Commonality in Disagreement and Asset Pricing*

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Abstract

This paper presents a dynamic model to demonstrate that, when differences-of-opinion over individual securities have a common component, the price of the portfolio can deviate from its fundamental even if investors agree on the portfolio fundamental, the common disagreement drives discount-rate news, and the model can explain the cross-sectional variation of stock return sensitivity to discount-rate news. Using analyst forecast dispersion to measure disagreement, empirical evidence indicates that the common component of individual stock disagreements mean-reverts, correlates with discount-rate news rather than cash-flow news, and has substantial explanatory power for the time-series variation of both equity premium and value premium.

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1 Introduction

What is the price of a *portfolio* of assets whose future payoff is agreed upon by all investors? Assuming for simplicity that investors are risk neutral, the net present value (NPV) formula suggests that the price equals the (agreed) expected payoff. However, consider the following stylized counterexample where the portfolio is the stock market. Assume for now that the investors fall into two styles: value and growth. Each investor is optimistic in one style and pessimistic in the other in such a way that all investors still agree on the market fundamental. When there is short-sale constraint, a likely scenario is that growth (or value) stocks are held by growth (or value) investors, hence their valuations reflect those of the optimists. The overall market, which aggregates the optimistic views in the cross section, can be valued above its fundamental, which is assumed to be agreed upon by all investors. The market valuation can deviate from the NPV but also is indeterminate, depending on the extent of individual stock disagreements.

In this example, there are two types of beliefs: belief about the overall portfolio's fundamental and beliefs about the individual stocks' fundamentals. In a frictionless market, the two beliefs imply the same portfolio valuation due to the law of one price (see Cochrane (2005)). However, the example in the previous paragraph shows a dichotomy of valuations. This dichotomy is rooted in the fact that disagreements do not aggregate straightforwardly. There is no straightforward mapping between individual security disagreements and the disagreement over the portfolio.[1] When individual stock disagreements and portfolio disagreement imply different valuations, which one dominates and what are the asset pricing implications? This paper builds a dynamic model to study the effect of individual security disagreements on portfolio pricing. Henceforward, "stock" denotes an individual security and "index" or "market" denotes a portfolio of these securities.

The model developed here shows that individual stock belief *dispersions* can affect the index valuation and generate time-varying expected return if the individual stock disagreements have a common component, which is termed "common disagreement." This holds even if the *levels* of individual stock beliefs are idiosyncratic so that there is no disagreement over the index. As an example of commonality in disagreements that are idiosyncratic in level, let us consider the valuation of a stock. Should a stock be valued according to firm-foundation theory, castle-in-the-air theory (Malkiel (2003)), or something else? Valuation may be more difficult when the methods give conflicting implications. Variations in such difficulty can lead to variations in belief dispersions for many stocks (variations in common disagreement) even though the level of belief in each stock may be largely idiosyncratic.

Because the model allows the disagreements to be idiosyncratic in level, investors share the same belief regarding the portfolio. From a portfolio perspective, the model can actually be viewed as a representative agent model. In this framework, Campbell and Shiller (1989) decompose return into discount-rate news and cash-flow news. A number of studies have relied on the discount-rate

[1]Specifically, knowing individual security disagreements does not pin down the disagreement over the portfolio, unless the belief correlations across individual securities are known. This is different from the level of beliefs where knowing the level of individual security beliefs determines the level of belief about the portfolio.

variation to address asset-pricing challenges. E.g., Fama and French (1988a), Campbell and Shiller (1989), and Campbell and Vuolteenaho (2004) use the discount-rate effect to address the time-varying equity premium and the value premium. However, it is unclear what drives the variations in discount rate.[2] The model in this paper shows that common disagreement can drive discount rate. When common disagreement increases, the portfolio is priced higher because the investors become more optimistic. This manifests as if the discount rate is lower. As a result, the model gives sharp predictions regarding the time-series variation of both equity premium and value premium.

Using the Institutional Brokers Estimates System (I/B/E/S) database on analyst forecast dispersion over individual stock long-term earnings growth rate to measure individual stock disagreement from 1981 to 2005, the findings in Section 3.2 confirm the co-movement of individual stock disagreements. Section 3.3 finds that the common disagreement, measured by the cross-sectional average of individual stock disagreements, slowly mean reverts. Shocks to the common disagreement have a half-life of about one year and largely mean revert within three years.

The model predicts low expected market return following high common disagreement. This prediction is consistent with the findings in Section 3.4 across the return horizons of one month to three years. The effect is stronger for one- to two-year returns, consistent with the mean-reversion speed of the common disagreement. For example, a one-standard-deviation increase in the common disagreement is associated with a statistically and economically significant drop in the expected one-year market return of 6.6% (e.g., from 9% to 2.4%). The common disagreement has substantial explanatory power for the time-series variation of the equity premium even after controlling for a host of other variables found by earlier studies to correlate with market return. These variables are reviewed in Campbell and Thompson (2007) and include the dividend-price ratio, earnings-price ratio and its smoothed version, book-to-market ratio, short-term interest rate, long-term bond yield, the term spread between long- and short-term Treasury yields, the default spread between corporate and Treasury bond yields, the lagged rate of inflation, the equity share of new issues, and the consumption-wealth ratio.[3] These variables together account for 21.7% of the variations in one-year market return, compared to 38.9% when common disagreement is added – an increase of 17% in regression adjusted R-square.

Building on the empirical finding in Campbell and Vuolteenaho (2004) that growth stocks are more sensitive to the discount-rate news than value stocks, the model in this paper predicts that the mean reversion of common disagreement affects growth stocks more than value stocks. Hence,

[2]Fama and French (1988a) (page 5) point out that "... The interesting economic question, motivated but unresolved by our results, is whether the predictability of returns implied by such temporary price components is driven by rational economic behavior (the investment opportunities of firms and the tastes of investors for current versus risky future consumption) - or by animal spirits." Campbell and Vuolteenaho (2004) echo that their paper is "... silent on what is the ultimate source of variation in the market's discount rate" (page 1270) and conjecture that "... it is possible that our discount-rate news is simply news about investor sentiment" (page 1261).

[3]A partial list of references for these variables includes Rozeff (1984), Fama and French (1988a), Campbell and Shiller (1989) and Campbell and Shiller (1988) on the dividend-price ratio, the earnings-price ratio and its smoothed version; Kothari and Shanken (1997) and Pontiff and Schall (1998) on the book-to-market ratio; Keim and Stambaugh (1986), Campbell (1987), Fama and French (1989), and Hodrick (1992) on interest rates of Treasury and corporate debt securities; Fama and Schwert (1977) and Fama (1981) on inflation; Baker and Wurgler (2000) on the equity share of new issues; Lettau and Ludvigson (2001) on the level of consumption in relation to wealth.

there is time-varying value premium associated with common disagreement. Consistently, Section 3.5 finds that a one-standard-deviation increase in common disagreement is associated with a drop in ex-post one-year growth (or value) stock return by 8.17% (or 2.58%). Consequently, there is evidence of time-varying expected Fama and French (1993) High-Minus-Low (HML) book-to-market portfolio return associated with common disagreement. The relation is statistically and economically significant for the one- to three-year HML returns. Common disagreement alone accounts for 22.3% of one-year HML return variations.

This paper also provides an explanation to the finding of Campbell and Vuolteenaho (2004) that growth stocks are more sensitive to the discount-rate news than value stocks. If the marginal investors in growth stocks show more optimism (per unit of belief dispersion) relative to those holding value stocks, the valuations of growth stocks are more affected by variations in belief dispersion (which drives the discount rate). This gives three predictions: (1) growth stocks have lower returns than value stocks and such underperformance by growth stocks is more pronounced among high disagreement stocks; (2) relative to value stock returns, contemporaneous growth stock returns are more positively related to shocks to common disagreement; and (3) ex-post growth stock returns are more negatively related to common disagreement than value stock returns. Such predicted dichotomy between value and growth stocks is supported by evidence in Section 3.6.[4]

This paper relates to the literature on differences of opinion and short-sale constraint in which some pessimistic opinions are absent from security prices.[5] However, different from the previous literature, a portfolio can be mispriced even if there is *no* disagreement over the portfolio fundamental. This paper suggests that knowing only the beliefs regarding the overall portfolio fundamental can be insufficient for its pricing, contrary to the NPV formula. The price of a portfolio may additionally reflect the distribution of the diverse opinions regarding the various individual securities. For example, if different individual houses are held by different optimists, the real estate market valuation, which aggregates the optimistic views in the cross section, can be higher than any single homeowner's belief of the market fundamental.[6] This has implications for the literature on asset price bubbles. It is well understood that, after a bubble has formed, short-sale constraint prevents attacks on the bubble. However, what generates a bubble? The model in this paper provides such a mechanism. Investors in this model behave fairly sensibly. After researching the available investment vehicles, each chooses to invest in the securities that appear attractive. No one pays more than their own subjective valuation and the subjective valuations are correct on average. However, the collective optimism of those who did invest inflates a bubble. This mechanism likely applies to

[4] The effect due to belief dispersion complements the effect in Campbell, Polk, and Vuolteenaho (2009), which finds that some of the cross-sectional variations in stock return sensitivity to discount-rate news are associated with the cross-sectional variations in the sensitivity of the stock fundamental to discount-rate news.

[5] For example, Miller (1977) studies a static setting, while Harrison and Kreps (1978), Harris and Raviv (1993), and Scheinkman and Xiong (2003) analyze dynamic settings. Hong and Stein (2007) provide a recent review of this literature. Chen, Hong, and Stein (2002) and Diether, Malloy, and Scherbina (2002) provide empirical evidence that, in the cross section, stocks with higher differences-of-opinion have lower subsequent returns. Pástor and Veronesi (2003) and Pástor and Veronesi (2007) study the effect of uncertainty on stock valuation, though their models do not focus on expected stock return.

[6] The aggregation result of Lintner (1969) does not hold here due to the short-sale constraint.

those markets where many heterogeneous securities exist, such as stocks, houses, art, or tulip bulbs with various shapes, etc.

This paper is organized as follows. Section 2 presents a model on common disagreement. Empirical evidence is documented in Section 3. Section 4 concludes. The proofs are in the Appendix.

2 Model

Two models are presented to study the effect of commonality in disagreement: a static model and a dynamic model. The static model allows a more parsimonious illustration of the intuition; the dynamic model analyzes more rigorously the effect of common disagreement on the time-varying equity premium, the discount-rate news, and the time-varying value premium, along with the effect of the marginal investors' optimism.

2.1 A static model

In the static model, there are two time periods, $t = 0, 1$. The following assumptions describe the securities and the market participants in this model.

Assumption 1 (Securities)**.** *There are two types of securities traded in the economy.*

- *A continuum of stocks indexed by $i \in [0, 1]$, each with net supply of one share. Each share of stock i pays off a liquidating dividend $v_i > 0$ in period 1. v_i is random with mean $m_i = m$ and v_i may not be idiosyncratic. For simplicity of illustration, assume $v_i \in [\underline{v}, \overline{v}]$, where $\underline{v}$ and $\overline{v}$ are known by all investors. Let P_i denote stock i's share price in period 0.*

- *A risk-free asset in zero net supply, where each unit pays off one dollar in period 1.*

Given the stock prices, the market index is:[7]

$$P_M = \int_0^1 P_i di.$$

Assumption 2 (Market participants)**.** *There is a continuum of investors (referred to as funds in this paper) indexed by $f \in [0, 1]$ who do not take short or leveraged positions for exogenous reasons. Each fund's net asset value (NAV) is normalized to W. The funds overall have capital W.*

That some investors face trading frictions is not unrealistic (e.g., actively managed mutual funds, see Almazan, Brown, Carlson, and Chapman (2004) and Koski and Pontiff (1999)). An earlier version of the paper incorporates arbitrageurs that can short or engage in leverage. As long as there is a limit to the extent these arbitrageurs can lever up their capital, the result of this section remains similar. These results are suppressed for brevity and are available from the author.

[7] An earlier version of this paper explicitly builds in index arbitrageurs who ensure that the index level equals the sum of constituent stocks. This result is suppressed for simplicity of illustration.

Assumption 3 (Beliefs). *The funds disagree on the mean payoff m_i of stock i. Let m_i^f denote fund f's belief of the expected stock i payoff.*

$$m_i^f = m + \sigma_i \cdot \varepsilon_i^f \tag{1}$$

where ε_i^f are random variables with mean zero and are independent and identically distributed (i.i.d.) across f and i. Let $F(\cdot)$ denote the cumulative distribution function (CDF) of ε_i^f. For simplicity of illustration, assume that $F' > 0$ and that ε_i^f is symmetrically distributed around 0 (so $F(0) = 1/2$). Assume the magnitude of the individual stock disagreement σ_i satisfies:

$$\sigma_i = \alpha_i + \beta_i \cdot \sigma \tag{2}$$

where $\beta_i > 0$. Let $\overline{\alpha}, \overline{\beta}$ denote the average of α_i and β_i. $\overline{\beta}$ is normalized to 1.

The common component of individual stock disagreements (termed "common disagreement") is defined next.

Definition 1 (Common disagreement). *The common disagreement is the variable σ in (2).*

The individual stock disagreement in (1) is idiosyncratic (in level) in that all investors agree on the market fundamental. Aggregating a fund f's beliefs for N different stocks,

$$\frac{1}{N}\sum\nolimits_{i=1}^{N} m_i^f = m + \frac{1}{N}\sum\nolimits_{i=1}^{N} \sigma_i \cdot \varepsilon_i^f \to m \qquad \text{when } N \text{ is large} \tag{3}$$

by the law of large numbers under fairly general conditions.[8] In the case of a continuum of stocks, all investors agree correctly on the expected market fundamental m. Therefore, common disagreement need not be related to the disagreement in the overall index fundamental. Indeed, there is no disagreement over the index fundamental in the model according to (3).

Although the disagreements are idiosyncratic in level, the magnitudes of individual stock disagreements are assumed to have a common component — referred to as common disagreement in this paper (see Definition 1). Averaging σ_i in (2) across stocks,

$$\overline{\sigma_i} = \overline{\alpha} + \sigma. \tag{4}$$

Other than a level effect of $\overline{\alpha}$, the cross-sectional average of individual stock disagreements measures the common disagreement σ. Assuming the time invariance of $\overline{\alpha}$, time-series variations in average individual stock disagreement capture time-series variations in common disagreement. This is the basis for the empirical proxy of common disagreement in Section 3.

