OPERATING RISK AND ACCOUNTING CONSERVATISM: AN EMPIRICAL STUDY

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ABSTRACT

This paper empirically tests the relation between a firm's degree of accounting conservatism and its level of operating risk. This paper constitutes the first empirical study in the accounting literature to test the risk signaling theory of accounting conservatism which is recently proposed by Wang, O hOgartaigh and van Zijl (2010), who argue that a firm optimally selects a degree of accounting conservatism in order to signal its own operating risk to the capital market. Consistent with the signaling theory, this paper reports empirical evidence that US firms with a lower level of operating risk are more likely to adopt a higher level of accounting conservatism than are firms with a higher level of operating risk. This finding indicates that a signaling separating equilibrium indeed exists in the capital market, where firms use accounting conservatism as a signaling device. The findings of this paper highlights the important economic role that accounting conservatism plays in reducing the capital market's information asymmetry with regard to the firm's operating risk.

JEL: G14, M40, M41.

KEYWORDS: Accounting Conservatism, Asymmetric Timeliness of Earnings, Basu Measure, Risk, Asset Volatility.

INTRODUCTION

Accounting conservatism is widely regarded as one of the oldest and most important principles of accounting (Sterling, 1967; Watts 2003a). Traditionally, conservatism in accounting ensures that costs are not understated in the accounts and revenues are not overstated, and it achieves this goal by requiring accountants, when facing uncertainties in economic transactions, or risks, to adopt higher verification criteria for assets and revenues, but lower verification criteria for liabilities and expenses (Basu 1997; Watts 2003a). Due to the pervasive nature of the conservatism principle in accounting, this principle has profound influences on many, if not all, accounting standards in US GAAP and IFRS, as well as on the professional judgments of generations of accountants.

The objective of this paper is to empirically examine the relation between a firm's choice of accounting conservatism and its operating risk. In a recent analytical study, Wang, O hOgartaigh and van Zijl (2010) propose a signaling theory of accounting conservatism in which accounting conservatism serves as a signal by which a borrower firm can convey their private information about their own operating risk to the lenders, *prior* to the signing of the debt contract. This signaling model of accounting conservatism has a separating equilibrium, in which the low risk firms choose a high degree of accounting conservatism and the high risk firms a low degree of conservatism (Wang et al., 2010). In this paper, I empirically test some of the key predictions of the signaling theory of accounting conservatism.

This study contributes to the accounting literature in the following two areas: First, this study offers the literature's first empirical test of the signaling theory of accounting conservatism proposed by Wang et al. (2010). Second, this study introduces the Vassalou and Xing (2004) iterative algorithm to the accounting literature, which is employed in this paper to quantify firms' operating risk. The Vassalou and Xing (2004) algorithm can be used not only to measure operating risk of a firm, but also to gauge the default risk of the firm, although this feature is not used in this particular study due to the fact that the focus of this study is on operating risk only. The rest of this paper is structured as follows: Section 2 critically reviews the literature on accounting conservatism and Section 3 analyzes the relation between accounting conservatism and the operating risk of the firm based on the signaling framework proposed by Wang et al. (2010). Section 4 discusses the Vassalou and Xing's (2004) iterative method for measuring asset volatility. Section 5 describes the sample data and their descriptive statistics. The main empirical tests and results are discussed in Section 6. Finally, Section 7 concludes the paper.

LITERATURE REVIEW

Broadly stated, conservatism is a principle under which accountants exercise a reasonable degree of *prudence* in recognizing transactions subject to genuine economic *uncertainties*. The role of conservatism as the accountants' guide through the waters of risk and uncertainty is evident in the IASB's definition of prudence (a synonym for conservatism):

"Prudence is the degree of caution in the exercise of the judgments needed in making the estimates required under conditions of uncertainty*, such that assets or incomes are not overstated and liabilities or expenses are not understated."* [Emphasis added] (IASB, 1989, pg. 39)

Due to the higher recognition criteria of good news than bad news that accounting conservatism imposes, conservatism often results in bad economic news being recognized in earnings faster than good economic news, which is described by Basu (1997) as the *asymmetric timeliness of earnings.* This asymmetric timeliness of earnings characteristic has become the anchor for a number of empirical and theoretical works on accounting conservatism in recent years (see Watts, 2003b and Ryan, 2006 for literature reviews). Conservatism's influence on modern accounting standards is pervasive, as examples of accounting conservatism can be found in many modern accounting standards such as the impairment of fixed-assets, revenue recognition, the expensing of the majority, if not all, of the research and development costs, provisions, and contingent assets and liabilities, and many others. All these rules or standards demonstrate the basic characteristic of conservatism, which is that accountants must exercise a degree of prudence in recognizing uncertain economic gains. In addition to the built-in conservatism in US GAAP and IFRS, which are mandatory, accountants frequently exercise conservatism in their professional judgments and discretions as well. Numerous empirical researches have shown that cross-sectional variations in the degree of accounting conservatism do exist between individual firms under the same set of accounting standards (Watts, 2003b; Ryan, 2006).

