The Profitability Premium: Macroeconomic Risks or Expectation Errors?*

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Abstract

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Keywords: Profitability premium, Macroeconomic risks, Expectation errors, Investor sentiment

JEL Classification: G14, G31, G32, M41, M42

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Abstract

Macroeconomic risks only partially capture the relation between profitability and future stock returns, while adding a misvaluation factor based on investor sentiment help explain a substantial amount of it. Profitability premium only concentrates in firms whose market valuations are inconsistent with profitability and therefore subject to ex-ante expectation errors. Direct evidence show that firms with high profitability but low market valuation have significantly higher abnormal earnings announcement returns, analyst earnings forecast errors and forecast revisions than firms with low profitability but high market valuation. Moreover, the profitability premium only exists during high sentiment periods for firms with ex-ante expectation errors.

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1 Introduction

Profitability has been widely documented to positively predict future stock returns. The return spread between firms with high and low profitability is often referred to as the profitability premium. Based on the dividend discount model with clean surplus accounting, Fama and French (2006, 2008) show that firms with high profitability measured by earnings have high subsequent returns after controlling for book-to-market ratio and investment. Novy-Marx (2013) further document that profitability as measured by gross profits (revenue minus costs of goods sold) has much stronger predictive power than earnings in the cross section of stock returns. A five-factor model proposed recently by Fama and French (2013) by including the profitability factor provides a good description of average returns. However, the valuation model is silent on distinguishing rational pricing versus irrational explanations.

The rational explanations suggest that profitability positively predicts future stock return because it is a proxy for firm risk. Motivated by the q-theory of ivestment, Hou, Xue, and Zhang (2012) use a four-factor model including the market factor, a size factor, an investment factor, and a profitability factor to explain a number of existing anomalies. However, due to its partial equilibrium nature, a simple q-theory argument does not give answers to the most fundamental question: what are the risks or, in other words, what determine the stochastic discount factor? While a general equilibrium model may help us better understand the question, it is ultimately an empirical mission whether we can uncover the risk factors that truly drive the profitability premium.

Risk-based theories may not be the only explanation. Asset prices may deviate from their fundamental values due to investors' expectation errors. Firm's fundamental value equals the sum of all its discounted future cash flows. If investors cannot correctly infer firm's future cash flows based on current profitability (for example, they may underestimate the cash flows of certain high profit firms but overestimate the cash flows of certain low profit firms), profitability may predict future return due to its correlation with investors' ex-ante expectation errors. Errors in investors' expectation have long been argued to be a potential explanation for many asset pricing irregularities, notably the value premium. Lakonishok, Shleifer, and Vishny (1994) attribute the high returns of firms with low market price-to-fundamental value ratio to biased extrapolation of firm past growth.

La Porta (1996) and La Porta et al. (1997) provide further evidence of systematic expectation errors for value and growth firms based on analyst forecasts and earnings announcement returns. Piotroski (2000) and Piotroski and So (2012) identify ex-ante expectation errors by comparing firms' price multiples and their accounting-based fundamentals. They find that the value premium and ex-post expectation errors are concentrated in firms with biased ex-ante expectations.

In this paper, we investigate the profitability premium by exploring two alternative explanations, the rational explanation based on macroeconomic risks and the mispricing explanation attributed to expectation errors. We find that the Chen, Roll, and Ross (1986) macroeconomic risks can at best explain one-third of the gross profitability premium. The explanatory power mainly comes from the industry production factor and the term premium factor. However, a single misvaluation factor based on investor sentiment can explain a large proportion of the gross profitability premium. Both the equal-weighted and value-weighted return spread between high and low profitability firms become insignificant after controlling for the misvaluation factor. We further show that the profitability premium mainly exists in firms whose market valuations are inconsistent with their profitability and therefore are subject to ex-ante expectation errors. We provide direct evidence supporting the error-in-expectation hypothesis: firms with high profitability but low market valuation have significantly higher abnormal earnings announcement returns, analyst earnings forecast errors and forecast revisions than firms with low profitability but high market valuation. Finally, we find that the profitability premium only exists during high sentiment periods for those firms with identifiable ex-ante expectation errors.

Our work contributes to the current literature in several aspects. First, our results help better interpret the risk-based explanations suggested by the investment theories. While the investment anomaly can be largely explained by macroeconomic risk factors as suggested by Cooper and Priestley (2011), our results show that the gross profitability premium cannot be fully explained by such risks but rather strongly affected by investor sentiment. Second, we add to the literature discussing how misprcing may be generated by expectation errors and leads to certain asset pricing anomalies. Our methodology of identifying ex-ante expectation errors shares a similar spirit with Piotroski and So (2012). Instead of referencing to the market-to-book equity ratio, we use a more comprehensive composite index combining a number of key return predictors following Stambaugh, Yu, and Yuan (2012) to measure the relative market valuation of a firm. Piotroski and So (2012) show that the value effect is stronger among firms with ex-ante expectation errors. Novy-Marx (2013) illustrates that the profitability effect seems to be the other side of the value effect. Our findings complement and synthesize the value effect and the profitability effect literature by suggesting that the two effects are indeed highly related in that they share the commonality of dependence on ex-ante expectation errors. Third, our studies provide additional evidence on how market-wide sentiment fluctuation may affect the cross section of stock returns. Firms are potentially subject to more misvaluation and therefore the profitability anomaly is stronger during high sentiment periods. In addition, we find that the profit of both the long leg and short leg of the profitability strategy increases significantly with sentiment, suggesting that both undervaluation and overvaluation contribute to the profitability premium.

The paper closest to ours is Wang and Yu (2013), who also suggest that the profitability effect is mainly driven by behavioral biases. Our paper differs from Wang and Yu (2013) in several important dimensions. First, we use a number of profitability measures with a particular focus on the gross profitability, which is suggested by Novy-Marx (2013) and Fama and French (2013) as the most powerful profitability measure in explaining the cross section of stock returns. In addition, we use annual profitability measures and rebalance portfolios annually, while Wang and Yu (2013) use quarterly earnings and rebalance portfolios at monthly frequency. Rebalancing on an annual basis potentially mitigates the effect of slow information diffusion. More importantly, we test the mispricing explanation by directly identifying ex-ante expectation errors, while Wang and Yu (2013) link mispricing to limits-to-arbitrage and under-reaction attributed to investor inattention. We not only analytically quantify the explanatory power of macroeconomic risk factors and the misvaluation factor, but also provide a number of direct evidence supporting the error-in-expectation hypothesis in generating the profitability premium.

The remainder of the paper proceeds as follows. Section 2 develops the main hypotheses tested in the paper. Section 3 describes the data. Section 4 presents the results on macroeconomic risks and the investor sentiment factor. Section 5 explores the mispricing explanation generated by ex-ante expectation errors. Section 6 concludes the paper.

2 Hypothesis Development

The rational asset pricing models suggest that expected returns should be fully explained by firms' exposures to systematic risks. The q-theory of investment suggests that, given the same level of investment, firms with high expected profitability have high exposure to systematic risks in equilibrium and therefore should earn high expected returns. Due to the partial equilibrium nature, the q-theory does not specify the sources of risks and the rational story remains incomplete without the identification of the underlying risks. The intertemporal capital asset pricing model (ICAPM) in Merton (1973) suggests that risk factors should be well-motivated economic state variables, which characterize the conditional distribution of future asset returns. Chen, Roll, and Ross (1986) search extensively among economic state variables and identify five macroeconomic variables that significantly explain asset returns. Motivated by their work, we test the rational explanation by exploring how the profitability premium can be explained by those macroeconomic risk factors.

The alternative explanation based on behavioral biases, such as expectation errors, however, argues that investor misvaluation contributes to the profitability premium. Baker and Wurgler (2006) suggest that misvaluation is closely related to investor sentiment. Stambaugh, Yu, and Yuan (2012) provide further evidence that overpricing during high sentiment periods contributes significantly to a number of asset pricing anomalies. As a result, the behavioral explanation suggests that a misvaluation factor constructed from investor sentiment should explain a significant portion of the profitability premium. These arguments lead to our first hypothesis.

Hypothesis 1a: *If the profitability premium is compensation for risks, it should be fully explained by economic state variables.*

Hypothesis 1b: *If the profitability premium is generated by mispricing due to expectation errors, it should be explained to a large extent by a misvaluation factor constructed from investor sentiment.*

Asset prices may deviate from their fundamental values for various reasons. In this paper, we explore the possibility that mispricing may arise due to errors in investor expectation about firms' future cash flows, which are identified by contrasting firms' profitability with their market valuation. Piotroski and So (2012) provide evidence that firms with inconsistent financial strength and market valuation are subject to ex-ante identifiable expectation errors. Firms with high profitability but low market valuation are more likely to be undervalued, while firms with low profitability but high market valuation are more possible to face overvaluation. Therefore, we develop our second hypothesis as follows.

Hypothesis 2: *The errors-in-expectation hypothesis suggests that the profitability premium should concentrate in firms with ex-ante expectation errors, which are identified as firms with inconsistent market valuation and profitability.*

Expectation errors may gradually get corrected after the true profitability of firms is revealed over time. Therefore, firms undervalued ex ante should experience significantly higher earnings surprises than firms overvalued ex ante, which would be reflected in earnings announcement abnormal returns, analyst forecast errors, and forecast revisions. Our third hypothesis is stated as follows.

Hypothesis 3: *The errors-in-expectation hypothesis suggests that firms with high profitability but low market valuation (undervalued ex ante) should have higher earnings announcement abnormal returns, higher analyst forecast errors and higher forecast revisions than firms with low profitability but high market valuation (overvalued ex ante).*

The magnitude of expectation errors and misvaluation should be high when investor sentiment is high. Therefore, the profitability premium should be stronger during high sentiment periods, especially for firms that are subject to ex-ante expectation errors, which is stated formally in our last hypothesis.

Hypothesis 4: *The errors-in-expectation hypothesis predicts that the profitability premium should be stronger following high sentiment periods than following low sentiment periods for firms with ex-ante expectation errors.*

3 Data

Our full sample includes all publicly traded firms in Compustat with fiscal year ranging from 1963 to 2010. We obtain monthly and daily stock return data from the Center for Research in Security Prices (CRSP). We include only common stocks traded on NYSE, Amex, and NASDAQ with available accounting and return data. We exclude financial and utility firms (i.e., firms with four-digit SIC codes between 6000 and 6999 or between 4900 and 4949) and firms with negative book equity. We require firms to have appeared on Compustat for at least two years in order to alleviate the selection and backfilling bias. Our final sample has on average 2,762 firm observations every year. Analyst forecast data are from the Institutional Brokers' Estimate System (I/B/E/S). We use the unadjusted IBES summary estimates file in order to avoid the rounding error due to the adjustment for stock splits.

Table 1 reports the summary statistics of firm characteristics in the full sample. All the variables are defined in Appendix A. We measure firm profitability using three different definitions, including gross profitability (GPA), return-on-equity (ROE), and return-on-assets (ROA).[1] The average GPA is 42.9%, while the average ROA and ROE are only 0.8% and -3.8%, respectively. Similar to Stambaugh, Yu, and Yuan (2012), we construct the relative valuation index (Vindex) based on ten anomaly variables,[2] including book-to-market ratio (BM), market capitalization (ME), cumulative return in the past 11 months (RET_2_12), net stock issues (NSI), asset growth (AG), investment-to-asset ratio (IA), net operating assets (NOA), accruals ($ACCRUAL$), financial distress measured by Ohlson's O-score ($OSCORE$), and organizational investment (SGA). We rank stocks into deciles based on each of these variables in ascending order (in descending order for BM, RET_2_12, and SGA), and Vindex is constructed each firm year by adding up the ranks of each variable. A high Vindex means high market valuation and therefore low subsequent returns.

We obtain the Chen, Roll, and Ross (1986) (CRR) five factors following Liu and Zhang (2008).[3] The growth rate of industry production is defined as $MP_t \equiv \log(P_t) - \log(P_{t-1})$, where P_t is the

[1] Ball et al. (2014) suggest that operating profitability, defined as revenue - costs of goods sold - selling, general and administrative expenses (excluding expenditures on research and development), has similar return predictability as gross profitability. We have also used operating profitability in all of our tests and the results remain qualitatively the same.

[2] We exclude anomaly variables that are directly linked to firm profitability.

