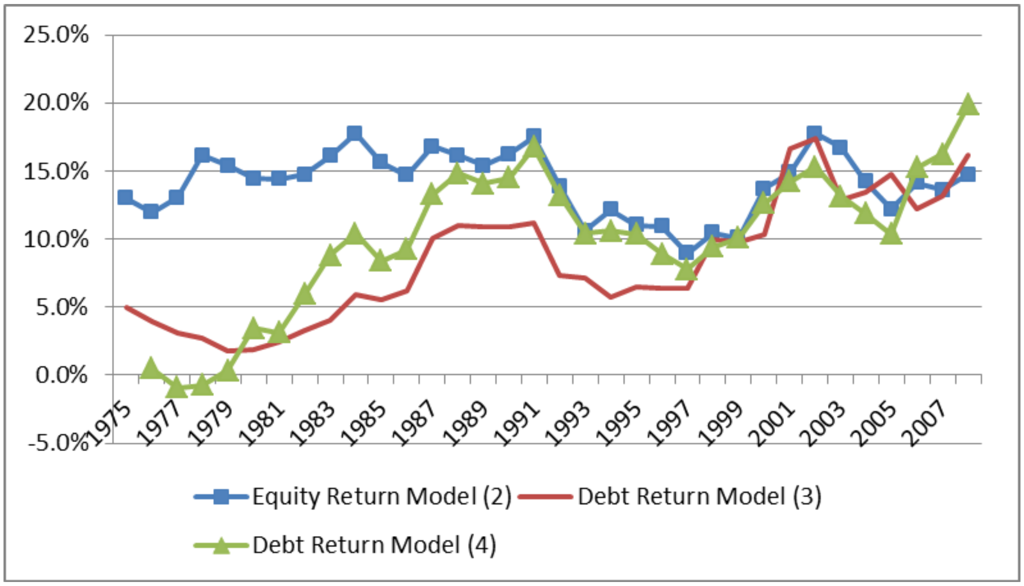
Adjusted R^2 Values from the Valuation Equations for Bonds and Stocks (5-Year Moving Averages)



This figure is based on the results presented in table 5. The valuation equations for bonds and stocks given in regressions (6), (7) and (5), respectively, are provided in section 4.2.2.

Figure 4

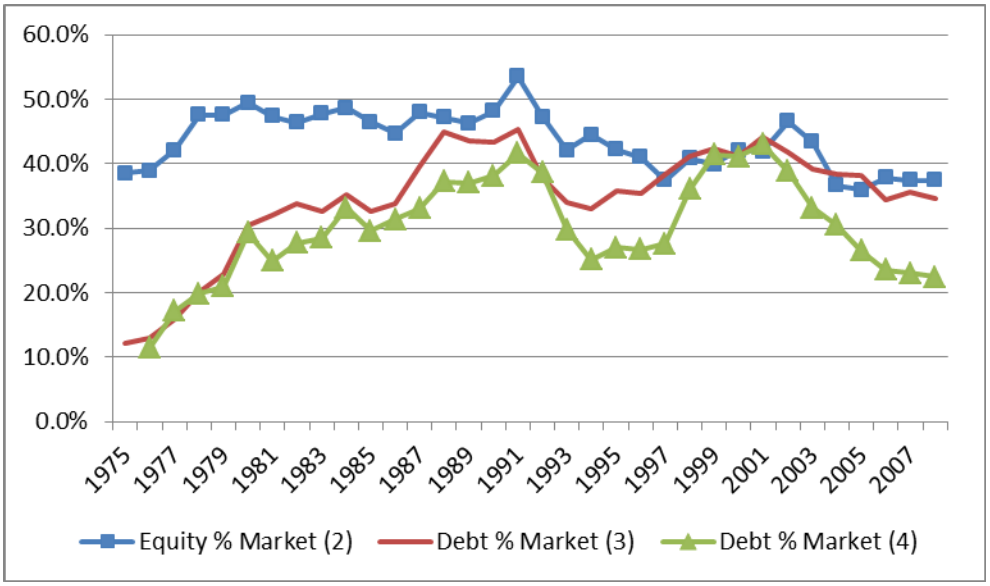
Adjusted R^2 Values from the Return Equations for Bonds and Stocks (5-Year Moving Averages)



This figure is based on the results presented in table 6. The valuation equations for bonds and stocks, regressions (3), (4) and (2), respectively, are provided in section 4.2.2.

