Identifying Conditional Conservatism in the Presence of Risky Debt and Mixed-Attribute Accounting

by

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*** The main portions of the paper that have not yet been performed and/or written up are: (1) the empirical results related to return volatility and credit ratings have been performed (and are entirely consistent with those presented) but not yet written up; and (2) some statistical tests have not been performed and all statistical tests do not incorporate the usual adjustments for clustering and heteroskedasticity.
In this paper, we illustrate issues that arise in identifying conditional conservatism as asymmetry because of the presence of risky debt and mixed-attribute accounting for assets versus debt. Conditional conservatism means that firms write down the book value of net assets in a relatively timely fashion upon receiving sufficiently bad news but do not write up net assets upon receiving good news, with the latter being the conservative behavior. Beginning with the seminal work of Basu (1997), most of the large and rapidly growing body of accounting research on conditional conservatism identifies its application by regressing net income on equity returns allowing for different slope coefficients on positive and negative returns. Researchers use returns as the proxy for news because they are the most comprehensive and broadly applicable measure of news available. Researchers infer the application of conditional conservatism when the estimated coefficient on negative returns is more positive than the coefficient on positive returns, i.e., as asymmetry.

Conditional conservatism can be viewed as an accounting option that is exercised when news crosses a threshold between good and bad. Ryan (2006,2007) argues that in order to identify this accounting option, it must be distinguished from various other economic and accounting options. For example, Basu (1997) and Watts (2003a,b) consider the abandonment option (i.e., sufficiently unprofitable projects are abandoned rendering losses more transitory than gains), and they conclude that this option cannot explain much of asymmetry or other manifestations of conditional conservatism. In this paper, we examine two other options that

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1 By debt, we mean all financial liabilities (e.g., including notes payable).
2 Various other methods have been used to identify conditional conservatism. Notably, Basu (1997) examines the differential persistence of positive and negative earnings changes. Ball and Shivakumar (2006) use cash flow from operations instead of returns as the measure of news. Ryan and Zarowin (2003) examine asymmetry with respect to both current and lagged returns. See Ryan (2006) and Ball and Kothari (2008) for discussions of these alternative methods and surveys of the conditional conservatism literature.
3 One can view the conditional conservatism option as being exercised either through write-downs when news is below a threshold, or, conversely, through the absence of write-ups when news is above a threshold. As is the case for options generally, the exercise of this accounting option need not be meaningfully discretionary, but it could be.
have direct and broadly applicable consequences for asymmetry. First, the proxy most commonly used for news, equity returns, is affected by the fact that risky debt imbeds a written put option on the firm (Merton 1974). This put option absorbs more of the firm’s incremental asset returns when news is bad than when news is good. This is true whether projects are abandoned or not, and so this option is not the same as and in most respects is more general than the abandonment option.

Second, since 2007 firms can choose to account for debt at fair value under FAS 159’s fair value option. When firms account for debt at fair value, they record (larger) gains when news is (more) unfavorable. These gains often will not be fully offset by recognized losses on assets in the same period, for various reasons. For example, if the amount of assets subject to conditional conservatism is smaller than the amount of debt accounted for at fair value (say because of the presence of unrecognized intangible assets), or if the application of conditional conservatism is subject to significant frictions (such as FAS 144’s requirement that tangible and intangible assets with definite lives be written down only when their book value exceeds the undiscounted sum of future cash flows), then the gains recorded on debt will tend to overwhelm the losses recorded on assets.

To convey the complex issues involved in identifying conditional conservatism as asymmetry amid these other options in a reasonably complete yet intuitive fashion, we conduct a mix of analytical, simulation, and archival empirical analyses. Our theoretical analysis demonstrates that risky debt absorbs a portion of downside asset returns and thus mutes downside equity returns relative to what those returns would have been had the debt been riskless. Our simulation analysis depicts this effect as well as the more multifaceted and contextual effects of mixed-attribute accounting for assets versus debt. Beaver and Ryan (2005)
argue that simulation is particularly useful for portraying the effects of conditional conservatism due to its probabilistic and history-dependent nature. Simulation is similarly useful for capturing the dynamically optional nature of risky debt, as illustrated by its frequent use in the finance literature devoted to options (e.g., Longstaff and Schwartz 2001).

Drawing on both the theoretical and simulation analyses, we develop testable hypotheses about the effect of the presence of risky debt and mixed-attribute accounting for assets and debt on asymmetry. We hypothesize that when firms account for risky debt at amortized cost, so that the change in the value of the embedded put option in risky debt is not reflected in net income, it yields asymmetry in the same direction as that induced by conditional conservatism even in the absence of conditional conservatism. We hypothesize that fair value accounting for debt can change the direction of asymmetry even in the presence of conditional conservatism, depending on the relative amounts of assets subject to conditional conservatism and debt accounted for at fair value.

In the empirical analysis, we show that researchers can use measures of economic leverage, equity return volatility, and debt credit ratings—variables familiar from the extensive bankruptcy prediction literature—to control successfully for the presence of risky debt. Debt is riskier if economic leverage and return volatility are higher or if credit ratings are below investment grade. We control for a measure of the percentage of economic assets that are recognized for accounting purposes (hereafter, the asset recognition percentage) and so are potentially subject to conditional conservatism. We control for the asset recognition percentage

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4 Following Bowman (1979), we measure economic leverage as the book value of debt divided by the sum of the book value of debt and the market value of equity.

5 See Beaver, McNichols, and Rhie (2005) for a recent example of the bankruptcy prediction literature.

6 We measure the asset recognition percentage as the book value of assets divided by the sum of the book value of assets and the pretax difference between the market and book values of equity.

7 Beaver and Ryan (2005) discuss how conditional conservatism can be preempted by unconditional conservatism.
in part because prior empirical research by Pae, Thornton, and Welker (2005), Roychowdhury and Watts (2007), and Ball and Kothari (2008) find that the book-to-market ratio (an alternative measure of asset recognition) is positively associated with asymmetry, and in part because our proxies for the presence of risky debt are correlated with the asset recognition percentage. We do not use the book-to-market ratio as our measure of the asset recognition percentage because it is also affected by economic leverage, which generally drives the book-to-market ratio away from one. Given our research question, it is critical to distinguish economic leverage, which pertains to the imbedded put option in risky debt, as cleanly as possible from the asset recognition percentage, which pertains to accounting measurement.

Consistent with our hypotheses regarding risky debt, we find that asymmetry rises significantly with higher economic leverage and return volatility and below investment grade credit ratings, controlling for the asset recognition percentage. While our results suggest that a significant portion of observed asymmetry is attributable to the presence of risky debt, asymmetry remains even when economic leverage and return volatility are low and credit ratings are investment grade. We also find that asymmetry rises significantly with the asset recognition percentage, controlling for economic leverage, return volatility, and noninvestment-grade credit ratings, consistent with the findings of the aforementioned prior empirical research. After controlling for the presence of risky debt and the asset recognition percentage, we find that significant asymmetry remains. We believe this post-control asymmetry can be attributed with considerably more confidence to conditional conservatism than can the pre-control asymmetry.

Continuing in this vein, we reexamine Basu’s (1997) finding that asymmetry, which he interprets as resulting from conditional conservatism, has trended up over time. We control for decreases in economic leverage and the asset recognition percentage over time as firms’ market
value of equity and economic intangible assets have risen (Lev 2001). Each year we group firms into economic leverage and asset recognition percentage terciles using tercile bounds that reflect the distribution of these variables in the middle of our sample period and do not change over time. The low economic leverage and low asset recognition percentage terciles—for which we expect and find asymmetry to be lower due to the presence of less/less risky debt or unrecognized economic assets that are immune to conditional conservatism—include increasingly large percentages of the sample observations over time. For most of the terciles and for all of the averages across the terciles, the upward trend in asymmetry is stronger and more monotonic than is the upward trend in the asymmetry for the overall sample that Basu examines. The upward trends for the terciles are more likely to reflect conditional conservatism than is the upward trend for the overall sample because economic leverage and the asset recognition percentage are held constant. This finding is a relatively mild manifestation of Simpson’s paradox, which states that the difference or trend in an average of averages can have the opposite sign (in our case, weaker but same sign) than the difference or trend in all (in our case, most) of the individual averages, because of changes in the number or composition of observations underlying the individual averages. We believe that controlling for changes in risky debt and unrecognized economic assets strengthens researchers’ ability to isolate trends in asymmetry attributable to conditional conservatism.

In principle, we could also test our hypotheses about firms’ accounting for debt at fair value versus cost. However, too few firms (even including financial institutions, which are not included in our sample) have chosen the fair value option for debt thus far to develop a sample of sufficient size to do this with any statistical power. Hence, we do not attempt to test these hypotheses in this paper. This limitation of the empirical analysis can be remedied if and when
the FASB and IASB choose to require fair value accounting for debt and other financial instruments, as they have said they intend to do. 8

We emphasize that our analysis of risky debt and mixed attribute accounting has implications that go well beyond the identification of conditional conservatism as asymmetry, such as for the identification of other aspects of accounting measurement and for the specification of accounting-based valuation and risk assessment models. Researchers interested in these other topics should also find this analysis relevant. We focus on conditional conservatism in this paper because Watts (2003a,b), Ball and Shivakumar (2005), Ryan (2006), Roychowdhury and Watts (2007), and Ball and Kothari (2008) argue convincingly that conditional conservatism is a critical aspect of accounting that accounting researchers need to be able to identify. We focus on asymmetry because it is the dominant approach to identifying conditional conservatism because, as Ryan (2006) and Ball and Kothari (2008) argue, asymmetry is the most direct manifestation of conditional conservatism.

