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will discuss

"Losses Happen…but do expected Losses? : An examination of the cost of equity capital for firms with low or negative expected earnings"

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Losses Happen…but do *expected* Losses? : An examination of the cost of equity capital for firms with low or negative expected earnings

Losses occur frequently.[1] Not only are they frequent, but prior accounting research demonstrates that some losses are predictably persistent (Joos and Plesko 2005, Darrough and Ye 2007, Balakrishnan et al 2010, Dhaliwal et al 2010, Li 2010). Furthermore, on average, firms with predictable future losses or high risk of financial distress subsequently experience negative *realized* future abnormal returns (Campbell et al 2008, Balakrishnan et al 2010, Dhaliwal 2010, Li 2010). These findings pose an interesting question: Do investors in such firms *expect*, ex ante, that these securities are likely to generate negative returns on their investment, or are these investors naively optimistic and consistently disappointed, leading to predictable mispricing and negative future abnormal returns?

Given the possibility of negative expected returns posed in the above question, one might also ask *why* (on earth) an investor might purchase an asset which he/she expects to generate a negative return. While there may be more than one explanation for such behavior, one need look no further than lottery tickets or insurance contracts, both generally negative expected return investments, as evidence that investors often do purchase assets with negative expected returns. In the case of insurance contracts, economic theory generally posits loss aversion, the tendency for risk-averse investors to strongly prefer avoiding losses to acquiring gains, as an explanation for investors' willingness to accept negative expected returns. Another way of describing loss aversion would be to state that investors value skewness with respect to losses. More directly, Barberis and Huang (2008), in a paper entitled "Stocks as Lotteries: The Implications of

[1] I define a loss as a firm reporting negative earnings before extraordinary items. Over the past decade, more than 30% of firms listed on COMPUSTAT experience annual losses (For example, Joos and Plesko 2005, Dhaliwal et al 2010).

Probability Weighting for Security Prices," show that under Tversky and Kahneman's (1992) cumulative prospect theory, "a security's own skewness can be priced: a positively skewed security can be 'overpriced' and can earn a negative average excess return" (Barberis and Huang 2008, p. 2066). While additional relevant literature exists, suffice to say, for now, that both theoretical and empirical evidence support the possibility of negative expected returns.

This returns us to the question of firms with predictable losses and/or high risk of financial distress. While empirical literature suggests that subsequent *realized* returns for such firms are negative, we know little about ex ante *expected* returns of these types of firms. Investors' expected returns are an important topic of study for equity valuation, because most equity valuation models assume that investors use the expected return on an equity security to discount the security's expected future cash flows. This discount rate, or expected return, is also referred to as the cost of equity (COE). [2] Two, relatively independent, streams of research in accounting and finance examine investors' estimates of COE. In finance, researchers in the asset pricing literature attempt to identify systematic market risk factors, and estimate a firm or portfolio's COE as a function of its historical sensitivity to systematic risk (e.g. Fama and French 1997). In accounting, researchers have attempted to estimate the COE by solving for the "implied" COE, where the implied COE is the internal-rate-of-return (IRR) that equates market prices with estimates of future earnings, discounted under various earnings-based valuation models (See Easton 2009 for an extensive review of this literature). Neither stream of literature,

[2] There is a variety of nuanced terminology in the literature related to estimating the cost of equity/expected return. Indeed the terms "expected return" and "cost of equity" are sometimes used interchangeably, while at other times these two terms are intended to denote differing assumptions about the interpretation of the same empirical construct (e.g. whether market efficiency is assumed). Throughout this document I use the terms cost of equity and COE for ease of exposition, with the intention that, in future drafts, I will more carefully consider the appropriate terminology for my study. I note that COE is the abbreviation used in Nekrasov and Ogneva (2010).

however, has provided evidence of a reliable method for estimating COE for firms with predicted losses or high risk of financial distress.

For example, most methods of estimating implied COE in the accounting literature cannot, mathematically, be calculated for firms with expected future losses. Furthermore, even in implied COE studies in which these firms *could* be included, such studies generally exclude firms with negative estimated COE from the sample, under the assumption that a negative equity premium is unreasonable. Likewise, commonly used asset pricing models from the finance literature are unable to explain financial distress risk, such that firms with high predicted risk of financial distress realize systematic "abnormal" negative returns to those predicted by the common models. I propose a plan of research to examine this void in prior literature.

