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# "Does the Deferred Tax Asset Valuation Allowance Signal Firm Creditworthiness?"

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# Does the Deferred Tax Asset Valuation Allowance Signal Firm Creditworthiness?

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## Abstract

Recent years have seen a dramatic decline in the creditworthiness of firms and increasing concern regarding the reliability of credit estimates provided by rating agencies. In this paper, I find evidence that a particular account, the valuation allowance for deferred tax assets, helps predict the future creditworthiness of a firm. Under the provisions of SFAS No. 109, a firm records a deferred tax asset provided they expect to generate sufficient taxable income to realize the asset in the form of tax savings in the future. If a firm does not expect to generate sufficient taxable income to realize the asset, a valuation allowance is created to reduce the balance. As a result, the deferred tax asset valuation allowance indicates management's expectation of future taxable income, which could be informative in predicting the ability of the firm to make future interest and principal payments on debt. Alternatively, the valuation allowance may not be informative regarding creditworthiness if it is a result of overly conservative accounting practices or if it is used as an earnings management tool. I document a positive (negative) association between increases in the valuation allowance and the cost of debt (contemporaneous and future credit ratings), evidence that is consistent with increases in the valuation allowance signaling a decline in firms' creditworthiness.

## 1. Introduction

Recent years have seen a dramatic decline in the creditworthiness of firms and increasing concerns over the reliability of credit estimates provided by rating agencies (IMF 2009, G20 2008). In this study I use material increases in the deferred tax asset valuation allowance as an implicit forecast by management of poor future performance and, I examine changes in the deferred tax asset valuation allowance as a signal of firm creditworthiness. Specifically, I examine whether the information conveyed by material increases in the deferred tax asset valuation allowance are associated with (i) increases in a firm's cost of debt; (ii) decreases in credit ratings issued by Standard & Poor's (S&P); and (iii) the timing of the decreases in credit ratings.[1] Statement of Financial Accounting Standards No. 109 (SFAS No. 109), now part of Accounting Standards Codification section 740 (ASC 740), requires the creation of a deferred tax asset to recognize the expected future tax savings realized when there are temporary differences between book income and taxable income. After deferred tax assets have been recognized, they must then be reduced through the use of a valuation allowance (a contra-asset) if it is more likely than not that the deferred tax asset will not be realized. Managers make a determination about the magnitude of the allowance (subject to external audit) based on expectations about future taxable income.

To the extent that a positive relation between future taxable income and future accounting earnings exists, the SFAS No. 109 provisions create a unique setting where management provides a public assessment of low (or negative) earnings persisting into the future. This assessment could be informative in assessing firms' future performance and firm value. Dhaliwal

[1] I focus on increases, as opposed to decreases, in the deferred tax asset valuation allowance account for two reasons. First, increases are more common than decreases and, as a result, are observable for a greater number of firms. Second, in order to include a broad sample of firms in my tests, I utilize an algorithm to identify significant increases in the deferred tax asset valuation allowance account. Because of the mechanics of SFAS No. 109, a similar algorithm is not feasible for decreases in the deferred tax asset valuation allowance account.

et al. (2010) examine the differential persistence of accounting losses based on firms' tax attributes. They document evidence consistent with losses being most persistent for firms in which a full deferred tax asset valuation allowance is established against the current period net operating loss (NOL). Persistent losses are a negative signal of creditworthiness. Therefore, I expect a negative association between increases in the deferred tax asset valuation allowance and proxies for firm creditworthiness.

Prominent examples of firms recording large increases in the deferred tax asset valuation allowance include Bethlehem Steel's 2001 increase of $1.2 billion and General Motor's 2007 increase of almost $40 billion. Both of these examples occurred prior to poor future performance at the respective firms, eventually leading to large scale corporate bankruptcies. These anecdotes are consistent with increases in the deferred tax asset valuation allowance indicating a decrease in firm creditworthiness.

The change in the deferred tax asset valuation allowance is an appealing signal to use in assessing creditworthiness for the following reasons. Unlike other management issued guidance about future performance such as earnings forecasts, or third party assessments of creditworthiness such as credit ratings, the deferred tax asset valuation allowance is a required disclosure under U.S. GAAP that all firms (that do not meet the more likely than not criteria for recognition of a deferred tax asset) are required to make. Additionally, the valuation allowance is an audited disclosure in the financial statements. This third party verification of the disclosure potentially increases the reliability of the information contained within the valuation allowance and therefore the decision usefulness of the disclosure.

I begin my analysis using the cost of debt as a proxy for creditworthiness. A decline in creditworthiness will manifest through an increase in the borrowing rate. I expect a positive

relation between material increases in the deferred tax asset valuation allowance and the cost of debt. Provided there is an association between material increases in the deferred tax asset valuation allowance and creditworthiness, credit rating analysts are expected to incorporate this information into their ratings. Credit rating analysts face a trade-off between issuing an unbiased rating and the reputational costs of issuing a more lax rating (Mathis et al. 2009). Additionally, Kraft (2010) provides evidence that, although rating agencies are for the most part efficient in processing accounting information, analysts may not make sufficiently conservative soft adjustments (as opposed to hard adjustments to financial statement line items). It is even less clear *when* the information contained within increases in the deferred tax asset valuation allowance will be incorporated into credit ratings. Credit analysts are specifically excluded from the provisions of Regulation Fair Disclosure (FD). As a result, analysts at rating agencies may have access to confidential information about firms. If the analysts are able to use their exclusion from the provisions of Regulation FD in order to gain access to private information, then changes in credit ratings will occur prior to the public disclosure of material increases in the valuation allowance at the end of the fiscal period. Alternatively, credit analysts may be slow to revise their ratings due to concerns that a rating downgrade may become a self-fulfilling prophecy (Moody's 2002). Therefore, whether changes in credit ratings occur prior to or following material increases in the deferred tax asset valuation allowance is an empirical question.

I find evidence consistent with material increases in the valuation allowance for deferred tax assets helping predict the future creditworthiness of a firm. I observe an increase in the cost of debt in the year following a firm recording a valuation allowance against the deferred tax asset. In addition, I document a negative relation between S&P issuer credit ratings and material increases in the deferred tax asset valuation allowance during the fiscal period in which a firm

records the allowance and in the period following the disclosure of a material increase in the valuation allowance. The negative relation between future credit ratings and increases in the deferred tax asset valuation allowance is stronger for the initial disclosure of a material increase in the valuation allowance relative to subsequent increases. This result is consistent with the initial disclosure of an increase in the deferred tax asset valuation allowance providing a relatively stronger signal than subsequent disclosures. I also examine the timeliness of the initial disclosure. Timeliness is measured in relation to reported book losses. A material increase in the valuation allowance after relatively fewer periods with reported book losses is a more timely source of information than a material increase in the valuation allowance that occurs after many consecutive years of losses. The timeliness of the initial disclosure also increases the strength of the relation between increases in the deferred tax asset valuation allowance and lower future credit ratings.

This study is of interest for several reasons. First, understanding the creditworthiness of a firm is an important issue, particularly in today's economy. The recent financial crisis has highlighted the importance of understanding the creditworthiness of parties with whom a firm contracts. In this study, I identify material increases in the deferred tax asset valuation allowance as a widely available summary measure that signals a significant decrease in a firm's creditworthiness.

Second, I contribute to the literature examining the role of financial reporting information in the formation of credit ratings. Academics have called for research that investigates the use of accounting information by lenders (Holthausen and Watts 2001). In a survey conducted by Graham and Harvey (2001), managers identify credit ratings as the second greatest concern when determining capital structure of the firm. Credit ratings play an important role in the capital

markets and, in recent years, credit ratings have become increasingly important due to firms shifting debt financing from commercial banks towards the rated capital markets (Pettit et al. 2004). Given the importance of credit ratings, relatively little is known about the rating process. In response to concerns about the reliability and integrity of the credit rating process, the Securities and Exchange Commission (SEC) has called for more accountability among the credit rating agencies and greater disclosures regarding the rating process (SEC 2003; 2009). Additionally, the New York Attorney-General's office recently announced it is investigating credit rating agencies and their independence from Wall Street banks (Farrell 2010).

Third, this study contributes more broadly to our understanding of the information contained within the tax accounts in the financial statements. There is an ongoing debate among policymakers and within the tax literature regarding the desirability of conforming firms' two major performance reports, the financial accounting income statement and the tax return (commonly known as book-tax conformity). Prior research argues that the conformity of these two measures of income would result in a loss of information, despite the fact that one of the sources, taxable income, is not directly observable for most public firms (see Hanlon et al. 2005, Hanlon et al. 2008).[2] I provide further evidence on the information content of these two sources of performance reporting.

The remainder of this paper is organized as follows. Section 2 discusses related literature and develops the hypotheses. Section 3 details the sample selection and describes the research design. Section 4 presents results and the significance of findings. Finally, Section 5 concludes.

## 2. Prior Literature and Hypotheses Development

Deferred tax assets and liabilities are the result of temporary differences between book

[2] Taxable income must be inferred through financial accounting information as tax returns are usually not made available to investors.

and taxable income. A firm determines cumulative temporary differences, applies the tax rate at which these differences are expected to reverse, and presents the resulting amount as a deferred tax asset or deferred tax liability. The deferred tax expense for the year is the net change in the firm's deferred tax assets and liabilities. In a sample of Fortune 50 firms, Poterba et al. (2007) document substantial heterogeneity in the source of the timing differences that generate their deferred tax assets and liabilities. The largest sources of timing differences that generate deferred tax assets for their sample firms were NOLs and tax credit carryforwards, and Employment and Post-employment Benefits. The largest sources of the timing differences that generate deferred tax liabilities were Property, Plant & Equipment and Leases. After deferred tax assets have been recognized, firms must reduce deferred tax assets by a valuation allowance if "it is more likely than not (a likelihood of more than 50 percent) that some portion or all of the deferred tax assets will not be realized" (ASC 740-10-30-5). The primary source of realization for deferred tax assets is future taxable income.[3] To the extent a positive relation between future taxable income and future cash flows exists, the deferred tax asset valuation allowance provides financial statement users, including credit rating analysts, with an assessment by management of the likelihood of future profitability. Prior research related to the valuation allowance can be organized into two groups: (i) research focused on the use of the valuation allowance as an earnings management tool; and (ii) research focused on the extent to which equity investors and financial analysts use the information in the deferred tax asset valuation allowance account.

### *2.1 Earnings Management and the Deferred Tax Asset Valuation Allowance*

The provisions of SFAS No. 109 allow for considerable latitude in the timing and amount of valuation allowance managers record. Consistent with this fact, prior studies have documented

[3] Additional sources of realization for deferred tax assets are reversals of existing temporary differences, taxable income in prior carryback years, and tax-planning strategies.

the use of the valuation allowance as an earnings management tool. Schrand and Wong (2003) test for earnings management at banks through manipulation of the deferred tax asset valuation allowance. Their evidence indicates that most banks do not record a valuation allowance to manage earnings but rather follow the guidelines of SFAS No. 109. However, they find that if a bank is sufficiently well capitalized to absorb the current-period impact on capital, the amount of the valuation allowance increases with a bank's capital. Also, in the later years of their sample, bank managers adjust the valuation allowance to smooth earnings. Frank and Rego (2006) provide evidence on earnings management via the valuation allowance in a broader sample of firms. Their results provide evidence that firms use the valuation allowance to smooth earnings toward the mean analyst forecast. Christensen et al. (2008) examine whether firms increase "big bath" behavior using the valuation allowance. After modeling the expected valuation allowance, they find that firms that create a larger-than-expected valuation allowance have poorer future operating performance and that subsequent valuation allowance reversals are used to meet or beat the mean analyst earnings forecast. These prior studies are indicative of firms possessing substantial flexibility on the timing and amount of changes in the valuation allowance.

Overall, prior research has documented evidence consistent with earnings management through the deferred tax asset valuation allowance account, but not at levels sufficient to overwhelm the information in the account to assist in the prediction of future accounting performance. In Hanlon and Heiztman's (2010) survey of tax research, they opine that ". . . the incremental contribution of additional studies on the use of the valuation allowance to manage earnings will be limited. There are likely more interesting issues to address" (p. 19). In this study, I examine the relation between increases in the valuation allowance and decreases in firm

creditworthiness, building on the extant literature and documenting a potential use of the information contained within the valuation allowance account.

### *2.2 Equity Markets and the Deferred Tax Asset Valuation Allowance*

Ayers (1998) was among the first to examine deferred taxes under SFAS No. 109.[4] He finds that SFAS No. 109 disclosures are incrementally informative to the disclosures under APB 11. Although it is not the focus of his study, in a value-relevance regression of the components of deferred tax assets and deferred tax liabilities, he observes a significant negative coefficient on the valuation allowance, consistent with the disclosure being value relevant. Miller and Skinner (1998) examine the determinants of the deferred tax asset valuation allowance and find that the valuation allowance is positively associated with deferred tax assets, tax credits and NOLs, and negatively associated with higher levels of expected future income.[5]

As discussed in section 2, when managers create or increase the valuation allowance account, they are publicly signaling poor expected future performance. This view is consistent with anecdotes and examples from the popular press indicating that increases in a firm's deferred tax asset valuation allowance are predictive of future earnings problems. Amir and Sougiannis (1999) examine investor and analyst valuation of tax carryforwards and document evidence consistent with analysts considering earnings of firms with tax carryforwards to be less persistent

[4] Prior to the Ayers (1998) study, Givoly and Hayn (1992) examine the market reaction to the Tax Reform Act of 1986 (TRA86) statutory federal tax rate reduction. They document that firms with larger deferred tax liabilities experience larger increases in the value of equity. They also document that the reduction in the statutory tax rate increases a firm's equity value for firms with greater growth in liabilities and higher likelihood of future losses (both proxies for likelihood of future deferred tax liability settlement). The Givoly and Hayn (1992) study was conducted pre-SFAS NO. 109, and as a result they do not report any results relating to deferred tax assets (which did not exist under APB 11).