[3] We thank Laura X.L. Liu for providing the data of CRR five factors on her website.

index of industrial production in month t from the Federal Reserve Bank of St.Louis. Unexpected inflation and the change in expected inflation are defined as $UI_t \equiv I_t - E_{t-1}[I_t]$ and $DEI_t \equiv E_t[I_{t+1}] - E_{t-1}[I_t]$, respectively. I_t is the inflation rate at time t, measured as the change in natural log of the seasonally adjusted consumer price index (CPI) obtained from the Federal Reserve Bank of St. Louis. Expected inflation is calculated following Fama and Gibbons (1984). The term premium (UTS) is defined as the yield spread between the long-term and the one-year Treasury bonds obtained from the Ibbotson database. The default premium (UPR) is defined as the yield spread between Moodys Baa and Aaa corporate bonds obtained from the Federal Reserve Bank of St. Louis.

We obtain the market-wide investor sentiment index developed by Baker and Wurgler (2006) from Jeffrey Wurgler's website. The Baker and Wurgler investor sentiment index is constructed as the first principle component of six (standardized) sentiment proxies, including the average closed-end fund discount, the number and the first-day returns of IPOs, NYSE turnover, the equity share of total new issues, and the dividend premium (the natural log of the difference in the average market-to-book ratio between dividend payer and nonpayers). All the underlying proxies are orthorganized with respect to a set of macroeconomic conditions. The sentiment index is available from 1965 to 2010.

4 The Gross Profitability Premium, Macroeconomic Risks, and Investor Sentiment

4.1 Macroeconomic Risk Factors and the Cross Section of Expected Returns

The gross profitability is suggested to be the strongest predictor of future stock returns among various profitability measures. For example, the results from portfolio sorts based on ROE is relatively weak as shown by Fama and French (2008). Therefore, our results in this section are mainly based on the gross profitability measure.[4]

We form portfolios by sorting firms into quintiles based on firm gross profitability using NYSE

[4] We show in the later sections that ROE and ROA also generate significant return difference in portfolio sorts for firms with ex-ante expectation error although their unconditional effects in the full sample are relatively weak. The unconditional premiums associated with ROA or ROE with annual rebalancing in our sample are not statistically significant and therefore we do not examine them in this section.

breakpoints. Following Fama and French (1993), we rebalance our portfolios in June every year using information available at the previous calendar year end.[5] We confirm previous findings that firms with high gross profitability earn high average expected returns. From 1963 to 2010, the hedge portfolio of buying firms in the highest gross profitability quintile and selling firms in the lowest quintile generates a value-weighted average excess return of 0.31% (t-statistic=2.16) per month. The Fama and French three-factor alpha and the Carhart four-factor alpha are 0.55% (t-statistic=4.49) and 0.50% (t-statistic=4.34) per month, respectively. The equal-weighted average excess return, the Fama and French three-factor alpha, and the Carhart four-factor alpha are 0.42% (t-statistic=3.05), 0.40% (t-statistic=2.99), and 0.35% (t-statistic=2.96) per month, respectively.

In order to evaluate how well the gross profitability premium can be explained by macroeconomic risks, we form mimicking portfolios for the Chen, Roll, and Ross (1986) five macroeconomic factors. There are several advantages of using mimicking portfolios rather than the original macroeconomic risk factors. First, some of the CRR factors are not traded assets. In order to test the asset pricing model and directly estimate abnormal returns (alphas) of test portfolios, we need to generate mimicking factors in the return space for all five CRR factors. Second, as suggested by Cochrane (2005) , mimicking factors in the asset return space contain less measurement errors than the original macroeconomic risk factors themselves. As a result, mimicking factors provide sharper estimates of factor loadings and risk premiums.[6]

We form mimicking portfolios applying the Lehmann and Modest (1988) methodology, which is also used by Cooper and Priestley (2011). We use the ten equal-weighted book-to-market, size, and gross profitability portfolios and ten value-weighted momentum portfolios as the basis assets.[7] First, we regress the monthly excess returns of the 40 basis portfolios (R) on the original CRR five factors. Let matrix B (5×40) represents the coefficients on these basis assets and matrix V (40×40) be the covariance matrix of the error term. Second, we calculate the weights for the mimicking

[5]We rebalance portfolios on an annual basis using annual profitability measures throughout the paper. While rebalancing monthly based on quarterly profitability measures generates a higher profitability premium, portfolio strategies formed on annual data are less subject to earnings surprises and therefore better reflect the effect of the level of profitability. Moreover, portfolio strategies rebalanced annually incur less transaction costs compared with those rebalanced monthly.

[6]The estimates for risk premium and factor loadings are similar if we use the original macroeconomic risk factors. However, the standard errors of the factor loadings across portfolios are much smaller when we use mimicking portfolio factors.

[7]We use value-weighted momentum portfolios as the basis assets since they generate higher returns than the equal-weighted momentum portfolios.

portfolios with respect to the basis assets: $w = (BV^{-1}B^T)^{-1}BV^{-1}$, which is a 5×40 matrix. Lastly, the mimicking portfolio returns are derived as $F = Rw^T$. One important advantage of the Lehmann and Modest (1988) method is that the mimicking factors in the return space are unit-beta portfolios of each original factor being mimicked and therefore provide clean interpretations of the risk premium associated with each macroeconomic factor.

We estimate the risk premium of the CRR five factors using both the time-series average and the two-pass Fama and MacBeth (1973) cross-sectional regression. We estimate the factor loadings in the first stage using the full sample.[8] The results are reported in Table 2. The industry production (MP) and term premium (UTS) factors have significantly positive premiums in both the time-series and cross-section tests. The risk premium for MP is 0.53% (t-statistic = 4.13) per month in the time-series average and 1.24% (t-statistic = 6.56) per month in the cross-sectional regression. The risk premium for UTS is 1.08% (t-statistic = 4.05) and 0.81% (t-statistic = 1.70) per month in the time-series average and cross-sectional test, respectively. The unexpected inflation factor does not bear a significant risk premium in either test. The risk premium for the change in expected inflation is negative and marginally significant in the cross-sectional test but is insignificant in the time-series average. The default factor has a negative premium in the time-series average, however, does not have significant risk premium in the cross-sectional regression. In sum, among the five macroeconomic risk factors, the industry production and term premium factors bear robust risk premiums in both the time-series and cross-sectional tests.

Next, we examine the explanatory power of the five macroeconomic risk factors for the gross profitability premium. The growth rate of industry production and the term premium turn out to be the most relevant risk factors. Both of these factors are macroeconomic variables that are closely linked to business cycles. The growth of industry production reflects time-varying aggregate growth opportunities, which is highly related to equity market returns. The term premium has long been recognized to be able to predict aggregate output (see,for example, Chen (1991)) and market returns (see, for example, Fama and French (1989)). It also reflects monetary conditions and reveals expectations about future interest rates. We report the average excess returns, alphas, and risk loadings with respect to the five macroeconomic risk factors for the gross profitability portfolios

[8]The results are qualitatively the same if we use a five-year rolling window or an extending window, which always starts in 1963 and end in the most recent month.

and the high-low hedge portfolios in Table 3. From Panel A, the CRR five-factor alpha of the equal-weighted hedge portfolio return remains significantly positive, which is 0.26% per month with t-statistic of 2.58, after controlling for CRR five risk factors. The macroeconomic factors can only explain 0.16% per month of the hedge portfolio return, which accounts for roughly one third of the total premium. The high GPA portfolio has significantly higher factor loadings with respect to MP and UTS factors than those of those of the low GPA portfolio. And the MP and UTS factors explain 0.08% ($0.15 \times 0.53\%$) and 0.10% ($0.09 \times 1.08\%$) per month of the hedge portfolio return, respectively. From Panel B, the CRR five-factor alpha of the value-weighted hedge portfolio return also remains significantly positive, which is 0.26% per month with t-statistic of 1.82. The macroeconomic factors (mainly the industry production factor) can only explain 0.05% per month of the hedge portfolio return, which accounts for roughly 15% of the total premium.

Taken together, macroeconomic risk factors can only account for 15-35% of the high-low hedge portfolio return of gross profitability, which leaves a large fraction of the profitability premium unexplained.[9]

4.2 Investor Sentiment and the Cross Section of Expected Returns

The fact that macroeconomic risk factors cannot fully explain the gross profitability premium casts doubt on a solely risk-based explanation. Alternatively, it opens the door to the potential role of mispricing due to behavioral biases. We start testing the mispricing hypothesis by constructing a misvaluation factor based on investor sentiment and investigating its power in explaining the gross profitability premium.

Similarly, we form mimicking portfolios of the five macroeconomic risk factors together with the investor sentiment factor measured by Baker and Wurgler (2006) investor sentiment index. Since the sentiment index is constructed in such a way that it is orthogonal to a number of macroeconomic conditions, this additional factor can be viewed as capturing the incremental effect of investor sentiment above any macroeconomic risks. Table 4 report the estimated risk premiums of the six mimicking portfolio factors using both the time-series average and the two-pass Fama and MacBeth (1973) cross-sectional regression in the full sample. Industry production and term premium factors

[9] We have also tested other risk factors, including aggregate unemployment, liquidity, and uncertainty. None of the existing risk factors can explain the gross profitability premium.

continue to have positive and significant risk premiums. More importantly, it is evident that the risk premium for the investor sentiment factor is significantly positive in both the time-series and cross-sectional tests. The risk premium is 0.49% per month with t-statistic of 2.57 in the time-series average and 0.48% per month with t-statistic of 1.87 in the cross-sectional regression.

We report the average excess returns, alphas and risk loadings with respect to the five macroeconomic risk factors together with the investor sentiment factor for the gross profitability portfolios and high-low hedge portfolios in Table 5. From Panel A, it is clear that after adding the sentiment factor, the six-factor alpha of the equal-weighted hedge portfolio return becomes insignificant, which is 0.12% per month with t-statistic of 1.03. The macroeconomic factors with the additional sentiment factor can explain 0.30% per month of the hedge portfolio return, which accounts for more than two thirds of the total premium. All the portfolios have significant and negative loadings of the sentiment factor and the factor loading monotonically increases with firm profitability. The high GPA portfolio has significantly higher risk loading of the sentiment factor than that of the low GPA portfolio. The sentiment factor alone can explain 0.15% ($0.30 \times 0.49\%$) per month of the high-low hedge portfolio return, which accounts for more than one third of the total premium. From Panel B, the six-factor alpha of the value-weighted hedge portfolio return also becomes insignificant, which is 0.15% per month with t-statistic of 0.99. The macroeconomic factors together with the additional sentiment factor can explain 0.16% per month of the hedge portfolio return, which accounts for more than half of the total premium. The sentiment factor alone can explain 0.08% ($0.17 \times 0.49\%$) per month of the hedge portfolio return, which accounts for roughly one fourth of the total premium.

In sum, the results suggest that macroeconomic factors can only explain a limited amount of the gross profitability premium. Adding a misvaluation factor based on market-wide investor sentiment helps to account for a significant fraction of the premium. Both the equal-weighted and value-weighted high-low hedge portfolio returns based on the gross profitability become insignificant after adjusting for the sentiment factor.

4.3 Predictive Regression for the Profitability Premium

If the profitability premium is explained by systematic risks, it should be predicted by macroeconomic variables that traditionally predict risk premiums. However, if the profitability premium is generated by misvaluation, it should be predicted by investor sentiment due to mispricing correction. When sentiment is high, low profitability firms are more likely to be overvalued and should experience lower subsequent returns when mispricing is corrected. Therefore, the profitability premium should appear stronger after high sentiment periods.

In this section, we further test the misvaluation explanation by performing the following predictive regression for the profitability premium:

$$R_{High-Low,t} = a_0 + a_1 SENT_{t-1} + \gamma MACRO_{t-1} + \varepsilon_t. \tag{1}$$

The dependent variable is the monthly equal-weighted (Panel A) and value-weighted (Panel B) return spread between the highest and lowest quintile portfolios formed on gross profitability. The monthly return spreads from July of year t to June of year $t+1$ are regressed on the sentiment index in June of year t and lagged monthly macro variables ($MACRO_{t-1}$), including industrial production (MP), unexpected inflation (UI), change in expected inflation (DEI), term premium (UTS), default premium (UPR), and NBER business cycle indicator (NBERdum, which equals 1 for expansion and zero for recession).