While the phenomenon of accounting conservatism has intrigued many accounting researchers since the very early stages of the development of accounting theory, there have been an eclectic and divided range of opinions and debates about accounting conservatism, and much of the controversy still exists today. Between the 1930s and the 1980s, conservatism had been criticized by a number of prominent accounting scholars, including Gilman, Hatfield, May and Paton (Chatfield, 1996). According to Chatfield (1996), some of the most frequently used arguments against conservatism are: (1) accounting conservatism is not consistent in that it produces lower income in one period and leads to higher income in another period; (2) accounting conservatism is arbitrary and gives managers too much discretionary power over reporting, among other problems. Even the standard setters have been influenced by such criticisms of conservatism and attempt to abandon the conservatism principle in favor of the "neutrality principle" (IASB, 2006; FASB 2006). However, as Watts (2003a; 2003b) has noted, despite the criticisms of conservatism, not only has accounting conservatism survived numerous accounting reforms, new regulations and economic crises in the past century, but also the average degree of accounting conservatism, in the US at least, has actually increased significantly during the past 30 years or so. So there must be some very good reason that the accounting profession still embraces accounting conservatism as a key principle guiding financial reporting. In fact, recent theoretical and analytical researchers have made some significant contributions towards discovering the underlying rationale for accounting. This literature on conservatism literature can be categorized according to the five rational explanations of accounting conservatism as follows (Watts, 2003a): (1) *the litigation risk explanation, (2) the debt-contracting explanation, (3) the managerial-contracting explanation, (4) the political cost explanation,* and *(5) the tax-incentive explanation.*

Of these five explanations, the debt-contracting theory is one of the most widely accepted economic explanations for conservatism, and also the most widely researched (Ahmed et al., 2002; Beatty et al., 2008; Zhang, 2008; Guay, 2008). The debt-contracting theory of conservatism argues that conservatism improves the debt-contracting efficiency between lenders and borrowers, for two main reasons: First, under conservatism, earnings reflect bad-news more timely than good-news, triggering earlier technical defaults on the debt-covenants which allows the lenders to control the firm earlier and constrains any wealth transfers from debt-holders to equity-holders in a failing firm. Second, because conservatism provides more protection to debt-holders in a firm, the interest rate on the firm's debt may be lowered as a result. Watts (2003), Ahmed et al. (2002), Ball et al. (2008) and Zhang (2008), contend that a more conservative accounting system can reduce the interest rates charged by debt-holders, and thereby increase the value of the debt in a firm, *ceteris paribus*. This effect can happen because conservatism influences accounting-based debt covenants. Accounting-based debt covenants are contractual agreements that specify the minimum or maximum levels of certain key accounting ratios that the borrower firm can have. The main purpose of these covenants is to align equity-holders' incentives with those of the debt-holders, and to restrain the transfer of wealth from debt-holders to equity-holders. Examples of accounting-based debt covenants are the minimum net worth requirement, the minimum interest coverage requirement, the maximum leverage requirement and the minimum current ratio (working capital) requirements.

While the theory above is intuitively appealing and has some empirical support (Ahmed et al., 2002; Ball et al., 2008; Beatty et al., 2008; Zhang, 2008), the debt-contracting theory of conservatism, as described above, has some weaknesses. The theory is, at best, an *incomplete* depiction of the role that accounting conservatism plays in the debt-contracting process. For example, Guay and Verrecchia (2006) criticized the common view held by Watts (2003a), Bushman and Piotroski (2006) and others that conservatism improves debt contracting efficiency by reducing the debt covenant slacks. Guay and Verrecchia (2006) said that it is inefficient to set debt covenants that trigger too often or too infrequently. The best accounting information mechanism is the one that accurate report both good and bad news and exaggerate or depresses either (Guay and Verrecchia, 2006). This means that conservatism is rather an inefficient mechanism for reducing debt-contracting slacks. Therefore, the existing literature on accounting conservatism, with few exceptions, fails to capture the essence of conservatism in the debt contracting context (Guay and Verrecchia, 2006).

Gigler et al. (2009) offer an analytical study on the role of conservatism in the debt-contracting setting, and their conclusion contradicts the above mentioned debt-contracting theory of conservatism. Gigler et al.'s (2009) model shows that conservatism may be *'inefficient'* in debt-contracting because conservatism can trigger too many *'false alarms'* in debt-contracts. By 'false alarms', the authors refer to the situations where an accounting-based debt covenant is violated when the actual performance of the firm is still sound. Gigler et al.'s paper clearly highlights the problems with the existing debt-contracting explanation of conservatism and calls for a re-examination of it.

Wang et al. (2010), however, argue that a major weakness of the prior debt-contracting theory of conservatism is that the theory itself and the empirical tests of the theory over-emphasize the benefits of conservatism and ignore any potential costs associated with conservatism. But if accounting conservatism was indeed so good at all times, one would logically conclude, based on the prior debt-contracting theory of conservatism, that all firms in the world should adopt the highest, extreme, level of conservatism in financial reporting. That is obviously inconsistent with the large amount of empirical observations, which show that firms do not all choose the same, or the highest, level of accounting conservatism (Watts, 2003b; Ryan, 2006). To address this issue, Wang et al.'s (2010) model explicitly models the trade-off between the benefits and costs of accounting conservatism in a debt market context. I will discuss the details of Wang et al.'s new theory in the next section.

Conservatism Vs. Operating Risk

In this section, I discuss the tradeoff between the benefit and cost of accounting conservatism and how that tradeoff determines the relation between a firm's choice of the degree of conservatism in financial reporting and the firm's own operating risk. The analytical foundation of this section's discussion is underpinned by Wang et al. (2010), who propose a risk-signaling theory of accounting conservatism in the debt market. The key elements of this new theory of conservatism are summarized below. First, Wang et al.'s (2010) theory shows that the economic demand for accounting conservatism may be driven not only by the issue of moral hazards – firms may misuse the borrowed funds after signing the debt covenant – but also by *information asymmetry* in the debt market prior to the signing of the debt covenant. The signaling model shows that accounting conservatism, acting as a signaling device, can reduce the information asymmetry between lenders and borrowers.

