Expected Earnings Growth, Stock Valuation and Investor Sentiment

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ABSTRACT

The sensitivity of stock valuations to expected earnings growth, termed as the growth premium, fluctuates substantially over time. This study investigates whether these fluctuations can be explained by investor sentiment. The testable prediction is that investor sentiment affects the growth premium, causing expected earnings growth to be valued differently. Empirical analysis shows that expected growth is valued high (low) in periods in which measures of irrational sentiment are high (low). The effect of sentiment on the growth premium is documented at both the individual stock level and the aggregate market level. Moreover, future return patterns based on expected growth-related characteristics are consistent with the hypothesis that sentiment causes the mispricing of stocks whose earnings are expected to grow quickly and stocks whose growth is valued at too high or too low a level. The impact of sentiment on the growth premium is robust after controlling for the known proxies for risk premia.

I. INTRODUCTION

The relation between expected earnings growth and stock value remains a key issue in financial and investment analysis. Prior studies document that expected earnings growth is positively related to stock value (e.g., Cragg and Malkiel 1982; Zarowin 1990; Thomas and Zhang 2006). Intuitively, this positive relation implies a market-wide price for growth, in the form of an increment to the stock valuation per unit of expected growth (the *growth premium*). Casual observation suggests that the growth premium varies substantially over time: investors are willing to pay a much higher premium for growth in bull markets than in bear markets. The objective of this paper is to document and examine the underlying causes of the time variation in the growth premium and to determine whether the variation can be attributed to investors' irrational sentiment.

The time-varying growth premium has important implications for both researchers and practitioners. Conceptually, the growth premium is indicative about the underlying valuation process that transforms expectations of future earnings growth into market valuations. We may gain insights about the unobservable valuation process from studying the behavior of the growth premium. Practically, the changing growth premium means that investors wishing to assess a stock's valuation need to not only forecast future earnings growth, but also gauge the premium commanded for the growth. Moreover, understanding the fluctuation in the growth premium is relevant to management who desire to tailor corporate characteristics in order to maximize the firm's market value. Despite such importance, the growth premium has received little attention in the literature, and our understanding of its fluctuations remains limited.[1]

[1] Several early studies note that the empirical growth-value relation is unstable over time (e.g., Granger and Morgenstern 1970; Cragg and Malkiel 1982; Lev and Ohlson 1982). Lev and Ohlson (1982) believe that the time-series behavior of the valuation coefficients is driven by the dynamics of macroeconomic variables. Cragg and

This study fills in a gap in the valuation literature by systematically examining the time-series behavior of the growth premium and exploring whether investors' *irrational* sentiment can explain such variations. The core hypothesis in the paper is that the growth premium is prone to the influence of irrational sentiment, which is investors' assessment of market conditions, unwarranted by economic fundamentals.[2] If investors are optimistic about overall market conditions, business environments, or technology breakthroughs, they are likely to find stocks with high growth potential particularly attractive. Over-enthusiasm may lead investors to have unrealistic perceptions of the level, duration and persistence of future earnings growth.[3] As a result, investors bid up the prices of stocks with rosy growth stories. In contrast, when pessimistic about market conditions, investors often take defensive strategies like "flight-to-safety", flocking into safer, mature, and acyclical stocks with less glamorous growth. Such a flow of funds narrows the valuation gap between stocks with different levels of expected growth and results in a lower growth premium. In summary, to the extent that there is an irrational component in investors' changing attitudes, preferences, or fads (i.e., sentiment), the growth premium varies with investor sentiment.

To investigate this prediction empirically, and to gain a tangible understanding of the time variation in the growth premium, I start by constructing a series of growth premium estimates. This is conveniently achieved by estimating the coefficient of expected earnings growth in a

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Malkiel (1982) cite the anecdote that growth stocks were highly in favor at the end of 1961 but fell out of favor in 1962. Neither paper attempted to systematically investigate the underlying cause. Recently, in the value-relevance context, Kothari and Shanken (2003) examine the economic determinants of the time variance in the value-relevance regression coefficients on financial statement items. They note, "[w]hile some variation in coefficients is to be expected due to rationally based aggregate discount rate or growth effects, the observed variation seems too great to be completely explained in this manner" (p. 73). See Section II for further discussion.

[2] The concept of investor sentiment is further explained in Section II. Section III discusses empirical measures of investor sentiment.

[3] Investors' over-optimism undoubtedly affects their assessment of discount rates. As I argue in Section VII, this influence on discount rates does not appear to explain the fluctuation of the growth premium.

cross-sectional value-growth regression. Specifically, I regress the forward earnings yield (i.e., the forward earnings-to-price ratio) on analysts' forecasts for long-term earnings growth by each quarter between 1982 and 2005. The resulting slope estimates exhibit a desirable property: the estimates consistently retain an economically sensible sign that reflects the investor's trade-off between near-term gains (i.e., the earnings yield) and long-term gains (i.e., future earnings). These estimates thus can be sensibly interpreted as the market-wide price for individual stocks' growth, i.e., the growth premium. Noticeably, the measure fluctuates considerably over the sample period and the variations are visibly aligned with major stock market episodes.

Two measures of broad-based investor sentiment are used in the empirical analysis, as suggested in the literature. One measure, following Lemmon and Portniaguina (2006), is based on a consumer confidence survey and, by construction, is unrelated to economic fundamentals. The other measure follows Baker and Wurgler (2006, 2007) and is a composite index, extracted from trading-related variables, including closed-end fund discounts, IPO activities, market turnover, aggregate equity issuance, and the dividend premium. Both sentiment measures are shown to be related to stock market mispricing (Lemmon and Portniaguina 2006; Baker and Wurgler 2006, 2007).

The main empirical test examines whether the growth premium co-moves with the sentiment measures in a time-series regression over the period from 1982 to 2005.[4] Consistent with the prediction, I find that the sentiment measures contribute to the observed fluctuations in the growth premium, even after controlling for economic factors such as real interest rates, market volatility, the quality of analyst forecasts, and business cycles. The relation between the growth

[4] The sample period is chosen as such in order to avoid the run-up towards the 2007-2008 Financial Crisis, which is arguably unrepresentative of the normal functioning of stock markets over a longer horizon. Section III further explains the sample choice.

premium and the sentiment measures is sensible and significant in economic terms. Specifically, when sentiment increases by one standard deviation, investors give up sixteen basis points (in the form of the earnings yield) for every incremental percentage of expected earnings growth. These results suggest that investors value expected earnings growth differently, depending on the prevailing level of sentiment.

In the next test, I examine whether investor sentiment affects the growth premium at the macroeconomic level. The aggregate growth premium reflects the price of the expected growth in aggregate earnings, when stock is regarded as a broad asset class. Operationally, I treat sentiment as a conditional variable in the time-series regression of the aggregate price-to-earnings (P/E) ratio on aggregate growth forecasts. The results confirm the prediction that aggregate earnings growth is valued higher as sentiment grows increasingly optimistic.

At face value, the results so far suggest that *the fluctuation in the growth premium is* (*at least partially*) *driven by investor sentiment*. Because investor sentiment is often blamed for causing mispricing (e.g., Barberis and Thaler 2003; Baker and Wurgler 2006), one naturally asks whether stock returns are predictable as a consequence of the mispriced growth. If the growth premium is too high (low) during high (low) sentiment periods, high-growth stocks are more likely to be overpriced (underpriced), whereas low-growth stocks are affected in an opposite fashion. This leads to another testable hypothesis that the relative performance between high- and low-growth stocks reverses when sentiment shifts. To test it, I perform two-way sorting based on analysts' long-term growth forecasts (LTG for short) and sentiment measures. The results show that, for portfolios formed on high sentiment dates, the highest LTG stocks underperform the lowest by nine percentage points over the subsequent six months. In contrast, when the portfolios are formed on low sentiment dates, the pattern reverses, with the highest LTG stocks outperforming

the lowest by two percentage points. Additional sorting based on the price/earnings-to-growth (PEG) ratio and sentiment provides some evidence that stocks whose growth is valued at too high or too low a level are sensitive to sentiment-induced mispricing.

In summary, I test a behavioral view that investor sentiment affects stock valuation by affecting how expected earnings growth is priced. To the best of my knowledge, little empirical research exists examining stock valuation from a behavioral perspective. My findings have a number of implications for valuation research. First, the results verify the validity of the first-cut valuation principle -- the forward P/E ratio increases with expected earnings growth, controlling for risk. Second, the findings confirm a common impression that the relation between a stock's market value and fundamentals changes over time. This phenomenon is relevant to studies that rely on the growth-value relation. For instance, prior research reverse engineers valuation models to estimate the cost of equity (e.g., Clause and Thomas 2001; Gebhardt *et al*. 2001; Easton 2004; Easton and Sommers 2007). The results of this study raise doubt about whether existing static valuation models adequately approximate the actual valuation process. Third, this paper provides evidence that investor sentiment explains fluctuations in the growth premium. This finding lends validity to the colorful accounts in the popular media claiming that investors' behavior switches "between fear and greed" (e.g., Wall Street Journal, July 27, 2007, p. C1). One implication is that we may need to take into account the effect of broad-based sentiment when conducting security analysis.

The rest of the paper is organized as follows. Section II surveys relevant literature. Section III describes the empirical approach and key measures. Section IV examines the time-series relation between the *cross-sectional* growth premium and sentiment. Section V tests the influence of sentiment on the *aggregate* growth premium. Section VI presents the sorting tests

for growth-related mispricing. Alternative explanations are discussed in Section VII. Section VIII concludes.

II. PRIOR LITERATURE

This paper builds on the valuation research that aims at understanding how earnings growth, among other intrinsic value determinants, is related to equity value. However, it departs from the efficient market view and is partly motivated by the fast-growing field of behavioral finance.

The paper is closely related to empirical and theoretical works in the valuation literature. Empirically, early empirical studies find that realized earnings growth weakly explains the cross-sectional variation in the P/E ratio (i.e., Boatsman and Baskin 1982; Alford 1992; Penman 1996). This comes as no surprise because realized growth is a poor proxy for the growth perceived by investors. Later studies use analysts' long-term forecasts to proxy for expected earnings growth and document that, compared to realized growth, forecasted growth exhibits a stronger explanatory power for stock valuation (e.g., Cragg and Malkiel 1982; Zarowin 1990; Thomas and Zhang 2006). Theoretically, valuation models, such as the residual income model (Ohlson 1995; Feltham and Ohlson 1995) and the OJ model (Ohlson and Juettner-Nauroth 2005) assign growth a prominent role in determining stock value. The OJ model motivates the empirical procedure used in this paper to estimate the growth premium. (This empirical procedure also resembles the cross-sectional regression approach commonly employed by prior empirical studies.) This study extends the valuation literature by introducing investor sentiment as a conditional variable.

Fluctuations in the value-growth regression coefficient (i.e., growth premium) were noticed by early authors (e.g., Granger and Morgenstern 1970; Cragg and Malkiel 1982; Lev and Ohlson

1982), but the literature has made little effort to investigate the underlying cause of such fluctuations. One exception is Kothari and Shanken (2003), who comment that the time variations in the valuation coefficient of earnings appear too large to be completely explained by rationally determined economic factors (p. 73). My study systematically investigates the time-series behavior of the valuation of growth, and furthermore, explores both fundamental and non-fundamental factors as determinants.

The fast growing literature of behavioral finance provides both theoretical underpinnings and empirical tools for this study. In this new paradigm, mispricing occurs when systematic sentiment creates uninformed demand shocks, and when market frictions prevent stock prices from returning to their fundamental levels. Cumulating evidence suggests that mispricing occurs in various assets and on various occasions, such as IPOs (e.g., Lowry 2003; Cornelli *et al.* 2006), closed-end funds (e.g., Lee *et al.* 1990), and the broad market (e.g., Neal and Wheatley 1998; Brown and Cliff 2005; Lamont and Stein 2006). This study adds to the body of evidence on the impact of sentiment by focusing on growth. Baker and Wurgler (2006) find that market-wide sentiment causes differential levels of mispricing among stocks in the cross section, depending on stocks' characteristics, such as size, age, and volatility, among others. The evidence in the current study suggests that the effect of sentiment on individual stocks also depends on expected earnings growth, which by itself is a salient characteristic of stocks.

