

RISK OR MISPRICING? FROM THE MOUTHS OF PROFESSIONALS

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Most tests of asset pricing models rely on realized returns as a proxy for expected returns, and cannot determine whether security characteristics are associated with returns because they affect risk or because they reflect mispricing. This paper avoids these problems by conducting two experiments in which we directly elicit how Beta, Market-to-Book ratios and firm size affect the returns expected by Wall Street professionals, and how those factors affect perceived risk and mispricing. Consistent with traditional asset pricing models, professionals expect firms with higher Betas to be riskier investments and generate higher returns. Consistent with behavioral models, professionals expect firms with higher Market-to-Book ratios to be over-priced (and riskier). Professionals expect large firms to be less risky, but do not view firm size to be a sign of mispricing.

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Over the last several decades, financial economists have investigated how Beta, Market-to-Book and firm size are associated with stocks' returns, and why. Evidence suggests that returns are negatively tied to Market-to-Book and firm size (Fama and French 1992, 1993).¹ The link between return and Beta is more controversial and ambiguous. Using data from the late 1920s to the 1960s, Black, Jensen and Scholes (1972), Fama and MacBeth, (1973) among others, find a positive and significant relation between returns and Beta. Using later data, Fama and French (1992, 1993) and others do not find any significant relation, while Easley et al. (2002) find a negative relation. Other recent studies find a positive relation, using different return intervals to measure Beta (Kothari et al., 1995), and different empirical specifications (e.g., Jaganathan and Wang, 1996).

While researchers debate the consistency of these associations, an even more controversial issue is whether these associations reflect risk or mispricing. Some argue that, in a rational world, each factor that can predict future returns must be a risk factor. For example, Fama and French (1992) argue that the Market-to-Book ratio is a proxy for firms' financial distress that is not captured by Beta. Market-to-Book and size may affect expected returns because they serve as a proxy for higher-order factors that result from a more dynamic equilibrium (e.g., Berk, Green and Naik , 1999, Lettau and Ludvigson 2001).

Others argue that some factors are related to future returns not because they represent systematic risk factors but rather because of behavioral factors (e.g., De Bondt and Thaler, 1985, Lakonishok, Shleifer and Vishny, 1994, Daniel and Titman, 1997). For example De Bondt and

¹ See also earlier literature such as Banz (1981), Keim (1983) and Reinganum (1981).

Thaler (1985) find that investors overvalue stocks that have gone up and undervalue stocks that have gone down. Lakonishok, Shleifer, and Vishny (1994) find that investors tend to extrapolate past growth and thus over-value firms that have been growing. These behavioral biases can lead to systematic mispricing that may manifest themselves in factors such as Market-to-Book (e.g. Barberis, Shleifer and Vishny, 1998, Daniel et al, 1998, and Hong and Stein, 1999).²

Empirical studies have limited ability to reveal why variables like Market-to-Book ratio are associated with assets' returns. Firms with high Market-to-Book ratios could generate lower returns because they are less risky or because they are overpriced. Empirical studies are rarely able to distinguish between these possibilities, other than by simply assuming that markets are efficient, and that pricing errors are therefore impossible (e.g., Fama, 1970). Thus, as Fama and French (1996) and others argue, even if Market-to-Book ratios, Beta and size explain a large portion of the cross-sectional variation in returns, it is difficult to interpret those results as supporting one school of thought or the other without detailed knowledge of what causes those relations.

The ability of empirical studies to examine the association between expected return and factors is also affected by the measure that is being used for investors' expectations. While the theory links expected return to various factors (e.g., Sharp, 1964, Ross, 1976, Merton, 1973 and many more) all empirical studies (for example, Black, Jensen and Scholes, 1972, Fama and MacBeth, 1973, Gibbons, 1982, Shanken, 1985) by necessity, use realized returns as a proxy for expected returns. As Elton (1999) explains, using realized returns to proxy for expected returns assumes that "information surprises tend to cancel out over the period of a study and realized returns are therefore an unbiased estimate of expected returns." Unfortunately, this assumption

² For a detailed explanation of these theories see Barberis and Thaler (2002).

may not be valid, even over long horizons and may impact our conclusions regarding the relation between expected returns and factors.

In summary, existing empirical studies have two shortcomings that may limit their ability to determine how and why security characteristics are related to expected returns: they use average realized returns as the proxy for expected returns, and they cannot easily distinguish risk from mispricing. This paper attempts to address both of these issues by obtaining direct experimental evidence on the relation between security characteristics (Beta, Market-to-Book and size) and investors' *expectations* about risk, return and mispricing. We use controlled experiments to determine how these characteristics affect professional investors' assessments about risk, returns and mispricing. The professional investors participating in the experiment are sell-side research analysts, investment bankers, and traders. These groups of investors not only represent a large portion of trades in financial markets, but they also affect expectations of others.

Our study shares some characteristics with the survey reported by Welch (2000) on the equity premium. Both papers collect data on beliefs from an important group of participants (investment professionals in our study, academic experts in Welch's study) regarding likely future events. However, our study is a controlled experiment, rather than a survey, because we manipulate our variables of interest (Beta, Market-to-Book and firm size) and examine how those manipulations cause differences in beliefs. This design allows us to draw stronger inferences on the causes of the effects we observe.

In the first experiment, we collected data from 198 investment bankers, research analysts and traders at the associate level (typically a rank given to fresh MBA graduates) at two Wall Street firms. We presented these participants with information about several characteristics of a

firm, including its Market-to-Book ratio and its Beta.³ Half of them were given information about a firm with either high or low Beta (and a Market-to-Book ratio of a typical firm in the market). The other half of the participants were given information about a firm with either high or low Market-to-Book (and a Beta of a typical firm in the market). All other information about the firm is exactly the same for all participants. We then asked them to assess the firm's expected annual return, risk, and mispricing.

Consistent with the Capital Asset Pricing Models, those who saw a firm with a high-Beta expected higher returns and perceived greater risk than those who saw a low-Beta firm. However, the level of Beta did not affect their view of whether the firm is mispriced or not.

On the other hand, participants did not expect firms with different Market-to-Book ratios to present different risks. They did, however, expect firms with the higher Market-to-Book ratio to be more overpriced than firms with the lower Market-to-Book ratio. Those told that a firm had a low Market-to-Book ratio assessed the firm as substantially underpriced. Those told that a firm had a high Market-to-Book ratio assessed the firm as slightly overpriced. These results suggest that the investment professionals view Market-to-Book ratio as an indicator of mispricing, although they do not expect that mispricing to result in a significant abnormal returns over one year. There is no indication that low Market-to-Book stocks are viewed as riskier, as some of the literature suggests.