[5] Behn, et al. (1998) also examine the determinants of the deferred tax asset valuation allowance and provide empirical evidence on the association between the recognized deferred tax asset valuation allowance and certain variables put forth as sources of evidence of future realization in the FASB's SFAS No. 109. They find a negative association between the valuation allowance and deferred tax liabilities (a proxy for future book-tax reversals), order backlog, current period earnings, effective tax rate, the deferred tax asset associated with other post-employment benefits, and market value, and a positive association with financial distress and material contingent liabilities.

because of the increased likelihood of future losses. Consistent with the expectation of lower future performance, they also document a significant negative relation between the valuation allowance and the present value of expected earnings (5 years of analyst forecasts). In an event study around the initial disclosures of changes in the deferred tax asset valuation allowance, Kumar and Visvanathan (2003) observe negative abnormal announcement period returns. Dhaliwal et al. (2010) examine whether tax expense and other tax disclosures provide incremental information about the persistence of book losses for firms reporting accounting losses (loss firms). They classify book loss firms into three groups based upon whether the loss firm appears to have (1) positive taxable income, (2) a net operating loss creating a deferred tax asset, or (3) a net operating loss with a full valuation allowance against the NOL (current year deferred tax benefit). The authors find that accounting losses are least persistent for firm-years that are likely to report positive taxable income (group 1) and most persistent for firm-years in which a full valuation allowance is established against the current period NOL (group 3). They also document significant mean abnormal long window returns, results consistent with investors not correctly pricing the information contained within the valuation allowance.

### *2.3 Hypotheses*

Where prior research has focused on the relation between the deferred tax asset valuation allowance and equity performance, I examine the relation between the deferred tax asset valuation allowance and debt. The public debt market is a key component of the capital markets. In 2009, almost $1.1 trillion in corporate debt was underwritten; whereas, firms issued $263 billion in equity (SIFMA 2010). Regardless of firm performance, a firm will never pay creditors more than the promised interest and principal payments, but if a firm experiences financial difficulties they may default and pay creditors less than the promised cash flows. In this sense, a

creditor's claim is parallel to a written put option (Black and Scholes 1973). As a result, creditors are primarily concerned with the downside risk of a firm. When managers record a material increase in the valuation allowance against a firm's deferred tax assets, they are publically signaling their expectation of poor future performance. Prolonged periods of losses reduce firm net assets and increase the probability of insolvency. As a result, I expect firms that materially increase the deferred tax asset valuation allowance to have a decline in creditworthiness. Accordingly, I hypothesize the following:

*H1: There is a negative association between material increases in the deferred tax asset valuation allowance and firm creditworthiness.*

In my empirical analysis I examine the relation between material increases in the deferred tax asset valuation allowance and firm creditworthiness using the cost of debt as a proxy for creditworthiness. A firm that experiences a decline in creditworthiness will face higher borrowing costs in the future. Given an association between material increases in the deferred tax asset valuation allowance and firm creditworthiness, credit rating analysts are expected to incorporate this information into their credit ratings of firms increasing a valuation allowance. It is less clear *when* the information contained within the increases in the deferred tax asset valuation allowance will be incorporated into credit ratings.

Credit ratings play two important roles in the capital markets. First, credit ratings have a role in valuation by disseminating information to market participants. Credit rating agencies gather and analyze information relevant for assessing credit quality. The results of their analyses are made widely available to investors, portfolio managers, and others. Credit ratings also facilitate contracting: credit ratings are used in financial regulation, loan agreements, bond covenants, and other financial agreements (Frost 2007). Credit rating agencies consider public

and private, financial and non-financial criteria when making rating decisions. Public information includes SEC filings, news reports, industry reports, bond and stock price trends, and proxy statements. Nonpublic information is often provided by management pursuant to a confidentiality agreement. Meetings with management, questionnaires, and information request letters are used to gather information. Annual and periodic meetings between issuers and credit rating agencies are common (SEC 2003).

Credit rating agencies are specifically excluded from the provisions of Regulation FD.[6] As a result, credit analysts at rating agencies may have access to confidential information before it is released to the public. Jorion et al. (2005) examine the effect of credit rating changes on stock prices and find that the informational effect of downgrades and upgrades is much greater in the post-FD period, evidence that is consistent with more private information being revealed through credit ratings post Regulation FD. It is possible that credit rating analysts use their access to private information and are able to ascertain the private information prior to management's disclosure of a change in the deferred tax asset valuation allowance. If credit rating analysts are able to use their exclusion from Regulation FD and gain access to private information in order to make more timely changes in their ratings, then changes in credit ratings should lead or occur within the same period as, increases in the deferred tax asset valuation allowance.[7] Conversely, credit rating agencies may be slow to revise their ratings even if they

[6] As part of the recently enacted Dodd-Frank Wall Street Reform and Consumer Protection Act, credit rating agencies exclusion from Regulation FD has been removed. In a letter to Issuers and Arrangers dated August 16, 2010, S&P expressed their view that ".. the elimination of the rating agency exemption by itself should not affect the manner in which issuers share confidential information with us as part of the ratings process." They note that, in their opinion Regulation FD was never intended to apply to sharing confidential information with rating agencies and an additional exemption in Regulation FD, permitting the sharing of confidential information with any person who agree to keep the information confidential, will still apply to S&P.

[7] Note, I do not explicitly test for a change in the timeliness of credit ratings pre- and post-Regulation FD, as the absolute level of access to private information enjoyed by credit analysts did not change pre- vs. post-Regulation FD. The level of access to private information available to credit analysts *relative* to other market participants changed pre-/post-Regulation FD; it is this variation in relative level of access that Jorian et al. (2005) examine.

possess this information before it is public, possibly due to concerns that a rating downgrade may become a self-fulfilling prophecy (Moody's 2002). Additionally, prior research has documented that credit ratings of certified agencies, such as S&P's, are inherently "sticky," particularly in the case of credit rating downgrades (Beaver et al. 2006). As a result, whether or not credit rating analysts use information within material increases in the deferred tax asset valuation allowance in contemporaneous fiscal period credit rating decisions is an empirical question.[8] Accordingly, I hypothesize the following:

*H2: There is a negative association between material increases in the deferred tax asset valuation allowance and contemporaneous fiscal period credit ratings.*

Credit analysts may be unable or unwilling to use their access to private information to preempt the negative information related to future performance contained within material increases in the deferred tax asset valuation allowance. If this is the case, contemporaneous fiscal period credit ratings will not be associated with increases in the deferred tax asset valuation allowance. The information related to future performance contained within material increases in the valuation allowance will be captured in subsequent credit ratings and there will be a negative relation between material increases in the deferred tax asset valuation allowance and *future* credit ratings. Note that it is possible that an initial reaction consistent with hypothesis 2 may not fully account for the information in increases in the deferred tax asset valuation allowance and, as a result, there will be a leading and subsequent relation between credit ratings and increases in the valuation allowance. Accordingly, I hypothesize the following:

*H3: There is a negative association between material increases in the deferred tax asset valuation allowance and future credit ratings.*

[8] I measure contemporaneous fiscal period credit ratings at the end of the fiscal year for which a firm books a material increase in the valuation allowance. Measurement of the credit rating on this date is prior to the release of the 10-k and likely before the public disclosure of the increase in the valuation allowance.

It is possible that I will not observe the hypothesized relation between material increases in the deferred tax asset valuation allowance and either contemporaneous fiscal period or future credit ratings for several reasons. First, as discussed in section 2.1, prior studies have documented the use of the deferred tax asset valuation allowance as an earnings management tool. To the extent that managers are opportunistically manipulating earnings through this account, changes in the balance of the account will not be informative regarding future creditworthiness. Second, although a change in the deferred tax asset valuation allowance impacts tax expense and the balance of the deferred tax accounts, it does not appear directly within the balance sheet or income statements; rather, it is disclosed within the tax footnote. Prior research indicates that financial statement users react less to disclosed information than to recognized information. This lower level of reaction may be due to one of two factors that are difficult to disentangle. The information may not be relevant or the market may not efficiently process the information (Bernard and Schipper 1994). If credit rating agencies do not believe that increases in the deferred tax asset are reliable or do not efficiently process the information then I will not observe a relation with leading or future credit ratings.

**3. Research Design and Sample Selection**

In this study, I use material increases in the deferred tax asset valuation allowance as an implicit forecast by management of poor future performance. I focus on material increases in order to capture the essence of my hypothesized relation, a decline in management's expectation of future overall firm performance. Management may record small increases in the valuation allowance for reasons other than a decline in expectation of future overall firm performance. For example, a firm may have NOLs in a foreign subsidiary that cannot be used against income of the parent. The valuation allowance against these NOLs would not be indicative of

management's expectations of overall firm performance. For example, in 2009 Merck & Co. Inc. recorded a $101.4 million increase in their deferred tax asset valuation allowance (against a gross deferred tax asset of $6,858.3 million) despite a reported net income of $12,901.3 million. In their tax footnote Merck noted, "The valuation allowance in 2009 primarily relates to various foreign entity NOL carryforwards resulting primarily from losses generated by restructuring actions" (Merck & Co. Inc. 2009, p. 173).

To examine the validity of using material increases in the deferred tax asset valuation allowance as an implicit management forecast of poor future performance, I begin by examining one-year ahead management forecasts for firms recording a material increase in the valuation allowance.[9] Figure 3 plots the following one-year ahead items: actual earnings, management forecast of earnings, and management forecast optimism (management earnings forecast – actual earnings). Data are from First Call's CIG database and observations are scaled by lagged fiscal period end stock price. Mean actual and forecasted earnings for both groups are positive, this is likely due to First Call reporting earnings numbers that are adjusted to exclude unusual items that a majority of the contributing analysts deem non-operating and/or non-recurring. Consistent with the notion that poor future performance follows a significant increase in the valuation allowance, actual earnings in the period following a valuation allowance are significantly lower than earnings of firms that did not record a significant increase in the valuation allowance account ($p < .0001$). Management forecast of next period earnings are also significantly lower for firms that record a significant increase in the valuation allowance ($p < .0001$).

[9] One-year ahead management forecast is defined as the first earnings forecast issued by the firm beginning 365 days, but no less than 180 days prior to the forecasted year-end data. I include only forecasts from firms that issued a forecast in the prior year to attempt to control for the decision to release a forecast. These requirements result in 2,386 unique firm-year observations.

There are several advantages to the use of the deferred tax asset valuation allowance as a forecast of future earnings as compared to actual management issued forecasts. First, firms that do not meet the more likely than not criteria for recognition of a deferred tax asset are required by GAAP to create or increase a valuation allowance. There is no similar requirement under GAAP to issue management forecasts. Second, deferred tax assets and related valuation allowances are part of the financial statements, and are therefore subject to audit. In contrast, management forecasts are not audited and are potentially susceptible to additional management bias. Consistent with this contention, the forecasted change in earnings is significantly greater in firm-years with an increase in the valuation allowance ($p < .0001$), and management forecast are significantly more optimistic when a firm records a valuation allowance against their deferred tax asset ($p < .0001$). Based on the preceding, management appears to be relatively more conservative in their audited disclosure of a deferred tax asset valuation allowance and relatively more aggressive in their unaudited voluntary disclosure of an earnings forecast. These preliminary findings are consistent with the deferred tax asset valuation allowance providing a more reliable forecast of future performance than management earnings forecasts.

### *3.1 Sample Selection*

I obtain financial statement data from the Compustat Annual database, prime loan interest rates from the Federal Reserve, and credit rating data from the Compustat Ratings database.[10] I begin my sample period in 1993, so that all sample firms have adopted SFAS No. 109, and I use all firm-year observations through 2009 with the required data available. Consistent with prior research examining the informativeness of the financial reporting of tax information, I restrict my sample to firms that are incorporated in the U.S. because foreign firms face different tax and

[10] Data available through the Federal Reserve Statistical Release website at http://www.federalreserve.gov/releases/h15/data.htm

financial accounting rules, and that are not financial institutions (SIC codes 6000 – 6999) or public utilities (SIC codes 4900 – 4999), as regulated firms have different financial reporting requirements then nonregulated firms (Lev and Nissim 2004; Hanlon 2005; Hanlon et al. 2005). The final sample for the cost of debt tests and credit rating tests consists of 30,455 firm-year observations (5,023 firms) and 8,812 firm-year observations (1,373 firms) respectively.

### *3.2 Hypothesis 1: Creditworthiness*

I estimate the relation between increases in the deferred tax asset valuation allowance and firm creditworthiness using the cost of debt as a proxy for creditworthiness. I test hypothesis 1 using the following ordinary least squares model:

$$\begin{aligned} INTEXP_{it+1} = {} & \alpha + \beta_1 * VA_{it} + \beta_2 * PRIME_{it} + \beta_3 * ROA_{it} + \beta_4 * CFO_{it} + \beta_5 * LOSS_{it} + \beta_6 * NUMLOSS_{it} \\ & + \beta_7 * AGE_{it} + \beta_8 * LEV_{it} + \beta_9 * SIZE_{it} + \beta_{10} * INTCOV_{it} + \beta_{11} * CAPINT_{it} + \beta_{12} * SUB_{it} \\ & + \beta_{13} * NEGEQ_{it} + \beta_{14} * BTM_{it} + \beta_{15} * INTEXP_{it} + \sum \beta_t * YEAR_{it} + \sum \beta_{FF48} * IND_{it} + \varepsilon_{it} \quad [1] \end{aligned}$$

The dependent variable in the model ($INTEXP_{it+1}$) is a firm's cost of debt in year *t+1*. INTEXP is calculated as interest expense (Compustat data item xint) divided by average debt (Compustat data items dltt + dlc).[11] This measure is a blend of both the historical and current cost of debt. I rely on at least some component of the measure capturing the current cost of debt. This would be true for firms that: (i) issue new public or private debt in the year, (ii) renegotiate the rate on existing debt during the year, and/or (iii) have performance pricing in their debt contracts. Reliance on these factors is supported by the fact that a substantial amount of new debt

[11] Although this measure of the cost of debt is somewhat crude and measured with noise, I choose this definition for several reasons. First, although there are undoubtedly some components of the cost of debt not captured in equation [1], I include current year cost of debt in the model. The inclusion of this control will capture much of this unmodeled variation in the cost of debt. The $R^2$s of my regression analysis provided confirmation of this assertion. The inclusion of current year cost of debt increases the explanatory power of the model by a factor of 3, from approximately 7.5% to approximately 30.5% (16.0% to 41.3% when a larger portion of the tails is winsorized). Second, the inputs into the measure are well populated in the Compustat annual file. This allows for a broad range of firm-year observations and helps to ensure that my results are not driven by the small subset of loss firms with the necessary data to calculate a more refined measure of the cost of debt (for example – publicly traded bonds yields or credit default swaps).

is issued every year, as noted in section 2.3 almost $1.1 trillion in corporate debt was underwritten in 2009 (SIFMA 2010). Additionally, performance pricing is prevalent in debt contracts. Asquith et al. (2005) note that in their sample of 8,761 debt contracts ($1.8 trillion of loans) 41% (54% by value) have performance pricing provisions. In a debt contract with performance pricing the interest rate spread is linked to the borrower's performance through the use of financial ratios or credit ratings. Interest-increasing (decreasing) performance pricing increases (reduces) interest rate spreads if credit quality deteriorates (improves).