The results are reported in the Appendix (Table A1). The results support the mispricing-based explanation by showing that the sentiment index has significant predictive power for the profitability premium. The coefficient on sentiment is significantly positive in regressions for both the equal-weighted and value-weighted return spread. When sentiment is high, the high-minus-low hedge portfolio of gross profitability earns significantly higher returns. In terms of magnitudes, one-unit increase in sentiment index (which equals a one-standard-deviation increase in sentiment since the index is standardized) is associated with a 0.39% (0.33%) increase in the monthly equal-weighted (value-weighted) high-minus-low profitability portfolio return. The significance and magnitude of the coefficient on sentiment index does not change much when we add macroeconomic variables in the regressions. None of the macroeconomic variables has significant coefficient in the predictive regressions.

In sum, the high-minus-low profitability portfolio returns is higher following higher sentiment periods and vice versa. The results suggest that misvaluation and its subsequent correction plays an important role in determining the profitability premium. Macroeconomic variables do not have significant predictive power for the profitability premium.

5 The Profitability Premium, Mispricing, and Ex-ante Expectation Errors

5.1 The Profitability Premium and Valuation

The fact that adding an investor sentiment factor helps explain a substantial part of the profitability premium lends support to the misvaluation-based explanation. The fundamental value of a firm should equal all its discounted future cash flows. Misvaluation may exist due to either errors in discount rates or errors in future cash flows or both. We focus on the systematic expectation errors in cash flows since they are easy to observe and verify. If investors estimate firms' future cash flows based on their current profitability, ex-ante expectation errors are more likely to exist in firms whose market valuations are inconsistent with their profitability. And the profitability premium should concentrate in firms identified with ex-ante expectation errors.

We test the errors-in-expectation hypothesis by studying the profitability premium conditional on firms' market valuation. We identify ex-ante expectation errors by comparing firms' profitability measure with their relative market valuation. Firms with high profitability but low market valuation are potentially undervalued, while firms with low profitability but high market valuation are more liked to be overvalued.[10] In order to fully capture firms' relative valuation position, we apply the methodology in Stambaugh, Yu, and Yuan (2012) to construct the relative valuation index (Vindex) based on ten anomaly variables, which have been widely documented to have predictive power for future risk-adjusted stock returns and therefore proxy for firms' relative valuation. A high Vindex means high market valuation and low subsequent returns.

At the end of June every year, we sort firms into terciles independently on profitability and Vindex, and form nine 3×3 portfolios by taking the interaction. The portfolios are rebalanced every year. Table 5 presents the value-weighted portfolio average excess returns, the Fama and French three-factor alphas, and the Carhart four-factor alphas. We also present the profitability

[10] It is not necessary for all the firms with inconsistent profitability and market valuation to be misvalued. For example, low profitable firms may have high valuation if they face low cost of capital. However, as long as some of those firms are subject to systematic expectation errors, the misvalued profitability strategy should generate abnormal future returns, which cannot be justified by risks.

premium (the high-low hedge portfolio return) conditional on firms' relative market valuation index (Vindex). Moreover, we provide the premium for the nonmisvalued profitability strategy and the misvalued profitability strategy, respectively. The nonmisvalued profitability strategy consists of a long position in firms with high profitability and high Vindex and a short position in firms with low profitability and low Vindex. The misvalued profitability strategy consists of a long position in firms with high profitability but low Vindex and a short position in firms with low profitability but high Vindex.

Panel A in Table 6 presents the results for gross profitability. The unconditional profitability premium is significantly positive. The average excess return, the Fama and French three-factor alpha, and the Carhart four-factor alpha of the high-low profitability hedge portfolio are 0.23% (t-statistic = 1.77), 0.44% (t-statistic = 3.91), and 0.41% (t-statistic = 3.78), respectively. More importantly, further examination suggests that the profitability premium only exists in firms with identifiable ex-ante expectation errors (whose profitability is inconsistent with market valuation) but not for firms without expectation errors (whose profitability is consistent with market valuation). The profitability premium for the misvalued profitability strategy is significantly positive. The average excess return, the Fama and French three-factor alpha, and the Carhart four-factor alpha are 0.55% (t-statistic = 2.41), 0.70% (t-statistic = 2.99), and 0.53% (t-statistic = 2.45), respectively. By contrast, the profitability premium does not exist for the nonmisvalued profitability strategy. The average excess return, the Fama and French three-factor alpha, and the Carhart four-factor alpha are -0.46% (t-statistic = -2.00), -0.06% (t-statistic = -0.29), and 0.05% (t-statistic = 0.24), respectively.

We further look carefully into the long and short legs of both the misvalued and the nonmisvalued profitability strategy. Consistent with the errors-in-expectation hypothesis, the risk-adjusted returns (alphas) for firms with consistent profitability and market valuation are always insignificant. The Fama and French three-factor alpha and the Carhart four-factor alpha are 0.19% (t-statistic = 1.22) and 0.11% (t-statistic = 0.70), respectively, for firms with low profitability and low market valuation, and 0.13% (t-statistic = 1.18) and 0.16% (t-statistic = 1.39), respectively, for firms with high profitability and high market valuation. On the other hand, the risk-adjusted returns for firms with inconsistent profitability and market valuation are always significant. The Fama and French three-factor alpha and the Carhart four-factor alpha are significantly positive for firms with high profitability but low market valuation, which are 0.37% (t-statistic = 2.78) and 0.28% (t-statistic = 2.14), respectively, and significantly negative for firms with low profitability but high market valuation, which are -0.33% (t-statistic = -2.49) and -0.25% (t-statistic = -2.07), respectively.

Panel B and C in Table 6 report the results when we measure profitability using ROA and ROE. The results are similar to those of gross profitability except that the unconditional premiums for ROA and ROE are in general weaker in portfolio sorts, which is consistent with the findings in Fama and French (2006). The premiums for both ROA and ROE are strong in firms identified with ex-ante expectation errors, for example, firms with high market valuation but low profitability or firms with low market valuation but high profitability. The premiums become insignificant in firms without expectation errors, for example, firms with both high market valuation and high profitability or firms with low market valuation and low profitability. For both ROA and ROE, the misvalued profitability strategy earns significantly positive Fama and French three-factor alpha and the Carhart four-factor alpha. By contrast, the nonmisvalued profitability strategy does not generate any significant alphas.

In sum, our results show that the profitability premium only exists in firms with ex-ante expectation errors, identified by the discrepancy between firm profitability and market valuation. The misvalued profitability strategy delivers significant risk-adjusted returns, while the nonmisvalued profitability strategy does not generate any significant alphas. Our results support the errors-in-expectation hypothesis in explaining the profitability premium.

5.2 Earnings Announcement Abnormal Returns

In order to provide evidence that investors indeed have biased expectations for those firms with large discrepancy between their profitability and market valuation, we study earnings announcement abnormal returns within one year after the portfolio formation. The prices of firms should rise (fall) if the actual earnings are higher (lower) than expectations and therefore should have high (low) abnormal returns around earnings announcements. La Porta (1996) and La Porta et al. (1997) document that value (growth) firms have high (low) earnings announcement returns within one year from the portfolio formation. They suggest that a large proportion of the value premium is due to errors in the expectation of firms' future cash flows. Piotroski and So (2012) extend the analysis by showing that the value premium and ex-ante expectation errors depend on firms' financial strength. We apply similar analysis to show how the profitability premium is related to the errors-in-expectation hypothesis.

We measure earnings announcement abnormal returns as the cumulative abnormal returns around firms' four subsequent three-day quarterly earnings announcement windows within one year after portfolio formation.[11] The three-day, buy-and-hold cumulative abnormal returns for each announcement window are calculated from a market model.[12] The results are reported in Table 7. It is evident that, unconditionally, firms with high gross profitability on average have high cumulative earnings announcement abnormal returns. The average earnings announcement abnormal return of firms in the highest gross profitability tercile is 0.96% (t-statistic=2.03) higher than that of firms in the lowest tercile.

More importantly, when conditioning the profitability portfolios on market valuation, we find that the earnings announcement abnormal returns across portfolios exhibit patters consistent with the errors-in-expectation hypothesis. Firms with high gross profitability but low market valuation have the highest earnings announcement abnormal returns (1.76% with t-statistic of 4.78), while firms with low gross profitability but high market valuation have the lowest earnings announcement abnormal returns (0.01% with t-statistic of 0.07). Moreover, the positive abnormal returns during earnings announcements only exist for the long-short misvalued profitability strategy but not for the nonmisvalued profitability strategy. The average earnings announcement abnormal return for the misvalued profitability strategy is 1.74% (t-statistic=5.07), which is almost twice as large as that of the unconditional profitability strategy. By contrast, the earnings announcement abnormal return for the misvalued profitability strategy is insignificant, -0.36% with t-statistic of -0.64.

The evidence for ROA and ROE is relatively weaker. Unconditionally, we do not find significant return difference between high and low ROA (ROE) firms. The earnings announcement abnormal returns for misvalued profitability strategy is positive although not significant. And the earnings announcement abnormal returns for nonmisvalued profitability strategy is non-positive (negative).

[11] We also measure earnings announcement abnormal returns as the three-day, buy-and-hold abnormal return around firms first annual earnings announcement following the portfolio formation. The results are qualitatively the same.

[12] We use a 250-day pre-event window to estimate the market model coefficients and require available return data for at least 20 days. We use a 30-day gap between the the pre-event estimation period and the event window in order avoid any microstructure effects and mechanical results. We also use the Fama and French three-factor model and the Carhart four-factor model, and our results remain qualitatively the same.

In sum, the errors-in-expectation hypothesis is supported by the analysis of the earnings announcement abnormal returns, especially for the gross profitability strategy. Firms with high gross profitability but low market valuation has significantly high earning announcement abnormal returns than firms with low gross profitability but high market valuation. The results are consistent with hypothesis 3.

5.3 Analyst Forecast Errors and Forecast Revisions

Earnings announcement abnormal return is a return-based indirect measure of investors' expectation. In this section, we use two non-return-based measures, analyst forecast errors and forecast revisions, to directly quantify expectation errors conditional on firm profitability and market valuation. Analyst forecasts are widely purchased by institutional investors and therefore more likely to reflect those sophisticated investors' expectations about firms' future cash flows.

We define analyst forecast errors as the actual earnings per share (EPS) next year minus the consensus EPS forecast, scaled by book assets per share at the beginning of portfolio formation. Consensus earnings forecast is measured as the median of annual EPS forecasts one month before portfolio formation. We measure analyst forecast revisions as the last consensus EPS forecast before the annual earnings announcement next year minus the initial consensus EPS forecast, scaled by book assets per share. By definition, relatively high (low) analyst forecast errors or high (low) analyst forecast revisions suggest that analysts have relatively low (high) expectation about firms' future earnings, or in other words, are relatively pessimistic (optimistic) about firms' future earnings.

Table 8 reports the results for analyst forecast errors (Panel A) and forecast revisions (Panel B). The first fact to notice is that the average analyst forecast errors and forecast revisions are always negative for the full sample or any particular portfolio. The results suggest that on average analysts are overly optimistic, which is consistent with findings from previous studies. However, the magnitude of analyst forecast errors and forecast revisions vary significantly with firm profitability and relative market valuation.

Unconditionally, high ROA (ROE) firms have significantly higher analyst forecast errors and forecast revisions than low ROA (ROE) firms. The differences in average analyst forecast errors and forecast revisions between high and low ROA (ROE) firms are 0.0152 with t-statistic of 5.02

(0.0181 with t-statistic of 5.50) and 0.0054 with t-statistic of 1.93 (0.0080 with t-statistic of 2.97), respectively. More importantly, when conditioning on profitability and market valuation, analyst forecast errors and forecast revisions across portfolios exhibit patterns that are consistent with the errors-in expectation hypothesis. Firms with high ROA (ROE) but low market valuation have the highest analyst forecast errors and forecast revisions, while firms with low ROA (ROE) but high market valuation have the lowest analyst forecast errors and forecast revisions.[13] Moreover, the significantly positive differences in analyst forecast errors and forecast revisions only exist for the long-short misvalued profitability strategy but not for the nonmisvalued profitability strategy. When the profitability is measured by ROA (ROE), the differences in analyst forecast errors and forecast revisions for misvalued profitability strategy are 0.0389 with t-statistic of 8.11 (0.0422 with t-statistic of 8.66) and 0.0204 with t-statistic of 7.13 (0.0242 with t-statistic of 8.23), respectively. The magnitudes are more than twice (three times) as large as those of the unconditional profitability strategy. By contrast, the differences in analyst forecast errors and forecast revisions for the nonmisvalued profitability strategies are all insignificant.

