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The second moment matters! Cross-sectional dispersion of firm valuations and expected returns ☆

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ABSTRACT

Behavioral theories predict that firm valuation dispersion in the cross-section ("dispersion") measures aggregate overpricing caused by investor overconfidence and should be negatively related to expected aggregate returns. This paper develops and tests these hypotheses. Consistent with the model predictions, I find that measures of dispersion are positively related to aggregate valuations, trading volume, idiosyncratic volatility, past market returns, and current and future investor sentiment indexes. Dispersion is a strong negative predictor of subsequent short- and long-term market excess returns. Market beta is positively related to stock returns when the beginning-of-period dispersion is low and this relationship reverses when initial dispersion is high. A simple forecast model based on dispersion significantly outperforms a naive model based on historical equity premium in out-of-sample tests and the predictability is stronger in economic downturns.

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1. Introduction

In the past two decades, a large volume of studies have examined the market return predictability based on aggregate fundamental-to-price ratios, such as the dividend-to-price, book-to-market equity, and earnings-to-price ratios.[1] Although there exists a debate regarding the out-of-sample power of these variable to predict future aggregate returns, many have identified significant in-sample predictability. One explanation is that aggregate valuation ratios measure stock market mispricing caused by price overreaction to news.[2] Thus, an unusually high price relative to fundamentals indicates market overpricing and predicts low future returns.

At the aggregate level, the fundamental-to-price ratios can be interpreted as the first moment (mean) of firm-level fundamental-to-price ratios. Interestingly, behavioral theories (Daniel et al., 2001; Scheinkman and Xiong, 2003; Hong et al., 2006) also imply that not only the first moment, but also the second moment—the standard deviation of logarithmic firm valuation ratios in the cross-section, termed *dispersion*, is an indicator of investor overreaction and market mispricing, and should negatively forecast aggregate returns. This paper is the first to develop and test this hypothesis. I provide novel evidence that dispersion is a powerful predictor of future aggregate returns in and out-of-sample as well as the cross-sectional relationship between beta and stock returns.

To gain an intuition why dispersion should forecast future market returns, consider a single-period version of the Campbell and Shiller (1988) decomposition of the logarithmic dividend-to-price ratio with zero risk-free rates and no dividend growth $(d-p)_i$

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[1] For earlier literature, see Campbell and Shiller (1988) and Fama and French (1988) for the dividend yield and the payout yield; Kothari and Shanken (1997) and Pontiff and Schall (1998) for the book-to-market equity; Lamont (1998) for the earnings-to-price ratio. For recent debate, see Goyal and Welch (2008), Campbell and Thompson (2008) and Cochrane (2008), among others.

[2] E.g., Daniel and Titman (1997), Lee et al. (1999), Daniel et al. (2001) and Griffin and Lemmon (2002).

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$\simeq$ E(r_i). Suppose the expected log firm return, E(r_i), is approximately linearly related to the expected log market return, E(r_m), through beta, so E(r_i) $\simeq \beta_i$E(r_m).[3] Taking the cross-sectional standard deviation of both sides in the decomposition equation yields $\sigma(d-p) \simeq |\text{E}(r_m)|\sigma(\beta)$. In a pure rational setting, such as the CAPM, the above equation implies $\sigma(d-p) \simeq \text{E}(r_m)\sigma(\beta)$ due to non-negativity of the equity premium. That is, given the dispersion in beta, the rational framework predicts a positive relationship between dispersion of firm valuations and expected market returns.

In contrast, this dispersion-return relation can reverse under a behavioral framework. Consider the overconfidence-based model of Daniel et al. (2001), still holds $\sigma(d-p) \simeq |\text{E}(r_m)|\ \sigma(\beta)$, but the true conditional expected market return can be negative.[4] In this model, rational and overconfident investors, after the arrival of noisy signals about aggregate cash flows, disagree on the conditional mean and volatility of market-wide cash flows. In equilibrium, the market as a whole is priced to reflect these average subjective beliefs. Therefore, the true conditional expected aggregate return reflects both risk premium and stock market mispricing. When the stock market is overpriced and the overpricing is sufficiently large, the expected market return can be negative. Therefore, $\sigma(d-p)$ is associated with extreme market returns caused by high levels of overconfidence.

Further, $\sigma(d-p)$ is more likely to be associated with market overpricing due to several reasons. First, as in Daniel et al. (2001), overconfidence lowers the perceived market risk and thus commands a lower risk premium. Therefore, when overconfidence is high, the unconditional expected market return is low. Second, as in Hong et al. (2006), if investors are unwilling to sell short due to institutional or psychological constraints, overconfidence will have a stronger effect in producing over- than underpricing. Third, as in Daniel et al. (1998), if overconfidence tends to grow upon receiving favorable signals but remain subdued for unfavorable signals,[5] overpricing will be on average larger in magnitude than underpricing. Thus, in all three channels, a higher level of overconfidence, measured by dispersion, will primarily indicate aggregate overpricing and low expected returns. Empirically, the three channels can reinforce each other to strengthen this negative dispersion-return relationship.