Second, the concept of conservatism as used by Wang et al. (2010) is consistent with the existing literature's view that accounting conservatism means that higher verification criteria for good news than for bad news (Watts, 2003a; Basu, 1997). Wang et al. (2010) investigated for analytical properties of accounting conservatism based on this concept. One of the most important analytical properties of conservatism is that the marginal effect of conservatism on earnings is stronger when the firm has greater operating risks (Wang et al., 2010). This is intuitive because if a firm faces no risks or uncertainties, then the degree of conservatism will have no impact on the firm's reported earnings at all, since conservatism only applies to situations of uncertainty. Third, the concept of the *operating risk* of a firm, or simply *risk* refers the volatility of the firm's values generated by 'news', which corresponds to Basu's (1997) interpretation of conservatism (Wang et al., 2010). 'News' is essentially the random value-shocks to the firm, and therefore the volatility of the random value-shocks is a logical measure of the *operating risk* of the firm. Firms subject to significant swings in their values are considered as having a higher operating risk. Fourth, in Wang et al.'s (2010) analytical model, a separating signaling equilibrium exists with regard to the firms' operating risk levels. More specifically, it is assumed that there are two levels of risk: Risky and Safe. The firm itself and its equity-holders know its own level of operating risk, but the lenders in the credit market do not have that information.

In the long-run, this information asymmetry problem may lead to adverse-selection in the credit-market, and possibly a credit-rationing problem (Stiglitz and Weiss, 1981). The model shows that accounting conservatism can help resolve this problem, by serving as an information signal about the firm's true level of risk. In particular, their model proves that if certain regularity conditions holds (i.e. the Single-Crossing Property of conservatism), then there exists a separating signaling equilibrium for the game. In the separating equilibrium, the risky firms choose a low level of conservatism (usually the zero level), while the safe firms choose a high level of conservatism. Thus, by observing what level of conservatism a firm adopts, outside investors who are not privy to the firm's private information is able to correctly tell the level of operating risk in that firm. Effectively this reduces, or eliminates, the information asymmetry about the firm's operating risk in the debt market.

The intuition for the separating equilibrium in Wang et al. (2010) is as follows: First, the prior literature shows that accounting conservatism provides more protection to creditors, because conservatism tends to trigger debt defaults earlier, with the benefit of paying lower interest charges. But such earlier debt defaults do not come without costs to the borrower, who now faces greater bankruptcy risks due to the increased likelihood of default. Then the increased bankruptcy risk in turn reduces the value of equity in the firm. Thus, a higher degree of accounting conservatism produces two opposite forces on the value of equity: one force is the lower interest expenses that pulls up the value of equity; and the other force us the higher bankruptcy risk that lowers the value of equity. By rationally optimizing these two forces, the firm is able to select an optimal level of accounting conservatism that produces the highest value equity. And it turns out that the low risk firm will optimally select a higher equilibrium level of conservatism, whereas the high risk firm will optimally select a lower level of conservatism. Thus, the model generates the following hypothesis:

Hypothesis: The firm of low operating risk would choose a higher level of conservatism, but the firm of high operating risk would choose a lower level of conservatism.

Lastly, Wang et al.'s (2010) model of the debt market is conceptually based on a strand of economic literature (Bester, 1985; Stiglitz and Weiss, 1981). This literature analyses adverse selection and signaling problems in the debt market. Stiglitz and Weiss (1981) shows that when borrower firms have more information about the risk levels of their investments than do the banks, the banks will ration the supply of credit to the market, which leads to an excessive demand for credit. That arises because adverse selection will "squeeze" low risk borrowers out of the debt marking and leave only the high risk borrowers in the market, gradually creating a debt market for "lemons" (Akerlof, 1970). Further research by Bester (1985) and Grinblatt and Hwang (1989) argue that the credit-rationing may not be necessary if there are certain signaling mechanisms to help reduce information asymmetry in the market. The signaling role of accounting conservatism appears to be another way of reducing the information asymmetry in the debt market, according to Wang et al. (2010).

Measuring Asset Volatility Using Vassalou And Xing's (2004) Algorithm

This paper defines operating risk as the volatility of the economic value of the total assets of the firm. I empirically measure firms' asset volatility, which is calculated as the standard deviation of a firm's daily economic/market value of assets, by employing Vassalou and Xing's (2004) advanced iterative method. Vassalou and Xing (2004) method is a robust iterative algorithm for calibrating the volatility (σ) and the daily values (V) of the firm, based on the Black-Scholes-Merton model of equity value (see Equation 1) as shown below. The advantage of using the Vassalou and Xing algorithm is that this method produces a significantly more accurate estimate of firms' asset volatility σ than any other existing methods employed in accounting research (Crosbie and Bohn, 2003, pp. 16-17). As a testimony to the accuracy and power of this method, credit-rating agencies, such as Moody's *KMV*, also employ similar methods to evaluate default risk for credit-rating purposes (Crosbie and Bohn, 2003).

The Vassalou and Xing (2004) method is based on the contingent assets pricing model proposed by Merton (1974), who treats the value of equity as a call option the value of the underlying assets of the firm and the maturity value of debt as the strike price. Using this approach, Merton (1974) derived the following Black-Scholes-Merton (BSM) formula for the value of equity (E_t):

$$E_t = V_t N(d_1) - De^{-rt} N(d_2) \tag{1}$$

where $d_1 = \frac{\ln(V_t/D) + (r + \sigma^2/2)t}{\sigma\sqrt{t}}$; $d_2 = d_1 - \sigma\sqrt{t}$.