Advances in empirical techniques and greater data availability make it possible to quantify the elusive concept of investor sentiment. This study relies on two measures of investor sentiment, proposed by Lemmon and Portniaguina (2006) and Baker and Wurgler (2006, 2007), respectively. Section III discusses these measures in more detail.

In the current study, I examine the distorted *functional* relation between expected growth and

stock values. Such an emphasis differs from those of prior studies that examine the effects of distorted *expectation* of growth (see Lakonishok *et al.* 1994; La Porta 1996; Dechow *et al.* 2000; Chan *et al.* 2003). Using analyst forecasts as a proxy for market expectations, these previous studies find strong evidence against rational expectations. A common criticism to their results points out that analyst forecasts may not adequately proxy for market expectations. The proxy issue is of less concern in the present study: to the extent that the distortion in expected growth moves in the same direction with the growth premium, rational investors would recognize the bias in analyst forecasts and discount it properly. In sharp contrast, I report that investors not only take analyst forecasts at face value but in fact exacerbate the distortion by assigning a high growth premium -- this finding strengthens the rejection of the null.

III. EMPIRICAL APPROACH AND DATA

Empirical Approach

The key prediction in this study is that prevailing sentiment influences the growth premium, which is the price investors are willing to pay for future earnings growth. Due to social, psychological, or institutional reasons, investors' sentiment shifts between bullish and bearish.[5] When sentiment is high, investors with often ungrounded optimism may find high future earnings growth to be a particularly attractive trait. Some investors do so simply because they believe exceptional growth will actually substantiate in a favorable environment. Others favor high growth stocks because these stocks are good targets for speculation. Regardless of the exact motives, optimistic investors bid up the valuation of high growth stocks, and depress the

[5] This study does not attempt to explicate the source of the sentiment. See Barberis and Thaler (2003) for a review of the psychological phenomena that are relevant to stock markets.

valuation of stocks with modest or low expected growth; as a consequence, the growth premium rises.

When sentiment is low, many investors adopt the strategy of "flight to quality", buying stable, mature, acyclical stocks with only modest growth and selling stocks which may be expected to grow quickly but whose rosy prospects are likely to be seriously doubted in the circumstances. The reallocation of funds results in a narrowing valuation gap between high and low growth stocks. Consequently, a lower growth premium follows.

Because the variation in broad-based sentiment is displayed in time series, I test the prediction using a time-series analysis:

$$Growth\ Premium_t = f(Sentiment_t, Controls)\ . \qquad (1)$$

Empirically, the growth premium is the sensitivity of the stock valuation to expected earnings growth. A time series of the growth premium can be conveniently estimated from repeated cross-sectional regressions of the forward earnings yield (i.e., the forward earnings-to-price ratio) on analysts' long-term forecasts (LTG); the latter is a proxy for expected long-term earnings growth. This estimated growth premium is the price of growth applicable to valuing individual stocks, similar to the equity risk premium. The estimated growth premium is then regressed against the sentiment measures time serially. Thus, the hypothesis is tested following the exact form of model (1).

Alternatively, I consider the growth premium for aggregate growth, when the stock market is valued as a whole. Because the market-level data does not allow me to explicitly estimate a series of growth premia, the cross-sectional test described above does not apply in the exact same form. However, by treating sentiment measures as conditional variables in a regression of the market earnings yield on growth in aggregate earnings, I am still able to examine the impact of

investor sentiment; Section V explains this empirical design in detail.

Sample

The firm-level data are obtained from the merged CRSP-COMPUSTAT-IBES database. The final sample contains all U.S. common stock issuers, excluding financial institutions and utilities, between 1982 and 2005.[6] The sample period starts from 1982, the first year IBES provides long-term growth forecasts (LTG), and is cut off prior to the lead-up of the 2007-2008 Financial Crisis and the subsequent global recession; the later period is clearly unrepresentative of "normal" market conditions which this study aims at understanding. Although the sample is weighted more heavily towards large-cap stocks, according to Baker and Wurgler (2006), large-cap stocks are less sensitive to sentiment. Therefore, the current sample works against rejecting the null hypothesis. Another concern is that IBES coverage changes over time. To address this issue, I repeat all tests on industrial stocks in S&P 500, which IBES covers consistently throughout the sample period. The results are qualitatively similar.

Measuring the Growth Premium

I obtain the growth premium from a cross-sectional regression, estimated quarterly,

$$FEY_{it} = \gamma_{1t} LTG_{it} + \gamma_{2t} RISK_{it}, \qquad (2)$$

where FEY is the forward earnings yield, LTG is the consensus (median) analysts' long-term growth forecasts and RISK controls for systematic risk. Both price and forecast data are obtained in the third month of each calendar quarter. Model (2) is a linearized version of the OJ model, and is similar to those used in previous valuation research (e.g., Cragg and Malkiel 1982; Zarowin 1990; Thomas and Zhang 2006). Model (2) is estimated quarterly to maximize the

[6] 1982 was the first year in which IBES provided long-term growth forecasts (LTG).

number of observations in the resulting series of estimated growth premia.

FEY is the one-year-ahead forward earnings per share (EPS) divided by the stock price. Its inverse, the forward P/E ratio, has become the primary valuation metric in practice. Using forward earnings rather than trailing earnings is justified on the grounds that forward earnings are *the* attribute that investors (should) focus on. As the estimation date approaches the end of the forecast period, the regular one-year-ahead forward EPS contains diminishing forward looking information. [7] To counter this problem, I construct a rolling four-quarters-ahead forward EPS, using available quarterly and annual EPS forecasts, whenever the data are available. Using the forward earnings yield, rather than the price-to-forward earnings ratio ensures that the ratio is continuous, even when forward EPS happens to be zero.

I use consensus (median) long-term growth forecasts (LTG) as a proxy for the expected earnings growth that investors may assume during the valuation process. Some may question the validity of LTG on the grounds that: (i) analysts' forecasts may not be an adequate proxy for the stock market's expectation of earnings growth, and (ii) analysts' forecasts are shown to be irrational (i.e., La Porta 1996; Dechow *et al*. 2001; Chan *et al*. 2003). I contend, however, that these concerns are less of a problem in the current setting. Regarding the first concern, the validity of LTG in the current application does not hinge on the assumption that LTG exactly replicates the stock market's expectation. Rather, the proxy is sensible as long as investors use LTG as an input into their valuation decisions.[8] Regarding the second concern, under the null

[7] EPS forecasts supplied by IBES close to the end of the fiscal year are not entirely forward-looking, but a mixture of realizations and forecasts. For example, in a consensus forecast for the 2004 annual EPS, obtained in November, 2004, the fourth quarter component is a forecast. The components from the other three quarters are already realized.

[8] On a related point, LTG is not meant to be a number from which one can literally extrapolate future earnings. Instead, one should regard LTG as an indicator of investors' expectations for growth. LTG may potentially summarize a spectrum of aspects related to growth, say, precision of the growth expectations, the robustness of growth, the span of growth, and so on.

hypothesis that sentiment does not affect the growth premium, the growth premium should decline (rise) when LTG becomes inflated (deflated). In other word, the bias in LTG works against rejecting the null hypothesis.

The slope coefficient of LTG, γ_{1t}, is the estimated growth premium at date *t*. In the current setup, this is expected to have a *negative* sign, meaning that investors must give up short-term payoffs (in terms of the earnings yield) for long-term benefits (long-term earnings growth). To facilitate the interpretation, in the rest of empirical application I take absolute values of the raw estimates. The reversal of the sign leads to a more intuitive interpretation: the larger is the growth premium, the more expensive is growth.[9]

The regression slope in model (2) serves as a desirable measure of the growth premium for several reasons. First, as mentioned above, the estimate captures the key tradeoff that investors must make--giving up near-term benefits for long-term payoffs. Second, the slope is unit-free and unrelated to the level of growth, making comparisons straightforward. Third, the estimate can be conveniently estimated using a cross-sectional regression.

Two sets of systematic risk proxies are used in model (2): (a) market beta; and (b) factor loadings from the Fama-French three-factor model (i.e., market beta, loadings on size, and loadings on book-to-market or B/M). Both sets of risk proxies are estimated over rolling 36-month windows.

[Insert Table 1 here]

[Insert Figure 1 here]

Model (2) is estimated quarterly from 1982, Quarter I to 2005, Quarter IV, and separately for

[9] Since the estimates remain reliably negative, taking the absolute value transforms the original series monotonically, and does not affect the validity of the inferences I draw later.

each set of risk proxies. The resulting two series, GP_M when controlling for market beta and GP_3F when controlling for the three Fama-French factors, are described in Table 1 and plotted in Figure 1. The plots show that the growth premium fluctuates substantially over the sample period, with the peaks and troughs being visually aligned with anecdotal accounts of bull and bear markets. Looking at Panel A, which shows the growth premium estimated from controlling for market beta, the plot reaches a peak in the first half of 1987, before the market crash which happened in October of that year. The bear market turned out to be short-lasted and the stock markets advanced with resilience. This recovery process is captured by the upward curve to the early 1990s. The growth premium bottoms again in 1998, when stock markets were depressed by the ripple of the financial crisis in South-East Asia and Russia. Under the Federal Reserve's strong intervention, stock markets soon rebounded and this led to the most spectacular bull market in recent history, which can clearly be identified by the highest peak in the sequence.

I formally test the stability of the estimated growth premia as follows. For each quarter between 1982 and 2005, the following pair of regressions is jointly estimated using the Seemingly Unrelated Regression (SUR):

$$\begin{aligned} FEY_{it} &= \gamma_{1t} LTG_{it} + \gamma_{2t} RISK_{it} \\ FEY_{i,t-4} &= \gamma_{1,t-4} LTG_{i,t-4} + \gamma_{2,t-4} RISK_{i,t-4} \ . \end{aligned} \tag{3}$$

The null hypothesis is $\gamma_{1t} = \gamma_{1t\text{-}4}$. I then count the number of times the null can be rejected. As shown in Panel D of Table 1, with either measure of the growth premium, the null is rejected in 77% of the 92 pairs of adjacent years, below the 10% significance level. This result provides formal support to the casual observation that over time investors change their attitudes to growth.

The estimated growth premium is rather persistent. The first-order autocorrelation of GP_M over the whole sample period equals 0.79. But the autocorrelation declines reasonably quickly and becomes statistically insignificant after four lags. Both GP_M and GP_3F are stationary, as

shown in the augmented Dickey-Fuller test.

The descriptive statistics, shown in Panel C of Table 1, reveal other features of the growth premium estimates. First, the two sequences of growth premia, obtained with different risk controls, are almost indistinguishable. This offers some comfort that the measurement of the growth premium is not sensitive to the controlling of systematic risk. Second, both GP_M and GP_3F are reliably negative, suggesting that model (2) is economically and empirically sensible. Third, the R^2 of the quarterly estimated model (2) stays low: averaged over the sample period, it is only 8% in the estimation for GP_M and 11% for GP_3F.. This suggests that factors other than expected growth and systematic risk play important roles in determining stock valuation in the cross section. Model (2), at the most, is a crude approximation to the underlying valuation process.

Measures of Investor Sentiment

I rely on the finance literature to select measures of investor sentiment, which fall into two broad types: survey-based measures and trading-based measures.[10] In this study I use both types of measures – a measure based on consumer confidence surveys (Lemmon and Portniaguina 2006) and a composite index based on trading variables (Baker and Wurgler 2006, 2007). My choice is necessarily a balance between intuition, existing empirical support, and data accessibility.

