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Abstract

A substantial literature investigates conditional conservatism, and how it depends on market, political and institutional variables. Studies typically assume the Basu (1997) asymmetric timeliness coefficient (incremental slope on negative returns in a piecewise-linear regression of accounting income on stock returns) is a valid measure of conditional conservatism, defined as asymmetric accounting recognition of economic shocks (“news”). We analyze the measure’s validity, in the context of a model with accounting income incorporating different types of information with different lags, and adding noise. We use the model to demonstrate that the asymmetric timeliness coefficient varies with firm characteristics affecting their information environments, including the relative importance of growth option expectation revisions (a proxy for which is the market-to-book ratio), the length of firms’ operating and investment cycles, and diversification. We also conclude that much criticism of the Basu regression misconstrues researchers’ objectives.

**Keywords:** Capital markets; Conditional conservatism; Timely loss recognition; Basu model; Returns-earnings regressions; Earnings response coefficients
Econometrics of the Basu Asymmetric Timeliness Coefficient and Accounting Conservatism

1. Introduction

Conservatism has been a central accounting principle for centuries (Watts and Zimmerman, 1986; Basu, 1997; Watts, 2003a). Basu (1997, p. 7) defines conservatism as “the accountant’s tendency to require a higher degree of verification to recognize good news as gains than to recognize bad news as losses,” a definition that is consistent with the adage “anticipate no profits but anticipate all losses.” Basu tests the resulting prediction that accounting income is timelier in incorporating negative shocks to firm value (“bad news”) than positive shocks (“good news”), as follows. In an efficient market, stock return reflects all public information arriving during the return period, and thus is a valid measure of new economic shocks to firm value. In a piecewise-linear regression of accounting income on fiscal-period stock return, the incremental coefficient on negative return (a proxy for bad news) is assumed to be a valid measure of asymmetrically timely loss recognition. Basu predicts and finds that the incremental coefficient on negative stock return indeed is positive.

Under this definition of conservatism, accounting income is contingent on the sign of the shock to firm value, so Ball and Shivakumar (2005) and Beaver and Ryan (2005) term it conditional conservatism. This contrasts with defining conservatism as reporting unconditionally low accounting outcomes for earnings or book value of equity. The key difference between these concepts is that conditional conservatism carries new information. This formulation of conservatism was an important breakthrough in our understanding of financial reporting rules and practices.

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1 We use the term “validity” as shorthand for what commonly is described as “construct validity,” which Peter (1981, p. 134) notes “generally is used to refer to the vertical correspondence between a construct which is at an unobservable, conceptual level and a purported measure of it which is at an operational level.” The notion is developed more fully in the classic Cook and Campbell (1979) text and its following editions.
2 The model and its origins are described in Basu (2009).
3 See also Basu (2005, Section 2), Ball, Kothari, and Robin (2000, fn. 15) and Ball and Shivakumar (2005, 2008a). Other things equal, conditional conservatism implies unconditional conservatism, but the converse does not hold. Conditional conservatism is the stricter concept, in the sense that it requires a correlation with real shocks to firm value.
In a comparatively short period of time, the Basu (1997) piecewise-linear regression of accounting income on stock return has become one of the principal models of the financial accounting literature, used in a wide range of studies summarized in Appendix A.\(^4\) The range and importance of these applications is testimony to the pervasiveness of conservatism as a property of financial reporting, and also to researchers’ confidence in the validity of their estimates of it. Furthermore, these studies regularly report differences in conditional conservatism that are consistent with plausible hypotheses, which provides added confidence in the validity of the estimates.

Nevertheless, researchers have assumed the Basu regression produces valid measures of conditional conservatism due largely to its intuitive appeal, and without rigorous formal analysis.\(^5\) The need for formal econometric analysis is heightened by several claims that the Basu asymmetric timeliness coefficient is not a valid measure of conservatism (notably, Dietrich et al., 2007), and that coefficient estimates are biased and should be avoided by researchers (Patatoukas and Thomas, 2011). Here too, the claims are based largely on intuitive or informal analysis. Further complicating the issue, Ball, Kothari and Nikolaev (2011) show formally and empirically that the standard Basu piecewise linear regression suffers from a correlated omitted variables problem due to correlation between the expected values of firm’s earnings (scaled by price) and the expected values of their returns. They also show that this correlation differs between positive and negative return periods, which biases the Basu estimate of incrementally timely loss recognition, and that implementing controls for the expected components of earnings and returns essentially eliminates the bias.

A formal analysis requires a more detailed specification of what conditional conservatism entails than simply asserting a regression function. We build our analysis on a novel model of the relation between accounting income and economic income that captures what we believe to be the

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\(^4\) As of 21 December 2011, Basu (1997) has 1613 citations in Google Scholar and 290 citations in the Social Sciences Citation Index, making it one of the most highly referenced papers in the modern accounting literature.

\(^5\) Basu (1997) offers no formal proof. Increasingly formal but nevertheless limited analyses are offered over time in Ball, Kothari and Robin (2000), Pope and Walker (1999), Ryan and Zarowin (2003), and Beaver and Ryan (2005).
salient properties of income recognition as it is practiced. We then use the model to derive and analyze the Basu earnings asymmetric timeliness coefficient. The model addresses shocks to firm value that arise from different types of information, and consequently our analysis is conducted entirely in the context of “news” and its incorporation in earnings. In particular, we ignore variation in expected returns across both time and firms. This framework allows a more formal derivation of the Basu measure of conservatism, and also improves our understanding of how that measure relates to and interacts with other attributes of a firm’s information system.

The model distinguishes four components of information that financial reporting rules and practices cause to be incorporated in accounting income at different points in time. One information component is incorporated contemporaneously. The second information component is incorporated contemporaneously or with a lag, depending on its sign or magnitude. This earnings component is the source of conditional conservatism, which arises because negative news about future cash flows is subject to a lower accounting verification threshold than positive news. The third information component in our model always is incorporated with a lag, such as news about “unbooked” rents or growth options. The first three information components are assumed to be reflected in security prices, even when they are not recognized in current earnings (i.e., when disclosed via other information channels). The model also has accounting income reflecting “noise,” for example due to random errors in counting inventory or in valuing accounts receivable, that reverses over time. We believe this is the first model of the relation between accounting and economic incomes that incorporates the salient properties of accounting recognition rules and practices.

In this model, the information components that are contemporaneously incorporated in accounting income might cause returns, or vice versa. For reasons outlined below, we address the estimation of the “association” between accounting and economic incomes, and in particular the
timing differences between them, so estimating the direction or directions of causality in the earnings-returns relation is not an issue here.

The primary result in this paper is that the Basu regression provides econometrically valid estimates of conditional conservatism, when it is defined as asymmetrically timely incorporation of economic news. For example, we show that the Basu regression identifies conditional conservatism when it exists, but not when it does not exist. This reconciles with the Ball, Kothari and Nikolaev (2011) conclusion that empirically there is no significant evidence of the bias reported in Patatoukas and Thomas (2011) when the Basu regression controls for expected values and therefore estimates how the unexpected “news” component of returns is reflected in accounting earnings.

The model also allows us to pursue the secondary goal of this paper, which is to show how conditional conservatism varies as a function of firm attributes. It is well known that the timeliness of accounting income varies among firms. Well-known extremes in timeliness are stock mutual funds (whose assets are actively-traded securities that are marked to market daily) and start-up firms in intellectual property industries (whose assets mainly are growth options about which accounting income reflects comparatively little new information). Our analysis develops a conjecture in Ball, Kothari and Robin (2000, p. 48), that the asymmetry in earnings timeliness is decreasing in the relative importance of information about growth options. We use our earnings-returns model to demonstrate that the asymmetrically timely loss recognition coefficient decreases in the variance of information about growth options relative to the variance of all information about the firm: that is, in the proportion of shocks to firm value associated with news about growth options. Because the market-to-book ratio is a likely proxy for this news proportion, a negative relation between firms’ market-to-book ratios and asymmetric timeliness coefficients is expected.

The model offers a number of additional insights into the firm characteristics affecting conditional conservatism. One such characteristic is the proportion of news that is symmetrically
verifiable, a proxy for which would be the ratio of current assets (whose expected realization in cash is near-term) to long term assets. Other likely determinants of conditional conservatism are the correlation between shocks to the firm’s growth options and its assets in place (which in turn is affected by the degree of diversification), and the length of the fiscal period.

Our analysis shows that Basu coefficient is not a structural (causal) parameter that needs to be identified but rather is a function of more fundamental properties of the accounting information system. Notably, we view the negative relation between the market-to-book ratio and the Basu asymmetric timeliness coefficient as a property of income recognition in accounting. This is different from the perspective offered by Roychowdhury and Watts (2007), even though the approaches make similar predictions. Several criticisms of the Basu measure, in our view, are attributable to a lack of understanding of this result.

We believe these results have substantial implications for empirical research using Basu regression estimates of conditional conservatism, which we show reflect firm characteristics as well as accounting rules and practices. They formalize the intuition behind the Ball, Kothari and Robin (2000, Section 6.4) controls for industry, which those authors use to proxy for potentially correlated omitted variables when estimating the effect of different international accounting rules and practices on asymmetric timeliness. Subsequent empirical literature has paid scant attention to controlling for firm characteristics, perhaps due in part to the absence of a formal framework to guide them. As we note below, there are unresolved issues such as whether firm characteristics truly are exogenous in cross-country research on the effects of accounting, legal and economic institutional variables.

Section 2 outlines the model of the income-return relation that incorporates salient properties of accounting income. Section 3 then proceeds with a formal analysis of the Basu regression in the context of that model. Section 4 analyzes the relation between timeliness and firm characteristics, the role of the market-to-book ratio, and other empirical implications. Section 5 extends the analysis to
the effect of recognition lags on the variance of earnings relative to returns. Section 6 addresses the arguments of Dietrich et al. (2007) that return endogeneity and sample truncation lead to biased Basu regression estimates. A short summary and our conclusions appear in section 7.

2. A framework for interpreting regressions of earnings on returns

We propose what we believe to be the first model of the relation between accounting and economic incomes to incorporate realistic and intuitive assumptions about how accounting rules and practices lead to different types of information about economic value being incorporated into accounting income in different ways, depending on properties of the information. The origins of the model can be traced back to Ball and Brown (1968), Beaver, Lambert, and Morse (1980), Fama (1990), Kothari and Sloan (1992), Basu (1997), Kothari (2001), and others. We first present a general form of the model and subsequently offer simpler cases. We use this model as a framework to analyze the validity of Basu regression model parameters as measures of the underlying construct of asymmetrically timely recognition of economic gains and losses.

To facilitate tractability we assume throughout that capital markets are informationally efficient. We believe violation of this assumption is not central in typical studies using the Basu model. Most studies use annual returns, to coincide with the periodicity of reported earnings and with the settlement period in contracts based on earnings (notably, debt, supply and compensation agreements). As argued in Ball et al. (2000), annual horizons substantially mitigate concerns about the informational efficiency of security prices.

Because we focus on shocks to firm value arising from different types of information, the entire analysis is performed using continuously compounded growth rates (i.e., log growth rates) in income and stock prices. We do not model expected returns, implicitly ignoring variation in expected returns across both time and firms. Under the maintained hypotheses of market efficiency and
constant expected rates of return, stock prices follow a “random walk”, and thus growth in prices is permanent and unexpected returns are serially uncorrelated (Bachelier 1900, Samuelson 1965, Fama, 1970; Campbell, Lo, and MacKinlay, 1997). We therefore assume growth in price and all its components are permanent.

Since we assume capital markets are informationally efficient, prices reflect all publicly available information in a timely fashion. In contrast, accounting rules and practices emphasize verifiability, objectivity, and conservatism, as reflected for example in the historical cost principle and revenue recognition rules, and hence accounting income in any period incorporates some but not all the information that becomes publicly available during the period. The consequence is that accounting income incorporates some information with a lag: that is, “prices lead earnings.”