The results for gross profitability are relatively weaker. Unconditionally, the analyst forecast errors and forecast revisions for firms with high gross profitability are not significantly higher than those for firms with low gross profitability . However, the difference between high and low gross profitability is significantly positive for firms with ex-ante expectation errors. The average analyst forecast errors and forecast revisions for misvalued profitability strategy is 0.0141 (t-statistic=2.34) and 0.0057 (t-statistic=2.10), respectively. The difference between high and low gross profitability is nonpositive (negative) for firms without ex-ante expectation errors.

In sum, the errors-in-expectation hypothesis gains support from the analysis of analyst forecast errors and forecast revisions. Firms with high profitability but low market valuation have significantly higher analyst forecast errors and forecast revisions than firms with low profitability but high market valuation. The results again are consistent with hypothesis 3.

[13] Analyst forecast revisions of firms with high profitability are slightly lower than those of firms with medium profitability, but always remain significantly higher than those of firms with low profitability, both unconditionally and conditionally.

5.4 Regression Analysis

In order to alleviate the concern that our results may be driven by omitted variables, we perform regression analysis to control for other firm characteristics, including book-to-market ratio, firm size, and momentum. Similar to Piotroski and So (2012), we identify the effect of ex-ante misvaluation by running the following cross-sectional regression:

$$\begin{aligned} Y_{it+1} =& b_1 HighProf_{it} + b_2 HighProf_{it} * LowVindex_{it} + b_3 HighProf_{it} * MidVindex_{it} \\ &+ b_4 MidProf_{it} + b_5 MidProf_{it} * LowVindex_{it} + b_6 MidProf_{it} * HighVindex_{it} \\ &+ b_7 LowProf_{it} + b_8 LowProf_{it} * MidVindex_{it} + b_9 LowProf_{it} * HighVindex_{it} \\ &+ b_{10} BM_{it} + b_{11} ME_{it} + b_{12} RET\_2\_12_{it} + \varepsilon_{it+1}, \end{aligned} \tag{2}$$

where Y_{it+1} represents monthly excess return, earnings announcement abnormal return, analyst forecast error or forecast revision for firm i in month $t+1$. The indicator variables HighProf, MidProf, and LowProf equal one if the firm is in the high, middle, and low profitability tercile, respectively, and zero otherwise. The indicator variables HighVindex, MidVindex, and LowVindex equal one if the firm is in the high, middle, and low Vindex tercile, respectively, and zero otherwise. BM, ME, and RET_2_12 are book-to-market ratio, market capitalization, and momentum measured by the cumulative return in past 11-month.[14] The intercept in the regression is omitted to avoid multicollinearity problem. Profitability is measured by gross profitability (Panel A), return-on-assets (Panel B), and return-on-equity (Panel C), respectively.

Table 9 presents the regression results. The errors-in-expectation hypothesis predicts that firms with high profitability but low market valuation are potentially subject to systematic undervaluation and therefore the coefficients on $HighProf_{it} * LowVindex_{it}$ (b_2) should be positive. By contrast, firms with low profitability but high market valuation are potentially subject to systematic overvaluation and therefore the coefficients on $LowProf_{it} * HighVindex_{it}$ (b_9) should be negative. The regression results largely confirm the predictions. The coefficients on $HighProf_{it} * LowVindex_{it}$ are always significantly positive for

[14] Similar to Piotroski and So (2012), we use decile ranks for BM, ME, and RET_2_12 in order to alleviate the effect of intertempral distribution changes of these variables. Our results hold qualitatively the same if we use the value of these variables directly.

monthly excess return, earnings announcement abnormal returns, analyst forecast errors and forecast revisions in all specifications. The coefficients on $LowProf_{it} * HighVindex_{it}$ are significantly negative for monthly excess returns, earnings announcement abnormal returns, analyst forecast errors, and forecast revisions for most of the specifications.

In sum, the regression results provide evidence consistent with the error-in-expectation hypothesis (hypothesis 2 and 3 in particular). More specifically, firms with high profitability and low market valuation earn high subsequent returns, have high earnings announcement abnormal returns, high analyst forecast errors and forecast revisions, while firms with low profitability but high market valuation earn low subsequent returns, have low earnings announcement abnormal returns, low analyst forecast errors and forecast revisions.

5.5 Profitability Premium, Expectation Errors, and Investor Sentiment

In the previous section, we have shown that investor sentiment as a misvaluation factor can explain a large proportion of the unconditional profitability premium. In this section, we further study how investor sentiment affects the profitability premium conditional on market valuation.

We split the whole sample period into low, medium, and low sentiment subperiods based on the Baker and Wurgler (2006) sentiment index in the previous month. Table 10 presents the premiums for unconditional, nonmisvalued, and misvalued profitability strategies in different sentiment subperiods. The results suggest that the unconditional profitability premium is significantly positive only during the high sentiment subperiod. More importantly, consistent with the errors-in-expectation hypothesis, the profitability premium only exists for the misvalued profitability strategy during the high sentiment subperiod but is totally absent for the misvalued profitability strategy during any sentiment subperiod. For gross profitability, the value-weighted average excess return, the Fama and French three-factor alpha, and the Carhart four-factor alpha of the misvalued profitability strategy are as large as 1.49% (t-statistic = 3.40), 1.60% (t-statistic = 3.71), and 1.37% (t-statistic = 3.74) per month, respectively, during the high sentiment subperiod. The magnitudes are two to three times as large as those of the unconditional profitability strategy.The results are strikingly similar for ROA and ROE. The value-weighted average excess return, the Fama and French three-factor alpha, and the Carhart four-factor alpha are only significantly positive for the misvalued profitability strategy during the high sentiment subperiod, reaching 2.04% (t-statistic = 4.31), 2.12% (t-statistic =5.81), and 1.60% (t-statistic = 5.27) per month, respectively, for ROA, and 2.03% (t-statistic = 4.06), 2.11% (t-statistic = 5.09), and 1.50% (t-statistic = 4.34) per month, respectively, for ROE.

In sum, the profitability premium only concentrates in firms with ex-ante expectation errors during times when investor sentiment is high, which is formally stated in our hypothesis 4. The results provide further evidence supporting the errors-in-expectation hypothesis in explaining the profitability premium over time.

5.6 Additional Test - Return Decomposition and the Role of Cash Flow News

Our previous results suggest that ex-ante expectation errors in firm earnings and subsequent corrections play an important role in generating the profitability premium. In this section, we provide additional evidence based on return decomposition that the cash-flow news component of stock returns explains a substantial fraction of the return spread between high and low profitability firms.

We apply the traditional vector autoregression (VAR) method as in Campbell and Shiller (1988) and Campbell (1991) to implement return decomposition. Following Vuolteenaho (2002) and Chen, Da, and Zhao (2013), we decompose individual firm's stock returns into an expected return component ($Eret$), a cash-flow news component ($CFret$), and a discount-rate news component ($DRret$) using earnings instead of dividend growth as the basic cash-flow fundamental. Appendix B provides detailed procedures for the decomposition. The expected return component is the ex-ante discount rate that equates the stock price with the present value of all future cash flows. The cash-flow news component and the discount-rate component together capture the unexpected part of realized stock returns. The cash-flow news component measures the change in stock returns due to the change in market expectations about a firm's future cash flows. A positive cash-flow shock is associated with an unexpected increase in contemporaneous stock returns. The discount-rate news component measures the change in stock returns due to the change in market expectations about a firm's required cost of capital or discount rate. A positive discount-rate shock is associated with an unexpected decrease in contemporaneous stock returns.

Table A2 in the Appendix reports the monthly average of total stock return (Ret) and the VAR-based return components for portfolios sorted by gross profitability. If the return differences across profitability portfolios are anticipated by the market, they should be mainly reflected in the expected return component. And the changes in market expectations about future cash flows or discount rates should not vary systematically with the level of firm profitability. However, if market expectations about future cash flow (discount-rate) are systematically biased and the bias depends on firm profitability, e.g., the market overestimates the future profitability of unprofitable firms, this systematic error will be reflected in the cash-flow news (discount-rate news) component. Our results suggest the later case.

For the equal-weighted returns (Panel A), the total returns increase monotonically with the level of gross profitability. The total return associated with the high-minus-low hedge portfolio is 0.46% per month. It turns out that the cash-flow news component explains most of the high-minus-low hedge portfolio return. $CFret$ increases monotonically with the level of profitability and the high-minus-low $CFret$ spread is 0.41%, which explains more than 90% of the total return spread. The high-minus-low spread for the discount-rate news component is insignificant. The expected return component cannot explain the high-minus-low return spread either, and the $Eret$ spread is negative.

For the value-weighted returns (Panel B), the cash-flow news component again contributes the most to the return spread between the high and low profitability portfolios. The high-minus-low total return spread is 0.28% per month, while the cash-flow news component alone generates a 0.40% return spread. In addition, the discount-rate news component also increases with the level of gross profitability and generates a 0.33% return for the high-minus-low hedge portfolio. In contrast, the expected return component decreases with the level of gross profitability and generates a negative return (-0.48% per month) for the hedge portfolio.

In sum, the VAR-based return decomposition shows that unexpected cash flow surprises vary systematically with the level of firm profitability. More (less) profitable firms experience higher (lower) cash flow surprises and therefore earn higher (lower) subsequent returns. While the cash-flow news component of stock returns explains a substantial part of the profitability premium, the expected return component has little explanatory power.

6 Conclusion

Our paper sheds light on the profitability premium by identifying the complementary roles played by macroeconomic risks and mispricing due to expectation errors. We extensively search for the fundamental risks associated with the profitability premium and find that macroeconomic risk factors can at best explain one third of it. Adding a misvaluation factor based on investor sentiment explains a large proportion of the gross profitability premium, suggesting the important role played by mispricing-based explanations.

Ex-ante expectation errors about future cash flows may exist in firms with inconsistent fundamental (profitability) and market valuation. We provide supporting evidence that firms with high profitability and low market valuation have significantly high earnings announcement abnormal returns, analyst forecast errors, and forecast revisions than firms with low profitability and high market valuation. The facts that the profitability premium only exists in firms identified with ex-ante expectation errors and is only significantly positive during high sentiment periods lend strong support to the errors-in-expectation hypothesis. Our results further suggest that contrasting firm profitability with market valuations provides useful information for identifying potential deviation of asset prices from fundamental values, especially during high sentiment periods.

Appendix A Definition of Variables

BM Book-to-market equity ratio, which is the book value of equity at fiscal year end in the previous calender year divided by the market value of equity at the end of December in previous calender year. Book value of equity is defined as common equity (item CEQ) if available or total assets (item AT) minus liability (item LT), plus balance sheet deferred taxes (item TXDB) if available, plus investment tax credits (item ITCI) if available, minus preferred stock liquidation value (item PSTKL) if available or redemption value (item PSTKRV) if available or carrying value (item PSTK) if available.

ME Market value of equity, which is the closing stock price multiplied by the number of shares outstanding at the end of December in previous calender year.

RET_2_12 Cumulative return from month $t-2$ to $t-12$.

NSI Net stock issue, the natural log of the split-adjusted shares outstanding (annual item CSHO times item ADJEX_C) divided by lagged split-adjusted shares outstanding.

AG Total asset growth, change in total assets (item AT) scaled by lagged book assets.

IA Investment-to-assets ratio, sum of change in gross property, plant and equipment (item PPEGT) and the change in inventory (item INVT) scaled by lagged book assets.

NOA Operating assets minus operating liabilities, scaled by lagged total assets at fiscal year end in the previous calender year. Operating asset is defined as total assets minus cash and short-term investment (item CHE). Operating liabilities is defined as total assets − short-term debt (item DLC) − long-term debt (item DLTT) − minority interest (item MIB) − preferred stocks (item PSTK) − common equity (item CEQ). If any variable of short-term debt, long-term debt, minority interest and preferred stocks is missing, is is set to zero in order to prevent unnecessary loss of data.

