# Managers' Assessment of Economic Factors and Firms' Investment Efficiency

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**Abstract of Dissertation**

Managers' Assessment of Economic Factors and Firms' Investment Efficiency

The success of a firm critically depends on the success of its' managers' investment decisions. This study seeks to add to the literature that provides evidence on the determinants of managers' investment decision-making process. Specifically, this study investigates how managers' assessment of economic factors (such as interest rates and inflation) influences their valuation of investment projects and thus is associated with their investment efficiency. Using the weight that managers assign to economic factors when providing earnings forecasts as an empirical measure for the managers' assessment of economic factors, I find that managers who mis-weight economic factors in prior quarters invest inefficiently in the next quarter. Further, I find that such inefficient investing varies with the economic state: managers who over-weight economic factors over-invest in economic upturns due to over-optimism and under-invest in economic downturns due to over-pessimism. Overall, the findings suggest that managers' assessment of economic factors is an important determinant of their investment efficiency. This study provides insights into managers' valuation process and the resulting impact on their investment decisions. Moreover, the setting of this study demonstrates how a firm's external disclosure is associated with the firm's internal strategic decisions.

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## List of Symbols

1. $q$ Subscript denotes quarter
2. $e$ Realized earnings
3. $M$ A vector of macroeconomic factors
4. $B'M$ Economic component of earnings
5. $m$ Firm-specific component of earnings
6. $f$ Management earnings forecasts
7. $\Gamma$ Weighting assigned to the economic component of earnings in management earnings forecasts
8. $\gamma$ Weighting assigned to the firm-specific component of earnings in management earnings forecasts
9. $i$ Subscript denotes firm
10. $k$ Subscript denotes the industry in which firm $i$ operates
11. $j$ Subscript denotes the $j$th variable in the vector of control variables

# Chapter 1: Introduction

When an investment opportunity emerges, managers need to appraise the project's value by forecasting its future cash flows. Based on their appraisal, the managers decide whether to proceed with the project. When assessing investment projects, managers need to consider both firm-specific characteristics as well as general economic factors. For example, interest rates affect the cash flows of a capital-intensive project. Similarly, inflation influences the payoffs of a labor-intensive project. Therefore, the success of an investment decision critically depends on managers' ability to evaluate the economic condition.[1] Even if the managers are proficient at assessing the firm's competitive advantages, they can still make inefficient investment decisions if they mis-assess the impact of the exogenous economic factors on the investment projects. In this study, I investigate how managers' (mis-)assessment of economic factors affects firms' investment efficiency.

Measuring managers' (mis-)assessment of economic factors is an empirical challenge. First, managers' investment decision-making process is unobservable. However, how managers appraise an investment project is similar to how managers forecast earnings. When evaluating investment projects, managers need to consider the impact of economic factors on the future payoffs of the current investment opportunities. Similarly, when providing earnings forecasts, managers need to predict how economic factors affect the future payoffs of their past investment decisions (Goodman, Neamtiu, Shroff, and White 2014). Therefore, managers who mis-assess economic factors in their

[1] Economic factors can have a general impact on all firms or an industry-specific impact on firms in different industries. Moreover, the impact of these economic factors can differ for firms in the same industry, depending on specific investment projects pursuit. Regardless of the channel of the impact, economic factors are considered to be exogenous to firms.

earnings forecasts are likely to have similar mis-assessment when making investment decisions. Therefore, managers' (mis-)assessment of economic factors can be inferred from their earnings forecasts.

Second, managers' mis-assessment can take different forms. For example, a firm's managers may misidentify the unemployment rate as the most influential economic factor affecting an investment project, but the actual driving force is the consumer price index (CPI). Alternatively, the managers may realize the importance of the CPI, but their prediction of future changes in CPI is inaccurate. Furthermore, the managers may mis-evaluate how the payoffs of the investment project covary with CPI. To capture various forms of mis-assessment, I rely on Bonsall, Bozanic, and Fischer (2013)'s framework and construct an empirical measure that quantifies managers' (mis-)assessment into the (mis-)weighting that the managers assign to a set of economic factors[2] implied in their earnings forecasts.

Using the managers' (mis-)weighting as an empirical measure for their (mis-) assessment of economic factors, I investigate whether managers' mis-assessment of economic factors is associated with firms' future investment efficiency. Managers who mis-weight economic factors are likely to mis-appraise the values of investment opportunities; consequently, their investment decisions are expected to be inefficient. Accordingly, I hypothesize that managers who mis-weight economic factors in prior quarters invest inefficiently in the next quarter.

[2] In the analyses of this study, I consider the following economic factors: consumer price index inflation rate, housing starts, index of industrial production, real gross domestic product, unemployment rate, three-month treasury bill rate, risk premium, and term premium (Bonsall et al. 2013; Ognea 2013).

Next, I examine how the direction of such inefficient investing varies with the economic state. Specifically, managers who over-weight economic factors are likely to be overly optimistic when the economy is booming and over-invest accordingly. Conversely, when the economy is contracting, those managers are likely to be overly pessimistic and thus under-invest. Therefore, I hypothesize that managers' over-weighting of economic factors is associated with over-investment in economic upturns and under-investment in economic downturns.

The three key constructs in the analyses are managers' mis-weighting of economic factors, investments, and the economic state. To measure managers' mis-weighting, I first estimate the weight that managers assign to economic factors using Bonsall et al. (2013) framework.[3] Then I calculate managers' mis-weighting as the difference between the estimated weight and unity – the theoretically correct weight per Bonsall et al. (2013)'s model. To test the association between managers' mis-weighting and the likelihood of inefficient investing, I measure the non-directional degree of mis-weighting by the absolute difference. To measure the directional degree of mis-weighting for testing its association with over- and under-investing, I use the estimated weight minus unity. Moreover, I rank the raw measures into decile groups by year-quarter to control for potential measurement errors and sample skewness.

Following Biddle, Hilary, and Verdi (2009), I define investments as the sum of capital expenditures, research and development expenses, and acquisition costs.[4] I

[3] The estimation is conducted for each firm-quarter with the management earnings forecasts made during the past 12 quarters (see Figure 1.1 for the estimation timeline).
[4] I consider all types of investments because they can be substitutes for each other. For example, instead of conducting internal R&D, managers may decide to acquire a firm with related technology or products. Therefore, separately examining different types of investments will lead to issues caused by omitted correlated variables.

determine whether a firm invests efficiently based on the difference between its actual investment and its expected investment, i.e., the unexplained investment, which is estimated from a growth model. As in Biddle et al. (2009), I rank firms' unexplained investments into quartile groups by year-quarter and then categorize firms with unexplained investments in the top quartile as over-investing firms, firms in the middle two quartiles as efficient-investing firms, and firms in the bottom quartile as under-investing firms. By construction, the likelihood of inefficient investing is measured by the likelihood of a firm being categorized into the two extreme quartiles.

I characterize the economic state by the level of investment opportunities present in the industry.[5] A high number of investment opportunities in the industry suggests a booming economy. Hence, I use the average level of investments in a given industry as a proxy for the overall economic state for that industry.[6] Specifically, I rank industries' average investments into quartile groups by year-quarter. I then identify the state of the economy for an industry as good (bad) if the industry is in the top (bottom) quartile.[7]

The analyses yield several key findings. First, I find a positive association between the non-directional degree of managers' mis-weighting of economic factors and the likelihood of making inefficient investment decisions. Compared to managers who do not mis-weight economic factors (i.e., they are ranked in the bottom decile for mis-

[5] Conceptually, the realization of economic factors can be used as a direct measure of the economic state. However, the same economic factors can have different, and sometimes opposite, impacts on different industries. Therefore, it is difficult to build a consistent measure for the economic state across different industries based on the realization of economic factors. Alternatively, market indicators such as market sentiment and aggregate returns may serve as proxies for the economic state. However, those measures are problematic for this study because they reflect investors' perceptions and are expected to have a direct impact on corporate investments (see, e.g., Baker, Stein, and Wurgler 2003; Shleifer and Vishny 2003).
[6] I consider the average level of investments in a given industry as the realization of the investment opportunities presented in that industry (Baber, Janakiraman, and Kang 1996).
[7] The likelihoods that an industry is ranked in the same quartile for two, three, and four consecutive quarters are 48.84%, 28.90%, and 18.50%, respectively.

weighting), managers who mis-weight economic factors to the greatest extent (i.e., they are ranked in the top decile for mis-weighting) are 5% more likely to invest inefficiently in the next quarter. The results are consistent with the hypothesis that a higher degree of managers' mis-weighting predicts a higher likelihood of making inefficient investment decisions in the future.

Second, I find that the effect of managers' mis-weighting on investments depends on the economic state, as expected. When the economic state is good for the industry, increasing managers' over-weighting by one decile-rank increases total investments by 2.13%. On the contrary, when the economic state is bad, increasing managers' over-weighting by one decile-rank decreases total investments by 1.05%. These results indicate that managers who over-weight economic factors tend to over-invest in economic upturns (due to over-optimism) and under-invest in economic downturns (due to over-pessimism).[8] Overall, these findings indicate that managers' mis-assessment of economic factors is an important determinant firm's investment efficiency.

The inferences I obtain from the above analyses rely on my empirical model's ability to control for efficient investment levels. If the model falsely identifies efficient investment as inefficient, then the apparent inefficient investment may reflect managers' efficient response to the change in the economic state. To support my main findings that managers who mis-weight economic factors invest inefficiently, I include two additional analyses.

[8] Note that the ranked degree of managers' directional mis-weighting is continuous, where a higher (lower) rank suggests a higher degree of over-weighting (under-weighting). Hence, increasing managers' over-weighting by one decile-rank is equivalent to decreasing managers' under-weighting by one decile-rank. Given the construction of the measure for managers' mis-weighting, the results also suggest that managers who under-weight economic factors tend to under-invest in economic upturns and over-invest in economic downturns.

First, if managers' mis-weighting of economic factors is associated with inefficient investment decisions, then such mis-weighting should be negatively associated with firms' future profitability. Consistent with this expectation, I find that an increase in the non-directional degree of managers' mis-weighting is associated with lower future return-on-assets (ROA). Moreover, path analyses indicate that one of the underlying drivers for such decrease in ROA is the increase in the likelihood of inefficient investment.