Figure 5

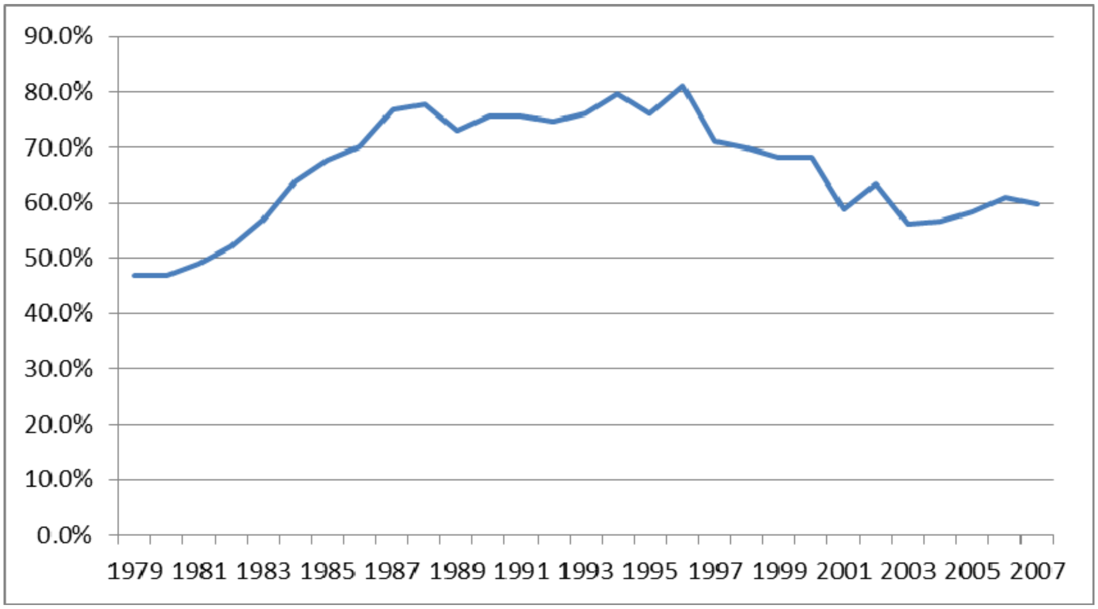
Excess Return from an Accounting-based Hedge Portfolio Strategy*
(5-Year Moving Average)



This figure is based on the results presented in table 7. They show the %Market, that is, the fraction that the security excess return from the accounting-based strategy constitutes of the contemporaneous excess return that could be obtained through perfect foresight of the sign of the bond's return. The accounting-based strategy is described in section 4.2.3. The %Market is based on return models represented by regression 2, 3 and 4.

Figure 6

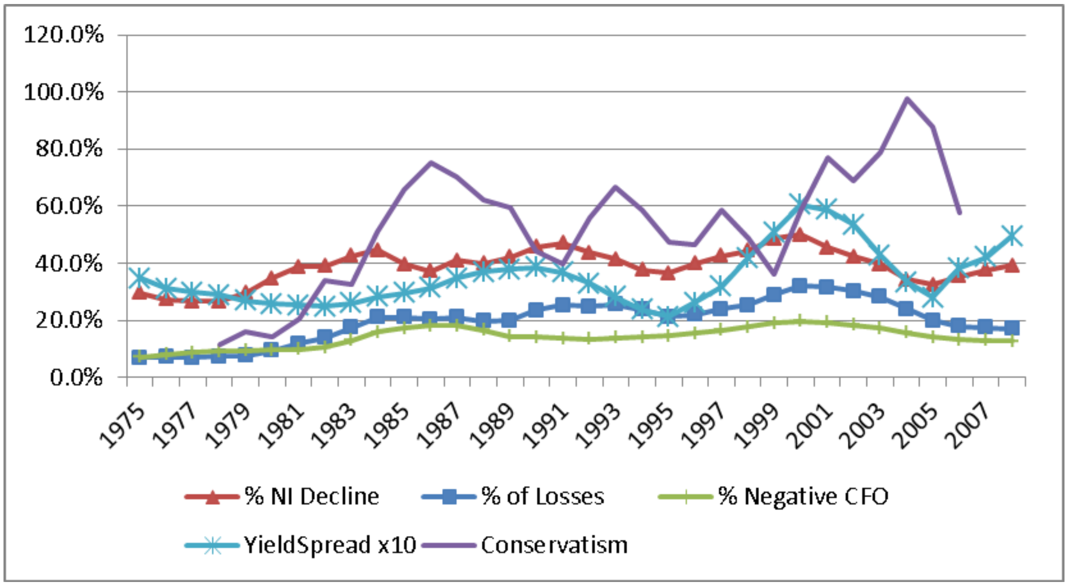
Predictive Ability of Accounting Numbers with respect to Bond Downgrades (Somers' D Statistic)



The annual value of Somers' D statistic, as described in section 6.2.4, is shown in this graph and also provided in table 8. Bond "downgrades" are defined as those with an excess return in the bottom decile of the distribution of excess bond returns for a given year.

Figure 7a

Factors Potentially Influencing the Information Content of Accounting Numbers to Debt Holders, (5-Year Moving Averages)



% NI Decline is the percentage of firms with earnings decline from the end of year t-1 to the end of year t.