The independent variable of interest ($VA_{it}$) is an indicator variable designed to capture material increases in the deferred tax asset valuation allowance. I use an algorithm developed by Dhaliwal et al. (2010) and set the indicator variable ($VA_{it}$) equal to 1 for firm-year observations where firm *i* books a full valuation allowance against a deferred tax asset (loss carryforward) created in year *t* (see Appendix A for a more detailed explanation). Consistent with hypothesis 1, I predict a negative coefficient on $VA_{it}$.

In modeling the cost of debt, I include a control variable for the average prime rate ($PRIME_{it}$) in a given year *t* as reported by the Federal Reserve. The prime rate is comprised of the risk-free rate and a default premium for the lender's most creditworthy customers. Including the average prime rate for the year controls for changes in the underlying cost of capital (Pitman and Fortin 2004). In addition to controlling for economy-wide time series variation in prime lending rates, I also include controls for additional firm specific variables where prior research has documented an association with the cost of debt (Blackwell et al. 1998, Sengupta 1998, Pitman and Fortin 2004, Jiang 2008). I control for profitability by including the following variables: return on assets ($ROA_{it}$) in year *t*, cash flow from operations ($CFO_{it}$) in year *t*, an indicator variable equal to one if a firm has a book loss in the current year ($LOSS_{it}$) and zero

otherwise, and a count variable for the number of contiguous book losses up to and including the current year ($NUMLOSS_{it}$). Inclusion of $NUMLOSS_{it}$ is also appealing because it controls for the possibility that increases in the deferred tax asset valuation allowance are merely capturing firms that have had a string of bad performance, information that is already publicly available through examination of the historical financial statements of the firm. In fact, SFAS No. 109 (ASC 740-10-30-21) states "Forming a conclusion that a valuation allowance is not needed is difficult when there is negative evidence such as cumulative losses in recent years." The $NUMLOSS_{it}$ variable is exposed to a potential survivorship bias in that the longer a firm has been reported in the Compustat database, the greater the potential for a string of continuous losses. To mitigate this concern, I include firm age ($AGE_{it}$) as an additional control variable.

I control for leverage ($LEV_{it}$) using the ratio of debt to total assets at the end of year *t*. I control for size by including the natural logarithm of total assets at the end of year *t* ($SIZE_{it}$). To control for a firms' ability to make future interest and principal payments, I include the firm's interest coverage ratio ($INTCOV_{it}$). I control for differences in assets structure by including capital intensity ($CAPINT_{it}$), because firms with greater capital intensity present lower risk to debt providers. Indicator variables are included to capture if the firm has outstanding subordinate debt ($SUB_{it}$) or has negative book value of shareholder's equity ($NEGEQ_{it}$). Controls are also included for the book-to-market ratio ($BTM_{it}$) and cost of debt in year *t* ($INTEXP_t$). Finally, I control for year ($YEAR_{it}$) and industry ($IND_{it}$) fixed effects to capture factors that may influence the cost of debt within an industry and through time that are not captured by my other control variables. Variable definitions are presented in Appendix A.

### *3.3 Hypothesis 2: Contemporaneous Fiscal Period Credit Ratings*

I test my hypothesized relation between issuer credit ratings and the deferred tax asset

valuation allowance by estimating an ordered logit model. Ordinary least squares estimation is not appropriate in this setting, as credit ratings convey ordinal risk assessments where the differences across credit ratings are not equally spaced. I use the following model to examine whether credit analysts use their access to private information and incorporate the negative information conveyed by material increases of the deferred tax asset valuation allowance prior to the disclosure of the increase.

$$CR_{it} = f(\beta_0 + \beta_1 * VA_{it} + \beta_2 * ROA_{it} + \beta_3 * CFO_{it} + \beta_4 * LOSS_{it} + \beta_5 * NUMLOSS_{it} + \beta_6 * AGE_{it} + \beta_7 * LEV_{it} + \beta_8 * SIZE_{it} + \beta_9 * INTCOV_{it} + \beta_{10} * CAPINT_{it} + \beta_{11} * SUB_{it} + \beta_{12} * PBTD_{it} + \beta_{13} * NBTD_{it} + \beta_{14} * CR_{it-1} + \sum \beta_t * YEAR_{it} + \sum \beta_{FF48} * IND_{it} + \varepsilon_{it}) \quad [2]$$

The dependent variable in the model ($CR_{it}$) is a firm's S&P issuer credit rating at the end of year *t*. [12] The S&P issuer credit rating is a current opinion of an issuer's overall creditworthiness; this opinion focuses on the obligor's capacity and willingness to meet its long-term financial commitments. Credit ratings from S&P range from a rating of D, for payment default on financial commitments, to AAA, for firms with an extremely strong capacity to meet financial commitments (Standard & Poor's 2009). For the regression analysis, credit rating letters scores are converted into a numerical scale from 1 (D) to 22 (AAA) with greater numbers assigned to higher issuer credit ratings, see Table 5 Panel A. In the ordered logit regression, each value of the dependent variable is assigned a separate intercept. To ensure my results are not driven by the relation between increases in the valuation allowance and credit ratings within some of the rating levels, I also repeat the analyses grouping credit ratings into 7 broad

[12] I implement a levels model, as opposed to a changes model, for the following reason. Although estimating an order logit model does not require observations for the dependent variable to be equally spaced intervals, it does require that observations are ordinal. This may not be true for a changes model of credit ratings. For example, a 1 unit credit rating downgrade (coded as -1) from BBB- to BB+ (investment grade to noninvestment grade) may be more important than a 2 unit credit rating downgrade (coded as -2) from AA+ to AA-. In untabulated tests I repeat my analysis with the change in credit rating as my dependent variable and include the following controls $\Delta ROA_{it}$, $\Delta CFO_{it}$, $LOSS_{it}$, $NUMLOSS_{it}$, $AGE_{it,}$ $\Delta LEV_{it}$, $\Delta SIZE_{it}$, $\Delta INTCOV_{it}$, $\Delta CAPINT_{it}$, $SUB_{it}$, $PBTD_{it}$, $NBTD_{it}$. Inferences from these results are consistent with those from the levels specification.

categories ($CatCR_{it}$), see Table 5 Panel A. These groupings are consistent with prior research examining the relation between credit ratings and accounting information (Ashbaugh-Skaife et al. 2006).

My independent variable of interest in equation [2] is an indicator variable designed to capture material increases in the valuation allowance account ($VA_{it}$) and is coded as discussed in section 3.2. Consistent with hypothesis 2, I predict a negative coefficient on $VA_{it}$. In modeling issuer credit ratings, I include control variables for additional firm specific characteristics where prior research has documented an association with credit ratings (Kaplan and Urwitz 1979; Ziebart and Reiter 1992; Ayers et al. 2010). See section 3.2 for discussion of these variables.

I also include controls for the difference between book and taxable income as book-tax differences may signal changes in earnings quality or changes in off-balance sheet financing. Prior research has documented a significant relation between both positive and negative book-tax differences and firm credit ratings (Ayers et al. 2010, Crabtree and Maher 2009); as a result, I include a separate control variable for each of these two groups ($PBTD_{it}$ and $NBTD_{it}$ respectively) to ensure the relation between increases in the deferred tax asset valuation allowance and issuer credit ratings is incremental to the information contained within book-tax differences. Ayers et al. (2010) and Crabtree and Maher (2009) examine the relation between credit ratings and overall book-tax differences. In their studies, the book-tax difference is viewed as a signal of earnings quality, off-balance-sheet financing activity, or tax reporting aggressiveness. In his discussion of the Ayers et al. study, Wilson (2010) suggests that researchers must understand what is driving the association between book-tax differences and credit ratings before researchers can begin to include a measure of changes in book-tax

differences into a model of the determinants of credit rating. I document a possible source of the information related to book-tax differences.

A control for year *t - 1*'s credit rating is also included. The prior year credit rating control is necessary for two reasons: (1) firms that book a material increase in the deferred tax asset valuation allowance are often firms with lower credit ratings, compared to sample firms that did not booking a material increase in the valuation allowance (mean lagged crediting rating for VA=1/VA=0 firms of B+/BBB-); and (2) credit ratings are inherently "sticky" - approximately 75% of Compustat firm-year observations have no change in credit rating (see figure 1). Finally, I control for year ($YEAR_{it}$) and industry ($IND_{it}$) fixed effects to capture factors that may influence credit ratings within an industry and through time that are not captured by my other control variables.[13] Variable definitions are presented in Appendix A.

***3.4 Hypothesis 3: Future Credit Ratings***

Next, I examine whether credit analysts use the negative information conveyed in material increases in the deferred tax asset valuation allowance in the period following a firm booking the increase in the valuation allowance against their deferred tax asset. To examine future credit ratings, I modify equation [2] as follows:

$$CR_{it+1} = f(\beta_0 + \beta_1 * VA_{it} + \beta_2 * ROA_{it} + \beta_3 * CFO_{it} + \beta_4 * LOSS_{it} + \beta_5 * NUMLOSS_{it} + \beta_6 * AGE_{it} + \beta_7 * LEV_{it} + \beta_8 * SIZE_{it} + \beta_9 * INTCOV_{it} + \beta_{10} * CAPINT_{it} + \beta_{11} * SUB_{it} + \beta_{12} * PBTD_{it} + \beta_{13} * NBTD_{it} + \beta_{14} * CR_{it} + \sum \beta_t * YEAR_{it} + \sum \beta_{FF48} * IND_{it} + \varepsilon_{it}) \quad [3]$$

Consistent with hypothesis 3, I predict a negative coefficient for $\beta_1$. All variables are defined as in section 3.3 with the exception of the dependent variable which is measured at the end of year *t + 1*, the period following a firm booking a material increase in the deferred tax

[13] As an alternative to fixed effects, in untabulated tests, I correct for cross-sectional and times-series dependence using cluster-robust standard errors. Results after this correction are qualitatively and quantitatively similar to those reported in the tables.

asset valuation allowance, and the control for the prior year credit rating which is measured at the end of year *t*. I choose one year ahead credit ratings as a cut off for the following reasons: (1) credit ratings (particularly the credit ratings issued by certified agencies such as S&P) are often slow to react to information (Pinches and Singleton 1978, Beaver et al. 2006), and a one year horizon allows for time for rating agencies to react; (2) as shown in figure 2, credit rating changes appear to occur regularly throughout the year (i.e., there does not appear to be clustering around financial report dates or other significant events); and (3) prior research examining future credit ratings often use a one year horizons as well, so using the same horizon allows for comparability to those studies.

***3.5 Additional Cross Sectional Tests***

Given that material increases in the deferred tax asset valuation allowance convey information related to decreased creditworthiness, the incremental amount of information provided by management's disclosure of an increase in the deferred tax asset valuation allowance is greatest when management has not recorded a material increase in the deferred tax asset valuation allowance in the prior year. The initial disclosure of a material increase in the valuation allowance provides a relatively stronger signal than subsequent disclosures, as it is likely to provide new information that is not in the prior year's disclosure, unlike subsequent material increases in the valuation allowance.

To examine whether the initial material increase in the valuation allowance provides greater information regarding firm creditworthiness, as compared to a valuation allowance disclosure in subsequent years, I make an additional modification to equations [1], [2], and [3]. I add an indicator variable, $INITIAL\_VA_{it}$, to the regression model designed to capture the year in which a firm initial records a material increase in the valuation allowance. $INITIAL\_VA_{it}$ is

coded as 1 for firm-years where $VA_{it}$ is equal to 1 (i.e., firm *i* recorded a significant deferred tax asset valuation allowance during the year) and $VA_{it-1}$ is equal to 0 or missing (i.e., the firm did not record a material increase in the valuation allowance in the prior year). I predict a negative coefficient on $INITIAL\_VA_{it}$ in all three models.

In Statement of Financial Accounting Concepts No. 8 (FASB 2010), the Financial Accounting Standards Board details the characteristics of information that make it a desirable commodity; relevance and faithful representation. Timeliness is identified as a characteristic that enhances the usefulness of information that is relevant and faithfully represented, and is defined as having information available to decision makers before it loses its capacity to influence decisions. More timely information is more relevant for decision making by financial statement users. An increase in the deferred tax asset valuation allowance will be most informative to users when it is disclosed in a timely fashion.

To examine this final conjecture, I modify equations [1], [2], and [3] by adding an additional independent variable, $TIMELY\_VA_{it}$, to the regression model (in addition of INITIAL_VA). $TIMELY\_VA_{it}$ is a measure of the timeliness of the initial disclosure of a material increase in the deferred tax asset valuation allowance. Timeliness is measured as how early in a string of book losses the initial material increase in the valuation allowance is recorded (i.e., a material increase in the valuation allowance in the first year with a book loss is more timely than when the initial material increase in the valuation allowance is recorded after three consecutive years of reported losses). The variable is coded so that greater values of $TIMELY\_VA_{it}$ represent more timely disclosures. The variable is defined as one divided by one plus the number of contiguous prior periods with a reported book loss ($LOSS_{it} = 1$) up to and including the year of the initial disclosure of a deferred tax asset valuation allowance

(INITIAL_VA$_{it}$ = 1). For example, if the initial disclosure of a valuation allowance occurs following three years of consecutive book losses, TIMELY_VA$_{it}$ = 0.25 (1 / [1 + 3]). In firm-years without an initial disclosure of a valuation allowance (i.e., INITIAL_VA$_{it}$ = 0), TIMELY_VA$_{it}$ equals zero. I predict a negative coefficient on TIMELY_VA$_{it}$.