I have a plan of research related to the cost of equity (COE) for firms with negative earnings and/or negative estimated COE. First, I plan to estimate four measures of COE that have the potential to explain COE for these types of firms: two utilizing accounting earnings forecasts, and two utilizing factor-based asset pricing models. Second, I plan to evaluate the reliability of the four COE proxies by examining their relationship with realized returns, controlling for ex-post cash flow and discount rate surprises (using the Easton and Monahan 2005 methodology), focusing especially on the performance of the COE measures for firms with negative earnings and/or negative estimated COE. I will compare the reliability of the proxies across profit/loss, positive/negative COE, etc. To my knowledge, no prior study has specifically examined estimates of COE for these types of firms.

The third step of the research program will be somewhat contingent on the findings from the second stage. If, in the second stage, the COE proxies are found to be reliable for firms with negative estimated COE, I will likely delve deeper into this result, along two dimensions. First, I may delve into the economic justification for firms to be able to operate with a negative COE. For example, as discussed above, investors may value positive skewness in returns. I may also evaluate if negative COE estimates are reliable for some types of firms, but not others. For example, COE may be different for growing start-ups that have not yet achieved profitability versus distressed firms. In this last regard, the research will proceed in a similar fashion if the proxies are found NOT to be reliable for firms with negative earnings/COE. That is, I will dig deeper into the sample to determine if, despite the fact that *overall*, COE cannot be reliably estimated for negative earnings/COE firms, COE can be reliably estimated for some subset of these firms.

If COE estimates are NOT reliable for negative earnings/COE firms, then I will likely attempt some modifications or extensions as an attempt to improve the estimation of COE for these firms. For example, the literature on the valuation of loss firms has some models for predicting the earnings of loss firms (e.g. Joos and Plesko 2005, Dhaliwal et al 2010, Li 2010) that could be plugged into COE estimation models (e.g. Hou et al 2010) or used to extend the earnings forecast model in Hou et al (2010). Other possible extensions might incorporate a decomposed COE estimation technique that would decompose earnings into revenues and costs, or incorporate the recent three-factor model proposed by Chen et al (2010) (discussed further below) into existing estimation techniques. The proposed decomposition could potentially capitalize on differential information in revenues and costs, as well as eliminate mathematical estimation challenges that arise from negative values or sign changes in earnings. Incorporating the Chen et al (2010) factor model might be useful because Chen et al claim that their factor model is able to explain the anomalously low returns of distressed firms reported by Campbell et al (2008).

While the framing of the proposed study is likely to vary with the findings in the third stage of the planned research, the remainder of this document will elaborate on the first two steps of the planned research.

Step 1: Estimate Four COE Proxies

I plan to estimate four (at least to begin with) measures of COE. The methods generally used to estimate COE can be classified into two types of measures: accounting-based measures and factor-based measures. Accounting-based measures estimate COE as the internal rate of return implied by earnings forecasts and market prices, according to some type of valuation model. Factor-based measures estimate COE by estimating firm-specific loadings on common risk factors, based on historical returns, and applying the estimated factor-loadings to current-period factor values. There are potential strengths and weaknesses to both types of measures. I plan to estimate two variations of each of these two types of metrics, for a total of four COE proxies.

1.1 Accounting-Based Measures

I first describe the accounting-based COE measures. As mentioned, accounting-based COE measures require future earnings forecasts. Prior literature commonly uses analyst earnings forecasts as inputs for COE estimation. However, analyst earnings forecasts pose a number of problems in my research setting: 1. Analyst coverage is poor for firms with negative earnings or firms with potentially negative COE, 2. For general samples of firms, prior COE literature finds that analysts' optimistic bias and poor LTG forecasts are a primary source of measurement error in accounting-based COE estimates (e.g. Easton and Monahan 2005, Easton and Sommers 2007), 3. Prior literature on analyst forecasts indicates that analysts are more optimistically biased for loss firms, compared with profitable firms (Brown 2001, Ciccone 2005).