In the Black-Scholes-Merton equation above, V is the value of the firm's underlying assets, α represents the (steady-state) constant growth rate of the value of the firm; σ denotes the standard deviation of the value of the firm. Lastly, the subscript t denotes a point in time, which is counting downwards towards the maturity date. The maturity value of debt, D, is the strike price of the call-option, and there exists a risk-less bond in the economy, with a continuous rate of return r.

The goal of the Vassalou and Xing (2004) method is to solve the problem of reliably calculating both asset value (*V*) and asset volatility (σ) from the above BSM equation. To get very reliable answers, the Vassalou and Xing method does the following procedure iteratively: (1) Use daily stock prices over the 12 months prior to the desired balance date to form an initial estimate of the volatility of equity σ_E. (2) Use the initial σ_E to derive an initial estimate of the asset volatility, σ, by $\sigma = [E/(E+D)]\sigma_E$. (3) Use the new σ to solve the Black-Scholes-Merton equity-pricing equation (Equation 1) for the value of V_t in each of the trading days over a 12 months period. (4) Obtain a new σ from the newly estimated daily values of V_t. This new σ is then used as the input to the Black-Scholes-Merton equity-pricing equation in the next iteration. (5) Repeat Steps 3 and 4, until the values of σ from two consecutive iterations converge, specifically, where the difference between two consecutive σ is less than 0.001. In the actual computation of this Vassalou and Xing algorithm using the sample data, most of the sample firm-years converge pretty quickly, usually within 2 to 3 iterations.

This iterative procedure is carried out once each year for every firm at the December fiscal year-end. Due to the considerations of data availability and consistent with Vassalou and Xing (2004), the time until debt repayment or refinancing, *t*, is kept at 1 year for all firms. The firm's *steady growth rate* α, which is also its *weighted average cost of capital ("WACC")*, is calculated according to the Capital Assets Pricing Model (CAPM). I first estimate the equity beta for each firm-year using prior *monthly* returns up to 60 months, ending in December of the year of estimation. In the case that there are less than 24 months of stock return data available, I estimate the equity beta based on *daily* stock returns in the year of estimation itself. Once the equity betas (β_E) are estimated, I then convert them into asset betas (β_A) by Hamada's formula (ignoring income tax): $\beta_A = [E/(E+D)]\beta_E$ (Hamada, 1972). After that, I can easily calculate the WACC for each firm-year using the estimated β_A and the appropriate market risk premium and risk-free rates. Per Dimson et al. (2009), I set the risk premium of the US market at 5%. The risk-free rate, *r*, is the average rate of 3-Month US Treasury Bills in the relevant year. The default point, *D*, is approximated by the firm's total liabilities (*Debt*) reported at each year-end from the COMPUSTAT database. The resulting estimates of assets values (*V*) and asset volatility (denoted as *VOL* in the data sample) are then added to our main data sample.

The data sample and its descriptive statistics are discussed below. Please note that the original purpose of the Vassalou and Xing's (2004) method is to accurately estimate a firm's distance-to-default, and estimating assets value and asset volatility is just an intermediate step towards eventually calculating the distance-to-default. But there is no need to calculate distance-to-default in the present paper because all that is needed here is the estimate of asset volatility for each firm-year.

Sample Descriptive Statistics

The raw sample consists of all non-financial firms listed on NYSE, AMEX, and NASDAQ (national and OTC) exchanges from 1998 to 2006, excluding *ADR* firms, which was the maximum range of data the author could collect at the time of this study. With the exception of stock prices (*P*), all data items are collected at the *annual frequency*. The data on stock prices (P), however, are collected at the *daily frequency* as required by the Vassalou and Xing (2004) algorithm. In order to simplify the computations of the Vassalou and Xing (2004) algorithm, I delete any firm-years that do not have a December year-end. In doing so, the sample firms' fiscal years coincide with the calendar years. To reduce the effects of outliers and follow the standard practice, I trim the top and bottom 1% of the following variables: buy-and-hold stock return (R_{it}), earnings per share scaled by beginning stock price (EPS_{it}/P_{it-1}), Operating accruals scaled by beginning total assets (ACC_{it}/TA_{it-1}) which is calculated according to the balance sheet method used by Ball and Shivakumar (2006), and operating cash flow scaled by beginning total assets (CFO_{it}/TA_{it-1}). In addition, I delete those observations with a missing value in any of the key variables, and those observations with a zero or negative Market-to-Book (*MTB*) ratio. Since the Vassalou and Xing (2004) algorithm requires 12 months of un-interrupted daily stock price data, I also delete those firm-years that do not have un-interrupted daily stock price data in the relevant calendar year. After this trimming process, the final sample consists of 12,531 firm-years, covering 8 calendar years from 1999 to 2006.