## 4. Findings

### *4.1 Hypothesis 1: Creditworthiness*

Table 1 presents descriptive statistics and correlations for the cost of debt sample. All continuous variables are winsorized at the 1st and 99th percentiles. The mean cost of debt (INTEXP$_{t+1}$) is 10.1%, approximately 3.0% above the mean prime rate for my sample period. There is some negative skew in return on assets (ROA) and cash flow from operations (CFO). 37% of firm-year observations report a loss, and 27% of observations in the sample include a material increase in the valuation allowance against deferred tax assets created in the year of the loss. Consistent with prior research, approximately three quarters of loss firms record a material increase in the valuation allowance (Dhaliwal et al. 2010 report that 78% of loss firms in their broad sample record a material increase of the deferred tax asset valuation allowance). Table 1 Panel B presents univariate correlations. Consistent with hypothesis 1, one year ahead cost of debt is positively correlated with material increases in the valuation allowance (0.14, $p < .0001$).

Table 1 Panel C presents the number of material increases in the deferred tax asset valuation allowance observations by year. There is some clustering of material increases in the valuation allowances around 2000. This clustering may be due to poor economic conditions during that time, potentially causing managers to revise their expectation of future taxable income downwards and be more inclined to determine that deferred tax assets do not meet the

more likely than not condition of realization included in SFAS No. 109. I include year fixed effects in my multivariate analysis to control for this possibility.

Table 2 presents additional descriptive statistics after separating the sample into firms that record a material increase in the valuation allowance and the remaining sample firms. Panel A presents the descriptive statistics for the cost of debt sample. Firms that record a material increase in the valuation allowance are significantly smaller (total assets and market capitalization) and younger than firms that do not ($p < .05$). Additionally, the valuation allowance firms are less profitable, in terms of both ROA and CFO, than control firms, both in the year they recorded a material increase in the valuation allowance and the next five years into the future ($p < .05$). The observed lower future profitability of the valuation allowance firms is further evidence consistent with a material increase in the valuation allowance acting as an implicit forecast by management of poor future performance. For comparison purposes, Panel B presents the descriptive statistics for the credit rating sample firms (discussed below in section 4.2).

Table 3 presents the regression results related to hypothesis 1. Column 1 contains the coefficients and p-values for equation [1]. I observe a significant positive coefficient ($p = 0.003$) on the VA variable, consistent with hypothesis 1. The observed coefficient of 0.568 on the VA variable is economically significant, representing an increase of 57 basis points in one-year ahead cost of debt. Column 2 contains the coefficients and p-values when INITIAL_VA is included in the regression model. Again, the coefficient on VA is positive and significant ($p < .0001$), but the coefficient on INITIAL_VA is negative and significant ($p < 0.015$). This result is consistent with material increases in the valuation allowance indicating a decline in creditworthiness in firms that record multiple consecutive material increases in the valuation allowance, but not for the initial material increase (combined coefficient on VA and

INITIAL_VA is 0.220, p = 0.382). An alternative plausible explanation for the lack of significance in these tests is that the decline in creditworthiness associated with recording an initial material increase in the deferred tax asset valuation allowance does not materialize in the cost of debt within a year of the disclosure. Column 3 contains the coefficients and p-values when TIMELY_VA is included in the regression model. The coefficient on VA remains positive and is significant (p <.0001), but the coefficient on TIMELY_VA is not significant. The results in column 3 are consistent with those reported in column 2, material increases in the valuation allowance are associated with the cost of debt but the relation is not significantly greater for the initial material increase, even when it is more timely relative to a string of losses.

To ensure results are not being driven by extreme observations, I repeat my analysis after winsorizing at the 5th and 95th percentiles. Panel B reports the regression estimates, which are also consistent with hypothesis 1, although the estimated coefficients on the VA variable are smaller in magnitude as compared to my baseline tests. Inferences are also consistent with those discussed above in relation to the INITIAL_VA and TIMELY_VA tests.[14]

### *4.2 Hypothesis 2: Contemporaneous Fiscal Period Credit Ratings*

Table 4 Panel A presents descriptive statistics for the credit rating sample. All continuous variables are winsorized at the 1st and 99th percentiles. The mean and median credit rating is 13 (BBB-), and credit ratings range from D through AAA (see Table 5 Panel A). Consistent with the requirement that all observations have a credit rating, sample firms are large (mean total assets $2.6 billion) and profitable (mean return on assets of 3.2% and only 24% of firm-years report an accounting loss). 13% of firm-year observations record a material valuation allowance against deferred tax assets created in the year, approximately half the number of loss observations. The

[14] In untabulated results I truncate at the 5th and 95th percentiles. Results after truncation are qualitatively and quantitatively similar to those reported in Table 3.

proportion of loss firms booking a material increase in the valuation allowance against deferred tax assets created in the year is smaller than in the cost of debt sample; this smaller percentage is not surprising given the sample restrictions and bias towards larger, more profitable firms. Of the 13% of firm-year observations reporting a material increase in the deferred tax asset valuation allowance, 56% do not record a material increase in the valuation allowance in the prior year, indicating that my sample of valuation allowance firms is not simply comprised of "serial allowers" who book an allowance every year. As a result, there is potentially new information when a firm records a deferred tax asset valuation allowance, as the disclosure is not simply the same as the prior year.

Table 4 Panel B presents univariate correlations. Consistent with hypothesis 2 and 3, contemporaneous fiscal period and one-year ahead credit ratings both exhibit significant negative correlation with material increases in the deferred tax asset valuation allowance ($p < .0001$). Additionally, the initial instance of a deferred tax asset valuation allowance by a firm is significantly negatively correlated with one-year ahead credit ratings. Table 4 Panel C presents the number of material increases in the deferred tax asset valuation allowance observations by year. Consistent with the cost of debt sample reported in Table 1 there is some clustering of material valuation allowance increases in the early 2000s. Again, year fixed effect controls are included in the multivariate analysis.

Table 2 Panel B presents additional descriptive statistics for the credit rating sample after separating firms that record a material increase in the valuation allowance from the remaining sample firms. The credit rating sample firms, for both the VA=0 and VA=1 groups are significantly larger, older, and more profitable than the cost of debt sample firms ($p < .05$). Within the credit rating sample, firms that record a material increase in the valuation allowance

are significantly smaller (total assets and market capitalization) and younger than the control firms ($p < .05$). Furthermore, the VA = 1 firms are less profitable, in terms of both ROA and CFO, than the control firms in the year of the material increase in the valuation allowance and in the following five fiscal periods ($p < .05$).

Table 5 Panel A presents the distribution of credit ratings in the sample. The vast majority of ratings (approximately 90%) are between B- and A+ with relatively few observations in the tails.[15] Table 5 Panel B presents the number of credit rating changes in my sample by year. Observations are spread throughout my sample period with some clustering in the early 2000s. Approximately 10% of firm-year observations experience a credit rating upgrade, 15% of firm-year observations experience a credit rating downgrade, and 75% of firm-year observations do not change.

Figure 4 presents further univariate evidence consistent with hypotheses 2 and 3. Firms that book a material increase in the deferred tax asset valuation allowance experience a mean credit rating downgrade of 0.44 in the year of the material increase in the valuation allowance and a mean downgrade of 0.43 in the following year. Figure 5 presents preliminary univariate evidence consistent with the initial material increase in the valuation allowance providing greater information regarding firm creditworthiness, as compared to a valuation allowance disclosure in a subsequent year. Firms that book an initial material increase in the valuation allowance experience a mean credit rating downgrade of 0.44 in the year of the initial increase and a mean downgrade of 0.58 in the following year.[16]

[15] In untabulated tests, to ensure results are not driven by firms in extreme financial distress, I remove firm-year observations with a credit rating of D or SD (default and selective default respectively). Results after this data screen are qualitatively and quantitatively similar to those reported in the Tables.

[16] The differences between VA = 0 and VA = 1 groups in Figure 4 and Figure 5 are significant at greater than the 5% level in both time periods.

Table 6 presents the regression results related to hypothesis 2. Column 1 contains the coefficients and p-values for equation [2]. Consistent with hypothesis 2, I observe a significant negative coefficient (p = 0.003) on the VA variable. Column 2 contains the coefficients and p-values when INITIAL_VA is included in the ordered logit model. Again, the coefficient on VA is negative and significant (p = 0.013), but the coefficient on INITIAL_VA is not significantly different than zero. Column 3 contains the coefficients and p-values when TIMELY_VA is included in the ordered logit model. The coefficient on VA remains significantly negative (p = 0.008), but the coefficient on TIMELY_VA is not significantly different than zero. These results are consistent with no association between contemporaneous fiscal period credit ratings and the initial disclosure of a material increase in the deferred tax asset valuation allowance but lower credit ratings preceding subsequent consecutive material increases in the deferred tax asset valuation allowance. Alternatively stated, credit analysts appear to incorporate subsequent consecutive material increases in the valuation allowance into their ratings prior to the disclosure but do not preempt the initial material increase.[17]

In Panel B, I re-estimate equation [2], substituting the broad categories 1 through 7 for the numerical coding of credit ratings. Results are consistent with hypothesis 2, I observe a significant negative coefficient on VA under all three specifications of the model but, as in Panel A, I do not observe a significant coefficient on either the INITIAL_VA or TIMELY_VA variables. Overall, results are consistent with material increases in the valuation allowance exhibiting a strong negative correlation with contemporaneous (year *t*) credit ratings. These findings are consistent with the view that for "serial allowers" (i.e., the disclosure of a material increase in the valuation allowance subsequent to the initial disclosure), credit analysts use their

[17] As in the cost of debt tests, an alternative plausible explanation for the lack of significance is that the decline in creditworthiness associated with recording a material increase in the deferred tax asset valuation allowance does not materialize in the credit ratings within a year of the disclosure.

access to private information to incorporate the negative signal of firm creditworthiness into their ratings prior to the disclosure of a material increase in the deferred tax asset valuation allowance.

### *4.3 Hypothesis 3: Future Credit Ratings*

As discussed in section 4.2, univariate results in Table 3 and Figure 4 are consistent with hypothesis 3. Table 7 presents the regression results related to hypothesis 3. In Panel A, column 1 contains the coefficients and p-values for equation [3]. Consistent with hypothesis 3, I observe a significant negative coefficient ($p = 0.028$) on the VA variable. Column 2 contains the coefficients and p-values when INITIAL_VA is included in the ordered logit model. The coefficient on VA is no longer significant, but the coefficient on INITIAL_VA is negative and significant ($p = 0.004$). Column 3 contains the coefficients and p-values when TIMELY_VA is included in the regression model. As in column 2, the coefficient on VA is not significantly different then zero. The coefficient on INITIAL_VA is negative and significant ($p < .0001$), and the coefficient on TIMELY_VA is also negative and significant ($p < .0001$). These results are consistent with hypothesis 3, a negative association between material increases in the deferred tax asset valuation allowance and future (year $t + 1$) issuer credit ratings. The evidence presented in column 2 and 3 is consistent with the relation between future credit ratings and material increases in the valuation allowance being driven by the initial disclosure of a material increase and the relation being strongest when the disclosure is relatively timely.

In Table 7 Panel B, I re-estimate equation [3], substituting the broad categories 1 through 7 for the numerical coding of credit ratings. Results are consistent with hypothesis 3. In column 1, I observe a negative coefficient on $VA_{it}$ ($p = 0.054$). Consistent with the results in Panel A, the coefficient on $VA_{it}$ is not significant after including the INITIAL_VA and TIMELY_VA variables, but the coefficient on INITIAL_VA and TIMELY_VA are both significantly negative.

Overall, the results for hypothesis 3 are also consistent with the initial recording of a material increase in the deferred tax asset valuation allowance exhibiting a stronger negative correlation with future credit ratings as compared to all deferred tax asset valuation allowances. Additionally, the evidence is consistent with increased timeliness of the initial disclosure increasing the strength of the negative relation between increases in the valuation allowance against deferred tax assets and future credit ratings.

### *4.4 Economic Significance*

I examine the economic significance of the relation between material increases in the deferred tax asset valuation allowance and credit ratings using the change in the predicted probability of a credit rating upgrade or downgrade for a firm that records a material increase in the valuation allowance, holding all other variables constant at their mean values. Table 8 Panel A presents the results for contemporaneous fiscal period credit rating changes. For the average firm, a material increase in the valuation allowance in year *t* is associated with a 28.6% proportional decrease in the probability of an upgrade in credit rating during year *t* and a 12.3% proportional increase in the probability of a downgrade during year *t*.

In Table 8 Panel B, I repeat this analysis but examine future (one year ahead) credit ratings upgrades and downgrades. I also calculate the changes in probability for the significant cross sectional determinants of the relation, the initial material increase in the valuation allowance and timeliness. For the average firm, recording a material increase in the valuation allowance in year *t* is associated with a 19.0% proportional decrease in the probability of an upgrade in credit rating during year *t + 1* and a 11.6% proportional increase in the probability of a downgrade during year *t + 1*. The initial disclosure of a material increase in the valuation allowance is associated with a 18.3% proportional decrease in the probability of an upgrade in

credit rating during year *t + 1* and a 21.8% proportional increase in the probability of a downgrade. Finally, I illustrate the impact of a one standard deviation change in the timeliness of the initial material increase in the valuation allowance. For the average firm, a one standard deviation increase in timeliness is associated with a 32.4% proportional decrease in the probability of an upgrade in credit rating during year *t + 1* and a 23.6% proportional increase in the probability of a downgrade.

**5. Conclusion**

As highlighted by the recent financial crisis, understanding the creditworthiness of a firm is an important issue. In this study, I examine the relation between increases in the deferred tax asset valuation allowance and firm creditworthiness, and the incorporation of the information in the valuation allowance into credit ratings. Increases in the deferred tax asset valuation allowance are an attractive signal of creditworthiness for several reasons. In contrast to other forms of management issued guidance of future performance such as earnings forecasts, or third party assessments of creditworthiness such as credit ratings, the deferred tax asset valuation allowance is a required disclosure under U.S. GAAP. As a result, the disclosure is required for all firms who do not meet the more likely than not threshold for recognition of their deferred tax assets. The GAAP requirement ensures that this disclosure, or lack thereof, is available from all firms. Additionally, the valuation allowance is an audited disclosure in the financial statements. The third party verification of the disclosure increases the reliability of the information contained within the valuation allowance and therefore the decision usefulness of the disclosure.