Assumption 4 (Preferences). *The investors are risk neutral and maximize period 1 wealth.*

Other than simplifying the illustration, risk neutrality implies that the model does not need to

[8] Theorem 19.1 in Davidson (2002).

make assumptions on investors' differences of opinion on volatility or other higher-order moments of asset payoffs.

Assumption 5 (Multi-advisor fund). *Each fund has a continuum of advisors indexed by $i \in [0,1]$. Each advisor i is in charge of W capital and chooses only between the risk-free asset and stock i.*

This assumption simplifies the illustration and is not essential for the model implications. Without this assumption, a fund will invest in the stock that has the most favorable view. However, the probability distribution of the maximum of many random variables is difficult to work with, especially if disagreements vary across stocks.[9] With Assumption 5, a fund will include stock i in its portfolio as long as it is optimistic in i even if there may be other stocks with more favorable views. To some extent, Assumption 5 is also realistic. The two largest mutual fund families according to assets under management in 2007 (American funds, Vanguard) both have multi-advisor funds.[10] In an earlier version of the paper, I derive an equilibrium with two stocks without the multi-advisor assumption and the result is similar.

2.1.1 Static equilibrium

Proposition 1 (Static equilibrium). *When $W/2 > m$, under Assumptions 1–5, there exists an equilibrium in which $r_f = 0$ and the individual stock prices satisfy $P_i > m$. The market index is above the fundamental that all investors agree on,*

$$P_M > m.$$

Further, the index satisfies:

$$\frac{d}{d\sigma} P_M > 0, \frac{d}{d\sigma} E\left(r_M\right) < 0 \tag{5}$$

where the expectation is under the true probability.

This is an interesting equilibrium because, as shown in (3), all the investors correctly agree on the expected payoff of the market. However, the market valuation is indeterminate and depends on the common disagreement. In this equilibrium, a fund invests in those stocks it is optimistic in and sits on the sideline of other stocks. Different individual stocks are bid up by different optimists. Hence, the index is higher than any one investor's belief regarding the index fundamental.[11]

2.1.2 Comparison with Miller (1977)

Proposition 1 builds on the insight of Miller (1977) that a stock can be overvalued when there is friction in shorting (hence pessimistic views are absent in the price). Nonetheless, the finding that

[9] See Sarhan and Greenberg (1962) for more details on order statistics.

[10] For example, the \$186 billion Growth Fund of America states in its prospectus that it "... uses a system of multiple portfolio counselors in managing mutual fund assets. Under this approach, the portfolio of a fund is divided into segments managed by individual counselors. Counselors decide how their respective segments will be invested."

[11] The mathematical intuition of this paper is that the average of the maximum $\geq$ maximum of the average, where the average is taken across stocks and the maximum is taken across investors regarding their beliefs. In Proposition 1, the condition $W/2 > m$ depends on $W/2$ because there is only a 50% chance that a fund is optimistic in a stock.

the market is overvalued is distinct from Miller (1977) because there is no disagreement regarding the market fundamental. In fact, all investors know the correct market fundamental in the model.

2.1.3 Time series versus cross section

Example 1 compares the effect of time-series variations in common disagreement to the effect of cross-sectional variations in individual stock disagreement.

Example 1. *Figure 1 plots the equilibrium stock prices for three cases: case 1 (line AB), $\sigma_i = \sigma$, where $\sigma = 1$; case 2 (line CD): $\sigma_i = \sigma$, where $\sigma = 1/2$; and case 3 (line AE), $\sigma_i = \sigma(1+i)$, where $\sigma = 1$. The parameters are $m = 1$ (true fundamental) and $W = 4$ (fund capital). ε_i^f is distributed uniformly between $[-1, 1]$. The equilibrium stock price can be solved from (24), as $P_i = 4(\sigma_i + 1)/(\sigma_i + 4)$. The true fundamental is line FG in Figure 1.*

When the common disagreement is higher (compare case 1 with case 2 in Figure 1), the index is more over-valued hence the ex-post return is lower. Cases 1 and 2 are constructed such that there is an absence of cross-sectional variation in individual stock disagreement. This shows that the main implication of Proposition 1 is in the time series — the index return is low following times of high common disagreement. This mechanism is distinct from the cross-sectional findings in Chen, Hong, and Stein (2002) and Diether, Malloy, and Scherbina (2002) that focus on the difference between line AE and AB in Figure 1.

Example 1 also suggests that commonality in disagreement is essential to generate time-varying return implications. Without variations in common disagreement, there is a level effect in index value but there may not be time-varying expected return. This is analyzed more rigorously in the dynamic model below.

2.2 A dynamic model

In this section, the static equilibrium is extended to a dynamic setting to study the effect of common disagreement on the time-varying expected return and discount-rate news. Specifically, a parsimonious overlapping-generations model with two-period-lived investors is considered (De Long, Shleifer, Summers, and Waldmann (1990)).

In the dynamic setting, each stock i is now infinitely lived and pays off dividend $d_{i,t}$ in each period. For simplicity, the true dividend is assumed to be non-random and set to one in each period, i.e., $d_{i,t} = 1$. Following De Long, Shleifer, Summers, and Waldmann (1990), the risk-free rate r_f is assumed to be exogenous and constant over time.[12] The fundamental value of each stock is therefore $1/r_f$. However, each investor thinks the dividend is random and there is difference of opinion over it. Specifically, investor f at time $t-1$ expects the dividend in the next period to be:

$$1 + \sigma_{i,t}\varepsilon_{i,t}^f \tag{6}$$

[12] As shown in the previous section, endogenizing the risk-free rate (Loewenstein and Willard (2006)) does not affect this paper's result.

where ε is independent and identically distributed across f and i. Since the disagreement is idiosyncratic across stocks, all investors know correctly that the market dividend is 1 (see (3)). Hence all investors know that the market fundamental is $1/r_f$. For simplicity, assume:

$$\sigma_{i,t} = \sigma_t = \begin{cases} \sigma_h > 0 & \text{with probability } p \\ \sigma_l = 0 & \text{with probability } 1-p \end{cases}$$

and its realization is independent across time. This can be mapped to (2) by setting $\alpha_i = 0$, $\beta_i = 1$, and the common disagreement to either σ_h or σ_l. The common disagreement is time-varying. In some periods, the common disagreement is high and, in other times, it is low (zero here). The independent realization over time implies that common disagreement mean reverts in one period, which simplifies the analysis but is not essential. Investors are aware that the disagreement changes over time. For simplicity, ε is further assumed to be uniformly distributed between $[-1, 1]$. Let $P_{i,t}$ and $P_{M,t}$ denote the ex-dividend price of stock i and the index. The model is otherwise identical to that in Section 2.1.

Given the symmetry of the individual stocks and the independent realization of disagreement over time, this section looks for a stationary equilibrium in which the ex-dividend prices of individual stocks are:

$$P_{i,t} = P_{M,t} = \begin{cases} P_h & \text{if } \sigma_t = \sigma_h \\ P_l & \text{if } \sigma_t = 0 \end{cases}$$

When there is disagreement, let b_h denote the cutoff so that optimistic investors with belief $\varepsilon^f_{i,t} \geq b_h$ hold stock i. The present value relation implies:

$$\begin{aligned} P_h &= \frac{1}{1+r_f}\left(1 + \sigma_h b_h + pP_h + (1-p) P_l\right) \\ P_l &= \frac{1}{1+r_f}\left(1 + pP_h + (1-p) P_l\right). \end{aligned} \tag{7}$$

Market clearing implies:

$$P_h = W\frac{1-b_h}{2}. \tag{8}$$

Equations (7) and (8) can be solved to give P_h, P_l, and b_h. The equilibrium is shown in the next proposition.

Proposition 2 (Time-varying equity premium)**.** *When $W/2 > 1/r_f$, there exists an equilibrium in which the individual stock and the market price are P_h (or P_l) when the common disagreement is high (or low).*

$$\begin{aligned} P_h &= \frac{1}{r_f}\left(1 + \frac{(r_f W - 2)}{r_f W (1+r_f) + 2\sigma_h (r_f + p)} (r_f + p)\, \sigma_h\right) \\ P_l &= \frac{1}{r_f}\left(1 + \frac{(r_f W - 2)}{r_f W (1+r_f) + 2\sigma_h (r_f + p)} p\sigma_h\right) \end{aligned}$$

and the prices are higher than the market fundamental:

$$P_h > P_l > \frac{1}{r_f}. \tag{9}$$

When there is disagreement, the marginal investor is:

$$b_h = 1 - \frac{2(1+r_f) + 2\sigma_h (r_f + p)}{r_f W (1+r_f) + 2\sigma_h (r_f + p)} > 0.$$

Further,

$$E_h [r_M] < E_l [r_M] = r_f \tag{10}$$

where $E_h [r_M]$ (or $E_l [r_M]$) denotes the expected one-period index return under the true probability when the common disagreement is high (or low).

Proposition 2 implies that, when common disagreement is high, the index valuation is high and the expected return going forward is low. The condition $W/2 > 1/r_f$ ensures that the optimists have sufficient wealth to hold all outstanding shares (recall that $1/r_f$ is the index value if it is priced at its fundamental). P_l is higher than the index fundamental because of the opportunity to flip shares at a higher price in the future when disagreement emerges. When disagreement disappears ($\sigma_h \to 0$), both P_h and P_l converge to the market fundamental.

2.2.1 Common disagreement and discount-rate news

A useful return decomposition in the representative agent framework is to separate the unexpected stock returns into two components: cash-flow news and discount-rate news (see, e.g., Campbell and Shiller (1989) and Campbell (1991)). Specifically, let r_t denote the log market return. A log-linear approximation results in:

$$\begin{aligned} r_{t+1} - E_t r_{t+1} &= (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t) \sum_{j=1}^{\infty} \rho^j r_{t+1+j} \\ &= NCF_{t+1} - NDR_{t+1} \end{aligned} \tag{11}$$

where d denotes the log dividend, Δ denotes a one-period change, E_t denotes a rational expectation at time t, and ρ is a coefficient used in the log-linear approximation, which Campbell and Shiller (1989) set to the average log dividend yield. NCF denotes news about future cash flow and NDR denotes news about future discount rates (i.e., expected returns).

One can map the equilibrium in Proposition 2 into (11). Because the disagreements are idiosyncratic, all investors correctly agree that the expected market dividend is 1. This does not vary over time, hence there is no cash-flow news. Therefore, all the unexpected return is attributed to discount-rate news. This leads to the following proposition.

Proposition 3 (Discount-rate news). *Under the setting of Proposition 2,*

$$NCF_{t+1} = 0 \quad \text{for all } t$$

$$NDR_{t+1} = \begin{cases} (1-p)\left[\log\left(1+P_l\right) - \log\left(1+P_h\right)\right] < 0 & \text{if } \sigma_{i,t+1} = \sigma_h \\ p\left[\log\left(1+P_h\right) - \log\left(1+P_l\right)\right] > 0 & \text{if } \sigma_{i,t+1} = \sigma_l \end{cases}$$

This proposition shows that common (idiosyncratic) disagreement drives discount-rate news rather than cash-flow news. A positive innovation in common disagreement is associated with a contemporaneous reduction in the "discount rate." Note that, in this heterogeneous agent framework, the discount-rate news does not come from actual investors changing their required rate of return, but from the market aggregating time-varying optimism in the cross section.

2.2.2 Common disagreement and the value premium

Proposition 3 suggests that common disagreement drives contemporaneous discount-rate news. Campbell and Vuolteenaho (2004) find empirically that growth stocks have higher discount-rate beta than value stocks after the 1960s.[13] Proposition 3 and the finding in Campbell and Vuolteenaho (2004) imply that the growth and value stock returns have different sensitivities to common disagreement.

Corollary 4 (Time-varying value premium). *Growth stock returns are more sensitive to contemporaneous innovations in common disagreement. Ex-post, the mean reversion in common disagreement affects growth stocks more than value stocks.*

2.2.3 Comparative statics — variation of the marginal investor

The next corollary shows that the predictions of Proposition 2 are stronger when b_h is higher (or, equivalently, W is higher).

Corollary 5 (Variation of the marginal investor). *The equilibrium in Proposition 2 satisfies*

$$\frac{\partial}{\partial b_h}P_h > 0, \frac{\partial}{\partial b_h}P_l > 0, \frac{\partial}{\partial b_h}\frac{P_h}{P_l} > 0, \frac{\partial}{\partial b_h}E_h\left[r_M\right] < 0, \frac{\partial}{\partial b_h}E_l\left[r_M\right] = 0,$$
$$\frac{\partial}{\partial W}b_h > 0,$$
$$\frac{\partial}{\partial W}P_h > 0, \frac{\partial}{\partial W}P_l > 0, \frac{\partial}{\partial W}\frac{P_h}{P_l} > 0, \frac{\partial^2}{\partial W \partial \sigma_h}P_h > 0, \frac{\partial^2}{\partial W \partial \sigma_h}P_l > 0, \frac{\partial^2}{\partial W \partial \sigma_h}\frac{P_h}{P_l} > 0,$$
$$\frac{\partial}{\partial W}E_h\left[r_M\right] < 0, \frac{\partial}{\partial W}E_l\left[r_M\right] = 0, \frac{\partial^2}{\partial W \partial \sigma_h}E_h\left[r_M\right] < 0.$$

Intuitively, for given common disagreement σ, the marginal investor's total optimism is $b_h\sigma$. Controlling for belief dispersion, higher optimism (hence higher b_h) implies higher valuation and

[13] Section 3.6 of this paper offers an explanation on why growth stocks have higher discount-rate beta.

lower expected ex-post return (both unconditional return and return conditioning on high disagreement). Conversely, more sensitivity to contemporaneous variations in common disagreement indicates that a portfolio is likely held by investors with higher b_h, hence its ex-post return likely correlates more negatively with common disagreement. Such implications are supported by evidence in Section 3.6 and provide an explanation to the cross-sectional variation in stock return sensitivity to discount-rate news documented by Campbell and Vuolteenaho (2004).

3 Empirical findings

3.1 Data

The I/B/E/S database on analyst forecasts of the earnings-per-share (EPS) long-term growth rate (LTG) provides the main proxy for investors' beliefs regarding the future prospects of individual stocks. This measure is used in a number of studies (see Moeller, Schlingemann, and Stulz (2007) for a recent example). The long-term forecast has several advantages. First, it features prominently in valuation models. Second, it is less affected by a firm's earnings guidance relative to short-term forecasts. Because the long-term forecast is an expected growth rate, it is directly comparable across firms or across time.