In the second experiment, we examined the expectations of 25 senior research analysts, who had much greater work experience than participants in the first experiment, and worked for a different Wall Street firm. We also extended our first experiment by asking participants' not only about Beta and Market-to-Book but also about differences in firm size. Because access to

³ Most studies use book-to-market ratios instead of Market-to-Book ratios, to avoid dividing by 0 or a negative number. We use Market-to-Book, which is more familiar to our participants.

high-level professionals is difficult, we used a more powerful “within-subjects” experimental design that examines how differences in firms’ characteristics cause analysts’ assessments to differ. Specifically, each analyst was asked to compare the riskiness, expected return and mispricing of three pairs of firms, with the firms in each pair differing only in a single characteristic (Beta, Market-to-Book or firm size).

The senior research analysts’ responses to Beta and Market-to-Book are consistent with the associates’ responses. Senior research analysts expect high-Beta firms to earn significantly higher returns than low Beta stocks. They also expect those firms to be riskier. There is no evidence that senior analysts view high Beta firms to be more over- or undervalued than low-Beta firms.

Consistent with observed realized data, senior analysts expect high Market-to-Book stocks to earn lower returns than low Market-to-Book stocks. Inconsistent with the notion that Market-to-Book is a risk factor that proxies for financial distress, analysts expect high Market-to-Book stocks to be *riskier* than low Market-to-Book stocks. Consistent with behavioral stories, they also indicate that high Market-to-Book stocks are overvalued relative to low Market-to-Book stocks. Senior analysts expect large firms to have no different returns than small firms and they do not view them as more or less mispriced. However, they do expect large firms to present slightly less risk than small firms.

Senior analysts also state that the Market-to-Book ratio is the most important of the factors in assessing misvaluation, while Beta is the most important in assessing risk. Similarly, they state that Beta and size are more important for assessing risk than for assessing returns or misvaluation, while the Market-to-Book ratio is more important for assessing misvaluation than for assessing risk or returns.

Overall, our data on investment professionals' stated expectations provide new insights into longstanding debates about how and why Beta, Market-to-Book and size influence expected returns. Consistent with the CAPM, our participants expect high-Beta stocks to have high returns because they present more risk. Consistent with behavioral models, our participants expect high Market-to-Book firms to have low returns despite the fact that they present high risk, because they are overpriced. Our participants expect large firms to present less risk, but provide mixed evidence on whether they expect firm size to affect returns or mispricing.

The paper proceeds as follows. In section I we describe the design of experiment 1 and report the results of the experiment. We also perform several robustness checks that are reported in that section. The design and results of experiment 2 are reported in Section II. Section III concludes.

I. Experiment 1

A. Design

The goal of the first experiment is to determine how variations in Beta and Market-to-Book ratios affect expectation of firms' future returns, risk and mispricing. By eliciting these beliefs directly, we avoid two problems confronting research that uses historical data: that ex-post return may not be a good proxy for ex-ante expected return, and that it is rarely possible to determine whether differences in returns reflect risk or mispricing.

To address these questions, we collected data from 198 associates during a training program at two large Wall Street firms over August and the first week of September, 2001. Each analyst received a questionnaire stating that the firm they would be analyzing “manufactures and distributes equipment for both business and household use. Virtually all of their customers are in

the United States.” The front page also provided additional information in the following form (with actual values of Market-to-Book ratios and Beta as indicated below):

Earnings have been roughly in accordance with analysts’ estimates over the last two years. The firm is now trading at a market/book ratio of [X]; (market price is [100X]% of its book value). The firm is considered a “mid-cap” firm (a measure of firm size). The firm has a Beta of about Y. (Beta measures the past variation of the firm’s stock price with the stock market as a whole.)

Half of the participants were told that the Market-to-Book ratio was 1.2, which is approximately the median value of Market-to-Book among firms in a sample of NYSE/AMEX firms in the period 1967-1993.⁴ Of these participants, half were told that the firm’s Beta was 1.7, which is greater than the Beta for 80% of the firms in the sample described above. The other half were told that the firm’s Beta was 0.8, which is less than the Beta for 80% of the firms in the sample described above. This group of participants allows us to compare the effect of Beta on expected returns, risk and mispricing, given a median level of Market-to-Book. The comparison is “between subjects” because different groups face different levels of the independent variable (Beta).

The other half of the participants provided data for a similar between-subjects experiment testing the effects of the Market-to-Book ratio, given a median level of Beta. These participants were told that the Beta was 1.05, which is approximately the median value of Beta among firms in our base sample. Of these participants, half were told that the firm’s Market-to-Book was 3.0, which is greater than the Market-to-Book for 80% of the firms in the sample described above. The other half were told that the firm’s Market-to-Book was 0.8, which is less than the Market-to-Book for 80% of the firms in the sample described above.

⁴ The median Market-to-Book sample is constrained to dividend paying firms, which are more likely to be followed by analysts. See Grullon, Michaely and Swaminathan (2001) for a detailed description of this sample selection.

After receiving this information, all participants were asked to predict the firm's return over the next year, relative to the market, to assess the stock's riskiness as a part of an investment portfolio, and to state the extent to which they believe that the stock is over- or under-valued relative to fundamentals. All answers were provided on 11-point Likert scales.

Unlike most experiments in finance and economics, we do not provide our participants with incentives. This procedural difference is driven by the difference in our motive—to elicit ex ante expectations about returns, and assessments of risk and mispricing. The incentive mechanisms typically used in experimental economics research would require us to base payments on ex post realizations, which would potentially distort our elicitation. While a lack of incentives might lead participants to devote less time or effort to the task, this would be unlikely to cause their responses to be biased in any particular direction; rather, this would simply create noise, which we can account for in our analysis.

B. Results

B.1. General. We begin by providing some descriptive statistics about the participant pool. The associates had just begun their current positions as investment bankers, analysts and traders, but had a median of one year's experience in the investments and banking industry, and a mean experience of 1.5 years. One-fourth of the participants had three or more year's experience in the industry. Almost all had an MBA degree.

We code responses to our questions as follows. Responses to the question regarding expected return were provided on an 11 point Likert scale, with the anchor "Much lower than market-wide return" coded as -5 and the anchor "Much higher than market-wide return" coded as +5. Responses to the question regarding risk were provided on an 11-point Likert scale, with

the anchor “not very risky” coded as -5 and the anchor “very risky” coded as $+5$. Responses to the question regarding mispricing were provided on an 11-point Likert scale, with the anchor indicating the price was “much too low, given its risk and fundamentals” coded as -5 and the anchor indicating the price was “much too high, given its risk and fundamentals” coded as $+5$. Higher-valued responses to the three questions indicate higher expected returns, higher assessed risk and higher prices relative to fundamentals, respectively.

B.1. Responses to Beta.

A total of 52 participants received the low-Beta scenario and 49 participants received the high-Beta scenario. Beta affects both expected return and risk perception in ways consistent with classic assets pricing theories such as the CAPM. As shown in Table I, analysts expect high Beta stocks to have lower returns than low-Beta stocks. On a scale of -5 (low return) to $+5$ (high return), the mean response is 1.35 for the low-Beta stock and -0.66 for the high-Beta stock. The difference of 2.01 is highly significant ($F = 44.66$, $p < 0.001$). (All p-values are 2-tailed.)⁵

Analysts also view high Beta stocks to be riskier than low-Beta stocks. On a scale of -5 (low risk) to $+5$ (high risk), the mean response is -0.06 for the low-Beta stock and -1.70 for the high-Beta stock. The difference of 1.64 is statistically significant ($F = 14.77$, $p < 0.004$).