ACCRUAL Following Sloan (1996), accrual is defined as change in current assets (item ACT) - change in cash/cash equivalents (item CHE) - change in current liabilities (item LCT) - change in debt included in current liabilities (item DLC) - change in income taxes payable (item TXP) - depreciation and amortization expense (item DP) scaled by the average of current and lagged book assets.

OSCORE Defined following Ohlson (1980).

SGA Selling, general, and administrative (item XSGA) expenses scaled by lagged book assets.

GPA Gross profitability, defined as gross profit (item GP) scaled by current book assets.

ROE Return on equity, defined as income before extraordinary items (item IB) scaled by current book value of equity.

ROA Return on assets, defined as income before extraordinary items (item IB) scaled by current book assets.

Appendix B VAR-based Return Decomposition

Following Vuolteenaho (2002) and Chen, Da, and Zhao (2013), we apply the VAR method to decompose firm-level stock returns into a cash flow news component, a discount rate news component, and an expected return component. This approach is in the similar spirit as the dividend-growth models developed by Campbell and Shiller (1988) and Campbell (1991) but uses firm-level earnings as the basic cash-flow fundamental.

Based on the model of log book-to-market ratio (denoted by bm) derived by Vuolteenaho (2000)

$$bm_{t-1} = k_{t-1} + \sum_{j=0}^{\infty} \rho^j r_{t+j} - \sum_{j=0}^{\infty} \rho^j (e_{t+j} - f_{t+j}), \tag{3}$$

Vuolteenaho (2002) decomposes the unexpected stock return using a earnings-based formula:

$$r_t - E_{t-1} r_t = \Delta E_t \sum_{j=0}^{\infty} \rho^j (e_{t+j} - f_{t+j}) - \Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j} + \Delta E_t k_{t-1}, \tag{4}$$

where r_t is the excess log stock return, ROE is denoted by $e_t = log(1 + X_t/B_{t-1})$ (X_t is earnings and B_{t-1} is book equity), f_t is log risk free rate, k is a constant plus the approximation error. ΔE_t denotes the change in expectations from $t-1$ to t (i.e., $E_t(\cdot) - E_{t-1}(\cdot)$). The stock return can then be written as the sum of a cash flow news component ($CFret$), a discount-rate news component ($DRret$), and an expected return component ($Eret$):

$$r_t = CFret_t + DRret_t + Eret_t, \tag{5}$$

where $CFret$, $DRret$, and $Eret$ are defined as

$$CFret_t = \Delta E_t \sum_{j=0}^{\infty} \rho^j (e_{t+j} - f_{t+j}) + \Delta E_t k_{t-1}, \tag{6}$$

$$DRret_t = -\Delta E_t \sum_{j=1}^{\infty} \rho^j r_{t+j}, \tag{7}$$

$$Eret_t = E_{t-1} r_t. \tag{8}$$

In order to implement the return decomposition, we perform the following first-order VAR:

$$z_{i,t} = A z_{i,t-1} + u_{i,t}, \tag{9}$$

where $z_{i,t}$ is a vector of k elements. The first element is the log stock return of stock i in period t. The other elements are firm-level state variables known to the market by the end of period t. We specify $z_{i,t}$ as $[r_{i,t}\ roe_{i,t}\ bm_{i,t}]'$. We calculate $r_{i,t}$ as log annual stock return from July of year t to June of year $t+1$ for stock i. $roe_{i,t} = log(1+ROE)$ and $bm_{i,t} = log(BM)$ are log return-on-equity and log book-to-market equity ratio known to the market by June of year $t+1$.

Coefficient A is a $k \times k$ matrix known as the companion matrix of the VAR, which is assumed to be constant over time and across firms. We estimate the VAR coefficient using the pooled prediction regression per state variable. We control for year fixed-effects in the regression, which is similar to Vuolteenaho (2002) who demean all variables cross-sectionally. Define $e1' \equiv [1\ 0\ 0]$ and

$$\lambda' \equiv e1'\rho A(I - \rho A)^{-1}. \tag{10}$$

It follows that the discount-rate news component and the cash-flow news component can be expressed as

$$DRret_{i,t} = \lambda' u_{i,t}, \tag{11}$$

$$CFret_{i,t} = (e1' + \lambda')u_{i,t}. \tag{12}$$

The expected return component is defined as

$$Eret_{i,t} = r_{i,t} - CFret_{i,t} - DRret_{i,t}. \tag{13}$$

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Table 1. Summary Statistics

This table reports the time-series averages of the number, mean, standard deviation, minimum, 25th percentile, median, 75th percentile, and maximum of firm characteristics, including gross profitability (GPA), return-on-equity (ROE), return-on-assets (ROA), book-to-market ratio (BM), firm size (ME), cumulative past 11-month return (RET_2_12), net stock issues (NSI), asset growth (AG), investment-to-assets ratio (IA), net operating assets (NOA), accrues ($ACCRUAL$), Ohlson's O-score ($OSCORE$), and organizational investment (SGA) in the full sample. See Appendix A for the definition of variables. All variables are winsorized at the 0.5% and 99.5% levels. The sample is from 1963 to 2010.

VAR	MEAN	STD	MIN	P25	MEDIAN	P75	MAX
GPA	0.429	0.254	-0.400	0.256	0.390	0.557	1.422
ROA	0.008	0.159	-1.118	-0.007	0.042	0.080	0.275
ROE	-0.038	0.604	-5.939	-0.013	0.086	0.148	0.869
BM	0.950	0.834	0.035	0.428	0.743	1.201	5.933
ME	4.503	1.971	0.355	3.058	4.353	5.792	10.066
RET_2_12	0.142	0.548	-0.763	-0.188	0.049	0.335	3.18
NSI	0.038	0.123	-0.245	-0.001	0.005	0.030	0.892
AG	0.108	0.263	-0.762	-0.015	0.077	0.193	1.408
IA	0.098	0.197	-0.473	0.012	0.065	0.143	1.399
NOA	0.709	0.325	-0.125	0.546	0.697	0.829	2.752
$ACCRUAL$	-0.026	0.100	-0.408	-0.075	-0.030	0.020	0.365
$OSCORE$	1.451	1.655	-2.926	0.302	1.343	2.472	6.896
SGA	0.366	0.283	0.014	0.168	0.301	0.484	1.768

Table 2. Risk Premium of Mimicking Macroeconomic Factors

We estimate risk premiums for the mimicking portfolios of the Chen, Roll, and Ross(1986) five macroeconomic risk factors, including the industrial production (MP), unexpected inflation (UI), change in expected inflation (DEI), term premium (UTS), and default premium (UPR). Panel A reports the risk premiums estimated from the time-series average. Panel B reports the risk premiums estimated from the two-stage Fama and MacBeth (1973) cross-sectional regression. In the first stage, we estimate the factor betas using the full window. We use 40 test portfolios, including ten equal-weighted size portfolios, ten equal-weighted book-to-market portfolios, ten value-weighted momentum portfolios, and ten equal-weighted gross profitability portfolios. All portfolio returns are in percentage. We report the estimation results from the second-stage regression: the intercept ($\widehat{\gamma}_0$), risk premiums ($\widehat{\gamma}$), and the average R^2. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors for the time-series average and from the Shanken (1992)-corrected standard errors for the two-stage cross-sectional regression. The sample is from July, 1963 to December, 2010.

Panel A. Time series average						
$\widehat{\gamma}_{MP}$	$\widehat{\gamma}_{UI}$	$\widehat{\gamma}_{DEI}$	$\widehat{\gamma}_{UTS}$	$\widehat{\gamma}_{UPR}$		
0.53	-0.01	-0.02	1.08	0.00		
(4.13)	(-0.49)	(-1.88)	(4.05)	(-0.05)		
Panel B. Two-pass regression						
$\widehat{\gamma}_{MP}$	$\widehat{\gamma}_{UI}$	$\widehat{\gamma}_{DEI}$	$\widehat{\gamma}_{UTS}$	$\widehat{\gamma}_{UPR}$	$\widehat{\gamma}_0$	$AvgR^2$
1.24	-0.02	-0.01	0.81	-0.36	0.21	0.43
(6.56)	(-0.39)	(-0.33)	(1.70)	(-3.59)	(0.98)	

Table 3. Monthly Average Excess Returns, Alphas, and Mimicking Macroeconomic Factor Loadings of Gross Profitability Portfolios

This table reports the average monthly excess returns (in %), alphas and factor loadings of the five equal-weighted (Panel A) and value-weighted (Panel B) portfolios formed on gross profitability (GPA). The factor loadings are estimated by regressing monthly portfolio returns on the mimicking portfolios of CRR five factors. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Panel A. Equal-weighted Returns

Rank_GPA	R	Alpha	MP	UI	DEI	UTS	UPR	$AdjR^2$
1	0.67	0.00	0.27	0.61	1.89	0.54	0.74	0.16
	(2.26)	(0.01)	(1.76)	(0.86)	(0.92)	(5.82)	(2.88)	
2	0.77	0.04	0.40	-1.54	5.17	0.57	0.64	0.19
	(2.75)	(0.14)	(3.14)	(-2.39)	(2.60)	(7.17)	(2.43)	
3	0.90	0.14	0.43	-1.48	5.00	0.58	0.95	0.20
	(3.20)	(0.45)	(3.43)	(-2.14)	(2.46)	(8.09)	(3.29)	
4	0.95	0.16	0.40	-1.77	4.71	0.63	0.97	0.22
	(3.37)	(0.50)	(3.20)	(-2.50)	(2.34)	(8.76)	(3.34)	
5	1.09	0.27	0.42	-1.73	3.96	0.62	1.11	0.23
	(3.73)	(0.84)	(3.32)	(-2.36)	(1.88)	(8.94)	(4.13)	
(5-1)	**0.42**	**0.26**	**0.15**	**-2.35**	**2.08**	**0.09**	**0.37**	0.34
	(3.05)	**(2.58)**	**(1.80)**	**(-9.44)**	**(4.00)**	**(2.03)**	**(3.50)**	

Panel B. Value-weighted Returns

Rank_GPA	R	Alpha	MP	UI	DEI	UTS	UPR	$AdjR^2$
1	0.30	-0.06	0.06	-0.60	0.40	0.30	0.25	0.08
	(1.39)	(-0.24)	(0.63)	(-1.70)	(0.32)	(4.29)	(1.49)	
2	0.36	-0.05	0.22	-1.42	3.62	0.33	0.25	0.12
	(1.74)	(-0.20)	(2.30)	(-3.55)	(2.22)	(4.73)	(1.72)	
3	0.52	0.11	0.23	-1.74	3.34	0.32	0.37	0.12
	(2.56)	(0.46)	(2.32)	(-4.18)	(2.00)	(4.83)	(2.18)	
4	0.43	-0.05	0.25	-2.17	3.01	0.37	0.60	0.15
	(2.02)	(-0.20)	(2.32)	(-4.52)	(1.89)	(5.94)	(3.75)	
5	0.61	0.20	0.24	-2.52	3.16	0.30	0.50	0.17
	(2.91)	(0.86)	(2.04)	(-5.60)	(2.93)	(5.36)	(3.28)	
(5-1)	**0.31**	**0.26**	**0.18**	**-1.92**	**2.76**	**0.00**	**0.25**	0.16
	(2.16)	**(1.82)**	**(1.98)**	**(-5.57)**	**(3.29)**	**(-0.06)**	**(1.89)**	

Table 4. Risk Premium of Mimicking Macroeconomic Factors with Sentiment

We estimate risk premiums for the mimicking portfolios of the Chen, Roll, and Ross(1986) five macroeconomic risk factors, including the industrial production (MP), unexpected inflation (UI), change in expected inflation (DEI), term premium (UTS), and default premium (UPR) together with the Baker and Wurgler (2006) sentiment index ($SENT$). Panel A reports the risk premiums estimated from the time-series average. Panel B reports the risk premiums estimated from the two-stage Fama and MacBeth (1973) cross-sectional regression. In the first stage, we estimate the factor betas using the full window. We use 40 test portfolios, including ten equal-weighted size portfolios, ten equal-weighted book-to-market portfolios, ten value-weighted momentum portfolios, and ten equal-weighted gross profitability portfolios. All portfolio returns are in percentage. We report the estimation results from the second-stage regression: the intercept ($\widehat{\gamma}_0$), risk premiums ($\widehat{\gamma}$), and the average R^2. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors for the time series average and from the Shanken (1992)-corrected standard errors for the two-stage cross-sectional regression. The sample is from July, 1965 to December, 2010.