Analyst forecasts from December 1981 through December 2005 are used in this study. For each firm i in each month t, the average and the standard deviation of analyst forecasts of long-term EPS growth rate are obtained from the unadjusted I/B/E/S summary database and denoted as $STKLTG_{i,t}$ and $STKDISAG_{i,t}$, respectively.[14] Both $STKLTG_{i,t}$ and $STKDISAG_{i,t}$ are in percentages. Monthly stock closing prices and shares outstanding are obtained from the Center for Research in Security Prices (CRSP). Only common stocks (CRSP item SHRCD = 10 or 11) listed on the NYSE / AMEX / NASDAQ are included. Let $MKTCAP_{i,t}$ denote the market capitalization of stock i at the end of month t. Figure 2 shows the time-series plots of the number of firms with non-missing stock-level disagreement $STKDISAG$, along with the average number of analysts following each stock. The sample contains a large number of firms. There are more than 700 stocks in the early part of the sample and around 2,000 stocks towards the end of the sample. The average number of analysts per firm is stable at around 5 to 7 analysts per firm.

Motivated by (4), the main proxy of common disagreement, $DISAG$, is the cross-sectional value-weighted average of individual stock disagreement,

$$DISAG_t = \sum_i MKTCAP_{i,t} \cdot STKDISAG_{i,t} \Bigg/ \sum_i MKTCAP_{i,t}. \tag{12}$$

[14] Diether, Malloy, and Scherbina (2002) find that the I/B/E/S summary file closely tracks the summary statistics constructed from the I/B/E/S detailed file. $STKLTG$ and $STKDISAG$ are winsorized at 1% and 99% levels to account for potential outliers or data errors. Due to the large number of firms involved in the construction of common disagreement, the result is insensitive to winsorizing. The pairwise correlation between winsorized and non-winsorized common disagreement is 0.982 and the results in this paper are essentially the same using the non-winsorized variables.

The cross-sectional value-weighted average of individual stock average forecast, LTG, is:

$$LTG_t = \sum_i MKTCAP_{i,t} \cdot STKLTG_{i,t} \Bigg/ \sum_i MKTCAP_{i,t}.$$

Figure 3 plots the time series of the common disagreement proxy $DISAG$. Table 1 provides summary statistics. The time-series average of common disagreement, $DISAG$, is 3.23% and the time-series average of LTG is 14.23%. On average, analysts expect the EPS of a typical stock to grow at the annual rate of 14.23% and the forecast dispersion, measured by standard deviation, of a typical stock is 3.23%.[15]

The monthly NYSE / AMEX / NASDAQ value-weighted index return (including distributions), the monthly individual stock returns, and the one-month Treasury bill (T-bill) rate from 1981 to the end of 2006 are obtained from CRSP. $MRET$ denotes the market return in excess of the T-bill rate. The average annual excess market return is 9.17%, with a standard deviation of 16.32%. Data on discount-rate news, NDR, and cash-flow news, NCF, are obtained from the return decomposition in Campbell and Vuolteenaho (2004).[16] The sample period for the discount-rate and cash-flow news is 1981 to the end of 2001.

3.2 Commonality in individual stock disagreements

Figure 3 suggests that the individual stock disagreements have a common component. This section confirms such commonality in individual stock disagreements using regression analysis similar to that in Chordia, Roll, and Subrahmanyam (2000). Specifically, for each stock i, the monthly proportional changes in stock disagreement are regressed on the proportional changes in the cross-sectional average of individual stock disagreements,

$$\frac{STKDISAG_{i,t} - STKDISAG_{i,t-1}}{STKDISAG_{i,t-1}} = \alpha_i + \beta_i \frac{DISAG_t - DISAG_{t-1}}{DISAG_{t-1}} + \varepsilon_{i,t}. \tag{13}$$

Each individual stock is removed from the computation of the average disagreement $DISAG$ used in that stock's regression, so the right-hand-side regressor does not contain the left-hand-side variable and the estimated coefficients are not artificially constrained.

The regression results of (13) are reported in column (1) of Table 2. The slope coefficient β_i in the stock-by-stock regressions averages to 0.297, which implies that a 1% increase in $DISAG$ is associated with a 0.297% increase in individual stock analyst disagreement. This relationship is statistically significant (t-stat = 2.22). 52% of the slope coefficients in the stock-by-stock regressions

[15] A one standard deviation from the mean ranges from 11% to 17.46% per year. It is documented that analyst forecasts may be biased (e.g., De Bondt and Thaler (1990), and Chan, Karceski, and Lakonishok (2003)). But it is unclear that a bias in the mean will affect the forecast standard deviation and its time-series variation in a systematic way. As documented in La Porta (1996), I/B/E/S coverage is tilted towards big stocks, though the performance of stocks in I/B/E/S is not statistically different from stocks in CRSP. The lack of small stock coverage in I/B/E/S has minimal impact on $DISAG$ because of value weight.

[16] The data are downloaded from the website of the *American Economic Review.*

are positive. 15.9% of them are positive significant, i.e., 15.9% of the Newey and West (1987) t-statistics in the time-series regressions are higher than 1.645 (the 5% critical level in a one-sided test). The median of the slope coefficients is 0.058. A signed test of the null hypothesis that median=0 is rejected in favor of a positive median with a p-value of 0.0005. Similar to Chordia, Roll, and Subrahmanyam (2000), the average R-square in the stock-by-stock regressions is low.

Column (2) of Table 2 runs another regression similar to (13) except that it also includes the lagged change in $DISAG$ as an explanatory variable to capture lagged adjustment of individual analyst forecast. The results are similar to those in column (1). The lagged change in $DISAG$ is positively correlated with the change in individual stock disagreement, though both the economic and statistical significances are lower than the contemporaneous effect. The sum of the contemporaneous and lagged slope coefficients averages to 0.595 and is statistically significant (t-stat = 2.86). A 1% increase in contemporaneous and lagged $DISAG$ is associated with a 0.595% increase in individual stock analyst disagreement.[17]

3.3 Mean reversion of common disagreement

Having established the commonality in individual stock disagreements in the previous section, this section studies the mean reversion property of the common disagreement. If common disagreement does not vary, it has only a level affect on prices but does not generate time-varying expected returns. Specifically, this section runs the following regression:

$$DISAG_t = \alpha + \beta \cdot DISAG_{t-lag} + \varepsilon_t. \tag{14}$$

The lag ranges from one month to three years. The results are reported in Table 3. The common disagreement is positively auto-correlated. At the one-month lag, the auto-correlation coefficient is 0.93 and highly statistically significant. The auto-correlation gradually decays over longer lags. The speed of decay is roughly in line with an autoregressive model with order one (AR(1)).[18] At the one-year horizon, the regression slope is 0.54, which implies that the half-life of a shock to common disagreement is about one year. The slope estimate is close to zero at the three-year horizon, at which point shocks to common disagreement have largely reverted. Also reported in Table 3 is the mean of common disagreement implied by the regression estimates (i.e., implied mean $= \alpha/(1-\beta)$). The implied mean is around 3.2%, consistent with the sample average in Table 1.

The evidence suggests that the common disagreement slowly mean reverts. Only a small fraction of shocks to common disagreement decay within one month. Shocks have a half-life of about a year and more than 80% mean reverts in two years. The remaining 20% largely reverts in the third year. This finding predicts that the effect of common disagreement on returns is stronger for the

[17]The results are similar using the equal-weighted average instead of the value-weighted average of individual stock disagreements, or using the level change as opposed to the proportional change in disagreement. These results are omitted for brevity.

[18]The Bayes Information Criterion (BIC) also suggests that the autoregressive order of common disagreement is one. The BIC result is suppressed for brevity.

one- and two-year return horizons.

3.4 Common disagreement and time-varying equity premium

Having established in the previous sections that differences-of-opinion regarding individual stocks have a common component and that this common component mean reverts, this section examines the negative relation between common disagreement and expected market return predicted by Propositions 1 and 2.

Figure 4 shows a scatterplot of the common disagreement and ex-post one-year market return in excess of the linked one-month T-bill rate. A negative relation is visible, which is confirmed by a nonparametric estimate of the expected return conditioning on the common disagreement.[19] The upper 95% confidence interval for observations with the largest common disagreement indicates a 5.64% annual return, which is lower than the lower 95% confidence interval (10.4% annual return) for observations with the smallest common disagreement. Return observations corresponding to lower common disagreements also tend to be positive; returns corresponding to higher common disagreements tend to be negative (though more volatile). Figure 4 provides visual evidence of the negative relation between common disagreement and ex-post return. Further, the relation is approximately linear, which motivates the next linear regression:

$$MRET_{t,t+h} = \alpha + \beta \cdot DISAG_t + \varepsilon_t \tag{15}$$

where $MRET_{t,t+h}$ is the excess market return from month t to $t+h$.[20] The horizon h ranges from 1 (one month) to 36 (three years). The results are in Panel A of Table 4. The coefficient of common disagreement is negative for all return horizons. Common disagreement has the least explanatory power at the one-month horizon, consistent with Table 3 that only a small fraction of shocks to common disagreement mean reverts within one month. At the one-year horizon, the coefficient of common disagreement is -0.174 and is statistically significant (t-stat = 2.59). The economic magnitude is large — a one-standard-deviation increase in common disagreement is associated with a 6.6% reduction in ex-post one-year return (e.g., 9% to 2.4%). To put the economic magnitude in perspective, the mean and the standard deviation of one-year market return during the sample period are 9% and 16%, respectively. The effect of common disagreement in Panel A roughly doubles going from one-year to two-year return and shows a slight further increase for the three-year return. The results are consistent with the mean reversion speed of common disagreement.

Next, the regression controls for the expected long-term EPS growth rate (LTG) and the price-

[19] The nonparametric estimation is implemented by the LOWESS procedure in the statistical software package Stata using the default bandwidth. See Fan and Gijbels (1996) for more details on nonparametric local polynomial estimation. The 95% pointwise confidence band adjusts for the correlation of overlapping annual returns using the Newey and West (1987) standard error with twelve lags.

[20] All the regressions in this paper have been re-run using raw market return instead of excess return over risk-free rate. The results are similar and therefore suppressed.

earnings ratio (PE),

$$MRET_{t,t+h} = \alpha + \beta \cdot DISAG_t + \gamma \cdot LTG_t + \delta \cdot PE_t + \varepsilon_t \tag{16}$$

The rationale for these controls is that high disagreement may coexist with high expectations of the growth rate and high valuation ratios (e.g., the dot-com era). The results are shown in Panel B of Table 4.[21] Both the economic and statistical significances of common disagreement remain similar. The expected level of the growth rate has essentially no effect on return, consistent with the explanation that the aggregate market is fairly efficient in incorporating the level of expected future growth.[22] The ex-post market return is negatively associated with its price-earnings ratio. The effect of PE is statistically significant for the one-year return horizon, and is marginally significant for the other horizons. This raises the question of whether the effect of common disagreement is robust to controlling other variables known to correlate with ex-post market return. Before investigating this, some econometric issues related to the baseline specification (15) are addressed.

The return horizons in regression (15) range from one month to three years. An econometric issue arises because observations of long-horizon returns overlap, which potentially biases the test towards rejecting the null hypothesis of zero explanatory power (see, e.g., Richardson and Stock (1989) and Hodrick (1992)). Newey and West (1987) t-statistics have been used to account for the overlapping returns. Additional econometric tests are now applied to ensure valid inference.

The simplest way to avoid overlapping returns is to use only observations on common disagreement and ex-post h-month return sampled at time $t = 0, h, 2h, 3h, \cdots$. In this case, the return from time 0 to h does not overlap with the return from time h to $2h$. The regression result using this simple non-overlapping specification is shown in Panel C of Table 4, which also controls for the price-earnings ratio found earlier to correlate with returns. Returns of all horizons remain negatively correlated with common disagreement and the relation is statistically significant for the one- to three-year horizons. However, this simple non-overlapping specification is not ideal. The problem is that very few observations are left in the long-horizon regressions and the inference depends on the unclear small sample property of the asymptotic distribution. This problem results from a loss of information in the simple specification. Because only observations at time $0, h, 2h, ...$ are used, in-between information on common disagreement is discarded. Two methods are used to solve this problem. The first method uses the overlapping return specification in (15) but applies asymptotic distributions, as in Hodrick (1992) and Valkanov (2003), that are specifically designed for the overlapping long-horizon regression setup. The second method uses a non-overlapping return specification in Hodrick (1992) that does not result in a loss of information.

[21]The monthly price-earnings ratio, PE, is constructed from the S&P composite index and its earnings, both of which are downloaded from Robert Shiller's website.

[22]This time-series result differs, though is not inconsistent with the cross-sectional result in La Porta (1996), who finds that stocks with rosy analyst expectations tend to do poorly afterwards.

3.4.1 Long horizon return regression

Following Hodrick (1992) and Valkanov (2003), this section uses log excess return as dependent variable although similar results are obtained using simple excess return.[23] Panel D of Table 4 shows the results using the Hodrick (1992) standard error.[24] The statistical significance is consistent with that from the Newey and West (1987) standard error in Panel A.

Valkanov (2003) constructs a $t \big/ \sqrt{T}$ test statistic from dividing the ordinary least squares (OLS) t-statistic by the square root of the sample length. The test allows for persistent right-hand-side regressors. Valkanov (2003) provides asymptotic distributions for the $t \big/ \sqrt{T}$ statistic and the OLS R-square.[25] The results are shown in Panel D of Table 4. The negative relation between common disagreement and ex-post return is statistically significant for all return horizons of one to three years. Under the null hypothesis of no effect from common disagreement, the probability of observing the high regression R-square by chance is less than 2%.

3.4.2 Non-overlapping return regression

This section studies an alternative specification that uses non-overlapping returns and involves no loss of information. Specifically, Hodrick (1992) suggests the following specification:

$$LOGMRET_{t,t+1} = \alpha + \beta \cdot \left(h^{-1} \sum_{\tau=0}^{h-1} DISAG_{t-\tau} \right) + \varepsilon_t \tag{17}$$

which regresses one-month return on the lagged h-month average of common disagreement.[26] The regression results are in Panel E of Table 4. There is a negative relation between common disagreement and ex-post return and the effect is stronger using the lagged one-year or two-year average of common disagreement. The adjusted R-squares are lower than those in Panel A because the dependent variable is the one-month return.