There is no evidence that Beta affects assessments of stocks’ over or under-valuation. On a scale of -5 (underpriced) to $+5$ (overpriced), the mean response is -0.60 for both the low-Beta stock and the high-Beta stock. The difference is not statistically significant ($F = 0.06$). Thus, as predicted by the CAPM, high values of Beta lead investors to expect higher returns, apparently because they assess higher risk—and not because they believe high Beta indicates underpricing.

⁵ All statistics for experiment 1 use Analysis of Variance (ANOVA). Because our design involves only one manipulation with two levels, the F-statistics reported here are simply squared t-statistics, and the p-values correspond to the p-values of the associated t-statistic.

B.2. Responses to Market-to-Book.

A total of 46 participants received the low-Market-to-Book scenario and 51 participants received the high-Market-to-Book scenario (both groups received information that beta equals to the median beta in the market).

Market-to-Book generates expectations largely consistent with behavioral models of pricing. As shown in Table II, participants presented with firms with different Market-to-Book ratios expect somewhat higher returns in low-Book-to-Market stocks than on high-Book-to-Market, but the difference is not statistically significant. On a scale of -5 (low return) to +5 (high return), the mean response is 0.67 for the low-Market-to-Book stock and 0.28 for the high-Market-to-Book stock. The difference of 0.39 is not significant ($F = 2.06$, $p = 0.15$). The participants also perceive little difference in the risk of the two stocks. On a scale of -5 (low risk) to +5 (high risk), the mean response is -1.63 for the low-Market-to-Book stock and -1.10 for the high-Market-to-Book stock. The difference of 0.53 is not statistically significant ($F = 1.54$, $p = 0.22$).

However, participants do believe that the high Market-to-Book firms are more overpriced (or less underpriced) than the low Market-to-Book firm. On a scale of -5 (underpriced) to +5 (overpriced), the mean response is -1.31 for both the low-Market-to-Book stock and 0.46 for the high-Beta stock. The difference of 1.77 is statistically significant ($F = 34.73$, $p < 0.001$). The non-parametric tests are consistent with the parametric tests reported above.

The results indicate that participants see Market-to-Book as an indicator of mispricing, and not as an indicator of risk, consistent with behavioral perspectives on the Market-to-Book effect (e.g., Lakonishok, Shleifer and Vishny 1994, Lee and Swaminathan, 2001 and Griffin and

Lemmon, 2001). We do not observe significant association between Market-to-Book and expected returns. This result may arise because participants do not believe that the mispricing indicated by the Market-to-Book ratio will be reversed within 12 months or because they believe that the higher risk indicated by the high Market-to-Book ratio offsets the overpricing. Alternatively, our design might simply lack the power to detect this association.

B.3. Robustness.

Nonparametric Wilcoxon tests confirm the parametric results (also reported in Tables 1 and 2). The effects of Beta on expected return and risk remain significant, as does the effect of Market-to-Book on mispricing, while the other results remain insignificant. The histograms (Figures 1 and 2) show that the results are not driven by outliers. For example, Panels A and B of Figure 1 shows that the distribution of responses about expected return and risk from those who saw high Beta stocks is to the right of the distribution of responses from those who saw low Beta stocks. Panel C indicates that the distributions to the mispricing question are similar to both groups.

We also conduct a generalized linear model including all factors that could be relevant to participants' choices. Our model includes the key manipulated variable (Beta or Market-to-Book), the firm employing the participant (firm 1 or firm 2), and the level of the participant's Wall Street experience. We measure experience by creating 3 groups of different experience levels: less than 1 year, 1-2 years and 3 years or more. Our model also includes all interactions of these factors. After including factors for experience and firm, our results are unchanged. A few higher order interactions exist, but none causes us to qualify our interpretation of the results.

II. Experiment 2

A. Design

The results of experiment 1 indicate that investment professionals with recent MBA training and several years of experience on Wall Street view Beta as a risk factor (as it is captured in traditional asset-pricing models), but view Market-to-Book as a characteristic indicating mispricing (as it is described by proponents of behavioral finance). The first experiment does not provide evidence that Market-to-Book is related to expected returns.

Our second experiment seeks to extend the first experiment in two ways. First, we examine the beliefs of more-experienced professionals. Second, we examine the effect of size on participants' expectations. Size is examined in many asset pricing studies, but resource constraints forced us to exclude it from experiment 1.

In this experiment, we use a "within-subjects" design that generates for each subject one observation reflecting his or her response to a *difference* in the key variables in question (Beta, Market-to-Book and firm size). In contrast, experiment 1 used a "between-subjects" design in which one group of subjects responded one level of each variable, and another group responded to another level. We used a within-subjects design for experiment 2 primarily out of necessity. Between-subject designs require large sample sizes to detect effects, because random variations among subjects cancel out only in large samples. However, we did not expect to be able to collect a large sample of responses from analysts with very high experience levels. Within-subject designs can detect effects even with relatively few subjects because each subject serves as his or her own control group, by providing an observation in each cell of the design.

For each characteristic (Beta, Market-to-Book and size), our questionnaire for experiment 2 stated the following:

Assume that the only thing you know about two firms is their [characteristic]...One firm has a [characteristic] that is much lower than the typical firm, while the other firm has a [characteristic] that is much higher than the typical firm.

We defined each characteristic with a single sentence at the top of the page: “The market/book ratio is the ratio of market price per share to accounting book value per share;” “Beta measures the past variation of the firm’s stock price with the stock market as a whole;” and “Market cap is the total market value of the firm’s equity securities.”⁶ We then asked participants to indicate their agreement with the following three statements:

- The firm with the higher [characteristic] will probably earn higher stock returns over my typical investment horizon.
- The firm with the higher [characteristic] is probably a riskier investment (as part of a well-diversified portfolio).
- The firm with the higher [characteristic] probably has a higher price, relative to its true value (it is more likely to be overpriced).

Note that the question regarding expected returns asks participants to focus on their typical investment horizon, rather than imposing a 12-month horizon (as in experiment 1). We made this change because we thought it is possible that participants would expect mispricing to be corrected over a different time horizon.

Participants indicated their agreement on an 11-point Likert scale ranging from “strongly agree” (+5) to “strongly disagree” (-5). Because strong disagreement could indicate either a strong belief that the sign of the indicated relationship is wrong, or a strong belief that there is no relationship at all, we constructed two questionnaires, with one indicating the positive relationships shown above, and the other indicating negative relationships (“the firm with the lower [characteristic] will probably earn higher stock returns....”).

⁶ We used the term “market cap” to indicate firm size in the questionnaire. However, we refer to this variable as “size” throughout our paper, to remain consistent with terms used in other research.

We then asked participants to indicate the importance of each characteristic in assessing expected returns, risk and mispricing. Participants indicated the importance of each characteristic on a 7 point scale, ranging from 1 (“not important”) to 7 (“very important”). Finally, we asked a number of demographic and debriefing questions.

