Information Environment and the Cost of Capital:

A New Approach

Orie Barron
The Pennsylvania State University
Oeb1@psu.edu

Xuguang (Simon) Sheng
American University
Sheng@american.edu

Maya Thevenot
Florida Atlantic University
Mtheveno@fau.edu

January 2012

Abstract: Sheng and Thevenot (2011) develop a new measure of uncertainty which is a modification of the uncertainty measure advanced by Barron, Kim, Lim and Stevens (BKLS 1998), and they find this new uncertainty measure to be superior to the BKLS measure in certain settings. We follow Sheng and Thevenot's suggestion for modifying other measures of the information environment, and we demonstrate that our new measures are superior in another setting. We also find that cost of equity capital increases greatly with our new measures of information asymmetry and average information precision even after controlling for the level of market competition. Our regression estimates suggest that information asymmetry and average information precision are more important factors than equity beta and firm size in determining firms' cost of capital, and that the seemingly great importance of these new measures is not apparent using the prior BKLS measures of information asymmetry and precision.

JEL Classification: M41, G14, G12, D82

Key Words: cost of capital, information quality, information asymmetry, ST uncertainty, BKLS

1. Introduction

Sheng and Thevenot (2011 hereafter ST) develop a new measure of uncertainty which is (1) a modification of a measure of uncertainty Barron, Kim, Lim, and Stevens (1998 hereafter BKLS) develop, and (2) subject to less measurement error than the BKLS measure in their setting. We follow ST's suggestion for modifying other measures of the information environment, and demonstrate that the cost of equity capital increases greatly with our new measures of average information precision and information asymmetry even after controlling for the level of market competition.

The effects of information asymmetry and information quality on firms' cost of equity capital are of great interest to managers and investors and have been much debated by academics in recent years. As a result, a number of analytical and empirical studies have attempted to disentangle the direct and indirect links among different information environment characteristics, such as information asymmetry and precision, and the cost of capital. Most pertinent to our examination is Botosan, Plumlee and Xie (2004), who examine the relation between BKLS precision measures of the information environment and the cost of capital. We further their research by introducing new measures of the information environment that allow us to better estimate the economic magnitude of their cost of capital effects using tests that are guided by recent theoretical studies.

We base much of our analysis on the theoretical papers by Easley and O'Hara (2004), Hughes, Liu and Liu (2007) and Lambert, Leuz and Verrecchia (2011). Easley and O'Hara (2004) identify information asymmetry and the precision of public and private information, among other non-information variables, as the main determinants of the cost of capital. One of the authors main and most cited result is that information asymmetry increases the cost of equity

capital. Hughes et al. (2007) and Lambert et al. (2011), on the other hand, argue that the relation between information asymmetry and the cost of capital depends on the nature of the market, i.e. the size of the economy and the extent to which a single transaction affects price. Specifically, Hughes et al. (2007) argue that information asymmetry does not affect the cost of capital in large economies where full diversification occurs. Lambert et al. (2011) show that after controlling for the average precision of information, information asymmetry does not affect the cost of capital when there is perfect market competition. While these theories suggest that information asymmetry does not have an effect on the cost of capital in certain settings, the relation between the two constructs is an empirical question. Hence, we test the hypothesis that the cost of capital is increasing in the information asymmetry after controlling for the average precision and the nature of the market, proxied by the level of market competition. In addition, we examine the effect of information quality on the cost of capital. Specifically, we predict a negative relation between the cost of capital and the average information precision and the precision of public information, and a significant relation in an unknown direction between the cost of capital and the precision of private information. Our study sheds light on the debate over the effect of firm-specific information characteristics on the cost of capital and provides an improvement over prior research, which focuses on a subset of these constructs or refers to them collectively as information risk or information quality.

To measure the constructs of interest, we use the Easton (2004) PEG ratio as this is one of the most widespread and appropriate measures of the cost of capital (see, e.g., Botosan and Plumlee 2005; Botosan, Plumlee and Wen 2011). To estimate the information environment characteristics, we use the BKLS approach modified by ST. BKLS express certain information features in terms of the expected dispersion of analyst forecasts, the expected squared error in the

mean forecast and the number of analysts following the firm. The authors then suggest using the observable outcomes in place of the expectations. ST provide a better estimate of the expected squared error in the mean forecast than the observed squared error using a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model. Based on this research, we obtain empirical proxies for information asymmetry, average precision and the precision of public and private information. As part of our analysis we show that these new measures are subject to less measurement error than BKLS measures in our setting.

To estimate a model of the cost of capital we collect a sample with available quarterly earnings forecasts in the I/B/E/S Detail data for the period 1983-2010. Our final sample includes a total of 36,919 firm/quarter observations from 636 firms. However, most of our analyses are based on the 614 sample firms that are listed on both Compustat and CRSP.

The results show that information asymmetry and average precision affect the cost of equity capital greatly even after controlling for the level of market competition. This is not necessarily inconsistent with Hughes et al. (2007) and Lambert et al. (2011) because it may be the case that none of our sample firms are characterized by perfect competition. Also, we do find evidence that the level of competition matters. Specifically, the effect of information asymmetry on the cost of capital is stronger when the market competition is lower and the difference between the two sets of firms is highly statistically significant with or without a control for average precision. In addition, we find that information quality also has an effect on the cost of capital – average precision and the precision of public information are negatively related to the cost of capital, while the precision of private information is positively related, although the coefficient estimate is economically small. Further analysis shows that when the amount of public information is low, the precision of private information actually decreases the cost of

capital, which is consistent with Easley and O'Hara's (2004) argument that more precise private information is better than no information.

To provide evidence on the adequacy of our new proxies for the information environment variables, we compare our results to the results obtained using the BKLS measures. The results are consistent in terms of the direction of the relations. However, the statistical and economic significance levels are much lower when the BKLS measures are used compared to using the new measures, which is consistent with the decrease in noise when using the ST approach. Somewhat surprisingly, our regression estimates using the new measure of information asymmetry (information precision) suggest that information asymmetry (information precision) is a more important factor than equity beta (firm size) in determining firms' cost of capital, and that the importance of these dimensions of the information environment are not apparent using the prior BKLS measures.

This paper makes two significant contributions to the literature. First, the paper provides systematic evidence of the relation between investors' information environment and the cost of equity capital. Prior empirical evidence in the literature is mixed due to the difficulties associated with measuring the necessary information environment characteristics and the lack of thorough understanding of the determinants of the cost of equity capital. In addition, recent theoretical research by Hughes et al. (2007) and Lambert et al. (2011) challenges the source and intuition behind the well-documented positive relation between information asymmetry and the cost of capital examined in depth by Easley and O'Hara (2004). This is the first paper that considers several important information environment characteristics in tandem and sheds light on their relative relation to the cost of capital. Providing empirical evidence on the determinants of the

cost of capital is important because there seems to be a common misconception about the pricing of information factors (Hughes et al. 2007).