Table 1: Descriptive Statistics

		Mean	Median	Min	Max	St. Dev.
ACC	($'million)	4	0	-8,409	15,080	276
BV	($'million)	2,608	294	0	250,800	8,955
CFO	($'million)	229	18	-4,447	24,110	832
DEBT	($'million)	1,635	111	0	205,700	6,192
EPS	($)	0.07	0.29	-400.00	212.20	8.53
EPS/P		-0.01	0.03	-0.90	0.33	0.14
LEV		0.75	0.39	0.00	26.70	1.14
MTB		3.49	2.20	0.12	86.77	4.97
MV	($'million)	2,600	344	0	116,800	8,184
NI	($'million)	89	5	-27,450	13,530	553
P	($)	19	12	0	2375	50
R		0.18	0.06	-0.82	4.11	0.65
TA	($'million)	2,394	258	0	247,300	8,344
V	($'million)	4,303	593	1	244,500	13,420
VOL (or σ)		0.46	0.35	0.03	4.37	0.36

ACC*: operating accrual according to Ball and Shivakumar's (2006) balance sheet method; BV: Book value of equity;* CFO*: cash-flow from operating activities;* EPS*: basic earnings per share before extra-ordinary items;* EPS/P*: earnings per share divided by opening share price;* LEV *: Total liabilities divided by market value of equity;* MTB*: closing market value of equity divided by closing net book value;* MV *: closing market value of equity;* NI*: net income including extra-ordinary items;* $NIBI_{it}/V_{it-1}$*: net income including extra-ordinary items but before interest expense, then divided by opening* V *;* P*: opening share price;* R*: buy-and-hold rate of return of equity stocks;* TA*: opening total assets;* V*: opening value of (of the assets of) the firm, calculated per Vassalou and Xing (2004) method;* VOL (σ)*: asset volatility of the firm, i.e. volatility of the value of the firm, calculated per Vassalou and Xing (2004) method.*

Table 1 provides the descriptive statistics of the final sample. All scale-related variables, such as Operating Accruals (*ACC*), Book Value of Equity (*BV*), Cash Flows from Operating Activities (*CFO*), Market Value of Equity (*MVE*), Total of Current and Long-term Liabilities (*DEBT*) and Total Assets (*TA*), vary significantly across firms, because of the varying sizes of the firms. Some of these scale-related variables are directly used in the main empirical tests of this paper (e.g. MVE and DEBT) or in the process of calculating the Vassalou and Xing (2004) algorithm (e.g. MVE and DEBT), while others are used in the robustness tests (e.g. ACC, BV, CFO, and TA). The mean (median) of EPS_{it}/P_{it-1} is -1% (3%). The mean (median) of stock returns, R_{it}, is 18% (6%), and this fact is consistent with the existence of the "fat-tail" in the distribution of stock returns. VOL_{it} (i.e. σ), V_{it} in Table 1 are calculated by myself using the Vassalou and Xing (2004) method. Table 1 shows that asset volatility, VOL_{it} (which, in my earlier notation used in the Merton model, is σ_{it}), has a mean of 44% (annualized), and a median of 34% (annualized). The correlation table is reported in Table 2, which shows no unexpectedly high or low correlation coefficients.

EMPIRICAL TESTS AND RESULTS

The aim of the tests is to examine whether the risk-signaling theory of accounting conservatism has validity in the real world. The theory predicts that firms of higher operating risk tend to adopt a lower degree of accounting conservatism, and conversely firms of lower operating risk tend to adopt a higher degree of accounting conservatism. Firms make such choices of accounting conservatism in order to signal their true risk levels. These tests employ the augmented regressions approach for testing the correlation between the degree of conservatism and the level of asset volatility. In particular, two cross-sectional measures of accounting conservatism are used: (1) Basu's (1997) asymmetric timeliness of earnings (AT) measure, (2) Ball and Shivakumar (2005) asymmetric accruals to cashflow (AACF) measure. I select these measures of conservatism because they are both consistent with *Basu's (1997) asymmetric timeliness of earnings* definition of accounting conservatism, which is the definition of conservatism adopted in the signaling theory of Wang et al. (2010).

Table 2: Correlation Table

	V	ACC	CFO	BV	DEBT	EPS/P	LEV	MTB	MVE	NI	R	VOL
V	1.000	0.024	0.860	0.884	0.820	0.094	0.064	0.061	0.870	0.483	-0.050	-0.173
ACC	0.096	1.000	-0.018	0.027	0.024	0.034	-0.004	0.013	0.013	0.193	-0.003	-0.012
CFO	0.716	0.017	1.000	0.874	0.844	0.140	0.058	-0.003	0.763	0.635	-0.008	-0.203
BV	0.924	0.099	0.809	1.000	0.976	0.106	0.126	-0.026	0.723	0.482	-0.020	-0.214
DEBT	0.878	0.090	0.795	0.972	1.000	0.097	0.158	-0.023	0.639	0.456	-0.018	-0.208
EPS/P	0.224	0.175	0.522	0.356	0.360	1.000	-0.073	0.005	0.115	0.188	0.106	-0.416
LEV	0.197	-0.015	0.314	0.387	0.532	0.175	1.000	-0.173	-0.034	-0.020	-0.133	-0.250
MTB	0.239	0.069	0.000	-0.005	-0.028	-0.071	-0.474	1.000	0.091	0.028	-0.086	0.172
MV	0.930	0.111	0.750	0.913	0.847	0.317	0.038	0.260	1.000	0.543	0.016	-0.176
NI	0.512	0.203	0.735	0.582	0.563	0.761	0.134	0.102	0.588	1.000	0.021	-0.139
R	-0.011	0.037	0.164	0.099	0.104	0.318	-0.120	-0.188	0.202	0.218	1.000	-0.025
VOL	-0.529	-0.086	-0.644	-0.703	-0.745	-0.456	-0.561	0.223	-0.533	-0.516	-0.153	1.000

Note: Pearson correlations are above the main diagonal, and Spearman rank-correlations are below the main diagonal.