The first measure, termed as the *Sentiment Component of Consumer Confidence* (SC), is the residual from a regression of the Index of Consumer Expectation on a set of macroeconomic

[10] Studies using survey measures include Fisher and Statman (2003), and Lemmon and Portniaguina (2006); those using trading measures include Lee *et al*. (1991), Baker and Wurgler (2000), Lowry (2003), Baker and Stein (2004), and Baker and Wurgler (2004). Brown and Cliff (2005) compare and evaluate multiple sentiment measures. The literature, however, has yet to reach a consensus on which measure (or which type of measure) should be favored.

variables, a method suggested by Lemmon and Portniaguina (2006).[11,12] The measure is unrelated to economic fundamentals by construction, and is shown to explain the time variation in the size premium, consistent with the hypothesis that optimistic investors overvalue small stocks relative to large stocks and vice versa (Lemmon and Portniaguina 2006).[13]

The second, trading-based, measure for sentiment is a composite index developed by Baker and Wurgler (2006, 2007), which is termed the *Sentiment Index* (SI) in this study. To compress sentiment information from trading, SI is constructed as the first principle component of the six underlying variables: the closed-end fund discount, stock market turnover, IPO numbers and first-day returns, the share of equity issuance in the total capital raised, and the dividend premium.[14] Baker and Wurgler (2006, 2007) show that cross-sectional future return patterns change depending on *ex ante* SI, consistent with the hypothesis that sentiment asserts differential influence in the cross section. I obtain the monthly orthogonalized SI series directly from Jeffrey Wurgler (http://www.stern.nyu.edu/~jwurgler/).[15]

Both SC and SI measures are calculated at the second month of each calendar quarter.

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[11] The Index of Consumer Confidence is part of the consumer confidence survey conducted by the University of Michigan Survey Research Center. The index is constructed from survey questions that ask consumers about their views on future personal financial condition and economy.

[12] Details of constructing the SC measure and the data sources are available from the author upon request.

[13] As additional evidence of the measure's validity, Lemmon and Portniaguina (2006) also report that stocks with low (high) institutional ownership have low (high) future returns following initially highly-measured sentiment. Moreover, there is evidence that consumer confidence is correlated with investor sentiment measures from direct surveys (Fisher and Statman 2003; Qiu and Welch 2006) and predicts aggregate market returns (Charoenrook 2002).

[14] These variables have all been suggested proxying for sentiment in the literature. For example, Lee et al. (1991) argues that the closed-end fund discount varies with individual investor sentiment. Baker and Stein (2004) model trading activities such that high liquidity (turnover) results from irrational investor optimism. IPO activities have long been considered to reflect investor sentiment (i.e., Ritter 1991; Lowry 2003). Baker and Wurgler (2000) find that a greater share of equity in total capital raised predicts lower market returns. Baker and Wurgler (2004) show that the initialization and omission of dividends are related to the dividend premium; the latter is considered by the authors as a proxy for investors' uninformed demand for dividend paying stocks.

[15] To remove the influence of economic fundamentals, before using the underlying variables to construct the SI measure, Baker and Wurgler (2006, 2007) regress each variable on a set of macroeconomic variables. The resulting estimates are called the orthogonalized SI.

Because the growth premium is measured at the quarter end, using lagged sentiment measures helps alleviate the causality concern that sentiment causes the growth premium to fluctuate, and not vice versa.

[Insert Table 2 here]

[Insert Figure 2 here]

Table 2 summarizes both the SC and SI measures and Figure 2 plots the two series.[16] The first impression is that there is significant variation in both measures over the sample period. The autocorrelation in both sequences is strong, but similarly to that of the growth premium, the autocorrelation declines to a reasonable level after four quarters. The two measures are reasonably well correlated, with a statistically significant Pearson correlation of 41% (see Table 3). A visual inspection of Figure 2 seems to suggest that SC leads SI, consistent with the idea that changes in belief precede trading.

IV. THE GROWTH PREMIUM AND INVESTOR SENTIMENT

This section seeks to answer whether the fluctuations in the growth premium can be attributed to changes in investor sentiment. I first describe the regression model and discuss estimation issues. Empirical results are presented subsequently.

Regression Model

To test the prediction that the growth premium co-moves with sentiment, I use the following time-series regression:

$$GP_t = a_1 SENTIMENT_t + a_2 INT_t + a_3 VOL_t + a_4 ANAFLW_t + a_5 GDPG_5 \ . \qquad (4)$$

[16] Both measures are scaled by ten to be quantitatively comparable to the magnitude of the growth premium.

Here, GP is the growth premium, estimated from the cross-sectional regression (2) in the previous section. As described before, I use two series of growth premia, which differ in terms of the risk measure used as a control in the valuation regression (2): (i) GP_M is the LTG slope, controlling for the market beta; (ii) GP_3F is the LTG slope, controlling for loadings on the three Fama-French factors (market beta, size, and B/M). To facilitate discussion, I take absolute values of both series of growth premia.[17]

The coefficient of investor sentiment (SENTIMENT), a_1, is my main focus. I predict a_1 to be *positive* – to the extent that sentiment measures capture non-fundamental factors contributing to mispricing, the high (low) growth premium is a manifestation of the overpricing (underpricing) of growth. To capture the elusive concept of investor sentiment, I use two measures for sentiment, SC and SI, which are detailed in Section III.

Regression (4) controls for fundamental factors that may contribute to the variation in the growth premium. Firstly, I control for *real* interest rates because interest rates have a major impact on stock valuation. Real, rather nominal interest rates are used because stocks are claims on real productive capital and their valuation is hedged against inflation. It is well known that real interest rates rise in expansions and drop in recessions, while the growth premium is likely to move in the same direction in these business cycles. Thus, I predict a positive relation between real interest rates and the growth premium.[18] The real interest rate (INT) is measured as

[17] Because the valuation regression (2) regresses the forward earnings yield on expected long-term earnings growth, the original estimates of growth premia are negative. See Section III for detail.

[18] Heuristically, during an expansion, high demand for capital by companies pushes interest rates high. Conversely, in a recession, low demand for capital causes interest rates to fall. Alternatively, it is also possible to predict a negative relation between real interest rates and the growth premium. Both variables reflect economic agents' tradeoffs between the present and the future. During periods when current consumption is valued more highly (i.e., real interests rates are high), investors should also be reluctant to give up too much of earnings yield in exchange for future earnings (i.e., the growth premium is low). Of course, the effect of interest rates on the real economy, the capital market, and agent expectations is likely to be far more complex than described here. A full-fledged discussion of the topic is beyond the scope of this paper.

the spread between three-month Treasury bill yields and the inflation rate.

Secondly, I include market volatility (VOL) in regression (4). Stock market volatility is shown to be positively related to expected returns, either as a risk proxy (French *et al*. 1987), or through volatility feedback (Campbell and Hentschel 1992). To the extent that stock valuation is more sensitive to market volatility than expected earnings growth is, market volatility should be negatively related to the growth premium. Following French *et al*. (1987), I measure VOL as ex ante volatility, that is, the GARCH estimate of the volatility in the value-weighted CRSP stock index.

Thirdly, the growth premium may fluctuate along with the stock market information environment. Under the null hypothesis that stock valuation is efficient, the growth premium, empirically the slope of the regression of the forward earnings yield on long-term growth forecasts (i.e., Model 2) declines with value-relevance of long-term growth forecasts. At the extreme, the growth premium would drop to zero when long-term growth forecasts contain no genuine growth information but pure noise. A higher analyst following indicates that more resources are devoted to information processing and that forecasts may be more informative (e.g., Alford and Berger 1999; Frankel and Li 2004). Thus I include the average number of analysts following the sample stocks (ANAFLW) in the regression as well.

Last, some may be concerned that the sentiment measures used here still reflect economic fundamentals, despite the efforts made to isolate such influences when constructing these measures. In particular, if the sentiment measures merely track the expansions and contractions of the economy, the co-movement between the growth premium and the sentiment merely mirrors rational investors' adjustment to changing growth prospect.[19] To address the issue, I

[19] When business conditions are good, high expected growth is likely to materialize, and meanwhile, investors may

include growth in real gross domestic product (GDPG) as an indicator of business cycles. The variable is calculated as the change in the log of the real per capita GDP, multiplied by 100.

The estimated growth premia and the sentiment measures are persistent, even though their autocorrelations decay to modest levels beyond the fourth lag (see descriptive statistics in Table 1 and Table 2). Preliminary estimations of regression (4) reveal that the OLS residuals are correlated. These data features suggest that the OLS standard errors for the regression coefficients are likely biased downwards and that the null hypothesis is rejected too often. Following Lemmon and Portniaguina (2006), I report the *t*-statistics constructed from Newey-West standard errors (with four lags). Alternatively, I (i) include an autoregressive term to account for residual serial correlation and (ii) bootstrap to correct biases in the OLS coefficients and generate standard errors. The results are qualitatively similar.

Empirical Results

Table 3 presents the regression results. Over the sample period of 1982 - 2005, there exits a positive and significant relation between the growth premium and the sentiment measures, indicating that growth becomes more expensive as sentiment increases.[20] Browsing across columns reveals that the relation between the growth premium and sentiment is robust to using different sentiment measures. Comparing the two measures of sentiment, the SI measure appears

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become less risk averse. Both would widen the gap between the valuations of high and low growth stocks, i.e, a large growth premium. Conversely, when business conditions are poor, investors may become hesitant to chase high growth stock as such growth is seen as less feasible now, resulting in a small growth premium. This explanation does not rely on the existence of irrational investors. Following a similar logic, Johnson (1999) finds that earnings persistence and earnings response coefficients are higher in expansion periods than in contraction periods.

[20] Despite the contemporaneous regression design here, I cautiously make the causal inference for two reasons. First, behavioral finance theory treats investor sentiment as the cause of mispricing (e.g., Barberis and Thaler 2003). The causality follows to the extent that the sentiment measures capture the theorized factors. Second, sentiment is measured in the 2nd month of each quarter, whereas the growth premium is estimated in the 3rd month. Because the sentiment measures predate the growth premium, it is less plausible that the causality goes from the growth premium to sentiment.

statistically more significant. This comes as no surprise because the measure is directly constructed from trading patterns, and thus is more likely to capture factors that influence stock valuation. To examine the economic significance of the sentiment measures, take the first column (sentiment is measured by SC) as an example. An increase of one standard deviation (SD) in sentiment (measured by SC) is associated with an increase of 37% SD in the growth premium (GP_M). This increase in the growth premium implies that investors must give up an extra sixteen basis points (in terms of the earnings yield) in exchange for one extra percentage point of expected earnings growth.

[Insert Table 3 here]

The adjusted R^2 for the regression is between 0.22 and 0.25, and is quite stable across different measures of key variables. The incremental contribution to the adjusted R^2, when sentiment is included as an additional explanatory variable, is 0.12 and 0.06, for GP_M and GP_3F, respectively. Recall that, compared to GP_M, GP_3F is the growth premium with additional control for the size and book-to-market factors. If one accepts the behavioral explanation for these two factors, it comes as no surprise that the sentiment measures should contribute less explanatory power.[21]. Taken as a whole, the sizeable improvement in the model's fitness reinforces the prediction that sentiment contributes to the fluctuation in the growth premium.

The control variables largely behave as predicted. The real interest rate (INT) is positively related to the growth premium and is by far the most significant explanatory variable. Market volatility has a negative coefficient (for GP_3F), consistent with the notion that high perceived

[21] If the size and book-to-market factors reflect rational pricing, it would indicate that the sentiment measures are probably contaminated by fundamental factors, despite efforts of disentangling them. Section VII further addresses this concern.

risk makes investors less willing to pay for future growth. Average analyst following and GDP growth have the right sign, but are statistically insignificant.

Overall, the results in Table 4 support the main prediction that changes in market-wide sentiment explain fluctuations in the growth premium. The documented statistical relation suggests that bullish investors are willing to pay a lofty price for expected earnings growth (if even such expectation is likely inflated). In contrast, bearish investors are reluctant to do so and thus growth appears to be cheap in such conditions.