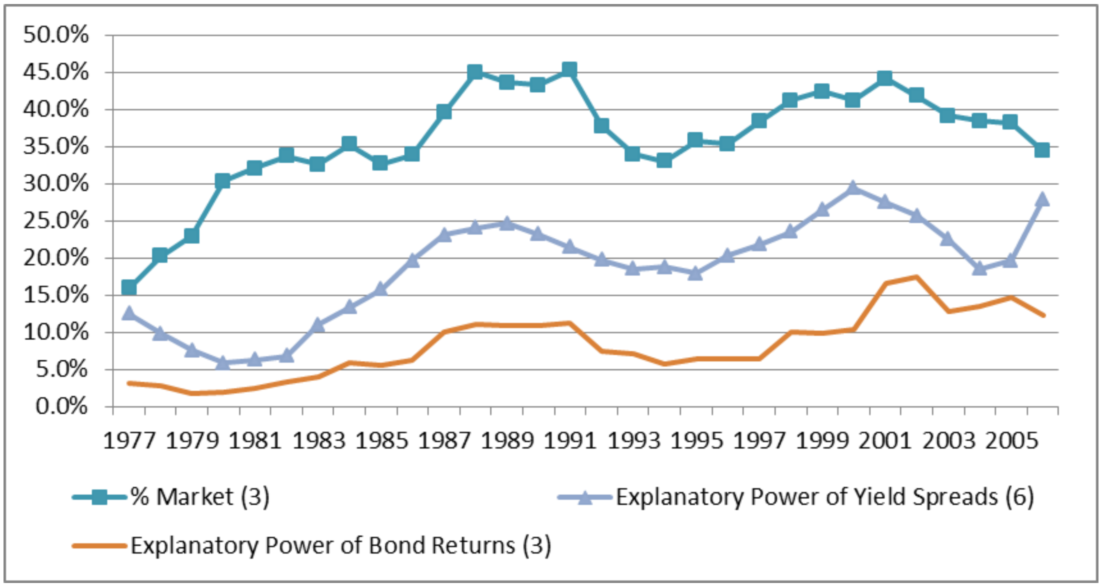
% of Losses is the percentage of firms with negative earnings at the end of year t.

% Negative CFO is the percentage of firms with a negative cash flow from operations at the end of year t. YieldSpread is the mean yield spread (or the "excess" yield) at the end of year t across all bonds. The yield spread is measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of a matched Treasury note as described in section 4.1. To allow a better visual display of the trend of this variable on the common Y-axis of the figure, the yield spread is multiplied by 10.

Conservatism is defined as the coefficient α_3 in regression (9): $\Delta NI_{i,t} = \alpha_0 + \alpha_1 D\Delta NI_{i,\,t-1} + \alpha_2 \Delta NI_{i,\,t-1} + \alpha_3 D\Delta NI_{i,\,t-1} * \Delta NI_{i,\,t-1} + \varepsilon_{i,\,t}$ where ΔNI is the change in income excluding extraordinary items from fiscal year t-1 to t, scaled by the beginning book value of total assets and DΔNI is a dummy variable set equal to one if ΔNI in the prior year is negative and zero otherwise. The cross-sectional regression is estimated each year t=0 from firm-years pooled over the five years t-2 to t+2.The sign of coefficient is multiplied by negative one.

Figure 7b

Selected Measures of the Information Content of Accounting Numbers to Debt Holders (5-Year Moving Averages)



%Market: This line is based on the results presented in table 7 and on figure 5. They show the %Market, the fraction that the bond excess return from the accounting-based strategy constitutes of the contemporaneous excess return that could be obtained through perfect foresight of the sign of the bond return. The accounting-based strategy is described in section 4.2.3.

Explanatory Power of Bond Returns: This line is the adjusted R^2 presented in table 6 and in figure 4. The return equation for bonds from which it is derived expresses bond returns as a function of earnings variables and leverage (see regression (3), section 4.2.1).

Explanatory Power of Yield Spreads: This line is the adjusted R^2 presented in table 5 and in figure 3. The valuation equation for bonds from which it is derived expressed the yield spread as a function of earnings variables and leverage (see regression (6), section 4.2.2).

Table 1
Sample Selection Procedure

Sample Composition, 1975 – 2008	No. of Firms	No. of Bonds	No. of Firm-years	No. of Bond-years
Initial Sample	4,174	27,293	38,147	177,153
Minus observations that are missing:				
• annual raw returns				(46,555)
• earnings data for the last two years				(7,600)
• time-to-maturity information				(108)
• annual Treasury bonds matches				(25,545)
Total number of bond-year observations with annual abnormal returns	3,123	18,581	23,495	97,345
Minus observations that are missing abnormal annual stock returns				(48,111)
Final sample with both bond and stock abnormal returns; includes firm-years with multiple issues for a given firm	2,367	10,460	16,391	49,234
Final sample with both bond and stock abnormal returns; consists of firm-years with only a single or "averaged" issue per firm	2,367	10,460	16,391	16,391

Table 2
Descriptive Statistics on the Firm Sample

A. Distribution of Sample Observations by Year

Year	Bonds	Firms	Average Number of Bonds per Firm
Full sample	49,234	16,391	3.00
By year:			
1975	554	138	4.01
1976	667	168	3.97
1977	727	162	4.49
1978	528	158	3.34
1979	602	169	3.56
1980	590	164	3.60
1981	1,218	419	2.91
1982	1,195	411	2.91
1983	1,232	437	2.82
1984	1,314	461	2.85
1985	1,260	449	2.81
1986	1,230	468	2.63
1987	1,323	457	2.89
1988	1,325	445	2.98
1989	1,322	438	3.02
1990	1,333	435	3.06
1991	1,361	453	3.00
1992	1,278	428	2.99
1993	1,257	445	2.82
1994	1,403	490	2.86
1995	1,429	519	2.75
1996	1,619	578	2.80
1997	1,792	631	2.84
1998	2,057	719	2.86
1999	2,275	773	2.94
2000	2,349	793	2.96
2001	2,221	740	3.00
2002	2,352	783	3.00
2003	2,406	772	3.12
2004	2,487	762	3.26
2005	2,269	731	3.10
2006	2,105	694	3.03
2007	1,964	631	3.11
2008	190	70	2.71