Second, the paper provides improved measures of the characteristics of investors' information environment. Obtaining the appropriate empirical proxies for unobservable constructs, such as information asymmetry and information precision, is of great interest to researchers, investors and others because they characterize the properties of investors' information environment which have important implications to other constructs of interest, such as stock price and volume reactions to new information and risk. In addition, the results from Verdi (2005) suggest that the choice of an information risk proxy can affect the inference from tests of whether increased information risk increases the cost of capital. This paper provides an econometric technique that can be used to obtain estimates of these unobservable properties that are well aligned with the underlying theoretical constructs and alleviate some of the limitations of other previously used measures.

The rest of the paper is organized as follows. Section 2 provides the hypothesis development. Section 3 discusses the research design and gives details on the empirical proxies used in the paper. Section 4 provides the sample section and descriptive statistics and Section 5 discusses the empirical results. Finally, Section 6 concludes.

2. Hypothesis Development

We explore the effect of certain information environment characteristics on the cost of capital. Specifically, we focus on the distribution of information (information asymmetry) and the quality of information (average precision and precision of public and private information) as

important determinants of the cost of capital. In addition, we consider the effect of market competition on these relations.

Our study on the relation between the distribution of information and the cost of capital is motivated by the theoretical papers by Easley and O'Hara (2004), Hughes et al. (2007) and Lambert et al. (2011). Easley and O'Hara (2004) develop a model in which differences in the composition of information between public and private affect the cost of capital, with investors demanding a higher return to hold stocks with greater private (and less public) information. However, Hughes et al. (2007) refute the price-protection intuition in Easley and O'Hara (2004) and suggest that the effect of information asymmetry on the cost of capital is driven by under-diversification by investors. Hughes et al.'s (2007) model further implies that the under-diversification effect disappears when the economy is large. In a similar vein, Lambert, et al. (2011) further point out that the relation between information asymmetry and the cost of capital depends on the quality of information and the role of market competition. With perfect competition, there is no separate systematic risk factor in price that stems from information asymmetry and thus, the cost of capital is not affected by information asymmetry per se but by the average information precision. With imperfect competition, however, information asymmetry affects the cost of capital even after controlling for investors' average precision. Overall, the studies imply that the relation between information asymmetry and cost of capital depends on the average information precision and the nature of the economy, e.g. the level of market competition. We examine the relations empirically as actual market outcomes are unlikely to be captured fully by a single analytical specification.

Prior research suggests that information asymmetry does not affect the cost of capital in large economies (Hughes et al. 2007) and in the presence of perfect competition (Lambert et al.

2011). However, to the extent that some market imperfection or friction exists, the effect of information asymmetry on the cost of capital will be observed. Therefore, the joint effect of information asymmetry and the nature of the market on the cost of capital is an empirical question. Consistent with this theory and based on different proxies for the degree of market competition, Armstrong, Core, Taylor and Verrecchia (2011) and Akins, Ng and Verdi (2011) find that the effect of information asymmetry on the cost of capital is stronger when the level of market competition is lower. However, we test the moderating effects of both average information precision and market competition on the relation between information asymmetry and the cost of capital.¹

H1: The cost of capital is increasing in the information asymmetry, holding average information precision fixed.

H2: The effect of information asymmetry on the cost of capital is stronger when the level of market competition is lower, holding average precision fixed.

As aptly pointed out by Lambert et al. (2011) and discussed above, the effect of information quality, i.e. average information precision on the cost of capital should be considered separately from the effect of information asymmetry. Their model implies that the cost of capital is always decreasing in the average information precision with both perfect and imperfect competition. Consistent with this idea, recent empirical research explores the interactive effects of information asymmetry and the quality of information on the cost of capital. Lambert, Leuz and Verrecchia (2006) show that information quality directly affects a firm's cost of capital because an improvement in information quality decreases non-diversifiable risk. Bloomfield and Fischer (2010) analyze how disagreement influences the cost of capital. They find that more precise information disclosure reduces the cost of capital by reducing uncertainty, regardless of disagreement. In addition, Ng (2011) shows that higher information quality decreases liquidity

¹ All hypotheses are stated in alternative form.

risk and thereby decreases the cost of capital. Using path analysis, Bhattacharya, Ecker, Olsson and Schipper (2011) find significant evidence of both a direct path from earnings quality to the cost of capital, consistent with an information quality effect, and an indirect path that is mediated by information asymmetry. This suggests that when there is a trade-off between the quality and distribution of information, increasing information quality has a bigger effect on the cost of capital than decreasing information asymmetry. Hence, both information asymmetry and overall precision have to be considered in tandem in order to isolate the effect of each on the cost of capital. We test the following hypothesis:

H3: The cost of capital is decreasing in the average information precision.

A standard assumption in the literature is that analysts' information set includes both public and private information (e.g. BKLS). Prior analytical and empirical research suggests that more precise public information decreases the cost of capital via a reduction in information asymmetry and estimation risk. However, prior studies provide conflicting results regarding the effect of private information precision on the cost of capital. One stream implies that more precise private information reduces the cost of capital through reduced estimation risk, although the effect exists when the level of public information is low, i.e. more private information is better than no information (see, e.g., Easley and O'Hara 2004). However, another stream implies that more precise private information increases the cost of capital through greater information asymmetry (see, e.g., Botosan, Plumlee and Xie 2004, Botosan and Plumlee 2007, Lambert, et al. 2011). In summary, the literature on the cost of capital supports a negative relation with respect to public information precision but not a directional relation with respect to private information precision. Therefore, we test the following hypotheses:

H4: More precise public information decreases the cost of capital.

H5: More precise private information increases or decreases the cost of capital.