Panel A. Time series average

$\widehat{\gamma}_{MP}$	$\widehat{\gamma}_{UI}$	$\widehat{\gamma}_{DEI}$	$\widehat{\gamma}_{UTS}$	$\widehat{\gamma}_{UPR}$	$\widehat{\gamma}_{SENT}$
0.46	0.01	-0.01	1.01	-0.03	0.49
(3.41)	(0.21)	(-0.45)	(3.73)	(-0.34)	(2.57)

Panel B. Two-pass regression

$\widehat{\gamma}_{MP}$	$\widehat{\gamma}_{UI}$	$\widehat{\gamma}_{DEI}$	$\widehat{\gamma}_{UTS}$	$\widehat{\gamma}_{UPR}$	$\widehat{\gamma}_{SENT}$	$\widehat{\gamma}_0$	$AvgR^2$
0.69	0.07	0.06	1.92	-0.38	0.48	0.22	0.51
(3.64)	(1.48)	(2.54)	(4.02)	(-3.55)	(1.87)	(1.00)	

Table 5. Average Monthly Excess Returns, Alphas, and Mimicking Macroeconomic and Sentiment Factor Loadings of Gross Profitability Portfolios

This table reports the average monthly excess returns (in %), alphas and factor loadings of the five equal-weighted (Panel A) and value-weighted (Panel B) portfolios formed on gross profitability (GPA). The factor loadings are estimated by regressing monthly portfolio returns on the mimicking portfolios of CRR five factors together with the investor sentiment factor. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Panel A. Equal-weighted Returns

Rank_GPA	R	Alpha	MP	UI	DEI	UTS	UPR	SENT	$AdjR^2$
1	0.67	0.49	0.22	0.79	1.56	0.48	1.15	-0.76	0.31
	(2.15)	(1.64)	(1.53)	(1.44)	(0.95)	(6.52)	(4.86)	(-8.42)	
2	0.76	0.52	0.35	-1.32	4.79	0.52	1.05	-0.76	0.33
	(2.60)	(1.71)	(2.90)	(-2.66)	(2.97)	(8.39)	(4.57)	(-8.96)	
3	0.90	0.61	0.37	-1.27	4.67	0.54	1.34	-0.72	0.33
	(3.05)	(2.01)	(3.10)	(-2.37)	(2.80)	(9.12)	(5.32)	(-8.13)	
4	0.96	0.58	0.36	-1.58	4.40	0.58	1.31	-0.62	0.32
	(3.24)	(1.90)	(2.95)	(-2.80)	(2.64)	(9.50)	(5.15)	(-6.74)	
5	1.09	0.61	0.38	-1.59	3.72	0.60	1.42	-0.46	0.30
	(3.57)	(1.93)	(2.99)	(-2.54)	(2.00)	(9.61)	(5.92)	(-4.96)	
(5-1)	**0.42**	**0.12**	**0.17**	**-2.38**	**2.15**	**0.11**	**0.27**	**0.30**	0.40
	(2.97)	**(1.03)**	**(2.13)**	**(-9.37)**	**(3.90)**	**(2.88)**	**(2.52)**	**(5.07)**	

Panel B. Value-weighted Returns

Rank_GPA	R	Alpha	MP	UI	DEI	UTS	UPR	SENT	$AdjR^2$
1	0.28	0.16	0.04	-0.51	0.21	0.28	0.44	-0.33	0.14
	(1.26)	(0.67)	(0.45)	(-1.61)	(0.18)	(4.26)	(2.59)	(-3.38)	
2	0.35	0.22	0.19	-1.33	3.39	0.30	0.49	-0.45	0.20
	(1.63)	(0.92)	(2.17)	(-3.79)	(2.34)	(4.82)	(3.37)	(-5.00)	
3	0.50	0.39	0.20	-1.63	3.15	0.29	0.62	-0.45	0.21
	(2.39)	(1.71)	(2.17)	(-4.73)	(2.19)	(4.63)	(4.03)	(-4.98)	
4	0.40	0.15	0.22	-2.10	2.85	0.35	0.81	-0.30	0.21
	(1.82)	(0.66)	(2.21)	(-5.06)	(2.02)	(5.85)	(5.62)	(-2.95)	
5	0.59	0.31	0.24	-2.50	3.08	0.29	0.65	-0.16	0.19
	(2.71)	(1.42)	(2.02)	(-6.01)	(3.12)	(5.21)	(4.45)	(-1.57)	
(5-1)	**0.31**	**0.15**	**0.20**	**-1.99**	**2.88**	**0.01**	**0.21**	**0.17**	0.18
	(2.06)	**(0.99)**	**(2.22)**	**(-5.67)**	**(3.49)**	**(0.31)**	**(1.71)**	**(2.41)**	

Table 6. Profitability Premium and the Relative Valuation of Stocks

This table reports the profitability premium (in %) conditional on relative market valuation of stocks (Vindex). Profitability is measured by gross profitability (Panel A), return-on-assets (Panel B), and return-on-equity (Panel C), respectively. Vindex is constructed based on ten anomaly variables, including book-to-market equity ratio (BM), firm size (ME), cumulative past 11-month return (RET_2_12), net stock issues (NSI), asset growth (AG), investment-to-assets ratio (IA), net operating assets (NOA), accrual ($ACCRUAL$), Ohlson's O-score ($OSCORE$), and organizational investment (SGA). We rank stocks into deciles based on each of these variables in ascending order (in descending order for BM, RET_2_12, and SGA), and Vindex is constructed by adding up the ranks of each variable for each firm year. The nonmisvalued profitability strategy consists of a long position in firms with high profitability and high Vindex and a short position in firms with low profitability and low Vindex. The misvalued profitability strategy consists of a long position in firms with high profitability but low Vindex and a short position in firms with low profitability but high Vindex. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors. The sample period is from July, 1963 to Dec, 2010.

Panel A. Gross profitability

	Low Prof			Medium Prof			High Prof			High-Low Prof		
	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4
Unconditional	0.33	-0.18	-0.16	0.47	0.02	0.04	0.56	0.27	0.25	0.23	0.44	0.41
	(1.61)	(-3.05)	(-2.93)	(2.32)	(0.38)	(0.66)	(2.67)	(4.07)	(3.93)	(1.77)	(3.91)	(3.78)
Low Vindex	0.87	0.19	0.11	0.92	0.41	0.35	0.76	0.37	0.28	-0.10	0.18	0.17
	(3.27)	(1.22)	(0.70)	(3.50)	(3.07)	(2.55)	(2.85)	(2.78)	(2.14)	(-0.49)	(0.86)	(0.81)
Medium Vindex	0.56	-0.02	-0.01	0.51	0.10	0.15	0.63	0.35	0.32	0.07	0.37	0.33
	(2.27)	(-0.20)	(-0.10)	(2.24)	(1.24)	(1.68)	(2.80)	(3.78)	(3.50)	(0.39)	(2.22)	(2.06)
High Vindex	0.21	-0.33	-0.25	0.38	-0.01	0.08	0.41	0.13	0.16	0.20	0.46	0.41
	(0.73)	(-2.49)	(-2.07)	(1.43)	(-0.09)	(0.81)	(1.42)	(1.18)	(1.39)	(0.98)	(2.40)	(2.23)
Nonmisvalued profitability strategy										**-0.46**	**-0.06**	**0.05**
										(-2.00)	**(-0.29)**	**(0.24)**
Misvalued profitability strategy										**0.55**	**0.70**	**0.53**
										(2.41)	**(2.99)**	**(2.45)**

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Panel B. Return on assets

	Low Prof			Medium Prof			High Prof			High-Low Prof		
	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4
Unconditional	0.34	-0.26	-0.15	0.46	-0.03	-0.02	0.47	0.15	0.14	0.14	0.41	0.28
	(1.16)	(-2.14)	(-1.24)	(2.34)	(-0.76)	(-0.54)	(2.40)	(3.54)	(3.21)	(0.86)	(2.90)	(2.05)
Low Vindex	0.81	0.08	0.12	0.88	0.33	0.21	0.78	0.40	0.29	-0.03	0.33	0.17
	(2.37)	(0.51)	(0.72)	(3.79)	(2.87)	(1.91)	(3.30)	(3.44)	(2.51)	(-0.12)	(1.75)	(0.95)
Medium Vindex	0.60	-0.07	-0.01	0.66	0.14	0.16	0.53	0.22	0.20	-0.07	0.29	0.21
	(1.74)	(-0.41)	(-0.05)	(2.72)	(1.78)	(2.06)	(2.49)	(3.29)	(2.89)	(-0.32)	(1.54)	(1.06)
High Vindex	0.02	-0.57	-0.40	0.34	-0.20	-0.12	0.39	0.08	0.12	0.37	0.65	0.52
	(0.06)	(-3.43)	(-2.67)	(1.26)	(-2.07)	(-1.32)	(1.43)	(1.04)	(1.54)	(1.97)	(3.75)	(3.13)
Nonmisvalued profitability strategy										**-0.43**	**0.00**	**0.01**
										(-2.11)	**(0.01)**	**(0.05)**
Misvalued profitability strategy										**0.76**	**0.97**	**0.68**
										(3.13)	**(4.25)**	**(3.40)**

Panel C. Return on equity

	Low Prof			Medium Prof			High Prof			High-Low Prof		
	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4
Unconditional	0.37	-0.22	-0.12	0.46	-0.01	-0.01	0.46	0.12	0.11	0.09	0.34	0.23
	(1.29)	(-1.73)	(-1.00)	(2.34)	(-0.24)	(-0.12)	(2.34)	(3.10)	(2.86)	(0.56)	(2.29)	(1.64)
Low Vindex	0.80	0.09	0.11	0.81	0.27	0.18	0.79	0.42	0.29	-0.02	0.33	0.18
	(2.36)	(0.57)	(0.67)	(3.57)	(2.42)	(1.66)	(3.19)	(3.44)	(2.46)	(-0.08)	(1.75)	(0.95)
Medium Vindex	0.51	-0.08	0.00	0.63	0.10	0.12	0.54	0.23	0.21	0.03	0.31	0.20
	(1.53)	(-0.46)	(0.02)	(2.51)	(1.20)	(1.31)	(2.57)	(3.56)	(3.17)	(0.14)	(1.52)	(1.03)
High Vindex	0.06	-0.49	-0.34	0.36	-0.12	-0.06	0.36	0.00	0.07	0.30	0.49	0.40
	(0.17)	(-2.70)	(-2.01)	(1.30)	(-1.15)	(-0.57)	(1.37)	(0.03)	(0.87)	(1.56)	(2.72)	(2.23)
Nonmisvalued profitability strategy										**-0.44**	**-0.08**	**-0.04**
										(-2.25)	**(-0.49)**	**(-0.24)**
Misvalued profitability strategy										**0.72**	**0.91**	**0.62**
										(2.77)	**(3.59)**	**(2.77)**

Table 7. Earnings announcement abnormal returns conditional on profitability and valuation

This table presents the average earnings announcement abnormal returns (in %) conditional on profitability and market valuation. Earnings announcement abnormal returns are defined as the cumulative abnormal returns around firms' four subsequent three-day quarterly earnings announcement windows within one year after portfolio formation. The profitability is measured by gross profitability, return-on-assets, and return-on-equity, respectively. The three-day buy-and-hold abnormal returns are calculated based on the market model. The nonmisvalued profitability strategy consists of a long position in firms with high profitability and high Vindex and a short position in firms with low profitability and low Vindex. The misvalued profitability strategy consists of a long position in firms with high profitability but low Vindex and a short position in firms with low profitability but high Vindex. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors. The sample period is from 1972 to 2010.