Table 2 (continued)

B. Industry Affiliation

Industry (2-digit SIC code) (listed in order of frequency)	Number of Firms	% of Firms in the Sample	% of Firms in these Industries [b]
Full sample	2,367	100%	100%
28	182	7.69%	11.53%
48	182	7.69%	4.13%
49	152	6.42%	6.09%
36	146	6.17%	9.24%
73	138	5.83%	12.65%
35	135	5.70%	4.92%
13	129	5.45%	4.86%
All other industries	1,303	55.05%	46.58%

[a] Results are based on the company's most recent year in the sample. Financial institutions (SIC codes 6000-6999) are not included.

[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=449)	Total Assets	2,621.7	210.6	763.4	2,619.6	582.4
	Sales	2,912.7	184.5	829.4	2,930.1	644.7
	Market Value	1,405.5	94.6	389.4	1,586.7	298.9
	Debt/Equity [c]	1.404	0.443	0.802	1.557	0.731
2005 (n=731)	Total Assets	9,519.5	1,274.5	3,589.2	10,408.8	1,801.2
	Sales	7,943.1	1,041.2	2,935.4	8,490.0	1,708.8
	Market Value	9,799.7	1,041.5	2,991.5	10,251.0	2,015.9
	Debt/Equity	1.343	0.433	0.713	1.347	0.625

[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 438 in 1985 and 686 in 2005.

Table 3
Bond Descriptive Statistics[a]

Variable[b]	Mean	Quartile 1	Median	Quartile 3
Maturity (years)	14.94	10.00	13.03	20.00
Years to maturity (years)	9.03	4.92	7.75	12.38
Yield-to-maturity[c]	9.81%	6.41%	8.43%	11.22%
Annual bond return[d]	9.78%	3.48%	8.43%	14.67%
Annual abnormal bond return[e]	1.11%	-3.01%	1.02%	5.11%
Annual stock return[f]	13.05%	-15.37%	8.67%	34.08%
Annual abnormal stock return[g]	-2.70%	-28.93%	-5.11%	18.60%

[a] If a firm has multiple bond issues outstanding in a given year, these are averaged annually before computing the reported values. The results are based on 16,391 firm-years.

[b] The distribution of each variable is winsorized at the extreme 1% values of the distribution.

[c] 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.

[d] The annual bond return is calculated from the monthly raw bond return computed as: $BR_{ijt} = (BP_t + C_{ijt} - BP_{ijt-1}) / BP_{ijt-1}$ where BP_{ijt} is the invoice price of bond j issued by firm i for a bond price at the end of month t. C_{ijt} is the sum of all coupon payments between day t-1 and day t. Invoice bond prices are computed as the evaluated price at month end reported by Interactive Data plus the accrued interest at month end. Based on the monthly bond returns, the annual buy-and-hold raw bond return is calculated beginning in the fourth month after the end of the firm's fiscal year t-1 and ending in the third month after the end of the firm's fiscal year t. Observations missing either the first or last monthly return of the annual period were eliminated.

[e] Annual abnormal bond returns are derived by subtracting the unadjusted matched annual Treasury returns from the annual raw bond returns. The unadjusted matched annual Treasury returns are the buy-and-hold monthly Treasury returns calculated from the unadjusted matched Treasury returns in the CRSP Monthly Treasury US Database for that same annual period. Each bond in Interactive Data is matched with a Treasury bond in the CRSP database that (1) has the same remaining time to maturity in years at time t-1 (in particular, a Treasury bond that matures six months before or after the time to maturity remaining from t-1 date), (2) has the most similar annual coupon rate. The coupon rate on the Treasury bond must be within 45% (which corresponds to 90% percentile of the distribution) of the bond's coupon rate.

[f] The annual stock return is calculated as the buy-and-hold return from the CRSP monthly returns files (including delisting).

[g] The annual abnormal stock return is the annual stock return minus the annual equal-weighted market return, where each return is calculated as the buy-and-hold return from the CRSP monthly returns files.

Table 4
Information Content of Accounting Numbers for Bondholders
By Select Groups of Firm-Years

	All firm-years		Earnings in current and prior year				Net Income in current and prior year				Yield to Maturity			
			Profit		Loss		Increased		Decreased		Low		High	
	No. of Obs.	Adj. R^2	No. of Obs.	Adj. R^2	No. of Obs.	Adj. R^2	No. of Obs.	Adj. R^2	No. of Obs.	Adj. R^2	No. of Obs.	Adj. R^2	No. of Obs.	Adj. R^2
Average over Annual Regressions														
Bond Returns[(a)]														
Regression 3	34	8.6%	34	3.5%	28	10.6%	33	7.7%	32	15.1%	34	3.8%	34	10.8%
Regression 4	33	10.3%	33	6.0%	25	26.7%	33	6.9%	27	28.2%	33	7.1%	33	15.9%
Bond Valuation[(b)]														
Regression 6	34	19.7%	34	5.6%	28	19.9%	33	8.1%	31	19.6%	34	3.4%	34	19.1%
Regression 7	34	24.0%	34	10.6%	28	15.9%	33	16.6%	32	35.9%	34	3.8%	34	21.9%
Single Pooled Regression over All Firm-Years														
Bond Returns[(a)]														
Regression 3	14,867[(c)]	4.2%	10,245	1.4%	1,850	9.7%	4,454	3.6%	1,931	11.1%	7,165	2.0%	7,153	7.9%
Regression 4	14,153[(d)]	5.1%	9,963	2.7%	1,645	4.4%	4,350	4.6%	1,843	8.5%	7,166	2.2%	6,488	7.8%
Bond Valuation[(b)]														
Regression 6	14,633[(e)]	19.1%	10,119	4.3%	1,803	11.6%	4,384	5.7%	1,922	27.8%	7,257	1.3%	7,229	20.8%
Regression 7	15,637[(f)]	25.3%	10,791	7.9%	1,955	7.3%	4,652	10.7%	2068	22.7%	7,831	1.0%	7,788	20.0%