We acknowledge that a number of recent papers—notably, Dietrich, Muller, and Riedl (2007)—raise various issues regarding the identification of conditional conservatism as asymmetry, with some authors concluding that accounting researchers should jettison asymmetry in favor of other approaches to identifying conditional conservatism. While our paper also raises issues regarding the identification of conditional conservatism as asymmetry, we view these issues as no less understandable or addressable than other of the myriad identification/construct

8 Alternatively, we could conduct empirical analysis using FAS 107 disclosures of the fair value of debt if we could assume that those disclosures incorporate the effects of changes in firms’ own credit risk. Our sense is this assumption is not valid for essentially all of our sample period, however, because FAS 107 does not require firms to incorporate their own credit risk in determining the fair value of their nontraded liabilities. Specifically, paragraph 68 of FAS 107 states “[s]ome entities will estimate fair value by using an incremental rate of borrowing that considers changes in an entity’s own credit risk, while others will use a settlement rate that ignores at least part of those credit risk changes. However, the Board concluded that it should not, at this time, prescribe a single method to be used for all unquoted liabilities.” In contrast, paragraph 15 of FAS 157 clearly states that the fair value of liabilities should reflect firms’ own credit risk. FAS 157 is not effective until 2007 for early adopters and 2008 for other firms.
validity issues that pervade empirical accounting research. Hence, research like this paper that provides constructive solutions to issues in identifying conditional conservatism as asymmetry is important.

The remainder of the paper is organized as follows. Section 2 discusses the most relevant portions of the related literatures on conditional conservatism, risky debt, and the mixed-attribute accounting model, as well as our contributions to those literatures. Section 3 provides analytical modeling of the effect of risky debt on equity returns and thereby on asymmetry. Section 4 conducts a simulation that depicts how the effects of risky debt on asymmetry depend on: (1) the risk of debt as captured by economic leverage; (2) whether debt is accounted for at cost or fair value; and (3) the relative amounts of assets subject to conditional conservatism versus debt accounted for at fair value. These depictions yield a rich set of hypotheses about how the presence of risky debt and the choice to account for that debt at fair value affect asymmetry. The hypothesis regarding the presence of risky debt is tested empirically in Section 5, with largely supportive results. Section 6 concludes and discusses a few of the enormous possibilities for further research on the implications of the presence of risky debt and the mixed-attribute accounting model.

2. Related Literatures and Contributions

In this section, we describe the most relevant portions of the related literatures on conditional conservatism, risky debt, and the mixed-attribute accounting model, and indicate our contributions to those literatures.
2.1. Returns as the Proxy for News in Identifying Conditional Conservatism

The literature on conditional conservatism typically uses returns as a proxy for news. The appropriateness of this proxy for news has been subject to considerable recent debate, with strongly stated positions both for and against. In the against camp, Dietrich, Muller, and Riedl (2007) argue that net income causes returns, not vice-versa, and so “reverse regressions” of net income on returns yield biased coefficients on the endogenous explanatory variables. Attempting to capture such endogeneity, Beaver, Landsman, and Owens (2008) specify and empirically estimate a simultaneous equations model, and find that asymmetry is not statistically significant in that model. In the for camp, Ryan (2006) and Ball and Kothari (2008) argue that while in principle it would be desirable to use a direct measure of news instead of returns, the use of returns is justified because they are much more comprehensive and broadly applicable than other possible measures, and also because the extent to which net income causes returns is sufficiently slight as to cause relatively little bias. Ball and Kothari argue further that the research question addressed by the literature on conditional conservatism is how news is reflected in net income, not in returns, and in this context regressions of net income on returns do not yield biased coefficients and really should not be referred to as reverse regressions. Moreover, the use of multiple (simultaneous) equations models is not necessary and may yield inappropriate inferences. Finally, while not falling neatly into either camp, Givoly, Hayn, and Natarajan (2007) provide evidence that the estimation of asymmetry depends on characteristics of the information environment and the degree of uniformity in the content of the news arriving during a period, which also speaks to the adequacy of returns as a proxy for news.

Our paper also uses returns as a proxy for news but raises a different issue about this use. In practice, conditional conservatism almost always applies to assets (e.g., real and financial
inventory, long-lived tangible and intangible assets, and financial assets such as loans and non-trading investment securities), not to liabilities. For most assets, U.S. generally accepted accounting principles (GAAP) require impairment write-downs when news about the value of those assets is sufficiently adverse. In contrast, the only significant class of liabilities for which GAAP requires the application of conditional conservatism is loss contingencies recognized under FAS 5, a standard that is conditionally conservative because it prohibits recognition of gain contingencies. In particular, no accounting standard requires or allows write-ups of risky debt when its value of rises but also prohibits write-downs of risky debt when its value falls. Since debt is never accounted for conditionally conservatively, the measure of returns used to estimate asymmetry ideally should be the return on net assets excluding debt (hereafter, asset returns).

In our analytical and simulation analyses, we show that the presence of risky debt mutes equity returns relative to what they would have been had debt been riskless—i.e., to linearly leverage-adjusted asset returns—all else being equal. This muting effect is stronger when news is bad than when news is good, and so yields asymmetry in the same direction as that induced by conditional conservatism. This muting effect and asymmetry are stronger when a firm holds more or riskier risky debt.

2.2 Risky Debt, Accounting Measurement, and Accounting-based Valuation

The fact that risky debt imbeds a written put option on the firm’s net assets and so absorbs some of downside asset returns has been well understood since Merton (1974). Despite this fact, remarkably few accounting research papers have examined the effect of the presence of risky debt on valuation or risk assessment relationships. A few papers have examined the effect
of risky debt on earnings response coefficients or other manifestations of the relationship between equity price or returns and earnings. Fischer and Verrecchia (1997) demonstrate theoretically and Dhaliwal, Lee, and Fargher (1991) and Dhaliwal and Reynolds (1994) show empirically that risky debt reduces earnings response coefficients and, more generally, implies that equity price and returns are convex functions of earnings. Barth, Hodder, and Stubben (2008) provide empirical evidence that risky debt attenuates the effect of declines in firms’ credit ratings on the value of their equity. Barth et al. also provide evidence that if firms accounted for their risky debt at fair value, then the gains that they would record on their debt if their credit risk deteriorated usually would be more than offset by recognized impairment losses on their conditionally conservatively accounted for assets. (We note that we do not expect this last finding to obtain for firms with low asset recognition percentages.)

Our paper examines how the presence of risky debt affects asymmetry. We show that risky debt accounted for at amortized cost yields asymmetry that is similar to that induced by conditional conservatism. We also show that this effect is stronger for firms with higher economic leverage and asset return volatility and lower credit ratings.

Elliott, Moon, and Ghosh (2008) empirically investigate the mirror-image question of how debt and equity holders benefit asymmetrically from net income growth, an upside risk. They document an asymmetry that is distinct from the one induced by conditional conservatism and that depends on the level of firms’ risk and whether the main driver of their net income growth is revenue versus other income statement line items. While this upside-risk-related asymmetry may affect the estimation and thus the identification of conditional conservatism as asymmetry, we expect it to do so in a relatively weak and highly contextual fashion. Accordingly, we do not consider this asymmetry in this paper.
2.3. The Mixed-Attribute Accounting Model

Perhaps the single most striking and pervasive aspect of financial accounting is the use of multiple measurement attributes to measure assets and liabilities with different “characteristics,” even when these items are economically very similar (e.g., loans versus leases). While there are often valid justifications for specific elements of the mixed attribute model—e.g., see Watts (2003a,b) and Ball and Shivakumar’s (2005) discussions of the rationale for conditional conservatism and Roychowdhury and Watts (2007) and Ball and Kothari’s (2008) discussion of the rationale for not booking economic rents—collectively the inconsistent portrayal of firms’ portfolios of assets and liabilities significantly limits the potential explanatory power of accounting-based valuation and risk assessment. Illustrating this point, Hodder, Hopkins, and Wahlen (2006) approximate full fair value accounting for banks’ assets and liabilities using banks’ incomplete and imperfect FAS 107 fair value of financial instruments disclosures and other fair value information. They find that full fair value accounting yields measures of total income and incremental income beyond reported comprehensive income that reflect banks’ risk more powerfully and with more theoretically correct signs than does the reported net and comprehensive income measures generated by the current mixed attribute model.

Despite the pervasiveness of the mixed-attribute accounting model, accounting research has addressed this model only in very specific settings and regarding very limited questions, which has not led to any sort of general understanding of its effects on valuation relationships or risk assessment models. As an example of the research that has been conducted thus far, Beaver and Ryan (2005) construct a model in which some (tangible) assets are recognized and subject to conditional conservatism while other (intangible) assets are unrecognized, and they demonstrate
using simulation that the presence of intangible assets weakens the asymmetry induced by
conditional conservatism. As another example, Gigler, Kanodia, and Venugopalan (2007)
examine the recognition of cash flow hedges of forecasted transactions at fair value on the
balance sheet, and show that the market interprets recognized gains and losses on the cash flow
hedge taking into account their implications for the unrecognized hedged forecasted transactions.

Our paper examines perhaps the most generally important manifestation of the mixed
attribute model: the inconsistent accounting for the assets that generate risk and return versus the
risky debt that absorbs some but not all of the assets’ downside risk and return. As in Beaver and
Ryan (2005), we allow for both tangible assets that are recognized and accounted for
conditionally conservatively and intangible assets that are unrecognized. We do this for the
limited purpose of varying the relative amounts of conditionally conservatively accounted for
assets and risky debt, however. We allow risky debt to be accounted for either at amortized cost,
as is usually the case, or at fair value under FAS 159’s fair value option. While our analysis
focuses on the effects of the presence of and accounting for risky debt on asymmetry, our basic
setting and approach can be used to address many other important valuation and risk assessment
issues.

3. Risky Debt, Equity Returns, and Asymmetry

In this section we demonstrate using simple mathematics how the presence of risky debt
mutes equity returns, more so when news is bad than when it is good. Because of this effect,
risky debt yields asymmetry in the same direction as that induced by conditional conservatism.
These effects are depicted using the simulation reported in Section 4.
Our analysis is based on two assumptions (essentially identities) commonly posited in finance theory. First, the balance sheet equation holds in market values, i.e.,

\[ MVE = MVA - MVD, \]  

where \( MVE \) denotes the market value of equity, \( MVA \) denotes the market value of assets, and \( MVD \) denotes the market value of debt. This assumption requires no positive or negative value complementaries to exist between assets and debt. Second, there are no intermediate investments, principal distributions to/from debtholders, or nondividend distributions to/from equityholders, and all cash flow from operations (CFO) is paid out to debtholders in interest (INT) or to equityholders in dividends (DIV), i.e.,

\[ DIV = CFO - INT. \]  

We make this assumption purely for simplicity, as with some extra notation and algebra it can be generalized to incorporate other distributions or cash retention.