	Gross profitability				**Return on assets**				**Return on equity**			
	Low	Medium	High	High-Low	Low	Medium	High	High-Low	Low	Medium	High	High-Low
Unconditional	0.19	1.07	1.15	0.96	0.80	1.20	0.41	-0.39	0.81	1.20	0.39	-0.41
	(0.55)	(5.99)	(4.35)	(2.03)	(1.70)	(4.89)	(1.73)	(-0.62)	(1.65)	(5.56)	(1.46)	(-0.61)
Low Vindex	0.88	1.87	1.76	0.87	1.72	1.85	0.91	-0.81	1.60	1.93	0.73	-0.87
	(2.08)	(7.21)	(4.78)	(1.87)	(3.85)	(6.23)	(2.64)	(-1.48)	(3.70)	(6.49)	(2.05)	(-1.63)
Medium Vindex	0.47	1.18	1.01	0.54	0.87	1.54	0.33	-0.54	0.88	1.27	0.56	-0.32
	(1.55)	(5.25)	(2.66)	(1.02)	(1.78)	(3.69)	(1.18)	(-0.83)	(1.83)	(3.70)	(1.62)	(-0.45)
High Vindex	0.01	0.42	0.52	0.51	0.19	0.50	0.12	-0.07	0.30	0.56	0.11	-0.19
	(0.07)	(1.97)	(2.06)	(1.59)	(0.53)	(2.25)	(0.46)	(-0.13)	(0.66)	(2.60)	(0.44)	(-0.33)
Nonmisvalued profitability strategy				**-0.36**				**-1.61**				**-1.49**
				(-0.62)				**(-2.61)**				**(-2.70)**
Misvalued profitability strategy				**1.74**				**0.72**				**0.43**
				(5.07)				**(1.27)**				**(0.67)**

Table 8. Analyst Forecast Errors and Forecast Revisions Conditional on Profitability and Valuation

This table presents the average analyst forecast errors (Panel A) and forecast revisions (Panel B) conditional on profitability and market valuation. Analyst forecast error is defined as the actual earnings per share (EPS) next year minus the consensus EPS forecast, scaled by book assets per share at the beginning of portfolio formation. Analyst forecast revision is defined as the last consensus EPS forecast before the annual earnings announcement next year minus the initial consensus forecast, scaled by book assets per share at the beginning of portfolio formation. The profitability is measured by gross profitability, return-on-assets, and return-on-equity, respectively. The nonmisvalued profitability strategy consists of a long position in firms with high profitability and high Vindex and a short position in firms with low profitability and low Vindex. The misvalued profitability strategy consists of a long position in firms with high profitability but low Vindex and a short position in firms with low profitability but high Vindex. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors. The sample period is from 1982 to 2010.

Panel A. Analyst forecast errors

	Gross profitability				**Return on assets**				**Return on equity**			
	Low	Medium	High	High-Low	Low	Medium	High	High-Low	Low	Medium	High	High-Low
Unconditional	-0.0177	-0.0174	-0.0204	-0.0028	-0.0300	-0.0107	-0.0148	0.0152	-0.0313	-0.0109	-0.0133	0.0181
	(-6.52)	(-6.82)	(-7.42)	(-1.45)	(-7.24)	(-7.22)	(-5.79)	(5.02)	(-7.10)	(-8.11)	(-5.54)	(5.50)
Low Vindex	-0.0183	-0.0127	-0.0145	0.0038	-0.0254	-0.0084	-0.0074	0.0180	-0.0252	-0.0077	-0.0073	0.0179
	(-4.78)	(-4.99)	(-5.60)	(1.01)	(-5.56)	(-5.92)	(-4.54)	(4.10)	(-5.49)	(-6.31)	(-3.67)	(3.73)
Medium Vindex	-0.0185	-0.0140	-0.0153	0.0032	-0.0308	-0.0103	-0.0096	0.0212	-0.0323	-0.0099	-0.0085	0.0238
	(-7.40)	(-5.83)	(-6.51)	(1.48)	(-7.84)	(-6.20)	(-5.16)	(7.08)	(-7.84)	(-6.75)	(-4.71)	(7.11)
High Vindex	-0.0286	-0.0234	-0.0314	-0.0028	-0.0463	-0.0186	-0.0236	0.0227	-0.0496	-0.0201	-0.0207	0.0289
	(-6.00)	(-6.92)	(-5.70)	(-0.46)	(-9.49)	(-5.89)	(-5.51)	(4.85)	(-9.00)	(-6.34)	(-5.60)	(6.72)
Nonmisvalued profitability strategy				**-0.0131**				**0.0019**				**0.0046**
				(-3.37)				**(0.49)**				**(1.17)**
Misvalued profitability strategy				**0.0141**				**0.0389**				**0.0422**
				(2.34)				**(8.11)**				**(8.66)**

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Panel B. Analyst forecast revisions

	Gross profitability				**Return on assets**				**Return on equity**			
	Low	Medium	High	High-Low	Low	Medium	High	High-Low	Low	Medium	High	High-Low
Unconditional	-0.0166	-0.0155	-0.0221	-0.0055	-0.0251	-0.0094	-0.0197	0.0054	-0.0258	-0.0106	-0.0178	0.0080
	(-10.74)	(-7.21)	(-8.87)	(-2.29)	(-10.35)	(-8.01)	(-7.35)	(1.93)	(-10.32)	(-8.39)	(-7.23)	(2.97)
Low Vindex	-0.0177	-0.0108	-0.0154	0.0024	-0.0204	-0.0076	-0.0130	0.0074	-0.0202	-0.0089	-0.0117	0.0084
	(-3.62)	(-6.42)	(-7.39)	(0.51)	(-5.57)	(-6.19)	(-6.48)	(2.37)	(-5.50)	(-7.39)	(-5.55)	(2.50)
Medium Vindex	-0.0164	-0.0142	-0.0200	-0.0036	-0.0248	-0.0103	-0.0168	0.0080	-0.0264	-0.0103	-0.0156	0.0108
	(-5.94)	(-5.51)	(-8.51)	(-0.95)	(-7.23)	(-7.26)	(-7.56)	(2.01)	(-7.22)	(-8.38)	(-6.87)	(2.51)
High Vindex	-0.0211	-0.0223	-0.0330	-0.0119	-0.0334	-0.0162	-0.0273	0.0061	-0.0360	-0.0171	-0.0243	0.0117
	(-9.97)	(-7.36)	(-7.72)	(-3.18)	(-15.88)	(-6.63)	(-6.89)	(1.45)	(-15.61)	(-7.18)	(-6.67)	(3.17)
Nonmisvalued profitability strategy				**-0.0153**				**-0.0069**				**-0.0041**
				(-2.79)				**(-1.63)**				**(-0.97)**
Misvalued profitability strategy				**0.0057**				**0.0204**				**0.0242**
				(2.10)				**(7.31)**				**(8.23)**

Table 9. Regression Analysis

This table presents the results from the following Fama and Macbeth (1973) cross-sectional regression:

$$\begin{aligned} Y_{it+1} = & b_1 HighProf_{it} + b_2 HighProf_{it} * LowVindex_{it} + b_3 HighProf_{it} * MidVindex_{it} \\ & + b_4 MidProf_{it} + b_5 MidProf_{it} * LowVindex_{it} + b_6 MidProf_{it} * HighVindex_{it} \\ & + b_7 LowProf_{it} + b_8 LowProf_{it} * MidVindex_{it} + b_9 LowProf_{it} * HighVindex_{it} \\ & + b_{10} BM_{it} + b_{11} ME_{it} + b_{12} RET\_2\_12_{it} + \varepsilon_{it+1} \end{aligned}$$

where Y_{it+1} represents monthly excess returns (in %), earnings announcement abnormal returns (in %), analyst forecast errors and forecast revisions, respectively, for firm i in month $t+1$. Profitability is measured by gross profitability (Panel A), return-on-assets (Panel B), and return-on-equity (Panel C), respectively. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Panel A. Gross profitability

Dependent variables	Monthly returns		EA returns (quarterly)		AF errors		AF revisions	
	1	2	1	2	1	2	1	2
HighProf	1.0230	1.3380	0.5243	1.5313	-0.0314	-0.0953	-0.0330	-0.0797
	(2.88)	(2.30)	(2.06)	(3.07)	(-5.70)	(-7.92)	(-7.72)	(-12.64)
HighProf*LowVindex	**0.8880**	**0.5360**	**1.2320**	**0.7252**	**0.0169**	**0.0073**	**0.0177**	**0.0092**
	(6.91)	**(4.85)**	**(3.02)**	**(2.21)**	**(3.63)**	**(2.20)**	**(5.88)**	**(3.92)**
HighProf*MidVindex	0.4850	0.3760	0.4844	0.4847	0.0161	0.0099	0.0130	0.0084
	(5.38)	(4.53)	(1.93)	(1.98)	(3.25)	(2.41)	(3.68)	(2.72)
MidProf	1.4810	1.5950	1.1807	1.7615	-0.0140	-0.0898	-0.0142	-0.0713
	(4.76)	(2.77)	(5.25)	(3.06)	(-5.83)	(-7.53)	(-5.51)	(-10.88)
MidProf*LowVindex	0.3700	0.1310	0.6890	0.2451	0.0013	-0.0008	0.0034	0.0009
	(4.49)	(1.68)	(3.36)	(1.27)	(0.78)	(-0.37)	(2.28)	(0.65)
MidProf*HighVindex	-0.4990	-0.3510	-0.7558	-0.6112	-0.0094	-0.0013	-0.0081	-0.0021
	(-6.69)	(-5.38)	(-3.13)	(-2.70)	(-5.01)	(-0.88)	(-6.43)	(-2.10)
LowProf	1.7860	1.5930	0.8813	0.8174	-0.0183	-0.0961	-0.0177	-0.0783
	(4.72)	(2.49)	(2.08)	(1.01)	(-4.78)	(-6.64)	(-3.62)	(-8.82)
LowProf*MidVindex	-0.4630	-0.2420	-0.4099	-0.1736	-0.0001	-0.0002	0.0013	0.0016
	(-3.70)	(-2.23)	(-1.40)	(-0.78)	(-0.04)	(-0.07)	(0.21)	(0.25)
LowProf*HighVindex	**-1.1600**	**-0.7600**	**-0.8666**	**-0.4035**	**-0.0102**	**-0.0033**	**-0.0034**	**0.0025**
	(-6.59)	**(-5.10)**	**(-2.78)**	**(-1.99)**	**(-2.61)**	**(-0.75)**	**(-0.62)**	**(0.46)**
Decile(BM)		0.0770		0.2780		0.0041		0.0040
		(2.94)		(8.47)		(5.11)		(8.35)
Decile(SIZE)		-0.0580		-0.0268		0.0055		0.0039
		(-1.83)		(-0.35)		(9.46)		(11.72)
Decile(MOM)		-0.0320		-0.3401		0.0037		0.0022
		(-1.29)		(-6.84)		(5.72)		(8.62)

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Panel B. Return on assets

Dependent variables	Monthly returns		EA returns (quarterly)		AF errors		AF revisions	
	1	2	1	2	1	2	1	2
HighProf	0.9490	1.4280	0.1164	1.9178	-0.0236	-0.0867	-0.0273	-0.0742
	(2.98)	(2.80)	(0.46)	(3.64)	(-5.51)	(-7.74)	(-6.89)	(-12.11)
HighProf*LowVindex	**0.6580**	**0.3790**	**0.7937**	**0.7112**	**0.0161**	**0.0050**	**0.0143**	**0.0070**
	(5.39)	**(3.68)**	**(2.88)**	**(2.73)**	**(5.06)**	**(2.17)**	**(5.98)**	**(4.04)**
HighProf*MidVindex	0.3940	0.3090	0.2101	0.3474	0.0140	0.0069	0.0105	0.0059
	(4.69)	(4.35)	(1.20)	(1.97)	(3.85)	(2.48)	(4.20)	(3.17)
MidProf	1.5210	1.6930	1.5415	2.8283	-0.0103	-0.0876	-0.0103	-0.0690
	(5.10)	(3.29)	(3.69)	(4.48)	(-6.20)	(-7.38)	(-7.26)	(-11.53)
MidProf*LowVindex	0.2630	0.0840	0.3055	0.2151	0.0018	-0.0003	0.0027	0.0009
	(3.56)	(1.26)	(1.17)	(0.90)	(1.78)	(-0.19)	(3.44)	(0.82)
MidProf*HighVindex	-0.6010	-0.4700	-1.0429	-1.0463	-0.0083	0.0002	-0.0059	0.0001
	(-6.86)	(-6.29)	(-2.83)	(-2.91)	(-3.78)	(0.19)	(-4.10)	(0.06)
LowProf	2.0180	1.9300	1.7220	2.4674	-0.0254	-0.0957	-0.0204	-0.0743
	(4.65)	(3.04)	(3.85)	(3.76)	(-5.56)	(-6.68)	(-5.57)	(-9.20)
LowProf*MidVindex	-0.5450	-0.3750	-0.8507	-0.7601	-0.0054	-0.0017	-0.0044	-0.0014
	(-5.27)	(-3.79)	(-3.78)	(-3.21)	(-1.59)	(-0.55)	(-0.99)	(-0.32)
LowProf*HighVindex	**-1.3680**	**-1.0890**	**-1.5358**	**-1.3722**	**-0.0209**	**-0.0124**	**-0.0130**	**-0.0060**
	(-8.40)	**(-7.02)**	**(-4.66)**	**(-4.32)**	**(-3.74)**	**(-2.41)**	**(-2.99)**	**(-1.23)**
Decile(BM)		0.0670		0.1851		0.0043		0.0040
		(2.67)		(8.12)		(5.15)		(7.63)
Decile(SIZE)		-0.0690		-0.0697		0.0048		0.0035
		(-2.48)		(-1.08)		(9.23)		(12.77)
Decile(MOM)		-0.0310		-0.3515		0.0037		0.0022
		(-1.32)		(-6.44)		(5.39)		(8.27)