Second, since managers' mis-weighting of economic factors is revealed by their earnings forecasts, I expect that the stock market and financial analysts will react negatively to the mis-weighting implied in their earnings forecasts.[9] I find that, although the stock market does not react during the short window around the management earnings forecast date, long-term stock returns are negatively associated with an increase in the non-directional degree of managers' mis-weighting. I also find that financial analysts revise their estimates downwards when management earnings forecasts suggest an increase in managers' mis-weighting. Overall, the results suggest that managers' mis-weighting of economic factors is associated with inefficient investment decisions.

I conduct several robustness analyses to validate the inferences I obtain from my main findings. First, I include managers' mis-weighting of firm-specific factors as a control, and I do not find that it affects the inferences for managers' mis-weighting of economic factors. Second, I re-estimate managers' mis-weighting using simultaneous equations instead of two-stage equations since the simultaneous estimation is robust to

[9] I test stock prices and financial analysts' reactions to management earnings forecasts for quarter $q + 1$ conditional on the change in managers' mis-weighting during quarter $q$ relative to quarter $q - 1$ (see Figure 1.2 for the estimation timeline).

measurement errors with over-identifying restrictions (Geraci 1976). The main results are robust to this alternative method of estimation. Also, I test and confirm that the main results are robust to alternative choices of cluster-robust errors. Lastly, to examine the empirical validity of the analytical framework that I rely on for measuring managers' mis-assessment of economic factors, I test whether two other measures for managers' use of economic information derived from the same framework are associated with investment efficiency.

Next, I discuss the potential determinants of managers' mis-weighting of economic factors. First, I do not find evidence supporting that managers' mis-weighting results from intentional biases. Test results show that future management earnings forecast accuracy is not predicted by managers' mis-weighting in prior periods, suggesting that managers do not make systematic errors or biases when assessing economic condition. Second, I find weak evidence suggesting that CEOs have a significant influence on the assessment of economic factors. In a small subsample where CEOs' managerial ability is measurable following Chang, Dasgupta, and Hilary (2010), I find CEOs' managerial ability to be significantly negatively associated with the managers' mis-weighting of economic factors. Overall, the results suggest that the measure for managers' mis-assessment of economic factors is more likely to capture the managers' ability to collect and incorporate economic information into their decision-making process rather than the managers' intentional biases.

This study makes several contributions to the literature. First, it provides insights into how managers determine the value of a project when making investment decisions. Conventional valuation theory states that an investment decision should start with

calculating the net present value of the project. However, how managers calculate this net present value in practice is still not well-understood. Except for survey studies that provide descriptive evidence (e.g., Graham and Harvey 2001; Graham and Harvey 2002), few studies directly examine managers' valuation process (McNichols and Stubben 2008; Jackson, Liu, and Cecchini 2009; Goodman et al. 2014; Rozenbaum 2019). Goodman et al. (2014) suggest that the valuation of an investment project involves the forecasting of future payoffs of the project. My study extends Goodman et al. (2014) by indicating that the outcome of this forecasting process depends on managers' assessment of economic factors outside their control. Further, my study provides an observable proxy for managers' use of economic information when evaluating investment opportunities.

Second, this study demonstrates how a firm's financial disclosure is associated with managers' strategic decisions. Managers are likely to rely on the same internal information system to generate financial disclosure and to make strategic decisions. Therefore, although managers' strategic decision-making process is externally unobservable, it can be inferred from the firm's public disclosure. Consistent with this expectation, Francis and Martin (2010) find that firms with more timely incorporation of economic losses into earnings make more profitable acquisitions. Cheng, Dhaliwal, and Zhang (2013) suggest that investment efficiency is lower for firms that have internal control weaknesses. The findings of this study indicate that management earnings forecasts imply how managers assess economic factors, which also affects their firms' investment efficiency.

Third, this study highlights the importance of managers' expertise in evaluating economic factors. Compared to the literature on managers' firm-specific expertise (e.g.,

Kor 2006), only a few studies provide direct evidence on how managers' non-firm-specific expertise contributes to the success of managers' decisions. Custódio and Metzger (2013) focus on mergers and acquisitions and find that a CEO with prior experience in the target industry is more likely to make more profitable acquisition decisions. This study generalizes Custódio and Metzger's (2013) results by providing evidence that a firm's investment efficiency depends on the managers' ability to assess the impact of economic factors.

The remainder of the paper proceeds as follows: Chapter 2 summarizes the relevant prior studies, Chapter 3 develops testable hypotheses, Chapter 4 describes the empirical design, Chapter 5 presents the main empirical findings, Chapter 6 discusses the additional analyses, Chapter 7 presents robustness tests, Chapter 8 discusses the determinates of managers' mis-assessment of economic factors, and Chapter 9 concludes.

# Chapter 2: Literature Review

## *2.1 Managers' Information Processing and Investment Efficiency*

Making an investment decision consists of two parts. First, the managers need to quantify the economic benefits from investment using matrices such as net present value (NPV) or internal rate of return (IRR) (Graham and Harvey 2002). Second, the managers decide whether to proceed with or forgo the investment opportunity. Most studies investigating corporate investment decision focus on the second step and identify various factors that incentivize managers to accept unprofitable projects or reject profitable projects (e.g., Jensen and Meckling 1976; Myers and Majluf 1984). Contrarily, only a few determinants are identified for managers' information collection and processing for measuring the economic benefits of an investment project.

First, a stream of recent literature shows that managers collect information from the stock market. Existing studies provide evidence that managers learn from both the firm's and its peers' stock prices and incorporate the information into their investment decisions (e.g., Luo 2005; Chen, Goldstein, and Jiang 2007; Bakke and Whitted 2010; Edman, Goldstein, and Jiang 2012; Foucault and Frésard 2012, 2014; Edman, Jayaraman, and Schneemeier 2017). Second, the studies exploring the common factors that affect both a firm's disclosure choices and its investment decision shed light on managers' information processing for investment decisions. For example, Jackson et al. (2009) suggest that managers' estimation of the useful life of assets affect their investment decisions. Goodman et al. (2014)'s findings indicate that managers' ability to correctly assess the profitability of a merger and acquisition deal critically depends on the managers' forecasting ability.

In summary, the existing literature examining the determinants of managers' investment decision-making process is limited. This study seeks to add to this literature by focusing on the managers' ability to process economic information and provide evidence on how such ability affect corporate investment efficiency.

*2.2 Macroeconomic Information Content of Management Earnings Forecasts*

In this study, I infer managers' assessment of economic condition by their earnings forecasts as I expect managers to consider similar economic factors when forecasting earnings and when making investment decisions. Consistent with the expectation, Bonsall et al. (2013) show that management earnings forecasts contain macroeconomic information content.

Among numerous papers examining the firm-specific information revealed by management earnings forecasts, Bonsall et al. (2013) are the first to turn the attention to the macroeconomic information contained in management earnings forecasts. Since a firm's earnings are impacted by the economic environment that the firm operates in, earnings inevitably contain a component determined by the economic factors and so do management earnings forecasts. Following this idea, Bonsall et al. (2013) develop an analytical framework as well as an empirical method to decompose both earnings and management earnings forecasts into firm-specific and economic components. The decomposition allows us to observe the difference between the economic component of earnings and the economic component of earnings forecasts. Such difference is determined by two aspects: first, changes in the economic condition; and second, the difference between how managers incorporate economic information into their earnings forecasts and how economic information actually impact earnings.

Bonsall et al. (2013) focus on the former determinants and investigate whether the changes in the economic condition implied in management earnings forecasts is unexpected and thus is informative to the aggregate market. Their study provides evidence that macroeconomic information can be transmitted to the broader market via management earnings forecasts.

Different from Bonsall et al. (2013), in this study, I focus on how managers' assessment of the macroeconomic impact deviates from the actual impact (measured in the form of mis-weighting) and examine how such deviation affects the managers' investment decisions. I follow Bonsall et al. (2013)'s methodology to decompose earnings and management earnings forecasts but derive different measures due to different research questions. My study highlights the importance of managers' ability to process economic information when making investment decisions.

*2.3 Financial Disclosure and Corporate Investment Decisions*

Researchers who aim to establish a link between financial disclosure and corporate investment propose two different mechanisms. First, a firm's financial disclosure can affect the firm's investments by influencing its information environment (e.g., Coller and Yohn 1997; Biddle et al. 2009; Chen, Hope, Li, and Wang 2011). Second, financial disclosure and investment are associated when common factors (such as managers' traits) that affect both managers' disclosure choices and their investment decisions. This study explores the second mechanism.[10]

Prior studies find that a firm's financial disclosure reflects the managers' over-

[10] Not included in the two categories are studies focusing on financial reporting regulations. Those studies investigate how the compliance of external financial reporting requirements changes a firm's investments (e.g., Bargeron, Lehn, and Zutter 2010; Kang, Liu, and Qi 2010; Bushman, Piotroski, and Smith 2011; Cho 2015).

confidence, perception of utility, forecasting ability, and focus of attention, which in turn determine the managers' investment decisions. Specifically, McNichols and Stubben (2008) argue that managers who over-state earnings either optimistically believe the misreported growth trend or understand the true state of the firm but attempt to turn around the performance by over-investing. Consistently, they find a positive association between earnings management and over-investing in the misreporting period. Jackson et al. (2009) find that firms that use straight-line depreciation make significantly less capital investment than firms that use accelerated depreciation. They argue that managers should not replace assets frequently if they perceive a longer useful life of the assets. Goodman et al. (2014) propose that both providing earnings forecasts and making investment decisions require managers to forecast future cash flows. Taking forecast accuracy as a signal for the broader managerial forecasting ability, they find managers who generate more accurate earnings forecasts also make more efficient investment decisions. Consistent with the argument that managers who disclose EBITDA in earnings announcements are also more likely to focus their attention on EBITDA when making investment decisions, Rozenbaum (2019) finds that those managers over-invest due to overlooking the expenses excluded in EBITDA.

This study extends the stream of literature by exploring how managers' considerations of economic factors affect both their earnings forecasts and investment decisions. My study appears to be most related to Goodman et al. (2014), as both studies examine management earnings forecasts. Specifically, Goodman et al. (2014) focus on managerial forecasting ability. This study investigates managers' assessments of economic factors. My study extends Goodman et al. (2014) since evaluating the impact

of economic factors is an important step in making forecasts. However, my study distinguishes itself from Goodman et al. (2014) since managers' economic perspectives should have a general impact on their strategic decisions regardless of whether forecasting is involved. Therefore, this study and Goodman et al. (2014) investigate two important yet distinct dimensions of managerial attributes reflected by management earnings forecasts.