Stambaugh (1999) discusses a regression bias that arises when return is regressed on a lagged regressor and innovations to the regressor and return are correlated. Unlike the dividend yield studied in Stambaugh (1999), common disagreement does not mechanically relate to the market return. Nonetheless, a simulation is conducted to measure the potential magnitude of the Stam-

[23] The log excess market return is defined as $\log(1 + \text{market return}) - \log(1 + \text{T-bill return})$, which is the log market return when T-bill instead of cash is used as numeraire.

[24] Specifically, the standard error is calculated using Equation (8) in Hodrick (1992). Ang and Bekaert (2007) show that it performs well in small samples.

[25] These asymptotic distributions can be obtained by simulation and depend on a nuisance parameter c, which is constructed in the current study using the procedure in Stock (1991), as suggested by Valkanov (2003). The nuisance parameter is set to $c = -19.41$. The other parameters used in the Valkanov (2003) test are $\delta = 0.1619$, number of simulation sample paths = 10000, and the step size in discretizing the continuous-time stochastic processes = 1/10000.

[26] The intuition is that the slope coefficient of regressing h-horizon return $LOGMRET_{t,t+h}$ on common disagreement $DISAG_t$ is derived from $cov\left(LOGMRET_{t,t+1} + \cdots + LOGMRET_{t+h-1,t+h}, DISAG_t\right)$ which, for stationary series, is equivalent to $cov\left(LOGMRET_{t,t+1}, DISAG_t + \cdots + DISAG_{t-h+1}\right)$.

baugh (1999) bias in Panel E of Table 4.[27] The bias is small relative to the actual estimate (e.g., the estimated bias is -0.0013 compared to the coefficient of -0.0189 in the actual one-year return regression). This panel also shows the p-value for the null hypothesis of zero effect from common disagreement by comparing the t-statistic in the actual regression (17) to the percentiles of the t-statistics in simulation.[28] The p-value from simulation is consistent with the t-statistic in the actual regression.

Panel E of Table 4 further constructs a Campbell and Yogo (2006) Bonferroni Q-test confidence interval for the coefficient of common disagreement in (17). The test is motivated by the uniformly most powerful test and allows broad dynamics of the regressor (e.g., a finite-order autoregressive process with the largest root less than, equal to, or even greater than one). Only 90% confidence intervals are shown because Campbell and Yogo (2005) and Campbell and Yogo (2006) tabulate for one-sided test of 5% p-value.[29] The confidence intervals are consistent with the t-statistics in Panel E.[30]

3.4.3 Control for other variables that correlate with expected market return

Motivated by the finding in (16), this section controls for a host of other variables that correlate with ex-post market return. These variables are reviewed in Goyal and Welch (2005) and Campbell and Thompson (2007) and include the price-earnings ratio PE, consumption-wealth ratio CAY, dividend-price ratio DP, smoothed earnings-price ratio $SMOOTHEP$, book-to-market ratio BM, short-term interest rate $SHORTYIELD$, long-term bond yield $LONGYIELD$, the term spread between long- and short-term Treasury yields $TERMSPREAD$, the default spread between corporate and Treasury bond yields $DEFAULTSPREAD$, the lagged rate of inflation $INFLATION$, and the equity share of new issues $EQUITYSHARE$.[31]

First, these variables are added one-by-one into regression (15). The regressions are monthly except for CAY (quarterly). Panel F of Table 4 shows the results. The coefficients of common

[27] The simulation is similar to those in Kothari and Shanken (1997), Lewellen (2004), and Ang and Bekaert (2007). In the simulation, the "true" coefficients are set to the estimates of (17). Common disagreement is assumed to follow an AR(1) process with coefficients given by column (1) of Table 3. The error terms are drawn with replacement from the joint empirical distribution of the two residuals in the regression (17) and in the regression in column (1) of Table 3. The Stambaugh (1999) bias is measured by the difference between the average simulation estimate of common disagreement in regression (17) and the "true" coefficient.

[28] This second simulation is identical to the first simulation except that the "true" coefficient is set to zero.

[29] Following Campbell and Yogo (2005), the autoregressive order of the regressor is determined using the Bayes Information Criterion (BIC) in computing the confidence intervals.

[30] The intuition why the t-statistics perform well is that the common disagreement does not mechanically relate to returns. For example, in the one-year regression, the Campbell and Yogo (2006) δ (defined as the correlation between innovations to return and innovations to common disagreement) is only 0.165. This contrasts with the dividend-price ratio, which has close to perfect correlation with return (Table 4 in Campbell and Yogo (2006)). According to Table 1 of Campbell and Yogo (2006), with such a low δ, the conventional t-statistics are valid unless the auto-correlation of common disagreement is so high that the auto-correlation coefficient is above 0.993. From column (1) of Table 3 in this paper, the actual auto-correlation in the sample is only 0.93.

[31] Quarterly data on the consumption-wealth ratio, CAY, are obtained from Martin Lettau's website. The other variables can be obtained from the website of Amit Goyal. Monthly observations on these variables are available from 1981 to 2005.

disagreement are negative across the return horizons and the additional control variables.[32] The estimates are statistically significant for all regressions involving the one- and two-year return horizons and for most three-year regressions. The estimates are in line with those in Panel A of Table 4.

Next, all of the control variables are added into the regression.[33]

$$\begin{aligned} MRET_{t,t+h} = \beta_0 &+ \beta_1 \cdot DISAG_t + \beta_2 \cdot PE_t + \beta_3 \cdot CAY_t + \beta_4 \cdot DP_t + \beta_5 \cdot SMOOTHEP_t \\ &+ \beta_6 \cdot BM_t + \beta_7 \cdot LONGYIELD_t + \beta_8 \cdot TERMSPREAD_t \\ &+ \beta_9 \cdot DEFAULTSPREAD_t + \beta_{10} \cdot INFLATION_t \\ &+ \beta_{11} \cdot EQUITYSHARE_t + \varepsilon_t. \end{aligned} \tag{18}$$

The results are in Panel G of Table 4. The coefficient of interest is β_1. It remains statistically and economically significant at the one-year to three-year horizons. Panel G provides two adjusted R-squares. The first R-square is for the regression (18). The second R-square is for a regression that is otherwise identical to (18) except that common disagreement is omitted. There is substantial improvement in regression fit when common disagreement is included. For example, when including all the controls, the R-square in the one-year regression is 21.7% compared to 38.9% when common disagreement is added. The two- and three-year regression results are similar.[34]

3.5 Common disagreement and time-varying value premium

Proposition 3 shows that innovations in common disagreement correlate with *contemporaneous* discount-rate news instead of cash-flow news. The following regression tests this prediction.

$$DISAG_t - DISAG_{t-h} = \alpha + \beta \cdot NDR_{t-h,t} + \gamma \cdot NCF_{t-h,t} + \varepsilon_t$$

where $DISAG$ is the common disagreement. $NDR_{t-h,t}$ ($NCF_{t-h,t}$) is the discount-rate news (cash-flow news) from month $t-h$ to t, constructed as the sum of the monthly discount-rate news $NDR_{t-h+1}, ..., NDR_t$ (monthly cash-flow news $NCF_{t-h+1}, ..., NCF_t$) from the return decomposition in Campbell and Vuolteenaho (2004). h ranges from six months to three years.[35]

The results are presented in Panel A of Table 5. Increases in common disagreement are associ-

[32]The coefficients of the other control variables are in line with earlier studies. Judging by the regression R-square in a separate univariate regression of ex-post return on these control variables one-by-one, price-earnings ratio has the most explanatory power in the sample followed by dividend-price ratio. These results are suppressed for brevity.

[33]In this regression, CAY is converted into monthly data by assigning to each observation the last available quarterly value. $SHORTYIELD$ is omitted because of multicollinearity with $LONGYIELD$ and $TERMSPREAD$.

[34]When common disagreement is included, substantial improvement in R-square is similarly observed in the regressions in Panel F of Table 4 where the other control variables are included one-by-one. These results are suppressed for brevity.

[35]The one-month horizon is excluded because, at this frequency, the measured change in disagreement does not entirely coincide with the return. This is because analyst disagreement is measured using the latest available forecasts prior to the month end and the return is measured using prices at the month end. This issue is less pronounced for longer horizons. Nonetheless, the regression has been repeated for the one-month horizon and the result is similar. This result is suppressed for brevity.

ated with negative contemporaneous discount-rate news and the relation is statistically significant for all horizons. In contrast, the estimates for cash-flow news flip signs depending on the horizon and none of them are statistically significant, confirming the predictions of Proposition 3.

This section then tests the prediction of Corollary 4. First, the predicted sensitivity of growth/value stock returns to *contemporaneous* variations in common disagreement is tested. Following Fama and French (1993), growth and value portfolios are formed at the end of June each year. Growth/value stocks are defined as those with the lowest/highest 30% book-to-market ratio using NYSE breakpoints. Book-to-market ratios are constructed as in Daniel and Titman (2006) and firms with negative book values are excluded. Let $LRET_{t-h,t}$ (or $HRET_{t-h,t}$) denote the value-weighted portfolio returns of low (or high) book-to-market stocks from month $t-h$ to t in excess of linked one-month T-bill rate. The following time-series regression is run separately for growth and value portfolios:

$$LRET_{t-h,t} \text{ (or } HRET_{t-h,t}) = \alpha + \beta \cdot (DISAG_t - DISAG_{t-h}) + \varepsilon_t.$$

The return horizon h ranges from one month to three years. The results are in Panel B of Table 5. Contemporaneously, growth stock returns are positively correlated with shocks to common disagreement. The correlation is statistically significant for all return horizons. In contrast, the correlations for value stocks, though positive, are smaller and less statistically significant.[36]

Having learned that growth stocks go up more when common disagreement is on the way up, then when common disagreement reaches a high level and subsequently mean reverts, the same sensitivity implies growth stocks go down more than value stocks (i.e., the negative relation between common disagreement and *ex-post* return should be stronger for growth stocks than for value stocks). To examine this, ex-post growth (value) portfolio returns are regressed on common disagreement:

$$LRET_{t,t+h} \text{ (or } HRET_{t,t+h}) = \alpha + \beta \cdot DISAG_t + \varepsilon_t. \tag{19}$$

Panel C of Table 5 shows the results. Consistent with the prediction, both growth and value stock returns correlate negatively with common disagreement, and the effect is stronger for growth stocks. A one-standard-deviation increase in common disagreement is associated with a reduction of ex-post one-year growth (or value) stock return by 8.17% (or 2.58%).

Given the different impact of common disagreement on growth and value stocks, one might conjecture that common disagreement has explanatory power for the time-series variations of the Fama and French (1993) HML (High-Minus-Low book-to-market portfolio) return. To test this prediction, the HML returns (downloaded from Kenneth French's website) are regressed on the common disagreement:

$$HML_{t,t+h} = \alpha + \beta \cdot DISAG_t + \varepsilon_t \tag{20}$$

where $HML_{t,t+h}$ refers to the linked HML return from month t to $t+h$. The results are presented

[36]The difference between value and growth stocks is statistically significant. This conclusion is based on a pooled regression of growth and value stock returns on changes in $DISAG$, a dummy variable that equals 1 (0) for growth (value) stock portfolio, and their interactions. The coefficient in front of the interactive term is statistically significant at 95% level for all return horizons. This result is suppressed for brevity.

in Panel D of Table 5. The coefficients of common disagreement are all positive and statistically significant for return horizons from one to three years. Common disagreement alone accounts for 22.3% of the one-year HML return variations.

The next regression controls additionally the book-to-market ratio of value stocks relative to growth stocks:

$$HML_{t,t+h} = \alpha + \beta \cdot DISAG_t + \gamma \cdot (LOGBM_H - LOGBM_L) + \varepsilon_t \tag{21}$$

where $LOGBM_H$ (or $LOGBM_L$) refers to the log of the value-weighted book-to-market ratio for the value (or growth) stock portfolio. The results are presented in Panel E of Table 5. Even after controlling for book-to-market ratios, the common disagreement has a statistically and economically significant effect on ex-post HML return. The coefficient of common disagreement in the one-year regression is 0.157 (t-stat = 2.47). A one-standard-deviation increase in common disagreement is associated with an increase of 5.97% (e.g., 2% to 7.97%) in ex-post one-year HML return.

3.6 Why are growth stocks more sensitive to discount-rate news?

The result in Corollary 4 builds on the empirical finding in Campbell and Vuolteenaho (2004) that growth stocks are more sensitive to discount-rate news than value stocks. To explain such cross-sectional variation in stock-return sensitivity to discount-rate news, this section examines the common disagreement of book-to-market (B/M) sorted portfolios. In this section, portfolio-specific common disagreement is constructed as the value-weighted average of individual stock disagreements within each sorted portfolio (as opposed to marketwide average in previous sections).

The stocks are sorted into quintile portfolios based on the B/M ratio. The B/M ratio is constructed in the same way as in Section 3.5. Panel A of Table 6 shows summary statistics of the five portfolios. On average, the low B/M portfolios (growth stock portfolios) have more stocks, larger market capitalization, more analyst coverage, and lower return.

Let $BMDISAG_t(i)$ for $i = 1, 2, ..., 5$ denote the common disagreement of each of the five B/M portfolios in month t. $BMDISAG$ is constructed as the value-weighted average of individual stock disagreements using only stocks in the corresponding B/M quintile. Panel B shows the correlation matrix of the portfolio-specific common disagreements. The common disagreements of the five portfolios are positively correlated, though the correlation diminishes for portfolios that are further apart in terms of the B/M ratio.

Controlling for belief dispersion, Corollary 5 predicts that Proposition 2 holds stronger for portfolios held by more optimistic investors. Using the notation of Section 2, the marginal investor's total optimism is $b_h\sigma$, where σ is the portfolio common disagreement and b_h is the optimism per unit of common disagreement (i.e., b_h is the optimism controlling for belief dispersion). Fixing b_h, high disagreement stocks are more overvalued relative to low disagreement stocks. The overvaluation is stronger if b_h is higher. It is plausible to conjecture that growth stocks are held by investors with higher b_h so that Proposition 2 applies more to growth stocks than value stocks.