3. Research Design and Empirical Proxies

3.1. Research Design

To test our hypotheses, we estimate the following regression models:

$$COC_{it} = \beta_0 + \beta_1 * Beta_{it} + \beta_2 * LMktvalue_{it} + \beta_3 * LBM_{it} + \beta_4 * (I-\rho)_{ait} + \beta_5 * LK_{ait} + e_{it} \quad (1)$$

and

$$COC_{it} = \gamma_0 + \gamma_1 * Beta_{it} + \gamma_2 * LMktvalue_{it} + \gamma_3 * LBM_{it} + \gamma_4 * Lh_{ait} + \gamma_5 * Ls_{ait} + u_{it} \quad (2)$$

where COC_{it} is the cost of capital for firm i in quarter t ; $Beta_{it}$ is the market model beta for firm i in quarter t ; $LMktvalue_{it}$ is the natural logarithm of the market value of equity for firm i in quarter t ; LBM_{it} is the natural logarithm of the book-to-market ratio for firm i in quarter t ; $(I-\rho)_{ait}$ is the adjusted (denoted a) information asymmetry for firm i in quarter t , where “adjusted” refers to the BKLS construct using the ST modification; LK_{ait} is the natural logarithm of adjusted average information precision for firm i in quarter t ; Lh_{ait} is the natural logarithm of adjusted public information precision for firm i in quarter t and Ls_{ait} is the natural logarithm of adjusted private information precision for firm i in quarter t .

We follow prior cost of capital research and include controls for risk ($Beta$), size ($LMktvalue$) and growth (LBM) in our models. We expect that the coefficient estimates on $Beta$ and LBM will be positive and the coefficient estimate on $LMktvalue$ will be negative. Our hypothesis H1 suggests that the coefficient on $(I-\rho)_{ait}$ is positive and H3 predicts that the coefficient on LK_{ait} is negative. Additionally, the coefficient on Lh_{ait} is predicted to be negative (H4) and the coefficient on Ls_{ait} is expected to be significantly different from zero (H5).

To explore the possible effect of market competition on the relation between information asymmetry and the cost of capital (H2), we include two interaction terms $(1-\rho)_a * HighComp$ and $(1-\rho)_a * LowComp$ in equation (1), where *HighComp* is an indicator variable equal to one if the number of shareholders is in the top quintile, zero otherwise and *LowComp* is equal to one if the number of shareholders is in the bottom quintile, zero otherwise. In addition, to examine the effect of the amount of public information on the relation between the precision of private information and the cost of capital, we include the interaction $Ls_a * LowPublic$ in equation (2), where *LowPublic* is equal to one if the ratio of public to total information is in the bottom quintile, zero otherwise. The variable measurements are explained in more detail in the next section.

3.2. Empirical Proxies

3.2.1. Cost of Capital (COC)

To estimate the firm's cost of capital we use Easton's (2004) PEG ratio method as this is one of the most widespread and well-behaved estimates of the implied cost of capital (see, e.g., Botosan and Plumlee 2005; Botosan, Plumlee and Wen 2011). According to this method, cost of capital can be estimated using the following expression:

$$COC_{it} = \sqrt{(eps_{i(t+2)} - eps_{i(t+1)})/p_{it}}, \quad (3)$$

where $eps_{i(t+1)}$ ($eps_{i(t+2)}$) is the firm's one-year ahead (two-year ahead) mean forecast of earnings and p_{it} is the current price from IBES summary files.² We estimate *COC* in the month of the current quarter-end.

² Our results are identical when we use median forecasts.

3.2.2. *Market Beta (Beta), Market Value of Equity (LMktvalue) and Book-to-Market Ratio (LBM)*

We follow prior research on the cost of capital and include control variables for risk, size and growth in all of our empirical analyses. Market beta (*Beta*) is estimated using the market model with a minimum of 30 out of 60 monthly returns and the value-weighted market index return from CRSP as a measure of the market return. The estimation for *Beta* ends in the month before the current quarter-end.

Firms' market value of equity is calculated as the number of common shares times the stock price and the book-to-market ratio is equal to common equity divided by the market value of equity. Both variables are calculated at the end of the quarter prior to the quarter in which *COC* is estimated using quarterly Compustat data. If unavailable, we use annual Compustat and calculate the variables at the fiscal year-end immediately prior to the current quarter-end. We follow prior research and take the natural logarithms of the variables to mitigate skewness in the distributions.

3.2.3. *Information asymmetry ((1- ρ)_a), Average Information Precision (LK_a) and Precision of Public Information (Lh_a) and Private Information (Ls_a)*

To obtain empirical proxies for information asymmetry, average information precision and the precision of public and private information we use the BKLS measures modified by ST (i.e., Sheng and Thevenot (2011)). BKLS show that one can express consensus, uncertainty and the precision of public and private information as follows:

$$\rho_{it} = \frac{SE_{it} - \frac{D_{it}}{N}}{SE_{it} + (1 - \frac{1}{N})D_{it}}, \quad (4)$$

$$K_{it} = 1 / (SE_{it} + (1 - \frac{1}{N})D_{it}), \quad (5)$$

$$h_{it} = \frac{SE_{it} - \frac{D_{it}}{N}}{[SE_{it} + (1 - \frac{1}{N})D_{it}]^2} \quad (6)$$

and

$$s_{it} = \frac{D_{it}}{[SE_{it} + (1 - \frac{1}{N})D_{it}]^2} \quad (7)$$

where ρ is consensus, K is average information precision, h is precision of public information, s is precision of private information, SE is the expected squared error of the mean forecast, D is expected forecast dispersion and N is the number of analysts. BKLS suggests that one can use observed dispersion and mean squared error as proxies for D_{it} and SE_{it} to empirically estimate the constructs in equations (4)-(7). Since it is based on information available to analysts at the time the forecasts are made, observed forecast dispersion seems to be a good proxy for its expected counterpart, D_{it} . However, using actual earnings to estimate SE_{it} may pose a serious problem because forecast errors are known to analysts only after the announcement of actual earnings. To alleviate the issues associated with using an *ex post* estimate of SE_{it} , ST use a GARCH model to estimate the squared error of the mean forecast using historical data only. Specifically, the method uses the time series of errors in the mean forecast to provide an estimate of their variance, σ_{it}^2 . After estimating the GARCH model, one can obtain the conditional variance, $\hat{\sigma}_{it}^2$, which is then used as an estimate of SE_{it} in the expressions above. When this substitution is used, we then refer to the BKLS measure as having been either “ST adjusted”, or simply “adjusted” and subscript the variable with an “*a*”.

We take $1-\rho$ as our measure of information asymmetry. Since ρ is the ratio of public to private information, $1-\rho$ measures the ratio of private to total information. This estimate of information asymmetry is used in prior research. The rationale for this measure is stated by Barron, Stanford and Yu (2009) as follows:

“We use lack of consensus ($1-\rho$) to proxy simultaneously for two forms of information asymmetry. First, this measure is specifically designed to gauge the degree to which individual analysts possess private information that is different from that of other analysts (i.e., information asymmetry among analysts). Second, we assume that the relative degree to which analysts possess private information also reflects the degree of information asymmetry between informed and uninformed investors. This assumption is consistent with analysts representing relatively informed investors who are likely to have more information than uninformed investors when a greater proportion of the analysts’ information is private in nature (p. 333).”