V. AGGREGATE GROWTH AND INVESTOR SENTIMENT

The findings in Section IV suggest that investor sentiment affects the valuations of individual stocks by inferring the premium assigned to expected earnings growth. It remains unclear whether sentiment exerts a similar influence on the valuation of aggregate market. In particular, when equity is considered as a broad class of assets, does the premium for aggregate growth co-move with investor sentiment? Examining how investor sentiment affects with the valuation of aggregate growth sheds light on stock valuation at the macroeconomic level. Since idiosyncratic effects from individual stocks are likely to be smoothed out in the aggregate data, the market-level analysis helps to demonstrate the systematic effect of investor sentiment on the valuation of expected earnings growth.

The aggregate growth premium is the *intertemporal* sensitivity of the market-level valuation of the expected growth in aggregate earnings. I quantify the construct as the slope of the aggregate growth forecasts in the following time-series valuation regression

$$FPE_t^m = \theta_1 LTG_t^m + \theta_2 RISK_t^m, \tag{5}$$

where FPE^m is the market P/E ratio, calculated as the aggregate market value divided by

aggregate forward earnings, where both components are summed over the sample stocks. LTG^m is the aggregate growth forecast, constructed as follows

$$LTG_t^m = \left(\frac{\sum_i (1 + LTG_t^i)^5 AE_t^i}{\sum_i AE_t^i} \right)^{1/5} .$$

Here AE_t^i is stock *i*'s reported (actual) earnings for the most recent fiscal year available at the end of quarter *t*. LTG_t^i is stock *i*'s long-term growth forecast reported by IBES. This method of aggregation is known as the "bottom-up" approach. Natural logarithms are taken of both FPE^m and LTG^m before their inclusion in the regression. The sample includes all industrial stocks in the merged CRSP-COMPUSTAT-IBES database over the period 1982 - 2005.

Unlike the growth premia estimated in Section III, the growth slope θ_1 in regression (5) pertains to average premium on aggregate growth over the entire sample period, not at a single point in time. As such, a time-series specification such as (4) in Section IV is not viable for the market-level analysis. Instead, I modify regression (5) into the following *conditional* regression:

$$FPE_t^m = a_0 + a_1 LTG_t^m + a_2 SENTIMENT_t \times LTG_t^m + a_3 SENTIMENT_t + a_4 NINT_t + a_5 PREM_t . \quad (6)$$

This regression is called "conditional" because the response of FPE^m to LTG^m is conditional on the contemporaneous level of sentiment. In this setup, the aggregate growth premium is simply $a_1 + a_2 SENTIMENT_t$, a (linear) function of investor sentiment. My main interest is in the coefficient a_2, the conditional effect of sentiment on the aggregate growth-value relation. The higher is sentiment, the more expensively I would expect aggregate growth to be valued. Hence, I predict a_2 to be positive.

Regression (6) controls for nominal interest rates (NINT) and the equity risk premium (PREM), both of which are related to the discount factor used in the valuation. I use the nominal

ten-year Treasury bond yield, partially motivated by the empirical relation between the equity yield and nominal interest rates (also known as the "Fed" model; e.g., Campbell and Vuolteenaho 2004).[22] The equity risk premium is measured as the future return on the CRSP stock index, in excess of the three-month Treasury bill return. The coefficients of both variables are expected to be negative, as a high discount rate reduces equity valuation, for a given level of expected growth. I estimate regression (6) with respect to both measures of investor sentiment, SC and SI.

The estimation and inference of regression (6) takes into account the persistence of the variables and the error autocorrelation. As in the previous section, *t*-statistics are constructed from Newey-West standard errors (with four lags). A close inspection of the data reveals that FPE^m and LTG^m have unit roots: the *p*-values of the augmented Dickey-Fuller test are 0.45 and 0.29, for FPE^m and LTG^m, respectively. Nevertheless, I argue that this data feature can reasonably be excluded on the grounds of economic theory. Rational investors would certainly not expect the rate of growth in future earnings to explode. Instead, the growth rate should revert to a "normal" level. A similar argument can be made for the market P/E. (In fact, the existence of nonstationarity in these financial ratios may be a manifestation of mispricing.) Campbell and Yogo (2006) make a similar discussion regarding the dividend yield. To verify the validity of the inference based on standard statistical methods, I calculate the seasonal differences in FPE^m and LTG^m, which makes both series stationary. The inferences are qualitatively similar when I re-estimate regression (6) using the differenced series (with a slight modification to the specification).

[Insert Table 5 here]

The first column of Table 5 reports the estimation results, in which investors' irrational

[22] The results remain qualitatively unchanged when real interest rates are used instead.

sentiment is constructed from the consumer confidence index (SC). The interaction term between the sentiment measure and the aggregate growth forecast ($SENTIMENT_t \times LTG_t^m$) is positive and significant at the 1% level. This provides formal support for the prediction that when sentiment is high, the aggregate growth forecast is valued with a premium, and that the premium shrinks when sentiment falls. In economic terms, when sentiment (measured by SC) is one standard deviation above the "no-sentiment" case, aggregate growth is valued, *on the margin*, 42% higher (see Panel D of Table 5). Compared to SC, the trading-based SI measure appears to be less significant; however, the incremental adjusted R^2 clearly indicates that the measure is economically significant.[23] The rest of the control variables behave as expected: aggregate growth (LTG^m) has a positive and significant coefficient, whereas nominal interest rates (NINT) and the risk premium (PREM) both have negative coefficients.

In this section I find evidence that expected aggregate earnings growth too is valued differently, depending on the prevailing sentiment. Thus, this section complements Section IV by showing that sentiment appears to exert a broader effect on stock valuation at the macro level, in addition to its effect on cross-sectional valuation. Aggregation and/or diversification do not completely diminish its effects. These findings corroborate those in Brown and Cliff (2005) and Lamont and Stein (2004, 2006), which show that sentiment contributes to inefficiency at the market level.

VI. IS GROWTH MISPRICED?

The behavioral explanation for the findings in the previous two sections is that expected earnings growth is mispriced as a result of sentiment. While intriguing, this explanation is

[23] The appearance of SI being less statistically significant could be partly due to its stronger persistence.

subject to the criticism that the inference largely hinges on the validity of the sentiment measures. To gain further insight into the mispricing of growth, I examine cross-sectional patterns of stock returns that can be identified ex ante by expected growth, conditional on sentiment. The analysis extends that in La Porta (1996), who documents that future returns are predictable from expected growth but does not explicitly consider the impact of sentiment. Baker and Wurgler (2006) report that the patterns of future returns based on various firm characteristics vary with sentiment; they do not examine expected earnings growth, however.

I expect that changes in sentiment over time and differing levels of expected growth in the cross section combine to create rich patterns in returns.[24] Specifically, when sentiment is high, stocks with high expected growth tend to be overvalued in comparison to those with low expected earnings growth. Subsequently, the former underperform the latter as the overpricing is gradually corrected. In contrast, when sentiment is low, over-pessimistic investors take defensive action by selling high growth stocks and holding "stable" stocks. Subsequently, high growth stocks outperform low growth stocks.[25]

[Insert Table 6 here]

Table 6 shows the results of sorting the sample stocks both according to LTG and according to the ex ante SI measure for sentiment. Specifically, I first sort the stocks into ten deciles on the basis of LTG, at the end of each calendar quarter between 1982, Quarter I and 2005, Quarter

[24] Baker and Wurgler (2006) argue that some stocks are sensitive to the influence of sentiment and are faced with large market frictions that prevent arbitrageurs from stabilizing the price. In the current setting, stocks with high expected growth are valued inherently with more subjectivity, and thus their valuations are more sensitive to sentiment. Meanwhile, these same stocks are often small, young, and less liquid, all characteristics that deter arbitrageurs from betting against mispricing.

[25] Strictly speaking, the sorting scheme here is not implementable. That is because the designation of high/low sentiment is done over the whole sample period. This induces a look-up bias. This caveat, however, does not invalidate the inference one may draw regarding the mispricing of growth.

IV.[26] Portfolio returns, which are equally weighted returns of constituent stocks, are cumulated over the following three-, six- and twelve-month periods. Next, I group the LTG portfolios based on the sentiment level at the formation date. A sentiment level is identified as high if the SI is above the 60th percentile of the measure's historical distribution, and low if it is below the 40th percentile.

As shown in Panel B of Table 6, the abnormal returns of the LTG deciles exhibit the predicted *conditional* cross-sectional patterns. Specifically, following low sentiment, the top (highest expected growth) decile outperforms the bottom (lowest expected growth) decile by 1.26 percentage points over the next three months. The relative performance reverses following high sentiment: The top decile underperforms the bottom decile by 5.11 percentage points. The performance reversal is consistent with my prediction that growth stocks are more prone to sentiment influence. The nonparametric Wilcoxon test confirms that the reversal of the relative performances of high and low growth stocks is statistically significant. It also appears that the return spreads between the top and bottom deciles are larger (in magnitude) following high sentiment than following low sentiment (for the three-month period, the figures are 1.26% and -5.11%). The asymmetry in the spreads may reflect the institutional nature of the short-selling constraint in that pessimistic investors are prohibited from short-selling in downturn markets.

The sentiment effect can also be observed for individual portfolios. The bottom decile's performance remains largely stable across the different levels of sentiment (the return spread between the two levels is only 1.5 percentage points over three months). The spread widens

[26] The decile breakpoints are based on all stocks available, rather than NYSE stocks only. Prior studies use NYSE breakpoints to ensure that extreme portfolios are not dominated by stocks traded on one particular exchange. However, LTGs for NYSE stocks in recent quarters are not well-dispersed. Sorting stocks into deciles based on NYSE breakpoints would result in too many ties, and in some quarters, would fail to form central portfolios. To verify that the sorting results do not depend on the choice of breakpoints, I also analyze the decile and quintile portfolios formed using NYSE breakpoints. The results remain largely unchanged.

among the upper deciles of LTG and reaches a maximum of 4.87 percentage points for the top decile. Examining other characteristics (see Panel A of Table 6) reveals distinctions between high and low LTG stocks. The lower deciles consist of big-cap, dividend payers. These are "safe" stocks whose valuations can be anchored around proven financial track records. The upper deciles are made up of small-cap, investment-intensive, and currently less profitable stocks. Because these stocks' valuations rely heavily on expectation of future growth, it is hardly a surprise that they are sensitive to sentiment.

The conditional effect of sentiment on cross-sectional return patterns is robust to the return period and the measurement of the return. As the return horizon lengthens, the conditional effect becomes more pronounced. For example, over one year, the return spread between the top and bottom deciles is less than one percentage point following low sentiment, but -25.7 percentage points following high sentiment.

[Insert Figure 3 here]

Figure 3 illustrates Panel B graphically. Other than the inferences drawn above, it reveals two interesting patterns. First, abnormal returns following low sentiment (clear bars) are less dispersed across portfolios than abnormal returns following high sentiment (solid bars). The rising solid lines (i.e., the difference in conditional returns) are effectively driven by the returns following high sentiment periods. In another words, high sentiment causes high (low) growth stocks to be over(under)-priced, whereas low sentiment does not appear to have a significant effect on the pricing. This asymmetry implies that high sentiment inflicts more distortion on pricing than low sentiment. Second, the upward pattern of the difference in conditional returns (solid lines) appears inconsistent with the U-shaped curve reported by Baker and Wurgler (2006, Panel J, Figure 2, p. 1663). They form deciles based on historical sales growth and might have

left risky, speculative stocks in the two tails and stable, mature stocks in the middle deciles. Forecasted growth is more likely to reveal the impact of sentiment because sentiment is inherently intertwined with growth expectations.

I also sort the stocks by the price-to-earnings-to-growth (PEG ratio along with the sentiment measures, with the aim of disentangling the source of return predictability. In the LTG-based sorting, the predictive power is likely to stem from two sources: erroneous *growth expectations* and the erroneous *growth premium*. The sharper design, using the PEG ratio, will examine whether the growth premium is related to subsequent returns. Because the PEG ratio can be considered as capturing a relation between the forward P/E ratio and expected growth for individual stocks, sorting stocks by the PEG ratio better focuses the growth premium, rather than the growth expectation. In addition, the ratio has gained some acceptance as a valuation metric in practice, which also warrants a careful examination of its merits.