Information in our model can be made public via earnings or any other information channel. We do not implicitly or explicitly assume that accounting has no informational role in price formation (or that equity prices would be the same in the absence of earnings announcements). Instead, we assume that to the extent the market responds to reported earnings, it understands its components. In particular, we assume the market distinguishes the components that reflect information made public in prior periods from those that reflect current-period information.

The model decomposes the total revision in security price (i.e., stock return) into three components, which are incorporated in accounting income differently:

\[ R_t = x_t + y_t + g_t \]  
(1.1)

\[ I_t = x_t + w_t y_t + (1 - w_t) y_{t-1} + g_{t-1} + e_t - e_{t-1} \]  
(1.2)

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6 The fact that prices lead earnings is clear from the graphs in Ball and Brown (1968), Foster, Olsen and Shevlin (1984) and Bernard and Thomas (1990), from longer-horizon studies such as Beaver, Lambert and Morse (1980) and Kothari and Sloan (1992), and from even a casual reading of the financial press.
where subscripts $t$ and $t-1$ refer to time periods.

$$R_t = \text{security return expressed as the continuously compounded growth rate in price, i.e., the natural logarithm of the firm’s economic income deflated by beginning-of-period price;}$$

$$I_t = \text{accounting income, expressed as the continuously compounded growth rate in earnings;}$$

$$x_t = \text{portion of the total growth rate in security price $R_t$ that invariably is contemporaneously captured in accounting income, $I_t$;}$$

$$y_t = \text{portion of the total growth rate in the security price that is not contemporaneously captured in $I_t$, unless required by conservative accounting;}$$

$$w_t = \text{is an indicator variable that takes the value of one when conservative accounting rules and practices lead to recognition of $y$ in the current period; and}$$

$$g_t = \text{portion of the total growth rate in the security price that never is contemporaneously captured in $I_t$, but always is incorporated with a lag;}$$

$$\epsilon_t = \text{“noise” in accounting earnings that reverses the next period.}$$

For analytical tractability, we assume $x_t, y_t, g_t,$ and $\epsilon_t$ are stationary, symmetric, and time-independent (i.e., serially uncorrelated) random variables whose variances are denoted by $\sigma_x^2, \sigma_y^2, \sigma_g^2$ and $\sigma_\epsilon^2,$ respectively, and:

$$\text{corr}(x_t, y_t) = \rho_{xy} > 0, \text{ corr}(x_t, g_t) = \rho_{xg} > 0, \text{ and corr}(y_t, g_t) = \rho_{yg} > 0$$

(1.3)

In this model, financial reporting rules and practices lead to accounting income always contemporaneously incorporating the information component $x_t,$ regardless of its sign or magnitude (i.e., without conditional conservatism). The intuition is that this component represents the least costly source of information to verify, and thus it invariably is recognized in the same period as it affects returns. This type of information could include current-period news about current-period cash flow, such as learning the actual realizations of current period revenues and expenses in comparison with their expectations. It also could include news about future cash flows that is verifiable at low

7 We discuss the case of asymmetric distributions in Section 6.
cost, and that is incorporated symmetrically in accounting income via working capital accruals. Symmetrically low-cost verification typically applies to current operating-cycle information, such as cash receipts and payments, and the quantities of accounts receivable, accounts payable and inventories. For example, accruals are used to adjust current-period cash flow for both increases and decreases in the quantity of closing inventory relative to opening inventory, because they are approximately equally low in cost to verify. Similarly, cash collections from customers are adjusted for both increases and decreases in accounts receivable. These working capital accruals incorporate into accounting income current information about future cash flows. For example, other things equal an increase in closing inventory is information that less cash will be spent on purchasing inventory in future periods, and it is verifiable at low cost regardless of its sign. In some limited circumstances, symmetrically low-cost verification can apply to long-cycle information as well, an example being index funds, in which gains and losses on long term investments in traded stocks are symmetrically low-cost to verify and in practice are accounted on a daily basis.

The second component of stock return, $y_t$, is incorporated in accounting income either contemporaneously or with a lag, depending on the accounting operator $w_t$. The intuition here is that $y_t$ represents information that is costly to verify and, because the verification threshold is lower for negative than for positive news (Basu 1997, page 4), this information is incorporated asymmetrically. Such information could include the current-period revision in the expectation of unrealized future-period cash flows from “booked” assets, including purchased long term assets in place and purchased intangible assets such as patents and goodwill. It could include information about the marketability of current assets such as inventory. This component also could include news about the present value of future-period cash outflows, such as lawsuit settlements. Using accrual accounting to bring forward shocks to expected future cash flows is known as timely gain and loss recognition. Conditional conservatism implies that $w$ is more likely to be triggered by bad news (adverse shocks to expected
future cash flows) than good news, and hence that loss recognition generally is timelier than gain recognition.\textsuperscript{8}

In the event that timely recognition is not triggered and thus the return component \(y_t\) is not contemporaneously incorporated in income, it is incorporated with a lag, the intuition being that some revisions in expectations of future cash flows are not reflected in accounting income until the actual cash flow realizations occur. Conditional conservatism implies that incorporation with a lag is more likely for good news than bad. The effect of asymmetrically delayed incorporation of information is that, in a two-period model, the total effect on current period income of revisions in cash flow expectations is \(w_t y_t + (1 - w_{t-1}) y_{t-1}\).

In practice, the extent of the timely recognition asymmetry is determined by a number of factors. Identification of these factors is the principal objective of the extensive literature surveyed in Appendix A. The factors studied include economic incentives, debt and compensation contracting, governance, GAAP, regulation, and taxes (e.g., Watts and Zimmerman 1986, and Watts 2003a,b), in addition to properties of information such as verifiability. Since our objective is not to provide an equilibrium model of the extent of conditional conservatism, but rather to investigate the validity of the Basu (1997) measure of conditional conservatism used in this literature, our model takes the extent of the asymmetry as a given, and studies the properties of its measurement. In our setting, timely recognition is triggered when \(y\) is below an exogenous threshold \(c\).\textsuperscript{9}

The third component of stock return, \(g_{t+1}\), invariably is incorporated in accounting income with a lag. One source of this component would be revisions in the value of growth options. Because they by definition are not “booked” as assets on balance sheets, shocks to firm’s growth

\textsuperscript{8} In this paper, we do not address why the threshold for incurring costly verification is lower for bad news, which is the subject of the extensive literature using Basu model estimates surveyed in Appendix A. Our purpose here is to study the validity of the estimates used in that literature.

\textsuperscript{9} Alternatively, timely loss recognition can occur with probability \(p\) which can be a function of \(y\), i.e., \(\Pr(w=1|y) = p(y)\).
opportunities ultimately are incorporated in earnings only when the associated cash flows are (or are not) realized. A related source of this component would be revisions in expectations of future monopoly rents (Roychowdhury and Watts, 2007).

The model also has accounting income incorporating uncorrelated “noise” that reverses over time. One source of this earnings component would be accounting errors arising from imperfect accounting accruals. Errors that reverse over time include miscounting inventory, which affects current and future cost of goods sold and hence earnings with opposing signs. Other examples are errors in estimating uncollectible accounts receivable, errors in forecasting deferred tax liabilities, the effects of using historical-cost interest rates on debt, and errors in estimating assets’ useful lives. Because accounting errors reverse over time, in our two-period model the error term is reversed out in the following period.\(^{10}\) For tractability we assume accounting error is uncorrelated with other variables, and thus we ignore “earnings management” or “smoothing,” which could produce a non-random error component that is negatively correlated with other components.

In this formulation, \(y_{t-1}\) and \(g_{t-1}\) are the two sources of delayed recognition of economic income in accounting earnings. They generate the anticipated or stale component of earnings growth whose value consequences are reflected in price prior to the period in which they are incorporated in accounting income. They are uncorrelated with current period return \(R_t\), which is influenced only by information arriving contemporaneously. We view this lagged recognition of some components of stock return as a natural feature of the income recognition process in accounting, which can be measured and investigated (for example, as a function of firm characteristics, managers’ incentives, or countries’ economic and political institutions). As will become evident, we do not view or model

\(^{10}\) Knowledge of \(\epsilon_{t-1}\) would help predict earnings, but not returns. We assume the market unravels the current accounting error \(\epsilon_t\) and does not react to it. This assumption can be relaxed without altering our conclusions.
the recognition lag as a measurement error issue, but as a property of accounting income that the researcher wishes to estimate.

While \( y_{t-1} \) and \( g_{t-1} \) are assumed to be uncorrelated with \( x_t, y_t, \) and \( g_t \), and, therefore, with \( R_t \), there are economic reasons to expect a positive correlation among \( x_t, y_t, \) and \( g_t \). Recall that all three components are a consequence of economic news affecting investors’ cash flow expectations. However, only the news generating the stock price growth rate component \( x_t \), and possibly also \( y_t \) (i.e., when \( w_t = 1 \)), is incorporated in accounting income contemporaneously, whereas news generating the return component \( g_t \) finds its way into accounting income in the following period.

Despite its simplifying assumptions, we believe the earnings process modeled in Equation (1) captures the important properties of asymmetric accounting recognition rules and practices, and their effect on how new information is incorporated in reported earnings. We next use this framework to investigate the properties of the Basu measure and develop empirical implications for the benefit of future research.

3. Econometrics of the Basu Regression

3.1 Association versus causality and specifying accounting income as the dependent variable. We begin with the general observation that the appropriate specification for relating accounting income to stock returns must depend on the objective of the analysis. If the goal is to explain a certain property of accounting income as actually reported by firms, the appropriate explained (or dependent) variable is accounting income, not stock return. In Basu (1997) and many subsequent studies, the property of accounting income being investigated is the asymmetric timeliness in recognizing economic gains and losses in accounting income, so in those contexts it is appropriate to specify accounting income
as the dependent variable and stock return (the proxy for economic income) as the independent variable.¹¹

Timeliness is the extent to which a dollar of unexpected economic income (i.e., abnormal returns) is reflected in accounting income in a certain period. Over a firm’s life, assuming “clean surplus” accounting, each dollar of stock returns translates into a dollar of earnings, and vice versa. Over shorter time periods (e.g., years), however, there is no one-to-one mapping between earnings and returns and thus they can be modeled as random variables sharing a joint probability distribution \( F(R, I) \). Econometrically, earnings timeliness thus is the conditional expectation of earnings, given a contemporaneous stock return realization, \( E(I | R) \).

When the research objective is to measure timeliness, the appropriate specification is that of an “association” study, with no attempt to estimate the direction or directions of causality in the earnings-returns relation. Kothari (2001, p.116) expresses this as follows:

An association study tests for a positive correlation between an accounting performance measure (e.g., earnings or cash flow from operations) and stock returns, both measured over relatively long, contemporaneous time periods, e.g., one year. Since market participants have access to many more timely sources of information about a firm’s cash flow generating ability, association studies do not presume that accounting reports are the only source of information to market participants. Therefore, no causal connection between accounting information and security price movements is inferred in an association study. The objective is to test whether and how quickly accounting measures capture changes in the information set that is reflected in security returns over a given period.

For purposes of estimating timeliness or asymmetric timeliness, the fact that annual stock returns are in part caused by annual earnings is irrelevant, as is the extent to which firms’ earnings calculations are influenced by stock returns. No attempt is being made to identify separate causal links.

Intuitively, the Basu regression informs us on how much contemporaneous information about

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¹¹ Stock return is the logical dependent variable when studying information effects on prices (e.g., when testing for market efficiency or the information effect of earnings announcements).
economic gains and losses is reflected in accounting income, regardless of whether the source of new information is accounting income itself.\footnote{In addition, as a practical matter return endogeneity does not seem important in the context of annual earnings and annual returns. Ryan (2006) offers a similar assessment. Short-window event studies such as Foster, Olsen and Shevlin (1984) and Bernard and Thomas (1990) show at least some causality running from earnings to returns. However, we have known since Ball and Brown (1968) that over annual periods this effect is small, because accounting income is primarily anticipated. Ball and Shivakumar (2008b) report that the average quarterly earnings announcement accounts for approximately 2\% only of annual stock return variance.}

3.1 Simple case with no accounting asymmetry

We start with a baseline case with no accounting asymmetry (i.e., $w_t = 0$), and hence financial reporting incorporates any news of type $y$ with a lag regardless of its sign, in the same fashion as $g$.