Taking first differences of equation (A1), adding equation (A2), dividing by beginning MVE, rearranging, and introducing time subscripts yields:

\[
\frac{\Delta MVE_t + DIV_t}{MVE_{t-1}} = \left( \frac{MVA_{t-1}}{MVE_{t-1}} \right) \times \left( \frac{\Delta MVA_t + CFO_t}{MVA_{t-1}} \right) - \left( \frac{MVD_{t-1}}{MVE_{t-1}} \right) \times \left( \frac{\Delta MVD_t + INT_t}{MVD_{t-1}} \right). \]  

(1)
Equation (1) portrays equity returns as equal to a weighted average of asset and debt returns, where the weights equal the percentages of the beginning market value of equity that are attributable to assets and debt, respectively.

Replacing \((\Delta \text{MVE}_t + \text{DIV}_t)/\text{MVE}_t\) by \(R_{E,t}\), \((\Delta \text{MVA}_t + \text{CFO}_t)/\text{MVA}_{t-1}\) by \(R_{A,t}\), and \((\Delta \text{MVD}_t + \text{INT}_t)/\text{MVD}_{t-1}\) by \(R_{D,t}\) in equation (1) and rearranging yields:

\[
R_{E,t} = R_{A,t} + \left(\frac{\text{MVD}_{t-1}}{\text{MVE}_{t-1}}\right) \times \left(\text{RA}_t - R_{D,t}\right).
\]

Taking the derivative of equation (2) with respect to \(R_A\) portrays how \(R_E\) varies with \(R_A\)

\[
\frac{\partial R_{E,t}}{\partial R_{A,t}} = 1 + \left(\frac{\text{MVD}_{t-1}}{\text{MVE}_{t-1}}\right) \times \left(1 - \frac{\partial R_{D,t}}{\partial R_{A,t}}\right).
\]

If debt is riskless, then \(\partial R_{D,t}/\partial R_{A,t}=0\) and equation (3) implies that \(R_{E,t}\) rises linearly with \(R_{A,t}\) in proportion to the beginning economic leverage ratio \(\text{MVD}_{t-1}/\text{MVE}_{t-1}\). In contrast, if debt is risky, then \(\partial R_{D,t}/\partial R_{A,t}>0\) and the positive association of \(R_E\) with \(R_A\) is muted relative to the association in the case of riskless debt, holding economic leverage constant. Moreover, \(\partial^2 R_{D,t}/\partial R_{A,t}^2 < 0\)—i.e., \(R_{D,t}\) is a concave function of \(R_{A,t}\)—because risky debt imbeds a written put option on the firm’s net assets that becomes more valuable to the purchaser of the option as the option moves toward being or deeper in the money. Hence, \(R_{E,t}\) is a convex function of \(R_{A,t}\) and the muting of \(R_{E,t}\) is stronger when \(R_{A,t}\) is lower. Figure 1 depicts the source of this muting, graphing \(\text{MVD}_t\) and \(\text{MVE}_t\) as functions of \(\text{MVA}_t\) and showing that in the presence of risky debt \(\text{MVD}_t\) (\(\text{MVE}_t\)) becomes more (less) sensitive to changes in \(\text{MVA}_t\) as \(\text{MVA}_t\) declines.
4. Simulation and Hypotheses

In this section, we describe and report the results of a single simulation analysis that illustrates the effect of the optionality of risky debt and mixed-attribute accounting for assets versus debt on asymmetry. We state testable hypotheses based on the simulation results. We empirically test the hypothesis pertaining to the presence of risky debt in Section 5.

4.1. Simulation Assumptions

We first state the economic assumptions and then the accounting assumptions underlying the simulation. To ensure clarity, we present all the main assumptions mathematically but emphasize that the simulation results apply far more generally than for the specific mathematics presented. Where possible, we maintain the same notation as in Section 3.

The simulation includes 1000 firms and eight simulation periods, with both numbers being more than sufficient to generate reliable plots. In period 0 immediately prior to the first simulation period, each firm invests a total of $1 (the amount does not matter) in tangible and intangible assets. The market values of assets, tangible assets, and intangible assets are denoted \( MVA, MVTA, \) and \( MVIA \), respectively. \( MVA_0=1 \) and \( MVA_t=MVTA_t+MVIA_t \), where subscripts denote the simulation period. The percentage of assets that is tangible is denoted \( k \) and takes one of three values: 10%, 50%, or 100%. Tangible and intangible assets are economically identical in all respects; in particular, they have proportional market values, i.e.,

\[
MVTA_t=MVA_t \times k \quad \text{and} \quad MVIA_t=MVA_t \times (1-k).
\]

We do not distinguish the two types of assets economically because our sole purpose for having two types is to allow us to vary the percentage of assets subject to conditional conservation.
The firm finances the initial purchase of assets by issuing a total of $1 market value of coupon-paying debt (MVD) and owners’ equity (MVE). MVD₀ equals the face value of debt. The initial economic leverage ratio MVD₀/MVE₀ is denoted d, after Merton (1974), and takes one of two values: 1 (MVD₀= MVE₀) and 9 (MVD₀= 9×MVE₀). Because of other assumptions stated below, debt is riskless when d=1 but risky when d=9. These two values for d suffice to illustrate the distinct effects of riskless and risky debt.

The debt and owners’ equity are the sole claims on the total assets of the firm, i.e., MVAₜ=MVDₜ+MVEₜ. Consistent with this assumption, the only uncertainty is about MVA, which follows a random walk with a multiplicative and binomially distributed error term that is ±.05 in each simulation period, with each of these outcomes occurring with 50% probability. i.e.,

\[ MVA_t = MVA_{t-1}(1 + \varepsilon_t), \text{ where } \varepsilon_t = \begin{cases} .05 \text{ with } 50\% \text{ probability and} \\ - .05 \text{ with } 50\% \text{ probability} \end{cases}. \]

This equation implies that assets do not amortize economically over the period of the simulation. It is silent as to whether assets have positive or zero net present value.

To generate a distribution of net income with more than two outcomes, which is necessary to depict the shape of asymmetry resulting from conditional conservatism, we assume net income is calculated over the first four simulation periods (hereafter, the accounting period), which can be thought of as quarters. This yields five possible ultimate outcomes over the accounting period; specifically, the number of increases less decreases in the market value of

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9 Allowing for economic amortization would require firms to reinvest to prevent shrinkage. As evidenced by Beaver and Ryan (2005), reinvestment is straightforward but tedious to incorporate in models and simulations, and it is even more so when combined with the dynamically optional nature of risky debt. Incorporating reinvestment and suffering the additional tedium would yield no incremental insights related to our research question. Merton (1974) makes analogous simplifying assumptions in his theoretical analysis for similar reasons.
assets is one of +4, +2, 0, -2, or -4. Given the market value of assets changes by ±5% per
simulation period, this corresponds to percentage changes in MVA over the accounting period
ranging from 21.6% to -18.5%.

The simulation includes an additional four periods beyond the end of the accounting
period so that risky debt exhibits ongoing optionality. As discussed below, the face value of the
debt is paid in simulation period 8. There are nine possible outcomes over the eight simulation
periods; specifically, the number of increases less decreases in the market value of assets is one
of +8, +6, …, or -8. This corresponds to percentage changes in MVA over the eight simulation
periods ranging from 47.7% to -33.7%. This last number implies that debt is risky when the
firm’s initial economic leverage d exceeds .663/.337≈1.97, which explains the prior statement
the debt is riskless when d=1 but risky when d=9. For simplicity, the firm continues to operate if
MVA falls below the face value of the debt MVD0.10

The firm’s assets generate cash flow from operations (CFO) equal to 10% of the end of
period market value of assets in simulation periods 4 and 8, i.e., CFOt=.1×MVA_t, for t=4 and 8.
Interest on the debt (INT) and dividends on the owners’ equity (DIV) are paid out of CFO at the
end of those periods. INT equals the lesser of the coupon rate r_c (specified below) times the face
value of the debt and CFO that period, i.e., INT_t=min(r_c×MVD_0,CFO_t), for t=4 and 8. DIV
equals any CFO remaining after INT is paid, i.e., DIV_t=CFO_t-INT_t for t=4 and 8. The principal
payment on the debt (PRIN) is made in simulation period 8 and equals min(MVD_0,MVA_8).
MVE_8 equals MVA_8-PRIN. The firm may continue after simulation period 8.

10 If firms were required to shut down before the end of the accounting period (i.e., in one of the first three
simulation periods) when MVD>MVA, then the plots generated by the simulation would be messier and
accompanying discussion much harder to follow. This is because certain relatively uncommon earnings and returns
combinations would correspond perfectly to specific shut-down paths because of the assumed binomial structure.
These combinations would need to be separately discussed. In contrast, shutting down the firm at or after the end of
the accounting period when MVD>MVA has minimal effect.
All of the net income and return variables analyzed in the simulation depend on market values, book values, and cash flows only at the beginning and end of the accounting period, i.e., in simulation periods 0 and 4. MVD and MVE in simulation periods 0 and 4 equal the corresponding expected discounted remaining cash flows. We discount debt cash flows at 5% per four simulation periods,\(^{11}\) so \(\text{MVD}_0 = E_0 \{\text{INT}_4/1.05 + (\text{INT}_8 + \text{PRIN})/1.05^2\}\) and 
\(\text{MVD}_4 = E_4 \{(\text{INT}_8 + \text{PRIN})/1.05\}\). The first of these equations determines the coupon rate \(r_c\), which must rise above the discount rate 5% to compensate for any expected default losses. Specifically, 
\(r_c = 5\%\) when \(d = 1\) and the debt is riskless and \(r_c = 5.914\%\) when \(d = 9\) and the debt is risky.