We take K_a as our measure of average information precision, which is simply the inverse of ST uncertainty. In a recent theoretical paper, Lambert et al. (2011) show that average information precision is equal to the average amount of uncertainty that investors assess and this uncertainty is measured by their average precision regarding the distribution of cash flows. Hence, the inverse of earnings forecast uncertainty provides a good proxy for the average information precision construct examined by Lambert et al. (2011).

Our measures of public and private information precision are provided in equations (6) and (7) and are obtained using the ST approach as discussed above. Specifically, we replace SE_{it} by $\hat{\sigma}_{it}^2$. We estimate our test variables using forecasts in the 90 days before the current quarter’s earnings announcement.

3.2.4. *Market Competition (HighComp and LowComp)*

We follow Armstrong, Core, Taylor and Verrecchia (2011) and use the number of shareholders to measure the extent of market competition. We use the number of shareholders of record from annual Compustat as of the fiscal year end immediately prior to the current quarter. As the authors discuss, this measure has certain limitations. To alleviate some of the problems, we define two indicator variables *HighComp* equal to one if the firm/quarter observation is in the highest quintile, zero otherwise and *LowComp* equal to one if the firm/quarter observation is in the lowest quintile, zero otherwise.

4. *Sample Selection and Descriptive Statistics*

Our initial sample includes all US firms with quarterly forecasts in the I/B/E/S Detail tape for the period 1983 – 2010. For the purposes of obtaining the measures of interest in this paper, we use analyst forecasts made 90 days prior to the quarterly earnings announcement where the earnings announcement is made within 90 days of the quarter end. If an analyst issued multiple forecasts in this period, we retain only the forecast closest to the earnings announcement date. In addition, we require that there are at least two forecasts for each firm/quarter in the 90 days before the earnings announcement. Since GARCH estimation requires long time-series of data, we require a minimum of 40 consecutive quarters of observations in the 1983 – 2010 time period. This yields a total of 36,919 firm/quarter observations from 636 unique firms of which 616 firms are listed on Compustat, 628 are listed on CRSP and 614 are listed on both Compustat and CRSP.

The descriptive statistics pertaining to the variables used in our empirical analyses are displayed in Table 1. The mean (median) value of our estimate of the cost of capital is 11.9 (10.0) percent. We lose some observations when we obtain an estimate of the cost of capital using the PEG ratio method because it requires that the two-year ahead mean forecast is higher than the one-year ahead mean forecast. Mean (median) market beta for our sample is 1.09 (1.05), which suggests that the average sample firm is riskier than the market. The mean (median) market value of equity of approximately \$12,790 (\$3,941) million indicates that our sample consists of primarily large firms. This is not surprising given our data requirements of a long time-series of available data. Mean (median) book-to-market ratio is 0.52 (0.46) implying that our sample firms trade at a large premium above book value. We follow most of prior research and take the natural logarithm transformations of *Mktvalue* and *BM* in our subsequent analyses.

$(I-\rho)_a$ may be interpreted as the ratio of analysts' private to total information and the mean (median) value of information asymmetry in our sample is approximately 20 (12) percent. Summary values of K_a , h_a and s_a in Table 1 show that these variables' distributions are highly skewed with large standard deviations. Therefore, we use natural logarithm transformations of these information environment variables in our later analyses.

Table 2 provides Spearman and Pearson correlation coefficients. Almost all correlation coefficients are highly statistically significant in the expected direction. Consistent with prior research, our cost of capital measure COC is positively related to $Beta$ and LBM and negatively related to $LMktvalue$. COC is negatively related to all our precision variables. The negative relation between COC and Ls_a suggest that higher precision of private information is associated with lower cost of capital, consistent with Easley and O'Hara's (2004) theory but inconsistent with Botosan et al.'s (2004) empirical findings. However, Lh_a and Ls_a are positively related and hence, it is necessary to examine their effect on the cost of capital while controlling for each other in a multivariate setting. Interestingly, the Spearman correlation coefficient between COC and $(I-\rho)_a$ is negative and highly statistically significant, while the Pearson correlation coefficient between the same variables is significant in the opposite direction. This highlights the need to examine the relation between these two variables in a multivariate analysis.

5. Empirical Results

5.1. Hypothesis Testing

Table 3 presents the regression results for the relation between the cost of capital and information asymmetry. All control variables are statistically significant in the right direction implying that the cost of capital measure is appropriate. Prior research suggests and finds a

positive relation between information asymmetry and the cost of capital. Our results reported in the first column of Table 3 are consistent with this finding. However, Lambert et al. (2011) point out that this relation is modified by the average information precision. Specifically, the association between information asymmetry and the cost of capital should decrease or even disappear if average precision is controlled for. The results are presented in the second column of Table 3 and suggest that information asymmetry has a separate effect on the cost of capital apart from average precision. The coefficient estimate of 0.015 is highly statistically significant with a t-value of 8.09 providing support for H1. This result is consistent with a large literature that has documented a positive relation between information asymmetry and the cost of capital (see, e.g., Botosan and Plumlee 2007, Bhattacharya, Desai and Venkataraman 2008, Barth, Konchitchki and Landsman 2011, among others). However, the magnitude of the coefficient estimate and the significance level decrease by one half when average precision is included in the model, which is consistent with Lambert et al.'s (2011) theory. In addition, the coefficient estimate on average information precision is negative and highly statistically significant with a t-value of -29.26, which provides a direct support for H3.

To examine the economic significance of our results we calculate the percentage change in the cost of capital for one standard deviation increase in each of the independent variables. Table 3 shows that the cost of capital increases by 5.42 (2.64) percent for one standard deviation increase in information asymmetry when average precision is excluded (included). This suggests that average information precision does indeed decrease the effect of information asymmetry on the cost of capital but the effect continues to be economically significant. For example, the economic effect of information asymmetry is almost twice the effect of beta on the cost of capital even when average precision is controlled for. Interestingly, average information precision has a

more significant economic effect on the cost of capital than does size; firm cost of capital decreases by 22.97 percent for one standard deviation increase in the logarithmic transformation of average information precision.