I document evidence consistent with material increases in the valuation allowance providing a widely available signal of firm creditworthiness. I observe an increase in the cost of debt in the year following a firm recording an increase in the valuation allowance against the

deferred tax asset. In addition, I document a negative relation between issuer credit rating and increases in the deferred tax asset valuation allowance during the fiscal period in which a firm records the allowance and in the period following the disclosure of an increase in the valuation allowance. The relation between increases in the deferred tax asset valuation allowance and future credit ratings is stronger for the initial recording of a valuation allowance, as the initial disclosure of a deferred tax asset valuation allowance provides a relatively stronger signal than subsequent disclosures. The timeliness of the initial disclosure (measured as the number of consecutive prior periods with reported book losses) also increases the strength of the relation between the deferred tax asset valuation allowance and lower future credit ratings.

The findings of this study are of interest to academics and practitioners. Creditworthiness and credit ratings play an important role in capital markets. Concerns about the reliability and integrity of the credit rating process have lead to recent calls by the SEC for greater disclosures regarding the rating process and more accountability among the credit rating agencies. In addition, the New York attorney-general's office is investigating rating agencies and their independence from Wall Street banks. This study contributes to our understanding of the use of accounting information in the rating process. Also, I contribute to our understanding of the information contained within the tax accounts in the financial statements and to the ongoing debate regarding the desirability of book-tax conformity. I provide further evidence documenting an additional information source, the deferred tax asset valuation allowance, which is a result of having two sources of performance reporting, tax and financial reporting.

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## Appendix A
## Variable Definitions

*Dependent Variables*

$INTEXP_{it}$

The cost of debt for the firm in year t. $INTEXP_{it}$ is calculated as interest expense (xint) divided by average debt (dltt + dlc).

$CR_{it}$

The firm's S&P issuer credit rating (splticrm) at fiscal year-end t. Credit ratings are reported as D (payment default) to AAA (extremely strong capacity to meet financial commitments) and are converted into numerical values from 1(D) to 22 (AAA).

$CatCR_{it}$

The firm's S&P issuer credit rating (splticrm) at fiscal year-end t grouped into seven broad categories. See Table 5 Panel A for specific coding.

*Independent Variables of Interest*

$VA_{it}$

An indicator variable designed to capture when a firm books a material increase in the valuation allowance against a deferred tax asset (loss carryforward) created in year t. $VA_{it}$ is set equal to 1 for firm-years with accounting losses (pi < 0) in year t and zero or positive U.S. deferred tax expense (txdfed >= 0). When a firm reports negative pretax income there should be a deferred tax benefit (i.e. the creation of a deferred tax asset for the loss carryforward). In order to create a deferred tax asset a firm must recognize a deferred tax benefit on the income statement. If U.S. deferred tax expense is zero or positive (i.e. not a deferred tax benefit), then a valuation allowance has been recorded against the "new" deferred tax asset. Dhaliwal et. al report that the algorithm correctly classifies approximately 90 percent of a test sample of 180 observations.

$INITIAL\_VA_{it}$

An indicator variable designed to capture the initial year a firm books a material increase in the valuation allowance against a deferred tax asset (loss carryfoward) created in year t. $INITIAL\_VA_{it}$ is set equal to 1 for firm-years with $VA_{it} = 1$ and the lagged value of $VA_{it} = 0$ or missing.

$TIMELY\_VA_{it}$

A measure of the timeliness of the initial deferred tax asset valuation allowance coded so that greater values represent timelier disclosures. The variable is coded as zero for firm-years where $INITIAL\_VA_{it} = 0$. Where $INITIAL\_VA_{it} = 1$, $TIMELY\_VA_{it}$ is defined as one divided by one plus the number of continuous prior periods with a reported loss ($LOSS_{it} = 1$) up to and including the year of the initial disclosure of a deferred tax asset valuation allowance.

*Control Variables*

$PRIME_{it}$

The average majority prime rate charged by banks on short-term loans to business, quoted on an investment basis for year t as reported by the Federal Reserve.

$ROA_{it}$

The firm's net income (ni) in year t, deflated by total assets at the end of year t-1 (at).

$CFO_{it}$

The firm's cash flow from operations (oancf) in year t, deflated by total assets (at) at the end of year t-1.

$LOSS_{it}$

An indicator variable designed to capture when a firm reports loss. $LOSS_{it}$ is set equal to 1 for firm-years where net income (ni) is less than zero and set equal to zero otherwise.

$NUMLOSS_{it}$

The number of contiguous prior periods with a reported loss ($LOSS_{it} = 1$) for the firm.

$AGE_{it}$

The number of years since the firm first appeared in Compustat (fyear – year1).

$LEV_{it}$

The firm's long term debt (dltt) divided by total assets (at) at fiscal year end t.

$SIZE_{it}$

The natural logarithm of the firm's total assets (at) at the end of year t.

$INTCOV_{it}$

The natural logarithm of one plus the firm's interest coverage ratio. Interest coverage ratio is calculated as income before interest and depreciation (oibdp + xint) divided by interest expense (xint) at the end of year t.

$CAPINT_{it}$

The firm's property, plant and equipment net of depreciation (ppent) at the end of year t, deflated by total assets (at) at the end of year t-1.

$SUB_{it}$

An indicator variable designed to capture firm-years with outstanding subordinated debt. $SUB_{it}$ is set equal to 1 for firm-years with a positive value for subordinated debt (ds) and set equal to zero otherwise.

$NEGEQ_{it}$

An indicator variable designed to capture when the firm has negative shareholders equity. $NEGEQ_{it}$ is set equal to 1 for firm-years where total stockholders equity (seq) is less than zero and set equal to zero otherwise.

$BTM_{it}$

The firm's book value of common stockholder's equity (ceq) divided by its market value of equity (prcc_f*csho) at the end of year t.

Book-tax difference

Book income less estimated taxable income. Book income is calculated as pre-tax book income (pi) less minority interest (mii). Taxable income is estimated as the sum of federal tax expense (txfed) and foreign tax expense (txfo) divided by 35% (the top U.S. statutory tax rate) less the change in NOL carryforward (dtlcf). Where federal or foreign tax expense are missing, taxable income is estimated as total income tax expense (txt) less deferred income tax expense (txdi) divided by 35%. Book-tax differences are deflated by total assets (at) at the end of year t-1.

$PBTD_{it}$

The decile rank for firm-years with positive book-tax differences (defined above). $PBTD_{it}$ is set equal to zero for firm-years with negative book-tax differences.

$NBTD_{it}$

The decile rank for firm-years with negative book tax differences (defined above). $NBTD_{it}$ is set equal to zero for firm-years with positive book-tax differences.

$YEAR_{it}$

An indicator variable set equal to 1 for all observations in year t and zero otherwise.

$IND_{it}$

An indicator variable set equal to 1 for all observations in a given industry and zero otherwise. I use the Fama French 48 industry classification to create the $IND_{it}$ indicators.

**Figure 1**
**Frequency of Credit Rating Changes by Magnitude**

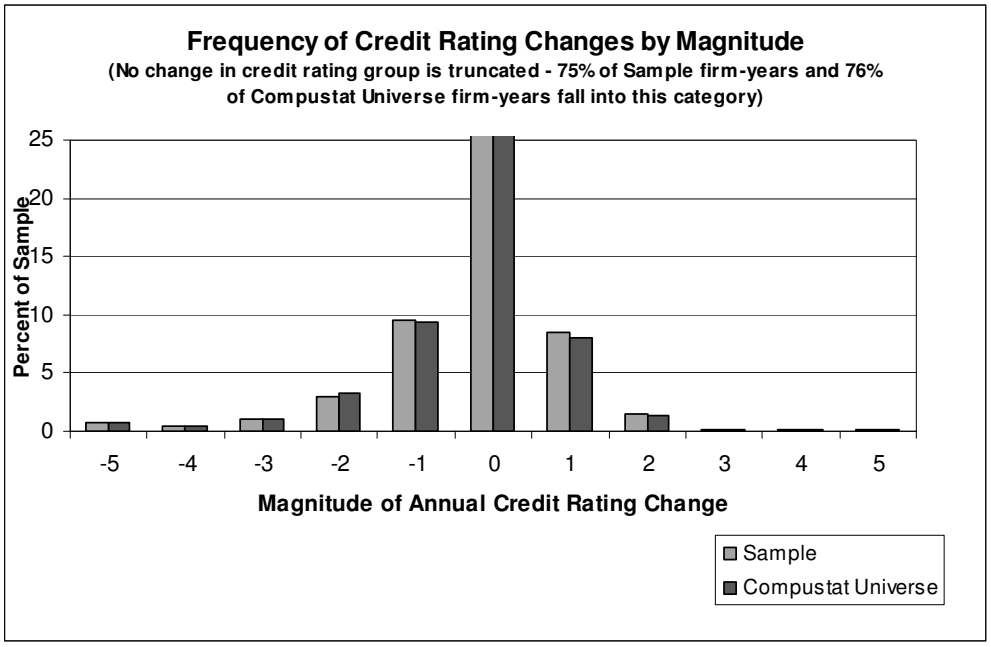


**Figure 2**
**Frequency of Credit Rating Changes by Month**

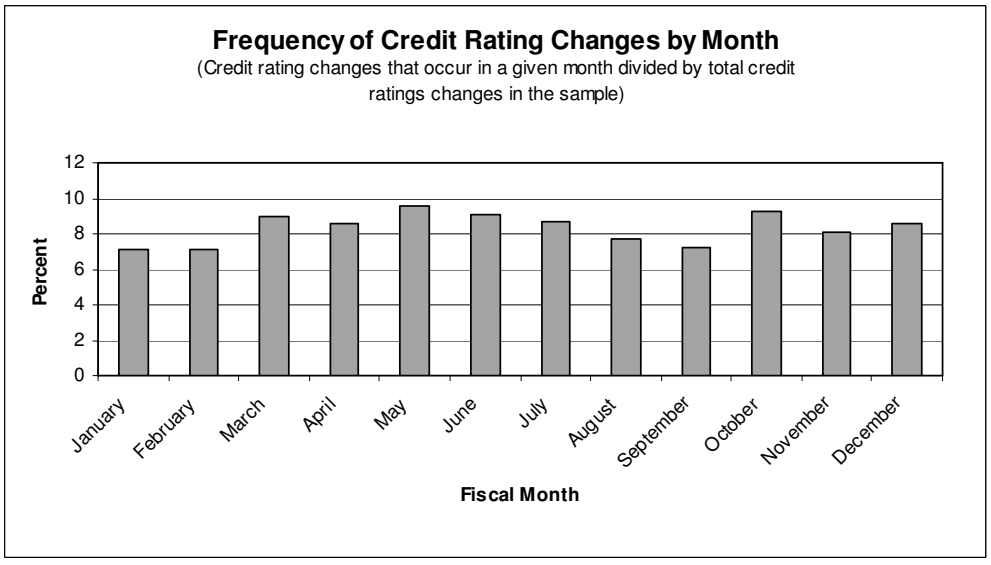

**Figure 3**
**Actual and Forecasted Performance Following a Material Increase in the Deferred Tax Asset Valuation Allowance**

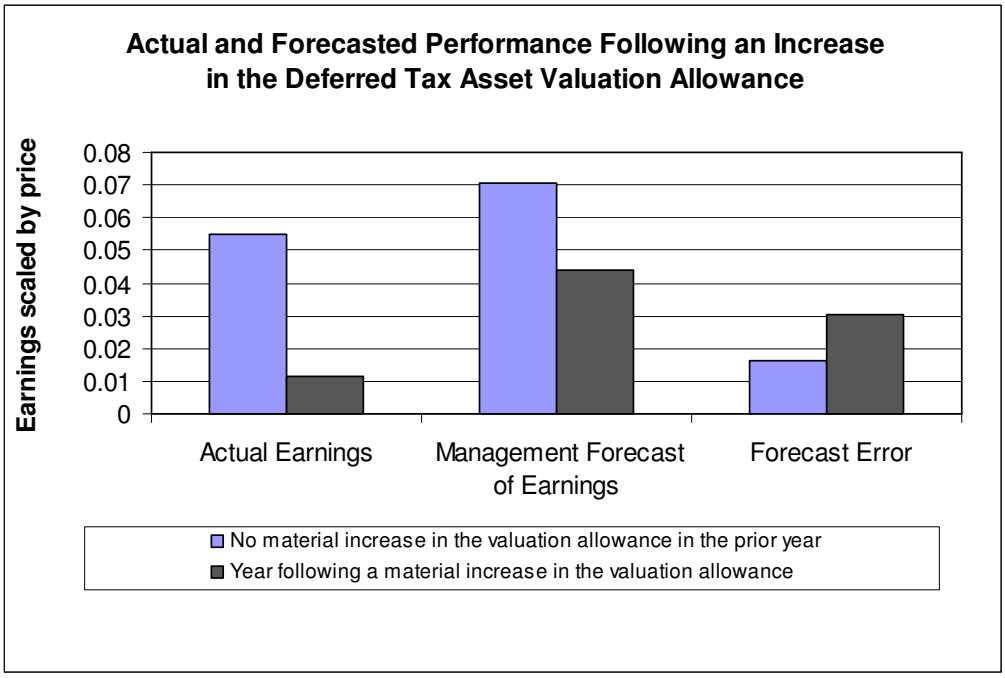

**Figure 4**
**Changes in Credit Ratings around a Material Increase in the Deferred Tax Asset Valuation Allowance**

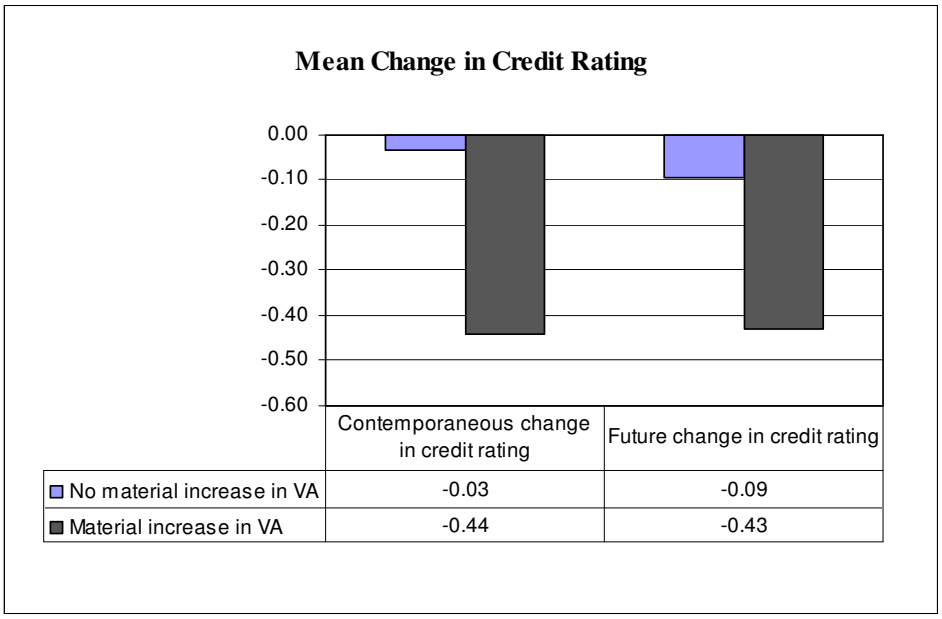


**Figure 5**
**Changes in Credit Ratings around the Initial Material Increase in the Deferred Tax Asset Valuation Allowance**