## Chapter 3: Hypotheses Development

According to the modern valuation theory, the value of an investment project is equal to the discounted present value of its expected future cash flows, i.e., net present value (NPV). Therefore, managers contemplating investment projects should start by calculating the NPV of the projects and then accept the projects with positive NPV and reject the projects with negative NPV.[11]

When forecasting the future cash flows for an investment project, managers need to consider both firm-specific and non-firm-specific factors. For example, when managers decide whether or not to invest in automated production lines, the managers need to consider firm-specific factors such as the expected interruptions in the firm's current production plans. The managers also need to consider the costs of general labor relative to the costs of specialized experts, which is non-firm-specific and is associated with economic factors such as unemployment rate and consumer price index. In other words, to calculate the NPV of an investment project, managers need to assess the impact of economic factors on the payoffs of this project. Managers' mis-assessment of such economic impact will lead to mis-valuation of the project's NPV, and thus resulting in inefficient investment decisions.

Though I expect managers' (mis-)assessment of economic factors to determine their investment efficiency, this expectation is not testable since managers' valuation process of investment projects is not externally observable. However, I expect managers who mis-assess economic factors when making investment decisions to have similar mis-assessment in their earnings forecasts. After all, earnings can be viewed as the aggregate

[11] 74.9% of the CFOs surveyed by Graham and Harvey (2002) report that they always or almost always used the NPV rule in capital budgeting.

payoff from all past investment projects, and thus forecasting the future cash flows of past investments is an essential part of forecasting future earnings (Goodman at al. 2014). Moreover, managers' (mis-)assessment of economic factors when forecasting earnings can be consistently measured by the (mis-)weighting that managers assign to economic factors in their earnings forecasts. Therefore, using managers' (mis-)weighting as an observable and comparable proxy for the managers' (mis-)assessment of economic factors when making investment decisions, I formalize the first testable hypotheses as follows:

> **H1**: The likelihood of inefficient investing in the next quarter is positively associated with managers' mis-weighting of economic factors implied in their prior earnings forecasts.

The above hypothesis predicts that managers' mis-weighting is associated with inefficient investing. Whether such mis-weighting will eventually lead to over- or under-investing depends on the economic state. Specifically, managers who over-weight economic factors are likely to be overly optimistic in economic upturns, and as a result, they tend to over-invest due to over-valuation of the investment opportunities. On the contrary, in economic downturns, managers who over-weight the impact of economic factors are likely to be overly pessimistic and under-invest due to under-valuation of the investment opportunities. Similarly, managers who under-weight economic factors are expected to under-invest in economic upturns and over-invest in economic downturns. Formally, the second set of hypotheses are stated as follows:

**H2a**: Managers who over-weight (under-weight) economic factors in their earnings forecasts over-invest (under-invest) in economic upturns.

**H2b**: Managers who over-weight (under-weight) economic factors in their earnings forecasts under-invest (over-invest) in economic downturns.

In summary, H1 tests the predictivity of managers' mis-weighting of economic factors for the likelihood of future inefficient investing. The tests for H1 are not conditional on any concurrent factors of the investment decisions, including the economic state when the investment decisions are made. Though H1 states an *ex-ante* prediction of inefficient investing, it cannot predict the direction of such inefficient investing. Complementary to H1, H2 forms expectation on the direction of future inefficient investing conditional on the future economic state.

## Chapter 4: Empirical Design

### *4.1 Measure of Managers' Mis-Assessment of Economic Factors*

I infer managers' mis-assessment of economic factors when evaluating investment projects from their earnings forecasts. To do so, I rely on the analytical framework and the two-stage empirical application developed by Bonsall et al. (2013). I repeat the following estimation for each firm-quarter with the observations from the past 12 quarters for the same firm (see Figure 1.1 for the estimation timeline).

In the first-stage regression, I regress earnings on a set of macroeconomic proxies to decompose the earnings into a component determined by the economic factors and a component determined by the firm:

$$e_q = B'M_q + m_q \quad (1)$$

where $e_q$ is quarter $q$'s earnings; $M_q$ is a vector of macroeconomic factors, including consumer price index inflation rate (*CPI*), housing starts (*HOUSING*), index of industrial production (I*NDPROD*), real gross domestic product (*RGDP*), unemployment rate (*UNEMP*), three-month treasury bill rate (*TBILL*), risk premium measured by the difference between Moody's Aaa corporate bond yield and 10-year treasury bond rate (*RPREM*), and term premium measured by the difference between 10-year treasury bond rate and three-month treasury bill rate (*TPREM*);[12] $B$ is a vector of coefficients on the macroeconomic proxies, representing the sensitivity of the firm's earnings to those macroeconomic factors; and $m_q$ is the model residual. By the construction of the model, $B'M_q$ captures the portion of earnings determined by economic factors, and $m_q$ reflects the firm-specific impact on earnings.

[12] I choose the macroeconomic proxies following Bonsall et al. (2013) with the modification suggested by Ognea (2013).

Then I regress management earnings forecasts on the estimated economic and firm-specific components of earnings, i.e., $\hat{B}'M_q$ and $\hat{m}_q$:

$$f_q = \mu_f + \Gamma \hat{B}'M_q + \gamma \hat{m}_q + \eta_q \quad (2)$$

where $f_q$ is the quarterly management earnings forecasts, $\mu_f$ is the constant, and $\Gamma$ and $\gamma$ are model coefficients representing managers' weighting of economic and firm-specific factors in their earnings forecasts, respectively. If managers' private information on the impact of the economic factors on earnings can be represented as the actual impact plus noise and the managers correctly weight the impact, $\Gamma$ should be equal to unity. Therefore, I measure the managers' mis-weighting of the economic factors by $\hat{\Gamma} - 1$, scaled by the standard errors of $\hat{\Gamma}$ (to control for the differences in model fitting across firms).[13]

To test the unconditional effects of managers' mis-weighting (H1), I focus on the non-directional degree of mis-weighting, i.e., $Abs[(\hat{\Gamma} - 1)/StdErr(\hat{\Gamma})]$, where a larger value suggests a higher degree of mis-weighting. To test the conditional effects of managers' mis-weighting (H2a and H2b), I use the directional degree of mis-weighting, i.e., $(\hat{\Gamma} - 1)/StdErr(\hat{\Gamma})$, where a larger (smaller) value suggests a higher degree of over-weighting (under-weighting). Moreover, to control for potential measurement errors, I sort both non-directional and directional mis-weighting into decile groups by industry-quarter, where the industry is defined by Fama and French's (1997) 48-Industry Classification. By construction, higher rank of non-directional mis-weighting indicates that managers mis-weight economic factors to a further extent, and higher rank of

[13] I do not distinguish whether managers' mis-weighting is caused by their information set or by their ability to incorporate the information into earnings forecasts.

directional mis-weighting suggests a higher degree of over-weighting of economic factors.

I implement a firm-specific rolling approach for estimating Equation (1) and (2). The benefits of this approach are twofold. First, the economic component of earnings estimated in the first-stage regression, i.e., $\hat{B}'M$, captures not only the general impact of the macroeconomic factors on all firms but also the impact on the industry that the firm belongs to and on the firm itself. Therefore, $\hat{B}'M$ measures the portion of earnings determined by exogenous factors outside managers' control regardless of the specific channel of impact. Second, the rolling method allows dynamic changes in managers' weighting of economic factors. It is possible that managers will update the way they generate earnings forecasts as the firms grow or as they learn from their past errors. The rolling method will capture such updates and allow examination of the consequences of the updates (see Chapter 6).[14]

*4.2 Unconditional Effects of Managers' Mis-Weighting on Firms' Investment Efficiency*

Hypothesis 1 predicts that managers are more likely to invest efficiently in the next quarter if they mis-weight economic factors in their prior earnings forecasts. To test these hypotheses, I categorize firms into over-investing, under-investing, and efficient-investing groups, and I measure how likely a firm's manager is to invest inefficiently by the likelihood that the firm is categorized as over- or under-investing.

Specifically, I estimate the following equation for each industry-quarter (Biddle et al. 2009):

[14] The major cost of using the firm-specific rolling estimation is that the estimation can only be conducted for firms that provide quarterly earnings forecasts on a regular basis. However, the way that managers assess investment projects should not differ systematically by whether or how they provide earnings forecasts. Therefore, I argue that the inferences of this study can be generalized to all firms.

$$Investment_{i,q+1} = \beta_0 + \beta_1 SalesGrowth_{i,q} + \varepsilon_{i,q} \quad (3)$$

where $Investment_{i,q+1}$ is defined as firm $i$'s total investments, including capital expenditures, research and development expenses, and acquisition costs in quarter $q+1$, and $SalesGrowth_{i,q}$ is the percentage change in sales from quarter $q-1$ to quarter $q$. The industry is defined according to Fama and French's (1997) 48-industry classification. The residuals of this equation measure the difference between firms' expected investments and their actual investments.

Then, based on the estimated residuals, I sort firms into quartiles by year-quarter. I classify firm-quarters in the top quartile (with the most positive residuals) into the over-investing group and firm-quarters in the bottom quartile (with the most negative residuals) into the under-investing group. The two extreme quartiles represent the firms that invest inefficiently as opposed to the firms in the middle two quartiles (the benchmark group).

I estimate the following logistic regression that predicts the likelihood that a firm will be classified into the two extreme quartiles as opposed to the benchmark group:

$$Ineff\_Invest_{i,q+1} = \beta_0 + \beta_1 Abs(EconWeight_{i,q}) + \Sigma \lambda_j Control_{j,i,q} + \varepsilon_{i,q} \quad (4)$$

where $Ineff\_Invest_{i,q+1}$ equals 1 if the firm-quarter is ranked into the two extreme quartiles (i.e., inefficient-investing firms), and 0 otherwise. $Abs(EconWeight_{i,q})$ is the industry-quarter decile-rank of the non-directional degree of managers' mis-weighting of economic factors measured in quarter $q$ (see Section 4.1). Standard errors are clustered by firm. Hypothesis 1 predicts that managers' mis-weighting is positively associated with the likelihood of inefficient-investing; that is, $\beta_1 > 0$.