We examine the econometric properties of regressing accounting income on security return:

$$I_t = \alpha + \beta R_t + \varepsilon_t$$

(2)

In this simple case, the regression slope reflects the extent to which accounting income contemporaneously captures economic income generally, i.e. both “good” and “bad” news. Let $\hat{\beta}$ denote the OLS estimate. It is well-known that:

$$\text{plim} \hat{\beta} = \frac{\text{cov}(I_t, R_t)}{\text{var}(R_t)}$$

$$= \frac{\text{cov}(x_t + y_{t-1} + g_{t-1} + \varepsilon_t - \varepsilon_{t-1}, x_t + y_t + g_t)}{\text{var}(x_t + y_t + g_t)}$$

The lagged income components, $y_{t-1}$ and $g_{t-1}$, do not correlate with $x_t$, $y_t$, and $g_t$, so in the symmetric accounting case:

$$\text{plim} \hat{\beta} = \frac{(\text{var}(x_t)+\text{cov}(x_t, y_t + g_t))}{(\text{var}(x_t)+2\text{cov}(x_t, y_t + g_t)+\text{var}(y_t + g_t))}.$$  \hfill (3)

In equation (3), the estimated slope coefficient from a regression of earnings on contemporaneous returns increases in the timeliness of earnings, $\text{var}(x_t)/\text{var}(y_t + g_t)$, which is the ratio of the information in returns that accounting income incorporates in a timely fashion to the information it incorporates with a lag. Equivalently, as timeliness increases the contribution to current accounting income $I_t$ of stale news, $y_{t-1}$ and $g_{t-1}$, diminishes.
In one extreme, accounting income is 100% timely with respect to economic income if \( \text{var}(y_t) \) and \( \text{var}(g_t) \) both are zero, in which case \( \hat{\beta} \) converges to one, and accounting income perfectly correlates with stock returns. This extreme is approximated by unlevered firms investing almost entirely in actively-traded securities that are marked to market, such as mutual funds. In the other extreme, accounting income is completely untimely for firms consisting entirely of growth options, as approximated by start-up firms investing almost entirely in intellectual property. In this case, \( \text{var}(x_t) \) and \( \text{var}(y_t) \) both are zero, \( \hat{\beta} \) converges to zero, and accounting income is uncorrelated with stock returns.

### 3.2 Asymmetric timeliness

We now consider the more general case with asymmetric timeliness (i.e., \( \text{E}(I | R) \) is expected to be piecewise linear). In terms of our model (1), this means financial reporting incorporates the information component \( y \) without a lag whenever it is below a threshold (i.e., \( w_t > 0 \)), but with a lag if it exceeds the threshold.

Basu (1997) estimates the asymmetric timeliness coefficient from the regression model:

\[
I_t = \alpha_1 + \alpha_2 D_t + \beta_1 R_t + \beta_2 D_t R_t + \epsilon_t
\]

where \( D_t = 0 \) if \( R_t \geq 0 \), \( D_t = 1 \) if \( R_t < 0 \), and \( \beta_2 \) is the asymmetric timeliness coefficient. \( \beta_2 \) then is the incremental coefficient on negative return (the proxy for negative economic income), and is predicted to be positive because conditionally conservative accounting incorporates negative economic income into accounting income sooner than it incorporates positive economic income.

Let \( \hat{\beta}_2 \) denote the OLS estimate of \( \beta_2 \) from equation (4). Then we have:

\[
\text{plim} \hat{\beta}_2 = \gamma_2 - \gamma_1,
\]

where \( \gamma_1 = \frac{\text{cov}(I_t, R_t | R_t \geq 0)}{\text{var}(R_t | R_t \geq 0)} \) and \( \gamma_2 = \frac{\text{cov}(I_t, R_t | R_t < 0)}{\text{var}(R_t | R_t < 0)} \).
Timely loss recognition in accounting is not triggered by all types of economic losses, with unbooked growth options being the most obvious example. Our model (1) represents this by assuming symmetrically timely recognition for the verifiable information component $x$, asymmetrically timely recognition triggered only when the information component $y$ falls below a threshold value such as zero, and symmetrically untimely recognition of the information component $g$. These components are unobservable to the researcher, so the Basu regression model (4) conditions the regression slope on total return $R$, which is observable. Because total return incorporates information components that are not recognized asymmetrically, there is a question as to whether the Basu regression provides valid estimators of conditional conservatism. We now show that the incremental regression coefficient $\beta_2 = 0$ if earnings is not conditionally conservative, and $\beta_2 > 0$ if earnings is conditionally conservative.

Our analysis incorporates what we believe to be a realistic scenario, that $x_t, y_t$, and $g_t$ are positively correlated. While we would like to continue the analysis under that assumption, the algebra becomes tedious, so we relegate derivations allowing correlation to Appendix B.

3.2.1 Basu regression coefficients with conditionally conservative accounting. We next derive the estimate for the $\beta_2$ coefficient under conditionally conservative accounting, and then show that it behaves in a predictable fashion as a function of the firm’s information environment. To keep the analysis tractable, we assume the distributions of earnings and returns are symmetric.\(^\text{13}\) We begin by considering a simpler case in which the information component $g$ is zero (this is relaxed in Section 4 below). Then:

$$\gamma'_1 = \frac{\text{cov}(x_i + w_{i-1} y_{i-1} + (1 - w_{i-1}) y_{i-1} + \varepsilon_{i-1}, x_i + y_i | R_i \geq 0)}{\text{var}(R_i | R_i \geq 0)}$$

(6.1)

\(^{13}\) Section 6 discusses the effect of asymmetry in the distributions of returns and earnings, and demonstrates that the shape of the distributions does not \textit{per se} bias the Basu regression coefficients.
Equation (6.2) follows from the efficiency assumption that all shocks to stock returns (and thus total return) are independent over time. Similarly:

$$\gamma_2 = \frac{\text{cov}(x_t, x_t + y_t | R_t < 0) + \text{cov}(w_t y_t, x_t + y_t | R_t < 0)}{\text{var}(R_t | R_t < 0)}$$

(6.3)

Symmetric earnings and returns distributions imply $\text{var}(R_t | R_t \geq 0) = \text{var}(R_t | R_t < 0)$ and thus we have:

$$\hat{\beta}_2 = \frac{\text{cov}(w_t y_t, x_t + y_t | R_t < 0) - \text{cov}(w_t y_t, x_t + y_t | R_t \geq 0)}{\text{var}(R_t | R_t \geq 0)}$$

(6.4)

Henceforth we drop the subscript $t$ for expositional ease, and all variables are measured at time $t$ unless explicitly indicated by the subscript $t-1$.

We model conditional conservatism as recognition of $y$ in the current period only when it is sufficiently “bad news.” We assume $w = 1$ if $y < c$ and zero otherwise, where $c$ is a threshold below which current period recognition is required (e.g., through impairment). In an unrealistic limiting case where $c = +\infty$, timely recognition of $y$ always occurs, there is symmetric recognition of good and bad news, and thus, $\text{plim} \hat{\beta}_2 = 0$. The same result follows in the limiting case of $c = -\infty$, where timely recognition of $y$ never occurs. The set up degenerates to $w = 0$, which is analyzed in section 3.1 above.

We set the threshold $c$ to zero to be in line with adage “anticipate no profits, but anticipate all losses” and to reconcile with the empirical formulation of the Basu (1997) regression. In practice, $c$ could be expected to be negative and close to zero. To the best of our knowledge, this assumption is not restrictive and does not bias the results.

To show that $\hat{\beta}_2$ is positive under these assumptions, it suffices to show that:
\[ \Delta \equiv \text{cov}(w_{y}, x + y \mid R < 0) - \text{cov}(w_{y}, x + y \mid R \geq 0) > 0 \]  

(6.5)

Equation (6.5) can be rewritten as:

\[ \Delta = \int_{-\infty}^{0} \int_{-\infty}^{0} y^2 \varphi(x, y \mid R < 0) dx dy - \int_{-\infty}^{0} \int_{-\infty}^{0} y^2 \varphi(x, y \mid R \geq 0) dx dy + \int_{-\infty}^{0} \int_{-\infty}^{0} xy \varphi(x, y \mid R < 0) dx dy - \int_{-\infty}^{0} \int_{-\infty}^{0} xy \varphi(x, y \mid R \geq 0) dx dy + E(x + y \mid R \geq 0) \int_{-\infty}^{0} \int_{-\infty}^{0} \varphi(x, y \mid y < 0) dx dy \]  

(6.6)

where \( \varphi(x, y) \) is a bivariate normal density.

The integrals can be evaluated explicitly, and under normality (see Appendix B for derivation):

\[ \Delta = 2\pi^{-1} \sigma_x \sigma_y \sqrt{1-\rho_{xy}^2} \left[1 + \alpha \arctan(\alpha) - \sqrt{1+\alpha^2}\right], \]  

(6.7)

where \( \alpha = \frac{\sigma_y + \sigma_x \rho_{xy}^2}{(1-\rho_{xy}^2)^{0.5} \sigma_x} \in (0, +\infty) \).

It further can be shown that for any positive \( \alpha \), the expression for \( \Delta \) is positive (to see this consider the intervals \((0, 1], (1, \sqrt{3}], \text{and} (\sqrt{3}, +\infty)\)). This result implies the Basu incremental coefficient on negative returns reflects the existence of conditional conservatism in accounting income.\(^{14}\)

3.2.2 Basu regression coefficients in the absence of conditional conservatism. As a validity check, we now derive the Basu asymmetric timeliness coefficient in the absence of conditional conservatism. Under those conditions, a valid estimator obviously should produce a coefficient of zero. In the absence of conditional conservatism, accountants symmetrically do not recognize any of the information in \( y_t \) in the current period \( t \), even if it indicates an adverse shock to future cash flows, and thus \( w_t \) always is 0. It is easy to see from equation (6.4) that \( \text{plim} \hat{\beta}_2 = 0 \). Thus, under the null hypothesis of no conditional conservatism, the Basu coefficient is zero, which indeed should be the case if the model is well-specified and the coefficient is a valid measure of conditional conservatism.

\(^{14}\) See also Pope and Walker (1999), Ryan and Zarowin (2003) and Beaver and Ryan (2005).
3.2.3 Basu regression coefficient validity. These results demonstrate that the Basu asymmetric timeliness coefficient $\hat{\beta}_2$ is positive in the presence of conditional conservatism, and zero in the absence of conditional conservatism, consistent with it being a valid estimator. Further, they show that the coefficient is not driven by a single structural parameter but rather is a function of conditional accounting conservatism and other attributes of the information environment, including the relative importance of information about growth options and rents, discussed next.

4. Conditional conservatism, firm characteristics and empirical implications

4.1 Market-to-book and the relative importance of information about growth options. Collins and Kothari (1989) and Easton and Zmijewski (1989) document that the market-to-book ratio correlates with return-earnings regression slope coefficients, though they do not study asymmetric timelines. Ball, Kothari and Robin (2000, p. 48) conjecture that “the proportion of growth options relative to assets in place” influences Basu asymmetric timeliness coefficients. This conjecture is based on the rule of thumb that market value of equity can be viewed as the sum of assets in place and the value of growth opportunities (Brealey et al., 2006, pp. 72-76; Ross et al., 2005, p. 120). Stock return then reflects news about the values of both assets in place and growth opportunities. Pae et al. (2005), Givoly et al. (2007) and Roychowdhury and Watts (2007) confirm the conjecture empirically, reporting evidence that the asymmetric timeliness coefficient is negatively correlated with the market-to-book ratio, a widely used proxy for the importance of growth options. We now examine the conjecture econometrically.