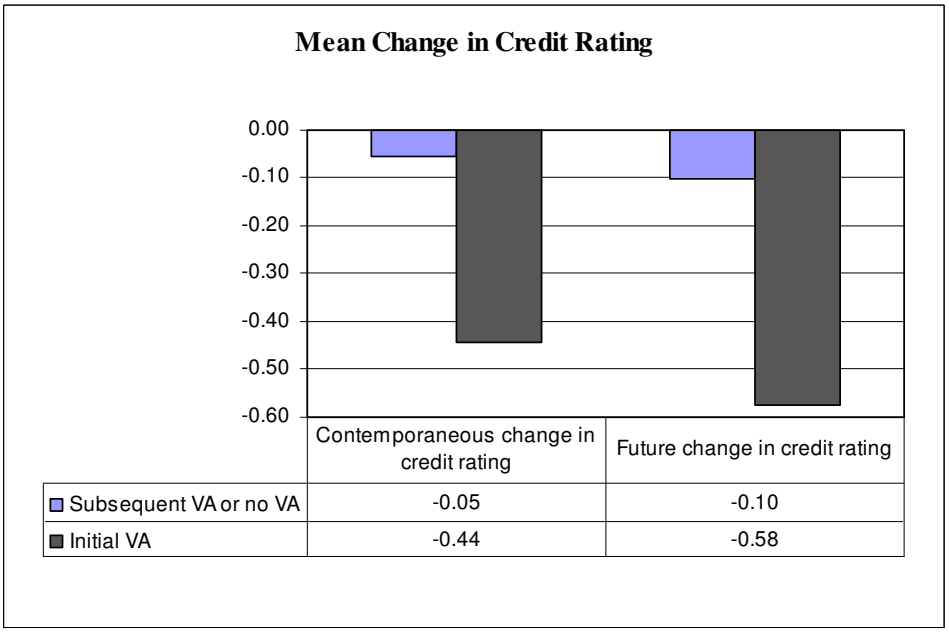

**Table 1**
**Descriptive Statistics - Cost of Debt Sample**

*Panel A: Sample Descriptive Statistics*

| Variable | N | Mean | Std Dev | Minimum | 5th Ptcl | 25th Pctl | Median | 75th Pctl | 95th Pctl | Maximum |
|---|---|---|---|---|---|---|---|---|---|---|
| $INTEXP_{t+1}$ | 30,455 | 10.139 | 11.163 | 1.408 | 3.276 | 6.108 | 7.861 | 10.209 | 21.051 | 92.834 |
| INTEXP | 30,455 | 9.970 | 9.696 | 1.400 | 3.338 | 6.193 | 7.964 | 10.298 | 20.543 | 79.269 |
| VA | 30,455 | 0.270 | 0.444 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| INITIAL_VA | 30,455 | 0.076 | 0.265 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| TIMELY_VA | 2,310 | 0.818 | 0.293 | 0.063 | 0.250 | 0.500 | 1 | 1 | 1 | 1 |
| PRIME | 30,455 | 7.066 | 1.631 | 4.120 | 4.120 | 6.000 | 7.960 | 8.350 | 9.230 | 9.230 |
| ROA | 30,455 | -0.031 | 0.234 | -1.201 | -0.498 | -0.057 | 0.029 | 0.080 | 0.192 | 0.395 |
| CFO | 30,455 | 0.047 | 0.187 | -0.808 | -0.308 | 0.003 | 0.075 | 0.139 | 0.272 | 0.447 |
| LOSS | 30,455 | 0.365 | 0.481 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| NUMLOSS | 30,455 | 1.212 | 2.309 | 0 | 0 | 0 | 0 | 1 | 6 | 15 |
| AGE | 30,455 | 16.786 | 14.581 | 1 | 3 | 6 | 11 | 24 | 48 | 58 |
| LEV | 30,455 | 0.240 | 0.223 | 0.000 | 0.000 | 0.055 | 0.194 | 0.354 | 0.672 | 1.070 |
| SIZE | 30,455 | 5.785 | 1.929 | 2.470 | 2.917 | 4.265 | 5.652 | 7.110 | 9.305 | 10.610 |
| INTCOV | 30,455 | 1.964 | 1.327 | -0.481 | 0.000 | 1.242 | 1.932 | 2.670 | 4.367 | 6.053 |
| CAPINT | 30,455 | 0.316 | 0.246 | 0.010 | 0.032 | 0.115 | 0.248 | 0.465 | 0.821 | 0.914 |
| SUB | 30,455 | 0.136 | 0.342 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| NEGEQ | 30,455 | 0.059 | 0.236 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| BTM | 30,455 | 0.517 | 1.112 | -6.556 | -0.144 | 0.240 | 0.451 | 0.775 | 1.887 | 4.615 |

*Panel B: Correlations*

| | INTEXP | VA | INITIAL _VA | PRIME | ROA | CFO | LOSS | NUM LOSS | AGE | LEV | SIZE | INT COV | CAP INT | SUB | NEGEQ | BTM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $INTEXP_{t+1}$ | **0.535** | **0.139** | **0.008** | **0.025** | **-0.161** | **-0.146** | **0.122** | **0.136** | **-0.103** | **-0.142** | **-0.179** | **-0.044** | **-0.099** | **-0.028** | **0.047** | **-0.043** |
| INTEXP | | **0.154** | **0.011** | **0.050** | **-0.203** | **-0.169** | **0.135** | **0.147** | **-0.115** | **-0.146** | **-0.186** | **-0.086** | **-0.097** | **-0.021** | **0.057** | **-0.057** |
| VA | | | **0.471** | **-0.030** | **-0.624** | **-0.517** | **0.764** | **0.537** | **-0.221** | **0.046** | **-0.322** | **-0.606** | **-0.087** | **-0.024** | **0.195** | **-0.093** |
| INITIAL_VA | | | | -0.008 | **-0.131** | **-0.050** | **0.354** | **-0.068** | **-0.045** | **0.030** | **-0.080** | **-0.183** | **0.006** | **0.027** | **0.032** | **0.058** |
| PRIME | | | | | -0.004 | **-0.029** | **-0.032** | **-0.082** | **-0.077** | 0.010 | **-0.074** | **-0.025** | **0.031** | 0.005 | **-0.035** | **0.029** |
| ROA | | | | | | **0.740** | **-0.647** | **-0.498** | **0.203** | **-0.031** | **0.267** | **0.610** | **0.125** | **0.030** | **-0.172** | **0.109** |
| CFO | | | | | | | **-0.481** | **-0.483** | **0.180** | **0.025** | **0.302** | **0.575** | **0.265** | **0.046** | **-0.089** | **0.040** |
| LOSS | | | | | | | | **0.467** | **-0.205** | **0.092** | **-0.258** | **-0.620** | **-0.077** | **0.020** | **0.185** | **-0.053** |
| NUMLOSS | | | | | | | | | **-0.181** | **0.083** | **-0.255** | **-0.470** | **-0.122** | **-0.032** | **0.212** | **-0.151** |
| AGE | | | | | | | | | | **-0.034** | **0.450** | **0.166** | **0.046** | **-0.032** | **-0.019** | -0.009 |
| LEV | | | | | | | | | | | **0.207** | **-0.282** | **0.271** | **0.328** | **0.406** | **-0.180** |
| SIZE | | | | | | | | | | | | **0.217** | **0.157** | **0.122** | **-0.024** | **-0.051** |
| INTCOV | | | | | | | | | | | | | **0.037** | **-0.107** | **-0.181** | **0.019** |
| CAPINT | | | | | | | | | | | | | | **0.041** | **0.027** | 0.001 |
| SUB | | | | | | | | | | | | | | | **0.104** | **-0.029** |
| NEGEQ | | | | | | | | | | | | | | | | **-0.540** |

**Table 1 cont.**

*Panel C: Number of material increases in the valuation allowance by year*

| Year | N | % of Sample | VA | % of Sample | VA / N |
|---|---|---|---|---|---|
| 1993 | 1,673 | 5.49 | 325 | 3.95 | 19.43 |
| 1994 | 1,779 | 5.84 | 335 | 4.07 | 18.83 |
| 1995 | 1,936 | 6.36 | 390 | 4.74 | 20.14 |
| 1996 | 2,110 | 6.93 | 460 | 5.59 | 21.80 |
| 1997 | 2,155 | 7.07 | 542 | 6.58 | 25.15 |
| 1998 | 2,136 | 7.01 | 568 | 6.89 | 26.59 |
| 1999 | 2,114 | 6.94 | 627 | 7.61 | 29.66 |
| 2000 | 2,094 | 6.88 | 671 | 8.15 | 32.04 |
| 2001 | 2,015 | 6.62 | 726 | 8.82 | 36.03 |
| 2002 | 1,878 | 6.17 | 637 | 7.74 | 33.92 |
| 2003 | 1,803 | 5.92 | 539 | 6.55 | 29.89 |
| 2004 | 1,763 | 5.79 | 480 | 5.83 | 27.23 |
| 2005 | 1,748 | 5.74 | 472 | 5.73 | 27.00 |
| 2006 | 1,763 | 5.79 | 466 | 5.66 | 26.43 |
| 2007 | 1,770 | 5.81 | 473 | 5.74 | 26.72 |
| 2008 | 1,718 | 5.64 | 523 | 6.35 | 30.44 |
| Total | 30,455 | 100.0 | 8,234 | 100.0 | |

Variable definitions are presented in Appendix A.

Firm and year t subscripts are suppressed for brevity.

Correlations significant at the 5 percent level are bolded.

All continuous variables are winsorized at the 1st and 99th percentile.

## Table 2
## Descriptive Statistics – Valuation Allowance Firms

*Panel A: Cost of Debt Sample*

| | VA = 1 | | | | VA = 0 | | | | Difference |
|---|---|---|---|---|---|---|---|---|---|
| Variable | N | Mean | Median | Std Dev | N | Mean | Median | Std Dev | in Means |
| $INTEXP_{t+1}$ | 8,234 | 12.7 | 9.4 | 13.5 | 22,221 | 9.2 | 7.5 | 10.0 | 3.5 |
| Total Assets | 8,234 | 743.4 | 87.6 | 4272.6 | 22,221 | 3854.8 | 438.2 | 21157.6 | -3111.4 |
| Market Capitalization | 8,234 | 497.7 | 81.3 | 2719.6 | 22,221 | 4006.8 | 396.6 | 21628.8 | -3509.0 |
| Age | 8,234 | 11.5 | 8.0 | 10.6 | 22,221 | 18.7 | 13.0 | 15.4 | -7.2 |
| ROA | 8,234 | -0.271 | -0.167 | 0.303 | 22,221 | 0.058 | 0.054 | 0.109 | -0.329 |
| $ROA_{t+1}$ | 8,234 | -0.229 | -0.128 | 0.699 | 22,221 | 0.038 | 0.047 | 0.323 | -0.267 |
| $ROA_{t+2}$ | 6,714 | -0.180 | -0.097 | 1.313 | 19,537 | 0.029 | 0.043 | 0.354 | -0.208 |
| $ROA_{t+3}$ | 5,506 | -0.232 | -0.076 | 2.856 | 16,938 | 0.027 | 0.042 | 0.392 | -0.259 |
| $ROA_{t+4}$ | 4,559 | -0.226 | -0.057 | 2.718 | 14,589 | 0.026 | 0.041 | 0.429 | -0.252 |
| $ROA_{t+5}$ | 3,748 | -0.313 | -0.047 | 4.622 | 12,583 | 0.026 | 0.040 | 0.506 | -0.339 |
| CFO | 8,234 | -0.112 | -0.035 | 0.240 | 22,221 | 0.105 | 0.101 | 0.117 | -0.217 |
| $CFO_{t+1}$ | 8,228 | -0.088 | -0.021 | 0.257 | 22,209 | 0.103 | 0.098 | 0.114 | -0.191 |
| $CFO_{t+2}$ | 6,700 | -0.081 | -0.009 | 0.306 | 19,502 | 0.100 | 0.096 | 0.132 | -0.181 |
| $CFO_{t+3}$ | 5,493 | -0.088 | 0.000 | 0.550 | 16,913 | 0.101 | 0.096 | 0.207 | -0.189 |
| $CFO_{t+4}$ | 4,547 | -0.085 | 0.010 | 0.902 | 14,572 | 0.100 | 0.096 | 0.209 | -0.185 |
| $CFO_{t+5}$ | 3,739 | -0.136 | 0.021 | 1.144 | 12,573 | 0.098 | 0.095 | 0.155 | -0.234 |