First, growth stocks have historically underperformed value stocks (see Panel A of Table 6 and, for example, Fama and French (1992)). In addition, Panel C1 of Table 6 shows, for portfolios double sorted by B/M ratio and disagreement, the annual return alphas relative to the market factor. Consistently, high disagreement stocks have lower return alpha than low disagreement stocks, and the underperformance is more pronounced for growth stocks. For example, within the top growth stock quintile, high disagreement stocks have an annual return alpha of -4.42% compared to low disagreement stocks whose alpha is 2.80%, a difference of -7.22% (t-stat = 2.17). The underperformance of high disagreement stocks diminishes monotonically for portfolios with higher B/M ratios. Within the top value quintile, the alpha spread between the high and low disagreement stocks is only -0.26% per year, which is statistically insignificant. The difference between the extreme value and growth quintiles is 6.96% per year (t-stat = 1.97).[37] Alternatively, holding disagreement fixed, stocks held by investors with higher b_h are predicted to be more overvalued and this overvaluation is more pronounced if the disagreement is high. Consistently, Panel C1 shows that, among high disagreement stocks, the value stocks have an annual alpha of 6.84% compared to growth stocks that have an annual alpha of -4.42%, a difference of 11.27% (t-stat = 2.15). This outperformance by value stocks diminishes monotonically for portfolios with lower disagreement. Among the portfolio of stocks with the lowest disagreement, the alpha spread between value and growth stocks is only 4.31% per year (t-stat = 1.63). Further, Panel D of Table 6 provides time-series evidence that growth stocks are held by investors with higher b_h. When common disagreement (σ) changes, portfolios with higher b_h should be more positively correlated with such changes in disagreement. This is confirmed in Panel D, which conducts the following regression for each of the five B/M portfolios:

$$BMRET_{t-h,t}(i) = \alpha + \beta \cdot (BMDISAG_t(i) - BMDISAG_{t-h}(i)) + \varepsilon_t.$$

$BMRET_{t-h,t}(i)$ denotes the value-weighted return from $t-h$ to t in excess of the linked T-bill rate for each B/M portfolio $i = 1, 2, ..., 5$. The results in Panel D show that the growth stock returns are more positively related to the contemporaneous changes in portfolio common disagreement.[38] The difference between growth and value stocks is statistically significant and holds across various return horizons.

Given the evidence that the marginal investors in growth stocks are more optimistic (controlling for belief dispersion), Corollary 5 predicts that the ex-post growth portfolio return is more negatively

[37] The monotonic patterns across portfolios are similar for other return horizons and the results are statistically significant at the 95% level for the return horizons of 1 to 3 years, significant at the 90% level for the return horizon of six months (Panel C2 of Table 6). The results using raw portfolio returns are similar though noisier because the high disagreement stocks tend to have high market beta. The results are also similar when controlling the Fama and French (1993) SMB factor. These results are suppressed for brevity. I do not control the Fama and French (1993) HML factor when computing the return alphas because this section studies portfolios sorted by B/M ratio.

[38] There is some suggestive evidence in Panels D and E of Table 6 that value stocks may even have pessimists ($b_h < 0$) as the marginal investor so that the value stocks' contemporaneous return is low when common disagreement increases and ex-post return is high following high common disagreement. However, this interpretation is subject to the caveat that it is unclear what the benchmark relation is in these two panels. Therefore, this paper focuses on the difference between growth and value portfolios.

correlated with portfolio common disagreement. Panel E of Table 6 conducts, for each B/M portfolio $i = 1, 2, ..., 5$, the following regression:

$$BMRET_{t,t+h}(i) = \alpha + \beta \cdot BMDISAG_t(i) + \varepsilon_t.$$

Consistent with the prediction of Corollary 5, the results in Panel E show that the ex-post growth portfolio returns are more negatively related to growth portfolio common disagreement.[39]

Taken together, the results show that the common disagreement channel provides an explanation for why growth stocks are more sensitive to discount-rate news than value stocks. Compared to value stocks, growth stocks are held by more optimistic investors (controlling for disagreement), whose valuations are more sensitive to changes in belief dispersion and hence more sensitive to those variations in discount rate driven by common disagreement.

3.7 Robustness checks

The scatterplot and the nonparametric estimate in Figure 4 indicate that the effect of common disagreement on return is not driven just by a few observations. To further confirm that it is not driven entirely by the dot-com era, a subsample analysis is conducted by dividing the sample period into two. The first subsample spans December 1981 – December 1993, a total of 145 monthly observations. The second subsample starts from January 1994 and ends in December 2005, a total of 144 monthly observations.[40] Regression (18) is run separately for each subsample. The results are in Panel A of Table 7. In both subsamples, there is a statistically and economically significant negative relation between market return and common disagreement for the one- to three-year horizons. The effect of common disagreement is similar in the subsamples for the one-year return and is somewhat stronger for the two- and three-year returns in the latter sample.[41] A subsample analysis is also conducted for the HML return regression (21). The effect of common disagreement on HML return is statistically and economically significant for both subsamples, though somewhat stronger in the more recent subsample.[42]

Panel B of Table 7 studies the effect of common disagreement for portfolios sorted by size. Ex-post size portfolio returns are negatively related to portfolio common disagreement and the effect is stronger for the return horizons of one to three years.

High turnover can also reflect disagreement (e.g., Scheinkman and Xiong (2003) and Baker and

[39] Similar to Figure 4, I have checked the scatterplots of ex-post return on portfolio common disagreement for each of the B/M portfolios and the results in Panel E of Table 6 do not appear driven just by a few observations. I have repeated the analysis controlling for the level of analyst forecast of long-term EPS growth rate of each portfolio. The results are similar and the forecast level is insignificant. I have also repeated the analysis for portfolios constructed by a double sort on B/M ratio and market capitalization. The result is similar except that it is somewhat noisier for small stocks, consistent with Panel B of Table 7. These results are suppressed for brevity.

[40] Other subsample classifications such as before/after year 1990 give similar results. These results are suppressed for brevity.

[41] I have repeated the subsample analysis by including the controls one-by-one using only those control variables that are statistically significant in the regressions in Panel F of Table 4 and the results are similar. These results are suppressed for brevity.

[42] These results are suppressed for brevity.

Stein (2004)). In Panel C of Table 7, turnover is measured by the average monthly turnover in the past twelve months to avoid seasonality within a year (see Hong and Yu (2008)).[43] Without common disagreement, ex-post market return is negatively related to turnover and the effect is statistically significant for the one- to three-year horizons. To the extent that turnover can be a proxy for disagreement, this is supportive evidence for the model predictions of this paper. However, turnover may have other interpretations (see, e.g., Amihud, Mendelson, and Pedersen (2005)). Therefore, the current study controls turnover when regressing return on common disagreement. Even after controlling for turnover, the effect of common disagreement on ex-post return remains statistically significant and is similar in magnitude to that in Panel A of Table 4. Compared to the regression with turnover alone, there is substantially more explanatory power from common disagreement according to the adjusted R-squares.

One reason why turnover is likely a noisier measure of common disagreement is that it does not distinguish common disagreement and disagreement in the aggregate market. This is because the market turnover mechanically equals the average of individual stock turnovers. However, common disagreement need not relate to disagreement over the market (recall that the model in Section 2 can deliver arbitrary common disagreement even if investors agree on the overall market fundamental). Section 2 assumes away disagreement in the aggregate to single out the effect of commonality in purely idiosyncratic disagreements. In reality, disagreement in the aggregate can also contribute to common disagreement through correlation between individual stock fundamental and market fundamental. Such common disagreement can affect market valuation through the same mechanism as common idiosyncratic disagreement. Disagreement in the aggregate is controlled next to disentangle the effect due to common idiosyncratic disagreement and disagreement in the aggregate. The I/B/E/S database provides analyst forecasts on annual S&P 500 index earnings during 1982-2001.[44] Following Diether, Malloy, and Scherbina (2002), disagreement in the aggregate, $MKTDISAG$, is measured by the analyst forecast standard deviation of S&P 500 earnings as a percentage of average analyst forecast.[45] Panel D1 of Table 7 shows the correlation between $DISAG$ and $MKTDISAG$.

[43] Turnover has increased sharply in recent years. Following Baker and Stein (2004), turnover is stochastically detrended by subtracting the average turnover in the previous five years and the regression includes the dividend-price ratio and equity share of new issues as additional control variables.

[44] After 2001, most analysts cease forecasting S&P 500 reported earnings and forecast S&P 500 operating earnings instead. Alternatively, a longer series is constructed by appending forecast dispersions of operating earnings to forecast dispersions of reported earnings after 2001 and the results are similar. Instead of linking the two series at 2001, the two series are also linked at 1996, when the number of analysts covering S&P 500 operating earnings exceeds that for reported earnings. To remove the discontinuity when the series for reported and operating earnings are joined together, the series for operating earnings is adjusted by adding (or multiplying) a constant so that the linked series are continuous, in addition to using the raw linked series. The results are similar. Analyst forecasts of the long-term growth rate of S&P 500 reported and operating earnings are also used to measure disagreement in the aggregate. There are significantly less analysts covering the long-term growth rate of S&P 500 earnings. Nonetheless, the effect of common disagreement remains similar. These results are suppressed for brevity.

[45] Within a year, as additional quarterly earnings are released, the disagreement over the annual earning is likely to decrease mechanically. To address this, I measure $MKTDISAG$ in each December using forecasts for fiscal year ending in December next year and set $MKTDISAG$ in January–November to its value in December of the previous year. Nonetheless, I have also used the raw monthly observations of forecast standard deviation scaled by average forecast. The results are similar using either forecasts for fiscal year 1 or fiscal year 2. I have also used the S&P 500 index return instead of the CRSP value-weighted index return as the dependent variable and the results are similar.

The correlation is 0.021 and is insignificantly different from zero. This confirms that common disagreement is not mechanically related to disagreement in the aggregate. The effect of disagreement in the aggregate is studied by running the following two regressions:

$$MRET_{t,t+h} = \alpha + \beta \cdot MKTDISAG_t + \varepsilon_t \tag{22}$$

$$MRET_{t,t+h} = \alpha + \beta \cdot MKTDISAG_t + \gamma \cdot DISAG_t + \varepsilon_t. \tag{23}$$

The results are presented in Panel D2 of Table 7. The results from regression (22) show that the disagreement in the aggregate is negatively associated with ex-post return, consistent with Park (2005). Even after disagreement in the aggregate is controlled for, Panel D2 shows that the common disagreement has a significantly negative relation with ex-post return and the magnitude is similar to that in Table 4. There is also substantial improvement in the adjusted R-Square when common disagreement is included. For the one-year return, the adjusted R-square for the univariate regression (22) is 7.2% and increases to 38.8% when common disagreement is included. The results suggest that the effect of common disagreement derives mainly from common idiosyncratic disagreement, not from disagreement in the aggregate. Consistent with the turnover results in Panel C of Table 7, the stronger results from $DISAG$ are likely due to its sharper focus on common disagreement than on disagreement in the aggregate. This interpretation is also consistent with Panel A of Table 5, which finds little correlation between $DISAG$ and cash-flow news. The prediction of zero correlation between $DISAG$ and cash-flow news in Proposition 3 is based on the assumption of idiosyncratic disagreement. When there is disagreement in the aggregate, variations in the optimism regarding the market fundamental will drive cash-flow news. The absence of correlation between $DISAG$ and cash-flow news in the data adds to the evidence that $DISAG$ is mainly driven by common idiosyncratic disagreement.

Panel E of Table 7 repeats the regression (15) except that the common disagreement is constructed using the equal-weighted (instead of value-weighted) individual stock disagreements and the results are similar to those in Table 4.[46]

In Panel F of Table 7, an alternative proxy of common disagreement is constructed using I/B/E/S analyst forecasts of the next fiscal year EPS instead of forecasts of long-term EPS growth rate. To avoid data-mining, the individual stock disagreement is measured by the analyst forecast standard deviation scaled by the absolute value of average forecast, following Diether, Malloy, and Scherbina (2002). The value-weighted average of this alternative proxy of individual stock disagreement, $FYDISAG$, is used to measure common disagreement.[47] Column (1) of Panel

These results are omitted for brevity.

[46] I have also used common disagreement in log scale, a binary measure of common disagreement (high versus low), common disagreement constructed without first winsorizing individual stock disagreements, and common disagreement constructed using only stocks covered by at least five analysts. The results are largely similar and are suppressed for brevity.

[47] Within a fiscal year, as additional quarterly earnings are released, the disagreement over the fiscal year EPS is likely to decrease mechanically. To address this, only firms whose fiscal years end in December are included. $FYDISAG$ is measured in each December using forecasts for the fiscal year ending in December next year. $FYDISAG$ in January–November is set to its value in December of the previous year.

F reports the regression result of ex-post one-year excess market return on $FYDISAG$. There is similarly a negative relation between common disagreement and ex-post return. Even when controlling for $FYDISAG$, the effect of $DISAG$ is statistically significant, with magnitude similar to that in Table 4.

De Bondt and Thaler (1985) and Fama and French (1988b) show that the stock market exhibits negative autocorrelation at long-horizons. Panel G of Table 7 controls for lagged market return when regressing ex-post market return on common disagreement. The coefficient of lagged return is negative and statistically significant for the three-year regression, consistent with Fama and French (1988b). Even with the additional control, the effect of common disagreement remains similar to that in Table 4.[48]

4 Conclusion

This paper studies the effect of individual security disagreements on portfolio valuation. The model in this paper shows that commonality in disagreements can make the portfolio valuation deviate from its fundamental, even if individual security beliefs are idiosyncratic (in level) and therefore all investors agree correctly on the NPV of the portfolio. The parsimonious model of common disagreement gives predictions on the time-varying equity premium, the time-series variation in discount-rate news, the cross-sectional variation in stock return sensitivity to discount-rate news, and the time-varying value premium. These predictions are supported by the empirical evidence.

The findings have interesting implications for asset price runups. They imply that a bubble can potentially persist even if all investors are aware of it. If different individual securities (such as individual houses) are held by different optimists, the market valuation can be higher than its fundamental by aggregating the optimistic views in the cross section.