[(a)] Bond returns are derived from, alternately, the return valuation equations (3) and (4). Results based on regression (3) (regression (4)) appear as the upper (lower) number in each cell. See section 4.2.1 for a description of these regressions.

[(b)] Bond valuations are derived from, alternatively, the valuation equations (6) and (7). Results based on regression (6) (regression (7)) appear as the upper (lower) number in each cell. See section 4.2.2 for a description of these regressions.

[(c)] The number of observations is smaller than 16,391, the full sample, due to missing data (107) observations, truncation (996 observations), and removal of influential observations using Cook's D Statistics (421 observations).

[(d)] The number of observations is smaller than 16,391, the full sample, due to missing data (2,238 observations).

[(e)] The number of observations is smaller than 16,391, the full sample, due to missing data (674 observations), truncation (785 observations), and removal of influential observations using Cook's D Statistics (299 observations).

[(f)] The number of observations is smaller than 16,391, the full sample, due to missing data (754 observations).

Table 5
Association between Security Valuation and Accounting Information
(Adjusted R^2 Values)[(a), (b)]

	No. of Observations	Bond Valuation		Stock Valuation
		Model (6)	Model (7)	
Yearly Average	34	19.7%	24.0%	55.9%
Firm-year Average	14,633[(c)]	19.1%	25.3%	43.6%
1975	119	17.1%	11.5%	67.6%
1976	146	13.7%	12.6%	67.1%
1977	143	12.5%	9.9%	64.3%
1978	139	9.8%	7.2%	60.6%
1979	138	7.5%	7.1%	59.5%
1980	143	5.8%	9.0%	59.0%
1981	374	6.2%	7.5%	59.8%
1982	360	6.8%	11.4%	63.9%
1983	389	11.0%	15.3%	66.5%
1984	410	13.4%	20.9%	68.9%
1985	393	15.8%	22.8%	69.6%
1986	415	19.6%	26.2%	69.2%
1987	419	23.1%	31.4%	67.9%
1988	410	24.0%	31.9%	66.6%
1989	399	24.6%	30.1%	64.3%
1990	398	23.2%	27.8%	63.7%
1991	413	21.4%	28.1%	61.6%
1992	389	19.7%	25.4%	60.1%
1993	403	18.5%	26.9%	57.8%
1994	446	18.7%	30.1%	55.8%
1995	459	17.9%	33.4%	51.3%
1996	522	20.3%	33.5%	45.8%
1997	554	21.8%	31.3%	38.6%
1998	632	23.5%	30.9%	34.4%
1999	679	26.5%	27.9%	32.0%
2000	707	29.3%	28.5%	33.2%
2001	663	27.5%	29.4%	38.0%
2002	682	25.7%	30.9%	44.4%
2003	682	22.5%	28.6%	49.5%
2004	668	18.5%	27.7%	51.6%
2005	646	19.6%	28.3%	52.4%
2006	614	27.9%	28.0%	51.7%
2007	563	30.5%	28.2%	50.9%
2008	59	37.1%	31.4%	49.9%

[(a)]The value reported for each year is the moving average over five years centered on that year (except for the first and last two years in the time-series). Tests on the time trend of the series reported in sections 6.2.1 and 6.2.2 are based on the original yearly values.
[(b)] The bond valuation models are described in section 4.2.2. The stock valuation model (regression (5)) is described in section 4.2.2
[(c)] The number of observations, 14,633 for model (6) and 15,637 for model 7, is smaller than the full sample of 16,391 due to observations with missing data, truncation of the extreme values of the distribution, and removal of influential observations.
.