B. Results

B.1. General.

We have questionnaires from a total of 25 senior analysts. The respondents have a mean experience of 9.8 years and a median experience of 10 years, with a range of 1 to 25 years. Almost all of the participants (22) indicate that they work in the community of research analysts (One reported working as a money manager, one as a broker, and one did not answer the question). The 16 participants stating a title include five Managing Directors, four senior vice presidents, two vice presidents, two senior research analysts, two research analysts, and one senior strategist. Respondents indicate an average investment horizon of 15.5 months, with a range of 6 to 36 months. Fifty percent of the respondents report an investment horizon of 12 months. The average response indicates that they expect a return of 10.4% over the next year. The median expected return is 10% and only one indicated an expectation of negative return over the next year.

Of the 25 analysts returning the questionnaire, 19 ask for agreement with statements of the form (“the firm with the lower [characteristic] will probably earn higher stock returns....”), while 6 ask for agreement with statements of the form “the firm with the higher [characteristic] will probably earn higher stock returns....”). For both questionnaires, we code strong agreement as +5 and code strong disagreement as -5. We make the responses comparable by reversing the

sign of responses to the questionnaires asking about firms with lower characteristics. As a result, positive responses for all questionnaires indicate belief in a positive relationship between the characteristic and the variable assessed (returns, risk or price relative to fundamentals).

B.2. Differences in Beta

Table III reports analysts' agreement with statements linking expected return, risk and mispricing to Beta. Senior analysts indicate a strong belief that the firm with the higher Beta will also have a higher stock return (response = 1.96, $t = 5.06$, $p < 0.001$), and higher risk (response = 2.68, $t = 6.39$, $p < 0.001$). The analysts do not expect the two firms to exhibit any difference in price relative to fundamentals (response = 0.26, $t = 0.61$, $p = 0.548$). Non-parametric Wilcoxon tests yield identical inferences.

These results are entirely consistent with the results of experiment 1, and with the predictions of traditional asset pricing models, such as the CAPM. That is, analysts expect return to be higher for stocks with higher Beta, and perceive Beta as a risk factor. These results are important in light of the ambiguous results on the relation between Beta and realized return several recent papers have reported (e.g., Fama and French, 1992).

B.3. Differences in Market-to-Book

Table IV reports analysts' agreement with statements linking expected return, risk and mispricing to Market-to-Book ratios. Senior analysts expect the firm with the higher Market-to-Book ratio to earn significantly lower expected returns (response = -2.12, $t = -6.20$, $p < 0.001$), present greater risk (response = 2.50, $t = 8.75$, $p < 0.001$), and be more overpriced, relative to

fundamentals (response = 2.54, $t = 6.96$, $p < 0.001$). Non-parametric Wilcoxon tests yield identical inferences.

These beliefs are consistent with behavioral models in which the Market-to-Book ratio is negatively associated with returns because it indicates overpricing. They are inconsistent with risk explanations, which assert that low Market-to-Book stocks are riskier than high Market-to-Book stocks; in fact, senior analysts believe the opposite.

Experiment 2 shows a strong link between Market-to-Book and expected returns, while experiment 1 does not. This difference is probably driven by the increased power of the within-subjects design in experiment 2.⁷ An alternative explanation is that the within-subjects design drew participants' attention to the association between Market-to-Book and returns, which participants in experiment 1 did not consider, because they did not see variation in Market-to-Book (each participant saw either a high or low value of Market-to-Book). However, the senior analysts clearly believe this association is important, as indicated by the results in Table VI, which will be discussed later. Thus, we do not believe this association is just an artifact of our design.⁸

B.4. Differences in Size.

Table V reports analysts' agreement with statements linking expected return, risk and mispricing to firm size. Senior analysts expect the larger firm to have returns no different from the smaller firm (response = -0.10, $t = -0.27$, $p = 0.789$). They expect the larger firm to present less risk

⁷ This difference could be driven by differences in the experience levels of the participants, or by the ability of participants in experiment 2 to focus on their typical investment horizon (rather than the 12 months imposed in experiment 1). However, we find no important effects of experience within either participants group. Also, typical investment horizons are quite close to 12 months. Thus, we believe these two explanations are unlikely.

⁸ See Libby, Bloomfield and Nelson 2002 for a more detailed discussion of considerations in using and interpreting within-subjects and between-subjects designs.

(response = -1.08, $t = -2.51$, $p = 0.019$). A parametric test indicates that they expect the larger firm to be overpriced relative to the smaller firm (response = 0.70, $t = 2.47$, $p = 0.021$); however, this result does not arise in the non-parametric Wilcoxon tests: the median and mode expected difference is 0. Overall, these results indicate that senior analysts do not see firm size as an important characteristic in determining expected returns, even though they believe that larger firms present less risk.

B.5. Robustness.

We use univariate regressions to test whether any of the results are influenced by analysts' experience. We find that more experienced analysts perceive less association between Beta and risk ($p = 0.071$), and perceive a more positive association between Beta and overpricing ($p = 0.041$). We also divided participants into a high-experience sample (those with experience greater than the median) and a low-experience sample (those with experience equal to or less than median). Both groups believe that high Beta stocks are riskier ($p < 0.0001$ for low-experience analysts and $p < 0.024$ for high-experience analysts), indicating that the link between Beta and risk is robust. The high-experience group believes that high values of Beta indicate high prices, relative to fundamentals (response = 1.3, $p = 0.036$), while the low-experience group perceives no significant association (response = -0.6, $p = 0.26$).

The correlations between return, risk and mispricing responses provide further support for the interpretation of Beta and size as indicators of risk. Participants who believe more strongly that high-Beta firms are riskier also believe more strongly that high-Beta firms generate higher returns ($r = 0.61$, $p < 0.001$). Similarly, participants who believe more strongly that large firms are less risky also believe more strongly that large firms generate lower returns ($r = 0.060$,

$p < 0.001$). There are no correlations between responses to mispricing and responses to the other questions for either Beta or firm size.

In contrast, participants who believe more strongly that firms with high Market-to-Book ratios indicate high risk also believe more strongly that such firms generate lower returns ($r = -0.74$, $p < 0.001$) and are more overpriced ($r = 0.66$, $p < 0.001$). Participants who believe that firms with high Market-to-Book ratios are overpriced also believe they will generate lower returns ($r = -0.64$, $p < 0.001$). The simplest explanation for these correlations is that participants believe that firms with high Market-to-Book ratios are overpriced in part because they are riskier, that risk is not accounted for in prices, and that the overpricing will result in lower returns. Thus, these correlations support the behavioral explanations of Market-to-Book effects.

B.6. Perceived Importance of Factors.

To provide additional evidence on how important Beta, Market-to-Book ratios and size are in assessing expected returns, risk and mispricing, we asked the participants to directly compare them. Figure 4 and Table VI reports analysts' perceptions of the importance of each of the three characteristics for each of the assessments. A response of 1 indicates low importance, while a response of 7 indicates high importance.