Given that the use of analyst forecasts is problematic, I plan to follow a recent method introduced by Hou et al (2010), and also applied by Lee et al (2010), for forecasting future earnings via a pooled cross-sectional regression model. Specifically, I plan to obtain earnings forecasts for the accounting-based COE measures using out-of-sample predicted values from the following regression:

$$E_{i,t+\tau} = \alpha_0 + \alpha_1 V_{i,t} + \alpha_2 A_{i,t} + \alpha_3 D_{i,t} + \alpha_4 DD_{i,t} + \alpha_5 E_{i,t} + \alpha_6 NegE_{i,t} + \alpha_7 AC_{i,t} + \varepsilon_{i,t+\tau} \quad (1)$$

Where $E_{i,t+\tau} (\tau = 1, 2, or 3)$ denotes earnings for firm i in year $t+\tau$, $V_{i,t}$ is the market value of the firm, $A_{i,t}$ is the total book assets, $D_{i,t}$ is the dividend payment, $DD_{i,t}$ is a dummy variable that equals 0 for dividend payers and 1 for non-payers, $NegE_{i,t}$ is a dummy variable that equals 1 for firms with negative earnings (0 otherwise), and $AC_{i,t}$ is operating accruals. As in Hou et al (2010), I plan to estimate expected earnings for years t+1 through t+3 by multiplying the independent variables observed at the end of year t with the coefficients from the pooled regression estimation of Equation (1) using the previous ten years (three years minimum) of data. Hou et al (2010) note that the survivorship bias of this method is minimal, since only non-missing values for the independent variables in year t are required to calculate earnings forecasts. This is important in my setting since firms with negative earnings/COE may be young firms with no data history or firms in financial distress that face a higher probability of future delisting.

I plan to use these model-generated earnings forecasts to estimate two accounting-based COE estimates. First, I consider a simple capitalized forward earnings model, denoted r_{pe}, and estimated as:

$$P_{it} = \frac{eps_{it+1} + r * dps_{it} + eps_{it+2}}{(1+r)^2 - 1} \quad (2)$$

Where P_{it} is the closing share price for fiscal year t, dps_{it} is dividends per share for year t, and $eps_{it+\tau}$ is the earnings per share forecast for year $t+\tau$. As noted by Easton and Monahan (2005) the valuation model underlying r_{pe} relies on two key assumptions: 1. Expected cum-dividend aggregate earnings for the next two years are valuation sufficient, and 2. the model implicitly assumes that after year t+2, cum-dividend aggregate earnings grow at a rate equal to the cost of capital. r_{pe} is one of the seven COE proxies evaluated by Easton and Monahan (2005). Easton and Monahan (2005) include r_{pe} "to provide a naïve benchmark," but find in their analysis that r_{pe} contains no more measurement error than the other, more sophisticated, proxies that they evaluate (Easton and Monahan 2005, p. 507). Lee et al (2010) also evaluate a one-year version of r_{pe} using Hou et al (2010) earnings forecasts, which they denote EPR, and find that "…EPR is on [sic] the best performing model in terms of returns prediction and minimal error variance" (Lee et al 2010, p. 23). An interesting property of r_{pe} for my study is that r_{pe} will be negative for any firm-year observation with negative forecasted earnings. The reliability of the resulting negative COE estimates is an empirical question. Indeed, negative expected returns for firms with current or expected losses may not be uncommon, given that analyzing the future returns for the sample of loss firms in Dhaliwal et al (2010) indicates that the median one-year-ahead return for loss firms is -18.9%.

I also plan to estimate a more sophisticated accounting-based COE measure, based on the residual income valuation model. Specifically, the version of the residual income valuation model estimated by Gebhardt et al (2001), which I denote r_{gls} is estimated as:

$$P_{it} = BPS_{it} + \sum_{K=1}^{11} \frac{E_t[(ROE_{it+k} - r_i) * BPS_{it+K-1}]}{(1+r_i)^K} + \frac{E_t[(ROE_{it+12} - r_i) * BPS_{it+11}]}{r_i * (1+r_i)^{11}} \quad (3)$$

Where BPS_{it} is equity book value at the end of year t, and $ROE_{it+\tau} = eps_{it+\tau} / bps_{it+\tau-1}$. Following Gebhardt et al (2001) and Hou et al (2010), after year $t+3$, I assume that *ROE* mean-reverts to the historical industry median value by year t+11, after which point the residual income becomes a perpetuity. Prior literature excludes loss firms from the industry median calculation, but I may examine the sensitivity to including them. However, including loss firms in the industry median calculation may be problematic if the industry median becomes negative.