Table 6
Association between Security Returns and Accounting Information
(Adjusted R^2 Values) [(a), (b)]

	No. of Observations	Bond Returns		Stock Returns
		Model (3)	Model (4)	Model (2)
Yearly Average	34	8.6%	10.3%	14.1%
Firm-year Average	14,867[(c)]	4.2%	5.1%	9.8%
1975	124	5.0%	--	13.0%
1976	149	3.9%	0.5%	11.9%
1977	145	3.1%	-0.9%	13.0%
1978	141	2.7%	-0.7%	16.2%
1979	144	1.8%	0.4%	15.4%
1980	151	1.9%	3.4%	14.5%
1981	380	2.4%	3.1%	14.4%
1982	380	3.3%	5.9%	14.7%
1983	398	4.1%	8.8%	16.1%
1984	425	5.9%	10.4%	17.8%
1985	413	5.6%	8.4%	15.6%
1986	426	6.2%	9.2%	14.7%
1987	413	10.1%	13.3%	16.8%
1988	402	11.0%	14.9%	16.1%
1989	400	10.9%	14.1%	15.4%
1990	396	10.9%	14.5%	16.2%
1991	410	11.2%	16.8%	17.5%
1992	384	7.4%	13.2%	13.9%
1993	404	7.1%	10.4%	10.6%
1994	449	5.7%	10.6%	12.2%
1995	466	6.4%	10.4%	11.0%
1996	527	6.4%	8.9%	10.9%
1997	562	6.4%	7.8%	9.0%
1998	647	9.9%	9.4%	10.5%
1999	698	9.8%	10.1%	10.1%
2000	723	10.3%	12.6%	13.7%
2001	664	16.6%	14.2%	14.9%
2002	689	17.4%	15.3%	17.8%
2003	699	12.9%	13.1%	16.7%
2004	690	13.5%	11.9%	14.2%
2005	668	14.7%	10.4%	12.2%
2006	628	12.2%	15.2%	14.1%
2007	577	13.1%	16.3%	13.6%
2008	64	16.2%	19.9%	14.7%

[(a)] The value reported for each year is the moving average over five years centered on that year (except for the first and last two years in the time-series). Tests on the time trend of the series reported in sections 6.2.1 and 6.2.2 are based on the original yearly values.
[(b)] The bond returns models are described in section 4.2.1. The stock returns model is described in section 4.2.1.
[(c)] The number of observations, 14,867 for the model (3) and 14,153 for model (4), is smaller than the full sample of 16,391 due to observations with missing data, truncation of extreme values of the distribution, and removal of influential observations.

Table 7
Excess Return from an Accounting-based Hedge Portfolio Strategy[a]

Year	No. of Observations	Bond Returns				Stock Returns Model (2)	
		Model (3)		Model (4)			
		Return[b]	%Market[c]	Return[b]	%Market[c]	Return	%Market
Yearly Average	34	3.7%	34.6%	3.0%	30.0%	14.2%	43.8%
Firm-year Average	13,054[d],[e]	4.0%	37.3%	3.3%	32.1%	14.4%	42.7%
1975	112	1.7%	12.1%	--	--	11.0%	38.6%
1976	134	1.5%	12.9%	0.7%	11.4%	11.0%	38.9%
1977	130	1.7%	15.9%	1.1%	17.2%	12.5%	42.1%
1978	128	2.1%	20.2%	1.6%	19.8%	16.1%	47.6%
1979	128	2.2%	22.9%	1.6%	20.9%	16.1%	47.6%
1980	132	3.5%	30.4%	3.0%	29.3%	17.8%	49.4%
1981	336	3.7%	32.0%	2.8%	24.9%	17.1%	47.4%
1982	328	3.8%	33.7%	3.1%	27.7%	16.0%	46.3%
1983	350	4.0%	32.6%	3.5%	28.5%	15.1%	47.8%
1984	370	4.6%	35.2%	4.1%	33.2%	15.8%	48.6%
1985	358	3.7%	32.7%	3.2%	29.6%	13.0%	46.5%
1986	374	3.7%	33.9%	3.3%	31.4%	12.6%	44.7%
1987	364	4.2%	39.5%	3.4%	33.0%	13.4%	47.9%
1988	354	4.3%	44.9%	3.3%	37.2%	12.2%	47.1%
1989	350	4.2%	43.6%	3.3%	37.1%	12.7%	46.2%
1990	348	4.4%	43.3%	3.5%	38.1%	14.1%	48.2%
1991	362	4.5%	45.2%	3.7%	41.6%	15.9%	53.5%
1992	344	3.7%	37.7%	3.4%	38.6%	14.0%	47.3%
1993	356	3.2%	33.9%	2.5%	29.7%	12.9%	42.1%
1994	392	2.7%	33.0%	1.8%	25.1%	12.6%	44.5%
1995	414	2.7%	35.7%	1.8%	27.0%	12.5%	42.2%
1996	462	2.8%	35.4%	1.9%	26.7%	12.5%	41.0%
1997	502	3.4%	38.3%	2.4%	27.6%	13.2%	37.4%
1998	570	4.5%	41.2%	3.9%	36.1%	16.1%	40.8%
1999	612	5.1%	42.3%	4.8%	41.4%	17.4%	39.9%
2000	632	5.3%	41.1%	5.0%	41.1%	17.3%	42.1%
2001	584	6.4%	44.1%	5.7%	43.0%	19.3%	41.9%
2002	608	5.8%	41.8%	5.0%	38.8%	19.3%	46.6%
2003	610	4.6%	39.1%	3.6%	33.2%	16.7%	43.4%
2004	608	3.8%	38.4%	2.8%	30.5%	13.2%	36.6%
2005	586	3.7%	38.2%	2.4%	26.5%	12.9%	36.0%
2006	556	3.1%	34.4%	2.1%	23.5%	10.2%	37.9%
2007	504	3.4%	35.6%	2.3%	23.1%	9.8%	37.4%
2008	56	3.8%	34.6%	2.6%	22.5%	9.1%	37.5%

[a] The value reported for each year is the moving average over five years centered on that year (except for the first and last two years in the time-series). Tests on the time trend of the series reported in sections 6.2.1 and 6.2.2. are based on the original yearly values.
[b] Return is the excess return from an accounting-based hedge portfolio strategy that takes a long (short) position in the security in firm-years for which the expected return (estimated alternately from regressions (3) and (4) for bonds and regression (2) for stocks) is in the highest 40% (lowest 40%) of the expected return distribution. For stocks, the excess return is market-adjusted return; for

bonds, the excess return is the difference between the bond's return and the return on Treasury notes matched on the bond's time-to-maturity and coupon rate (see section 4.2.3).