Basu's (1997) measure of accounting conservatism focuses on the implication that earnings will reflect 'bad news' more quickly than 'good news', which is known as the asymmetric timeliness of earnings. Basu (1997) was the first to link asymmetric timeliness with accounting conservatism - the greater the asymmetric timeliness, the greater the degree of accounting conservatism. Empirically, Basu (1997) developed the following cross-sectional regression, also known as the Basu regression, to estimate the degree of conservatism (i.e. asymmetric timeliness):

$$EPS_{it}/P_{it-1} = \alpha_0 + \alpha_1 DR_{it} + \beta_0 R_{it} + \beta_1 DR_{it} R_{it} + \epsilon_{it} \quad (2)$$

where EPS_{it} is earnings per share for firm *i* year *t*; P_{it-1} is opening stock market price for firm i year t; R_{it} is stock markets return for firm *i* year *t*; DR_{it} is a dummy variable that is equal to 1 if the stock market return for firm *i* in year *t* is negative, and equal to 0 if the stock market return for firm *i* in year *t* is non-negative. Basu (1997) regression above regresses accounting earnings (*EPS/P*) on stock returns (*R*) separately for 'good-news' and 'bad-news' observations. The Basu regression model uses the dummy variable, DR, to distinguish between 'good-news' and 'bad-news', and thereby allows the slope coefficients and the intercepts to differ between these two groups. Under good news ($R_{it} \geq 0$), DR is equal to 0 and the good-news timeliness coefficient is β_0. Under bad news ($R_{it} < 0$), DR is equal to 1 and the bad-news timeliness coefficient is $\beta_0 + \beta_1$. Clearly, β_1 is the asymmetric timeliness coefficient and is the primary indicator of accounting conservatism in the Basu model. The greater β_1 is, the higher the degree of conservatism. Ball and Shivakumar (2005) develop the AACF measure of conservatism which is broadly similar to the Basu (1997) ATC measure but does not require any stock price data. The AACF measure is based on the following regression:

$$ACC_{it} = \beta_0 + \beta_1 DCFO_{it} + \beta_2 CFO_{it} + \beta_3 DCFO_{it} CFO_{it} + \epsilon_{it} \quad (3)$$

where ACC_{it} is operating accruals, measured as *ΔInventory + ΔDebtors + ΔOther current assets - ΔCreditors - ΔOther current liabilities - Depreciation*, scaled by beginning total assets; $DCFO_{it}$ is a dummy variable that is set to 0 if $CFO_{it} \geq 0$, and is set to 1 if $CFO_{it} < 0$; CFO_{it} is operating cash-flow for period t, scaled by beginning total assets.

In the regression above, the dummy variable is *DCFO*, which equals 0 is $CFO \geq 0$, and equals 1 if $CFO < 0$. In the AACF measure, the proxy for the underlying economic news is cash flow from operations

(*CFO*). The extent of accounting conservatism is reflected by how much of the underlying economic news is incorporated in operating accruals. The more the operating accruals incorporate bad news as opposed to good news, the greater the degree of accounting conservatism. Thus, the coefficient β_3 is the AACF measure of accounting conservatism. A higher β_3 indicates a higher degree of accounting conservatism. However, the basic Basu AT measure and AACF measure outline above do not test how asset volatility impacts on the degree of accounting conservatism. To do that, I need to estimate the following augmented regressions for these two models:

(1) Basu (1997) AT regression augmented by asset volatility:

$$EPS_{it}/P_{it-1} = \alpha_0 + \alpha_1 DR_{it} + \beta_0 R_{it} + \beta_1 DR_{it}R_{it} + \beta_2 VOL_{it} + \beta_3 VOL_{it}DR_{it} + \beta_4 VOL_{it}R_{it} + \beta_5 VOL_{it}DR_{it}R_{it} + \epsilon_{it} \quad (4)$$

(2) Ball and Shivakumar's (2005) AACF regression augmented by asset volatility:

$$ACC_{it} = \alpha_0 + \alpha_1 DCFO_{it} + \beta_0 CFO_{it} + \beta_1 DCFO_{it}CFO_{it} + \beta_2 VOL_{it} + \beta_3 VOL_{it}DCFO_{it} + \beta_4 VOL_{it}CFO_{it} + \beta_5 VOL_{it}DCFO_{it}CFO_{it} + \epsilon_{it} \quad (5)$$

In both regressions (4) and (5) above, the correlation between asset volatility (*VOL*) and conservatism can be captured by the coefficient of the three-ways interaction term, β_5. The theory proposed in Section 3 predicts that both β_5's from these two regressions are *negative*. In other words, a negative β_5 is an indication that the degree of accounting conservatism and the asset volatility of the firm is inversely correlated. Table 3 shows the results of fitting the augmented Basu and AACF regressions (2 and 3) to the sample data. Panel A of Table 3 reports the result of the augmented Basu regression (2). Panel A shows that the β_5 coefficient on interaction term, *VOL*DR*R*, is - 0.101, and is statistically significant at 1% level. This negative interaction effect indicates that when a firm's asset volatility increases, its degree of conservatism decreases. This result is consistent with the theoretical prediction of the signaling model

The result of the augmented AACF regression is shown in *Table 3 - Panel B*. The result is very similar to that of *Panel A*: The β_4 coefficient on the interaction term, *VOL*DCFO*CFO*, is -0.189, and is statistically significant at 1% level. Thus, when *VOL* increases in a firm, its degree of conservatism tends to decreases, as predicted by the signaling theory. The other regression coefficients in *Table 3.2 - Panel B* are generally consistent with the prior literature (Ball and Shivakumar, 2005). The good news timeliness, which is proxied by the regression coefficient of *CFO*, is -0.149 and is significant at the 1% level. The asymmetric timeliness coefficient (*DCFO*CFO*) is 0.260 and significant at the 1% level.