One can extend the findings along many dimensions. While this paper largely focuses on the pricing of a portfolio versus individual stocks, the idea is applicable to other settings, such as the valuation of a corporation with multiple subsidiaries, which can generate potential implications for M&A or spin-offs. More generally, contrary to the NPV formula where the composition of cash flow is irrelevant, the findings suggest that prices may depend on how the total cash flow at each point in time decomposes and how investors form their diverse opinions on these cash-flow components. Aggregation of such diverse information or beliefs may not always lead to straightforward pricing implications. One may question whether disagreement will disappear after sufficiently long periods of learning. Acemoglu, Chernozhukov, and Yildiz (2006) suggest that the disagreement among Bayesian-learning agents may never disappear and can in some cases diverge, even after observing an infinite sequence of signals, if there is uncertainty regarding the interpretation of the signals. This suggests that the effect documented in this paper can potentially persist for a long time.

[48] I have included other control variables such as the Baker and Wurgler (2007) sentiment index, market return volatility, and market return skewness. The results are similar and suppressed for brevity.

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Appendix

Proof of Proposition 1: $r_f = 0$ because the demand for borrowing is zero and the supply is positive — pessimistic funds sit on the sideline due to short-sale constraint and invest in the risk-free rate, optimistic funds do not lever. A fund invests W in a stock when it is optimistic in this stock. To clear the market, the funds have to hold all outstanding shares:

$$P_i = \left(1 - F\left(\frac{P_i - m}{\sigma_i}\right)\right) W \tag{24}$$

which implies $P_i > m$ if $W/2 > m$ (otherwise, if $P_i \leq m$, $P_i = \left(1 - F\left(\frac{P_i - m}{\sigma_i}\right)\right) W \geq W/2 > m$, a contradiction). To see (5), (24) and the implicit function theorem (see Rudin (1976)) imply:

$$\frac{d}{d\sigma} P_i = (P_i - m)\, b_i / a_i > 0$$

where

$$\begin{aligned} a_i &= 1 + \frac{W}{\sigma_i} F'\left(\frac{P_i - m}{\sigma_i}\right) > 0 \\ b_i &= \frac{W\beta_i}{\sigma_i^2} F'\left(\frac{P_i - m}{\sigma_i}\right) > 0. \end{aligned}$$

Notice that σ_i and σ refer to the (total) disagreement of stock i and common disagreement, respectively. Therefore, the individual stock valuation hence the index valuation is increasing in common disagreement. The return implication in (5) follows because the payoff in the last period is unaffected by the common disagreement. The high period-0 price implies low return. □

Proof of Proposition 2: Equations (7) and (8) can be solved to give P_h, P_l, and b_h. When there is disagreement, $b_h > 0$ if $W/2 > 1/r_f$. $E_h[r_M] < E_l[r_M]$ follows from $P_h > P_l$ and the fact that the future dividend and stock price are unaffected by current disagreement. $E_l[r_M] = r_f$ because the individual-stock marginal investors make correct dividend forecasts when there is no disagreement, see (7). □

Proof of Proposition 3: This proposition follows from:

$$r_{t+1} - E_t r_{t+1} = \begin{cases} (1-p)\left[\log(1+P_h) - \log(1+P_l)\right] & \text{if } \sigma_{i,t+1} = \sigma_h \\ p\left[\log(1+P_l) - \log(1+P_h)\right] & \text{if } \sigma_{i,t+1} = \sigma_l \end{cases}$$

where r is the log return of the index and can be calculated from the prices in Proposition 2, given that investors agree that the index dividend is 1 in each period. □

Table 1: Summary Statistics

Panel A reports summary statistics for $DISAG$ and LTG. $DISAG$ (LTG) is the value-weighted cross-stock average of analyst forecast standard deviation (average forecast) of individual stock long-term EPS growth rate. The analysts' forecast standard deviations and average forecasts are winsorized at the 1% and 99% levels to construct $DISAG$ and LTG. $DISAG$ and LTG are in percentages. Panel B reports summary statistics for various portfolio returns. $MRET_{t,t+h}$ is the excess market return measured by the CRSP value-weighted return (including distributions) in excess of linked one-month T-bill rate from month t to $t+h$. NDR and NCF are the discount-rate and cash-flow news from the return decomposition in Campbell and Vuolteenaho (2004). For each variable, the sample period, number of observations (# obs), time-series average (avg), standard deviation (std dev), minimum (min), and maximum (max) are reported.

Panel A. Proxies of beliefs (%)

	sample period t	# obs	avg	std dev	min	max
$DISAG_t$	1981.12–2005.12	289	3.23	0.38	2.70	4.42
LTG_t	1981.12–2005.12	289	14.23	1.76	12.37	20.82

Panel B. Excess market portfolio return (×100)

	sample period t	# obs	avg	std dev	min	max
$MRET_{t,t+1}$	1981.12–2005.12	289	0.68	4.41	-23.13	12.43
$MRET_{t,t+6}$	1981.12–2005.12	289	4.37	11.09	-27.97	37.60
$MRET_{t,t+12}$	1981.12–2005.12	289	9.17	16.32	-34.71	58.36
$MRET_{t,t+24}$	1981.12–2004.12	277	18.64	23.60	-48.73	65.59
$MRET_{t,t+36}$	1981.12–2003.12	265	30.93	33.16	-52.48	106.04
$NDR_{t-1,t}$	1981.12–2001.12	241	-0.42	4.83	-17.20	21.18
$NCF_{t-1,t}$	1981.12–2001.12	241	-0.13	2.21	-10.55	5.48

Table 2: Commonality in Individual Stock Disagreements

Column (1) conducts, for each stock, a time-series regression of the monthly proportional changes in $STKDISAG$ (which is the individual stock's analyst forecast standard deviation of long-term EPS growth rate) on contemporaneous proportional changes in the value-weighted cross-sectional average of $STKDISAG$. The average of the stock-by-stock regression slope coefficients is reported with t-statistic adjusted for heteroskedasticity in parenthesis. "% positive" reports the percentage of positive slope coefficients, while "% positive significant" gives the percentage of stock-by-stock regression t-statistics (from Newey and West (1987)) that are greater than 1.645 (the 5% critical level in a one-sided test). Column (2) conducts, for each stock, a time-series regression of monthly proportional changes in its $STKDISAG$ on contemporaneous and lagged proportional changes in value-weighted cross-sectional average of $STKDISAG$. "Sum" is the sum of the contemporaneous and the lagged slope coefficients. "Median" is the median of the stock-by-stock slope coefficients in columns (1) and is the median of "Sum" in column (2). "p-value" is the p-value of a signed test of the null hypothesis that median=0. The average of the adjusted R-squares in the stock-by-stock regressions is also reported. A stock is excluded from the construction of the cross-sectional average of $STKDISAG$ in its own regression. The sample period is December 1981 – December 2005.

	(1)	(2)
Concurrent	0.297	0.426
t-stat	(2.22)	(3.09)
% positive	52.0	52.0
% positive significant	15.9	14.6
Lag		0.168
t-stat		(1.47)
% positive		47.8
% positive significant		12.1
Sum		0.595
t-stat		(2.86)
Median	0.058	0.075
p-value	0.0005	0.0010
Average adj R^2	0.76%	0.70%

Table 3: Mean Reversion of Common Disagreement

This table reports the regression results of:

$$DISAG_t = \alpha + \beta \cdot DISAG_{t-lag} + \varepsilon_t$$

where $DISAG$ is the common disagreement, which is the cross-sectional value-weighted average of individual stock disagreements (measured by analyst forecast standard deviations of long-term EPS growth rate). The lag ranges from one month to three years. Also reported is the mean of $DISAG$ implied by the regression estimates, i.e., implied mean $= \alpha/(1-\beta)$. The t-statistics in parentheses are adjusted for auto-correlation of 36 monthly lags using Newey and West (1987). The sample period is December 1981 – December 2005.

	(1)	(2)	(3)	(4)	(5)
Lag (in months)	1	6	12	24	36
$DISAG_{t-lag}$	0.930	0.751	0.540	0.193	0.041
t-stat	(34.40)	(12.04)	(5.96)	(1.46)	(0.24)
constant	0.225	0.807	1.473	2.556	3.039
t-stat	(2.65)	(3.92)	(4.85)	(5.22)	(4.85)
adj R^2	87.3%	57.4%	31.9%	4.8%	-0.2%
Implied mean $DISAG$	3.20	3.24	3.20	3.17	3.17

Table 4: Common Disagreement and Time-varying Equity Premium

Panel A reports the regression results of ex-post market return in excess of the risk-free rate on common disagreement $DISAG$. The return horizon ranges from one month to three years. Panel B conducts the same regression as in Panel A controlling for LTG (the expected long-term EPS growth rate) and PE (price-earnings ratio). Panel C repeats the regression in Panel A, controlling for PE using non-overlapping returns. Panel D reports the Hodrick (1992) t-statistics for the regression in Panel A except that the market return is in log scale following Hodrick (1992). Panel D also reports the Valkanov (2003) $t \Big/ \sqrt{T}$ statistic, the p-value for the $t \Big/ \sqrt{T}$ statistic, and the p-value for the regression R-square. Panel E regresses one-month ex-post excess market return, also in log scale, on lagged h-month average of $DISAG$. Panel E also estimates the potential magnitude of the Stambaugh (1999) bias via simulation and reports the Campbell and Yogo (2006) Bonferroni Q-test confidence interval (C.I.) for the regression slope of the lagged average of $DISAG$. Panels F and G report the regression results of ex-post market return in excess of the risk-free rate on $DISAG$, controlling a host of other variables that correlate with ex-post market return. In Panel F, I control these other variables one-by-one. In Panel G, I control all of these other variables in one regression. These other variables include price-earnings ratio PE, consumption-wealth ratio CAY, dividend-price ratio DP, smoothed earnings-price ratio $SMOOTHEP$, book-to-market ratio BM, short-term interest rate $SHORTYIELD$, long-term bond yield $LONGYIELD$, the term spread between long- and short-term Treasury yields $TERMSPREAD$, the default spread between corporate and Treasury bond yields $DEFAULTSPREAD$, the lagged rate of inflation $INFLATION$, and the equity share of new issues $EQUITYSHARE$. CAY is measured quarterly in Panel F and is converted to monthly in Panel G by setting an observation equal to the last available quarterly observation. The other variables are measured monthly. For brevity, only the coefficient of common disagreement is shown in Panels F and G. The t-statistics in Panels A–B and F–G are adjusted for auto-correlation using Newey and West (1987), with the number of lags being equal to the return horizons. The t-statistics in Panels C and E are adjusted for heteroskedasticity (White (1980)). The sample period is December 1981 – December 2005.

Panel A. Ex-post excess market return on common disagreement

Return horizon (in months)	1	6	12	24	36
$DISAG$	-0.006	-0.061	-0.174	-0.351	-0.443
t-stat	(0.88)	(1.51)	(2.59)	(2.92)	(2.12)
constant	0.027	0.240	0.654	1.317	1.734
t-stat	(1.21)	(1.94)	(3.16)	(3.48)	(2.70)
adj R^2	-0.1%	4.0%	16.2%	32.8%	27.4%

Panel B. Control for expected long-term growth rate (LTG) and price-earnings ratio (PE)

Return horizon (in months)	1	6	12	24	36
$DISAG$	-0.000	-0.041	-0.163	-0.280	-0.335
t-stat	(0.00)	(0.95)	(2.82)	(2.69)	(1.73)
LTG	-0.002	-0.003	0.004	-0.017	-0.023
t-stat	(0.65)	(0.29)	(0.24)	(0.53)	(0.44)
PE	-0.000	-0.003	-0.007	-0.007	-0.012
t-stat	(1.19)	(1.73)	(2.03)	(1.37)	(1.50)
adj R^2	0.7%	11.1%	26.7%	41.1%	41.0%

Panel C. Non-overlapping return regressions

Return horizon (in months)	1	6	12	24	36
$DISAG$	-0.004	-0.061	-0.127	-0.281	-0.704
t-stat	(0.58)	(1.23)	(2.06)	(1.92)	(2.68)
PE	-0.001	-0.003	-0.005	-0.008	-0.003
t-stat	(1.83)	(1.77)	(1.41)	(1.97)	(0.22)
adj R^2	0.9%	9.1%	13.6%	34.3%	53.1%
number of observations	289	49	25	12	8

Panel D. Hodrick (1992) t statistics and Valkanov (2003) $t\Big/\sqrt{T}$ statistics, log ex-post excess market return on $DISAG$. The asymptotic distributions in Valkanov (2003) depend on a nuisance parameter c. Following Valkanov (2003), c is set to -19.41 using the procedure in Stock (1991).

Return horizon (in months)	1	6	12	24	36
$DISAG$	-0.007	-0.064	-0.174	-0.321	-0.378
Hodrick (1992) t-stat	(0.04)	(1.59)	(2.16)	(2.21)	(2.03)
$t^{OLS}/\sqrt{T}$	-0.057	-0.234	-0.492	-0.770	-0.725
p-value of $t^{OLS}/\sqrt{T}$	0.374	0.112	0.018	0.006	0.018
R^2	0.3%	5.2%	19.6%	37.4%	34.6%
p-value of R^2	0.327	0.092	0.012	0.004	0.014

Panel E. Non-overlapping return regressions: Hodrick (1992) specification, one-month excess return on lagged h-month average (denoted $MA(h)$) of $DISAG$. In the simulation to measure the Stambaugh (1999) bias, the "true" coefficients are set to the regression estimates. $DISAG$ is assumed to follow an AR(1) process, with coefficients given by column (1) of Table 3. The error terms are drawn with replacement from the joint empirical distribution of the two residuals in the regressions of this panel and column (1) of Table 3. 10,000 simulated samples are drawn. The Stambaugh (1999) bias is measured by the difference between the average slope coefficients in the simulation and the "true" coefficient. This panel also shows the p-value of the lagged average of $DISAG$ by comparing the t-statistic in the actual regression to the percentiles of the t-statistics in a second simulation which is identical to the first simulation except that the "true" coefficient is set to zero. In computing the Campbell and Yogo (2006) confidence interval, the autoregressive order of the regressor is determined by Bayes Information Criterion (BIC), as suggested by Campbell and Yogo (2005).

h (in months)	1	6	12	24	36
$MA(h)$ of $DISAG$	-0.0067	-0.0118	-0.0189	-0.0218	-0.0186
t-stat	(0.96)	(1.59)	(2.40)	(2.40)	(1.81)
adj R^2	0.0%	0.6%	1.9%	2.0%	1.0%
Stambaugh (1999) bias	-0.0008	-0.0011	-0.0013	-0.0023	-0.0028
p-value of $DISAG$	0.350	0.121	0.018	0.019	0.074
Campbell and Yogo (2006) 90% C.I.					
lower	-0.0165	-0.0247	-0.0310	-0.0349	-0.0338
upper	0.0070	0.0007	-0.0051	-0.0062	-0.0001

Panel F. Slope coefficients of common disagreement in return regressions, controlling for other variables that correlate with ex-post market return one by one. */**/*** indicate statistical significance at the 90%/95%/99% levels.