[c] %Market is the fraction that the excess return from the accounting-based strategy constitutes of the contemporaneous excess return that could be obtained through perfect foresight of the sign of the security's excess return ((see section 4.2.3).

[d] The number of observations is smaller than 16,391, the full sample, due to missing data (107 observations), and due to the computation of the %Market that does not consider 20% of the observations – see section 4.2.3 (representing 3,230 observations).

[e] The number of observations for the Bond Return model (4) is 11,352, which is smaller than 16,391, the full sample, due to missing data (2,201 observations), and due to the computation of the %Market that does not consider 20% of the observations (representing 2,838 observations) – see section 4.2.3.for the computation of %Market.

Table 8
Predictive Ability of Accounting Information with respect to Future Rating Downgrades

Year	Number of "Downgrades"[(a)]	Number of "No Downgrades"	Somers' D Statistic[(b)]
1979	12	109	47.5%
1980	16	111	54.7%
1981	33	279	38.5%
1982	27	276	46.7%
1983	26	274	57.0%
1984	19	279	63.7%
1985	13	270	77.9%
1986	19	245	73.9%
1987	8	227	66.2%
1988	13	214	69.1%
1989	8	198	97.2%
1990	21	222	81.9%
1991	21	255	50.9%
1992	16	231	78.7%
1993	20	177	69.5%
1994	6	180	92.7%
1995	13	180	88.6%
1996	10	187	69.6%
1997	17	207	60.7%
1998	5	243	94.7%
1999	13	227	41.8%
2000	8	263	82.7%
2001	17	261	61.1%
2002	18	311	60.6%
2003	13	334	48.0%
2004	22	331	64.7%
2005	30	295	46.4%
2006	26	308	63.3%
2007	12	307	69.5%

[(a)] "Downgraded" ("No Downgraded") bonds are defined on an annual basis as those in the lowest decile (highest nine deciles) of the bond excess return distribution for the year. Since four years of lagged data are required to identify a "downgrade" (see equation (8) in section 4.2.4), the results in the table begin with 1979 and end with 2007, since there are not enough "Downgraded" observations for the calculations of year 2008.
[(b)] Somers' D statistic, described in section 6.2.4, reflects the predictive power of the model used to estimate downgrades.

Table 9
Association between the Information Content of Accounting Numbers for Bondholders and Its Potential Determinants

	Coefficient Values[(a),(b)]							
Intercept, (β_0)	0.184 (2.15)**	0.049 (0.53)	-0.089 (-0.75)	-0.066 (-0.53)	-0.034 (-0.31)	-0.031 (-0.27)	-0.051 (-0.38)	-0.056 (-0.40)
$YSpread_t$ (β_1)	0.091 (4.18)***	0.064 (2.89)***	0.067 (3.16)***	0.063 (2.87)***	0.093 (4.50)***	0.094 (3.42)***	0.089 (3.41)***	0.092 (3.17)***
$Loss_t$ (β_2)		1.157 (2.69)***		0.431 (0.63)		-0.059 (-0.10)		-0.180 (-0.26)
Neg CFO_t (β_3)			2.535 (3.01)***	1.858 (1.36)			0.262 (0.22)	0.465 (0.33)
$Conservatism_{t-1}$ (β_4)					0.475 (3.21)***	0.482 (2.93)***	0.456 (2.64)**	0.463 (2.61)**
Adj. R^2	33.3%	44.1%	46.7%	45.6%	51.5%	49.5%	49.6%	47.7%
Number of Observations	34	34	34	34	29	29	29	29

[(a)] Coefficient values reported in the table are derived from estimating the time-series regression (10):
$INFO\_Index_t = \beta_0 + \beta_1(YSpread)_t + \beta_2 (Loss)_t + \beta3(Neg\ CFO)_t + \beta_4\ Conservatism_{t-1} + \upsilon_{t.}$
[(b)] t-statistics are provided in parentheses, with asterisks indicating significance at the 10% (*), 5% (**) and 1% (***) levels, respectively, using a two-tailed test.

Variable Definitions

$INFO\_Index_t$ for each year is obtained by ranking the individual years by each of the three cross-sectional measures of information content, %Market, adjusted R^2 from the return regression (3), and adjusted R^2 from the valuation regression (6). Years are then divided into deciles based on the distribution of the 34 yearly values of the measure, with years with the highest (lowest) value of the measure assigned to the decile 9 (0). The value of the INFO_Index for year t is obtained by summing the ranks of the three measures for that year and dividing them by 27 so as to produce standardized ranking between 0 and 1(see section 6.2.4).