In the next set of tests, I include an additional control variable in our Basu (1997) and AACF regressions: financial leverage (LEV), which is measured as total liability deflated by market value of equity. Prior research has shown that the financial leverage (LEV) is highly positively correlated with the firm's degree of accounting conservatism, which is largely supported by the debt-contracting explanation of accounting conservatism (e.g. Khan and Watts, 2009; Zhang, 2008). Thus, including LEV in the tests controls for the effect of varying degrees of financial leverage on the firm's choice of accounting conservatism. This helps avoiding any potential confounding effect produced by financial leverage on the main results.

Thus, I include LEV along with the asset volatility (VOL) in Basu (1997) regressions as follows:

$$EPS_{it}/P_{it-1} = \alpha_0 + \alpha_1 DR_{it} + \beta_0 R_{it} + \beta_1 DR_{it}R_{it} + \beta_2 VOL_{it} + \beta_3 VOL_{it}DR_{it} + \beta_4 VOL_{it}R_{it} + \beta_5 VOL_{it}DR_{it}R_{it} + \gamma_1 LEV_{it} + \gamma_2 LEV_{it}R_{it} + \gamma_3 LEV_{it}DR_{it} + \gamma_4 LEV_{it}DR_{it}R_{it} + \epsilon_{it} \quad (6)$$

and in Ball and Shivakumar's (2005) AACF regression as follows:

$$ACC_{it} = \alpha_0 + \alpha_1 DCFO_{it} + \beta_0 CFO_{it} + \beta_1 DCFO_{it}CFO_{it} + \beta_2 VOL_{it} + \beta_3 VOL_{it}DCFO_{it} + \beta_4 VOL_{it}CFO_{it} + \beta_5 VOL_{it}DCFO_{it}CFO_{it} + \gamma_1 LEV_{it} + \gamma_2 LEV_{it}CFO_{it} + \gamma_3 LEV_{it}DCFO_{it} + \gamma_4 LEV_{it}DCFO_{it}CFO_{it} + \epsilon_{it} \quad (7)$$

Table 3: Basu AT and AACF Regressions Augmented by Asset Volatility (VOL)

Panel A: Basu AT Measure and Asset Volatility (VOL)	**Estimate**	**t value**	**p value**	
(Intercept)	0.073	18.14	<0.001	***
DR	-0.001	-0.22	0.827	
R	0.021	2.42	0.016	**
DR*R	0.155	7.92	0.000	***
VOL	-0.153	-14.20	<0.001	***
VOL*DR	-0.005	-0.28	0.778	
VOL*R	-0.028	-2.11	0.035	**
VOL*DR*R	-0.102	-3.20	0.001	***
Panel B: AACF Measure with Asset Volatility (VOL)	**Estimate**	**t value**	**Pr (> |t|)**	
(Intercept)	0.023	11.720	<0.001	***
DCFO	0.031	6.750	0.000	***
CFO	-0.149	-9.180	<0.001	***
*DCFO*CFO*	0.260	11.460	<0.001	***
VOL	-0.011	-2.190	0.029	**
*VOL*DCFO*	-0.024	-3.230	0.001	***
*VOL*CFO*	0.100	2.620	0.009	***
*VOL*DCFO*CFO*	-0.189	-4.570	<0.001	***

*Significance levels: *10%, **5%, ***1%. Residuals standards error: 0.1222 on 12523 degrees of freedomMultiple R-Squared: 0.202; Adjusted R-Squared: 0.2015. F- statistic: 452. 7534 on 7 12523 DF. P-value: 0. All t-statistics are White-adjusted Heteroskedasticity-Consistent-Estimators. Significance levels: *10%, **5%, ***1%. Residuals standard error: 0.0685 on 12523 degrees of freedom. Multiple R-Squared: 0.0309; Adjusted R-Squared: 0.0304. F-statistic: 57.0936 on 7 and 12523 DF, p-value: 0. All t-statistics are White-adjusted Heteroskedasticity-Consistent-Estimators.*

The results of estimating Equations 6 and 7 using OLS methods are reported in Table 4. Panel A of Table 4 shows the result of estimating the augmented Basu regression (Equation 6). This Panel indicates that the interaction coefficient, β_5, is significantly negative, at -0.07, with a highly significant t-statistic of -2.07. The new variable, financial leverage (LEV), is positively correlated with the Basu (1997) measure of conservatism, as the three-ways interaction coefficient, γ_4, is 0.058 and statistically significant at the 1% level. The positive correlation between financial leverage and the Basu measure is consistent with prior literature (e.g. Khan and Watts, 2009). Hence, our result of clearly indicate that even after controlling for financial leverage, the degree of conservatism is negatively correlated with asset volatility.

Table 4 - Panel B summarizes the result of the augmented AACF Regression (7) including both leverage and asset volatility. The results are largely similar to those reported in Panel B. In particular, the interaction coefficient, β_5, on $VOL*DCFO*CFO$, is significantly negative at -0.195. The level of significant for this coefficient based on the White-adjusted heteroskedasticity-consistent estimator is less than 1%. This is again supportive of the signaling theory of accounting conservatism that the degree of conservatism is negatively correlated with the level of operating risk of a firm. However, the sign of the coefficient γ_4, on $LEV*DCFO*CFO$, is negative, although it is only significant at a very marginal 10%

level of significance. The conflicting signs of β_5 seem to suggest that leverage is a questionable factor for the firm's choice of the degree of accounting conservatism.