H1's prediction of inefficient-investing is non-directional. To ensure that the

predicted inefficient-investing is not concentrated in one single direction, I also separate the cases of over- and under-investing and estimate the following multinomial logistic regression:

$$InvestGrp_{i,q+1} = \beta_0 + \beta_1 Abs(EconWeight_{i,q}) + \Sigma \lambda_j Control_{j,i,q} + \varepsilon_{i,q} \quad (4)'$$

where $InvestGrp_{i,q+1}$ equals 1, 0, and –1 if the firm-quarter is classified as over-investing (top quartile), efficient-investing, or under-investing (bottom quartile), respectively, where the efficient-investing group is set to be the base group. Similar to the estimation of Equation (4), standard errors are clustered by firm. I expect $\beta_1$ to be positive both when comparing firms in the over-investing group to firms in the benchmark group and when comparing firms in the under-investing group to firms in the efficient-investing group.

The following controls that could confound the findings are included in the estimation of Equation (4) and (4)'. First, I control for a set of firm characteristics (i.e., firm size, market-to-book ratio, PPE-to-assets ratio, firm age, and dividend indicator) that have been previously found to be related to corporate investment and can be related to managers' ability to assess investment projects. Second, Biddle et al.'s (2009) findings suggest that managers of firms with access to funds are more likely to ignore the internal valuation of investment projects and accept projects with negative NPV. Therefore, I control for the firms' financial constraint/freedom (debt-to-assets ratio, industry average debt-to-assets ratio, cash-to-PPE ratio, and Z-Score) and profitability (cash-flows-to-sales ratio, operating cycle, and loss indicator). Third, I control for investment volatility to ensure that the results are not driven by the mechanical relationship between over/under-investment and investment volatility (Biddle et al. 2009). Fourth, I include cash-flow and

sales volatilities to control for the potential relationship between managers' mis-weighting and the difficulty that the managers are faced with when forecasting the future cash flows of the investment projects. Fifth, I control for management earnings forecast accuracy to ensure that the managers' mis-weighting captures a different dimension of the managers' valuation process that is examined by Goodman et al. (2014). Lastly, I expect that better corporate governance makes it harder for managers to accept negative-NPV projects or reject positive-NPV projects. Accordingly, I include a set of corporate governance controls (institutional ownership, analyst following, G-Score, and missing G-Score indicator). All variables are defined in Appendix A.

*4.3 Conditional Effects of Managers' Mis-Weighting on Firms' Investment Efficiency*

To test whether managers' over-weighting of economic factors is positively associated with total investment in economic upturns (H2a) and negatively associated with total investment in economic downturns (H2b), I estimate the following model (Biddle et al. 2009):

$$\begin{aligned} Investment_{i,q+1} = {} & \beta_1 EconWeight_{i,q} + \beta_2 EconWeight_{i,q} \times EconUp_{i,q+1} \\ & + \beta_3 EconWeight_{i,q} \times EconDown_{i,q+1} \\ & + \beta_4 EconUp_{i,q+1} + \beta_5 EconDown_{i,q+1} \\ & + \beta_6 Investment_{i,q} + \Sigma\, \lambda_j Control_{j,i,q} + \mu_k + \tau_q + \varepsilon_{i,q} \end{aligned} \quad (5)$$

where $Investment_{i,q+1}$ and $Investment_{i,q}$ are firm $i$'s total investments in quarter $q+1$ and $q$, respectively; $EconWeight_{i,q}$ is the industry-quarter decile-rank of the directional degree of managers' mis-weighting of economic factors measured in quarter $q$ (see Section 4.1); $EconUp_{i,q+1}$ and $EconDown_{i,q+1}$ indicate economic upturns and downturns in quarter $q+1$, respectively. Specifically, $EconUp_{i,q+1}$ equals 1 if the average industry investment level is in the top year-quarter quartile (highest industry investment level) and $EconDown_{i,q+1}$

equals 1 if the average industry investment level is in the bottom quartile (lowest industry investment level). I construct *EconUp* and *EconDown* based on the expectations that a high level of industry investment opportunities suggests a booming economy for the industry and that the investment level is the realization of those investment opportunities (Baber et al. 1996).[15] I include the lagged level of investment ($Investment_{i,q}$) in the regression to ensure the inferences are not affected by the momentum of a firm's short-term investments. $\mu_k$ and $\tau_q$ denote industry and year-quarter fixed effects, respectively. The industry is defined by Fama and French's (1997) 48-industry classification. Equation (5) is estimated using ordinary least squares (OLS). Standard errors are adjusted for serial- and cross-sectional heteroscedasticity by using a two-dimensional cluster at the firm level and the year-quarter level.

$\beta_1$ measures the association between managers' mis-weighting of economic factors and the firms' investment when the economic state is neither good nor bad. $\beta_2$ and $\beta_3$ measure the association between managers' mis-weighting and investment when the economic state for the industry is good and bad, respectively. Hypothesis 2a predicts that managers who over-weight economic factors will over-invest in economic upturns, i.e., $\beta_2 > 0$. Hypothesis 2b predicts a negative association between managers' over-weighting of economic factors and the firms' investment in economic downturns, i.e., $\beta_3 < 0$.

All controls included in Equation (4) are included in Equation (5). Further, I

[15] Alternatively, I use the average fitted level of investments in industry as economic indicators. To obtain the fitted level of investments driven by economic factors, I regress firms' total investments on economic indicators by industry-quarter. I consider the average fitted level of investments in a given industry as the realization of the economic-driven investment opportunities presented in that industry. I set $EconUp_{i,q+1}$ as 1 if the average industry investment level is in the top year-quarter quartile (highest industry investment level) and $EconDown_{i,q+1}$ as 1 if the average industry investment level is in the bottom quartile (lowest industry investment level). This alternative identification yields quantitatively and qualitatively similar results.

control for the interactions between the management earnings forecast accuracy and the economic states, considering that economic states can affect the difficulty of forecasting. I also include the interactions between the economic states and cash-flows-to-sales ratio, operating cycle, and dividend indicator to control for the possibility that firms with adequate internally generated funds can quickly respond to the economic changes by adjusting their investment levels. All variables are defined in Appendix A.

## Chapter 5: Main Empirical Findings

### *5.1 Sample Selection and Descriptive Statistics*

I obtain all quarterly management earnings forecasts from I/B/E/S corporate guidance data for the sampling period from 2006 to 2017. The initial sample has 33,596 observations. I focus on bundled management earnings forecasts issued within one day of the earnings announcement date for the prior quarter's earnings. This step reduces the sample size to 24,208. I require at least 10 forecasts during the past 12 quarters for estimating Equation (1) and (2). This requirement reduces the sample size to 14,136. Then I remove observations for which regression variables are unavailable. I also remove firms in the financial or utility industries, or in industries with less than 10 firms. The final sample has 10,896 observations. A detailed description of the sample selection process is presented in Appendix B, Panel A.

Panel B and Panel C of Appendix B tabulate the distribution of observations by year and by industry, respectively. The sample observations are evenly distributed throughout the sampling period. The top three industries with the largest number of observations are business services (25.81%), electronic equipment (17.61%), and retail (11.44%).

Figure 2 presents the histogram of managers' weighting of economic factors estimated from Equation 2. The figure shows that the frequency of observations spikes around 1, i.e., the theoretically correct weight. The (untabulated) mean (median) weight is 0.865 (0.914), and the standard deviation of the weight is 0.230. Untabulated statistics show that the estimated weight is not statistically different from 1 at the 5% significance level for 79% of all firm-quarter observations. Altogether, the statistics suggest that

measurement errors exist but are not severe in the sample.

Panel A of Table 1 presents the summary statistics for regression variables. On average, the sampled firms invest at a level that equals 6.376% of their prior years' assets, have a book-to-market ratio of 3.449, and have operated for 21.470 years since being publicly traded.

Table 1, Panel B, presents the correlations among continuous variables. Both Pearson correlation and Spearman correlation between the ranked non-directional degree of managers' mis-weighting of economic factors ($Abs(EconWeight_{i,q})$) and the total investments ($Investment_{i,q+1}$) are insignificant.[16] The correlation matrix shows that the non-directional mis-weighting is significantly negatively correlated with firm size ($Log(AT_{i,q})$), firm age ($Age_{i,q}$), PPE intensity ($PPE\_AT_{i,q}$), management forecast accuracy ($MF\_AvgAcc_{i,q}$), and number of analysts following ($Log(N\_Analyst_{i,q})$). Also, the non-directional mis-weighting is significantly positively correlated with cash-flow volatility ($\sigma(CFO_{i,q-11\sim i,q})$).[17] Overall, given that most control variables are significantly correlated with both total investments and managers' mis-weighting of economic factors, the correlation matrix supports the choice of control variables in the main analyses.

*5.2 Results of Testing Hypothesis 1*

Table 2, Panel A, reports the results of estimating the logistic regression that tests the association between managers' mis-weighting of economic factors in their prior

[16] Untabulated statistics show that the ranked directional degree of managers' mis-weighting of economic factors ($EconWeight_{i,q}$) is also insignificantly correlated with total investments ($Investment_{i,q+1}$).

[17] In addition to the variables discussed, the correlation matrix shows that leverage ($Debt\_AT_{i,q}$), industry average leverage ($Ind\_Debt\_AT_{i,q}$), cash ($Cash\_PPE_{i,q}$), financial distress ($Z\text{-}Score_{i,q}$), cash-flows-to-sales ratio ($CFO\_Sales_{i,q}$), and operating cycle ($OperateCycle_{i,q}$) are also significantly correlated with the non-directional degree of managers' mis-weighting of economic factors. However, when regressing the mis-weighting on all control variables in a multivariate regression, the estimated coefficients of these variables either have opposite signs or are insignificant. The inconsistency indicates that, for these variables, the significant correlations in the univariate setting are manifested by the uncontrolled confounding factors.

earnings forecasts and the likelihood that the firms are categorized into the inefficient-investing group in the next quarter (H1). Column (1) of Table 2 presents the results for the baseline regression; Column (2) and Column (3) present the results estimated without and with control variables, respectively.

The results in Column (3) show that the non-directional degree of managers' mis-weighting of economic factors is significantly positively associated with the likelihood of inefficient-investing (*t*-statistic = 2.12). The marginal effects show that, compared to managers who do not mis-weight economic factors ($Abs(EconWeight_{i,q})$ = 1), managers who have the highest degree of mis-weighting ($Abs(EconWeight_{i,q})$ = 10) are 5% more likely to invest inefficiently in the next quarter.