Using a technique based on the Easton and Monahan (2005) methodology, Hou et al (2010) find r_{gls} to be positively associated with realized returns, even after controlling for cash flow and discount rate news. r_{gls} is also one of the proxies evaluated by Lee et al (2010) and found to be one of the four out of seven measures evaluated that was positively associated with realized returns. I plan to estimate r_{gls} based on these prior results, as well as the fact that the terminal value assumptions of r_{gls} should be more robust to losses than some of the other potential sophisticated accounting-based COE measures.

1.2 Factor-Based Methods

Factor-based methods for estimating firm-specific COE vary from accounting-based methods in a number of ways. Factor-based methods require no firm-specific information other than firm-level historical returns and make no assumptions on the form of the valuation model used by the marginal investor to discount future cash flows. Instead, factor-based models assume, based on portfolio theory, that only systematic risk is priced by investors. Thus, under a factor-based model, the COE required by investors is proportional to the firm's sensitivity to identified systematic risk factors. While the use of factor-based COE estimates is widespread in both academia and financial practice, prior research casts doubt on their reliability.

Easton and Monahan (2010) point out that the true market risk factors are either unknown or cannot be reliably estimated, noting that commonly used factor models, such as the Fama and French three-factor model, are based on ad-hoc factors derived from empirical findings, rather than financial theory. Irrespective of the validity of their underlying assumptions, factor-based models may still be useful if they are able to reliably predict future returns. However, in this regard, early work by Fama and French (1997) found that their factor-based COE estimates were *not* reliable estimates of industry-level COE, and recent work by Lee et al (2010) compares three factor-based firm-level COE estimates with a number of accounting-based firm-level COE estimates and finds the accounting-based estimates to be more reliable under all specifications. With that said, prior literature has not evaluated firm-level factor-based COE estimates using the Easton and Monahan (2005) methodology, and, as discussed more fully below, I also plan to evaluate a promising new factor model, recently introduced by Chen et al (2010), which has not been yet been evaluated in the COE literature.

In relation to my specific research context, factor-based COE estimates may be relevant for loss firms and negative COE firms, since factor-based COE estimates do not directly rely on firm-specific earnings information. As noted above, factor-based models require only firm-specific historical returns as input data for estimation. This indicates that factor-based models may be applied to a broader sample of firms than many accounting-based measures. However, implementations of factor-based estimates are usually based on 60-month rolling windows of historical return information, which creates greater survivorship requirements than the accounting-based forecasts developed by Hou et al (2010). Thus, the comparative data requirements and proportion of negative COE estimates between accounting-based and factor-based COE estimates will be an interesting empirical question. Barth et al (2010) provide a small hint as to the empirical incidence of negative COE estimates using factor-based techniques. Using a four-factor model, Barth et al (2010) winsorize any negative COE estimates to zero, and report that this winsorization affects approximately 12% of their sample.

I plan to estimate two factor-based COE proxies. First, I plan to follow the method used by Barth et al (2010) to derive COE estimates from the commonly used Carhart four-factor model (which adds a momentum factor to the Fama-French three factor model). Specifically, Barth et al (2010) estimate COE using a two-stage process. In the first stage, firm-specific betas are estimated using the following monthly time-series regression:

$$RET_{i,m} - R_{f,m} = \alpha_i + \beta_{RMRF,i}(R_{M,m} - R_{f,m}) + \beta_{SMB,i}SMB_m + \beta_{HML,i}HML_m + \beta_{MOM,i}MOM_m + \varepsilon_{i,m} \qquad (4)$$

where $RET_{i,m} - R_{f,m}$ is the firm's monthly return in excess of the risk-free rate. $R_{M,m} - R_{f,m}$ is the monthly return of the market portfolio in excess of the risk-free rate, HML_m and SMB_m are the monthly returns to the book-to-market and size factor mimicking portfolios as described in Fama and French (1993), and MOM_m is the monthly return to the momentum factor mimicking portfolio (Jegadeesh and Titman, 1993; Carhart, 1997). Following Barth et al (2010), I plan to estimate Equation (4) using the most recent 60 months returns prior to the beginning of firm i's fiscal year t.