To summarize, the empirical results are strongly consistent with the signaling theory of accounting conservatism. The higher the degree of risk in a firm, the lower the degree of conservatism is in that firm. Two measures of accounting conservatism – the Basu measure and the AACF measure – both yield similar results. The results remain valid even after controlling for the effects of financial leverage under both measures of accounting conservatism.

Table 4: Regressions with Both Asset Volatility and Leverage

Panel A: Basu AT Measure with Asset Volatility and Leverage				
	Estimate	**Std. Error**	**t value**	
(Intercept)	0.084	0.005	16.563	***
DR	-0.005	0.008	-0.666	
R	0.031	0.009	3.336	***
DR*R	0.093	0.023	4.084	***
VOL	-0.163	0.012	-14.071	***
VOL*DR	-0.006	0.018	-0.353	
VOL*R	-0.036	0.014	-2.582	***
VOL*DR*R	-0.070	0.034	-2.071	**
LEV	-0.021	0.007	-2.854	***
LEV*R	-0.025	0.013	-1.945	*
LEV*DR	0.007	0.010	0.695	
LEV*DR*R	0.058	0.020	2.889	***
Panel B: AACF Measure with Asset Volatility and Leverage				
	Estimate	**Std. Error**	**t value**	
(Intercept)	0.027	0.002	12.140	***
DCFO	0.027	0.005	5.413	***
CFO	-0.152	0.018	-8.343	***
CFO*DCFO	0.272	0.025	11.062	***
VOL	-0.015	0.005	-2.839	***
VOL*DCFO	-0.021	0.008	-2.784	***
VOL*CFO	0.103	0.039	2.665	***
VOL*DCFO*CFO	-0.195	0.042	-4.636	***
LEV	-0.002	0.002	-1.182	
LEV*CFO	-0.040	0.028	-1.417	
LEV*DCFO	-0.003	0.003	-1.008	
LEV*DCFO*CFO	-0.091	0.055	-1.656	*

Residual standard error: 0.1204 on 12519 degrees of freedom. Multiple R-squared: 0.2248. Adjusted R-squared: 0.2242. F-statistic: 330 on 11 and 12519 DF, p-value: < 2.2e-16. All t-statistics in Table 4 are White-Adjusted for heteroskedasticity. Residual standard error: 0.06835 on 12519 degrees of freedom. Multiple R-squared: 0.03487. Adjusted R-squared: 0.03404. F-statistic: 41.12 on 11 and 12519 DF, p-value: < 2.2e-16. All t-statistics in Table 4 are White-Adjusted for heteroskedasticity.

CONCLUSIONS AND IMPLICATIONS

In a Utopian world devoid of risk and uncertainty, there would be no role for accounting conservatism. But unfortunately, such an ideal world does not exist in real life. Firms and other economic actors must constantly wade through the murky waters of risk and uncertainty, and that is where accounting conservatism thrives. However, prior literature on accounting conservatism has paid scant attention to the role that risks play in shaping accounting conservatism and the role accounting conservatism plays in response to risks. This paper fills this gap in the literature from an empirical perspective. This paper tests the prediction of the signaling theory of accounting conservatism using US data, based on the analytical framework of Wang et al. (2010). The results are highly consistent with the prediction that the level of conservatism adopted by a firm is inversely correlated with the firm's operating risk. The degree of conservatism is measured by both the Basu (1997) measure and Ball and Shivakumar's (2005) asymmetric accruals to cash-flow measure. The empirical results are robust to the inclusion of financial leverage as an additional control variable.

This paper has some direct implications for standard setters in the IASB and FASB. The main finding of this paper suggest that conservatism is a naturally arisen equilibrium financial reporting practice, and this equilibrium is determined, at least partially, by the level of operating risk of the reporting entity. Thus, if the IASB and FASB were to fully eliminate the century-old principle of conservatism from the conceptual framework of accounting as their jointly released 2006 *"Preliminary Views"* document (2006) clearly indicates, they would effectively commit virtually all reporting entities to an out-of-equilibrium position. The consequence could be a less transparent capital market.

Investors and financial analysts may also benefit from the findings of this paper. Knowing that accounting conservatism is a mechanism of communicating the operating risk of the firm to the capital market, investors and financial analysts may then better utilize accounting conservatism as a tool of investment risk analysis. This could potentially improve the investors' and financial analysts' investment and risk management effectiveness. This study is subject to two limitations: First, the Basu (1997) measure of accounting conservatism employed in this study is not without measurement errors (Givoly et al., 2007). The use of the second measure of conservatism – Ball and Shivakumar's (2006) AACF – only partially mitigates this measurement error because the validity of the AACF measure itself is not yet well understood by the literature (Wang et al., 2009). Second, the sample of firms analyzed by this study is confined to only publicly listed firms, and private firms are not included in the sample largely due to the lack of availability of accounting data on private firms. Private firms, however, also need to access the credit market for debt financing, which may provide enough incentives for them to also use accounting conservatism to signal their operating risks to the lenders. Although not within the scope of the present study, analyzing the relation between private firms' choices of accounting conservatism and operating risk may become a fruitful area of research in the future.

Another future avenue of research is to empirically examine whether firms under International Financial Reporting Standards (IFRS) also signal their operating risks using accounting conservatism. Ball et al. (2008) argue that the debt market financing plays a bigger role in Europe, whereas the equity market financing has a more prominent role in the US. Given that the signaling theory of accounting conservatism developed by Wang et al. (2010) primarily focuses on the debt market, it seems reasonable to argue that the signaling power of conservatism is even stronger in Europe than in the US. Thus, it would be highly illuminating if future research could empirically compare the signaling power of accounting conservatism of European firms with that of US firms.

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