Table 2, Panel B, reports the results of estimating the multinomial logistic regressions where the over- and under-investing are tested separately. The results, presented in Column (3), show that the non-directional degree of managers' mis-weighting of economic factors is significantly positively associated with both the likelihood of under-investing (*t*-statistic = 2.02) and the likelihood of over-investing (*t*-statistic = 1.65). Specifically, the marginal effects indicate that, compared to managers who do not appear to mis-weight economic factors ($Abs(EconWeight_{i,q})$ = 1), managers who have the highest degree of mis-weighting ($Abs(EconWeight_{i,q})$ = 10) are 4% more likely to under-invest and 2% more likely to over-invest in the next quarter.[18] The results suggest that the predicted inefficient-investing is not concentrated in one single direction.

The findings in Table 2 are consistent with the expectation of the unconditional effects of managers' mis-weighting of economic factors on inefficient investing. Next, I

[18] Untabulated tests suggest that the difference in the increases in likelihood of over- and under-investing is not statistically significantly different from 0 at 10% level in Table 2, Panel B.

test for hypotheses 2a and 2b, which estimate the effects of managers' mis-weighting conditional on the direction of such mis-weighting and the economic state.

*5.3 Results of Testing Hypotheses 2a and 2b*

Table 3 reports the results for testing H2a and H2b. Column (1), (2), and (3) of Table 3 report the results for the baseline regression, the regression without control variables, and the regression with control variables, respectively.

The results in Column (3) show that managers' over-weighting of economic factors is positively associated with the investment level in economic upturns (*t*-statistic = 2.27) and negatively associated with the investment level in economic downturns (*t*-statistic = –1.82). Specifically, when the economic state is good for the industry, increasing managers' over-weighting by one decile-rank increases total investment by 0.136. Given the mean of total investment is 6.376, one decile-rank increase in managers' over-weighting of economic factors is associated with a 2.13% (= 0.136/6.376) increase in total investments. On the contrary, when the economic state is bad for the industry, increasing managers' over-weighting by one decile-rank decreases total investments by 1.05% (= 0.067/6.376).[19] When the economic state is neither good nor bad, the ranked directional degree of managers' mis-weighting is insignificantly associated with the investment level (*t*-statistic = 0.88).

The results in Column (3) also suggest that, on average, firms invest more in economic upturns ($\hat{\beta}(EconUp_{i,q+1})$ = 3.512 and *t*-statistic = 2.23) and less in economic downturns ($\hat{\beta}(EconDown_{i,q+1})$ = –0.768 and *t*-statistic = –0.77). The investment level is

[19] Given the continuous rank of the directional degree of managers' mis-weighting of economic factors, the results can also be interpreted as increasing managers' under-weighting by one decile-rank decreases total investments by 2.13% in economic upturns and increases total investments by 1.05% in economic downturns.

also positively associated with the firm's prior investment ($\hat{\beta}(Investment_{i,q})$ = 0.391 and *t*-statistic = 9.52). In terms of the control variables, the coefficient estimation is in general comparable to prior studies (e.g. Biddle et al. 2009; Rozenbaum 2019).

Overall, the findings in Table 3 support hypotheses 2a and 2b, indicating that managers who over-weight the impact of economic factors tend to over-invest in economic upturns and under-invest in economic downturns.

## Chapter 6: Additional Analyses

In this chapter, I discuss additional analyses regarding concerns in the primary analyses. First, the inferences from the main analyses rely on the assumption that the model specifications correctly distinguish inefficient investments from efficient investments. If this assumption is violated, then the apparent inefficient investment may be managers' efficient response to the change in the economic state. To support that managers' mis-weighting is indeed associated with their inefficient investment decisions, I examine whether managers' mis-weighting of economic factors is associated with lower firm profitability and negative market reaction. Specifically, in Section 6.1, I investigate how changes in managers' mis-weighting affect the firms' future profitability. Then, in Section 6.2, I explore the stock prices and analysts' reactions to changes in managers' mis-weighting of economic factors.

### *6.1 Changes in Managers' Mis-Weighting and Firms' Future Return-on-Assets*

If managers' mis-weighting of economic factors leads to their inefficient investment decisions, then such mis-weighting should ultimately affect the future profitability of the firm. I expect that an increase in managers' mis-weighting should lead to an increase in the likelihood of future inefficient investment decisions. Through such increase in likelihood, the increase in mis-weighting should ultimately lead to lower future performance of the firm. To test this hypothesized path, I estimate the following equation system:

$$Inc\_Ineff\_Invest_{i,q+1} = \beta\, \Delta EconWeightDev_{i,q} + \Sigma\, \lambda_j\, Control_{j,i,q} + \varepsilon_{i,q} \quad (6a)$$

$$ROA_{i,q+1} = \beta_1\, \Delta EconWeightDev_{i,q} + \beta_2\, Inc\_Ineff\_Invest_{i,q+1} + \Sigma\, \lambda_j\, Control_{j,i,q} + \varepsilon_{i,q} \quad (6b)$$

where $Inc\_Ineff\_Invest_{i,q+1}$ stands for the increase in the likelihood of inefficient investing from quarter $q$ to quarter $q + 1$, calculated as the change in the predicted likelihood that the firm is categorized into the inefficient investing group from estimating Equation (3). $\Delta EconWeightDev$ measures the change in the non-directional degree of managers' mis-weighting of economic factors from quarter $q - 1$ to quarter $q$ (see Figure 1.2 for the estimation timeline). *ROA* is the return-on-assets ratio for quarter $q + 1$. Included in the controls are firm size, market-to-book ratio, firm age, dividend indicator, loss indicator, institutional ownership, analyst following, G-Score, and missing G-Score indicator.[20] Standard errors are clustered by firm. All variables are defined in Appendix A.

The (untabulated) mean (median) change in managers' mis-weighting of economic factors, i.e., $\Delta EconWeightDev_{i,q}$, is -0.086 (-0.003), and the standard deviation of the change is 8.378. The statistics indicate that managers' mis-weighting decreases over time, and such a decrease suggests that, on average, managers learn from their past errors and update the way they generate earnings forecasts accordingly.

Column (1) of Table 4, Panel A, tests the overall impact of change in managers' mis-weighting on the firm's return-on-assets in the next quarter. The results suggest that an increase in managers' mis-weighting of economic factors is negatively associated with the firms' future return-on-assets ($t$-statistic = –6.18). Column (2) and (3) report the results for Equation (6a) and (6b), examining the path through which managers' mis-weighting affect the firms' future return-on-assets. Column (3) indicates a positive association between the increase in managers' mis-weighting and the increase in the likelihood of future inefficient-investing ($t$-statistic = 11.21). Column (4) suggests that

[20] The results are qualitatively unchanged if all controls included in Equation (4) are included in Equation (6a) and (6b).

such an increase in the likelihood of inefficient-investing caused by the increase in mis-weighting is negatively associated with the firms' future return-on-assets (*t*-statistic = –2.01).

To further validate the path analysis results, I separate the cases for over- and under-investing. Theoretically, only over-investing, not under-investing, should decrease a firm's return-on-assets. Therefore, I expect that, though an increase in managers' mis-weighting will increase both the likelihood of over-investing and the likelihood of under-investing, the mis-weighting should only lead to lower future return-on-assets through its impact on the over-investing side.

Panel B of Table 4 reports the corresponding results of testing the above expectation. Column (1) and (2) indicate that an increase in managers' mis-weighting of economic factors is positively associated with the increase in the likelihood of both over-investing (*t*-statistic = 6.69) and under-investing (*t*-statistic = 8.45). However, the results presented in Column (3) suggest that only the increase in the likelihood of over-investing leads to lower return-on-assets (*t*-statistic = –2.53), whereas the impact of managers' mis-weighting on return-on-assets through under-investing is statistically insignificant (*t*-statistic = –0.97). The results in Table 4, Panel B, are consistent with the *ex-ante* expectation.

Overall, the findings in Table 4 support the conjecture that managers' mis-weighting of economic factors leads to inefficient investment decisions rather than efficient responses to the change in the economic state. Next, I explore whether stock prices and analysts' reactions are also consistent with the conjecture.

*6.2 Stock price and Analysts' Reaction to Changes in Managers' Mis-Weighting*

The measure for managers' mis-weighting of economic factors suggests that such mis-weighting is publicly revealed through the managers' earnings forecasts. Therefore, I test whether the stock market and financial analysts react to the changes in managers' mis-weighting implied in their earnings forecasts:

$$CAR_{i,q+1} \text{ or } REV_{i,q+1} = \beta\, \Delta EconWeightDev_{i,q} + \Sigma\, \lambda_j\, Control_{j,i,q} + \mu_i + \tau_q + \varepsilon_{i,q} \quad (7)$$

where $CAR_{i,q+1}$ is the three-day cumulative market-adjusted abnormal return around firm *i*'s management earnings forecast date for quarter *q+1*; $REV_{i,q+1}$ is the individual analyst forecast revision made following firm *i*'s management earnings forecast date for quarter *q+1*; and $\Delta EconWeightDev_{i,q}$ measures the change in the non-directional degree of managers' mis-weighting of economic factors from *q – 1* to quarter *q* and is defined as in Section 6.1 (see Figure 1.2 for the estimation timeline).[21] I focus on the change instead of the level of managers' mis-weighting since the effects of the prior level of managers' mis-weighting of economic factors should have already been priced by the stock market and considered by the analysts. I choose control variables following prior studies (e.g., Rogers and Stocken 2005): management earnings forecast surprise, point forecast indicator and its interaction with the forecast surprise, past accuracy of management earnings forecasts and its interaction with the forecast surprise, signed squared forecast surprise, earnings surprise for the concurrent earnings announcement, loss indicator and its interaction with the earnings surprise, signed squared earnings surprise, firm size, and market-to-book ratio. I also include firm fixed effects ($\mu_i$) and year-quarter fixed effects

[21] I test the stock price and financial analysts' reaction to the management earnings forecast for quarter *q + 1* (that is also the earnings announcement date for quarter *q*) because it implies the change in the non-directional degree of managers' mis-weighting of economic factors from quarter *q – 1* to quarter *q*.

($\tau_q$). Standard errors are clustered by firm and by year-quarter. All variables are defined in Appendix A.

Column (1) of Table 5, Panel A, presents the results for testing the market price reaction during the three-day window around the management earning forecast date. The results suggest an insignificant relationship between the changes in managers' mis-weighting and short-window stock price reaction. However, the results reported in Column (2) and (3) of Table 5 show that the long-term buy-and-hold abnormal returns are significantly negatively associated with an increase in managers' mis-weighting of economic factors (with *t*-statistic = – 3.07 for window [-1,60] and *t*-statistic = – 3.74 for window [2,60] centered at management earnings forecast date). One potential explanation for such a delayed reaction is that the stock price only reacts when managers' mis-weighting of economic factors leads to actual inefficient investment decisions.