Consider the case where the (variance of) the information component $g$ in economic income is non-zero. Current-period accounting income then includes a component that represents a linkage to past positive shocks to the firm’s growth opportunities, as in equation (1.2) where shocks to growth opportunities show up in accounting income with a simple one-period lag.
Define \( z = x + g \), \( \sigma_z^2 = \text{var}(z) \), and \( \rho = \text{corr}(z, y) = \frac{\text{cov}(y, x) + \text{cov}(y, g)}{\sqrt{\text{var}(y)} \sqrt{\text{var}(x + g)}} \).

In this setup with innovations to growth opportunities, the Basu asymmetric timeliness coefficient is given by (see Appendix B for derivation):

\[
\text{plim} \hat{\beta}_z = \frac{\text{cov}(wy, x + y + g | R < 0) - \text{cov}(wy, x + y + g | R \geq 0)}{\text{var}(R | R \geq 0)}
\]

\[
= \frac{2\sigma_y \sigma_z \sqrt{1 - \rho^2}}{(\pi - 2) \text{var}(R)} \left(1 + \alpha_1 \arctan(\alpha_1) - \sqrt{1 + \alpha_1^2}\right) > 0
\]

(7.1)

where \( \alpha_1 = \frac{\sigma_y + \sigma_z \rho}{(1 - \rho^2)^{0.5}} \sigma_z \in (0, +\infty) \).

Several limiting cases are of interest. To avoid cumbersome notation, here we loosely refer to \( \text{plim} \hat{\beta}_z \) as \( \hat{\beta}_z \). As the correlation coefficient between \( z \) and \( y \) approaches 1, we have:

\[
\lim_{\rho \to 1} \hat{\beta}_z = \frac{\sigma_y}{\sigma_y + \sigma_z}
\]

(7.2)

This result is intuitive and suggests the asymmetric timeliness coefficient depends on the fraction of the variance of \( y \) in the total variance of returns, as one would expect when the components are perfectly correlated. \(^{15}\) As one also would expect, \( \lim_{\sigma_y \to \infty} \hat{\beta}_z = 1 \), and \( \lim_{\sigma_y \to 0} \hat{\beta}_z = 0 \). In the first case the variation in \( y \) subsumes all other components, while in the second there is no role of conditionally conservative accounting. Finally, we have \( \lim_{\sigma_y \to \infty} \beta_z = 0 \), and \( \lim_{\sigma_y \to 0} \beta_z = 1 \). These mirror the previous results, and also are intuitive. The limiting cases suggest the Basu specification captures the extent of accounting conservatism in a meaningful and intuitive way.

\(^{15}\) Equation (7.1) seems to suggest that \( \beta_z \) approaches zero as \( \rho \) approaches 1. This, however, is not the case since \( \alpha_1 \) tends to plus infinity in this case.
We now show that the Basu asymmetric timeliness coefficient declines in the variance of growth opportunities, and thus is expected to be negatively correlated with the market-to-book ratio.

The derivative of $\beta_2$ with respect to $\sigma_z$ is:

$$\frac{\partial \beta_2}{\partial \sigma_z} = \frac{2\sigma_y \sqrt{1-\rho^2}}{(\pi - 2)(\sigma_y^2 + 2\rho\sigma_y\sigma_z + \sigma_z^2)^2} \left( Y(\sigma_y - \sigma_z - \sigma_y^2 - \rho\sigma_z\sigma_y) - \arctan(\alpha)\sigma_y\sigma_z\sqrt{1-\rho^2} \right),$$

(7.3)

where $Y = 1 + \alpha \arctan(\alpha) - \sqrt{1 + \alpha^2} > 0$. This expression is negative for economically meaningful values of the parameters and the expression for $\beta_2$ is symmetric in $\sigma_z$ and $\sigma_y$. Since $\sigma_z$ is increasing in both $\sigma_x$ and $\sigma_g$, it follows that, holding the correlation coefficient $\rho$ constant, $\beta_2$ is decreasing in $\sigma_x$ and $\sigma_g$. This result is intuitive, in that the $x$ and $g$ components of revision in price are treated symmetrically in financial reporting (fully incorporated and fully ignored, respectively), whereas the $y$ component is not (incorporated only if below a threshold).

**Figure 1:** $\beta_2$ coefficient as a function of $\sigma_g$ and $\sigma_y$.
Figure 1 graphs the asymmetric timeliness coefficient as a function of $\sigma_g$ and $\sigma_y$. Other parameters are fixed at the following levels: $\rho_{xz} = \rho_{xg} = 0.3$ and $\sigma_x = 0.2$. As expected, the coefficient increases in the variance of $y$ (reaching 1 in the limit), as timely loss recognition becomes more important. Figure 1 also illustrates that asymmetrically timely loss recognition decreases in the variance of $g$ (information about growth options), reaching zero in the limit. This result also is intuitive. Shocks to growth expectations are not captured contemporaneously in accounting income, so in a regression of accounting income on stock returns their variability $\sigma_g$ dampens the coefficient on returns. These results confirm the original conjecture of Ball, Kothari and Robin (2000, p. 48) that asymmetric earnings timeliness is a function of the amount of news about “unbooked” growth options relative to news from other sources.

4.2 Additional empirical implications. As Figure 1 shows, the incremental coefficient on negative returns decreases in the variance of shocks to growth opportunities relative to other shocks. This is expected to be increasing in the relative magnitude of growth opportunities, which are less likely to be recorded on firms’ books than other assets, so it also should be increasing in the market-to-book ratio. Indeed, empirically return variability increases in market-to-book, controlling for firm size (see, for example, Lewellen, 1999, and Ali, Hwang and Trombley, 2003). Consequently, market-to-book acts as a proxy for the extent to which revision in price is associated with “booked” versus “unbooked” items, but does not per se determine the Basu slope. This implies that market-to-book need not be used as a control variable (depending on the question at stake) but rather can be used as an instrument for the degree of conservatism, as in Khan and Watts (2009).

The graphed results also show that the relation between the Basu slope and market-to-book is non-linear, suggesting that attributes of the information environment interact. This prediction is

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16 Analogous results obtain when other parameters are fixed at different levels, including correlation coefficients of zero. For illustration, we therefore report the results only under one set of parameters.
straightforward to test empirically. Finally, designing a powerful test to detect conditional conservatism can be a challenge for high market-to-book firms, because timely loss recognition is harder to detect for high growth firms and firms with larger portions of unbooked intangible assets. This does not mean that conditional conservatism is absent, or that the Basu model is miss-specified. To detect conditional conservatism in such companies, it is helpful to identify a setting or economic event when firms experience substantial shocks to assets in place (rather than growth opportunities), since timely loss recognition is increasing in the variance of \( y \) given the variance of \( g \).

The result that asymmetric timeliness is decreasing in \( \sigma_x \) also is intuitive in our setup and represents another empirical prediction. Companies with short operating cycles and short investment cycles, or companies that have a substantial realized component of economic income (such as mature companies), therefore should exhibit lower levels of timely loss recognition. This reconciles with the evidence reported in Khan and Watts (2009), and also with their predictions about conditional conservatism increasing in environmental uncertainty, which we expect to be inversely related to the variance of \( x \) and positively related to the variance of \( y \) (due to different verification requirements for earnings components that are more uncertain and more costly to verify).

Our return-earnings model also implies that asymmetric timeliness declines as one extends the earnings horizon. In line with this result, Basu (1997, §5.1) shows that the timeliness asymmetry declines with the length of the accounting period (he studies periods of one to four years) and Roychowdhury and Watts (2007) show that the negative association between growth opportunities and the asymmetric timeliness coefficient diminishes as the return horizon is extended back. Intuitively, as the return period is extended back, current-period earnings reflects more of the growth opportunities at the beginning of the period. Further, shocks to growth opportunities are more likely to flow through the financials over longer horizons. One can think of these as increasing the variance of \( x \) relative to the variance of the other components of \( I \), and hence the asymmetric timeliness
coefficient is attenuated. This is an implication of the more general proposition that, under “clean surplus” accounting, economic and accounting incomes converge as the observation interval increases.

4.3 Effect of correlation among components of earnings innovations. The literature is silent on how asymmetric timeliness is affected by complementarities or correlations among the information components that drive returns but that are reflected in earnings in different periods. We use equation (7.1) to plot $\beta_2$ as a function of the correlations $\rho_{xg}$ and $\rho_{yg}$ (we do not separately consider $\rho_{xy}$ since it is easy to see that its effect is the same as that of $\rho_{yg}$).

Figure 2: $\beta_2$ coefficient as a function of $\rho_{xg}$ and $\rho_{yg}$

Asymmetric timeliness: cor(y,g) vs cor(x,q)
Parameters: sigma(x)=sigma(y)=sigma(g)=0.2, cor(x,y)=0.3

Figure 2 presents results when other parameters are fixed at the levels: $\rho_{xy} = 0.3$ and $\sigma_x = \sigma_y = \sigma_g = 0.2$. As the figure shows, asymmetric timeliness increases in $\rho_{yg}$, the correlation between $y$ and $g$, and it decreases in $\rho_{xg}$, the correlation between $x$ and $g$. Intuitively, the first result
obtains because in our model $y$ exhibits timely recognition, but the researcher observes total return $R_t$, which also contains other information components. As the correlation between the return components $y$ and $g$ strengthens, the Basu model’s negative-return variable improves as an indicator of the negative news incorporated in accounting income contemporaneously, and hence the asymmetric timeliness coefficient increases. Similarly, the second result obtains because variation in the sum of the symmetrically-recognized $x$ and $g$ components becomes more pronounced due to their covariability, and the conditional conservatism asymmetry becomes less salient. Thus, the correlations and interactions between different information components are expected to have an effect on timely loss recognition empirically.

4.4. Comparison with other interpretations of market-to-book. Feltham and Ohlson (1995, 1996), Beaver and Ryan (2000 and 2005), Easton (2001), Easton and Pae (2004), Givoly and Hayn (2000), Dietrich et al. (2007) Givoly, Hayn and Natarajan (2007), and others model the entire difference between the market and book values of equity as resulting from accounting conservatism. Following Roychowdhury and Watts (2007), we view only a portion of the difference between the market and book values of equity as resulting from accounting conservatism (specifically, the difference between the net asset value and the book value of net assets). Similar views are held in Basu (1997), Holthausen and Watts (2001), Watts (2003a and 2003b), Ball and Shivakumar (2006), Roychowdhury and Watts (2007), and others. Because the objective of financial reporting is not to value the firm or its equity (FASB, 1978, ¶ 41), some components of market value would not be recorded in book value even in the absence of conservatism. For example, operating synergies among assets are central to the existence of the firm (Coase, 1937), but they are not recorded on balance sheets because the accounting system is transactions-based and therefore focuses on individual assets and not on aggregate firm value. It is this transactions-based property of accounting – not conservatism – that causes synergies to be omitted from book values until they are realized over time.
as net revenues from the firm’s operating activities.\textsuperscript{17} Thus, we view the market-to-book ratio as a potentially misleading proxy for conditional conservatism.\textsuperscript{18}

Several studies question the validity of the Basu asymmetric timeliness coefficient as a proxy for conditional conservatism because it is negatively correlated with the market-to-book ratio.\textsuperscript{19} Pae et al. (2005), Givoly et al. (2007) and Roychowdhury and Watts (2007) cast the negative correlation as indicating a measurement problem, the implication being that the coefficient is an inherently flawed conservatism measure. For example, Givoly et al. (2007, p. 67) conclude that because the asymmetric timeliness coefficient is negatively correlated with other measures of conservatism (notably, market-to-book), it “is insufficient to assess all dimensions of conservatism.” The negative correlation has lent credence to criticisms that (i) the Basu asymmetric timeliness coefficient is econometrically biased, and/or (ii) it picks up something other than accounting conservatism, such as earnings persistence (Price, 2005).