In the empirical tests, I form a composite measure of dispersion that incorporates cross-sectional standard deviations of three *logarithmic* firm valuation ratios: book-to-market equity, dividend-to-price, and earnings-to-price. I call this composite measure *cross-firm valuation dispersion* (CVD). Another measure, CVDr, is formed similarly but accounts for the cross-sectional differences in growth rates of firm fundamentals reflected in firm valuation ratios. These cross-sectional standard deviations of log firm valuation ratios are detrended using the mean values of the past three years and then incorporated into the composite dispersion measures using only prior information that is available to the market at each point in time. I then examine how the composite dispersion measures are related to other aggregate measures of investor overconfidence/sentiment and future market/portfolio returns.

The test results provide strong support for the behavioral models. First, the dispersion measures are highly correlated with aggregate idiosyncratic volatility (Scheinkman and Xiong, 2003), aggregate trading volume, past market performance (Statman et al., 2006), and the current and future sentiment indexes (Baker and Wurgler, 2006). These results support behavioral models (Odean, 1998; Daniel et al., 1998; Gervais and Odean, 2001; Scheinkman and Xiong, 2003) predicting that investor overconfidence generates excess trading and excess volatility, and that overconfidence tends to grow after past trading success, owing to biased self-attribution.[6] Interestingly, dispersion and the sentiment index share remarkable similarities. For example, both peak in 2000 about when the tech bubble of the late 90's started to burst. Additionally, the dispersion measures help forecast the sentiment index at one-year ahead, suggesting that dispersion might be an earlier indicator of the movement of investor sentiment.

Second, both dispersion measures are negative predictors of subsequent value-weighted market excess returns for the 1964–2012 period. Return predictability is statistically significant at horizons as short as three months and as long as one to three years. The economic impact of dispersion on future aggregate returns is also significant. During the sample period, a one-standard-deviation rise in dispersion on average reduces the equity premium by 1% in the next quarter, 5% in the next one-year, and 14% in the next three years. Such predictability extends to the longer sample periods of 1950–2012 and 1926–2012. It is also robust to alternative horizons used to detrend the cross-sectional standard deviations of firm log valuation ratios as well as to the choice of the component firms used to calculate the cross-sectional dispersion.

The above results have important values for market timing. Goyal and Welch (2008) show that most, if not all, well-known aggregate predictors do not beat the historical mean equity premium in forecasting future market returns out-of-the-sample, particularly in recent decades.[7] Employing their methodology, I find that the dispersion measures, however, forecast the equity premium significantly better than the historical mean premium in real time. The out-of-sample performance of the dispersion-based predictive model is particularly strong for predicting future one to three years of returns.

Third, the negative dispersion-return relationship is more pronounced among riskier (high-beta) firms, supporting the behavioral models. In the model, beta is a multiplier on the expected market return. Thus, an individual stock will inherit the aggregate mispricing according to its beta. When the market is overpriced, individual stocks are on average overpriced with high beta stocks overpriced the most. Therefore, the subsequent returns of high beta stocks will be lower than those of low beta stocks, resulting a negative beta-return relation conditional on initial high dispersion. In contrast, when the market is little mispriced in the beginning of the period, the positive risk-return trade-off will determine the beta-return relationship. The above predictions are confirmed in the data. In addition, I show that this predictability holds both before and after controlling for a set of common comovements in returns, including the Fama and French (1993) three factors, the momentum factor (Carhart, 1997), and the ICAPM factors by Brennan et al. (2004). The conditional negative beta-relationship can partially explain the puzzle that high-beta stocks do not outperform low-beta stocks (Baker et al., 2011; Frazzini and Pedersen, 2013).

My results are related to literature on the small value-spread (Brennan et al., 2004; Campbell and Vuolteenaho, 2004). My dispersion measure is similar to the small value-spread but captures the valuation dispersion across all firms. My results show that the ability of the value spread to forecast market returns may

[3] A linear relationship between beta and discrete returns under the CAPMs approximately holds for log returns with small risk-free rates or short intervals (Cochrane, 2001; Brennan et al., 2004).

[4] While my model is based on overconfidence, it is also consistent with the alternative modeling approach based on investor differences of opinion and short-sale constraints. See additional discussions in Sections 2 and 5.

[5] In our context, a favorable signal is also a confirming signal since an average investor is long the market.

[6] Biased self-attribution (Fischhoff, 1982) refers to the tendency to attribute one's success to one's own ability but failure to bad luck.

[7] For dissenting opinions, see Campbell and Thompson (2008), Cochrane (2008) and Lettau and Van Nieuwerburgh (2008).