Column (1), (2), and (3) of Table 5, Panel B, report the results for testing individual analyst revisions within 2, 10, and 30 days following the management earnings forecast date, respectively. The association between an increase in managers' mis-weighting of economic factors and individual analyst forecast revisions is significantly negative (with *t*-statistics ranging from –2.90 to –2.72).[22]

Overall, the results presented in Table 5 suggest that both investors and analysts react negatively if managers appear to mis-weight economic factors to a higher degree,

[22] Note that a change in the non-directional degree of managers' mis-weighting of economic factors suggests a change in the likelihood that the managers will under- or over-invest in the next quarter. Moreover, how such change in the likelihood leads to actual inefficient investment decisions depends on the economic state. Therefore, it is hard to interpret the economic significance of the results reported in Table 5.

which is consistent with the conjecture that managers' mis-weighting of economic factors is associated with their inefficient investment decisions.

## Chapter 7: Robustness Checks

### *7.1 Control for Managers' Mis-Weighting of Firm-Specific Factors*

In the main analyses, I only focus on managers' mis-weighting of economic factors. When making investment decisions, managers need to consider firm-specific factors as well as economic factors. However, unlike consideration on economic factors, the way managers assess firm-specific factors are different for investment decisions and for earnings forecasts. Therefore, it is questionable whether managers' mis-weighting of firm-specific factors in their earnings forecasts can serve as a reasonable proxy for their mis-assessment of firm-specific factors when making investment decisions.

Managers are expected to consider different firm-specific factors when making short-term earnings forecasts and long-term investment decisions. For example, when making earnings forecasts, managers need to consider the effects of the current sales on next quarter's earnings. However, when deciding whether to invest in a new product line, managers may consider launching advertising campaigns in the next year. Under such a case, managers' long-term plan for advertisement should not affect the firm's short-term earnings, and thus, their considerations for the future advertising campaigns will not be reflected in their current earnings forecasts. Moreover, there is no clear theory explaining the reason why managers will mis-weight firm-specific factors that, as opposed to economic factors, are fully under their control.[23]

Due to the lack of theoretical grounding and appropriate empirical proxy, I do not include managers' consideration of firm-specific factors in the main analysis. I do not

[23] One may argue that managers can intentionally mis-weight firm-specific factors and bias their earnings forecasts. Such concerns will further impair the validity of using managers' mis-weighting of firm-specific factors in the earnings forecasts as a measure for such mis-weighting in their investment decisions because managers should not impose similar bias when evaluating investment projects.

expect the absence of managers' firm-specific consideration to impact the interpretation of the main results, because I do not find reasons to believe that managers' mis-weighting of firm-specific factors confounds the findings for managers' mis-weighting of economic factors.

Notwithstanding, I report results with controls for managers' mis-weighting of firm-specific factors in Table 6.

The variable construction for managers' mis-weighting of firm-specific factors is similar to the variable construction for managers' mis-weighting of economic factors. First, I calculate managers' mis-weighting of firm-specific factors, scaled by its standard errors. Next, I rank the absolute value of mis-weighting into decile groups by year-quarter to proxy for the non-directional degree of managers' mis-weighting of firm-specific factors. Similarly, to measure the directional degree of managers' mis-weighting, I rank the raw value of mis-weighting into year-quarter decile groups.

The (untabulated) mean (median) weighting of firm-specific factors is 0.823 (0.742), and the standard deviation of the weight is 0.470. Untabulated statistics show that the estimated weight is not statistically different from 1 at 5% significance level for 87% of all firm-quarter observations. The ranked non-directional degrees of managers' mis-weighting of firm-specific factors and their mis-weighting of economic factors are significantly positively correlated: Pearson correlation and the Spearman correlation coefficient are 0.258 and 0.223, respectively; and the *p*-values for both correlation coefficients are smaller than 0.001. Both Pearson correlation and Spearman correlation between the ranked non-directional degree of managers' mis-weighting of firm-specific

factors and total investment are insignificant (untabulated).[24]

Panel A of Table 6 reports the results for testing the unconditional effects of managers' mis-weighting of economic factors on the likelihood of inefficient-investing with controls for their mis-weighting of firm-specific factors. The results in Column (1) show that, compared to managers who do not appear to mis-weight economic factors ($Abs(EconWeight_{i,q})$ = 1), managers who have the highest degree of mis-weighting ($Abs(EconWeight_{i,q})$ = 10) are 5% more likely to invest inefficiently in the next quarter. Column (2) and (3) test the likelihood of over- and under-investing separately, the results suggest managers' mis-weighting of economic factors is positively associated with both the likelihood of over-investing and the likelihood of under-investing after controlling for managers' mis-weighting of firm-specific factors.

Table 6, Panel B, presents the results for estimating the conditional effects of managers' mis-weighting of economic factors on total investments with controls for their mis-weighting of firm-specific factors. The results indicate that increasing managers' over-weighting by one decile-rank increases total investments by 1.79% (= 0.114/6.376) in economic upturns and decreases total investments by 1.07% (= 0.068/6.376) in economic downturns.

The findings in Table 6 are both quantitatively and qualitatively similar to the results reported in Table 2 and Table 3. Therefore, the inferences for how managers' mis-weighting of economic factors is related to their investment decisions are unchanged with controls for the managers' mis-weighting of firm-specific factors.

[24] In terms of the ranked directional degree of managers' mis-weighting of firm-specific factors, it is significantly positively correlated with the ranked directional degree of managers' mis-weighting of economic factors and insignificantly correlated with total investments.

*7.2 Alternative Method of Estimating Managers' Mis-Weighting*

To measure managers' mis-weighting of economic factors, I benchmark the estimated managers' weighting of economic factors to unity since it is the theoretically correct weight. However, both the sample mean and median of the estimated managers' weighting of economic factors are below 1 (although the estimated weighting is insignificantly different from 1 at 5% significance level for the vast majority of the sample). The statistics raise concerns for potential measurement errors. To address this concern, I re-estimate Equation (1) and (2) using the simultaneous equation method, since Geraci (1976) finds that the method is robust to measurement errors when the equation system is over-identified with more exogenous variables than endogenous variables.

The sample mean (median) of the re-estimated managers' weighting of economic factors is 0.883 (0.932), which is higher than the mean (median) of the estimated weighting in the main analyses. The portion of all firm-quarter observations with a re-estimated weight that is indifferent from 1 (at 5% significance level) is 85%, compared to 79% in the primary analyses. The (untabulated) summary statistics suggest that simultaneous equation estimation partially corrects the potential measurement errors.

The (untabulated) results for the unconditional effects of the re-estimated managers' mis-weighting of economic factors show that, compared to managers who do not appear to mis-weight economic factors, managers who have the highest degree of mis-weighting are 7% more likely to invest inefficiently (with *t*-statistic = 2.84) – 4% more likely to under-invest (with *t*-statistic = 2.29) and 3% more likely to over-invest (with *t*-statistic = 2.49) – in the next quarter. The (untabulated) results for the conditional effects of the re-estimated managers' mis-weighting indicate that increasing managers'

over-weighting by one decile-rank increases total investments by 2.31% (with *t*-statistic = 2.41) in economic upturns and decreases total investments by 1.24% (with *t*-statistic = –2.08) in economic downturns. Compared to the results reported in Table 2 and Table 3, the economic significance of the re-estimated managers' mis-weighting of economic factors is similar, and the statistical significance is larger. The inferences are unchanged with the re-estimated measure.

*7.3 Sensitivity of Results to Firm Clusters*

The main sample consists of 10,896 firms-quarter of 666 unique firms. Among all observations, 1,164 (10.68%) observations are contributed by 273 firms that have less than 10 firm-quarter observations.[25] Since the small number of observations in firm clusters may distort the significance of the estimated coefficients, I test the robustness of the main results to firm clusters.

First, I re-estimate Table 2 and 3 without firm clusters. Second, I keep the firm clusters and re-estimate Table 2 and 3 with a subsample that excludes firms with less than 5, 10, or 30 observations. All re-estimated results (untabulated) are similar to the reported results estimated with the full sample and firm clusters.

*7.4 Information Content of Management Earnings Forecasts*

The measure of managers' mis-weighting of economic factors is derived from the theoretical framework developed by Bonsall et al. (2013). Thus, the validity of the measure critically depends on the validity of the empirical application of the theoretical model. To address the concern for validity, I test whether two other measures for managers' use of economic information derived from the same framework is associated

[25] On average, each firms contributes 16.36 firm-quarter observations to the main sample.

with investment efficiency. Specifically, in this section, I discuss the measure of the information content of management earnings forecasts relative to the information content of the actual earnings. In the next section, I examine how the quality of managers' information on economic factors is associated with the quality of their investment decisions.

Bonsall et al. (2013) argue that, instead of receiving separate information on economic factors and firm-specific factors, managers may only have one aggregate signal that is influenced by both the economic state and firm-specific events. For example, managers may observe an unexpected increase in sales orders, which is driven by both an increase in the aggregate demand and a firm-specific sales event. Since the persistence of the impact of changes in economic state on earnings and the persistence of the impact of firm-specific shocks on earnings may be different, if managers base their earnings forecasts on the aggregate signal without proper adjustments, the information content of managers' earnings forecasts may differ from the information content of actual earnings. Bonsall et al. (2013) propose a measure for such a difference.[26]

Following Bonsall et al. (2013), I measure the information content of management earnings forecasts by $r_s^2/ r_i^2 - R_e^2/(1 - R_e^2)$, where $r_s^2$ denotes the estimated semi-partial $R^2$ of the economic component of management earnings forecasts (i.e., $\Gamma \hat{B}'M$ in Equation 2); $r_i^2$ denotes the estimated semi-partial $R^2$ of the firm-specific component (i.e., $\gamma \hat{m}$ in Equation 2); and, $R_e^2$ denotes the model $R^2$ of the earnings

[26] Bonsall et al. (2013) define firms with the greatest difference between the information content of management earnings forecasts and the information content of actual earnings as bellwether firms. They find that management earnings forecasts of bellwether firms convey timely macroeconomic information to the aggregate market.

estimation (i.e., Equation 1). A positive value suggests that "the private information underlying management forecasts is … more weighted towards the macroeconomic state relative to the impact of the macroeconomic state on earnings itself" (Bonsall et al. 2013). To measure the non-directional degree of the difference in the information content of management earnings forecasts and that of actual earnings, I rank the absolute value of the measure, i.e., $Abs[r_s^2/ r_i^2 – R_e^2/(1 – R_e^2)]$, into decile groups by industry-quarter. A higher rank indicates a larger difference and suggests that managers' private information is more disproportionally sensitive to economic factors versus firm-specific factors (and also the managers do not adjust for this disproportion when using the information). I expect those managers to invest inefficiently because they are likely to rely on the same mis-aligned information when providing earnings forecasts and when making investment decisions.