[Insert Table 7 here]

Table 7 reports the results of sorting according to the PEG ratio and the SI measure of sentiment. The PEG ratio is calculated as the stock price dividend by one-year-ahead forward earnings and LTG (as a percentage). Panel A reports the characteristics of the PEG deciles. It is apparent that the forward earnings yield and LTG exhibit opposite trends across the PEG portfolios. Stocks in the bottom decile have depressed valuation (high FEY) relative to LTG, while stocks in the top decile have heft valuation (low FEY) relative to LTG; these two groups are apparently anomalous considering that FEY usually is negatively related with LTG. Decile 6 has a PEG ratio close to one, the textbook benchmark of "correct valuation". Except for decile 10, the average size increases monotonically from the bottom to the top decile. The figures for the other characteristics give rise to conflicting pictures regarding the stocks in each decile, as

well. For example, stocks in the bottom decile have high historical EPS growth, low dividend payouts, high B/M, and stock prices that have performed poorly in the past. In the light of these characteristics, the high LTGs of these stocks are likely to be biased/outdated analyst forecasts. The top decile stocks perform equally disappointingly, in terms of both fundamentals and stock prices. Taken as a whole, one may conclude that stocks in both tails possess characteristics that make them sensitive to sentiment.

[Insert Figure 4 here]

Figure 4 illustrates the abnormal returns for the PEG portfolios, conditional on the sentiment level at the formation date (also reported in Panel B of Table 7). Compared to the sorting based on LTG, two different patterns emerge. First, unconditional future returns (dashed line) exhibit a reversed U-shape, that is, the tail deciles tend to underperform relative to the middle deciles. Second, the return spread between under high and low sentiment (solid line) is a U-shape. This is consistent with the earlier conjecture that stocks in the two tails are sensitive to sentiment, and thus more susceptible to mispricing.

In summary, the results from sorting according to LTG or PEG are consistent with the hypothesis that growth are more likely to be mispriced among stocks that are susceptible to sentiment: such are stocks with fast growth and stocks whose growth is valued very high or very low. As the prevailing sentiment shifts between pessimism and optimism, these stocks go from being undervalued to being overvalued.

VII. ALTERNATIVE EXPLANATIONS

In this section I examine rational explanations for the fluctuation in the growth premium, as alternatives to the sentiment explanation proposed up to now. The alternative explanations in the

rational framework look at either the rational risk premium or rational growth expectations. Evidence exists that the risk premium indeed changes over time (e.g., Ferson and Harvey 1991). It also seems plausible that rational investors change their expectations about earnings growth based upon available information. While each single piece of evidence can be reconciled with some rational explanation, no coherent rational theory exists that explains all the evidence collectively.

Growth and risk are so closely related that it is almost self-evident that high growth means high risk and vice versa. Thus, at first glance, risk should play some role in driving the changing valuation of growth. A more careful analysis, however, reveals that a classic rational setting cannot account for the time-varying valuation of growth reported in Sections IV and V.

One possibility is that the growth premium may vary with the time-varying risk premium. A low risk premium means low discount rates; future growth will be discounted by less and valuations will rise. Thus, the growth premium should move in the opposite direction to the risk premium. To examine the risk premium explanation, I include measures for it in the time-series regression (2) and examine whether the sentiment measure retains incremental explanatory power. Drawing upon prior finance literature, I consider two sets of measures for risk premium. The first set includes spreads for empirical risk factors: market beta, book-to-market, size, and momentum (Fama and French 1992; Jegadeesh and Titman 1993).[27] The second set is associated with economic state variables, identified by Chen *et al*. (1986) – industrial production (measured by GDP growth), default spread, and term spread.[28]

[27] I caution that exact economic interpretations of the empirical risk factors remain unsettled; the behavioral explanation has gained increasing acceptance.

[28] These variables are merely *state variables*, neither risk factors nor risk premia. Estimating a time-series of risk premia is empirically challenging. Common estimation methods rely on overlapped observations and, as a result, introduce autocorrelation into the estimates. The resulting estimates are often very noisy. For these reasons, I use the

[Insert Table 8 here]

Table 8 shows the results. Both the SC and SI measures of sentiment remain largely significant, albeit weaker. The measures for risk premium are mostly insignificant.

Moreover, changes in risk premia cannot explain the future return patterns documented in Section VI. I maintain the heuristic that "high growth means high risk" Now suppose that high (low) sentiment periods coincide with low (high) risk premia. It follows that the future return spread between high and low growth stocks is narrow (wide) following high (low) sentiment periods. The results in Table 6 and Table 7 do not support this prediction. On the contrary, the spread is larger following high sentiment. The risk premium explanation runs into further difficulty in the light of the reversal in the spread following different levels of sentiment.

It seems even less plausible to attribute fluctuations in the growth premium to investors' rational expectations. The irrationality of analysts' growth forecasts is well documented in the literature (e.g., La Porta 1996; Dechow *et al*. 2000; Chan *et al*. 2003; Hughes *et al*. 2008). Rational investors would discount rather than overreact to analysts' growth forecasts when these forecasts became too extreme. Instead, the results in this paper indicate that investors not only fail to discount erroneous expected growth, but assign inflated premium to such growth, and therefore exacerbating misvaluation.

VIII. CONCLUSIONS

Fundamental analysis centers on the P/E ratio and expected earnings growth. The growth premium captures the relation between a stock's valuation and expected earnings growth, and

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state variables themselves. The assumption made is that the time-variation in the state variables is correlated with the time-variation in the underlying risk premia.

matters to both investors and firms. This study documents the substantial fluctuation of the growth premium over time and seeks to understand why it does so. To that end, I examine the behavioral hypothesis that sentiment-induced mispricing causes expected growth to be priced differently.

The empirical findings confirm that the growth premium varies with investor sentiment, at both the individual stock level and the aggregate market level. I also find that the cross sections of future returns vary with initial sentiment. The patterns are intriguing: following a period of high sentiment, stocks prone to the sentiment influence (e.g., high LTG, and extreme PEG) underperform stocks that are insensitive to sentiment; in contrary, following a period of low sentiment, cross-sectional return patterns reverse. Collectively, these results are consistent with the behavioral view that sentiment causes the mispricing of expected growth. Overly-optimistic investors pay too much for good growth prospects, despite the fact that expected growth is likely to be biased. Pessimistic investors behave in the opposite way. I consider the alternative explanations that changing risk premia or (rational) expectation on growth drive the growth premium. However, these explanations appear unable to account for the findings as a whole.

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Table 1. Estimation of Growth Premium, 1982:I - 2005:IV

Panel A. Variables for Estimating Growth Premium

	Obs	Mean	Std	Min	Q1	Med	Q3	Max
FEY	163,316	0.08	0.04	0.00	0.05	0.07	0.09	0.98
Pre-1993	61,799	0.09	0.04	0.00	0.06	0.08	0.11	0.95
Post-1993	101,517	0.07	0.04	0.00	0.04	0.06	0.08	0.98
LTG	163,316	0.18	0.09	0.00	0.12	0.15	0.20	1.00
Pre-1993	61,799	0.16	0.08	0.00	0.11	0.15	0.20	1.00
Post-1993	101,517	0.18	0.09	0.00	0.12	0.16	0.22	0.99
BETA	161,784	1.19	0.73	-1.76	0.72	1.11	1.56	5.74
MKT	161,784	1.12	0.71	-2.08	0.68	1.06	1.49	5.19
SIZE	161,784	0.76	1.00	-3.70	0.09	0.66	1.33	6.68
B/M	161,784	-0.02	1.22	-6.50	-0.69	0.07	0.75	4.65

All variables are measured at the end of the calendar quarter. FEY is the forward earnings yield, in which forward earnings is the median EPS forecast for the coming 12 months. LTG is the consensus (median) long-term growth forecast. FEY and LTG are truncated between 0 and 1. BETA is estimated from the market model over 36 months. MKT, SIZE, and B/M are loadings on the three Fama-French factors: market beta, size, and book-to-market, estimated from the three-factor model over 36 months. Risk proxies are truncated by 0.5% at both tails. The sample excludes financial institutions and utility companies.

Panel B. Correlation

	FEY	LTG	BETA	MKT	SIZE	B/M
FEY		-0.24***	-0.11***	-0.03***	0.03***	0.13***
LTG	-0.30***		0.30***	0.12***	0.19***	-0.23***
BETA	-0.11***	0.30***		0.76***	0.14***	-0.28***
MKT	-0.03***	0.12***	0.74***		0.08***	0.24***
SIZE	0.04***	0.21***	0.13***	0.07***		0.15***
B/M	0.14***	-0.23***	-0.28***	0.25***	0.15***	

The lower and upper triangles report Pearson and Spearman correlations, respectively. *** indicates significance at 1%.

Table 1 (Continued)

Panel C. Estimated Growth Premia, 1982:I - 2005:IV

$FEY_{it} = \gamma_{1t} LTG_{it} + \gamma_{2t} RISK_{it}$

										Autocorrelation			Unit
	Obs	**Mean**	**Std**	**Min**	**Q1**	**Med**	**Q3**	**Max**	**Avg.R^2**	**1**	**2**	**4**	**6**	**Root**
GP_M	96	0.11	0.04	0.25	0.14	0.10	0.08	0.05	0.08	0.79*	0.60*	0.27	0.00	<.001
Pre-1993	44	0.12	0.03	0.20	0.15	0.12	0.10	0.06	0.06	0.73*	0.62*	0.49	0.24	
Post-1993	52	0.10	0.04	0.25	0.11	0.09	0.08	0.05	0.10	0.79*	0.55*	0.08	-0.19	
GP_3F	96	0.11	0.03	0.20	0.13	0.11	0.09	0.04	0.11	0.73*	0.59*	0.32	0.10	<.001
Pre-1993	44	0.13	0.03	0.20	0.15	0.12	0.11	0.06	0.08	0.67*	0.56*	0.38	0.07	
Post-1993	52	0.10	0.03	0.20	0.12	0.10	0.08	0.04	0.14	0.68*	0.50*	0.10	-0.06	

The model is estimated by OLS over the cross section at the end of each calendar quarter. The slope for LTG (γ_1) is the growth premium (GP). GP_M is the estimated growth premium when RISK is the market beta (BETA). GP_3F is the estimated growth premium when RISK includes loadings on the three Fama-French factors (MKT, SIZE, B/M). Both GP_M and GP_3F are absolute values of the initial estimates. Avg. R^2 is the average of the adjusted R^2 of the quarterly cross-sectional regressions over the sample period. * indicates that a value is greater than two standard errors. Unit Root reports the *p*-value from the augmented Dickey-Fuller test with the null hypothesis that there exists a unit root with a drift.

Table 1 (Continued)

Panel D. Stability of Growth Premium						
		Confidence Level for the Stability Test				
Model		**< 1%**	**1 - 5%**	**5 - 10%**	**> 10%**	**Total**
GP_M	Count	48	18	5	21	92
	%	52	20	5	23	100
GP_3F	Count	55	13	3	21	92
	%	60	14	3	23	100

Between 1982 and 2005, the following pair of regressions is jointly estimated using the Seemingly Unrelated Regression (SUR)

$$FEY_{it} = \gamma_{1t} LTG_{it} + \gamma_{2t} RISK_{it}$$
$$FEY_{it-4} = \gamma_{1t-4} LTG_{it-4} + \gamma_{2t-4} RISK_{it-4}.$$

The null hypothesis is $\gamma_{1t} = \gamma_{1t-4}$. The table reports the count (percentage) of rejections of the null under various confidence levels.