Next, we examine the effect of market competition since Lambert et al. (2011) show that information asymmetry has an effect on the cost of capital only when there is imperfect market competition. Therefore, we interact $(1-\rho)_a$ with *HighComp* and *LowComp*, our measures of high and low market competition, respectively, and repeat the analysis. The first column of Table 4 presents the results excluding average information precision as a conditioning variable. Both interactions are only marginally statistically significant and provide some support that the negative effect of information asymmetry on the cost of capital is exacerbated for firms with low level of market competition; the coefficient estimate on $(1-\rho)_a * LowComp$ is 0.008 with a t-value of 1.73. On the other hand, the effect is alleviated for high competition firms; the interaction on $(1-\rho)_a * HighComp$ is -0.008 with a t-value of -1.80. Our F-tests show that information asymmetry has a statistically significant effect on the cost of capital for both sets of firms and the magnitude of the effect is statistically different between the two groups (F-value of 8.35). When we include a control for the average information precision, the effect of information asymmetry on the cost of capital is decreased further for high competition firms but still, it is not completely eliminated. Indeed, an F-test for the sum of the coefficients shows that information asymmetry continues to have a negative effect on the cost of capital for both high and low competition firms, despite the insignificant coefficient on $(1-\rho)_a * LowComp$ when controlling for the average information precision. One explanation for this result is that even firms classified as high market competition firms in our sample do not enjoy perfect competition as defined by Lambert et al. (2011) and hence information asymmetry continues to have a significant negative effect on the cost of

capital, even after controlling for average information precision. However, when average precision is controlled for, there is only weak evidence that higher competition firms have a lesser effect of information asymmetry on their cost of capital than do lower competition firms (F-value of 3.43). In addition, the coefficient on LK_a continues to be negative and highly statistically significant, supporting H3. Additional results suggest that the effect of information asymmetry on the cost of capital is more economically significant for low competition firms, which experience a 7.27 (3.33) percent increase in their cost of capital when average precision is excluded (included) as compared to a 4.01 (1.33) percent increase for high competition firms for one standard deviation increase in information asymmetry.

Finally, we examine the effect of public and private information precision on the cost of capital in Table 5. Consistent with the theory of Easley and O'Hara (2004) and the empirical results of Botosan et al. (2004) we find that higher public information precision is associated with lower cost of capital; the coefficient on Lh_a is -0.011 and highly statistically significant with a t-value of -32.87 providing support for H4. The coefficient on Ls_a is statistically significant at the 0.05 level but economically small providing limited support for the hypothesis that higher private information precision increases the cost of capital. This may be due to the potential dual effect of private information precision on the cost of capital. On one hand, more precise private information may lead to greater information asymmetry and hence, is associated with higher cost of capital (see, e.g. Diamond and Verrecchia 1991). On the other hand, as Easley and O'Hara (2004) discuss, higher precision of private information may decrease the cost of capital, particularly when there is limited public information. Therefore the effect of private information precision on the cost of capital may depend on the amount of public information.

To examine this possibility we define a variable *LowPublic* equal to one if consensus, i.e. the ratio of public to total information, is in the bottom quintile, zero otherwise. Then we interact this variable with LS_a . The results of the regression including the interaction are presented in the second column of Table 5. The coefficient on LS_a increases and becomes more significant but is still economically small. However, the coefficient on the interaction term is negative and statistically significant with a t-value of -11.31. In addition, the total coefficient measuring the effect of private information precision on the cost of capital for the low public information group is negative and highly statistically significant with an F-value of 110.69. This suggests that when the portion of public information relative to total information is low, more private information precision decreases the cost of capital, which is consistent with Easley and O'Hara's (2004) argument that more private information is better than no information.

5.2. Comparison of the ST adjusted measures with the unadjusted BKLS Measures

To measure our variables of interest, we use the GARCH adjusted BKLS measures as suggested by ST. Specifically, we use the estimate of the expected squared error in the mean forecast obtained from a GARCH model, instead of the actual squared error to proxy for SE_{it} in equations (4)-(7). To provide evidence on the adequacy of our new measures, which we refer to as the adjusted measures (which are subscripted *a*), we compare our results discussed in the previous section with the results obtained using the original unadjusted BKLS measures (which are subscripted *u*).

Overall, descriptive statistics for the unadjusted BKLS measures (untabulated) suggest that their distributions are more skewed than the distributions of the ST measures provided in Table 1 with a large number of observations that are extreme outliers or measurement errors. For

example, more than ten percent of the unadjusted measures of public precision are negative, which suggest measurement errors, while the adjusted measures provide less than one percent of negative values. In addition, the unadjusted means of the average precision, public information precision and private information precision are almost 30 times larger than their respective medians, which suggest a large number of big outliers. Almost all correlation coefficients between the variables of interest and the unadjusted measures are much lower and very often less significant or insignificant than the ones provided in Table 2, which is consistent with the unadjusted BKLS measures being much more noisy than the ST adjusted measures.

Repeating the analysis presented in Table 3 using the unadjusted BKLS measures, shown in Panel B of Table 3, provides similar results except that the coefficients of interest are smaller and less significant. For example, in the regression of *COC* on information asymmetry, the estimate on $(1-\rho)_u$ is 0.002 (t-value 1.91), which is more than fifteen times smaller than the coefficient estimate on $(1-\rho)_a$ of 0.031 (t-value 17.81) reported in the first column of Table 3. When average information precision is controlled for, the coefficient on $(1-\rho)_u$ ($(1-\rho)_a$) is 0.006 (0.015) with a t-value of 5.97 (8.09) and the coefficient estimate on LK_u (LK_a) is -0.002 (-0.012) with a t-value of -16.81 (-29.26). Untabulated results show that the differences in coefficients between the ST adjusted and the BKLS measures for information asymmetry and average information precision in both regression models presented in Table 3 are highly statistically significant at the 0.001 suggesting that the adjusted measures are superior to the unadjusted measures. An examination of the respective economic effects of the information variables on the cost of capital support this conclusion.

The analysis of the effect of market competition on the relation between information asymmetry and the cost of capital using the BKLS measures is presented in Panel B of Table 4.

The results are weaker than the ones previously discussed. For example, when using the BKLS measures, there is no evidence that information asymmetry has a differential impact on the cost of capital for high and low competition firms, regardless of the presence of a control for the average information precision.

The results for the effect of public and private information precision on the cost of capital are mostly similar between using the adjusted and unadjusted measures except that there is no evidence that private information precision affects the cost of capital, both when the amount of public information is not considered and when there is low amount of public information. However, once again the differences in coefficient estimates between the unadjusted and the adjusted measures of public and private information precision are highly statistically significant at the 0.001 level in both regression models. In addition, the number of observations used for this analysis drops from 30,676 when using the adjusted measures to 26,065 when using the unadjusted measures, a drop of 15 percent. This is due to the large number of negative estimates for public information precision, which represent measurement errors.