We turn now to the accounting assumptions underlying the simulation. The book values of assets, tangible assets, and intangible assets are denoted \(BVA\), \(BVTA\), and \(BVIA\), respectively. Tangible assets are recognized for accounting purposes using one of three measurement attributes: (1) cost, (2) the lesser of cost and fair value (hereafter impaired cost), or (3) fair value. Fair values equal market values, but we use the term “fair value” when referring to accounting measurements. Consistent with the random walk assumption for MVA, tangible assets are not subject to accounting amortization,\(^{12}\) i.e.,

\[
BVTA_t = \begin{cases} 
BVTA_0 \text{ [cost], or} \\
\min(MVTA_0, BVTA_{t-1}) \text{ [impaired cost], or} \\
MVTA_0 \text{ [fair value].}
\end{cases}
\]

---

\(^{11}\) For simplicity, we do not use a different discount rate for riskless and risky debt or try to derive the appropriate discount rate for either type of debt. To do this properly would require making a host of assumptions about the term and risk structures of interest rates, and the main aspects of the simulation results would not change.

\(^{12}\) Allowing for accounting amortization equal to economic amortization would not noticeably affect our simulation results. See Beaver and Ryan (2005) for analysis of the case when accounting amortization is unconditionally conservative relative to economic amortization, so that accounting slack is created over time that partly or wholly preempts the application of conditional conservatism. Such accounting slack reduces asymmetry in a fashion similar but not identical to the presence of unrecognized intangible assets that we consider.
We consider accounting for tangible assets using the cost and fair value measurement attributes both to better understand the effects of accounting for tangible assets at impaired cost (i.e., conditionally conservatively) and to isolate the effects of accounting for debt at fair value.

Intangible assets are not recognized, i.e.,

\[ BVIA_t = 0. \]

This maximally unconditionally conservative accounting for intangible assets renders them immune to conditional conservatism.

The book value of debt is denoted BVD. Debt is accounted for at either cost or fair value, i.e.,

\[
BVD_t = \begin{cases} 
MVD_0 \ [\text{cost}] & \text{or} \\
MVD_t \ [\text{fair value}] 
\end{cases}
\]

When debt is accounted for at cost, BVD at any time prior to the payment of PRIN in simulation period 8 equals the face/initial market value of the debt MVD_0.

Net income (NI) equals cash flow from operations minus interest on debt plus the change in the book value of tangible assets minus the change in the book value of debt over the earnings period, i.e., \( NI = CFO_4 - INT_4 + (BVTA_4 - BVTA_0) - (BVD_4 - BVD_0) \). Consistent with the way that asymmetry is estimated in the literature, NI is divided by beginning-of-accounting-period market value MVE_0. We plot NI/MVE_0 for six different pairs of the three accounting measurement attributes for tangible assets and the two accounting measurement attributes for debt described
above: 1) both tangible assets and debt accounted for at cost, 2) tangible assets accounted for at impaired cost/debt accounted for at cost, 3) tangible assets accounted for at fair value/debt accounted for at cost, 4) tangible assets accounted for at cost/debt is accounted for at fair value, 5) tangible assets accounted for at impaired cost/debt is accounted for at fair value, and 6) both tangible assets and debt accounted for at fair value.

Asset, debt, and equity returns over the accounting period are defined as in Section 3, i.e., 
\[ R_A = \frac{(MVA_4-MVA_0+CFO_4)}{MVA_0}, \quad R_D = \frac{(MVD_4-MVD_0+INT_4)}{MVD_0}, \quad \text{and} \quad R_E = \frac{(MVE_4-MVE_0+DIV_4)}{MVE_0}. \]

4.2. Risky Debt and the Muting of Equity Returns

As portrayed in equation (3) and discussed immediately following that equation, the presence of risky debt mutes equity returns. This fact is depicted in Figure 2, which plots the means of \( R_A, R_D, \) and \( R_E \) against \( R_A \), for the cases of \( d=1 \) (riskless debt) in the left hand plot and \( d=9 \) (risky debt) in the right hand plot. Notice that all the relationships are linear in the case of riskless debt. In contrast, in the risky debt case \( R_D \) is a concave function of \( R_A \) for sufficiently low \( R_A \), and as a result \( R_E \) is a convex function of \( R_A \) for sufficiently low \( R_A \).

4.3. The Effects of Alternative Measurement Attributes for Tangible Assets and Debt

Figure 3 plots \( NI/MVE_0 \) against \( R_E \), where \( NI \) is measured using each of the six alternative pairs of measurement attributes for tangible assets and debt mentioned above. In this figure, \( k=100\% \) (assets are 100\% tangible), and we examine the cases of \( d=1 \) (riskless debt) and \( d=9 \) (risky debt). In the case of riskless debt, \( MVD_0=MVD_t \) for all \( t \) (i.e., the cost and fair value
of debt are equal), and so the six pairs of measurement attributes revert to the three for tangible assets.

The left hand plot in Figure 3 depicts the case of riskless debt, which is a benchmark for all of the remaining simulation plots. The lower curve in that plot is for the two pairs of measurement attributes in which tangible assets are accounted for at impaired cost. The steepening of the curve as $R_E$ decreases reflects the well-known asymmetry induced by conditional conservatism. The less steep straight line is for the two pairs of measurement attributes in which cost accounting is used for tangible assets, so that $NI=DIV_4$. The steeper straight line is for the two pairs of measurement attributes in which fair value accounting is used for tangible assets, so that $NI=DIV_4+(MVTA_4-MVTA_0)$. The different slopes for these lines reflects the fact that $DIV_t$ and $MVTA_4-MVTA_0$ are both perfectly positively associated with $R_E$ in the riskless debt case.

The right hand plot depicts the more interesting case of risky debt. The tangible assets at impaired cost/debt at cost curve and the tangible assets and debt at fair value line appear very similar to the corresponding curve and line in the riskless debt case, except that the higher economic leverage causes $R_E$ to take more extreme values. The other curves evidence noticeable and interesting differences, however. First, asymmetry in the same direction as induced by conditional conservatism is evident in the both tangible assets and debt at cost and the tangible assets at fair value/debt at cost curves, despite the absence of conditionally conservative accounting. This is because of the muting of $R_E$ that occurs as risky debt absorbs some of the downside realizations of $R_A$, which one can visually imagine as squeezing the horizontal axis of this plot from the left hand side. Second, the prior asymmetry in the tangible assets at impaired cost/debt at fair value curve is attenuated somewhat because gains are recorded on risky debt
when $R_E$ is sufficiently negative. Third, and relatedly, the tangible assets at cost/debt at fair value curve exhibits asymmetry in the opposite direction as that induced by conditional conservatism, again because of the gains recorded on the risky debt.

To conserve space, we only vary economic leverage, one contributor to the risk of debt, in Figure 3. Similar (albeit more two-sided) effects occur if we increase the volatility of asset returns instead.

This discussion yields two new hypotheses about sources of asymmetry, with all hypotheses in the paper being stated in the alternative.

[H1] Even in the absence of conditional conservatism, asymmetry in the same direction as that induced by conditional conservatism exists if debt is risky and accounted for at amortized cost. This effect is stronger if debt is riskier.

[H2] Even in the absence of conditional conservatism, asymmetry in the opposite direction as that induced by conditional conservatism exists if debt is risky and accounted for at fair value. This effect is stronger if debt is riskier.

4.3. Replacing Equity Returns with Asset Returns

Figure 4 is identical to the right hand plot in Figure 3, except that $R_E$ is replaced by $R_A$ as the independent variable. This eliminates the asymmetry that results from the muting of equity returns in the two tangible assets at cost cases just discussed, yielding the following hypothesis.
[H3] H1 does not hold if asset returns are used instead of equity returns in estimating asymmetry.

4.4. Varying the Proportion of Assets Subject to Conditional Conservatism

Figure 5 plots the results for the d=9 (risky debt) case and two pairs of measurement attributes: (1) tangible assets at impaired cost/debt at cost and (2) tangible assets at impaired cost/debt at fair value. In both these pairs, tangible assets are accounted for conditionally conservatively. However, the proportion of assets that are tangible and thus subject to conditional conservatism varies from k=100% to 50% to 10%. The 100% tangibles curves in Figure 5 are the same as in the right hand plot in Figure 3 for the corresponding pairs of measurement attributes.

The left hand plot depicts the tangible assets at impaired cost/debt at cost pair of measurement attributes. In this plot, decreasing the percentage of tangible assets k attenuates asymmetry but does not eliminate it, because changes in the value of intangible assets are not reflected in net income. Beaver and Ryan (2005) have previously shown this result. In contrast, the right hand plot depicts the tangible assets at impaired cost/debt at fair value pair of measurement attributes. In this plot, the asymmetry reverses direction slightly for k=50% and strongly for K=90%. This is because recognized gains on debt more than offset the impairment losses on the smaller amount of tangible assets.

This discussion of Figure 5 yields the following new hypotheses about sources of asymmetry, stated in the alternative.
In the presence of conditional conservatism, the asymmetry induced by conditional conservatism is reduced if debt is risky and accounted for at fair value. The direction of the asymmetry changes sign if the amount of debt is sufficiently large relative to the amount of assets subject to conditional conservatism.

5. Empirical Analysis

In this section, we empirically test only H1. We do not test H2 or H4 because we cannot observe a significant number of firms accounting for debt at fair value. We do not test H3 because we do not have a measure of the economic asset returns; we could linearly deleverage equity returns, of course, but that would not incorporate the nonlinearity that results from risky debt.

5.1. Sample and Variables

The sample includes the 35 years from 1973-2007 and all U.S. firms that are not in regulated or financial industries (SIC codes 4000-4999 or 6000-6999) and have the required data described below, whether the firms are currently active or inactive. We collected the following variables from Compustat’s annual industrial dataset (Xpressfeed format) on WRDS: total assets (ASS), short-term debt (STD), long-term debt (LTD), book value of common equity (BVE), annual net income (NI), annual ex-date dividends per share (DPS), S&P long-term credit rating, and fiscal-year-end closing price (PRI), common shares (SHA), and ex-date adjustment factor (ADJ). We collected monthly returns from CRSP and merged them with the Compustat data using cusip, because permno is no longer provided in the Xpressfeed format.
We use this data to calculate the following variables that we analyze empirically. To estimate asymmetry, we calculate net income scaled by beginning of year market value of equity (\(MVE_t = PРИ_{t-1} \times SHA_t\)) as \(X_t = NI_t / MVE_{t-1}\). We calculate fiscal year equity returns as 
\[R_t = \left(\frac{(PРИ_t + DPS_t) / ADJ_t}{(PŘI_{t-1} / ADJ_{t-1})} - 1\right)\]. \(NR_t\) denotes a dummy variable that takes the value of 1 if \(R_t\) is negative and 0 otherwise.