Table 2. Measures of Investor Sentiment, 1982:I - 2005:IV

									Autocorrelation			Unit
	Obs	**Mean**	**Std**	**Min**	**Q1**	**Med**	**Q3**	**Max**	**1**	**2**	**4**	**6**	**Root**
The Sentiment Component of Consumer Confidence (SC)													
Overall	96	0.00	0.10	-0.28	-0.04	0.01	0.07	0.22	0.41*	0.34*	0.30*	0.19	0.03
Pre-1993	44	0.01	0.10	-0.23	-0.04	0.01	0.08	0.21	0.51*	0.49*	0.39	0.24	
Post-1993	52	-0.00	0.10	-0.28	-0.04	-0.00	0.07	0.22	0.33*	0.23	0.18	-0.01	
The Sentiment Index (SI)													
Overall	96	0.02	0.07	-0.13	-0.04	0.01	0.06	0.30	0.74*	0.61*	0.36	0.25	0.02
Pre-1993	44	0.02	0.08	-0.13	-0.04	0.02	0.07	0.28	0.84*	0.72*	0.52	0.47	
Post-1993	52	0.02	0.07	-0.08	-0.03	0.00	0.05	0.30	0.63*	0.46*	0.15	-0.01	

The data is quarterly as of months 2, 5, 8, 11. SC is the residual from regressing the Index of Consumer Expectation on a set of macroeconomic variables. Details about of constructing the SC measure and the data sources are available from the author upon request. The monthly SI series was kindly provided by Jeffery Wurgler. SI is the first principal component of six variables: the closed-end fund discount, NYSE turnover, numbers and first-day returns of IPOs, the equity share of total raised capital, and the dividend premium. All contributing variables are first regressed on a set of macroeconomic variables to control for macroeconomic conditions. See Baker and Wurgler (2006, 2007) for further details. Both measures are scaled by 10. * indicates greater than two standard errors. Unit Root reports the *p*-value from the augmented Dickey-Fuller test with the null hypothesis that there exists a unit root with a drift.

Table 3. Variable Correlation, 1982:I – 2005:IV

	GP_M	GP_3F	SC	SI	INT	VOL	ANAFLW	GDPG
GP_M		0.86***	0.34***	0.45***	0.36***	0.04	0.05	0.05
GP_3F	0.88***		0.24**	0.37***	0.40***	-0.17	0.13	0.14
SC	0.19*	0.18*		0.36***	-0.06	0.15	-0.11	0.17*
SI	0.38***	0.26***	0.41***		0.31***	0.12	-0.19*	0.20*
INT	0.45***	0.40***	-0.01	0.31***		-0.02	0.10	-0.07
VOL	-0.06	-0.23**	0.20**	0.08	-0.02		-0.35***	-0.12
ANAFLW	0.11	0.14	-0.09	-0.22**	0.10	-0.28***		-0.11
GDPG	0.04	0.09	0.15	0.19*	0.05	-0.15	-0.13	

The lower left part of the table reports the Pearson correlation and the upper left part the Spearman correlation. These data are quarterly. GP_M (GP_3F) is the growth premium, controlling for market beta (loadings on the three Fama-French factors). SC and SI are as defined earlier in Table 2. INT is the real interest rate. VOL is *ex ante* market volatility. ANAFLW is the average number of analysts following the sample stocks. GDPG is growth in real gross domestic product. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

Table 4. Time-Series Regression of Growth Premium on Investor Sentiment, 1982:I - 2005:IV

$$GP_t = a_1 SENTIMENT_t + a_2 INT_t + a_3 VOL_t + a_4 ANAFLW_t + a_5 GDPG_t$$

	Predicted Sign	GP_M		GP_3F	
		SC	**SI**	**SC**	**SI**
SENTIMENT	(+)	0.148***	0.216***	0.090**	0.131***
		(2.40)	(3.63)	(2.28)	(2.85)
INT	(+)	0.018***	0.011***	0.017***	0.012***
		(4.51)	(2.58)	(4.39)	(3.70)
VOL	(-)	0.028	0.079	-0.337	-0.306
		(0.08)	(0.20)	(-1.25)	(-1.13)
ANAFLW	(+)	0.004	0.008	0.004	0.007
		(0.31)	(0.77)	(0.43)	(0.74)
GDPG	(+)	0.004	0.001	0.014*	0.013
		(0.28)	(0.08)	(1.29)	(1.12)
Adj. R^2		0.22	0.23	0.24	0.25
Incremental R^2		0.12	0.13	0.06	0.07
Obs		96	96	96	96

The data are quarterly. The dependent variable is the growth premium. Two sets of growth premia are estimated, differing in terms of the measure of risk controlled for: (i) market beta (GP_M); (ii) loadings on the three Fama-French factors (GP_3F). The regression uses the absolute value of the initially estimated growth premium. Investor sentiment (SENTIMENT) is measured by SC and SI. INT is the real interest rate, measured as the three-month Treasury bill yield, minus the inflation rate. VOL is *ex ante* market volatility, proxied by the GARCH estimate of the volatility of the value-weighted CRSP stock index. ANAFLW is the average number of analysts following the sample stocks. GDPG is growth in real gross domestic product. *t*-statistics are in parentheses, using Newey-West standard errors (lag = 4). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using a one-sided test. Incremental R^2 reports the improvement in adjusted R^2 after including sentiment measures.

Table 5. Influence of Investor Sentiment on Aggregate Growth Premium, 1982:I - 2005:IV

Panel A. Summary Statistics								
	Obs	**Mean**	**Std**	**Min**	**Q1**	**Med**	**Q3**	**Max**
FPE^m	96	15.52	5.08	6.17	11.74	14.95	19.03	27.03
LTG^m	96	0.13	0.01	0.11	0.12	0.13	0.14	0.16
NINT	96	0.02	0.04	-0.06	-0.01	0.02	0.05	0.16
PREM	96	0.02	0.08	-0.25	-0.02	0.03	0.07	0.20

The data are quarterly. FPE^m is the market P/E ratio, where total market value and forward earnings are aggregated over all sample stocks. LTG^m is the annualized growth for forecasted aggregate earnings over a five-year period

$$LTG_t^m = \left(\frac{\sum_i (1 + LTG_t^i)^5 AE_t^i}{\sum_i AE_t^i} \right)^{1/5} .$$

NINT is the nominal ten-year Treasury bond yield. PREM is the excess return on the value-weighted CRSP stock index, minus the three-month Treasury bill yield. PREM is one quarter ahead of the rest of the variables.

Panel B. Autocorrelation						
	1	**4**	**6**	**8**	**12**	**Unit Root**
FPE^m	0.92*	0.74*	0.68*	0.60	0.38	0.48
LTG^m	0.85*	0.62*	0.52*	0.32	-0.00	0.29
ΔFPE^m	0.71*	-0.06	0.03	-0.00	-0.20	0.01
ΔLTG^m	0.59*	-0.10	0.15	0.09	-0.19	0.10

ΔFPE^m and ΔLTG^m are the seasonal differences in log FPE^m and log LTG^m. * indicates that a value is greater than two standard errors. Unit Root reports the *p*-value from the augmented Dickey-Fuller test with the null hypothesis that there exists a unit root with a drift.

Table 5. (Continued)

Panel C. Time-Series Regression of the Market P/E on Aggregate Growth Forecast, Conditional on Investor Sentiment, 1982:I - 2005:IV

$$FPE_t^m = a_1 LTG_t^m + a_2 SENTIMENT_t \times LTG_t^m + a_3 SENTIMENT_t + a_4 NINT_t + a_5 PREM_t$$

	Sign	SC	SI
LTG^m	(+)	1.625***	2.190***
		(3.39)	(4.82)
SENTIMENT×LTG^m	(+)	6.847***	6.829*
		(2.51)	(1.66)
SENTIMENT	(+)	13.432***	11.876*
		(2.49)	(1.49)
NINT	(-)	-1.559**	-1.563***
		(-2.34)	(-2.87)
PREM	(-)	-0.224	-0.226
		(-0.85)	(-1.10)
Adj. R^2		0.37	0.50
Incremental R^2		0.03	0.16
Obs		96	96

The data used are quarterly. FPE^m and LTG^m are the natural logarithms of the respective measures. See Panel A for variable definitions. *t*-statistics are in parentheses, using Newey-West standard errors (with four lags). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using a one-sided test. Incremental R^2 reports the improvement in adjusted R^2 after including sentiment terms SENTIMENT and SENTIMENT ×LTG^m.

Panel D. Conditional Effect of Sentiment in Economic Terms

		Valuation of Aggregate Growth	
Sentiment Level	**Formula**	**SC**	**SI**
Base Case: Sentiment = 0	$\hat{a}_1$	1.63	2.19
One SD above the Base	$\hat{a}_1 + \hat{a}_2 SENTIMENT$	2.31	2.67

The estimated coefficients are taken from Panel C.

Table 6. Portfolios Formed Based on LTG, 1982:I – 2005:IV

Panel A: Properties of Portfolios

Characteristics	1 Low	2	3	4	5	6	7	8	9	10 High	All
LTG	0.08	0.11	0.13	0.14	0.17	0.18	0.21	0.24	0.28	0.41	0.18
FEY	0.07	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.04	0.02	0.06
B/M	0.88	0.72	0.64	0.62	0.58	0.52	0.49	0.46	0.42	0.36	0.60
Size ($ Mil)	4191	4144	4291	2773	2179	1907	1986	1692	1153	1038	2781
Five-Year EPS Growth	0.01	0.05	0.08	0.08	0.14	0.16	0.19	0.26	0.29	0.39	0.13
Fraction of Profitability	0.74	0.82	0.85	0.83	0.82	0.81	0.80	0.78	0.71	0.59	0.78
Dividend Payout	0.59	0.51	0.55	0.25	0.30	0.11	0.13	0.10	0.05	0.06	0.31
R&D Intensity	0.17	0.02	0.03	0.04	0.04	0.05	0.08	0.46	0.18	1.64	0.21
Raw Returns	10.42	12.06	14.29	15.00	16.32	18.86	21.60	20.83	27.94	33.95	17.76
Abnormal Returns	-2.93	-0.88	1.36	-1.25	2.97	1.89	4.93	6.12	9.50	16.46	2.84

At the end of June of each year, ten equally-weighted portfolios are formed on the basis of consensus (median) long-term growth forecasts (LTG). FEY is the forward earnings yield. B/M is the ratio of the book value of common equity (plus balance sheet deferred taxes) to market value. Size is the total market value of common equity, in millions. Five-Year EPS Growth is the slope of a fitted line over the past five years of positive EPS. Fraction of Profitability is the proportion of firms with positive earnings. Dividend Payout is the ratio of common dividends to earnings, if earnings are positive, or 0.08×common equity otherwise. R&D Intensity is the ratio of R&D expenses to sales. Returns are cumulated over one year prior to formation (as a percentage). Abnormal returns are calculated from the market model. The sample includes all industrial stocks in the merged CRSP-COMPUSTAT-IBES database, with LTG between 0 and 1. Accounting data from the fiscal year *t*-1 are matched to stock price and forecast data for year *t*.

Table 6 (Continued)

Panel B. Future Abnormal Returns by Sentiment and LTG													
	1									10	Comparison		
Sentiment	**Low**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**High**	**10 – 1**	**10 - 5**	**5 – 1**
3 Months													
Low	-0.03	-0.14	0.02	0.48	0.58	0.19	0.81	-0.09	-0.08	1.23	1.26	0.74	1.02
High	1.47	1.24	1.36	0.76	1.22	2.00	-0.51	-0.47	-2.45	-3.64	-5.11	-4.83	-0.26
Low - High	-1.50**	-1.38	-1.35	-0.28	-0.64	-1.81	1.32	0.38	2.37	4.87***	6.37***	5.57***	1.27*
6 Months													
Low	0.32	-0.56	-0.31	-0.20	-0.03	-1.38	-0.29	-1.68	-1.79	0.18	-0.14	0.66	0.48
High	3.70	3.67	3.57	2.48	2.96	3.51	-0.48	-1.26	-4.47	-7.75	-11.4	-10.4	-0.74
Low - High	-3.4***	-4.23	-3.88	-2.67	-2.99**	-4.89	0.20	-0.42	2.68	7.92***	11.3***	11.1***	1.22*
12 Months													
Low	0.58	-1.68	-0.62	-0.79	0.74	-0.49	-1.38	-2.39	-2.55	-0.04	-0.63	0.87	1.08
High	7.71	8.19	7.46	5.14	5.36	4.60	-0.99	-4.23	-11.1	-18.0	-25.7	-23.6	-2.39
Low - High	-7.1***	-9.88	-8.07	-5.93	-4.62**	-5.09	-0.39	1.84	8.54	18.0***	25.1***	24.5***	3.48***

At the end of each calendar quarter, ten equally-weighted portfolios are formed based on LTG. The sentiment level at the formation date is identified as low if the SI measure (refer to Table 2 for the definition) is below the 40th percentile of the measure's historical distribution, and high if it is above the 60th percentile. The panel reports average post-formation abnormal returns (as a percentage), over low-sentiment formation dates, and over high-sentiment formation dates, and the difference between these two averages. Abnormal returns are calculated from the market model. I test whether Low-High differs significantly from zero for deciles 1, 5, 10, and the three comparisons. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using the one-sided Wilcoxon test.