We first assess the relative importance of each characteristic (Beta, Market-to-Book and size) in determining the expected return, risk and mispricing of a stock. To this end, Panel A reports the mean score for each characteristic and ranks the characteristics for each of the assessments. A rank of (i) indicates the highest relative importance and a rank of (iii) the lowest. Cells assigned the same rank are not statistically distinguishable at the $p < 0.05$ level using a paired t-test. The importance of the three characteristics is indistinguishable for assessing

returns (Beta = 3.61, Market-to-Book = 3.78, Size = 3.39). Beta and Size are equally important in assessing risk (Beta = 4.70 and Size = 4.13), but both are more important than Market-to-Book (Market-to-Book = 3.13, $p < 0.001$ for both comparisons). Market-to-Book is more important than Size in assessing mispricing (Market-to-Book = 4.30, Size = 3.30, $p < 0.045$), and both Market-to-Book and Size are more important than Beta (Beta = 2.09, $p < 0.005$ for both comparisons).

Next, we assess the relative importance of the different uses of each characteristic. Panel B of Table VI ranks the importance of each characteristic for each of the three assessments. Beta's most important use is for assessing risk, its second most important use is for assessing future returns, and its least important use is for assessing mispricing (Risk = 4.70, Returns = 3.61, Mispricing = 2.09, $p < 0.001$ for all comparisons). The Market-to-Book ratio's most important use is for assessing mispricing (Mispricing = 4.30); assessing return and risk are less important uses, and are not statistically different from one another (Returns = 3.78, Risk = 3.13, $p < 0.05$ for comparisons to mispricing; $p = 0.08$ for comparisons to each other). Finally, Size is more important for assessing risk than for assessing mispricing (Risk = 4.13, Mispricing = 3.30, $p < 0.041$); its use for assessing returns is no different in importance than for either other purpose (Returns = 3.39, $p > 0.05$ for both comparisons). Histograms of the responses are displayed in Figure 4.

Both types of ranking procedures tell a similar story about how analysts use Beta and Market-to-Book. Consistent with our prior results, analysts use Beta to predict returns because they believe it is a strong indicator of risk, and use Market-to-Book to predict mispricing, which also affects returns (although less reliably). The results provide a less clear picture of how analysts use information about firm size. While Table V indicates that analysts see no

relationship between size and returns, Table VI indicates that they see it as equally important to Beta and Market-to-Book in predicting returns. Both tables show that analysts use size as an indicator of risk.

IV. Conclusion

Asset pricing models tie risk factors to expected returns. Other models attribute the association to behavioral biases that result in mispricing. Empirical studies test these models only indirectly, because they use ex post realized returns as a crude proxy for expected returns. Moreover, empirical tests using realized returns cannot clearly assess whether characteristics are associated with future returns because those characteristics indicate risk that is priced by investors or because they indicate mispricing.

This paper complements prior research by eliciting direct evidence of investment professionals' expectations of returns, and their beliefs about whether those returns arises as compensation for risk or as a correction of mispricing. We focus on the three variables that have been most central to the debate, Beta, the Market-to-Book ratio, and firm size.

Our results suggest that investment professionals expect firms with high Betas to have higher expected returns, and they expect them to be riskier. We find no evidence that they expect Beta to be an indicator of mispricing. These results are consistent with traditional asset pricing models, and belie the notion that "Beta is dead."

In contrast, the professionals expect firms with high market-to-book ratios to have low future returns, and believe that such firms are overpriced. They perceive high Market-to-Book ratios to indicate higher, rather than lower risk. As asset pricing models link higher risk to higher returns, the lower expected returns to high Market-to-Book firms apparently reflect

beliefs that such firms are overpriced, consistent with behavioral explanation. Our results are inconsistent with the notion that low Market-to-Book stocks are riskier.

The analysts' beliefs responses to size are more ambiguous. Analysts perceive large firms to be less risky. But they expect no relation between firm size and expected returns or between firm size and mispricing. These responses are somewhat puzzling, as the effect of size on risk should lead to lower returns. Moreover, our analysts report that size is just as important in predicting returns as Beta and Market-to-Book, and about as important as Beta in assessing risk. While we are not certain exactly how to interpret these results, they do suggest that size is a meaningful risk factor.

The strengths and weaknesses of our method are largely complementary to those of empirical studies. By eliciting beliefs from investment professionals, we are able to provide direct evidence on expected returns, and how they relate to beliefs about risk and mispricing. However, the weakness of our methodology is that we have only indirect evidence that such expectations and beliefs account for market behavior. It is possible that the beliefs of our participants do not drive market prices, which could be driven by other people (such as buy-side analysts). However, we are encouraged by the robustness of our results across three investment banking firms, by the broad range of experience levels, and by the similarities of our participants' expectations to the ex post returns measured in empirical studies. Also, Brav, Lehavi and Michaely (2002) show that the relation between sell-side analysts expected return and pricing factors are similar to the relation found for non-sell side analysts, and are largely consistent with the findings reported here. We do not believe that our results would differ substantially across different groups of market participants.

Our study measures the beliefs of Wall Street professionals at a single point in time. It is possible that these beliefs change over time, just as realized returns predicted by Beta, size and Market-to-Book ratios change over time. The relation between beliefs and realized returns can be complex, and is likely to vary with the nature of the belief. Beliefs about risk tend to be self-fulfilling. Investors who believe that Beta or size indicates risk will pay less for high-Beta and small stocks. This in turn will cause such stocks to earn high returns in the future, as they should if they are riskier. Beliefs about mispricing tend to be self-correcting. Investors who believe that high Market-to-Book firms are overpriced will pay less for such stocks. This in turn will cause high Market-to-Book firms to earn higher returns in the future, working against the low returns they should earn if high Market-to-Book ratios indicate overpricing. Future research could examine the link between beliefs and realized returns by tracking beliefs about the meaning of characteristics, just as researchers currently track investor sentiment and consumer confidence.

Figure 1: Effects of Beta in Experiment 1

These panels present histograms for questions about expected return (Panel A), Perceived Risk (Panel B) and Perceived mispricing (Panel C) for each group of participants in Experiment 1 who received a scenario describing a firm with an extreme value of Beta and a median Market-to-Book ratio. 52 participants received information describing a low-Beta firm (light blue) and 49 participants received information describing a high-Beta firm (dark red).