*Panel B: Credit Rating Sample*

| | VA = 1 | | | | VA = 0 | | | | Difference |
|---|---|---|---|---|---|---|---|---|---|
| Variable | N | Mean | Median | Std Dev | N | Mean | Median | Std Dev | in Means |
| CR | 1,104 | 8.9 | 9.0 | 2.591 | 7,708 | 13.5 | 14.0 | 3.7 | -4.6 |
| $CR_{t+1}$ | 1,104 | 8.5 | 8.0 | 2.704 | 7,708 | 13.4 | 14.0 | 3.7 | -4.9 |
| Total Assets | 1,104 | 3326.0 | 1046.3 | 8333.8 | 7,708 | 9630.7 | 2578.8 | 33148.8 | -6304.6 |
| Market Capitalization | 1,104 | 2043.8 | 500.9 | 6697.7 | 7,708 | 11269.4 | 2471.7 | 38089.5 | -9225.6 |
| Age | 1,104 | 17.2 | 10.0 | 15.3 | 7,708 | 26.8 | 25.0 | 16.9 | -9.7 |
| ROA | 1,104 | -0.089 | -0.060 | 0.095 | 7,708 | 0.049 | 0.046 | 0.068 | -0.138 |
| $ROA_{t+1}$ | 1,100 | -0.069 | -0.034 | 0.188 | 7,698 | 0.044 | 0.045 | 0.088 | -0.112 |
| $ROA_{t+2}$ | 849 | -0.039 | -0.014 | 0.182 | 6,548 | 0.042 | 0.046 | 0.091 | -0.081 |
| $ROA_{t+3}$ | 685 | -0.032 | -0.006 | 0.191 | 5,520 | 0.045 | 0.046 | 0.087 | -0.076 |
| $ROA_{t+4}$ | 544 | -0.019 | 0.007 | 0.198 | 4,636 | 0.045 | 0.046 | 0.087 | -0.064 |
| $ROA_{t+5}$ | 420 | -0.013 | 0.014 | 0.202 | 3,860 | 0.045 | 0.046 | 0.091 | -0.058 |
| CFO | 1,104 | 0.030 | 0.033 | 0.068 | 7,708 | 0.111 | 0.102 | 0.074 | -0.081 |
| $CFO_{t+1}$ | 1,104 | 0.033 | 0.041 | 0.102 | 7,708 | 0.110 | 0.101 | 0.081 | -0.077 |
| $CFO_{t+2}$ | 854 | 0.052 | 0.051 | 0.092 | 6,552 | 0.110 | 0.100 | 0.083 | -0.058 |
| $CFO_{t+3}$ | 688 | 0.062 | 0.060 | 0.093 | 5,523 | 0.111 | 0.100 | 0.081 | -0.049 |
| $CFO_{t+4}$ | 544 | 0.070 | 0.064 | 0.089 | 4,641 | 0.110 | 0.100 | 0.081 | -0.040 |
| $CFO_{t+5}$ | 422 | 0.078 | 0.067 | 0.096 | 3,861 | 0.110 | 0.100 | 0.082 | -0.032 |

Total assets (compustat data item at) and Market Capitalization (compustat data items prcc_f*csho) are measured at the end of year t.

INTEXP, CR, AGE, ROA and CFO definitions are presented in Appendix A.

Firm and year t subscripts are suppressed for brevity.

Continuous variables are winsorized at the 1st and 99th percentile.

All means across panels and within panels are significantly different at greater than the 5% level.

## Table 3
## Cost of Debt Regression Estimates

*Panel A: Continuous variables winsorized at the 1st and 99th percentile*

| | Predicted | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| | Coefficient | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| INTERCEPT | ? | 4.777 | <.0001 | 4.723 | <.0001 | 5.151 | <.0001 |
| **VA** | **+** | **0.568** | **0.003** | **0.851** | **<.0001** | **0.863** | **<.0001** |
| **INITIAL_VA** | **+** | | | **-0.631** | **0.015** | **-0.722** | **0.015** |
| **TIMELY_VA** | **+** | | | | | **-0.424** | **0.531** |
| PRIME | + | 0.041 | 0.707 | 0.041 | 0.704 | 0.042 | 0.699 |
| ROA | - | -0.902 | 0.027 | -0.826 | 0.044 | -0.819 | 0.046 |
| CFO | - | -2.049 | <.0001 | -1.975 | <.0001 | -1.979 | <.0001 |
| LOSS | + | 0.589 | 0.002 | 0.627 | 0.001 | 0.631 | 0.001 |
| NUMLOSS | + | 0.220 | <.0001 | 0.192 | <.0001 | 0.188 | <.0001 |
| AGE | - | -0.007 | 0.135 | -0.006 | 0.148 | -0.006 | 0.150 |
| LEV | ? | -3.100 | <.0001 | -3.067 | <.0001 | -3.064 | <.0001 |
| SIZE | - | -0.279 | <.0001 | -0.278 | <.0001 | -0.279 | <.0001 |
| INTCOV | - | 0.620 | <.0001 | 0.626 | <.0001 | 0.625 | <.0001 |
| CAPINT | - | -0.898 | 0.005 | -0.916 | 0.004 | -0.916 | 0.004 |
| SUB | + | 0.417 | 0.013 | 0.424 | 0.012 | 0.423 | 0.012 |
| NEGEQ | + | 1.353 | <.0001 | 1.352 | <.0001 | 1.349 | <.0001 |
| BTM | + | -0.007 | 0.907 | 0.003 | 0.963 | 0.003 | 0.959 |
| INTEXP | + | 0.569 | <.0001 | 0.569 | <.0001 | 0.569 | <.0001 |
| YEAR EFFECTS | | | Y | | Y | | Y |
| IND EFFECTS | | | Y | | Y | | Y |
| N | | | 30,455 | | 30,455 | | 30,455 |
| Adjust R2 | | | 30.5% | | 30.5% | | 30.5% |

*Panel B: Continuous variables winsorized at the 5th and 95th percentile*

| | Predicted | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| | Coefficient | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| INTERCEPT | ? | 4.929 | <.0001 | 4.913 | <.0001 | 5.143 | <.0001 |
| **VA** | **+** | **0.212** | **0.002** | **0.283** | **<.0001** | **0.289** | **<.0001** |
| **INITIAL_VA** | **+** | | | **-0.155** | **0.089** | **-0.204** | **0.050** |
| **TIMELY_VA** | **+** | | | | | **-0.228** | **0.335** |
| PRIME | + | -0.027 | 0.477 | -0.027 | 0.478 | -0.026 | 0.484 |
| ROA | - | -0.865 | <.0001 | -0.833 | <.0001 | -0.826 | <.0001 |
| CFO | - | -1.388 | <.0001 | -1.359 | <.0001 | -1.362 | <.0001 |
| LOSS | + | 0.295 | <.0001 | 0.306 | <.0001 | 0.309 | <.0001 |
| NUMLOSS | + | 0.071 | <.0001 | 0.065 | <.0001 | 0.063 | <.0001 |
| AGE | - | -0.001 | 0.481 | -0.001 | 0.498 | -0.001 | 0.503 |
| LEV | ? | -0.922 | <.0001 | -0.911 | <.0001 | -0.910 | <.0001 |
| SIZE | - | -0.168 | <.0001 | -0.168 | <.0001 | -0.168 | <.0001 |
| INTCOV | - | 0.092 | 0.001 | 0.094 | 0.001 | 0.094 | 0.001 |
| CAPINT | - | -0.270 | 0.018 | -0.277 | 0.016 | -0.277 | 0.016 |
| SUB | + | 0.397 | <.0001 | 0.399 | <.0001 | 0.398 | <.0001 |
| NEGEQ | + | 0.409 | <.0001 | 0.409 | <.0001 | 0.407 | <.0001 |
| BTM | + | -0.040 | 0.370 | -0.033 | 0.462 | -0.033 | 0.461 |
| INTEXP | + | 0.557 | <.0001 | 0.557 | <.0001 | 0.557 | <.0001 |
| YEAR EFFECTS | | | Y | | Y | | Y |
| IND EFFECTS | | | Y | | Y | | Y |
| N | | | 30,455 | | 30,455 | | 30,455 |
| Adjust R2 | | | 41.3% | | 41.3% | | 41.3% |

Dependent variable is $INTEXP_{t+1}$

Variable definitions are presented in Appendix A.

Firm and year t subscripts are suppressed for brevity.

One-tailed p-values are reported for coefficients with hypothesized directions, all other p-values are two-tailed.

**Table 4**
**Descriptive Statistics – Credit Rating Sample**

*Panel A: Sample Descriptive Statistics*

| Variable | N | Mean | Std Dev | Minimum | 25th Pctl | Median | 75th Pctl | Maximum |
|---|---|---|---|---|---|---|---|---|
| $CR_{t+1}$ | 8,812 | 12.824 | 3.914 | 1 | 10 | 13 | 16 | 22 |
| CR | 8,812 | 12.947 | 3.849 | 1 | 10 | 13 | 16 | 22 |
| $CatCR_{t+1}$ | 8,812 | 3.618 | 1.315 | 1 | 3 | 4 | 5 | 7 |
| CatCR | 8,812 | 3.652 | 1.309 | 1 | 3 | 4 | 5 | 7 |
| VA | 8,812 | 0.125 | 0.331 | 0 | 0 | 0 | 0 | 1 |
| INITIAL_VA | 8,812 | 0.070 | 0.254 | 0 | 0 | 0 | 0 | 1 |
| TIMELY_VA | 613 | 0.435 | 0.182 | 0.100 | 0.333 | 0.50 | 0.50 | 1 |
| ROA | 8,812 | 0.032 | 0.086 | -0.311 | 0.003 | 0.039 | 0.075 | 0.264 |
| CFO | 8,812 | 0.101 | 0.078 | -0.112 | 0.054 | 0.095 | 0.141 | 0.348 |
| LOSS | 8,812 | 0.235 | 0.424 | 0 | 0 | 0 | 0 | 1 |
| NUMLOSS | 8,812 | 0.544 | 1.276 | 0 | 0 | 0 | 0 | 13 |
| AGE | 8,812 | 25.614 | 17.024 | 1 | 9 | 22 | 43 | 57 |
| LEV | 8,812 | 0.350 | 0.233 | 0.003 | 0.191 | 0.298 | 0.450 | 1.201 |
| SIZE | 8,812 | 7.869 | 1.383 | 5.048 | 6.872 | 7.768 | 8.749 | 11.655 |
| INTCOV | 8,812 | 2.034 | 0.759 | 0.000 | 1.535 | 1.962 | 2.467 | 4.322 |
| CAPINT | 8,812 | 0.409 | 0.253 | 0.020 | 0.192 | 0.364 | 0.622 | 0.910 |
| SUB | 8,812 | 0.253 | 0.435 | 0 | 0 | 0 | 1 | 1 |
| PBTD | 8,812 | 3.394 | 3.497 | 0 | 0 | 2 | 6 | 10 |
| NBTD | 8,812 | 2.110 | 3.210 | 0 | 0 | 0 | 4 | 10 |

*Panel B: Correlations*

| | CR | VA | INITIAL_VA | ROA | CFO | LOSS | NUMLOSS | AGE | LEV | SIZE | INTCOV | CAPINT | SUB | PBTD | NBTD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $CR_{t+1}$ | **0.969** | **-0.414** | **-0.264** | **0.475** | **0.400** | **-0.449** | **-0.433** | **0.460** | **-0.544** | **0.507** | **0.651** | **0.117** | **-0.356** | **-0.074** | **-0.331** |
| CR | | **-0.393** | **-0.237** | **0.447** | **0.374** | **-0.417** | **-0.419** | **0.473** | **-0.548** | **0.523** | **0.638** | **0.118** | **-0.368** | **-0.095** | **-0.320** |
| VA | | | **0.723** | **-0.534** | **-0.344** | **0.632** | **0.605** | **-0.188** | **0.344** | **-0.209** | **-0.432** | -0.010 | **0.112** | **-0.175** | **0.394** |
| INITIAL_VA | | | | **-0.369** | **-0.222** | **0.452** | **0.246** | **-0.127** | **0.188** | **-0.155** | **-0.286** | -0.013 | **0.079** | **-0.125** | **0.272** |
| ROA | | | | | **0.581** | **-0.710** | **-0.595** | **0.209** | **-0.370** | **0.190** | **0.658** | **-0.027** | **-0.164** | **0.295** | **-0.497** |
| CFO | | | | | | **-0.390** | **-0.357** | **0.084** | **-0.231** | **0.135** | **0.610** | **0.195** | **-0.127** | **0.214** | **-0.264** |
| LOSS | | | | | | | **0.769** | **-0.196** | **0.352** | **-0.186** | **-0.493** | **-0.031** | **0.151** | **-0.284** | **0.508** |
| NUMLOSS | | | | | | | | **-0.183** | **0.380** | **-0.170** | **-0.449** | **-0.026** | **0.140** | **-0.224** | **0.434** |
| AGE | | | | | | | | | **-0.390** | **0.462** | **0.300** | **-0.035** | **-0.279** | **-0.156** | **-0.178** |
| LEV | | | | | | | | | | **-0.404** | **-0.616** | **0.080** | **0.402** | **0.024** | **0.274** |
| SIZE | | | | | | | | | | | **0.326** | -0.002 | **-0.203** | **-0.294** | **-0.330** |
| INTCOV | | | | | | | | | | | | **-0.043** | **-0.312** | **0.105** | **-0.342** |
| CAPINT | | | | | | | | | | | | | **-0.086** | **0.051** | **-0.051** |
| SUB | | | | | | | | | | | | | | **0.051** | **0.094** |
| PBTD | | | | | | | | | | | | | | | **-0.638** |

**Table 4 cont.**

*Panel C: Number of material increases in the valuation allowance by year*

| Year | N | % of Sample | VA | % of Sample | VA / N |
|---|---|---|---|---|---|
| 1993 | 535 | 6.08 | 54 | 4.89 | 10.09 |
| 1994 | 566 | 6.42 | 50 | 4.54 | 8.83 |
| 1995 | 570 | 6.47 | 48 | 4.36 | 8.42 |
| 1996 | 575 | 6.53 | 43 | 3.89 | 7.48 |
| 1997 | 547 | 6.21 | 46 | 4.17 | 8.41 |
| 1998 | 578 | 6.56 | 77 | 6.97 | 13.32 |
| 1999 | 658 | 7.47 | 84 | 7.61 | 12.77 |
| 2000 | 626 | 7.10 | 87 | 7.88 | 13.90 |
| 2001 | 634 | 7.19 | 129 | 11.68 | 20.35 |
| 2002 | 622 | 7.06 | 126 | 11.41 | 20.26 |
| 2003 | 603 | 6.84 | 92 | 8.33 | 15.26 |
| 2004 | 586 | 6.65 | 89 | 8.06 | 15.19 |
| 2005 | 563 | 6.39 | 70 | 6.34 | 12.43 |
| 2006 | 567 | 6.43 | 50 | 4.53 | 8.82 |
| 2007 | 582 | 6.60 | 59 | 5.34 | 10.14 |
| Total | 8,812 | 100.0 | 1,104 | 100.0 | |

Variable definitions are presented in Appendix A.