$YSpread_t$ is the mean yield spread (or the "excess" yield) at the end of year t across all bonds. It is measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of a matched Treasury note as described in section 4.1.

$Loss_t$ is the percentage of firms with negative earnings at the end of year t.

Neg CFO_t is the percentage of firms with a negative cash flow from operations at the end of year t.

$Conservatism_{t-1}$ is a measure of conservatism defined as the coefficient α_3 in regression (9): $\Delta NI_{i,t} = \alpha_0 + \alpha_1 D\Delta NI_{i,\,t-1} + \alpha_2\Delta NI_{i,\,t-1} + \alpha_3 D\Delta NI_{i,\,t-1}{*}\Delta NI_{i,\,t-1} + \varepsilon_{i,\,t}$ where ΔNI is the change in income excluding extraordinary items from fiscal year t-1 to t, scaled by the beginning book value of total assets and $D\Delta NI$ is a dummy variable set equal to one if ΔNI in the prior year is negative and zero otherwise. The cross-sectional regression is estimated each year (t=0) from firm-years pooled over the five years t-2 to t+2.The sign of the resulting coefficient is multiplied by negative one.

Table 10
Association between the Information Content of Accounting Numbers for Bondholders and Its Potential Determinants

	Coefficient Values [(a),(b)]							
Intercept (β_0)	0.124 (5.75)***	0.079 (3.51)***	0.103 (4.53)***	0.075 (3.21)***	0.110 (3.50)***	0.062 (1.92)*	0.089 (2.70)**	0.054 (1.62)**
$YSpread_{j,t}$ (β_1)	0.042 (12.0)***	0.032 (8.86)***	0.036 (9.84)***	0.030 (8.03)***	0.038 (8.76)***	0.028 (6.31)***	0.030 (6.61)***	0.024 (5.23)***
$SignE_{j,t}$ (β_2)		0.327 (7.09)***		0.298 (5.69)***		0.347 (6.02)***		0.316 (4.90)***
$SignCF_{j,t}$ (β_3)			0.238 (4.45)***	0.094 (1.60)			0.287 (4.05)***	0.136 (1.75)*
$C^*Score_{j,t-1}$ (β_4)					0.046 (1.22)	0.054 (1.42)	0.055 (1.41)	0.064 (1.61)
Pseudo R^2	7.5%	8.4%	7.6%	8.2%	5.7%	6.9%	5.6%	6.5%
Number of Observations[(c)]	12,519	12,519	11,792	11,792	8,478	8,478	7,974	7,974

[(a)] Coefficient values are derived from regression (11) estimated from the pooled sample of firm-years as follows: $DR_{j,t} = \beta_0 + \beta_1(YSpread)_{j,t} + \beta_2(SignE)_{j,t} + \beta 3(SignCF)_{j,t} + \beta_4(C^*Score)_{j,t-1} + \upsilon_{j,t}$.

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

[(c)] The number of observations used to estimate each of the regressions varies based on data availability. Estimating all regressions from a sample of 7,974 observations for which all variables are available leads to essentially the same results in terms of the value and significance of the coefficients.

Variable Definitions

$DR_{j,t}$ is a dummy variable receiving the value of 1 if the return from an investment strategy based on a perfect foresight of accounting numbers (as described in section 4.2.3) has the same sign as the realized return and 0 otherwise.

$YSpread_t$ is the mean yield spread (or the "excess" yield) at the end of year t across all bonds. The yield spread is measured as the difference between the yield-to-maturity on the bond and yield-to-maturity of a matched Treasury note as described in section 4.1.

$SignE_{j,t}$ is the dummy variables receiving the value of 1 if net income is negative at end of year t and 0 otherwise.

$SignCF_{j,t}$ is the dummy variables receiving the value of 1 if cash flows from operations is negative at end of year t and 0 otherwise.

$C^*Score_{j,t-1}$ is a measure of firm-year conservatism derived from a linear function of firm-specific characteristics (13) as follows: $C^*Score = \delta_{1,t} + \delta_{2,t}SIZE_{it} + \delta_{3,t}M/B_{it} + \delta_{4,t}Lev_{it}$. $SIZE_{it}$ is firm size, M/B_{it} is the market-to-book ratio, Lev_{it} is leverage, and the coefficients δ_i are estimated from the regression (12) an annual cross-sectional regression, as follows: $\Delta NI_{i,t} = \beta_1 + \beta_2 D\Delta NI_{i,t-1} + \Delta NI_{i,t-1}(\mu_1 + \mu_2 Size_{i,t} + \mu_3 M/B_{i,t} + \mu_4 Lev_{i,t}) + D\Delta NI_{i,t-1} * \Delta NI_{i,t-1}(\delta_1 + \delta_2 Size_{i,t} + \delta_3 M/B_{i,t} + \delta_4 Lev_{i,t}) + (\lambda_1 Size_{i,t} + \lambda_2 M/B_{i,t} + \lambda_3 Lev_{i,t} + \lambda_4 D\Delta NI_{i,t-1}Size_{i,t} + \lambda_5 D\Delta NI_{i,t-1}M/B_{i,t} + \lambda_6 D\Delta NI_{i,t-1}Lev_{i,t}) + \varepsilon_{i,t}$. C^*Score is multiplied by negative one in estimating regression (11).