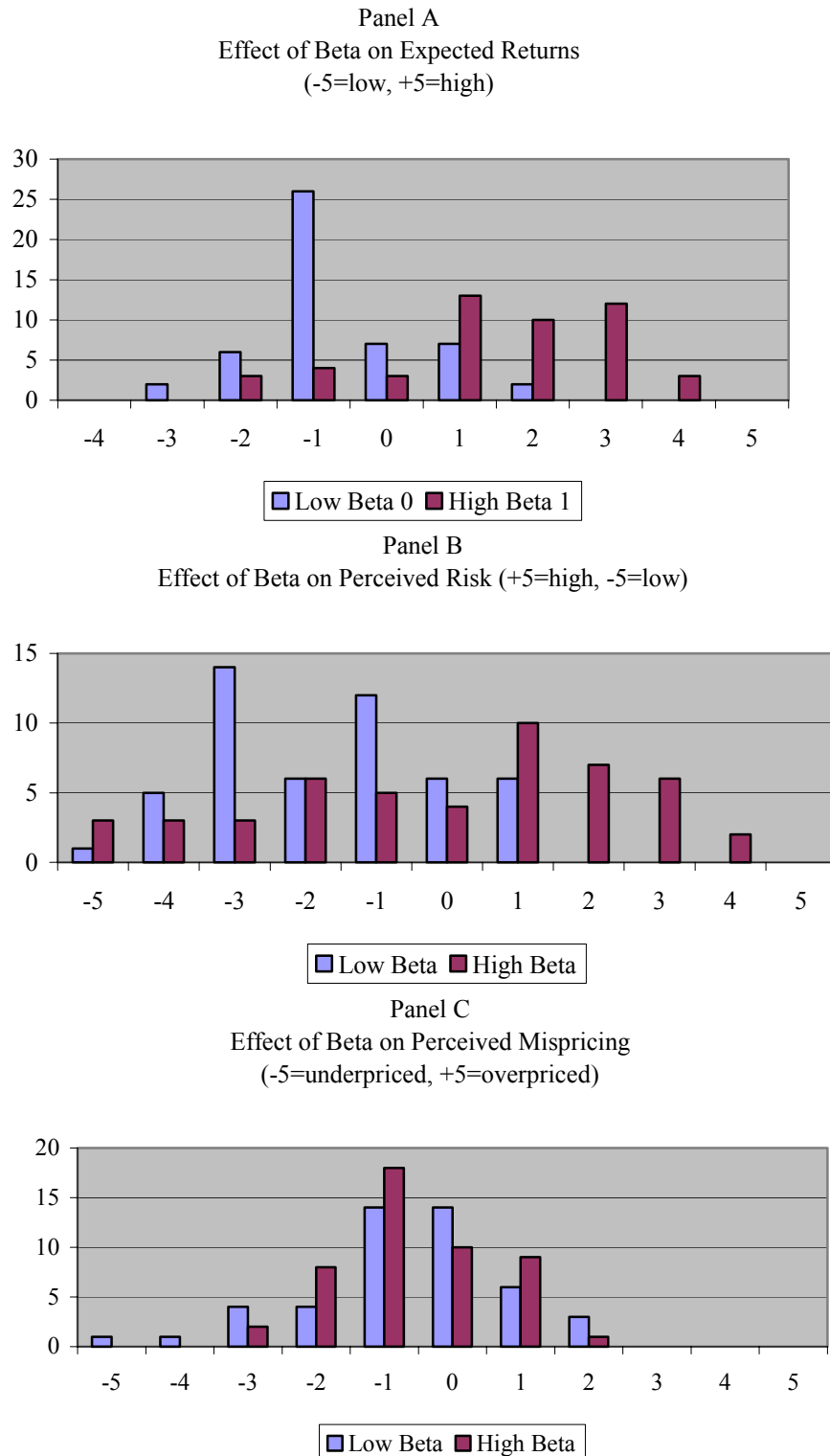


Figure 2: Effects of Market-to-Book in Experiment 1

These panels present histograms for questions about expected return (Panel A), Perceived Risk (Panel B) and Perceived mispricing (Panel C) for each group of participants in Experiment 1 who received a scenario describing a firm with an extreme Market-to-Book ratio and a median Beta. 46 participants received information describing a low-Market-to-Book firm (light blue) and 51 participants received information describing a high-Market-to-Book firm (dark red).

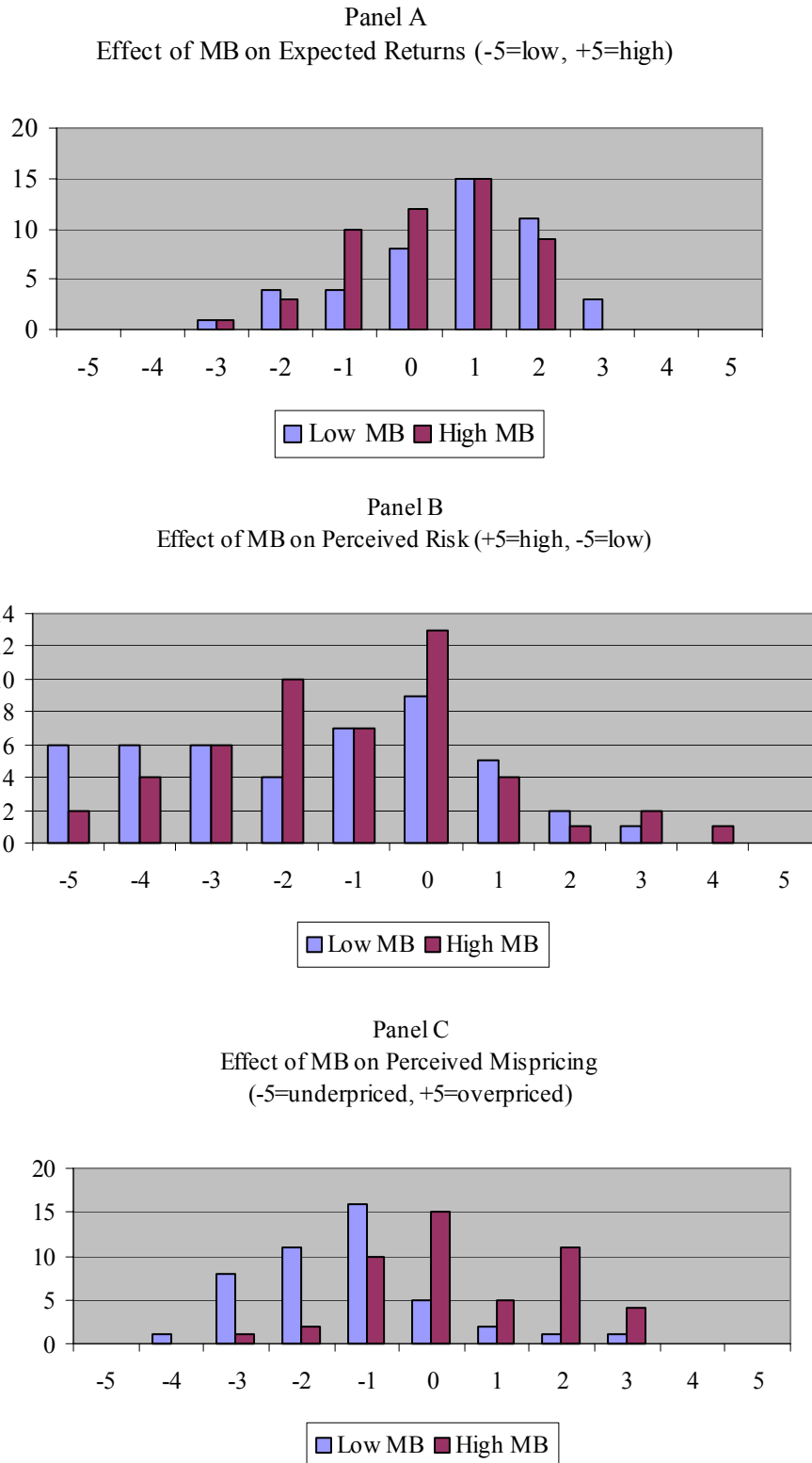
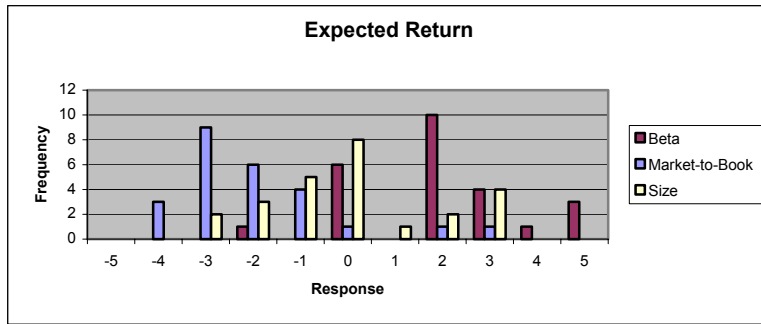