Overall, the hypothesis tests are mostly similar between the adjusted and unadjusted measures providing collaborating evidence of the relation between information environment characteristics and the cost of capital. However, comparison of results suggests that the ST adjusted measures are less noisy and provide higher power in testing hypotheses of interest than the unadjusted BKLS measures.

6. Conclusion

The purpose of this paper is to test three theories on the effect of important information environment characteristics on the cost of equity capital. Consistent with Easley and O'Hara

(2004) we find that information asymmetry is positively associated with the cost of capital, even after controlling for average precision. Consistent with Hughes et al. (2007) and Lambert et al. (2011) the results show that the information asymmetry effect depends on the nature of the market and is stronger for firms with lower market competition, although it continues to exist for high market competition firms. We find a negative relation between the cost of capital and both average and public information precision, which is consistent with these papers. Interestingly, the positive effect of private information precision on the cost of capital is small and becomes negative when the amount of public information is low.

This study provides measures of the information environment characteristics that are less noisy than previously used proxies, which may allow researchers to test new hypotheses. For example, the new measures will be particularly useful if a certain relation depends on the forecast horizon and if the researcher is interested in longer horizons. In addition, future research may examine the reaction of different market participants to the firm information environment characteristics. For example, it will be interesting examining how managers respond to increased earnings forecast uncertainty or information asymmetry.

Perhaps our most important finding concerns the economic significance of information asymmetry and the average precision of information in determining the cost of capital, a significance which is not seen when viewed through the lens of the traditional BKLS framework. Our results show that the cost of capital increases by 5.42 (2.64) percent for one standard deviation increase in information asymmetry when average precision is excluded (included) from our estimates. The economic effect of information asymmetry is almost twice the effect of beta on the cost of capital even when average precision is controlled for. Interestingly, average information precision also has a more significant economic effect on the cost of capital than does

firm size; firm cost of capital decreases by 22.97 percent for one standard deviation increase in the logarithmic transformation of average information precision.

References

- Akins, B., Ng, J. and Verdi, R.S. (2011). Investor Competition over Information and the Pricing of Information Asymmetry. *The Accounting Review*, forthcoming.
- Armstrong, C.S., Core, J.E., Taylor, D.J. and Verrecchia, R.E. (2011). When Does Information Asymmetry Affect the Cost of Capital? *Journal of Accounting Research* 49: 1-39.
- Barron, O.E., Kim, O., Lim, S.C. and Stevens, D.E. (1998). Using analysts' forecasts to measure properties of analysts' information environment. *The Accounting Review* 73: 421-433.
- Barron, O.E., Stanford, M.H. and Yu, Y. (2009). Further evidence on the relation between analysts' forecast dispersion and stock returns. *Contemporary Accounting Research* 26: 329-357.
- Barth, M. E., Konchitchki, Y. and Landsman, W. R. (2011). Cost of Capital and Earnings Transparency. Working paper, Stanford University.
- Bhattacharya, N., Desai, H. and Venkataraman, K. (2008). Earnings Quality and Information Asymmetry: Evidence from Trading Costs. Working paper, Southern Methodist University.
- Bhattacharya, N., Ecker, F., Olsson, P. and Schipper, K. (2011). Direct and Mediated Associations among Earnings Quality, Information Asymmetry, and the Cost of Equity. Working Paper.
- Bloomfield, R. and Fischer, P. E. (2010). Disagreement and the Cost of Capital. *Journal of Accounting Research* 49: 41-68.
- Botosan, C.A. and Plumlee, M.A. (2005). Assessing Alternative Proxies for the Expected Risk Premium. *The Accounting Review* 80: 21-53.

- Botosan, C.A. and Plumlee, M. A. (2007). Are Information Attributes Priced? Working paper, University of Utah.
- Botosan, C.A., Plumlee, M.A. and Xie, Y (2004). The Role of Information Precision in Determining the Cost of Equity Capital. *Review of Accounting Studies* 9:233-259.
- Botosan, C.A., Plumlee, M.A. and Wen, H. (2011). The Relation between Expected Returns, Realized Returns, and Firm Risk Characteristics. *Contemporary Accounting Research* 28: 1085-1122.
- Diamond, D. and Verrecchia, R. (1991). Disclosure, Liquidity and the Cost of Capital. *The Journal of Finance* 38: 1325-1360.
- Easley, D. and O'Hara, M. (2004). Information and the Cost of Capital. *The Journal of Finance* 59:1553-1583.
- Easton, P. (2004). PE Ratios, PEG Ratios, and Estimating the Implied Expected Rate of Return on Equity Capital. *The Accounting Review* 79: 73-95.
- Hughes, J.S., Liu, J. and Liu, J. (2007). Information Asymmetry, Diversification, and Cost of Capital. *The Accounting Review* 82: 705-729.
- Lambert, R., Leuz, C. and Verrecchia, R.E. (2006). Accounting Information, Disclosure, and the Cost of Capital. *Journal of Accounting Research* 45: 385-420.
- Lambert, R.A., Leuz, C. and Verrecchia, R.E. (2011). Information Asymmetry, Information Precision, and the Cost of Capital. *Review of Finance* 0: 1-29.

Ng, J. (2011). The Effect of Information Quality on Liquidity Risk. Working paper, Massachusetts Institute of Technology.

Sheng, X. and Thevenot, M. (2011) A new measure of earnings forecast uncertainty. *Journal of Accounting and Economics*, forthcoming.

Verdi, R. S. (2005). Information Environment and the Cost of Equity Capital. Working paper, University of Pennsylvania.

Table 1: Descriptive statistics

Variable	N	Mean	StdDev	Q 1	Median	Q 3
COC	34,424	0.119	0.105	0.083	0.100	0.127
Beta	34,899	1.090	0.565	0.717	1.048	1.375
Mktvalue	35,041	12,789.910	30,551.390	1,637.890	3,940.950	10,588.410
BM	34,545	0.519	0.370	0.288	0.456	0.664
$(1-\rho)_a$	36,919	0.196	0.222	0.036	0.115	0.275
K_a	36,919	3,049.430	26,740.580	68.099	287.585	1,380.440
h_a	36,919	2,418.270	24,188.040	50.625	222.907	1,075.520
s_a	36,919	631.162	5,572.270	4.378	30.715	189.934
Shareholders	34,477	63.677	184.078	4.162	15.576	49.566

The table is based on available firm/quarter observation from 1983 – 2010.