The results in Table 7, Panel A, show that the degree of the difference in the information content of prior management earnings forecasts and that of actual earnings is significantly positively associated with the likelihood of inefficient investing in the next quarter. The findings are consistent with the *ex-ante* prediction.

*7.5 Quality of Managers' Information on Economic Factors*

In addition to the information content of management earnings forecasts, the quality of managers' information on economic factors can also be measured under Bonsall et al.'s (2013) analytical framework.

Specifically, according to the analytical model, the quality of managers' information on economic factors increases with the semi-partial $R^2$ of the economic component of management earnings forecasts (i.e., $\Gamma \hat{B}'\hat{M}$ in Equation 2) and decreases

with the volatility of the economic component of earnings (i.e., *Var(B'M)* in Equation 1). Therefore, the quality of managers' economic information can be measured by $r_s^2/Var(\hat{B}'M)$, where $r_s^2$ denotes estimated semi-partial $R^2$ of the economic component of management earnings forecasts (from Equation 2). Similarly, the quality of managers' firm-specific information can be measured by $r_i^2/Var(\hat{m})$, where $r_i^2$ denotes estimated semi-partial $R^2$ of the firm-specific component of management earnings forecasts and $\hat{m}$ denotes the estimated volatility of the firm-specific component of earnings. I expect that, controlling for the quality of managers' firm-specific information, managers can better appraise the values of investment projects with higher quality economic information and thus invest more efficiently.

Panel B of Table 7 presents the results for testing the above prediction. The results show that the quality of managers' information on economic factors is significantly negatively associated with the likelihood of inefficient investing.[27] The results also indicate that investment efficiency improves with higher quality firm-specific information by reducing the likelihood of inefficient-investing. Overall, the findings indicate that the quality of managers' investment decisions is positively associated with the quality of managers' information.

*7.6 Inference of Managers' Mis-Assessment of Economic Factors from Earnings Forecasts*

There are two concerns related to the appropriateness of inferring managers' mis-assessment of economic factors when making investment decisions from their earnings forecasts.

[27] The results are qualitatively similar when the quality of managers' information on firm-specific factors is excluded from the regression (untabulated).

First, though valuation of the investment projects is the first step of an investment decision, studies suggest that managers have incentives to accept negative-NPV projects (Jensen and Meckling 1976; Berkovitch and Kim 1990) and bypass positive-NPV projects (Graham, Harvey, Rajgopal 2005). Under such cases, managers' valuation of the projects is not the sole determinant of the final investment decisions. Therefore, the presence of managers' incentives to make investment decisions regardless of the value of the projects will suppress the identified significance and magnitude of the impact of managers' mis-weighting of economic factors on their final investment decisions.

Second, managers' mis-weighting of economic factors for external reporting may not be a good measure for similar mis-weighting in the internal decision-making process. The literature shows that managers have incentives to bias their earnings forecasts to walk down market expectation to a meetable or beatable target (Graham and Harvey 2001; Matsumoto 2002). However, such expectation management is more likely to be an unconditional adjustment and thus should not affect the weight that managers assign to the economic factors. Another concern about using the setting of management earnings forecasts rises from the difference in the horizon. Managers need to consider short-term economic factors when forecasting earnings and consider long-term economic factors when making investment decisions. Thus, the weight that managers apply in earnings forecasts may only reflect their short-term beliefs but not the long-term perspectives of the economic state. If this were the case, I would not find results supporting the hypotheses.

In summary, managers' mis-weighting of economic factors in their earnings forecasts may not be a perfect measure for the managers' mis-assessment of economic

factors when making investment decisions. However, it will not affect the inferences of the findings of this study because the concerns will work against finding results for the impact of managers' mis-weighting of economic factors on their investment decisions.

## Chapter 8: Additional Discussion

In this chapter, I discuss the tests exploring the determinant of managers' mis-weighting of economic factors.

### *8.1 Managers' Intentional Biases in Weighting Economic Factors*

Managers who are capable of accurately assessing economic factor may still appear to mis-weight economic factors if they intentionally bias their assessment. However, such intentional biases are usually systematic and therefore, are detectable.[28] To detect whether the managers' mis-weighting measure capture managers' intentional bias, I test whether managers' mis-weighting predicts future management earnings forecast accuracy.

The results for the tests are reported in Table 8. Column (1) to (3) report the results of regressing future management forecast accuracy on managers' mis-weighting of economic factors with different sets of control variables. The estimated coefficients on managers' mis-weighting are insignificant in all columns (with *t*-statistic ranging from –0.08 to –0.85).[29] The findings do not provide evidence supporting that managers' mis-weighting of economic factors results from intentional biases.

### *8.2 Managers' Ability to Assess the Economic Condition*

Managers' mis-weighting of economic factors may result from their incapability of collecting and incorporating economic information into their decision-making process. To test whether managers' mis-weighting of economic factors are associated with their

[28] If managers intentionally introduce *random* biases into their earnings forecasts, the biases are non-detectable. However, random biases should be rare since introducing random noises reduces management earnings forecast accuracy for no obvious benefits.

[29] Managers' mis-weighting of economic factors, $Abs(EconWeight_{i,q})$, is unranked in Table 8 to be consistent with the unranked dependent variable, $Forecast\_Accuracy_{i,q+1}$.

ability, I focus on CEOs and investigate the association between mis-weighting and the CEOs' managerial ability.

Following Chang et al. (2010), I identify a group of CEOs who have relocated and measure the CEOs' managerial ability by the stock market reaction surrounding the announcement of the CEO departure. I obtain CEOs' turnover data from Compustat's ExecuComp database. Due to the limited overlap between the main sample and CEO relocation sample, the subsample of management earnings forecasts for which CEOs' managerial ability is measurable has only 66 observations representing 6 unique CEOs.[30]

Table 9, Panel A, reports the results testing the association between CEOs' managerial ability and managers' mis-weighting of economic factors. The results suggest that the degree of mis-weighting is smaller if the managerial ability of the firm's CEO is higher (*t*-statistic = – 1.82). Though the findings in Panel A suggest that CEOs are influential in affecting managers' assessment of economic factors, the number of observations that the findings are based on is small, and thus the evidence provided is only suggestive.

[30] The sample selection process is detailed as follows. First, I identify 253 cases of CEO relocation between 2000 and 2018 using Compustat's ExecuComp database. Then I exclude the cases in which the departing CEO takes another role in the company, such as board director (240 cases remaining). I further require the time interval between CEO relocation to be less than three years (140 cases remaining). Following Chang et al. (2010), I search LexisNexis for the announcement date of the CEO departure and compute cumulative abnormal returns from day -1 to +7 around the departure announcement as a proxy for the departing CEO's managerial ability.
Next, I append the CEO's managerial ability to the main sample. Due to the limited overlap between the main sample and CEO relocation sample, only 218 observations are matched, covering 32 unique CEOs. Given at least 10 quarters are required for measuring management economic mis-weighting, I further remove observations where the CEO has been with the firm for less than 10 quarters. This step reduces the number of observations to 99, covering 11 unique CEOs. Among the 11 CEO relocation cases, I drop 2 cases where the CEO is relocated due to mergers and acquisitions between departure and joining firms, 1 case where CEO is relocated between two affiliated firms, and 2 cases for interim CEOs. The final sample has 66 observations covering 6 unique CEOs.

To supplement Panel A, I partition the sample into CEO-turnover period (with the CEO's tenure less than 12 quarters) and non-CEO-turnover period. If CEOs are influential on the assessment of economic factors, then managers' mis-weighting measure should only predict inefficient investment during the non-CEO-turnover period because during CEO-turnover period, by construction, the measure of managers' mis-weighting is contaminated by the prior CEO's assessment. Column (1) and (2) of Table 9, Panel B report the results of testing the association between managers' mis-weighting and the likelihood of inefficient investing during CEO-turnover period and non-CEO-turnover period, respectively. Column (3) focuses on the 1st quarter of the CEO's tenure where the measurement period for managers' mis-weighting of economic factors is entirely under the management of the prior CEO. Contrarily, Column (4) focuses on the 12th quarter of the CEO's tenure where the measurement period for managers' mis-weighting of economic factors is entirely under the management of the new CEO. The coefficients on managers' mis-weighting are not statistically significant in Column (1) and (3), but are significantly positive in Column (2) and (4).[31] The findings suggest that managers' mis-assessment of economic factors are determined by CEOs.

Overall, the findings discussed in this chapter suggest that the measure for managers' mis-assessment of economic factors is more likely to capture the managers' ability to collect and incorporate economic information into their decision-making process rather than the managers' intentional biases.

[31] Untabulated results show that managers' mis-weighting are not significantly associated with inefficient investing for each quarter of the first 11 quarters of the CEO's tenure.

# Chapter 9: Conclusion

Managers' investment decisions start with appraising the values of the investment projects. Since the payoff of an investment project is affected by economic factors (such as interest rate and inflation), managers are expected to consider economic factors when making investment decisions. In this study, I investigate the association between managers' assessment of economic factors and their firm's investment efficiency. Specifically, I test whether managers will invest inefficiently if they mis-assess economic factors.

I infer whether managers mis-assess economic factors when evaluating investment projects by observing whether they mis-weight economic factors when providing earnings forecasts. I find that managers who mis-weight economic factors in their prior earnings forecasts also invest inefficiently in the next quarter. Further, I find that inefficient investing varies with the direction of managers' mis-weighting and the economic state: managers who over-weight economic factors over-invest in economic upturns due to over-optimism and under-invest in economic downturns due to over-pessimism. Overall, the findings suggest that managers' assessment of economic factors is an important determinant of firms' investment efficiency.

This study provides insight into managers' valuation process and the resulting impact on their investment decisions. Moreover, the setting of this study demonstrates how a firm's external disclosure can be used to infer the firm's internal strategic decisions. Although the sample of this study is restricted to firms that provide management earnings forecasts on a regular basis, the inferences of the main findings are

generalizable to all firms because the way that managers assess investment projects should not differ systematically by whether or how they provide earnings forecasts.