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Panel C. Return on equity

Dependent variables	Monthly returns		EA returns (quarterly)		AF errors		AF revisions	
	1	2	1	2	1	2	1	2
HighProf	0.9300	1.3860	0.1102	1.9132	-0.0207	-0.0841	-0.0243	-0.0721
	(2.92)	(2.72)	(0.44)	(3.55)	(-5.60)	(-7.80)	(-6.67)	(-12.30)
HighProf*LowVindex	**0.7270**	**0.4870**	**0.6178**	**0.7080**	**0.0133**	**0.0037**	**0.0126**	**0.0069**
	(6.51)	**(4.91)**	**(2.62)**	**(2.92)**	**(5.75)**	**(2.43)**	**(6.40)**	**(4.63)**
HighProf*MidVindex	0.4670	0.3970	0.4506	0.6564	0.0122	0.0052	0.0087	0.0047
	(5.89)	(5.57)	(2.84)	(3.74)	(4.31)	(2.92)	(4.13)	(3.16)
MidProf	1.4790	1.6380	1.2716	2.5498	-0.0099	-0.0858	-0.0103	-0.0686
	(4.95)	(3.14)	(3.70)	(4.51)	(-6.75)	(-7.43)	(-8.38)	(-11.32)
MidProf*LowVindex	0.2830	0.1270	0.6608	0.6131	0.0022	-0.0007	0.0014	-0.0008
	(4.19)	(2.06)	(3.10)	(2.92)	(2.13)	(-0.50)	(2.02)	(-0.83)
MidProf*HighVindex	-0.5850	-0.4490	-0.7082	-0.7315	-0.0102	-0.0030	-0.0068	-0.0014
	(-6.65)	(-6.08)	(-2.29)	(-2.43)	(-4.44)	(-2.29)	(-4.62)	(-1.52)
LowProf	1.9940	1.8780	1.6024	2.3247	-0.0252	-0.0952	-0.0202	-0.0747
	(4.64)	(2.96)	(3.70)	(3.66)	(-5.49)	(-6.64)	(-5.50)	(-8.98)
LowProf*MidVindex	-0.5370	-0.3500	-0.7209	-0.6256	-0.0070	-0.0027	-0.0062	-0.0027
	(-5.14)	(-3.40)	(-3.08)	(-2.60)	(-2.41)	(-0.91)	(-1.37)	(-0.60)
LowProf*HighVindex	**-1.3000**	**-1.0020**	**-1.3006**	**-1.1594**	**-0.0243**	**-0.0141**	**-0.0158**	**-0.0077**
	(-7.57)	**(-6.17)**	**(-4.61)**	**(-4.31)**	**(-4.04)**	**(-2.62)**	**(-3.41)**	**(-1.49)**
Decile(BM)		0.0710		0.1930		0.0044		0.0041
		(2.72)		(6.91)		(5.13)		(7.44)
Decile(SIZE)		-0.0690		-0.0766		0.0047		0.0035
		(-2.48)		(-1.21)		(9.61)		(13.13)
Decile(MOM)		-0.0330		-0.3545		0.0036		0.0021
		(-1.39)		(-6.39)		(5.48)		(8.02)

Table 10. Profitability Premium Conditional on Investor Sentiment

This table reports the portfolio returns (in %) of the unconditional, nonmisvalued and misvalued profitability strategies conditional on investor sentiment. We split the whole sample period into low, medium and low sentiment subperiods based on Baker and Wurgler (2006) sentiment index in the previous month. Profitability is measured by gross profitability (Panel A), return-on-assets (Panel B), and return-on-equity (Panel C), respectively. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

	Unconditional			Nonmisvalued			Misvalued		
	R	Alpha3	Alpha4	R	Alpha3	Alpha4	R	Alpha3	Alpha4
Panel A. Gross profitability									
Sentiment									
Low	0.08	0.14	0.06	-0.91	-0.39	-0.29	-0.06	0.05	-0.10
	(0.32)	(0.77)	(0.35)	(-2.10)	(-1.01)	(-0.73)	(-0.17)	(0.14)	(-0.31)
Medium	0.02	0.19	0.24	-0.10	0.05	0.09	0.23	0.33	0.28
	(0.11)	(1.10)	(1.45)	(-0.34)	(0.19)	(0.31)	(0.71)	(0.99)	(0.98)
High	0.55	0.85	0.84	-0.50	0.00	0.15	1.49	1.60	1.37
	(2.37)	(3.99)	(4.00)	(-1.17)	(-0.00)	(0.42)	(3.40)	(3.71)	(3.74)
High-Low	**0.48**	**0.71**	**0.78**	**0.41**	**0.39**	**0.44**	**1.55**	**1.55**	**1.46**
	(1.43)	**(2.56)**	**(2.85)**	**(0.67)**	**(0.72)**	**(0.83)**	**(2.72)**	**(2.90)**	**(3.03)**
Panel B. Return on assets									
Sentiment									
Low	-0.44	-0.01	-0.14	-0.80	-0.02	0.02	0.09	0.50	0.36
	(-1.55)	(-0.03)	(-0.48)	(-1.99)	(-0.06)	(0.06)	(0.23)	(1.44)	(0.99)
Medium	-0.08	0.06	-0.03	-0.33	-0.19	-0.24	0.20	0.32	0.18
	(-0.32)	(0.25)	(-0.13)	(-1.02)	(-0.65)	(-0.89)	(0.51)	(0.71)	(0.46)
High	0.93	1.11	0.97	-0.20	0.29	0.29	2.04	2.12	1.60
	(2.90)	(4.58)	(4.15)	(-0.61)	(0.98)	(0.93)	(4.31)	(5.81)	(5.27)
High-Low	**1.37**	**1.12**	**1.11**	**0.60**	**0.31**	**0.27**	**1.95**	**1.62**	**1.24**
	(3.19)	**(3.19)**	**(2.99)**	**(1.17)**	**(0.74)**	**(0.60)**	**(3.14)**	**(3.21)**	**(2.62)**
Panel C. Return on equity									
Sentiment									
Low	-0.39	-0.01	-0.11	-0.70	0.02	0.07	0.04	0.40	0.28
	(-1.39)	(-0.05)	(-0.39)	(-1.79)	(0.06)	(0.22)	(0.09)	(1.01)	(0.67)
Medium	-0.14	-0.03	-0.11	-0.50	-0.39	-0.38	0.14	0.23	0.17
	(-0.58)	(-0.11)	(-0.49)	(-1.64)	(-1.37)	(-1.43)	(0.33)	(0.49)	(0.41)
High	0.82	0.96	0.82	-0.14	0.22	0.22	2.03	2.11	1.50
	(2.43)	(3.35)	(2.92)	(-0.43)	(0.74)	(0.68)	(4.06)	(5.09)	(4.34)
High-Low	**1.21**	**0.97**	**0.92**	**0.56**	**0.21**	**0.15**	**1.99**	**1.72**	**1.23**
	(2.75)	**(2.57)**	**(2.36)**	**(1.12)**	**(0.49)**	**(0.32)**	**(2.98)**	**(3.01)**	**(2.28)**

Table A1. Predictive Regression for the Profitability Premium

This table reports the following predictive regression for the profitability premium:

$$R_{High-Low,t} = a_0 + a_1 SENT_{t-1} + \gamma MACRO_{t-1} + \varepsilon_t. \quad (14)$$

The dependent variable is the monthly equal-weighted (Panel A) and value-weighted (Panel B) return spread between the highest and lowest quintile portfolios formed on gross profitability. The monthly return spreads from July of year t to June of year $t+1$ are regressed on the sentiment index in June of year t and lagged monthly macro variables, including industrial production (MP), unexpected inflation (UI), change in expected inflation (DEI), term premium (UTS), default premium (UPR), and NBER business cycle indicator (NBERdum, which equals 1 for expansion and zero for recession). The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Panel A. Equal-weighted return spread

Model	Intercept	SENT	MP	UI	DEI	UTS	UPR	NBERdum	AdjR2
1	0.396	0.394							0.020
	(2.86)	(2.27)							
2	0.171	0.373	-0.134	-0.003	-0.289	0.127	0.084		0.018
	(0.33)	(2.18)	(-0.77)	(-0.00)	(-0.23)	(1.29)	(0.19)		
3	-0.198	0.387	-0.199	0.034	-0.354	0.117	0.178	0.354	0.018
	(-0.30)	(2.31)	(-1.09)	(0.05)	(-0.28)	(1.21)	(0.39)	(1.05)	

Panel B. Value-weighted return spread

Model	Intercept	SENT	MP	UI	DEI	UTS	UPR	NBERdum	AdjR2
1	0.267	0.327							0.009
	(1.82)	(2.04)							
2	0.111	0.317	-0.010	-0.423	-0.357	0.069	0.068		0.003
	(0.28)	(1.89)	(-0.04)	(-0.54)	(-0.20)	(0.61)	(0.23)		
3	0.290	0.311	0.021	-0.441	-0.326	0.074	0.022	-0.171	0.001
	(0.41)	(1.87)	(0.09)	(-0.56)	(-0.18)	(0.64)	(0.07)	(-0.34)	

Table A2. Return Decomposition

This table reports the monthly average of total stock return (*Ret*), the cash-flow news component (*CFret*), the discount-rate news component (*DRret*), and the expected return component (*Eret*) for portfolios sorted by gross profitability. The return componnets are estimated by the VAR method discussed in the Appendix. Equal-weighted and value-weighted average monthly returns in % are reported in panel A and Panel B, respectively. The sample period is from 1963 to 2010. The *t*-statistics are reported in parentheses.

Panel A. Equal-weighted returns

Rank_GPA	Ret	CFret	DRret	Eret	N
1	1.11	0.54	0.17	0.47	462
	(7.03)	(3.95)	(3.17)	(2.12)	
2	1.19	0.57	0.00	0.58	448
	(7.16)	(5.78)	(0.09)	(2.72)	
3	1.33	0.69	0.00	0.55	497
	(7.15)	(6.09)	(0.06)	(2.53)	
4	1.39	0.76	0.06	0.50	568
	(6.88)	(5.60)	(2.76)	(2.29)	
5	1.57	0.95	0.09	0.39	663
	(7.33)	(5.71)	(7.64)	(1.80)	
(5-1)	**0.46**	**0.41**	**-0.08**	**-0.08**	
	(3.28)	**(3.95)**	**(-1.51)**	**(-5.60)**	

Panel B. Value-weighted returns

Rank_GPA	Ret	CFret	DRret	Eret	N
1	0.80	0.43	-0.03	0.52	462
	(3.83)	(2.52)	(-1.01)	(2.33)	
2	0.82	0.45	-0.02	0.51	448
	(4.49)	(3.00)	(-0.93)	(2.29)	
3	0.93	0.57	0.01	0.43	497
	(5.61)	(3.82)	(0.50)	(1.88)	
4	0.85	0.54	0.16	0.23	568
	(4.09)	(2.93)	(4.60)	(1.03)	
5	1.08	0.82	0.30	0.04	663
	(4.32)	(3.54)	(5.39)	(0.18)	
(5-1)	**0.28**	**0.40**	**0.33**	**-0.48**	
	(1.72)	**(2.99)**	**(10.58)**	**(-19.37)**	