COC is the implied cost of capital based on the PEG ratio method (Easton 2004). *Beta* is the market beta estimated using the market model with a minimum of 30 out of 60 monthly returns prior to the month in which *COC* is estimated using the value-weighted market index return. *Mktvalue* is the market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated, stated in millions of dollars; if unavailable market value of equity at the previous fiscal year end is used. *BM* is common equity divided by market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated; if unavailable book-to-market ratio at the previous fiscal year end is used. $(1-\rho)_a$ is one minus ST adjusted consensus (i.e., a GARCH adjusted BKLS measure) calculated over the 90 days prior to the current quarter's earnings announcement. K_a is the ST adjusted average precision calculated over the 90 days prior to the current quarter's earnings announcement. h_a is the ST adjusted precision of public information. s_a is the ST adjusted precision of private information. *Shareholders* is the number of common shareholders on record as of the previous fiscal year end, stated in millions.

Table 2: Spearman (below the diagonal) and Pearson (above the diagonal) correlation coefficients

	COC	Beta	LMktvalue	LBM	$(1-\rho)_a$	LK _a	Lh _a	LS _a
COC		0.175	-0.255	0.280	0.039	-0.284	-0.289	-0.125
Beta	0.321		-0.146	-0.064	-0.032	0.048	0.050	0.010
LMktvalue	-0.355	-0.167		-0.349	0.112	0.107	0.089	0.105
LBM	0.305	-0.066	-0.344		-0.042	-0.444	-0.432	-0.218
$(1-\rho)_a$	-0.041	-0.045	0.144	-0.062		0.045	-0.101	0.325
LK _a	-0.280	0.059	0.106	-0.499	0.128		0.982	0.544
Lh _a	-0.274	0.061	0.089	-0.482	0.017	0.983		0.492
LS _a	-0.250	0.025	0.162	-0.426	0.605	0.849	0.774	

COC is the implied cost of capital based on the PEG ratio method (Easton 2004). *Beta* is the market beta estimated using the market model with a minimum of 30 out of 60 monthly returns prior to the month in which *COC* is estimated using the value-weighted market index return. *LMktvalue* is the natural logarithm of the market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated, stated in millions of dollars; if unavailable market value of equity at the previous fiscal year end is used. *LBM* is the natural logarithm of common equity divided by market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated; if unavailable book-to-market ratio at the previous fiscal year end is used. $(1-\rho)_a$ is one minus ST adjusted consensus (i.e., a GARCH adjusted BKLS measure) calculated over the 90 days prior to the current quarter's earnings announcement. *LK_a* is the natural logarithm of the ST adjusted average precision calculated over the 90 days prior to the current quarter's earnings announcement. *Lh_a* is the natural logarithm of ST adjusted precision of public information. *LS_a* is the natural logarithm of ST adjusted precision of private information.

All correlation coefficients are significant at the 1% level except the Pearson correlation coefficient between *Beta* and *LS_a*, which is significant at the 10% level.

Table 3: Analysis of the relation between information asymmetry and the cost of capital

Panel A: Using ST adjusted BKLS measures

Variable	Estimate		Percent change	Estimate		Percent change
Intercept	0.266 (48.36)	***		0.343 (56.87)	***	
Beta	0.003 (3.16)	***	1.36	0.003 (3.08)	***	1.35
LMktvalue	-0.016 (-28.78)	***	-17.71	-0.017 (-32.25)	***	-20.39
LBM	0.021 (24.63)	***	11.51	0.014 (15.54)	***	7.74
(1- ρ) _a	0.031 (17.81)	***	5.42	0.015 (8.09)	***	2.64
LK _a				-0.012 (-29.26)	***	-22.97
N	31,303			31,303		
Adj. R-sq	0.36			0.37		

Panel B: Using the unadjusted BKLS measures

Variable	Estimate		Percent change	Estimate		Percent change
Intercept	0.256 (46.26)	***		0.278 (49.06)	***	
Beta	0.003 (2.83)	***	1.24	0.003 (2.80)	***	1.21
LMktvalue	-0.014 (-25.55)	***	-15.72	-0.015 (-27.98)	***	-17.14
LBM	0.023 (26.45)	***	12.56	0.020 (23.51)	***	11.12
(1- ρ) _u	0.002 (1.91)	*	0.30	0.006 (5.97)	***	0.97
LK _u				-0.002 (-16.81)	***	-3.41
N	31,172			31,172		
Adj. R-sq	0.35			0.35		

The dependent variable *COC* is the implied cost of capital based on the PEG ratio method (Easton 2004). *Beta* is the market beta estimated using the market model with a minimum of 30 out of 60 monthly returns prior to the month in which *COC* is estimated using the value-weighted market index return. *LMktvalue* is the natural logarithm of the market value of equity as of the most recent quarter prior to the month, in which

COC is calculated, stated in millions of dollars; if unavailable market value of equity at the previous fiscal year end is used. *LBM* is the natural logarithm of common equity divided by market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated; if unavailable book-to-market ratio at the previous fiscal year end is used. $(1-\rho)_a$ is one minus ST adjusted consensus (i.e., a GARCH adjusted BKLS measure) calculated over the 90 days prior to the current quarter's earnings announcement. LK_a is the natural logarithm of the ST adjusted average precision calculated over the 90 days prior to the current quarter's earnings announcement.

***Significant at 1%; **Significant at 5%. T-values of two tailed tests are in parentheses.

The Percent change columns provide the percentage change in the cost of capital for one standard deviation increase in the respective variable.

Table 4: Analysis of the effect of market competition on the relation between information asymmetry and the cost of capital

Panel A: Using ST adjusted BKLS measures

Variable	Estimate	Percent change	Estimate	Percent change
Intercept	0.271 (48.44)	***	0.347 (56.84)	***
Beta	0.003 (2.99)	***	0.003 (2.94)	***
LMktvalue	-0.016 (-28.85)	***	-0.018 (-32.06)	***
LBM	0.020 (23.62)	***	0.013 (14.79)	***
(1- ρ) _a	0.031 (14.03)	***	0.016 (7.28)	***
(1- ρ) _a *HighComp	-0.008 (-1.80)	* 4.01	-0.009 (-2.11)	** 1.33
(1- ρ) _a *LowComp	0.008 (1.73)	* 7.27	0.001 (0.19)	3.33
LK _a			-0.012 (-29.17)	***
HighComp	0.006 (3.05)	***	0.006 (3.27)	***
LowComp	-0.009 (-4.17)	***	-0.007 (-3.23)	***
N	31,303		31,303	
Adj. R-sq	0.36		0.37	
F-test for (1- ρ) _a + (1- ρ) _a *HighComp = 0				
F-value	41.42	***	4.29	**
p-value	<0.0001		0.038	
F-test for (1- ρ) _a + (1- ρ) _a *LowComp = 0				
F-value	100.87	***	19.69	***
p-value	<0.0001		<0.0001	
F-test for (1- ρ) _a + (1- ρ) _a *HighComp = (1- ρ) _a + (1- ρ) _a *LowComp				
F-value	8.35	***	3.43	*
p-value	0.004		0.064	