In our model, the negative correlation of conditional conservatism and growth options (for which book-to-market is a proxy) is a fundamental property of accounting income that arises from accounting rules and practices interacting with firm properties. For example, if all firms were open-end mutual funds, their market-to-book ratios would be one and accounting rules and practices would generate zero Basu asymmetric timeliness coefficients. Equivalently, viewing the negative correlation

\textsuperscript{17} The accounting focus on prices paid for individual assets in arm’s length transactions (“historical costs”) presumably is because actual transactions are considerably less costly to verify than the private information of managers about future cash flows that would be required to calculate and report firm values.

\textsuperscript{18} Of course, one could define conservatism as the book/market ratio, and hence encompass all sources of difference between book and market values, but that would be at the expense of discarding correspondence with the meaning of conservatism in accounting. For example, this would make conservatism the reason accounting is transactions-based and not valuation-based, whose economic origin is symmetrically high costs of verifying private information (see prior footnote). Conservatism then also would encompass symmetric random errors in book values (e.g., arising from errors in counting closing inventory, or in accruals generally), whose economic origin is the cost of operating an accounting system, not conservatism. Conservatism would be a symmetric function of any lags in incorporating information into earnings, whose source also lies in accounting costs. Oddly, conservatism then would be a function of changes in expected returns (discount rates) that affect market prices, including both increases and decreases in expected returns symmetrically. More importantly, the correspondence between conservatism and the long-standing dictum “anticipate all losses and no gains” would be severed. Yet this is precisely what the Dietrich et al. (2007) model does, as shown below.

between the Basu asymmetric timeliness coefficient and the market-to-book ratio as a measurement error problem is equivalent to viewing accounting income – as actually reported by firms – to be an error-laden version of some non-existent alternative notion of income. For the purposes of studying actual reporting behavior by firms, the true level of conditional conservatism in reported earnings is a decreasing function of market-to-book.

Our analysis most closely relates to Roychowdhury and Watts (2007), who argue that the negative relation between the market-to-book ratio and the Basu asymmetric timeliness coefficient occurs because both measure conservatism with error, and that this error diminishes as the measurement horizon is increased. The rationale is that a high market-to-book ratio might indicate the presence of rents (or growth opportunities) which serve as a “buffer” against having to record subsequent losses, thus lowering asymmetric timeliness. Cross-sectional variation in the beginning-of-period market-to-book ratio therefore is likely to add correlated error when measuring conditional conservatism. Over longer horizons, the market-to-book ratio likely is a less noisy measure of conditional conservatism, for example because rents present in the beginning of the period tend to disappear over time due to competition.

Our analysis has several distinctions. First, we do not rely on the presence of a “buffer” that dampens loss recognition in subsequent periods. Despite its appeal, this argument relies on the assumption that subsequent bad news is treated as a reversal of unbooked rents, which need not be the case (for example, that the presence of growth options reduces the likelihood of accounting impairment of spoiled inventory). It may well be that bad news affects the value of booked assets or affects proportionally both the value of rents and the value of separable assets, in which case a negative relation between the proportion of rents in the book-to-market ratio and asymmetric timeliness does not arise. Our second distinction is that the absence of recognition of rents is not important. Roychowdhury and Watts (2007, p. 12), argue that since increases or decreases in rents
(or unverifiable assets) are not recognized by accountants, this reduces asymmetric timeliness. While this argument holds, our analysis shows that even in a hypothetical case where rents are recorded by accountants, their presence can lower the asymmetric timeliness coefficient. The key is their symmetric treatment by the accounting system. Our analysis suggests the asymmetric timeliness coefficient decreases in the proportion of return components that are either symmetrically recognized or symmetrically deferred.

4.5. Summary: Firm characteristics and conditional conservatism. We have shown that conditional conservatism arises from the intersection of firm characteristics with accounting rules and practices. Researchers interested in isolating the effects of accounting rules and practices per se therefore might consider the need to control for salient firm characteristics, including those we have identified above. These results formalize the intuition behind the Ball, Kothari and Robin (2000, Section 6.4) controls for industry membership when estimating the effect of international accounting, legal and economic institutional variables on asymmetric timeliness.

Nevertheless, it is not always apparent that controlling for firm characteristics is appropriate. Ball, Robin and Sadka (2008, p.201) raise the issue of whether firm characteristics truly are exogenous in cross-country research, or whether they are determined jointly with countries’ accounting, legal and economic systems. For example, do timely loss recognition rules and practices facilitate the creation of deep debt markets, do deep debt markets create a demand for loss recognition timeliness, or are debt markets and timely loss recognition economic complements that are jointly determined? To take another example, we argue above that conditional conservatism is increasing in the length of firms’ operating and investment cycles. Do timely loss recognition rules and practices facilitate longer operating and investment cycles, does the existence in an economy of firms with longer cycles create a demand for loss recognition timeliness, or are they jointly determined? Institutional complementarity implies that firm characteristics are jointly determined.
with accounting rules and practices, so it is not always meaningful to assign causation (as distinct to consistency) to individual variables. We therefore caution that over-controlling for endogenously determined variables is as inappropriate as under-controlling.

5. Effect of recognition lags on the variability of accounting income relative to returns

In this section we briefly examine the converse implication of accounting conservatism, i.e., the recognition of some components of economic income in accounting earnings with a lag, for the volatility of accounting earnings in relation to stock returns. A large body of literature in finance and economics starting with Shiller (1981) argues that the volatility of stock returns is large relative to that of dividends and accounting income. One interpretation of this result is that prices have excessive volatility compared to underlying fundamentals, due for example to investors overreacting to economic news or due to frequent changes in discount rates. We show that the volatility of stock returns also is expected to be large relative to that of accounting income due to the way accounting income is calculated. The lack of timeliness of accounting income makes it a function of both current and lagged stock returns, and hence the time series of accounting income is smoother than that of returns.

In our model, the components of the firm’s total economic growth rate that are incorporated in growth in accounting income in a timely and lagged fashion are $x_t$ and $(y_{t-1} + g_{t-1})$, respectively. A quantitative measure of timeliness of accounting income therefore is the relative variances of $x_t$ and $(y_{t-1} + g_{t-1})$. The higher the variance of $x_t$, other things equal, the timelier is accounting income in capturing the information in economic income. Recall that $x_t$ is intended to capture information that

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21 This is due to our casting differences between accounting and economic income as a property of income recognition rules in accounting, and not as a measurement error issue. Consequently, differences in the amount of information
is symmetrically low-cost to verify, such as actual realizations of current-period cash flows and working capital accruals, and that consequentially it is incorporated in income regardless of its sign or magnitude. Because $y_{t-1}$ is simply the lagged value of $y_t$ and the process is stationary across time, their variances are equal. Moreover, all information affecting the stock price in the current period (i.e., $x_t$, $y_t$, and $g_t$) is not correlated with the stale components $y_{t-1}$ and $g_{t-1}$ of earnings growth. To simplify the presentation, and without loss of generality, we restrict the variances of growth options $g_t$ and accounting error $e_t$ to zero. The variance of accounting income then is:

$$\text{var}(I_t) = \text{var}(x_t + w_t y_t + (1 - w_{t-1}) y_{t-1})$$

$$= \text{var}(x_t) + 2\text{cov}(x_t, w_t y_t) + \text{var}(w_t y_t) + \text{var}((1-w_{t-1}) y_{t-1})$$

$$= \text{var}(x_t) + \text{cov}(x_t, y_t) + 2\text{var}(w_t y_t). \tag{8.1}$$

The last result follows because $\text{cov}(x_t, w_t y_t) = E(w_t y_t x_t) = E(y_t x_t)/2 = \text{cov}(x_t, y_t)/2$, and $\text{var}(w_t y_t) = \text{var}((1-w_{t-1}) y_{t-1})$, assuming symmetry and stationarity.

The variability of returns also is a function of the variances of its components, $x_t$ and $y_t$:

$$\text{var}(R_t) = \text{var}(x_t + y_t)$$

$$= \text{var}(x_t) + 2\text{cov}(x_t, y_t) + \text{var}(y_t). \tag{8.2}$$

Comparing equations (8.1) and (8.2), stock return is more variable than accounting income because it incorporates the positively-correlated shocks $x_t$ and $y_t$, whereas accounting income incorporates $x_t$, but (unless there is timely loss recognition) incorporates the other as an uncorrelated shock $y_{t-1}$ from the previous period. The sum of the uncorrelated shocks $x_t$ and $y_{t-1}$ to accounting income is less variable than the sum of the positively-correlated shocks $x_t$ and $y_t$ to stock return. In the absence of a positive correlation between the $x_t$ and $y_t$ components, it is straightforward to show that the variability of returns exceeds that of accounting income.

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conveyed in the two variables directly map into differences in their true variances. In other words, the variances need not be interpreted as indicators of measurement error.
This result is clearer in the reasonable case where the loss recognition threshold $c = 0$, which implies $\text{var}(w_t y_t) = \text{var}(y_t)/2 - E(y_t \mid y_t < 0)^2$. Then:

$$\text{var}(I_t) = \text{var}(x_t) + \text{cov}(x_t, y_t) + \text{var}(y_t) - 2E(y_t \mid y_t < 0)^2$$

$$= \text{var}(R_t) - \text{cov}(x_t, y_t) - 2E(y_t \mid y_t < 0)^2 \quad (8.3)$$

A consequence of accounting income being less timely than stock returns in reflecting economic income, due largely to historical cost accounting, therefore is a smoother time series for earnings than returns. The effect is evident in our two-period model, and would be magnified in a more realistic multi-period analysis.

The difference between dividend and return volatilities is expected to be even greater than is evident for earnings. Corporations smooth dividends as a function of past accounting income (relevant evidence dates back to Lintner, 1956, and more recently Ball et al., 2000, and Sadka, 2007). To the extent that dividends are a weighted sum of current and past accounting income, they will exhibit an even smoother time series than accounting income, and hence than stock returns.

Finally, changes in expectations about growth options will affect stock prices, and will thus generate volatility, but some of these changes will never affect accounting earnings or dividends. For example, an increase in growth prospects in one year one can be offset entirely by a decrease in the following year. Since the changes are offsetting, they will not affect accounting earnings but will affect the volatility of stock prices.

**Empirical implications.** In general, the literature on allegedly excess volatility in stock returns does not explore the implications of prices leading earnings and dividends for their relative volatilities, and consequently tends to over-estimate “excess” volatility. The implicit assumption in the excess volatility literature that income and dividend volatilities provide a valid benchmark for return volatility is not consistent with the economic roles and fundamental properties of accounting income and dividend distributions. The time series of accounting income and dividends are smoother
than prices because they convey the information in price revision with a lag. An interesting empirical
question, in our view, is the extent to which the volatility of stock returns relative to the volatility of
earnings is explained by the properties of accounting earnings, such as timeliness and conservatism,
as distinct from extant explanations such as investor irrationality or information-processing biases,
and time-varying expected returns.

6. Return Endogeneity and Sample Truncation

This section addresses the arguments in Dietrich et al. (2007), henceforth DMR, that the Basu
regression is misspecified due to return endogeneity and sample truncation bias resulting from the
piecewise-linear specification.

6.1 Is return endogeneity a problem in this context?

It is well-known that earnings cause returns, in several senses. Short-window event studies
demonstrate that earnings *announcements* cause price changes (Foster, Olsen and Shevlin, 1984;
Bernard and Thomas, 1990). At a more fundamental level, over the long term earnings (as distinct from
earnings announcements) are the primary if not exclusive determinant of changes in firm value. Returns
can be decomposed into shocks to cash flows (earnings) and shocks to expected returns (Campbell and
Shiller, 1988; Campbell, 1991). The effect of the latter reverses over the life of the firm, the
implication being that in the long run returns are driven primarily by news about earnings.