We calculate economic leverage as the ratio of the book value of total debt to the book value of total debt plus the market value of equity, i.e., 
\[EL_t = \frac{STD_t + LTD_t}{STD_t + LTD_t + MVE_t}\].

As is the case in almost all prior research using economic leverage ratios (e.g., Bowman 1979), we use the book value of debt as a proxy for the market value of debt, because the market value of debt is not observable for firms’ (often substantial) nonpublic debt. While this is not ideal given our research question, it is the best we can do. When \(EL\) is sufficiently high that debt absorbs some of the downside risk of the return on net assets (higher than that), we expect some (more) asymmetry to be attributable to the presence of risky debt. [Note: untabulated results show the effect of \(EL\) is stronger when return volatility is high and credit ratings are noninvestment grade.]

We calculate the asset recognition percentage as the ratio of the book value of total assets to the book value of total assets plus the pretax difference between the market value and book value of owners’ equity using a 35% tax rate, i.e., 
\[AR_t = \frac{ASS_t}{ASS_t + [MVe_t - BVE_t] / .65}\].\(^{13}\) We calculate the book-to-market ratio in the usual way, i.e., 
\[BM_t = BVE_t / MVe_t\]. \(AR_t\) and \(BM_t\) both decline as \(MVe_t\) rises relative to \(BVE_t\), and so these variables are highly positively correlated, as discussed below. Because we find that \(AR_t\) is considerably more strongly associated with asymmetry than is \(BM_t\), however, in our tabulated tests we employ \(AR_t\) rather than \(BM_t\). When

\(^{13}\) In calculating asset recognition, we divide \(MVe_t - BVE_t\) by one minus the tax rate to reflect the fact that the government has a equity-like claim on firms’ future taxable income.
AR is higher, we expect the more asymmetry due to conditional conservatism, because unconditional conservatism preempts conditional conservatism less.

The dummy variable CRATD, takes a value of 0 (1) if the S&P long-term credit rating is investment (noninvestment) grade. We calculate equity return volatility, VOL_t, as the variance of monthly returns over the prior 3 years, requiring at least 18 of the monthly returns during this period to be nonmissing.

We refer to EL, AR, BM, VOL, and CRATD collectively as the partitioning variables. To avoid tautological relationships between the partitioning variables and asymmetry, we estimate asymmetry using the year t values of X and R for groups formed based on the year t-1 values of the partitioning variables. To minimize the effect of outliers, we winsorize the outside 1% of both tails of all continuous variables.

We form terciles based on the partitioning variables using two distinct approaches: (1) with annually recalculated tercile bounds that yield equally sized terciles each year, and (2) with fixed tercile bounds that yield equally sized terciles in the 1988-1992 subperiod in the middle of our sample period. For both partitioning approaches, we denote the discrete variables that correspond to each partitioning variable by adding D to the partitioning variable’s name. For example, we denote the EL terciles by the discrete variable ELD, which equals 1 for the low tercile, 2 for the middle tercile, and 3 for the high tercile. To demonstrate the effect of each partitioning variable holding the other partitioning variable constant, we also examine the nine groups formed by the intersection of the ELD and ARD terciles (e.g., ELD=2 & ARD=3 is one of these groups). Finally, to demonstrate the joint effect of the two partitioning variables, we examine three combinations of these nine groups that are denoted by the discrete variable ELARD: (1) ELD=1 & ARD=1, ELD=1 & ARD=2, and ELD=2 & ARD=1 (ELARD=1);
ELD=2 & ARD=2, ELD=1 & ARD=3, and ELD=3 & ARD=1 (ELARD=2); and (3) ELD=3 & ARD=3, ELD=2 & ARD=3, and ELD=3 & ARD=2 (ELARD=3). ELARD=1 (ELARD=3) indicates the groups for which we expect asymmetry is expected to be lowest (highest).

Our three samples are: (1) all firm-year observations with nonmissing values of all Compustat variables except CRAT (which is missing much more than the other variables); (2) the same as (1) except VOL is also nonmissing; and (3) the same as (1) except CRAT is nonmissing. [Note: thus far we have only tabulated the results for the analyses using sample 1, and we refer to this as the overall sample.]

5.2. Descriptive Statistics

Panel A of Table 1 reports means and quartiles of the variables for the overall sample. We do not discuss these statistics as they are typical of prior research.

Panel B of Table 1 reports the means of the partitioning variables EL, AR, and BM for the seven consecutive five-year subperiods of the overall sample. All three of these variables decline strongly and almost monotonically from the first to last subperiod. We show in Section 5.4 below that these trends work to reduce estimated asymmetry.

Panel C of Table 1 reports correlations of the variables. EL, AR, and BM are all strongly positively correlated, with the correlation between AR and BM being particularly strong. \( R_t \) is positively correlated with all of the partitioning variables, reflecting its well-known positive association with \( BM_{t-1} \) (Fama and French 1992).

Panel D of Table 1 reports the results of an OLS regression of BM on EL and AR. BM has by far the stronger association with AR, which has a coefficient of 1.205 \((t=603.7)\) compared to a coefficient on EL of .067 \((t=16.9)\). Almost all of the explanatory power over BM in this
regression is attributable to AR. Hence, in the multivariate analyses in which we partition by both ELD and ARD, we view ARD as a (preferable) substitute for BM, but ELD as largely distinct from BM.

Panel E of Table 1 reports the number of observations and the percentage of the overall sample for each of the nine groups formed by the intersections of ELD and ARD. ELD and ARD are formed based on annually recalculated tercile bounds. The largest percentages and 54.2% of the total sample observations fall on the main diagonal, reflecting the positive correlation of EL and AR reported in Panel C. More than 5% of the sample falls in each of the off-diagonal cells, however, with the exception of ELD=3 and ARD=1, which contains only 2% of the observations. Hence, ELD and ARD are meaningfully distinct constructs.

5.3. Differences in Asymmetry across Groups Formed Based on Annually Recalculated Tercile Bounds

Table 2 reports the results of estimating asymmetry using Basu’s (1997) traditional model

\[ X_t = \alpha + \beta NR_t + \gamma R_t + \eta (R_t \times NR_t) + \epsilon_t. \]  

We estimated BASU for the overall sample, for each of the ELD terciles and ARD terciles, for the nine groups formed by the intersection of the ELD and ARD terciles, and for the three ELARD groups. Because the large number of groups analyzed, we report only the coefficient $\eta$, which captures the extent to which net income reflects current bad news (negative returns) more than current good news, the corresponding $t$ statistic, and the number of observations in each regression. We refer to $\eta$ as the asymmetry coefficient.
All the asymmetry coefficients are significantly positive, including those in the groups for which we expect asymmetry to be low. For example, as expected we find the lowest asymmetry in the ELD=1 & ARD=1 group, but the estimated asymmetry coefficient is still .197 (t=50.3). This finding is consistent with conditional conservatism being a significant contributor to estimated asymmetry regardless of the context.

The asymmetry coefficients rise strongly and monotonically with ARD, whether or not ELD is held constant. This is consistent with the findings of prior empirical research by Pae, Thornton, and Welker (2005), Watts and Roychowdhury (2007) and Ball and Watts (2008) who show that asymmetry rises with BM, which as discussed above is a proxy for the asset recognition percentage and is highly positively correlated with AR. When ARD is higher, unconditional conservatism preempts conditional conservatism less, and so it is more likely that conditional conservatism is applied and yields asymmetry. This finding is consistent with conditional conservatism being a more significant contributor to estimated asymmetry when unconditional conservatism is less.

The asymmetry coefficients also rise strongly and monotonically with ELD not holding ARD constant and when moving from ELD=2 to ELD=3 holding ARD constant. This finding is consistent with sufficiently risky debt being a significant contributor to estimated asymmetry, as hypothesized in H1.

As a complement to the partitioning analysis reported in Table 2, Table 3 reports the estimation of various nested versions of the following expanded version of the BASU model
$X_j = \alpha + \alpha_1 ELD_{t-1} + \alpha_2 ELD^3_{t-1} + \alpha_3 ARD_{t-1} + \alpha_4 ARD^3_{t-1} + \alpha_5 ELARD2_{t-1}$
\begin{align*}
+ \alpha_6 ARD^3_{t-1} + \beta NR_i + \beta_1 (NR_i \times ELD_{t-1} NR_i) + \beta_2 (NR_i \times ELD^3_{t-1}) \\
+ \beta_3 (NR_i \times ARD_{t-1}) + \beta_4 (NR_i \times ARD^3_{t-1}) + \beta_5 (NR_i \times ELARD2_{t-1} NR_i) \\
+ \beta_6 (NR_i \times ELARD^3_{t-1}) + \gamma R_i + \gamma_1 (R_i \times ELD_{t-1}) + \gamma_2 (R_i \times ELD^3_{t-1}) \\
+ \gamma_3 (R_i \times ARD_{t-1}) + \gamma_4 (R_i \times ARD^3_{t-1}) + \gamma_5 (R_i \times ELARD2_{t-1}) \\
+ \gamma_6 (R_i \times ELARD^3_{t-1}) + \eta (R_i \times NR_i) + \eta_1 (R_i \times NR_i \times ELD_{t-1}) \\
+ \eta_2 (R_i \times NR_i \times ELD^3_{t-1}) + \eta_3 (R_i \times NR_i \times ARD_{t-1}) + \eta_4 (R_i \times NR_i \times ARD^3_{t-1}) \\
+ \eta_5 (R_i \times NR_i \times ELARD2_{t-1}) + \eta_6 (R_i \times NR_i \times ELARD^3_{t-1}).
\end{align*}

(XBASU)

XBASU includes intercept and slope dummy variables indicating the observations for which ELD, ARD, and ELARD equal two or three (e.g., ELD2 takes a value of one for the observations for which ELD=2 and zero otherwise). XBASU does not include dummy variables for the nine groups formed by the intersection of ELD and ARD, however, and in this respect this regression approach is cruder than the analysis reported in Table 2. A benefit of the regression approach is it allows for additional control variables to be added to the model.