Table 7. Portfolios Formed Based on the PEG Ratio, 1982:I – 2005:IV

Panel A: Properties of Portfolios

Characteristics	≤ 0	1 Low	2	3	4	5	6	7	8	9	10 High	All
PEG	N/A	0.40	0.58	0.69	0.80	0.90	1.01	1.14	1.31	1.62	4.33	1.00
LTG	0.23	0.26	0.22	0.20	0.18	0.17	0.16	0.15	0.14	0.14	0.13	0.18
FEY	N/A	0.13	0.09	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.04	0.06
B/M	0.82	0.71	0.64	0.59	0.56	0.55	0.54	0.52	0.51	0.55	0.73	0.60
Size ($ Mil)	841.1	428.3	652.2	932.9	1375	2020	2372	3160	4835	6883	5314	2771
Five-Year EPS Growth	0.07	0.25	0.21	0.19	0.18	0.16	0.13	0.12	0.09	0.06	0.00	0.13
Fraction of Profitability	0.17	0.81	0.85	0.87	0.88	0.87	0.87	0.87	0.85	0.80	0.59	0.78
Dividend Payout	0.17	0.12	0.11	0.11	0.21	0.31	0.21	0.34	0.43	0.67	0.58	0.31
R&D Intensity	2.47	0.05	0.04	0.05	0.11	0.03	0.03	0.03	0.03	0.04	0.05	0.21
Raw Returns	-0.70	2.24	10.03	16.27	19.54	21.02	22.73	23.69	25.95	25.32	18.12	17.66
Abnormal Returns	-16.2	-13.8	-5.62	1.50	4.71	6.27	8.18	8.96	11.40	10.79	3.48	2.74

At the end of June of each year, ten equally-weighted portfolios are formed on the basis of the PEG ratio. The PEG ratio is stock price, divided by one-year-ahead forward earnings and LTG (as a percentage). LTG is consensus (median) long-term growth forecasts. FEY is the forward earnings yield. B/M is the ratio of the book value of common equity (plus balance sheet deferred taxes) to market value. Size is the total market value of common equity, in millions. Five-Year EPS Growth is the slope of a fitted line over the past five years of positive EPS. Fraction of Profitability is the proportion of firms with positive earnings. Dividend Payout is the ratio of common dividends to earnings, if earnings are positive, or 0.08×common equity otherwise. R&D Intensity is the ratio of R&D expenses to sales. Returns are cumulated over the one year prior to formation (in percentage). Abnormal returns are calculated from the market model. The sample includes all industrial stocks in the merged CRSP-COMPUSTAT-IBES database, with LTG between 0 and 1. Accounting data from the fiscal year *t*-1 are matched to stock price and forecast data for year *t*.

Table 7 (Continued)

Panel B. Future Abnormal Returns by Sentiment and the PEG Ratio														
		1									10	Comparison		
Sentiment	**≤ 0**	**Low**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**High**	**10 – 1**	**10 - 5**	**5 – 1**
3 Months														
Low	0.88	0.67	0.53	0.50	0.73	0.40	0.30	-0.01	-0.39	-0.83	-0.60	-1.27	-1.00	-0.27
High	-1.17	-1.26	-0.40	0.23	0.95	0.98	0.54	1.01	0.79	0.22	-0.83	0.43	-1.81	2.24
Low – High	2.04	1.93**	0.93	0.26	-0.22	-0.58	-0.24	-1.02	-1.18	-1.05	0.23	-1.7**	0.82	-3***
6 Months														
Low	0.68	-1.19	-0.41	-0.47	0.10	0.05	0.14	-0.51	-0.94	-1.44	-1.10	0.09	-1.15	1.24
High	-2.57	-1.92	0.25	1.17	2.17	2.35	1.74	2.44	2.18	1.69	-1.07	0.85	-3.42	4.27
Low – High	3.25*	0.73	-0.66	-1.63	-2.07	-2.3**	-1.60	-2.95	-3.12	-3.12	-0.03	-0.76	2.28	-3***
12 Months														
Low	2.82	-2.91	-1.11	-2.03	-0.63	-0.22	-0.66	-0.98	-1.70	-1.71	-0.22	2.70	0.00	2.69
High	-7.63	-3.53	1.59	3.40	3.46	5.19	3.38	4.19	3.94	1.91	-3.68	-0.15	-8.87	8.72
Low – High	10.5**	0.61	-2.70	-5.43	-4.09	-5***	-4.04	-5.16	-5.64	-3.62	3.46	2.85	8.9***	-6.0**

At the end of each calendar quarter, ten equally-weighted portfolios are formed based on the PEG ratio. The sentiment level at the formation date is identified as low if the SI measure (refer to Table 2 for the definition) is below the 40th percentile of the measure's historical distribution, and high if it is above the 60th percentile. The panel reports average post-formation abnormal returns (as a percentage), over low-sentiment formation dates, and high-sentiment formation dates, and the difference between these two averages. Abnormal returns are calculated from the market model. I test whether Low - High differs significantly from zero for deciles 1, 5, 10, "≤ 0", and the three comparisons. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using the one-sided Wilcoxon test.

Table 8. Time-Series Regression of the Cross-Sectional Growth Premium on Sentiment, Controlling for Risk Premia, 1982:I – 2005:IV

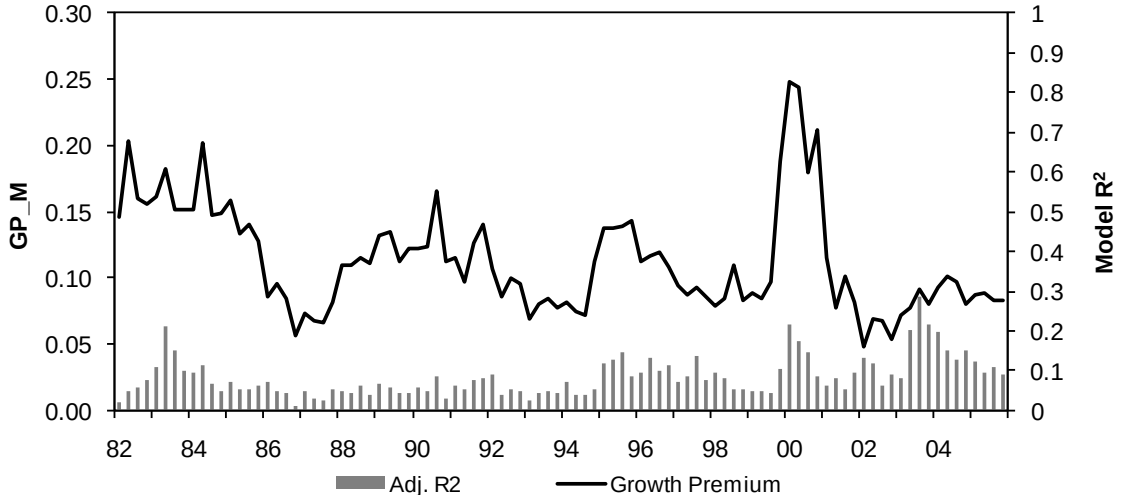
$$GP_t = a_1 SENTIMENT_t + a_2 VOL_t + a_3 ANAFLW_t + a_4 GDPG_t + RISK\ PREMIA$$

	GP_M				GP_3F			
	SC		SI		SC		SI	
SENTIMENT	0.14***	0.12**	0.29***	0.24***	0.08**	0.07**	0.18***	0.18***
(+)	(2.45)	(1.69)	(4.07)	(3.34)	(1.82)	(1.75)	(2.96)	(2.99)
VOL	-0.036	-0.139	0.127	-0.044	-0.361	-0.458	-0.294	-0.397*
(-)	(-0.07)	(-0.29)	(0.27)	(-0.09)	(-0.92)	(-1.29)	(-0.82)	(-1.29)
ANAFLW	0.006	-0.003	0.012	0.005	0.006	0.000	0.010	0.007
(+)	(0.56)	(-0.26)	(1.11)	(0.42)	(0.71)	(0.01)	(1.03)	(0.59)
GDPG	0.002	0.007	-0.003	0.003	0.015	0.021*	0.010	0.017*
(+)	(0.11)	(0.44)	(-0.16)	(0.22)	(1.11)	(1.66)	(0.78)	(1.39)
Risk Premium								
RMRF	-0.067		-0.000		-0.037		-0.003	
	(-0.84)		(-0.00)		(-0.56)		(-0.05)	
SMB	0.096		0.037		-0.057		-0.091	
	(0.87)		(0.37)		(-0.71)		(-1.15)	
HML	-0.035		-0.085		0.022		-0.020	
	(-0.30)		(-0.86)		(0.24)		(-0.26)	
UMD	0.079		0.098*		0.038		0.043	
	(0.93)		(1.49)		(0.61)		(0.88)	
DEF		0.087		0.043		0.053		0.017
		(1.08)		(0.58)		(0.90)		(0.32)
TERM		0.001		0.001		0.002**		0.002**
		(0.65)		(1.10)		(1.82)		(2.09)
Adj. R^2	0.08	0.11	0.21	0.20	0.08	0.12	0.17	0.21

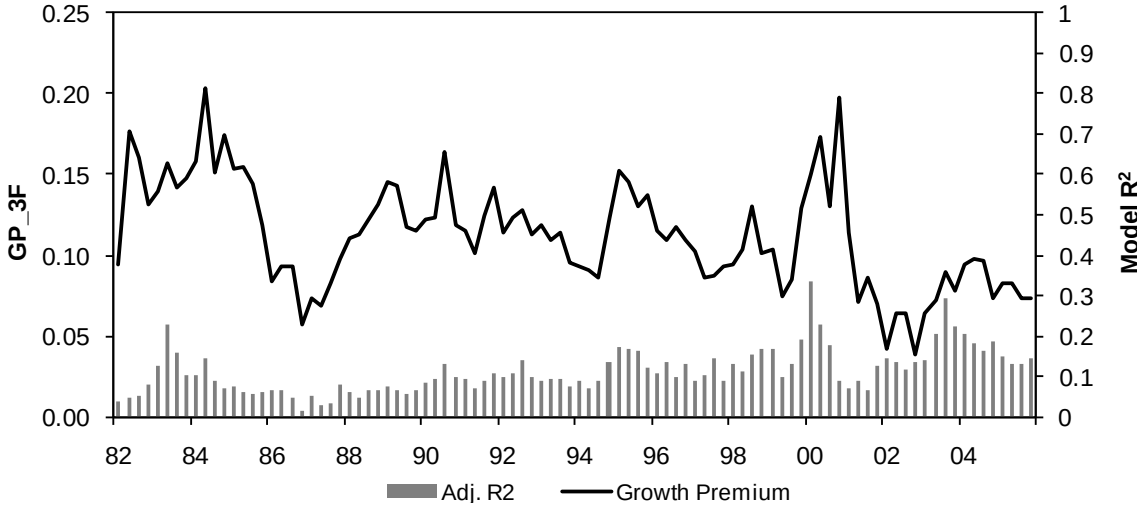
The data used are quarterly. GP_M and GP_3F are defined in Table 1 and SC and SI in Table 2. VOL is *ex ante* market volatility, measured as the GARCH estimate of CRSP index return variance. ANAFLW is the average number of analysts following the sample stocks. GDPG is growth in real gross domestic product. RMRF is the excess return of the value-weighted CRSP index over the risk-free rate. SMB is the return spread between small and large ME portfolios. HML is the return spread between high and low B/M

portfolios. UMD is the return spread between high and low momentum portfolios. (These portfolios are taken from Ken French's website and are described in more detail there.) DEF is the default spread, measured as the yield difference between Moody's Baa- and Aaa-rated corporate bonds. TERM is the term spread, measured as the yield spread between a ten-year Treasury bond and a one-month Treasury bill. *t*-statistics are in parentheses, using Newey-West standard errors (with four lags). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using a one-sided test.