The question is whether the existence of causality running from earnings to returns invalidates
the Basu regression specification with earnings as the dependent variable. We do not believe it does
because, as discussed in Section 3, the objective of earnings-returns “association study” research
designs is not to establish causation but to identify the shape of the conditional expectation \( E(I \mid R) \), in order to assess the timeliness with which earnings reflect the information in returns.\(^{22}\)

Consider the following model specification, without making any distributional assumptions about the variables:

\[
I = \mu(R) + \varepsilon \tag{9.1}
\]

where \( \mu(\cdot) \) is an arbitrary function, and where \( I \) and \( R \) are observed contemporaneously. A well-known econometric result is that that:

\[
E(I \mid R) = \arg \min_{\mu(R)} E(I - \mu(R))^2 \equiv \hat{\mu}(R) \tag{9.2}
\]

It follows directly from result (9.2) that, for a correctly specified functional form, the least squares estimation of (9.1) yields an unbiased conditional expectation function. Thus, a regression of earnings on returns fulfills the “association study” research objective of estimating the contemporaneous earnings-return association.

As always, it is incumbent on researchers to specify the correct functional form of \( \mu(\cdot) \), including whether the function is linear or non-linear. Because conditional conservatism is one source of non-linearity, it is typically is incorporated via a pricewise linear regression specification as in Basu (1997). If other sources of non-linearity are present in \( \hat{\mu}(\cdot) \), the researcher estimating conditional conservatism must control for them to minimize the likelihood of drawing spurious inferences. An important source of non-linearity is the correlation between the expected values (as distinct from news components) of earnings and returns identified by in Ball, Kothari, and Nikolaev.

\(^{22}\) Interpreting “association” studies within the framework of a structural model leads to anomalous results. For example, if regressing earnings on returns is misspecified because of causality running from earnings to returns, consider the ubiquitous regression of returns on earnings. Because accounting income lags economic news reflected in stock returns, returns cause future earnings and the entire literature on the return-earnings relation is invalidated. Further, if returns were completely caused by earnings, then controlling for that direction of causality in a structural model would produce zero slopes in a Basu equation, implying earnings possess zero (not perfect) timeliness.
(2011) and Patatoukas and Thomas (2011). Nevertheless, for a well-specified model $\mu(\cdot)$, the least squares regression of earnings on returns can be used to identify asymmetric timeliness of earnings.

DMR’s analysis of the Basu regression is based on a linear structural model in which (p. 100) “stock returns … will be a function of accounting earnings and non-earnings sources of information.” The model takes the form:

$$ R_t = \gamma I_t + \eta_t $$

(9.3)

where the error term $\eta_t$ is independent of $I_t$, all variables have zero mean, and $\gamma$ is commonly referred to as the “earnings response coefficient.” The model suppresses conditional conservatism and hence it is important to note that the variable $I$ as defined in this section is different from the variable $I$ in our analyses above, because accounting income now is assumed to have different properties. ²³

DMR then assume the Basu model is a reverse regression estimator of their model (9.3). Under that assumption, the Basu regression coefficient is not an unbiased estimator of the earnings response coefficient because of sample variance ratio bias arising from reversing a structural model:

$$ I_t = \frac{1}{\gamma} R_t - \frac{1}{\gamma} \eta_t = \phi R_t + \tilde{\eta}_t $$

(9.4)

The bias arises because the error term $\tilde{\eta}_t$ is not independent of $R_t$ and the OLS estimate of $\hat{\phi}$ is a biased estimate of $1/\gamma$. Consequently, under the assumption that (9.3) is the true economic model being estimated, the Basu regression cannot be used to identify the structural parameter $\gamma$.

We do not disagree that earnings is an important source of information that affects stock returns, or that both earnings and returns are generated contemporaneously as a result of economic events taking place within and outside firms. However, estimating the inverse earnings response coefficient $1/\gamma$ is not the research objective in typical studies using the Basu model. The typical

²³ In particular, DMR’s (9.3) and derivative equations cannot be substituted into our equations in previous sections.
research objective is to measure the proportion of economic income that is contemporaneously captured in accounting income, and whether it depends on the sign of economic income. More formally, while DMR focus on estimating $E(R \mid I)$, the objective we address is estimating $E(I \mid R)$, which (9.2) implies is achieved by least squares regression without bias. Given that the sample variance ratio bias takes place only if the research objective is to estimate an earnings response coefficient, the criticism in DMR is simply not relevant for the model in Basu (1997).  

6.2 Does partitioning on returns result in sample truncation bias?

DMR (p. 102) also argue that partitioning of returns based on their sign causes sample truncation bias in estimated Basu regression coefficients. We believe this claim is also without merit. The argument in DMR begins with the “no-conservatism” equation (9.4) and considers estimating the two separate regressions:

\[
I_t = \delta_0 R_t + \xi_{0t} \mid R_t \geq 0 \quad \text{("Good" news regression),} \tag{9.6a}
\]

\[
I_t = \delta_1 R_t + \xi_{1t} \mid R_t < 0 \quad \text{("Bad" news regression)} \tag{9.6b}
\]

They argue that if the two regressions yield different estimates under the null of no conservatism, there is truncation bias. The probability limits of the OLS estimates from the two regressions are:

\[
\text{plim}(\hat{\delta}_0) = \frac{E(R_t, I_t \mid R_t \geq 0)}{E(R_t^2 \mid R_t \geq 0)} \quad \text{and} \quad \text{plim}(\hat{\delta}_1) = \frac{E(R_t, I_t \mid R_t < 0)}{E(R_t^2 \mid R_t < 0)} \tag{9.7}
\]

Substituting equation (9.4) into (9.7) and the probability limits become:

\[
\text{plim}(\hat{\delta}_0) = \frac{E(\gamma I_t^2 + \eta I_t \mid R_t \geq 0)}{E(R_t^2 \mid R_t \geq 0)} \quad \text{and} \quad \text{plim}(\hat{\delta}_1) = \frac{E(\gamma I_t^2 + \eta I_t \mid R_t < 0)}{E(R_t^2 \mid R_t < 0)} \tag{9.8}
\]

24 DMR effectively assume that the probability distribution $F(R, I)$ is such that conditional expectation of $E(R \mid I)$ is linear in $I$. Given this, it is also natural to assume that $E(I \mid R)$ is linear (we discuss the case of non-linearity further), or that $E(I \mid R) = \delta R$. The solution to the least squares minimization problem defined above is given by $\hat{\delta}^* = \frac{E(RI)}{E(R^2)}$. Note that we can write $I = E(I \mid R) + \xi = \delta R + \xi$ where the error term is mean independent of $R$, such that $E(R\xi) = E(RE(\xi \mid R)) = 0$. Therefore, $E(R(I - \delta R)) = 0$ and the true expectation parameter is $\delta = \frac{E(RI)}{E(R^2)}$. Hence, OLS correctly identifies the conditional expectation.
These conditions are analogous to DMR equations (1.7a and 1.7b) which are at the center of their critique. They contend that the two probability limits will not be equal because \( E(I\eta | R > 0) \neq 0 \) and \( E(I\eta | R < 0) \neq 0 \), and therefore that truncation bias must be present. They argue that truncation induces a negative covariance between the regressor and the error term in equation (9.4), thereby creating an endogeneity problem. However, the condition \( E(I\eta_i | R_i > 0) \neq 0 \) is only relevant in a regression of returns on earnings, as in (9.4). The relevant condition for a Basu association study regression is \( E(R_i\xi | R_i > 0) = 0 \), where \( \xi = I - E(I | R) \) (recall that \( E(I | R) \) measures the timeliness of earnings Basu (1997) model aims to identify). Note that indeed \( E(R_i\xi_i | R_i > 0) = E(E(R_i\xi_i | R_i) | R_i > 0) = E(R_i E(\xi_i | R_i) | R_i > 0) = 0 \).

At first blush this conclusion might seem difficult to reconcile with the results in DMR (section 2.1) from an exercise they refer to as a “simulation,” in which they observe a significant incremental Basu regression coefficient in data constructed such that, they conjecture, it should not be observed. In Appendix C we show that this conjecture is incorrect, and report a genuine simulation that concludes that truncation bias does not exist in the context of a Basu regression specification (as distinct from DMR’s “earnings response coefficient” specification). 25

Another way to see that truncation bias does not arise is to note that least squares regression on a truncated sample yields the following conditional expectation:

\[
E(I | R, \text{truncation rule}) = E(E(I | R) + \xi | R, \text{truncation rule}) = E(I | R) + E(\xi | \text{truncation rule}) \tag{9.5}
\]

where \( \xi = I - E(I | R) \). Truncation bias arises when \( E(\xi | \text{truncation rule}) \neq 0 \).

---

25 We also note that truncation is figuratively depicted incorrectly in Dietrich et al. (2007, Figure 2), where the regression of earnings on returns minimizes the horizontal (squared) deviations from the regression line, *not the vertical deviations*. After one notes this, it immediately becomes clear from the graph that no truncation bias is present in a Basu regression.
However, note that $E(\xi \mid R) = 0$ and, therefore, truncating the sample on $R$ (or a function of $R$) does not lead to a bias. For example, using the law of iterated expectations,

$$E(\xi \mid R < 0) = E(E(\xi \mid R) \mid R < 0) = 0.$$ 

It is also worth noting that $\hat{\delta}_{\text{plim}}$ and $\hat{\delta}$ can differ for reasons other than conditional conservatism in accounting or alleged truncation bias. As noted above, controlling for omitted variables and non-linearities in the data is necessary to avoid spurious inferences about conditional conservatism. As a result, DMR and more recently Patatoukas and Thomas (2011) fail to consider alternative interpretations of their results. For example, Patatoukas and Thomas (2011) provide evidence of bias in Basu estimates which they attribute to truncation bias. However, Ball, Kothari, and Nikolaev (2011) show that this bias arises due to failure to control for omitted variables, and, more specifically, for non-linearity in relation between expected earnings and returns. A related source of non-linearity was identified and controlled for in earlier papers by Beaver and Ryan (2008) and Easton, Nikolaev, van Lent (2008). The possibility of correlated omitted variables applies to almost any empirical specification, the Basu regression included.

We conclude that truncation bias does not arise. While the conditional expectation $E(I \mid R)$ can be non-linear for reasons other than conservatism, then researchers need to identify the sources of non-linearity and attempt to take them into account, rather than assume they are due to factors such as sample truncation. 26

7. Summary and Conclusions

We present a model of accounting income that is based on salient properties of income recognition in accounting, and use it to analyze the econometrics of the Basu asymmetric timeliness coefficient. The analysis addresses conceptual and econometric challenges to the coefficient’s

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26 The assumption of linearity in conditional expectation is not too restrictive because one can often approximate a non-linear function by a function linear in parameters. This can be done, for example, by including higher order polynomial terms in a linear fashion as additional regressors in the Basu model.
validity as a measure of conditional conservatism. We show that the Basu measure is unbiased under the null hypothesis of zero asymmetry, and that under the alternative hypothesis it captures conditional conservatism as formulated in our model. We also demonstrate that any differential persistence in economic gains and losses (as opposed to differential persistence in the gains and losses that are “recognized” in accounting) does not explain the Basu coefficient.

We also demonstrate that conditional conservatism is a function of a variety of firm characteristics. Notably, we extend the Roychowdhury and Watts (2007) analysis and demonstrate econometrically that a negative relation between market-to-book ratio and the asymmetric timeliness coefficient is expected as a consequence of how changes in the market’s expectations concerning “unbooked” growth options are reflected in earnings. The market-to-book ratio does not per se determine asymmetric timeliness; its effect arises because it is correlated with the amount of price revision associated with revisions in “unbooked” components such as growth option expectations.

We also discuss the effect on conditional conservatism of variables such as the length of the firm’s operating and investment cycles, its maturity, the correlation between the components of returns (hence the degree of diversification) and the length of the fiscal period studied. An important and by no means obvious issue is whether, within the context of a particular research objective, it is appropriate to control for such firm characteristics.