The first column of Table 3 reports the BASU model, the second column reports the effects of adding the ELD2 and ELD3 intercept and slope dummies to the BASU model; the third column reports the effects of adding the ARD2 and ARD3 intercept and slope dummies to the BASU model; the fourth column reports the effects of adding the ELD2, ELD3, ARD2, and ARD3 intercept and slope dummies to the BASU model; and the fifth column reports the effects of adding the ELARD2 and ELARD3 intercept and slope dummies to the BASU model.

The results reported in Table 3 are consistent with those reported in Table 2, and so we discuss only the more striking findings. The $R^2$ of the model rises by 45% from .120 for the BASU model in the first column to the table to .174 for the model with the ELD2, ELD3, ARD2, and ARD3 intercept and slope dummies in the fourth column, reflecting the importance of these variables for asymmetry. Of this .054 increase in $R^2$, .009 is attributable to the ELD dummies.
alone, .023 is attributable to the ARD dummies alone, and .022 is attributable to the common effect of the ELD and ARD dummies.

In the fourth column, the effect of EL on asymmetry is seen primarily in the ELD3 group, for which the incremental asymmetry coefficient is .204 (t=20.2). This result is consistent with debt having significant effects on asymmetry only debt is sufficiently high to absorb some of the downside risk of asset returns. The incremental asymmetry coefficient for ARD2 is .154 (t=16.6) and for ARD3 is .382 (t=37.1), consistent with the reduction of unconditional conservatism having a monotonic effect on asymmetry.

5.4. Trends in Asymmetry over Time for Groups Formed Based on Fixed Tercile Bounds

As shown in Table 1, Panel B, both EL and AR trend strongly and almost monotonically downward over our sample period. The results reported in Tables 2 and 3 imply that these trends work to reduce estimated asymmetry. In this section, we attempt to isolate the changes in asymmetry over time that are purely due to changes in the application of conditional conservatism, by holding risky debt (EL) and unconditional conservatism (AR) within fixed tercile bounds. We chose these fixed bounds to yield equally sized ELD and ARD terciles in the 1988-1992 subperiod in the middle of the overall sample period.

Table 4, Panel A reports the percentage of the sample falling in the same groups that are reported in Table 2, ignoring the change in the way that the tercile bounds are calculated. Dramatic movements in the composition of the sample toward (away from) the low (high) asymmetry groups are evident. For example, the ELARD=1 (ELARD=3) group contains 17.9% (65.3%) of the sample in the 1973-1977 subperiod but 52.9% (25.3%) of the sample in the 2003-2007 subperiod.
Table 4, Panel B reports the coefficients and t statistics on the time trend, \( s=1 \) to \( 7 \), in regressions of the estimated asymmetry coefficients in the BASU model across the seven subperiods on that time trend, i.e.,

\[
\eta_s = a + bs + e,
\]

for the overall sample and each group. The first row in the panel reports the results for the overall sample, which yields a coefficient \( b \) on the time trend of \( .043 \) (\( t=2.2 \)), consistent with Basu’s (1997) finding of increasing asymmetry over time.\(^{14}\)

Of the groups presented in the remaining rows of the panel, 13 out of 18 or 72% evidence a greater increase in asymmetry over time than does the overall sample. Specifically, two out of the three ELD groups, two out of the three ARD groups, seven out of the nine groups formed on the intersection of ELD and ARD, and two out of the three ELARD groups have a higher coefficient on the time trend than does the overall sample. Moreover, for the remaining five groups, either asymmetry is expected to be low (ELD=1, ARD=1, ELD=1 & ARD=1, ELARD=1) or they contain relatively few observations (ELD=3 & ARD=1), and even these groups evidence relatively similar increases in asymmetry over time as the overall sample. Most importantly, the averages of the coefficients and the t statistics on the time trend for each set of groups are considerably higher than the coefficient and t statistic on the time trend for the overall sample. For example, for the nine groups formed by the intersection of ELD and ARD, the average coefficient is \( .068 \), 58% larger than the \( .043 \) coefficient for the overall sample, and the

\(^{14}\) The estimated increase in asymmetry would be considerably larger if our sample extended further back in time, as in Basu (1997). Basu’s Figure 3 shows that asymmetry was very low from 1963-1969, at which time asymmetry began rising sharply. We chose to begin the sample in 1973 primarily because of Compustat’s incorporation of NASDAQ firms in 1974, extending the sample back one year to have 35 years of data to facilitate the analysis of subperiods of equal length.
average t statistic is 3.4, 55% larger than the 2.2 t statistic for the overall sample. These results are consistent with an increase in asymmetry due to increasing conditional conservatism over time that is offset in part by a decrease in asymmetry due to less risky debt and more unconditional conservatism over time. As discussed in the introduction, the differences between the trends in asymmetry for the overall sample and for the groups constitute a mild version of Simpson’s paradox. More importantly, Basu’s findings and conclusions (1997) regarding increasing conditional conservatism over time are understated, because asymmetry is being reduced over time by changes in factors other than conditional conservatism. These results are also consistent with hypothesis H1.

6. Conclusions and Future Research Opportunities

Our study has many implications and suggests even more possibilities for future accounting research. Our analytical, simulation, and empirical analyses show that risky debt that is accounted for at cost yields asymmetry in the same direction as that induced by conditional conservatism. This implies that, to identify conditional conservatism as asymmetry, accounting researchers must either employ measures of returns on net assets excluding risky debt or control for the absorption of the returns on net assets by risky debt. In our empirical analysis, we show how accounting researchers can use measures of economic leverage, return volatility, and credit ratings to provide such control.

As previously discussed by Barth, Hodder, and Stubben (2008), the effect of risky debt on accounting-based valuation relationships and risk assessment models has, with remarkably few exceptions, been largely ignored by prior accounting research. Our empirical results suggest that risky debt absorbs increasingly less of the downside risk of the return on net assets later in
our sample period from 1973-2007, although this may change with the recent severe decline in most firms’ market values. This may contribute to the findings of the many accounting research studies that report changing estimated coefficients and $R^2$s in valuation relationships over time.

Finally, our results imply that incorporation of mixed attribute accounting for different types of assets and for assets versus debt can have profound effects on valuation relationships and risk assessment models. Specifically, we show that the amount of assets subject to conditional conservatism relative to the amount of risky debt, and whether that debt is accounted for at cost or fair value, has significant effects on the identification of conditional conservatism as asymmetry. Generalizing, our results imply that accounting researchers need to begin thinking about more than one accounting measurement issue at a time, and specify their empirical models accordingly.
FIGURE 1
Relationships among the Market Values of Equity, Risky Debt, and Assets
Figure 2
Relationships among Asset, Debt, and Equity Returns
Varying d=Economic Leverage
Figure 3
Alternative Measurement Attributes for Tangible Assets and Debt
k=100% Tangible Assets, Varying d=Economic Leverage
Figure 4
Alternative Measurement Attributes for Tangible Assets and Debt
Replacing Equity Return with Asset Return
d=9 Economic Leverage
Figure 5
Selected Alternative Measurement Attributes for Tangible Assets and Debt
Varying $k =$ Percentage of Tangible Assets, $d =$ 9 Economic Leverage

Tangible Assets at Impaired Cost/Debt at Cost

Tangible Assets at Impaired Cost/Debt at Fair Value
TABLE 1
Descriptive Statistics
1973-2007 and Seven Five-Year Subperiods

Panel A: Means and Quartiles for Sample 1 (191,872 observations)

<table>
<thead>
<tr>
<th>variable</th>
<th>mean</th>
<th>minimum</th>
<th>25%</th>
<th>median</th>
<th>75%</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
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<td>X_t</td>
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<td>-1.251</td>
<td>-.032</td>
<td>.054</td>
<td>.108</td>
<td>.466</td>
</tr>
<tr>
<td>R_t</td>
<td>.129</td>
<td>-.843</td>
<td>-.239</td>
<td>.051</td>
<td>.361</td>
<td>2.636</td>
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<tr>
<td>R_t×NR_t</td>
<td>-.145</td>
<td>-.843</td>
<td>-.239</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EL_{t-1}</td>
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<td>0</td>
<td>.042</td>
<td>.224</td>
<td>.477</td>
<td>.910</td>
</tr>
<tr>
<td>AR_{t-1}</td>
<td>.775</td>
<td>.024</td>
<td>.402</td>
<td>.736</td>
<td>1.010</td>
<td>3.033</td>
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<tr>
<td>BM_{t-1}</td>
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<td>-1.240</td>
<td>.309</td>
<td>.599</td>
<td>1.030</td>
<td>3.914</td>
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</table>

Panel B: Means of Partitioning Variables for Seven-Year Subperiods

<table>
<thead>
<tr>
<th>Period</th>
<th>EL</th>
<th>AR</th>
<th>BM</th>
<th># obs</th>
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<tbody>
<tr>
<td>1973-1977</td>
<td>.402</td>
<td>1.159</td>
<td>1.375</td>
<td>18,106</td>
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<tr>
<td>1978-1982</td>
<td>.374</td>
<td>.994</td>
<td>1.112</td>
<td>20,255</td>
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<tr>
<td>1983-1987</td>
<td>.290</td>
<td>.772</td>
<td>.752</td>
<td>24,657</td>
</tr>
<tr>
<td>1993-1997</td>
<td>.235</td>
<td>.666</td>
<td>.600</td>
<td>33,444</td>
</tr>
<tr>
<td>2003-2007</td>
<td>.231</td>
<td>.621</td>
<td>.503</td>
<td>31,806</td>
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</table>

Panel C: Pearson Correlations for Overall Sample (191,872 observations)

<table>
<thead>
<tr>
<th></th>
<th>X_t</th>
<th>R_t</th>
<th>R_t×NR_t</th>
<th>EL_{t-1}</th>
<th>AR_{t-1}</th>
<th>BM_{t-1}</th>
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</thead>
<tbody>
<tr>
<td>X_t</td>
<td>1.000</td>
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<td></td>
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<tr>
<td>R_t</td>
<td>.211</td>
<td>1.000</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>R_t×NR_t</td>
<td>.345</td>
<td>.677</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>EL_{t-1}</td>
<td>-.038</td>
<td>.066</td>
<td>.096</td>
<td>1.000</td>
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<tr>
<td>AR_{t-1}</td>
<td>.012</td>
<td>.140</td>
<td>.193</td>
<td>.424</td>
<td>1.000</td>
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<tr>
<td>BM_{t-1}</td>
<td>.024</td>
<td>.138</td>
<td>.173</td>
<td>.375</td>
<td>.839</td>
<td>1.000</td>
</tr>
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</table>
TABLE 1 (continued)