From the regression of Equation (4), Barth et al (2010) take the estimated beta coefficients and apply them to the following second-stage equation to estimate COE:

$$r_{ff} = \bar{R}_{f,t} + \hat{\beta}_{RMRF,i,t} * \overline{(R_M - R_f)}_t + \hat{\beta}_{SMB,i,t} * \overline{SMB}_t + \hat{\beta}_{HML,i,t} * \overline{HML}_t + \hat{\beta}_{MOM,i,t} * \overline{MOM}_t \qquad (5)$$

where I refer to the four-factor COE estimate as r_{ff} and $\overline{(R_M - R_f)}_t, \overline{SMB}_t, \overline{HML}_t,$ and $\overline{MOM}_t$, are the *expected* annual Fama-French and momentum factor returns for year t+1. Expected annual factor returns are estimated by first calculating each factor's average monthly return over the 60 months prior to month m, and then compounding the resulting average monthly returns over twelve months. As in Barth et al (2010), the estimated risk-free rate is based on a one-year rolling risk-free rate.

I chose the Barth et al (2010) factor-based implementation because it is similar to many factor-based implementations in the literature (e.g. Ang and Liu 2004, Kothari et al 2009, Lee et al 2010). It is also well-documented, and perhaps one of the more sophisticated four-factor implementations (For example, Barth et al 2010 employ four factors with time-varying expected values while Kothari et al 2009 employ three factors with static expected values). Lee et al (2010) evaluate a similar four factor implementation, and, as mentioned above, find that it is less reliable than the accounting-based estimates that they examine. However, Lee et al (2010) truncate negative COE estimates and do not control for the Easton and Monahan (2005) cash flow and return news proxies.

I also plan to evaluate a recently introduced alternative three-factor model presented in Chen, Novy-Marx, and Zhang (2010). Chen et al (2010) propose the following three-factor model:

$$r_{cnz} = R_f + \beta_{RMRF,i,t} * (R_m - R_f)_t + \beta_{INV,i,t} * E[r_{INV}] + \beta_{ROA,i,t} * E[r_{ROA}] \tag{6}$$

Where I refer to the Chen et al (2010) COE measure as r_{cnz}, β_{RMRF} is the market beta as in Equation (5), β_{INV} is the beta on an investment-based factor, and β_{ROA} is the beta on a profitability factor measured by return on assets. Chen et al (2010) motivate this alternative factor model from *Q*-theory, and find that it outperforms traditional factor models in their asset pricing tests. Comparing their factor model with the Fama French model, the authors write:

> Our contribution is to provide a new workhorse model for estimating expected returns. We offer an update of Fama and French (1996), who show that their three-factor model summarizes what we know about the cross-section of returns as of the mid-1990s. Similarly, we show that the new factor model is a good start to understanding the cross-section of returns as of the early 2010s. We also elaborate a conceptual framework in which many anomalies can be interpreted simultaneously in an economically meaningful way. (Chen et al 2010, p. 4)

Importantly, Chen et al (2010) provide evidence, using asset pricing tests, that their factor model explains the low average returns of financially distressed firms, which have been viewed as anomalous with respect to the CAPM and Fama French models (e.g. Campbell et al 2008). As financial distress may be an important risk factor for many firms with negative earnings or negative estimated COE, the Chen et al (2010) factor model may provide improved expected return estimates for these types of firms. While Chen et al (2010) promote their model as a candidate for calculating COE, they do not implement COE estimates using their model or evaluate the reliability of such estimates compared with accounting-based measures. Thus, evaluating COE estimates based on the Chen et al (2010) factor model is an important contribution to the literature.

I plan to implement the Chen et al (2010) model using the same methodology as described above for estimating the Barth et al (2010) measure. I will simply substitute the factors from the original model with those proposed by Chen et al (2010). While the Four-Factor data is available from WRDS and Ken French's website, I may have to do additional work to manually recreate the factor returns used by Chen et al (2010). However, Chen et al (2010) describe the factor formation procedures in their paper.