Figure 1. Time Plot of Estimated Growth Premium, 1982:I – 2005:IV



A. Controlling for Market Beta



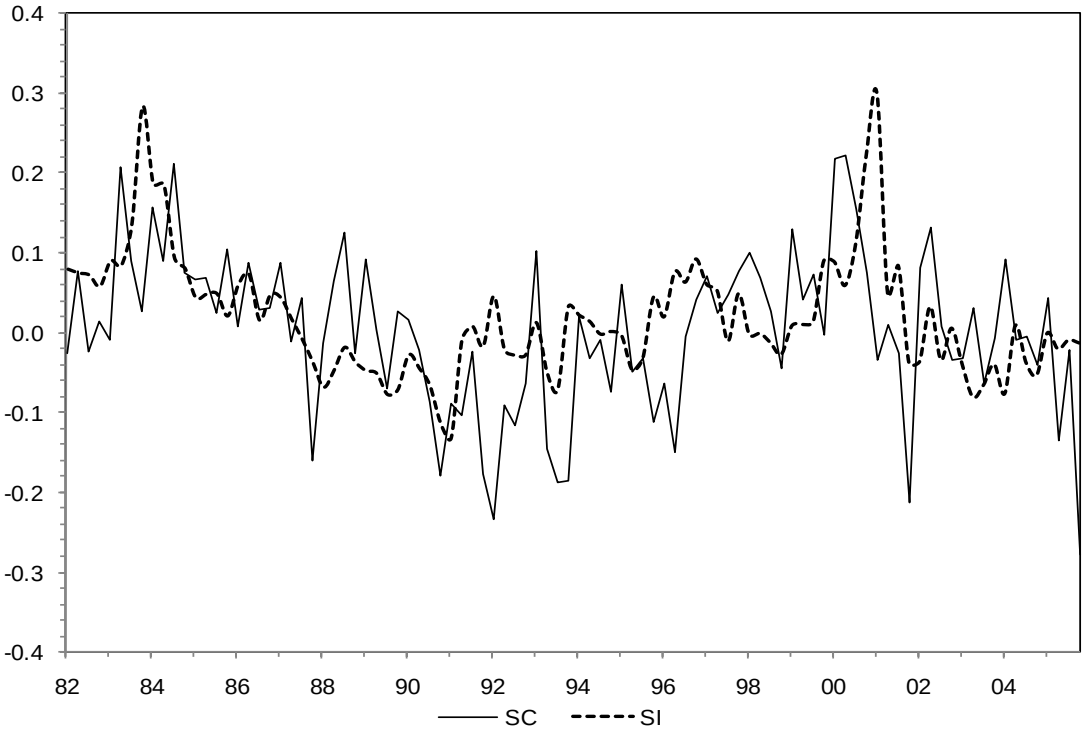
B. Controlling for Loadings on the Three Fama-French Factors

At each calendar quarter end, the following cross-sectional model is estimated using OLS

$$FEY_{it} = \gamma_{1t} LTG_{it} + \gamma_{2t} RISK_{it},$$

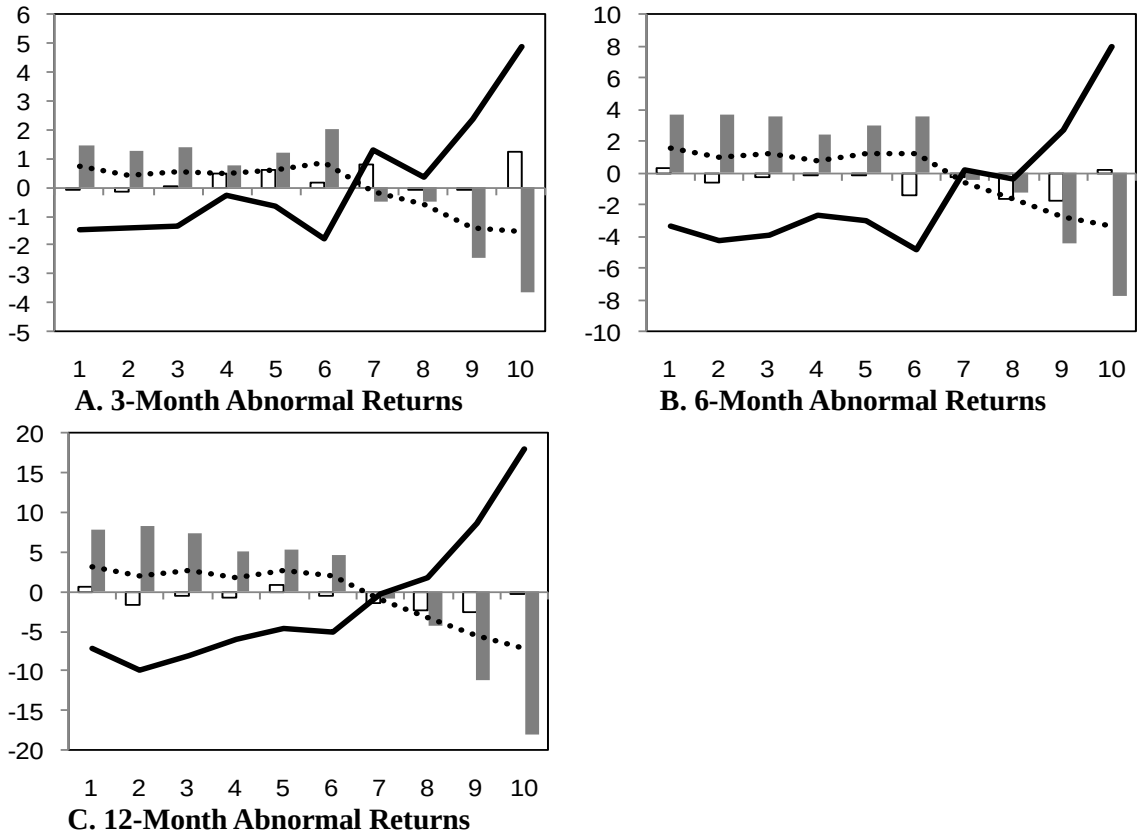
where FEY is the forward earnings yield and LTG is long-term growth forecasts. The regression slope (after taken absolute values) for LTG (γ_1) is the estimated growth premium. Panel A (B) shows GP_M (GP_3F), estimated with market beta (loadings on the three Fama-French factors, i.e., market beta, size and B/M). The solid line is estimated growth premia (left axis). The columns are the regression R^2 (right axis).

Figure 2. Measures of Investor Sentiment, 1982:I – 2005:IV



The data used are quarterly as of February, May, August, and November. The solid line depicts the Sentiment Component of Consumer Confidence (SC), which is the residual from regressing the Index of Consumer Expectation on a set of macroeconomic variables. See Appendix A for the construction of the measure. The dotted line depicts the Sentiment Index (SI). The original monthly SI series was kindly provided by Jeffery Wurgler. SI is the first principal component of six variables: closed-end fund discount, NYSE turnover, numbers and first-day returns of IPOs, the equity share in total raised capital, and dividend premium. All contributing variables are first regressed on a set of macroeconomic variables to control for macroeconomic conditions. Both measures are scaled by 10.

Figure 3. Two-Way Sorts by Sentiment and LTG: Future Returns, 1982:I – 2005:IV



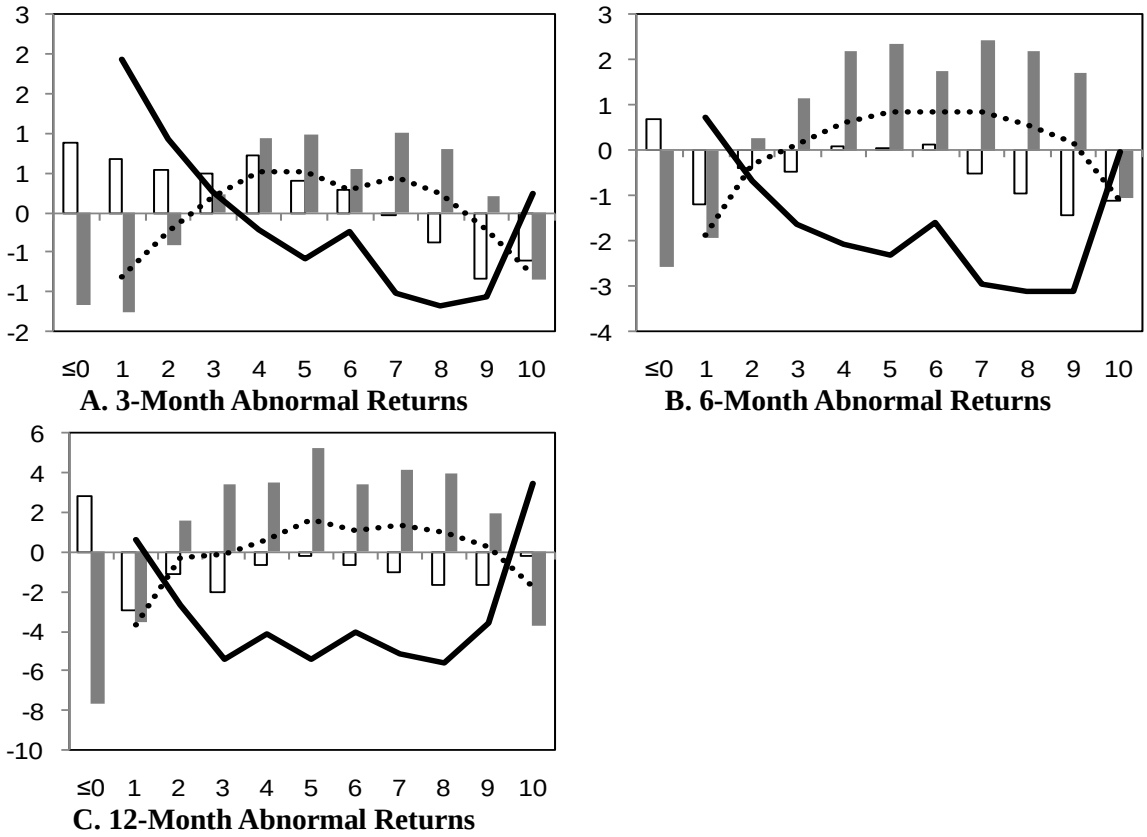
A. 3-Month Abnormal Returns

B. 6-Month Abnormal Returns

C. 12-Month Abnormal Returns

At each calendar quarter end, ten equally-weighted portfolios are formed based on LTG. The formation-date sentiment is low if the SI measure is below the 40th percentile of the measure's historical distribution, and high if it is above the 60th percentile. The clear (solid) bars are returns following low (high) sentiment. The dashed line is the average across both levels of sentiment and the solid line is the difference between them. Abnormal returns are from the market model and in percentage.

Figure 4. Two-Way Sorts by Sentiment and PEG: Future Returns, 1982:I –2005:IV



At each calendar quarter end, ten equally-weighted portfolios are formed based on the PEG ratio. The formation-date sentiment is low if the SI measure is below the 40th percentile of the measure's historical distribution, and high if it is above the 60th percentile. The clear (solid) bars are returns following low (high) sentiment. The dashed line is the average across both levels of sentiment and the solid line is the difference between them. Abnormal returns are from the market model and in percentage.