Panel B: Using the unadjusted BKLS measures

Variable	Estimate	Percent change	Estimate	Percent change
Intercept	0.261 *** (46.37)		0.282 *** (49.13)	
Beta	0.003 *** (2.69)		0.003 *** (2.66)	
LMktvalue	-0.014 *** (-25.61)		-0.016 *** (-27.9)	
LBM	0.022 *** (25.60)		0.020 *** (22.74)	
$(1-\rho)_u$	0.001 (0.67)		0.005 *** (4.01)	
$(1-\rho)_u$ *HighComp	0.003 (1.17)	0.61	0.003 (1.09)	1.23
$(1-\rho)_u$ *LowComp	0.002 (1.01)	0.61	0.002 (0.92)	1.28
LK _u			-0.002 *** (-16.77)	
HighComp	0.003 (1.44)		0.003 (1.32)	
LowComp	-0.009 *** (-3.73)		-0.008 *** (-3.67)	
N	31,172		31,172	
Adj. R-sq	0.35		0.35	
F-test for $(1-\rho)_u + (1-\rho)_u$ *HighComp = 0				
F-value	2.91 *		12.20 ***	
p-value	0.088		0.001	
F-test for $(1-\rho)_u + (1-\rho)_u$ *LowComp = 0				
F-value	2.28		10.50 ***	
p-value	0.131		0.001	
F-test for $(1-\rho)_u + (1-\rho)_u$ *HighComp = $(1-\rho)_u + (1-\rho)_u$ *LowComp				
F-value	0.01		0.01	
p-value	0.913		0.904	

The dependent variable *COC* is the implied cost of capital based on the PEG ratio method (Easton 2004). *Beta* is the market beta estimated using the market model with a minimum of 30 out of 60 monthly returns prior to the month in which *COC* is estimated using the value-weighted market index return. *LMktvalue* is the natural logarithm of the market value of equity as of the most recent quarter prior to the month, in which

COC is calculated, stated in millions of dollars; if unavailable market value of equity at the previous fiscal year end is used. *LBM* is the natural logarithm of common equity divided by market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated; if unavailable book-to-market ratio at the previous fiscal year end is used. $(1-\rho)_a$ is one minus ST adjusted consensus (i.e., a GARCH adjusted BKLS measure) calculated over the 90 days prior to the current quarter's earnings announcement. $(1-\rho)_u$ is one minus unadjusted BKLS consensus calculated over the 90 days prior to the current quarter's earnings announcement. LK_a is the natural logarithm of the ST adjusted average precision calculated over the 90 days prior to the current quarter's earnings announcement. LK_u is the natural logarithm of the unadjusted BKLS average precision calculated over the 90 days prior to the current quarter's earnings announcement. *HighComp* is equal to one if *Shareholders* is in the top quintile, zero otherwise. *LowComp* is equal to one if *Shareholders* is in the bottom quintile, zero otherwise. $(1-\rho)_a * HighComp$, $(1-\rho)_a * LowComp$, $(1-\rho)_u * HighComp$, and $(1-\rho)_u * LowComp$ are interaction variables which represent the incremental effect of either adjusted or unadjusted information asymmetry with either high or low competition.

***Significant at 1%; **Significant at 5% * Significant at 10%. T-values of two tailed tests are in parentheses.

The Percent change columns provide the percentage change in the cost of capital for one standard deviation increase in the respective variable.

Table 5: Analysis of the effect of public and private information precision and the cost of capital

Panel A: Using ST adjusted BKLS measures

Variable	Estimate		Estimate	
Intercept	0.339	***	0.336	***
	(56.24)		(55.22)	
Beta	0.003	***	0.003	***
	(3.26)		(3.04)	
LMktvalue	-0.018	***	-0.017	***
	(-32.06)		(-31.56)	
LBM	0.014	***	0.014	***
	(15.96)		(15.68)	
Lh _a	-0.011	***	-0.011	***
	(-32.87)		(-28.39)	
LS _a	0.000	**	0.000	***
	(2.14)		(2.74)	
LS _a *LowPublic			-0.005	***
			(-11.31)	
LowPublic			0.024	***
			(9.31)	
N	30,676		30,676	
Adj. R-sq	0.37		0.37	
F-test for $LS_a + LS_a * LowPublic = 0$				
F-value			110.69	***
p-value			<0.0001	

Panel B: Using unadjusted BKLS measures

Variable	Estimate		Estimate	
Intercept	0.274	***	0.276	***
	(43.26)		(43.55)	
Beta	0.004	***	0.004	***
	(3.29)		(3.49)	
LMktvalue	-0.015	***	-0.015	***
	(-24.35)		(-25.16)	
LBM	0.022	***	0.022	***
	(22.89)		(22.46)	
Lh _u	-0.002	***	-0.002	***
	(-10.89)		(-8.6)	
LS _u	0.000		0.000	
	(1.55)		(1.15)	
LS _u *LowPublic			0.000	**
			(-2.05)	
LowPublic			0.009	***
			(8.08)	
N	26,065		26,065	
Adj. R-sq	0.3485		0.3503	
F-test for LS _u + LS _u *LowPublic = 0				
F-value			2.00	
p-value			0.16	

The dependent variable *COC* is the implied cost of capital based on the PEG ratio method (Easton 2004). *Beta* is the market beta estimated using the market model with a minimum of 30 out of 60 monthly returns prior to the month in which *COC* is estimated using the value-weighted market index return. *LMktvalue* is the natural logarithm of the market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated, stated in millions of dollars; if unavailable market value of equity at the previous fiscal year end is used. *LBM* is the natural logarithm of common equity divided by market value of equity as of the most recent quarter prior to the month, in which *COC* is calculated; if unavailable book-to-market ratio at the previous fiscal year end is used. *Lh_u* is the natural logarithm of ST adjusted precision of public information. *Lh_u* is the natural logarithm of the unadjusted BKLS precision of public information. *LS_a* is the natural logarithm of ST adjusted precision of private information. *LS_u* is the natural logarithm of the unadjusted BKLS precision of private information. *LowPublic* is equal to one if the ratio of public to total information is in the bottom quintile, zero otherwise.

*LS_a*LowPublic* and *LS_u*LowPublic* are interactions which represent the incremental effect of either adjusted or unadjusted precision of private information with low public information.

***Significant at 1%; **Significant at 5%; T-values of two tailed tests are in parentheses.