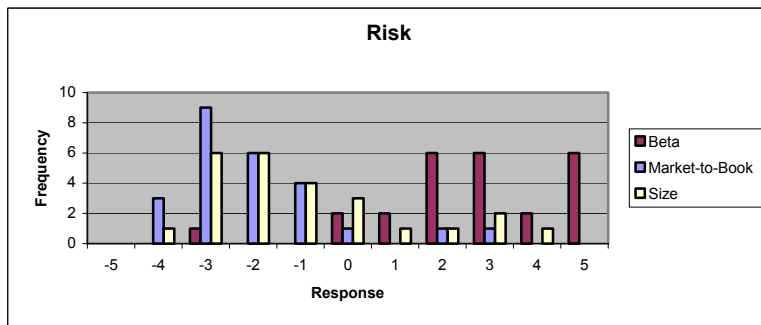
Figure 3: Responses to Factors in Experiment 2

These panels present histograms for questions about expected return (Panel A), Perceived Risk (Panel B) and Perceived mispricing (Panel C) for the 25 participants in Experiment 1. For each firm characteristic (Beta, Market-to-Book and firm size), each participant was asked to agree or disagree with statements that a firm with a higher level of that characteristic would have higher returns, higher risk and more overpricing relative to fundamentals. A response of +5 indicates strong agreement, while a response of -5 indicates strong disagreement.

Panel A: The firm with the higher [Characteristic] will probably earn higher stock returns over my typical investment horizon.



Panel B. The firm with the higher [Characteristic] is probably a riskier investment (as part of a well-diversified portfolio).



Panel C. The firm with the higher [Characteristic] probably has a higher price, relative to its true value (it is more likely to be overpriced).

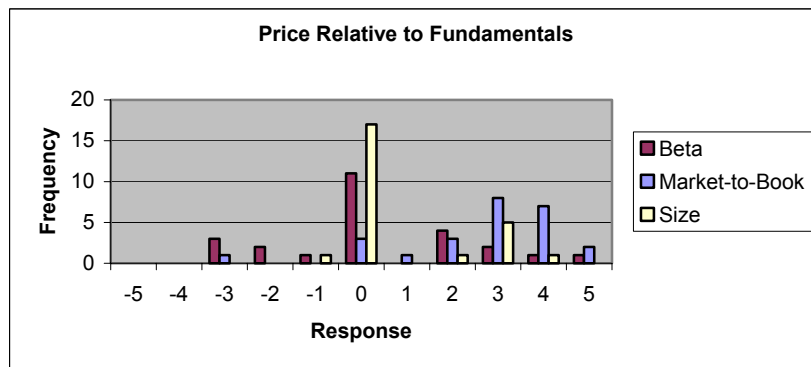
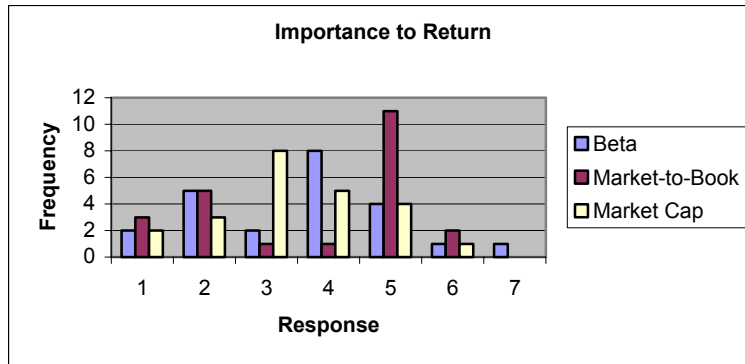
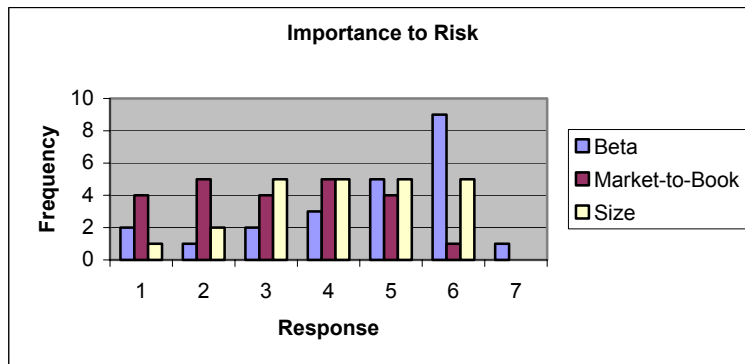


Figure 4: Importance of Factors in Experiment 2. Each panel reports histograms of responses to the indicated questions for each factor (Beta, Market-to-Book and firm size) in experiment 2. A response of 1 indicates “not important,” while a response of 7 indicates “very important.”

Panel A. How important is the factor in predicting returns over your typical investment horizon?



Panel B. How important is the factor in assessing risk?



Panel C. How important is the factor in assessing mispricing?

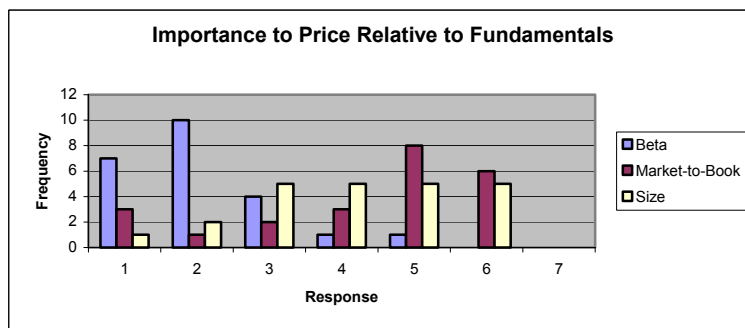


Table I: The effect of Beta on perceived risk, mispricing and expected return, Experiment 1.