Step 2: Evaluate the COE Estimates

Prior studies employing COE estimates generally exclude firms with negative estimated COE, and in many cases firms with negative earnings as well. The justification for this data truncation is based on the assumption that negative COE estimates are unreasonable. While negative COE may be a challenge for financial theory, it is empirically possible for negative COE estimates to possess useful properties. The COE literature generally evaluates the usefulness/reliability of COE estimates by examining their association with common risk factors or their association with realized returns. Thus, negative COE estimates, while theoretically puzzling, may be correlated with risk factors or realized returns in the same sense as positive COE estimates. Prior literature has not performed this type of analysis for negative COE estimates. Many firms with negative earnings or LTG forecasts, but potentially positive COE estimates, have also been excluded from prior literature evaluating the reliability of COE estimates, since they are often mathematically difficult to estimate. In the first part of this paper, I have identified metrics that may expand the scope of firms for which COE can be estimated, but expanding the scope of estimation is only helpful if such estimates are reliable for the broader set of firms.

Thus, I plan to evaluate the reliability of the COE proxies that I estimate in Step 1 of the analysis by analyzing their association with realized returns, following the Easton and Monahan (2005) methodology. Easton and Monahan analyze the reliability of expected return proxies by estimating the following regression based on the Vuolteenaho (2002) return decomposition:

$$r_{it+1} = \alpha_{0t+1} + \alpha_{1t+1} * e\hat{r}_{it+1} + \alpha_{2t+1} * c\hat{n}_{it+1} + \alpha_{3t+1} * r\hat{n}_{it+1} + \varepsilon_{it+1} \quad (7)$$

where r_{it+1} is firm *i*'s realized, continuously compounded return for year *t*+1, $e\hat{r}_{it+1}$ is the expected return proxy, $c\hat{n}_{it+1}$ is a cashflow news proxy, and $r\hat{n}_{it+1}$ is a proxy for *negative* return news, which EM refer to as the return news proxy. EM note that return news generally has a negative impact on return because, *ceteris paribus*, increases in future discount rates lead to a decrease in contemporaneous price, and thus, realized return is lower than the expected return. Briefly, the motivation for estimating this return decomposition as a method for evaluating expected return proxies is that "since Equation (1) reflects the effect of changes in expectations about future cash flows and future discount rates on realized returns, it provides a direct means of dealing with Elton's (1999) argument that information surprises cause realized returns to be a biased and noisy measure of expected returns" (EM, p. 505). For a more complete discussion of the motivation underlying EM's methodology, see EM.

Since all three of the proxies in Equation (1) are likely to contain measurement error, EM further use a refinement of the approach discussed in Garber and Klepper (1980) and Barth (1991) to isolate the portion of the bias in α_{1t+1} that is solely attributable to the measurement error in $e\hat{r}_{it+1}$. EM analyze measurement error using both a standardized and unstandardized regression equation. The standardized/modified measurement error regression, which provides coefficient estimates that can be compared across expected return proxies, is described as follows:

$$v_{Cit+1}^{M} = \delta_{0t+1} + \delta_{1t+1}^{M} * \varepsilon_{1it+1}^{A} + \delta_{2it+1} * \varepsilon_{2it+1}^{A} + \delta_{3it+1} * \varepsilon_{3it+1}^{A} + \mu_{it+1} \quad (8)$$

where δ_{1t+1}^{M} is the regression coefficient relating to the measurement error variance of $e\hat{r}_{it+1}$ and the full definitions of the remaining variables are described in Easton and Monahan (2005). For the purposes of this document, it is sufficient to simply note that lower values of δ_{1t+1}^{M} imply less measurement error in $e\hat{r}_{it+1}$, and that values of δ_{1t+1}^{M} are comparable across regressions of alternate expected return proxies. Thus, not only does the EM methodology allow me to examine, for each proposed measure, whether it has a positive association with realized returns (controlling for ex-post news), the EM methodology also allows me to evaluate the *relative* reliability of each measure in terms of measurement error.

Conclusion

As noted in the beginning of this document, the research program will evolve based on the findings from the empirical work described in steps 1 & 2 above. With that said, regardless of the findings in steps 1 & 2, I am optimistic that this proposed research will provide ample opportunities to make a contribution to the literature.

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