Return horizon (in months)	1	6	12	24	36
PE	-0.004	-0.048	-0.152***	-0.323***	-0.394***
CAY (quarterly)	-0.012	-0.056	-0.166**	-0.285**	-0.233
DP	-0.006	-0.058	-0.168***	-0.344***	-0.433***
$SMOOTHEP$	-0.007	-0.068**	-0.190***	-0.372***	-0.481***
BM	-0.006	-0.063*	-0.179***	-0.358***	-0.457***
$SHORTYIELD$	-0.006	-0.064*	-0.185***	-0.361***	-0.467**
$LONGYIELD$	-0.006	-0.064*	-0.184***	-0.366***	-0.472***
$TERMSPREAD$	-0.006	-0.059	-0.169***	-0.337***	-0.419**
$DEFAULTSPREAD$	-0.009	-0.085***	-0.226***	-0.402***	-0.523***
$INFLATION$	-0.006	-0.061	-0.173***	-0.350***	-0.441**
$EQUITYSHARE$	-0.006	-0.074**	-0.207***	-0.415***	-0.572***

Panel G. Slope coefficients of common disagreement in return regressions that include all the other control variables. The first (second) adjusted R-square is for the regression of ex-post market return on all the controls with (without) $DISAG$.

Return horizon (in months)	1	6	12	24	36
$DISAG$	0.004	-0.064	-0.261	-0.438	-0.412
t-stat	(0.45)	(1.66)	(6.27)	(7.56)	(6.72)
all other variables	...	...	...	...	...
adj R^2	4.1%	22.1%	38.9%	58.6%	65.4%
adj R^2 without $DISAG$	4.4%	20.1%	21.7%	34.4%	54.3%

Table 5: Common Disagreement and Time-Varying Value Premium

Panel A reports the regression results of:

$$DISAG_t - DISAG_{t-h} = \alpha + \beta \cdot NDR_{t-h,t} + \gamma \cdot NCF_{t-h,t} + \varepsilon_t$$

where $DISAG$ is the common disagreement. $NDR_{t-h,t}$ ($NCF_{t-h,t}$) is the discount-rate news (cash-flow news) from month $t-h$ to t constructed as the sum of the monthly discount-rate news $NDR_{t-h+1}, ..., NDR_t$ (sum of the monthly cash-flow news $NCF_{t-h+1}, ..., NCF_t$) from the return decomposition in Campbell and Vuolteenaho (2004). Panel B regresses the value-weighted portfolio returns (in excess of risk-free rate) of growth or value stocks (denoted by $LRET$ or $HRET$, respectively) from month $t-h$ to t on contemporaneous changes of the common disagreement:

$$LRET_{t-h,t} \text{ (or } HRET_{t-h,t}) = \alpha + \beta \cdot (DISAG_t - DISAG_{t-h}) + \varepsilon_t.$$

Growth/value stocks are defined as those with the lowest/highest 30% book-to-market values using NYSE breakpoints. Following Fama and French (1993), book-to-market portfolios are formed at the end of June each year. Book-to-market ratios are constructed as in Daniel and Titman (2006). Stocks with negative book values are excluded. Panel C regresses ex-post growth/value portfolio returns in excess of risk-free rate on the common disagreement:

$$LRET_{t,t+h} \text{ (or } HRET_{t,t+h}) = \alpha + \beta \cdot DISAG_t + \varepsilon_t.$$

Panel D regresses ex-post Fama and French (1993) HML (High-Minus-Low book-to-market portfolio) returns on the common disagreement:

$$HML_{t,t+h} = \alpha + \beta \cdot DISAG_t + \varepsilon_t$$

where $HML_{t,t+h}$ refers to the linked monthly HML return from month t to $t+h$. The HML returns are downloaded from Kenneth French's website. Panel E repeats the regression specification in Panel D, controlling for $LOGBM_H - LOGBM_L$. $LOGBM_H$ (or $LOGBM_L$) refers to the log of the value-weighted book-to-market ratio for the value (or growth) stock portfolio. The t-statistics are from Newey and West (1987) with h lags. The sample period is December 1981 – December 2005.

Panel A. Common disagreement and discount-rate news

h	6	12	24	36
$NDR_{t-h,t}$	-0.926	-1.419	-1.253	-1.094
t-stat	(2.91)	(4.54)	(3.07)	(3.19)
$NCF_{t-h,t}$	-1.476	-0.268	0.665	1.294
t-stat	(1.81)	(0.30)	(0.80)	(1.47)
adj R^2	17.1%	34.3%	41.0%	52.4%

Panel B. Contemporaneous growth/value stock returns on changes in common disagreement

h	6	12	24	36
growth stocks				
$DISAG_t - DISAG_{t-h}$	0.151	0.298	0.373	0.495
t-stat	(2.65)	(6.23)	(4.55)	(4.60)
adj R^2	10.0%	31.7%	33.0%	35.3%
value stocks				
$DISAG_t - DISAG_{t-h}$	0.001	0.063	0.021	0.083
t-stat	(0.01)	(0.88)	(0.20)	(0.57)
adj R^2	-0.4%	1.3%	-0.2%	1.4%

Panel C. Ex-post growth/value stock returns on common disagreement

Return horizon (in months)	1	6	12	24	36
growth stocks					
$DISAG$	-0.008	-0.080	-0.215	-0.450	-0.608
t-stat	(1.05)	(1.81)	(3.07)	(3.72)	(2.88)
adj R^2	0.0%	5.9%	20.8%	39.3%	37.3%
value stocks					
$DISAG$	0.002	-0.008	-0.068	-0.160	-0.240
t-stat	(0.32)	(0.24)	(1.29)	(2.53)	(1.87)
adj R^2	-0.3%	-0.3%	2.2%	7.7%	9.5%

Panel D. Ex-post Fama and French (1993) HML returns on common disagreement

Return horizon (in months)	1	6	12	24	36
$DISAG$	0.008	0.070	0.178	0.315	0.335
t-stat	(1.08)	(1.63)	(2.39)	(3.40)	(3.61)
constant	-0.021	-0.200	-0.519	-0.904	-0.927
t-stat	(0.92)	(1.51)	(2.22)	(2.93)	(2.99)
adj R^2	0.5%	8.2%	22.3%	34.0%	36.9%

Panel E. Ex-post Fama and French (1993) HML returns on common disagreement, controlling for the difference in book-to-market ratio between value and growth stock portfolios

Return horizon (in months)	1	6	12	24	36
$DISAG$	0.005	0.057	0.157	0.284	0.294
t-stat	(0.81)	(1.57)	(2.47)	(3.59)	(3.72)
$LOGBM_H - LOGBM_L$	0.014	0.073	0.118	0.169	0.223
t-stat	(1.48)	(1.38)	(1.56)	(1.52)	(2.59)
adj R^2	1.3%	11.3%	25.8%	37.4%	42.8%

Table 6: Common Disagreement of Book-to-Market Sorted Portfolios

Panel A shows the time-series average of the number of stocks, the average market capitalization (in millions US dollars), the average number of analysts covering a stocks, and the value-weighted portfolio return for each of the book-to-market (B/M) quintile portfolios. Following Fama and French (1993), the B/M portfolios are formed at the end of June each year using NYSE breakpoints. B/M ratios are constructed as in Daniel and Titman (2006). Stocks with negative book values are excluded. Common disagreement for each B/M portfolio (denoted by $BMDISAG\,(i)$ for $i = 1, 2, ..., 5$) is constructed as the value-weighted average of individual stock disagreements using only stocks in the corresponding B/M portfolio. The stock-level disagreements are measured by the analyst forecast standard deviations of long-term EPS growth rate. Panel B shows the correlation matrix of B/M portfolio common disagreements. Panels C1 and C2 show the ex-post portfolio return alphas relative to the market factor (measured by the CRSP value-weighted return) for portfolios sorted independently by B/M and disagreement. Panel D shows, for each B/M portfolio $i = 1, 2, ..., 5$, the estimates of β in the regression:

$$BMRET_{t-h,t}\,(i) = \alpha + \beta \cdot (BMDISAG_t\,(i) - BMDISAG_{t-h}\,(i)) + \varepsilon_t.$$

$BMRET_{t-h,t}\,(i)$ denotes the value-weighted return from $t-h$ to t of a B/M portfolio in excess of the risk-free rate. h ranges from one month to three years. Panel E shows, for each B/M portfolio $i = 1, 2, ..., 5$, the estimates of β in the regression:

$$BMRET_{t,t+h}\,(i) = \alpha + \beta \cdot BMDISAG_t\,(i) + \varepsilon_t.$$

The t-statistics in parentheses are from Newey and West (1987) with the number of lags being equal to the return horizons. The sample period is December 1981 – December 2005.

Panel A. Summary statistics of B/M portfolios

	Growth	2	3	4	Value
number of stocks	459	343	291	232	175
market capitalization (M$)	4596	2896	2075	1888	1665
analysts per stock	6.8	6.0	5.7	5.7	5.1
monthly return (%)	0.74	0.80	0.88	0.91	1.02

Panel B. Correlation matrix of common disagreement of B/M portfolios

	Growth	2	3	4	Value
Growth	1				
2	0.555	1			
3	0.465	0.564	1		
4	0.208	0.229	0.299	1	
Value	0.090	0.132	0.214	0.550	1

Panel C1. Ex-post annual return alpha ($\times 100$) relative to the market factor for portfolios sorted by B/M and disagreement. Portfolio returns are measured by value-weighted individual stock returns.

	Disagreement				
	1 (Low)	2	3 (High)	3-1	t-stat
1 (Growth)	2.80	-0.77	-4.42	-7.22	(2.17)
2	5.60	1.76	-1.16	-6.76	(2.61)
3	5.99	3.62	2.06	-3.93	(1.70)
4	5.69	3.14	4.37	-1.31	(0.69)
5 (Value)	7.11	6.63	6.84	-0.26	(0.13)
5-1	4.31	7.41	11.27	6.96	
t-stat	(1.63)	(2.06)	(2.15)	(1.97)	

Panel C2. Ex-post return alpha ($\times 100$) relative to the market factor for other return horizons. Only alphas for the diff-in-diff portfolio are shown. Within each book-to-market quintile, the "3-1" return is constructed as the return difference between the high and low disagreement portfolios. The diff-in-diff portfolio return is the difference of the "3-1" return between the top and bottom B/M quintiles.

months	1	6	12	24	36
alpha (diff-in-diff portfolio)	0.47	3.70	6.96	17.56	20.71
t-stat	(1.30)	(1.89)	(1.97)	(3.28)	(3.02)

Panel D. Contemporaneous B/M portfolio returns on changes in portfolio common disagreement

h (in months)	6		12		24		36	
1 (Growth)	0.099	(2.09)	0.167	(2.65)	0.286	(2.53)	0.368	(2.52)
2	0.023	(0.80)	0.108	(2.06)	0.156	(2.01)	0.181	(2.32)
3	0.014	(0.70)	0.076	(2.41)	0.059	(1.78)	0.179	(3.49)
4	-0.011	(0.78)	-0.009	(0.43)	-0.044	(1.70)	-0.074	(2.99)
5 (Value)	0.000	(0.03)	-0.017	(0.94)	-0.061	(2.42)	-0.100	(2.26)
5-1	-0.098	(2.08)	-0.185	(2.84)	-0.347	(2.73)	-0.468	(2.56)

Panel E. Ex-post B/M portfolio returns on portfolio common disagreement

h (in months)	1		6		12		24		36	
Growth	0.000	(0.01)	-0.062	(1.42)	-0.173	(2.12)	-0.342	(2.36)	-0.501	(2.50)
2	-0.010	(1.98)	-0.067	(2.74)	-0.152	(4.41)	-0.261	(4.21)	-0.328	(3.55)
3	-0.007	(1.24)	-0.033	(2.01)	-0.062	(2.16)	-0.067	(1.35)	-0.159	(1.66)
4	0.003	(0.76)	0.026	(1.37)	0.038	(1.07)	0.018	(0.60)	0.057	(1.44)
Value	0.004	(1.16)	0.023	(1.33)	0.047	(1.39)	0.072	(2.10)	0.106	(2.65)
5-1	0.004	(0.47)	0.085	(2.01)	0.219	(2.64)	0.415	(2.82)	0.607	(2.84)

Table 7: Robustness Checks

Panel A conducts subsample analysis for the regression in Panel G of Table 4. Panel B shows, for each size portfolio, the regression results of ex-post return from time t to $t+h$ in excess of the risk-free rate on portfolio common disagreement at time t. Panel C repeats the regression in Panel A of Table 4, controlling for the average monthly turnover in the past year, denoted by $TURNOVER$. Following Baker and Stein (2004), $TURNOVER$ is stochastically detrended by subtracting the average turnover in the previous five years from it and the regression includes as additional control variables the dividend-price ratio DP and the equity share of new issues $EQUITYSHARE$. Panel D1 reports the pairwise correlation coefficient between $DISAG$ and $MKTDISAG$, where $MKTDISAG$ is the standard deviation of I/B/E/S analyst forecasts of annual S&P 500 earnings as a percentage of average analyst forecast. $MKTDISAG$ is sampled in December each year using analyst forecasts of S&P 500 earnings for fiscal year ending in December next year. $MKTDISAG$ in January – November is set to its value in December of the previous year. Panel D2 reports the regression results of ex-post market return over risk-free rate on $MKTDISAG$ alone, and on both $DISAG$ and $MKTDISAG$. Panel E shows the regression results of ex-post market return in excess of the risk-free rate on the equal-weighted average of individual-stock analyst disagreements over the long-term EPS growth rate, $EWDISAG$. In Panel F, individual stock disagreement is constructed using the standard deviation of analyst forecasts of the next fiscal-year EPS scaled by the absolute value of average forecast. The value-weighted cross-sectional average of this alternative proxy of individual stock disagreement is denoted by $FYDISAG$. Only firms whose fiscal years end in December are included. $FYDISAG$ is measured in each December using forecasts for fiscal year ending in December next year. $FYDISAG$ in January–November is set to its value in December of the previous year. Regression results of ex-post one-year excess market return on $DISAG$ and $FYDISAG$ are reported. Panel G regresses ex-post h-month market return in excess of the risk-free rate $MRET_{t,t+h}$ on $DISAG_t$, controlling for lagged h-month market return $MRET_{t-h,t}$. The t-statistics in parentheses are from Newey and West (1987), with the number of lags being equal to the return horizons. The sample period is December 1982 – November 2001 in Panel D1 and D2, and is December 1981 – December 2005 in other panels.