52 participants receive information about a low- Beta stock and 49 participants receive information about a high Beta stock. Both groups receive the same information about all of the firm’s other characteristics. All participants are Associates at two Wall Street firms. P-values are provided for parametric analysis of variance (ANOVA) tests, and for an exact Wilcoxon non-parametric test.

Question	Low Beta (n = 52)	High Beta (n=49)	Diff (F-stat) p-value <i>Wilcoxon p</i>
How high do you predict this firm’s stock price return to be over the next year? From “Much lower than market-wide return” (-5) to “Much higher than market-wide return” (+5).	-0.66	1.35	2.01 (44.66) p < 0.001 <i>p < 0.001</i>
How risky do you view this security, as part of a well-diversified portfolio? From “Very Risky” (+5) to “Not Very Risky” (-5).	-1.70	-0.06	1.64 (14.77) p < 0.004 <i>p < 0.001</i>
How do you view the current stock price for this firm? <i>From “Much too low, given its risk and fundamentals” (-5) to “Much too high, given its risk and fundamentals” (+5).</i>	-0.66	-0.60	0.06 (0.05) ns <i>ns</i>

Table II: The effect of Market-to-Book on perceived risk, mispricing and expected return, Experiment 1.

46 participants receive information about a low Market-to-Book stock and 51 participants receive information about a high Market-to-Book stock. Both groups receive the same information about all of the firm's other characteristics. All participants are Associates at two Wall Street firms. P-values are provided for parametric analysis of variance (ANOVA) tests, and for an exact Wilcoxon non-parametric test.

Question	Low Market-to-Book (n=46)	High Market-to-Book (n=51)	Diff (F-stat) p-value <i>Wilcoxon p</i>
How high do you predict this firm's stock price return to be over the next year? From "Much lower than market-wide return" (-5) to "Much higher than market-wide return" (+5).	0.67	0.28	0.39 (2.06) p = 0.15 <i>p < 0.12</i>
How risky do you view this security, as part of a well-diversified portfolio? From "Very Risky" (+5) to "Not Very Risky" (-5).	-1.63	-1.10	0.53 (1.54) p = 0.22 <i>p = 0.30</i>
How do you view the current stock price for this firm? <i>From "Much too low, given its risk and fundamentals" (-5) to "Much too high, given its risk and fundamentals" (+5).</i>	-1.31	0.46	1.77 (34.73) p < 0.001 <i>p < 0.001</i>

Table III: The Effect of Beta changes on perceived risk, mispricing and expected return, Experiment 2

The table describes the results of the within sample experiment with 25 senior analysts. Participants respond to the questions below, and are provided no information on other characteristics. We code strong agreement as +5 and code strong disagreement as -5. We flip the signs for participants responding to the statements “The firm with the lower Beta...,” so that positive responses always indicate belief in a positive association between Beta and assessment (return, risk or price relative to fundamentals.) P-values are provided for a parametric t-test and a sign test.

Question	Mean (t-stat) p-value <i>Sign-test p</i>
The firm with the higher Beta will probably earn higher stock returns over my typical investment horizon	1.96 (5.06) p < 0.001 <i>p < 0.001</i>
The firm with the higher Beta is probably a riskier investment (as part of a well-diversified portfolio).	2.68 (6.39) p < 0.001 <i>p < 0.001</i>
The firm with the higher Beta probably has a higher price, relative to its true value (it is more likely to be overpriced).	0.26 (0.61) p = 0.548 <i>p < 0.586</i>

Table IV: The Effect of Market-to-Book changes on perceived risk, mispricing and expected return, Experiment 2.

The table describes the results of the within sample experiment with 25 senior analysts. Participants respond to the questions below, and are provided no information on other characteristics. We code strong agreement as +5 and code strong disagreement as -5. We flip the signs for participants responding to the statements “The firm with the lower Market-to-Book...,” so that positive responses always indicate belief in a positive association between Market-to-Book and assessment (return, risk or price relative to fundamentals.) P-values are provided for a parametric t-test and a sign test.

Question	Mean (t-stat) p-value
The firm with the higher market-book ratio will probably earn higher stock returns over my typical investment horizon	-2.12 (-6.20) p < 0.001 <i>p < 0.001</i>
The firm with the higher market-book ratio is probably a riskier investment (as part of a well-diversified portfolio).	2.50 (8.75) p < 0.001 <i>p < 0.001</i>
The firm with the higher market/book ratio probably has a higher price, relative to its true value (it is more likely to be overpriced).	2.54 (6.96) p < 0.001 <i>p < 0.001</i>

Table V: The Effect of changes in market capitalization on perceived risk, mispricing and expected return, Experiment 2.

The table describes the results of the within sample experiment with 25 senior analysts. Participants respond to the questions below, and are provided no information on other characteristics. We code strong agreement as +5 and code strong disagreement as -5. We flip the signs for participants responding to the statements “The firm with the lower market cap...,” so that positive responses always indicate belief in a positive association between the size (market cap) and assessment (return, risk or price relative to fundamentals.) P-values are provided for a parametric t-test and a sign test.

Question	Mean (t-stat) p-value
The firm with the higher market cap will probably earn higher stock returns over my typical investment horizon	-0.10 (-0.27) p = .789 <i>p < 0.910</i>
The firm with the higher market cap is probably a riskier investment (as part of a well-diversified portfolio).	-1.08 (-2.51) p = 0.0191 <i>p < 0.030</i>
The firm with the higher market cap probably has a higher price, relative to its true value (it is more likely to be overpriced).	0.70 (2.47) p = 0.0208 <i>p < 0.023</i>

Table VI
Importance of Factors in Experiment 2.

Each panel reports the mean responses to the indicated questions for each factor. A response of 1 indicates “not important,” while a response of 7 indicates “very important.” For each assessment (return, risk and mispricing), Panel A ranks the importance of the factors (Beta, Market-to-Book and Size). For each factor, Panel B ranks the importance of that factor for each of the three assessments. A rank of (i) indicates the highest importance. Cells assigned the same rank are not statistically distinguishable at the $p < 0.05$ level using a paired t-test.

Panel A: Comparison across factors for each purpose

	Beta	Market-to-Book	Size
How important is the factor in predicting returns over your typical investment horizon?	3.61 (i)	3.78 (i)	3.39 (i)
How important is the factor in assessing risk?	4.70 (i)	3.13 (iii)	4.13 (i)
How important is the factor in assessing mispricing?	2.09 (iii)	4.30 (i)	3.30 (ii)

Panel B: Comparison across purposes for each factor

	How important is the factor in predicting returns over your typical investment horizon?	How important is the factor in assessing risk?	How important is the factor in assessing mispricing?
Beta	3.61 (ii)	4.70 (i)	2.09 (iii)
Market-to-Book	3.78 (ii)	3.13 (ii)	4.30 (i)
Market Cap	3.39* --	4.13 (i)	3.30 (iii)

*not different from either number in this row.

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