Our prior belief is that conditional conservatism is a true property of accounting income, not merely a statistical artifact. As Basu (1997) notes, the adage “anticipate no profits but anticipate all losses” is centuries old, so there are strong priors in favor of an asymmetry existing in fact. The Financial Accounting Standards Board’s Accounting Standards Codification (FASB, 2009) lists impairment rules for debt and equity securities, property, plant and equipment, goodwill, intangibles, receivables, beneficial interests, servicing assets, loans, deferred costs, exchange memberships, life settlement contracts, joint ventures, capital leases, non-refundable fees, and cumulative foreign
exchange translation adjustments for foreign subsidiaries, among other things. Furthermore, asset impairment charges and restructuring charges were practiced well before formal standards such as SFAS No. 121 (issued 1995, since superseded) required them, but upward revaluation of long-term assets is comparatively rare. More importantly, the economic incentives of financial statement preparers are biased toward timely loss recognition relative to gain recognition, particularly in litigious jurisdictions (Ball et al., 2000; Ball et al., 2003).

Our priors that conditional conservatism is a true property of accounting income are reinforced by the variety of studies (summarized in Appendix A) in which estimated asymmetric timeliness coefficients reveal predictable associations with economic, legal and political institutional variables, at the firm, industry, and jurisdictional levels. The variety and consistency of the predicted associations further suggests that estimated asymmetric timeliness coefficients capture a true property of accounting income, not some statistical artifact. In addition, asymmetric timeliness estimates based on alternative research designs discussed in the previous section generally produce similar results to the Basu regression coefficients, and vary in predictable ways with its economic determinants, such as listing status (public/private) and listing jurisdiction. These research designs provide additional evidence that the more conventional price-based estimates indeed capture conditional conservatism.

In sum, since asymmetrically timely loss recognition is a basic property of GAAP, exhibits predictable associations with economic, legal and political institutional variables, and behaves consistently under alternative measures, claims that go so far as to conclude that the results of prior studies employing the asymmetric timeliness measure are attributable entirely to biases, and cannot be interpreted as evidence of accounting conservatism, can be discounted. The claims have developed some credence, nevertheless.

We trust that the analysis will clarify the econometrics of the Basu (1997) asymmetric timeliness methodology, and stimulate its application to even more contexts.
Appendix A

Summary of Research Using the Basu Model

Researchers have estimated asymmetric timeliness to investigate conditional conservatism in a wide variety of contexts, including:

(i) as a function of countries’ market, political, legal and taxation regimes;\(^{27}\)

(ii) over time, due to regime change;\(^{28}\)

(iii) across fiscal quarters;\(^{29}\)

(iv) as a function of litigation, auditors’ legal liability, earnings management or auditor malfeasance;\(^{30}\)

(v) as a function of the different demands on financial reporting of public companies, private companies and not-for-profit organizations, and of family ownership;\(^{31}\)

(vi) to study the effect of conditional conservatism on the equity cost of capital;\(^{32}\)

(vii) to study the role of debt;\(^{33}\)

(viii) to examine the role of accounting accruals;\(^{34}\)

(ix) to study management compensation, independent directors, and corporate governance;\(^{35}\)


\(^{31}\) Francis, Lafond, Olsson, and Schipper (2004).

\(^{32}\) Ball, Bushman and Vasvari (2007), Ball, Robin and Sadka (2008), Wittenberg-Moerman (2008), Callen et al. (2009), Hammermeister and Werner (2009), and Nikolaev (2009).

\(^{33}\) Basu (1997, Table 2), Ball, Kothari and Robin (2000, Table 6), and Ball and Shivakumar (2005, 2006).
(x) to study the effect of conditional conservatism on corporate investment and acquisitions;\textsuperscript{36}

and

(xi) as a function of environmental uncertainty and the investment cycle.\textsuperscript{37}

These studies analyze measures of asymmetric conservatism from a variety of perspectives, including costly contracting and agency theory, legal institutions, and political and tax influences on financial reporting. The concept of asymmetric earnings timeliness also has been utilized to increase our understanding of phenomena such as the shape of the earnings distribution and the properties of analysts’ earnings forecast errors (Gu and Wu, 2003), the payoff function for analysts (Basu and Markov, 2004), and the properties of accounting accruals (Ball and Shivakumar, 2006).


\textsuperscript{36} Bushman, Piotroski and Smith (2007), Francis and Martin (2010).

\textsuperscript{37} Khan and Watts (2009).
Appendix B

Derivation of the expression for the asymmetric timeliness coefficient

We derive the asymmetric timeliness coefficient for a general case where all three components of return, \(x, y,\) and \(g,\) are considered. The cases when some of these components are omitted follow immediately. We omit subscripts \(t\) when all random variables are contemporaneous.

We start by noting that:

\[
\gamma_1 = \frac{\text{cov}(x_t + w_t y_t + (1 - w_{t-1}) y_{t-1} + g_{t-1} + \varepsilon_t - \varepsilon_{t-1}, x_t + y_t + g_t | R_t \geq 0)}{\text{var}(R | R \geq 0)}
\]

\[
= \frac{\text{cov}(x_t, y_t, x_t, y_t, g_t | R_t \geq 0)}{\text{var}(R | R \geq 0)}
\]

\[
= \frac{\text{cov}(x, y + g | R \geq 0) + \text{cov}(w y, x + y + g | R \geq 0)}{\text{var}(R | R \geq 0)}
\]

(A1)

and

\[
\gamma_2 = \frac{\text{cov}(x, y + g | R < 0) + \text{cov}(w y, x + y + g | R < 0)}{\text{var}(R | R < 0)}
\]

(A2)

Exploiting symmetry we have:

\[
\hat{\beta}_2 = \gamma_2 - \gamma_1 =
\]

\[
= \frac{\text{cov}(w y, x + y + g | R < 0)}{\text{var}(R | R < 0)} - \frac{\text{cov}(w y, x + y + g | R \geq 0)}{\text{var}(R | R \geq 0)}
\]

(A3)

\[
= \frac{\text{cov}(w y, x + y + g | R < 0) - \text{cov}(w y, x + y + g | R \geq 0)}{\text{var}(R | R \geq 0)}
\]

where \(w = I(y < 0)\) is an indicator variable taking a value of one in case \(y < 0\) and zero otherwise.

Define \(z = x + g,\) \(\sigma_z^2 \equiv \text{var}(z),\) and

\[
\rho \equiv \text{corr}(z, y) = \frac{\text{cov}(y, x) + \text{cov}(y, g)}{\sqrt{\text{var}(y) \text{var}(x + g)}} = \frac{\rho_{y, x} \sigma_x + \rho_{y, g} \sigma_g}{\sqrt{\sigma_x^2 + 2 \rho_{y, g} \sigma_x \sigma_g + \sigma_g^2}}.
\]

To show that is \(\beta_2 = 0\) positive it suffices to show that \(\Delta > 0,\) where:

\[
\Delta \equiv \text{cov}(w y, z + y | R < 0) - \text{cov}(w y, z + y | R > 0) > 0.
\]
Note further that:

\[ \Delta = E(wy^2 + wyz | R < 0) - E(wy^2 + wyz | R \geq 0) - E(wy | R < 0)E(z + y | R < 0) + E(wy | R \geq 0)E(z + y | R \geq 0) \]

\[ = \int_{-\infty}^{0} \int_{-\infty}^{\infty} (y^2 + zy)\phi(z, y | R < 0)dzdy - \int_{0}^{\infty} \int_{-\infty}^{\infty} (y^2 + zy)\phi(z, y | R \geq 0)dzdy + E(z + y | R \geq 0) \int_{0}^{\infty} y\phi(z, y | y < 0)dzdy \]

\[ = \int_{-\infty}^{0} \int_{-\infty}^{\infty} y^2\phi(z, y | R < 0)dzdy - \int_{0}^{\infty} \int_{-\infty}^{\infty} y^2\phi(z, y | R \geq 0)dzdy + \]

\[ + \int_{-\infty}^{0} \int_{-\infty}^{\infty} zy\phi(z, y | R < 0)dzdy - \int_{0}^{\infty} \int_{-\infty}^{\infty} zy\phi(z, y | R \geq 0)dzdy + E(z + y | R \geq 0) \int_{0}^{\infty} y\phi(z, y | y < 0)dzdy \]

(A4)

where \( \phi(z, y) = \frac{1}{2\pi\sigma_x\sigma_y(1-\rho^2)^{0.5}} \exp\left( -\frac{1}{2(1-\rho^2)} \left( \frac{z^2}{\sigma_z^2} - \frac{2\rho z y}{\sigma_z \sigma_y} + \frac{y^2}{\sigma_y^2} \right) \right) \) is bivariate normal

density and \( E(z + y | R \geq 0) = E(R | R \geq 0) = \frac{\phi(0)}{1-\Phi(0)} \sqrt{\text{var}(R)} = \frac{2\sqrt{\sigma_z^2 + 2\rho\sigma_z\sigma_y + \sigma_y^2}}{\sqrt{2\pi}}. \)

The integrals can be evaluated explicitly under the normality assumption, first noting that symmetry implies \( \Pr(R < 0) = 0.5. \)

\[ \Theta = \frac{1}{2\pi\sigma_x\sigma_y(1-\rho^2)^{0.5}} \int_{-\infty}^{0} \int_{-\infty}^{\infty} y \exp\left( -\frac{1}{2(1-\rho^2)} \left( \frac{z^2}{\sigma_z^2} - \frac{2\rho z y}{\sigma_z \sigma_y} + \frac{y^2}{\sigma_y^2} \right) \right) dzdy \]

\[ = \frac{1}{\pi\sigma_y(1-\rho^2)^{0.5}} \int_{-\infty}^{0} y \exp\left( -\frac{1}{2(1-\rho^2)} \left( \frac{\sigma_z^2 z - \rho \sigma_z y}{(1-\rho^2)^{0.5} \sigma_z \sigma_y} \right)^2 + (1-\rho^2) \frac{y^2}{\sigma_y^2} \right) \right) dy \]

\[ = \left\{ u = \frac{y}{\sigma_y}, \ v = \frac{\sigma_z z - \rho \sigma_z y}{(1-\rho^2)^{0.5} \sigma_z \sigma_y}, \ dy = \sigma_y du, \ dz = \sigma_z (1-\rho^2)^{0.5} dv \right\} \]

\[ = \frac{\sigma_y}{\pi} \int_{-\infty}^{0} u \exp\left( -\frac{1}{2} u^2 \right) du \int_{-\infty}^{0} \exp\left( -\frac{1}{2} v^2 \right) dv = -\frac{2\sigma_y}{\sqrt{2\pi}} \]

Further, making the same transformation, and integrating by parts it can be shown that:
\[ \Theta_1 = \frac{\sigma_y}{\pi \sigma_z (1-\rho^2)^{0.5}} \int_{-\infty}^{0} \int_{-\infty}^{y} y^2 \exp \left\{ -\frac{1}{2(1-\rho^2)} \left( \frac{\sigma_y z - \rho \sigma_z y}{\sigma_y \sigma_z} \right)^2 + (1-\rho^2) \frac{y^2}{\sigma_y^2} \right\} \, dz \, dy \]

\[ = \left\{ u = \frac{y}{\sigma_y}, v = \frac{\sigma_y z - \rho \sigma_z y}{(1-\rho^2)^{0.5} \sigma_z}, \, dy = \sigma_z \, du, \, dz = \sigma_z (1-\rho^2)^{0.5} \, dv, -\frac{\sigma_y + \sigma_z \rho}{(1-\rho^2)^{0.5} \sigma_z} \equiv -\alpha u \right\} \]

\[ = \frac{\sigma_y}{\pi} \int_{-\infty}^{0} \int_{-\infty}^{-\alpha u} u^2 \exp \left( -\frac{1}{2} \left( v^2 + u^2 \right) \right) \, dv \, du = \frac{\sigma_y^2}{\pi} \left[ \pi - \omega + \frac{\alpha^2}{1+\alpha^2} \right] \]

(A6)

where \( \omega = \pi / 2 - \arctan(\alpha) \), and \( \alpha = \frac{\sigma_y + \sigma_z \rho}{(1-\rho^2)^{0.5} \sigma_z} \in (0, +\infty) \).