Firm and year t subscripts are suppressed for brevity.

Correlations significant at the 5 percent level are bolded.

All continuous variables are winsorized at the 1st and 99th percentile.

**Table 5**
**Distribution of Credit Ratings and Frequency of Credit Rating Changes**

*Panel A: Distribution of Credit Ratings*

| $CR_{t+1}$ | Numerical Value | Broad Category | N | % of Sample |
|---|---|---|---|---|
| AAA | 22 | 7 | 157 | 1.78 |
| AA+ | 21 | 6 | 44 | 0.50 |
| AA | 20 | 6 | 214 | 2.43 |
| AA- | 19 | 6 | 202 | 2.29 |
| A+ | 18 | 5 | 493 | 5.59 |
| A | 17 | 5 | 701 | 7.96 |
| A- | 16 | 5 | 510 | 5.79 |
| BBB+ | 15 | 4 | 693 | 7.86 |
| BBB | 14 | 4 | 903 | 10.25 |
| BBB- | 13 | 4 | 730 | 8.28 |
| BB+ | 12 | 3 | 500 | 5.67 |
| BB | 11 | 3 | 712 | 8.08 |
| BB- | 10 | 3 | 914 | 10.37 |
| B+ | 9 | 2 | 926 | 10.51 |
| B | 8 | 2 | 557 | 6.32 |
| B- | 7 | 2 | 298 | 3.38 |
| CCC+ | 6 | 1 | 118 | 1.34 |
| CCC | 5 | 1 | 65 | 0.74 |
| CCC- | 4 | 1 | 13 | 0.15 |
| CC | 3 | 1 | 18 | 0.21 |
| SD | 2 | 1 | 0 | 0.00 |
| D | 1 | 1 | 44 | 0.50 |
| Total | | | 8,812 | 100.0 |

*Panel B: Changes in Credit Rating by Year*

| Year | Upgrades | Downgrades | No Change | N |
|---|---|---|---|---|
| 1994 | 42 | 50 | 443 | 535 |
| 1995 | 76 | 43 | 447 | 566 |
| 1996 | 54 | 51 | 465 | 570 |
| 1997 | 72 | 57 | 446 | 575 |
| 1998 | 69 | 64 | 414 | 547 |
| 1999 | 41 | 75 | 462 | 578 |
| 2000 | 49 | 119 | 490 | 658 |
| 2001 | 48 | 143 | 435 | 626 |
| 2002 | 45 | 136 | 453 | 634 |
| 2003 | 75 | 121 | 426 | 622 |
| 2004 | 62 | 82 | 459 | 603 |
| 2005 | 73 | 89 | 424 | 586 |
| 2006 | 62 | 87 | 414 | 563 |
| 2007 | 77 | 74 | 416 | 567 |
| 2008 | 66 | 116 | 400 | 582 |
| Total | 911 | 1,307 | 6,594 | 8,812 |
| Percentage | 10.3% | 14.8% | 74.8% | |

## Table 6
## Credit Rating Order Logit Regression Estimates

*Panel A: Dependent variable $CR_t$*

| | Predicted | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| | Coefficient | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| **VA** | **-** | **-0.245** | **0.003** | **-0.285** | **0.013** | **-0.314** | **0.008** |
| **INITIAL_VA** | **-** | | | **0.061** | **0.660** | **0.412** | **0.186** |
| **TIMELY_VA** | **-** | | | | | **0.592** | **0.208** |
| ROA | + | 2.853 | <.0001 | 2.858 | <.0001 | 2.823 | <.0001 |
| CFO | + | 1.017 | 0.015 | 1.013 | 0.015 | 1.024 | 0.014 |
| LOSS | - | -0.511 | <.0001 | -0.522 | <.0001 | -0.526 | <.0001 |
| NUMLOSS | - | -0.001 | 0.977 | 0.005 | 0.870 | 0.013 | 0.682 |
| AGE | + | 0.000 | 0.933 | 0.000 | 0.931 | 0.000 | 0.899 |
| LEV | ? | -0.575 | <.0001 | -0.573 | <.0001 | -0.570 | <.0001 |
| SIZE | + | 0.185 | <.0001 | 0.185 | <.0001 | 0.186 | <.0001 |
| INTCOV | + | 0.673 | <.0001 | 0.673 | <.0001 | 0.675 | <.0001 |
| CAPINT | + | 0.436 | 0.001 | 0.436 | 0.001 | 0.437 | 0.001 |
| SUB | - | 0.070 | 0.231 | 0.070 | 0.233 | 0.069 | 0.239 |
| PBTD | - | 0.002 | 0.869 | 0.002 | 0.867 | 0.002 | 0.851 |
| NBTD | - | 0.007 | 0.627 | 0.007 | 0.627 | 0.007 | 0.628 |
| $CR_{t-1}$ | + | 2.839 | <.0001 | 2.839 | <.0001 | 2.839 | <.0001 |
| YEAR EFFECTS | | | Y | | Y | | Y |
| IND EFFECTS | | | Y | | Y | | Y |
| Generalized R2 | | | 96.75% | | 96.75% | | 96.75% |
| N | | | 8,812 | | 8,812 | | 8,812 |

*Panel B: Dependent variable $CatCR_t$*

| | Predicted | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| | Coefficient | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| **VA** | **-** | **-0.250** | **0.036** | **-0.358** | **0.036** | **-0.387** | **0.027** |
| **INITIAL_VA** | **-** | | | **0.162** | **0.451** | **0.548** | **0.280** |
| **TIMELY_VA** | **-** | | | | | **0.649** | **0.401** |
| ROA | + | 3.334 | <.0001 | 3.354 | <.0001 | 3.318 | <.0001 |
| CFO | + | 1.971 | 0.002 | 1.959 | 0.003 | 1.978 | 0.002 |
| LOSS | - | -0.626 | <.0001 | -0.654 | <.0001 | -0.662 | <.0001 |
| NUMLOSS | - | -0.116 | 0.012 | -0.100 | 0.052 | -0.091 | 0.086 |
| AGE | + | 0.003 | 0.212 | 0.003 | 0.210 | 0.003 | 0.219 |
| LEV | ? | -0.826 | 0.000 | -0.821 | 0.000 | -0.821 | 0.000 |
| SIZE | + | 0.301 | <.0001 | 0.301 | <.0001 | 0.302 | <.0001 |
| INTCOV | + | 0.938 | <.0001 | 0.938 | <.0001 | 0.938 | <.0001 |
| CAPINT | + | 0.454 | 0.032 | 0.456 | 0.032 | 0.457 | 0.031 |
| SUB | - | 0.081 | 0.390 | 0.079 | 0.399 | 0.078 | 0.406 |
| PBTD | - | -0.017 | 0.370 | -0.017 | 0.378 | -0.017 | 0.386 |
| NBTD | - | -0.027 | 0.226 | -0.027 | 0.231 | -0.027 | 0.228 |
| $CR_{t-1}$ | + | 5.471 | <.0001 | 5.471 | <.0001 | 5.472 | <.0001 |
| YEAR EFFECTS | | | Y | | Y | | Y |
| IND EFFECTS | | | Y | | Y | | Y |
| Generalized R2 | | | 92.52% | | 92.53% | | 92.52% |
| N | | | 8,812 | | 8,812 | | 8,812 |

Variable definitions are presented in Appendix A.

Firm and year t subscripts are suppressed for brevity.

Continuous variables are winsorized at the 1st and 99th percentile.

One-tailed p-values are reported for coefficients with hypothesized directions, all other p-values are two-tailed.

## Table 7
## Future Credit Rating Ordered Logit Regression Estimates

*Panel A: Dependent variable $CR_{t+1}$*

| | Predicted | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| | Coefficient | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| **VA** | **-** | **-0.168** | **0.028** | **0.064** | **0.610** | **0.152** | **0.229** |
| **INITIAL_VA** | **-** | | | **-0.355** | **0.004** | **-1.452** | **<.0001** |
| **TIMELY_VA** | **-** | | | | | **-1.848** | **<.0001** |
| ROA | + | 1.106 | 0.014 | 1.099 | 0.015 | 1.221 | 0.007 |
| CFO | + | 2.179 | <.0001 | 2.201 | <.0001 | 2.154 | <.0001 |
| LOSS | - | -0.745 | <.0001 | -0.682 | <.0001 | -0.669 | <.0001 |
| NUMLOSS | - | 0.115 | <.0001 | 0.080 | 0.009 | 0.054 | 0.085 |
| AGE | + | 0.001 | 0.393 | 0.001 | 0.382 | 0.002 | 0.338 |
| LEV | ? | -0.137 | 0.325 | -0.151 | 0.279 | -0.150 | 0.281 |
| SIZE | + | 0.125 | <.0001 | 0.125 | <.0001 | 0.125 | <.0001 |
| INTCOV | + | 0.420 | <.0001 | 0.418 | <.0001 | 0.416 | <.0001 |
| CAPINT | + | 0.177 | 0.173 | 0.171 | 0.188 | 0.169 | 0.193 |
| SUB | - | 0.073 | 0.200 | 0.075 | 0.189 | 0.078 | 0.173 |
| PBTD | - | -0.003 | 0.826 | -0.003 | 0.808 | -0.004 | 0.753 |
| NBTD | - | 0.000 | 0.999 | 0.000 | 0.980 | 0.000 | 0.999 |
| CR | + | 2.619 | <.0001 | 2.621 | <.0001 | 2.624 | <.0001 |
| YEAR EFFECTS | | | Y | | Y | | Y |
| IND EFFECTS | | | Y | | Y | | Y |
| Generalized R2 | | | 96.25% | | 96.25% | | 96.25% |
| N | | | 8,812 | | 8,812 | | 8,812 |

*Panel B: Dependent variable $CatCR_{t+1}$*

| | Predicted | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| | Coefficient | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| **VA** | **-** | **-0.213** | **0.054** | **0.015** | **0.938** | **0.088** | **0.657** |
| **INITIAL_VA** | **-** | | | **-0.336** | **0.054** | **-1.254** | **0.003** |
| **TIMELY_VA** | **-** | | | | | **-1.555** | **0.012** |
| ROA | + | 1.840 | 0.006 | 1.807 | 0.007 | 1.878 | 0.005 |
| CFO | + | 3.432 | <.0001 | 3.457 | <.0001 | 3.428 | <.0001 |
| LOSS | - | -0.778 | <.0001 | -0.719 | <.0001 | -0.703 | <.0001 |
| NUMLOSS | - | 0.018 | 0.686 | -0.016 | 0.754 | -0.039 | 0.444 |
| AGE | + | 0.005 | 0.037 | 0.005 | 0.038 | 0.005 | 0.033 |
| LEV | ? | -0.206 | 0.338 | -0.222 | 0.301 | -0.221 | 0.304 |
| SIZE | + | 0.218 | <.0001 | 0.216 | <.0001 | 0.216 | <.0001 |
| INTCOV | + | 0.668 | <.0001 | 0.667 | <.0001 | 0.667 | <.0001 |
| CAPINT | + | 0.149 | 0.455 | 0.146 | 0.463 | 0.141 | 0.479 |
| SUB | - | 0.105 | 0.232 | 0.108 | 0.222 | 0.110 | 0.210 |
| PBTD | - | -0.021 | 0.251 | -0.021 | 0.245 | -0.021 | 0.233 |
| NBTD | - | -0.030 | 0.149 | -0.031 | 0.143 | -0.030 | 0.145 |
| CR | + | 5.119 | <.0001 | 5.122 | <.0001 | 5.125 | <.0001 |
| YEAR EFFECTS | | | Y | | Y | | Y |
| IND EFFECTS | | | Y | | Y | | Y |
| Generalized R2 | | | 91.87% | | 91.87% | | 91.88% |
| N | | | 8,812 | | 8,812 | | 8,812 |

Variable definitions are presented in Appendix A.

Firm and year t subscripts are suppressed for brevity.

Continuous variables are winsorized at the 1st and 99th percentile.

One-tailed p-values are reported for coefficients with hypothesized directions, all other p-values are two-tailed.

**Table 8**
**Probability of a Change in Credit Rating**

*Panel A: Probability of a Change in Credit Rating in Year t*

| | Probability of an Upgrade | Probability of a Downgrade |
|---|---|---|
| VA = 0 | 6.6% | 8.2% |
| VA = 1 | 4.7% | 9.3% |
| Change in probability | -1.9% | 1.0% |
| Proportional change | -28.6% | 12.3% |

*Panel B: Probability of a Change in Credit Rating in Year t + 1*

| | Probability of an Upgrade | Probability of a Downgrade |
|---|---|---|
| VA = 0 | 7.2% | 11.6% |
| VA = 1 | 5.9% | 12.9% |
| Change in probability | -1.4% | 1.3% |
| Proportional change | -19.0% | 11.6% |
| | | |
| INITIAL_VA = 0 | 6.5% | 11.3% |
| INITIAL_VA = 1 | 5.3% | 13.8% |
| Change in probability | -1.2% | 2.5% |
| Proportional change | -18.3% | 21.8% |
| | | |
| TIMELY_VA set at one standard deviation below mean | 2.0% | 24.0% |
| TIMELY_VA set at mean | 1.3% | 29.7% |
| Change in probability | -0.6% | 5.7% |
| Proportional change | -32.4% | 23.6% |

Panel A change in credit rating measured from year-end t - 1 through year-end t.

Panel B change in credit rating measured from year-end t through year-end t + 1.

All variables (excluding VA, INITIAL_VA and TIMELY_VA) are equal to their sample means.