Panel A. Subsample analysis

Return horizon (in months)	1	6	12	24	36
Subsample: December 1981 – December 1993					
$DISAG$	0.018	-0.043	-0.156	-0.239	-0.206
t-stat	(1.47)	(1.09)	(3.16)	(3.87)	(3.88)
Subsample: January 1994 – December 2005					
$DISAG$	-0.003	-0.015	-0.162	-0.366	-0.396
t-stat	(0.16)	(0.24)	(2.50)	(3.84)	(6.26)

Panel B. By size: ex-post value-weighted size portfolio returns on portfolio common disagreement. The size portfolios are constructed monthly. Big/medium/small stocks are defined as those with the highest 30%/middle 40%/lowest 30% market capitalization using NYSE break points. The common disagreements in this panel are constructed for each size portfolio separately.

h (in months)	1	6	12	24	36
1 (Big)	-0.005	-0.057	-0.165	-0.360	-0.481
	(0.74)	(1.35)	(2.35)	(2.76)	(2.11)
2	-0.005	-0.045	-0.090	-0.116	-0.121
	(0.70)	(1.94)	(2.61)	(2.53)	(2.03)
3 (Small)	0.000	-0.010	-0.034	-0.048	-0.037
	(0.05)	(0.37)	(0.82)	(1.16)	(0.54)

Panel C. Control for turnover. Both regression results with and without $DISAG$ are reported.

Return horizon (in months)	1	6	12	24	36
no $DISAG$					
$TURNOVER$	-0.121	-1.475	-3.115	-7.461	-9.898
t-stat	(0.52)	(1.80)	(2.21)	(2.26)	(3.51)
adj R^2	0.4%	8.8%	18.7%	23.4%	24.4%
with $DISAG$					
$DISAG$	0.001	-0.034	-0.145	-0.351	-0.517
t-stat	(0.18)	(0.81)	(2.27)	(3.36)	(2.69)
$TURNOVER$	-0.137	-1.104	-1.533	-3.026	-1.384
t-stat	(0.57)	(1.25)	(1.13)	(0.93)	(0.25)
adj R^2	0.1%	9.3%	25.7%	43.5%	44.8%

Panel D1. Correlation between $DISAG$ and $MKTDISAG$

	coef	p-value
$Corr\,(DISAG, MKTDISAG)$	0.021	0.752

Panel D2. Controlling for disagreement over the market

Return horizon (in months)	1	6	12	24	36
no $DISAG$					
$MKTDISAG$	-0.001	-0.009	-0.030	-0.080	-0.062
t-stat	(0.40)	(1.16)	(2.06)	(2.67)	(1.40)
adj R^2	-0.4%	1.1%	7.2%	19.8%	6.0%
with $DISAG$					
$DISAG$	-0.010	-0.088	-0.219	-0.397	-0.510
t-stat	(1.32)	(2.92)	(5.35)	(6.11)	(3.18)
$MKTDISAG$	-0.001	-0.009	-0.029	-0.078	-0.059
t-stat	(0.38)	(1.25)	(3.18)	(5.62)	(2.29)
adj R^2	-0.1%	11.9%	38.8%	59.6%	40.7%

Panel E. Equal-weighted average of individual stock disagreements

Return horizon (in months)	1	6	12	24	36
$EWDISAG$	-0.007	-0.055	-0.117	-0.194	-0.257
t-stat	(1.36)	(2.95)	(3.22)	(2.55)	(2.45)
adj R^2	0.5%	9.0%	19.3%	26.5%	24.2%

Panel F. Ex-post one-year market return on disagreement constructed from forecasts of next fiscal-year EPS

	(1)	(2)
$DISAG$		-0.167
t-stat		(2.11)
$FYDISAG$	-0.282	-0.085
t-stat	(2.09)	(0.58)
adj R^2	2.6%	16.1%

Panel G. Controlling for lagged market return

Return horizon (in months)	1	6	12	24	36
$DISAG_t$	-0.006	-0.061	-0.174	-0.360	-0.438
t-stat	(0.90)	(1.51)	(2.53)	(3.16)	(2.32)
$MRET_{t-h,t}$	0.051	-0.017	-0.197	-0.158	-0.385
t-stat	(0.80)	(0.17)	(1.24)	(1.46)	(3.43)
adj R^2	-0.2%	3.7%	20.3%	35.2%	42.3%

Figure 1: Stock prices in Example 1. This figure shows the equilibrium prices in Example 1. The stocks are indexed by $0 \leq i \leq 1$. Three cases are plotted: case 1 (line AB), $\sigma_i = \sigma$, where $\sigma = 1$; case 2 (line CD), $\sigma_i = \sigma$, where $\sigma = 1/2$; case 3 (line AE), $\sigma_i = \sigma\,(1+i)$, where $\sigma = 1$. Line FG plots the true stock fundamental.

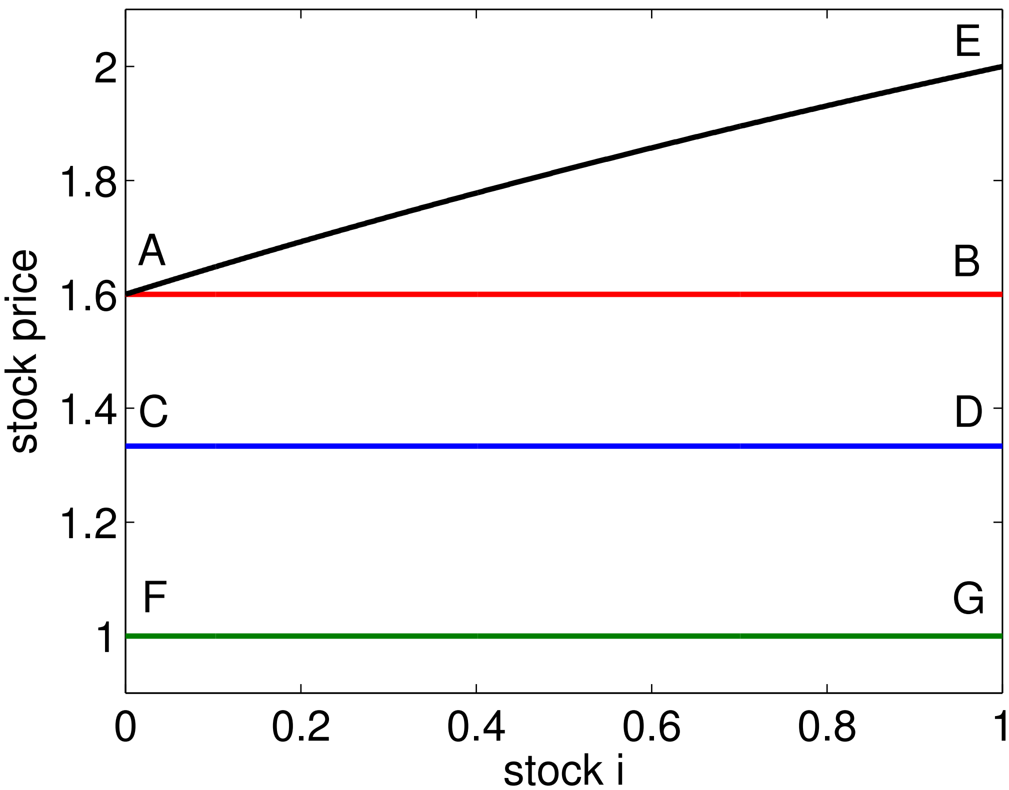

Figure 2: Time series of the number of firms and the average number of analysts per firm. This figure shows the monthly time-series plots of the number of firms covered by at least two analysts (left vertical axis) so that forecast standard deviation can be computed, along with the average number of analysts covering these firms (right vertical axis).

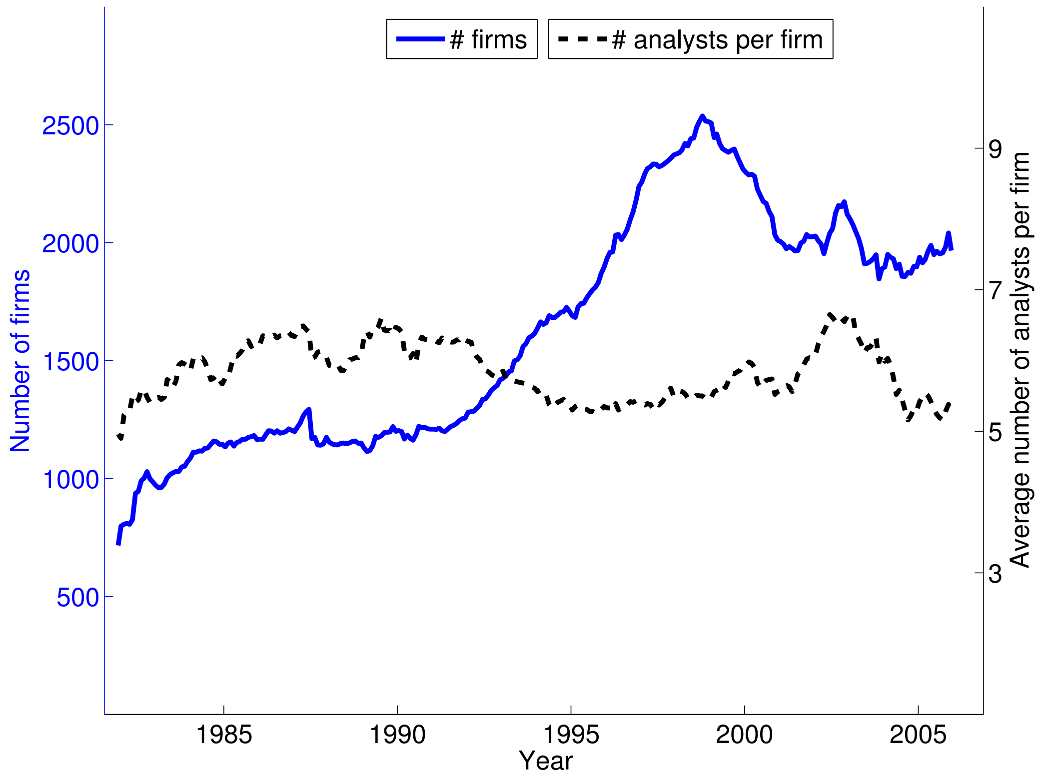

Figure 3: Time series of common disagreement. This figure plots the time series of the common disagreement, which is measured by the cross-stock average (weighted by market capitalization) of analyst forecast standard deviations of long-term EPS growth rate. The sample period is December 1981 – December 2005.

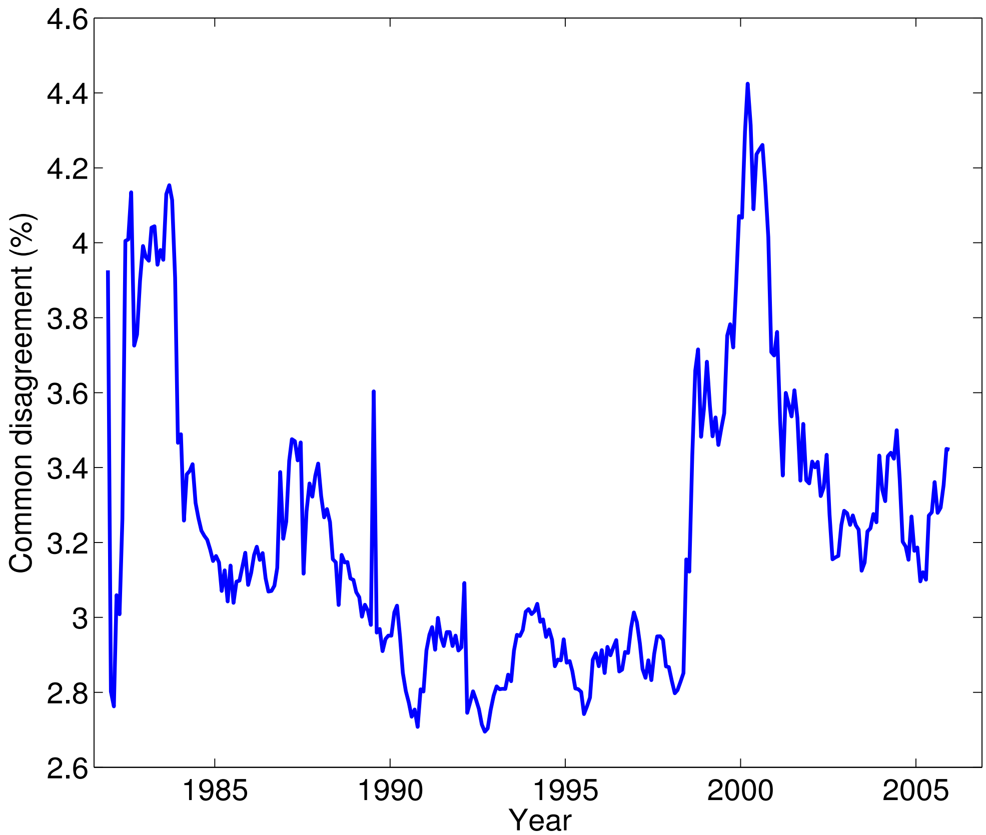

Figure 4: Common disagreement and ex-post market return. This figure shows the scatterplot of common disagreement and ex-post one-year CRSP value-weighted market return (including distributions) in excess of the risk-free rate. Common disagreement is measured by the cross-stock average (weighted by market capitalization) of the analyst forecast standard deviations over long-term EPS growth rate. Also plotted is a local polynomial nonparametric estimate of the expected ex-post one-year excess return conditioning on the common disagreement (implemented by the LOWESS procedure in the software package Stata using the default bandwidth). The 95% pointwise confidence band adjusts for the correlation of overlapping annual returns using the Newey and West (1987) standard error with twelve lags. The sample is monthly and spans December 1981 – December 2005.