Panel D: OLS Regression of $BM_t$ on $EL_t$ and $AR_t$

\[
BM_t = -0.194 + 0.067 \times EL_t + 1.205 \times AR_t \\
(-110.8) \quad (16.9) \quad (603.7)
\]

$R^2 = .70 \quad \#obs = 191,872$

Panel E: Number and Percentage of Sample Observations in $ELD$ and $ARD$ Terciles Formed Using Annually Recalculated Tercile Bounds

<table>
<thead>
<tr>
<th>ELD</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>40317</td>
<td>12779</td>
<td>10858</td>
</tr>
<tr>
<td>(21.0%)</td>
<td>(6.7%)</td>
<td>(5.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19720</td>
<td>27403</td>
<td>16841</td>
</tr>
<tr>
<td>(10.3%)</td>
<td>(14.3%)</td>
<td>(8.8%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3917</td>
<td>23786</td>
<td>36251</td>
</tr>
<tr>
<td>(2.0%)</td>
<td>(12.4%)</td>
<td>(18.9%)</td>
<td></td>
</tr>
</tbody>
</table>

a) The overall sample comprises 191,872 observations from 1973-2007. In panel B, the overall sample period is broken into seven consecutive five-year periods.
b) $X_t$ denotes net income in year $t$ divided by year $t-1$ market value of owners’ equity. $R_t$ denotes annual fiscal year $t$ equity return. $NR_t$ denotes a dummy variable that takes a value of one if $R_t$ is negative and zero otherwise. $EL_{t-1}$ denotes the economic leverage ratio in year $t-1$, calculated as the book value of short- and long-term debt divided by the book value of short- and long-term debt plus the market value of owners’ equity. $AR_{t-1}$ denotes the asset recognition percentage in year $t-1$, calculated as the book value of total assets divided by the book value of total assets plus the difference between the market and book values of owners’ equity. $BM_{t-1}$ denotes the book-to-market ratio in year $t-1$, calculated as the book value of owners’ equity divided by the market value of owners’ equity. $ELD$ and $ARD$ denote discrete variables that take a value of 1 for the low tercile of $EL$ ($AR$), 2 for the middle tercile of $EL$ ($AR$), and 3 for the high tercile of $EL$ ($AR$), where the tercile bounds are annually recalculated and so yield equally sized terciles each year.
c) The upper and lower 1% of all variables are winsorized.
TABLE 2
Asymmetry Coefficients in OLS Regressions of the BASU Model for Overall Sample and ELD, ARD, and ELARD Groups Formed Using Annually Recalculated Tercile Bounds 1973-2007

\[ X_t = \alpha + \beta NR_t + \gamma R_t + \eta (R_t \times NR_t) + \varepsilon_t. \]  
(BASU)

<table>
<thead>
<tr>
<th>Group Description</th>
<th>( \eta ) Coefficient on ( R_t \times NR_t )</th>
<th>t Statistic</th>
<th># Observations</th>
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<tbody>
<tr>
<td>whole sample</td>
<td>.393</td>
<td>109.1</td>
<td>191,872</td>
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<tr>
<td>ELD=1</td>
<td>.264</td>
<td>59.7</td>
<td>63,954</td>
</tr>
<tr>
<td>ELD=2</td>
<td>.341</td>
<td>67.5</td>
<td>63,964</td>
</tr>
<tr>
<td>ELD=3</td>
<td>.663</td>
<td>76.4</td>
<td>63,954</td>
</tr>
<tr>
<td>ARD=1</td>
<td>.242</td>
<td>56.9</td>
<td>63,954</td>
</tr>
<tr>
<td>ARD=2</td>
<td>.471</td>
<td>81.7</td>
<td>63,968</td>
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<tr>
<td>ARD=3</td>
<td>.740</td>
<td>82.4</td>
<td>63,950</td>
</tr>
<tr>
<td>ELD=1 &amp; ARD=1</td>
<td>.197</td>
<td>50.3</td>
<td>40,317</td>
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<tr>
<td>ELD=1 &amp; ARD=2</td>
<td>.442</td>
<td>42.2</td>
<td>12,779</td>
</tr>
<tr>
<td>ELD=1 &amp; ARD=3</td>
<td>.766</td>
<td>35.5</td>
<td>10,858</td>
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<tr>
<td>ELD=2 &amp; ARD=1</td>
<td>.260</td>
<td>36.6</td>
<td>19,720</td>
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<tr>
<td>ELD=2 &amp; ARD=2</td>
<td>.347</td>
<td>53.1</td>
<td>27,403</td>
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<tr>
<td>ELD=2 &amp; ARD=3</td>
<td>.639</td>
<td>41.3</td>
<td>16,841</td>
</tr>
<tr>
<td>ELD=3 &amp; ARD=1</td>
<td>.467</td>
<td>11.3</td>
<td>3,917</td>
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<tr>
<td>ELD=3 &amp; ARD=2</td>
<td>.584</td>
<td>48.9</td>
<td>23,786</td>
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<tr>
<td>ELD=3 &amp; ARD=3</td>
<td>.755</td>
<td>60.8</td>
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<td>ELARD=1</td>
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<td>71.3</td>
<td>72,816</td>
</tr>
<tr>
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<td>61.0</td>
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<tr>
<td>ELARD=3</td>
<td>.663</td>
<td>86.4</td>
<td>76,878</td>
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</table>

a) See the notes to table 1 for the description of the sample, variables, and winsorization rule.
b) The discrete variable ELARD indicates combinations of the nine groups formed by the intersection of the ELD and ARD terciles. ELARD=1 indicates the combinations ELD=1 and ARD=1, ELD=1 and ARD=2, and ELD=2 and ARD=1; ELARD=2 indicates the combinations ELD=2 and ARD=2, ELD=1 and ARD=3, and ELD=3 and ARD=1; and ELARD=3 indicates the combinations ELD=3 and ARD=3, ELD=2 and ARD=3, and ELD=3 and ARD=2.
TABLE 3
OLS Regressions of the XBASU Model Using Dummies for the ELD, ARD, and ELARD Groups Formed Using Annually Recalculated Tercile Bounds 1973-2007

\[ X_t = \alpha + \alpha_1 \text{ELD}_2_{t-1} + \alpha_2 \text{ELD}_3_{t-1} + \alpha_3 \text{ARD}_2_{t-1} + \alpha_4 \text{ARD}_3_{t-1} + \alpha_5 \text{ELARD}_2_{t-1} + \alpha_6 \text{ELARD}_3_{t-1} + \beta \text{NR}_t + \beta_1 (\text{NR}_t \times \text{ELD}_2_{t-1} \text{NR}_t) + \beta_2 (\text{NR}_t \times \text{ELD}_3_{t-1}) + \beta_3 (\text{NR}_t \times \text{ARD}_2_{t-1} \text{NR}_t) + \beta_4 (\text{NR}_t \times \text{ARD}_3_{t-1}) + \beta_5 (\text{NR}_t \times \text{ELARD}_2_{t-1} \text{NR}_t) + \beta_6 (\text{NR}_t \times \text{ELARD}_3_{t-1}) + \gamma_1 (\text{R}_t \times \text{ELD}_2_{t-1}) + \gamma_2 (\text{R}_t \times \text{ELD}_3_{t-1}) + \gamma_3 (\text{R}_t \times \text{ARD}_2_{t-1}) + \gamma_4 (\text{R}_t \times \text{ARD}_3_{t-1}) + \gamma_5 (\text{R}_t \times \text{ELARD}_2_{t-1}) + \gamma_6 (\text{R}_t \times \text{ELARD}_3_{t-1}) \]

<table>
<thead>
<tr>
<th></th>
<th>with ELD dummies</th>
<th>with ARD dummies</th>
<th>with ELD and ARD dummies</th>
<th>with ELARD dummies</th>
</tr>
</thead>
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<tr>
<td>Intercept</td>
<td>.066 (69.9)</td>
<td>.058 (34.7)</td>
<td>.044 (25.7)</td>
<td>.044 (22.6)</td>
</tr>
<tr>
<td></td>
<td>.053 (33.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELD2_{t-1}</td>
<td>.014 (6.2)</td>
<td>.003 (1.1)</td>
<td>.003 (1.1)</td>
<td>.003 (1.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.014 (6.2)</td>
<td>.003 (1.1)</td>
<td>.003 (1.1)</td>
</tr>
<tr>
<td>ELD3_{t-1}</td>
<td>.005 (2.3)</td>
<td>-.010 (-4.1)</td>
<td>-.010 (-4.1)</td>
<td>-.010 (-4.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(14.8)</td>
<td>(15.0)</td>
<td>(15.0)</td>
</tr>
<tr>
<td>ARD2_{t-1}</td>
<td></td>
<td>.035 (4.2)</td>
<td>.038 (4.2)</td>
<td>.038 (4.2)</td>
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<tr>
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<td>(14.8)</td>
<td>(15.0)</td>
<td>(15.0)</td>
</tr>
<tr>
<td>ARD3_{t-1}</td>
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<td>.025 (5.6)</td>
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<td>(5.6)</td>
<td>(5.6)</td>
<td>(5.6)</td>
</tr>
<tr>
<td>ELARD2_{t-1}</td>
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<td></td>
<td>.023 (9.1)</td>
<td>.023 (9.1)</td>
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<tr>
<td>ELARD3_{t-1}</td>
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<td>.014 (6.7)</td>
<td>.014 (6.7)</td>
</tr>
<tr>
<td>NR_t</td>
<td>-.010 (-6.3)</td>
<td>-.018 (-6.3)</td>
<td>-.010 (-3.6)</td>
<td>-.015 (-4.7)</td>
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<td></td>
<td>(-6.3)</td>
<td>(-6.3)</td>
<td>(-3.6)</td>
<td>(-4.7)</td>
</tr>
<tr>
<td>NR_t \times ELD2_{t-1}</td>
<td>.017 (4.2)</td>
<td>.013 (3.2)</td>
<td>.013 (3.2)</td>
<td>.013 (3.2)</td>
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<tr>
<td>NR_t \times ELD3_{t-1}</td>
<td>.022 (5.6)</td>
<td>.009 (2.0)</td>
<td>.009 (2.0)</td>
<td>.009 (2.0)</td>
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<tr>
<td>NR_t \times ARD2_{t-1}</td>
<td>.027 (6.7)</td>
<td>.020 (4.6)</td>
<td>.020 (4.6)</td>
<td>.020 (4.6)</td>
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<tr>
<td>NR_t \times ARD3_{t-1}</td>
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<td>.019 (4.1)</td>
<td>.019 (4.1)</td>
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<tr>
<td>NR_t \times ELARD2_{t-1}</td>
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<td>.013 (3.0)</td>
<td>.013 (3.0)</td>
</tr>
<tr>
<td>NR_t \times ELARD3_{t-1}</td>
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<td></td>
<td>.023 (6.1)</td>
<td>.023 (6.1)</td>
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</table>
TABLE 3 (continued)