By analogy (making the same substitution as above) we have:

\[ \Theta_2 = \frac{\sigma_y^2}{\pi} \int_{-\infty}^{0} \int_{-\infty}^{0} u^2 \exp \left( -\frac{1}{2} \left( v^2 + u^2 \right) \right) \, dv \, du = \frac{\sigma_y^2}{\pi} \left[ \omega - \frac{\alpha^2}{1+\alpha^2} \right] \]

(A7)

Using integration by parts, it can be further shown that:

\[ \Theta_3 = \frac{1}{\pi \sigma_z \sigma_y (1-\rho^2)^{0.5}} \int_{-\infty}^{0} \int_{-\infty}^{z y} z y \exp \left( -\frac{1}{2(1-\rho^2)} \left( \frac{z^2}{\sigma_z^2} - 2 \rho \frac{z y}{\sigma_z \sigma_y} + \frac{\rho^2 y^2}{\sigma_y^2} + (1-\rho^2) \frac{y^2}{\sigma_y^2} \right) \right) \, dz \, dy \]

\[ = \left\{ u = \frac{y}{\sigma_y}, v = \frac{\sigma_y z - \rho \sigma_z y}{(1-\rho^2)^{0.5} \sigma_z}, \, dy = \sigma_z \, du, \, dz = \sigma_z (1-\rho^2)^{0.5} \, dv, -\frac{\sigma_y + \sigma_z \rho}{(1-\rho^2)^{0.5} \sigma_z} \equiv -\alpha u \right\} \]

\[ = \frac{\sigma_y \sigma_z}{\pi} \int_{-\infty}^{0} \int_{-\infty}^{-\alpha u} u \exp \left( \sqrt{1-\rho^2} + \rho u \right) \exp \left( -\frac{1}{2} \left( v^2 + u^2 \right) \right) \, dv \, du \]

\[ = \frac{\sigma_y \sigma_z}{\pi} \sqrt{1-\rho^2} \frac{1}{1+\alpha^2} + \rho \left( \pi - \omega + \frac{\alpha^2}{1+\alpha^2} \right) \]

(A8)

and, by analogy,

\[ \Theta_4 = \frac{\sigma_y \sigma_z}{\pi} \int_{-\infty}^{0} \int_{-\infty}^{0} u \exp \left( \sqrt{1-\rho^2} + \rho u \right) \exp \left( -\frac{1}{2} \left( v^2 + u^2 \right) \right) \, dv \, du \]

\[ = \frac{\sigma_y \sigma_z}{\pi} \sqrt{1-\rho^2} \frac{1}{1+\alpha^2} + \rho \left( \omega - \frac{\alpha^2}{1+\alpha^2} \right) \]

(A9)

Now we can use these results to evaluate the expression for \( \Delta \):
\[
\Delta = \int_{-\infty - y}^{0}(y^2 + zy)f(z, y)dzdy - \int_{-\infty - y}^{0}(y^2 + zy)f(z, y)dzdy + E(z + y \mid R > 0) \int_{-\infty}^{0} y f(x, y)dzdy
\]
\[
= \Theta_1 - \Theta_2 + \Theta_3 - \Theta_4 + \Theta_5 \frac{2\sqrt{\sigma_z^2 + 2\rho\sigma_z\sigma_y + \sigma_y^2}}{\sqrt{2\pi}} = \frac{\sigma_y^2}{\pi} \left[ \pi - \omega + \frac{\alpha}{1 + \alpha^2} \right] - \frac{\sigma_y^2}{\pi} \left[ \omega - \frac{\alpha}{1 + \alpha^2} \right] \\
+ \frac{\sigma_z\sigma_y}{\pi} \left[ \sqrt{1 - \rho^2} \frac{1}{1 + \alpha^2} + \rho \left( \pi - \omega + \frac{\alpha}{1 + \alpha^2} \right) \right] - \frac{\sigma_z\sigma_y}{\pi} \left[ -\sqrt{1 - \rho^2} \frac{1}{1 + \alpha^2} + \rho \left( \omega - \frac{\alpha}{1 + \alpha^2} \right) \right] \\
- \frac{2\sigma_y}{\sqrt{2\pi}} \frac{2\sqrt{\sigma_z^2 + 2\rho\sigma_z\sigma_y + \sigma_y^2}}{\sqrt{2\pi}}. \tag{A10}
\]

Rearranging this expression yields:
\[
\Delta = \frac{\sigma_y}{\pi} \left( (\sigma_y + \rho\sigma_z)(\pi - 2\omega + \frac{2\alpha}{1 + \alpha^2}) + \frac{2\sigma_z\sqrt{1 - \rho^2}}{1 + \alpha^2} - 2\sigma_z\sqrt{1 - \rho^2}\sqrt{1 + \alpha^2} \right) \\
= \frac{2\sigma_y\sigma_z\sqrt{1 - \rho^2}}{\pi} \left( 1 + \alpha \arctan(\alpha) - \sqrt{1 + \alpha^2} \right) > 0. \tag{A11}
\]

Now the asymmetric timeliness coefficient can be computed as follows:
\[
\beta_z = \frac{\Delta}{\text{var}(R \mid R > 0)} = \frac{2\sigma_y\sigma_z\sqrt{1 - \rho^2}}{(\pi - 2)\text{var}(R)} \left( 1 + \alpha \arctan(\alpha) - \sqrt{1 + \alpha^2} \right) > 0 \tag{A12}
\]

where we use the result that \( \text{var}(z + y \mid R > 0) = \text{var}(R) - E(R \mid R > 0)^2 = \text{var}(R) \left( 1 - \frac{2}{\pi} \right) \).
Appendix C: Simulating Conditional Conservatism

Dietrich et al. (2007, section 2.1) conducted an exercise they refer to as a “simulation,” in which they observe a significant incremental Basu regression coefficient in data constructed such that, they conjecture, it should not be observed. They no proof of this proposition, and rely on an intuition that turns out to be incorrect.

It is important to note that this procedure is not in fact a simulation and does not generate simulated data. It is a bootstrap-type of empirical procedure using actual data, and these synthetic data retain their real-world properties. In particular, we show below that the data indeed are expected to exhibit a significant incremental Basu regression coefficient.

C.1 The DMR procedure

Step 1: Using CRSP/Compustat data, run the following cross-sectional regression of annual returns \( R \) on scaled earnings \( X \); save the residuals and predicted values:

\[
R_i = \delta_0 + \delta_1 X_i + \tau_i
\]

(R1.1)

Step 2: Match the predicted value for firm \( i \), \( \hat{R}_{it} \) with a randomly selected (without replacement) residual for another firm \( k \), \( \tau_{kt} \) \((k \neq i)\), to compute a synthetic return variable \( R^S_{it} = \hat{R}_{it} + \tau_{kt} \).

Step 3: Estimate a Basu (1997) piecewise linear regression using these synthetic returns:

\[
X_i = \alpha_0 + \alpha_1 D(R^S_i < 0) + \beta_0 R^S_i + \beta_1 D(R^S_i < 0) * R^S_i + \varepsilon_i.
\]

(R1.2)

DMR appeal to intuition when they argue that a significant conditional conservatism coefficient \( \beta_i \) should not be observed in model (R1.2) by design of the simulated return. The intuition is incorrect, as follows. Because the model estimated in step one (R1.1) is miss-specified in the presence of conditional conservatism, the residual \( \tau_{it} \) is over-represented by large positive values (conditionally conservative accounting is less likely to incorporate good news into earnings in a timely fashion) and it is correspondingly under-represented by negative values. Therefore, positive synthetic returns \( R^S_{it} \) are less likely to result from true “good news” for firm \( i \) itself, and more likely to be caused by overly positive values of the firm \( k \) residual \( \tau_{kt} \). In contrast, negative synthetic returns, \( R^S_{it} \), are more likely to be a result of true “bad news” for firm \( i \) than due to negative values of the matched firm’s residual \( \tau_{kt} \). Thus, values of the synthetic returns \( R^S_{it} \) remain informative about the both the sign and the magnitude of “bad” and “good” economic news for a firm \( i \) in year \( t \), and hence they exhibit a significant incremental coefficient on “bad” news in regression R1.2.

Therefore, the results based on synthetic returns are expected to be analogous to those based on actual returns. The claim in DMR (1997, p. 113) that “the simulated return for firm \( i \) in year \( t \) will reflect the average relation with earnings, but will not reflect the conservatism in the earnings of firm \( i \) because the error term associated with firm \( i \) for year \( t \) … is not used to calculate the corresponding simulated return” is incorrect.

C.2 Conducting a true simulation procedure

We next conduct a genuine simulation of conditionally conservative earnings that asymmetrically incorporate the news in stock returns (i.e., with no expected component of returns). We use the
simulated data to demonstrate: (A) the Basu regression’s incremental coefficient on negative unexpected returns is an unbiased estimator of the true asymmetry; and (B) a positive incremental coefficient on negative unexpected returns is estimated when the DMR “simulation” procedure is applied to the data. The simulation is as follows:

1. Assume that returns \( R_{it} \) is log-normally distributed based on the standard normal distribution; simulate a sample of 10,000 observations and mean-center the distribution of \( R \) at zero.
2. Construct conditionally conservative earnings \( X_{it} \) as follows:
   \[
   X_{it} = 0^* R_{it} + 1.0^* R_{it}^* D(R_{it} < 0) + \epsilon_{it},
   \]
   where \( \epsilon_{it} \) is mean-zero accounting noise that follows the standard normal distribution. Note that the true coefficient on positive returns is zero and the true coefficient on negative returns is 1.
3. Estimate the Basu model using these simulated returns, and compare the estimated coefficients with their true values (0 and 1).
4. Using the simulated returns and earnings, follow the DMR procedure (steps 1-3 in Subsection C.1 above) for matching the predicted and residual values of different simulated firms to construct synthetic returns \( R_{it}^S \).
5. Re-estimate the Basu model using these synthetic returns and compare them with the zero values that DMR predict (the procedure is alleged to create returns that are free of conditional conservatism).

The results are presented in the table below.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \beta_0 )</th>
<th>( \beta_1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimates</td>
<td>0.02808</td>
<td>-0.00211</td>
<td>-0.00857</td>
<td>1.02502</td>
</tr>
<tr>
<td>t-statistics</td>
<td>1.29</td>
<td>-0.06</td>
<td>-1.44</td>
<td>34.72</td>
</tr>
</tbody>
</table>

*Panel A: Basu regression, simulated data:* \( X_{it} = \alpha_0 + \alpha_1 D(R_{it} < 0) + \beta_0^* R_{it}^* + \beta_1 D(R_{it} < 0)^* R_{it}^* + \epsilon_{it} \)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \beta_0 )</th>
<th>( \beta_1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimates</td>
<td>0.00170</td>
<td>-0.01597</td>
<td>-0.04399</td>
<td>0.98146</td>
</tr>
<tr>
<td>t-statistics</td>
<td>0.09</td>
<td>-0.56</td>
<td>-7.84</td>
<td>50.76</td>
</tr>
</tbody>
</table>

*Panel B: Using DMR synthetic returns:* \( X_{it} = \alpha_0 + \alpha_1 D(R_{it}^S < 0) + \beta_0^* R_{it}^S + \beta_1 D(R_{it}^S < 0)^* R_{it}^S + \epsilon_{it} \)

Panel A shows that in simulated data with no expected components of returns and earnings, the Basu estimator is unbiased. The estimated \( \beta_0 \) is very close to its true value of 0.0 and the estimated \( \beta_1 \) is very close to its true value of 1.0. They should be even closer in a larger trial.

Panel B confirms that the DMR procedure does not eliminate estimated conditional conservatism and cannot meaningfully identify a bias in the Basu model.
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