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<tr>
<th></th>
<th>BASU with ELD dummies</th>
<th>with ARD dummies</th>
<th>with ELD and ARD dummies</th>
<th>with ELARD dummies</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_t$</td>
<td>-.020 (-15.7)</td>
<td>-.033 (-15.8)</td>
<td>-.043 (-20.3)</td>
<td>-.048 (-20.2)</td>
</tr>
<tr>
<td>$R_t \times ELD_{2t-1}$</td>
<td>.031 (10.0)</td>
<td>.023 (7.3)</td>
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<tr>
<td>$R_t \times ELD_{3t-1}$</td>
<td>.015 (4.8)</td>
<td>.007 (-2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times ARD_{2t-1}$</td>
<td>.033 (10.5)</td>
<td>.032 (9.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times ARD_{3t-1}$</td>
<td>.046 (15.2)</td>
<td>.049 (14.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times ELARD_{2t-1}$</td>
<td></td>
<td>-.005 (-1.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times ELARD_{3t-1}$</td>
<td></td>
<td>.037 (12.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times NR_t$</td>
<td>.393 (109.1)</td>
<td>.264 (46.3)</td>
<td>.242 (44.7)</td>
<td>.222 (36.1)</td>
</tr>
<tr>
<td>$R_t \times NR_t \times ELD_{2t-1}$</td>
<td>.077 (9.0)</td>
<td>.014 (1.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times NR_t \times ELD_{3t-1}$</td>
<td>.399 (46.1)</td>
<td>.204 (20.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times NR_t \times ARD_{2t-1}$</td>
<td></td>
<td>.229 (27.1)</td>
<td>.154 (16.6)</td>
<td></td>
</tr>
<tr>
<td>$R_t \times NR_t \times ARD_{3t-1}$</td>
<td></td>
<td>.500 (55.8)</td>
<td>.382 (37.1)</td>
<td></td>
</tr>
<tr>
<td>$R_t \times NR_t \times ELARD_{2t-1}$</td>
<td></td>
<td>.267 (27.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_t \times NR_t \times ELARD_{3t-1}$</td>
<td></td>
<td>.422 (52.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.120</td>
<td>.151</td>
<td>.165</td>
<td>.174</td>
</tr>
</tbody>
</table>

a) See the notes to Tables 1 and 2 for the description of the sample, variables, and winsorization rule.

b) t statistics are in parentheses.
TABLE 4  
Seven Five-Year Subperiods 

Panel A: Percentage of Sample in Groups Formed Using 1988-1992 Define Tercile Bounds in Seven Five-Year Subperiods

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ELD=1</td>
<td>.193</td>
<td>.222</td>
<td>.328</td>
<td>.333</td>
<td>.339</td>
<td>.300</td>
<td>.325</td>
</tr>
<tr>
<td>ELD=2</td>
<td>.306</td>
<td>.450</td>
<td>.319</td>
<td>.333</td>
<td>.241</td>
<td>.286</td>
<td>.236</td>
</tr>
<tr>
<td>ELD=3</td>
<td>.501</td>
<td>.450</td>
<td>.319</td>
<td>.333</td>
<td>.241</td>
<td>.286</td>
<td>.236</td>
</tr>
<tr>
<td>ARD=1</td>
<td>.142</td>
<td>.195</td>
<td>.337</td>
<td>.333</td>
<td>.436</td>
<td>.439</td>
<td>.481</td>
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<td>.207</td>
<td>.236</td>
<td>.323</td>
<td>.334</td>
<td>.325</td>
<td>.297</td>
<td>.339</td>
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<td>ARD=3</td>
<td>.651</td>
<td>.569</td>
<td>.380</td>
<td>.333</td>
<td>.238</td>
<td>.264</td>
<td>.180</td>
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<td>ELD=1 &amp; ARD=1</td>
<td>.094</td>
<td>.121</td>
<td>.218</td>
<td>.210</td>
<td>.296</td>
<td>.296</td>
<td>.321</td>
</tr>
<tr>
<td>ELD=1 &amp; ARD=2</td>
<td>.039</td>
<td>.045</td>
<td>.064</td>
<td>.060</td>
<td>.067</td>
<td>.062</td>
<td>.076</td>
</tr>
<tr>
<td>ELD=1 &amp; ARD=3</td>
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<td>.057</td>
<td>.047</td>
<td>.063</td>
<td>.056</td>
<td>.058</td>
<td>.041</td>
</tr>
<tr>
<td>ELD=2 &amp; ARD=1</td>
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<td>.068</td>
<td>.106</td>
<td>.107</td>
<td>.125</td>
<td>.117</td>
<td>.132</td>
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<tr>
<td>ELD=2 &amp; ARD=2</td>
<td>.107</td>
<td>.122</td>
<td>.156</td>
<td>.146</td>
<td>.151</td>
<td>.124</td>
<td>.150</td>
</tr>
<tr>
<td>ELD=2 &amp; ARD=3</td>
<td>.154</td>
<td>.138</td>
<td>.091</td>
<td>.081</td>
<td>.063</td>
<td>.060</td>
<td>.045</td>
</tr>
<tr>
<td>ELD=3 &amp; ARD=1</td>
<td>.002</td>
<td>.006</td>
<td>.015</td>
<td>.017</td>
<td>.016</td>
<td>.026</td>
<td>.028</td>
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<td>ELD=3 &amp; ARD=2</td>
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<td>.069</td>
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<td>.128</td>
<td>.106</td>
<td>.111</td>
<td>.114</td>
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<tr>
<td>ELD=3 &amp; ARD=3</td>
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<td>.374</td>
<td>.200</td>
<td>.188</td>
<td>.119</td>
<td>.146</td>
<td>.094</td>
</tr>
<tr>
<td>ELARD=1</td>
<td>.179</td>
<td>.234</td>
<td>.388</td>
<td>.377</td>
<td>.488</td>
<td>.475</td>
<td>.529</td>
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<tr>
<td>ELARD=2</td>
<td>.168</td>
<td>.185</td>
<td>.218</td>
<td>.226</td>
<td>.223</td>
<td>.208</td>
<td>.219</td>
</tr>
<tr>
<td>ELARD=3</td>
<td>.653</td>
<td>.581</td>
<td>.395</td>
<td>.397</td>
<td>.288</td>
<td>.317</td>
<td>.253</td>
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</tbody>
</table>
### TABLE 4 (Continued)

**Panel B: Estimated Time Trends on Asymmetry Coefficients from BASU Model for in Groups Formed Using 1988-1992 Define Tercile Bounds**

\[ X_i = \alpha + \beta NR_i + \gamma R_i + \eta (R_i \times NR_i) + \varepsilon_i. \]  

(BASU)

\[ \eta_i = a + bs + e. \]

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>b Coefficient on Time Trend (per 5-year subperiod)</th>
<th>t Statistic</th>
</tr>
</thead>
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<tr>
<td>Whole subperiod sample</td>
<td>0.043</td>
<td>2.2</td>
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<td>ELD=1</td>
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<td>2.5</td>
</tr>
<tr>
<td>ELD=2</td>
<td>0.054</td>
<td>4.4</td>
</tr>
<tr>
<td>ELD=3</td>
<td>0.069</td>
<td>2.1</td>
</tr>
<tr>
<td>Average of ELD groups</td>
<td>0.054</td>
<td>3.0</td>
</tr>
<tr>
<td>ARD=1</td>
<td>0.043</td>
<td>4.0</td>
</tr>
<tr>
<td>ARD=2</td>
<td>0.064</td>
<td>2.8</td>
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<tr>
<td>ARD=3</td>
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<td>2.3</td>
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<tr>
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<tr>
<td>ELD=1 &amp; ARD=1</td>
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<td>3.0</td>
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<tr>
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<td>ELD=1 &amp; ARD=3</td>
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<td>4.9</td>
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<tr>
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<td>5.1</td>
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<tr>
<td>ELD=2 &amp; ARD=2</td>
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<td>2.9</td>
</tr>
<tr>
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<td>4.7</td>
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<tr>
<td>ELD=3 &amp; ARD=1</td>
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<tr>
<td>ELD=3 &amp; ARD=2</td>
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<td>2.4</td>
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<tr>
<td>ELD=3 &amp; ARD=3</td>
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<td>1.6</td>
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<tr>
<td>Average of ELD &amp; ARD groups</td>
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<td>3.4</td>
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<td>ELARD=1</td>
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<td>ELARD=2</td>
<td>0.100</td>
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<td>2.0</td>
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<tr>
<td>Average of ELARD groups</td>
<td>0.068</td>
<td>3.6</td>
</tr>
</tbody>
</table>

---

a) The notes to Tables 1 and 2 for describe the sample, variables, and winsorization rule, with the following exception.

b) As in prior tables, ELD and ARD denote discrete variables that take a value of one for the low tercile of EL (AR), two for the middle tercile of EL (AR), and three for the high tercile of EL (AR). Unlike in prior tables, the tercile bounds are fixed over time and set to yield equally sized terciles in the middle 1988-1992 subperiod.

c) The time trend variable \( s \) takes values from one (for the first five-year subperiod) to seven (for the last five-year subperiod.)
References