There are a few extensions that are out of the scope of this study but are potentially interesting. First, I do not distinguish whether managers' mis-weighting of economic factors is driven by their information set or the managers' ability to incorporate the information into their earnings forecasts. Separating the two mechanisms will provide further insight into the black box of managers' investment decision-making process.

Second, I do not examine whether managers' ability to assess the impact of economic factors depends on the channel of the impact. Some economic factors (such as gross domestic product and aggregate demand) affect the macroeconomic environment and thus have a general impact on all firms. Other economic factors may only affect firms in specific industries, e.g., crude oil prices for the transportation industry. Hutton, Lee, and Shu (2012) suggest that managers can better assess the industry-specific impact compared to the general economic impact. Distinguishing the channel of the impact of economic factors will help explain why some managers mis-weight economic factors to a greater extent than others.

Lastly, I do not consider managers' sources for economic information. Managers may have a specialized economic background and analyze the impact of economic factors themselves. Alternatively, they can learn about the economic state from in-house economists or outside consultants. It would be intriguing to investigate whether managers' ability to assess economic factors depends on their information source for economic factors.

This study provides initial evidence on the importance of managers' economic acumen. More follow-up studies are needed to provide a comprehensive picture of how managers' economic perspectives, relative to their firm-specific expertise, contribute to the success of their strategic decisions.

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## Appendix A

Variable definitions and data sources

*Main Proxies for managers' use of economic information*

| | |
|---|---|
| *Abs(EconWeight)* | Non-directional degree of managers' mis-weighting of economic factors, measured by the year-quarter decile-rank of the absolute value of the estimated mis-weighting of the economic component of earnings ($\hat{\Gamma} - 1$ in Eq.2), scaled by the standard errors of $\hat{\Gamma}$ |
| *EconWeight* | Directional degree of managers' mis-weighting of economic factors, measured by the year-quarter decile-rank of the estimated mis-weighting of the economic component of earnings ($\hat{\Gamma} - 1$ in Eq.2), scaled by the standard errors of $\hat{\Gamma}$ |
| $\Delta$*EconWeightDev* | Change in the degree of managers' mis-weighting of economic factors, measured by the change in the absolute value of the estimated mis-weighting of the economic component of earnings ($\hat{\Gamma} - 1$ in Eq.2) from the last quarter to the current quarter |

*Dependent variables*

| | |
|---|---|
| *Investment* | Total investments, measured by the sum of capital expenditures, research and development expenses, and acquisition costs less cash from sales of property, plant, and equipment multiplied by 100 and scaled by the lagged total assets (Compustat) |

| | |
|---|---|
| *Ineff_Invest* | Categorical indicator for inefficient investing, equals 1 if the firm-quarter is classified as inefficient investing, and 0 otherwise; the classification depends on the year-quarter quartile rank of the estimated residuals of Eq.3: firm-quarters in the two extreme quartiles are classified as inefficient investing |
| *InvestGrp* | Categorical indicator for over- and under-investment, equals 1, 0, or –1 if the firm-quarter is classified as over-investing, efficient-investing, or under-investing, respectively; the classification depends on the year-quarter quartile rank of the estimated residuals of Eq.3: firm-quarters in the top quartiles, middle two quartiles, and bottom quartiles are classified as over-investing, efficient-investing, and under-investing, respectively |
| *Proxy for industry investment opportunities* | |
| *EconUp* | Indicator of economic upturns, equals 1 if the mean *Investment* for firms in the same Fama-French 48 industry is in the top quartile by year-quarter, and 0 otherwise |
| *EconDown* | Indicator of economic downturns, equals 1 if the mean *Investment* for firms in the same Fama-French 48 industry is in the bottom quartile by year-quarter, and 0 otherwise |
| *Control variables* | |
| *Log(AT)* | Firm size, measured by the natural logarithm of total assets (Compustat) |

| | |
|---|---|
| *MTB* | The ratio of market value of equity to book value of equity (Compustat, CRSP) |
| *PPE_AT* | The ratio of property, plant, and equipment to total assets (Compustat) |
| *Age* | Firm age, measured by the number of years since the firm first appears in CRSP (CRSP) |
| *Dividend* | Dividend indicator, equals 1 if the firm paid a dividend, and 0 otherwise (Compustat) |
| *Debt_AT* | The ratio of total debt to total assets (Compustat) |
| *Ind_Debt_AT* | Mean *Debt_AT* for firms in the same SIC 3-digit industry (Compustat) |
| *Cash_PPE* | The ratio of cash to property, plant, and equipment (Compustat) |
| *Z-Score* | Revised *Z-Score* by Altman (2013), calculated as 0.012 × (current assets – current liabilities)/total assets + 0.014 × retained earnings/total assets + 0.033 × earnings before interest and taxes/total assets + 0.006 × market value of equity/book value of total liabilities + 0.999 × sales/total assets (Compustat, CRSP) |
| *CFO_Sales* | The ratio of cash flows from operations to sales (Compustat) |
| *OperateCycle* | Operating cycle, measured by the natural logarithm of accounts receivables to sales plus inventory to cost of goods sold multiplied by 360 plus 1 (Compustat) |
| *Loss* | Loss indicator, equals 1 if the income before extraordinary |

| | |
|---|---|
| | items is negative, and 0 otherwise (Compustat) |
| *σ(Investment)* | Investment volatility, measured by the standard deviation of *Investment* for past 12 quarters (Compustat) |
| *σ(CFO)* | Cash-flow volatility, measured by the standard deviation of cash flows from operations scaled by average total assets for past 12 quarters (Compustat) |
| *σ(Sales)* | Sales volatility, measured by the standard deviation of sales scaled by average total assets for the past 12 quarters (Compustat) |
| *MF_AvgAcc* | Management earnings forecast accuracy, measured by year-quarter decile-rank of the mean management earnings forecast errors multiplied by minus 1 for the past four quarters (I/B/E/S) |
| *InstituteOwn* | The percentage of shares held by institutional investors (SEC Analytics Suite) |
| *Log(N_Analyst)* | Natural logarithm of the number of analysts following the firm (I/B/E/S) |
| *InvG-Score* | *G-Score* by Gompers, Ishii, and Metrick (2003), calculated by the number of anti-takeover protection (out of 19 collected by ISS since 2006), multiplied by minus 1 (ISS) |
| *G-ScoreDum* | Missing *G-Score* indicator, equals 1 if *G-Score* is missing, and 0 otherwise (ISS) |

*Variables in additional analysis*

| | |
|---|---|
| *ROA* | Income before extraordinary items over average total assets, multiplied by 100 (Compustat) |
| *Inc_Ineff_Invest* | Change in the likelihood of inefficient investing, measured as the difference between the predicted likelihood that a firm is categorized into inefficient investing group in the next quarter and the predicted likelihood that the firm is categorized into inefficient investing group in the current quarter; the categorization depends on the year-quarter quartile rank of the estimated residuals of Eq.3: firm-quarters in the two extreme quartiles are classified as inefficient investing |
| *Inc_Over_Invest* | Change in the likelihood of over-investing, measured as the difference between the predicted likelihood that a firm is categorized into over-investing group in the next quarter and the predicted likelihood that the firm is categorized into over-investing group in the current quarter; the categorization depends on the year-quarter quartile rank of the estimated residuals of Eq.3: firm-quarters in the top quartile are classified as over-investing |
| *Inc_Undr_Invest* | Change in the likelihood of under-investing, measured as the difference between the predicted likelihood that a firm is categorized into under-investing group in the next quarter and the predicted likelihood that the firm is categorized into under- |

| | |
|---|---|
| | investing group in the current quarter; the categorization depends on the year-quarter quartile rank of the estimated residuals of Eq.3: firm-quarters in the bottom quartile are classified as under-investing |
| *CAR* | Cumulative market-adjusted abnormal returns around management earnings forecast date (day 0); the market returns are measured by CRSP value-weighted market index (CRSP) |
| *BHAR* | Buy-and-hold market-adjusted abnormal returns from management earnings forecast date (day 0); the market returns are measured by CRSP value-weighted market index (CRSP) |
| *REV* | Individual analyst forecast revisions made following management earnings forecast date (day 0); a forecast revision is calculated as the revised analyst forecast minus the most recent forecast issued by the same analyst within 180 days prior to the management earnings forecast date, multiplied by 100 and scaled by the closing stock price two days prior to the management earnings forecast date (I/B/E/S, CRSP) |
| *MF_Surp* | Management earnings forecast surprise, calculated as the management earnings forecast value (point, mid-point of a range forecast, or bound for a minimum/maximum forecast) minus the analyst consensus multiplied by 100 and scaled by the closing stock price two days prior to the management earnings forecast date; analyst consensus is calculated as the |

| | |
|---|---|
| | mean of the most recent earnings forecasts made by each analyst following the firm within 180 days prior to the management earnings forecast date (I/B/E/S, CRSP) |
| *MF_Point* | Point forecast indicator, equals 1 if the management earnings forecast is a point estimate, and 0 otherwise (I/B/E/S) |
| *EA_Surp* | Earnings surprise, calculated as the actual earnings-per-share minus the analyst consensus multiplied by 100 and scaled by the closing stock price two days prior to the bundled management earnings forecast date; analyst consensus is calculated as the mean of the most recent earnings forecasts made by each analyst following the firm within 180 days to 2 days prior to the earnings announcement date (I/B/E/S, CRSP) |
| *EA_Loss* | Loss indicator for earnings announcement, equals 1 if the actual earnings announced is negative, and 0 otherwise (I/B/E/S) |
| *Other proxies on managers' use of economic information* | |
| *Abs(FirmWeight)* | Non-directional degree of managers' mis-weighting of firm-specific factors, measured by the year-quarter decile-rank of the absolute value of the estimated mis-weighting of the firm-specific component of earnings ($\hat{\gamma} - 1$ in Eq.2), scaled by the standard errors of $\hat{\gamma}$ |
| *FirmWeight* | Directional degree of managers' mis-weighting of firm-specific factors, measured by the year-quarter decile-rank of the estimated mis-weighting of the firm-specific component of |

| | |
|---|---|
| | earnings ($\hat{\gamma} - 1$ in Eq.2), scaled by the standard errors of $\hat{\gamma}$ |
| *InfContent_BBF* | Information content of management earnings forecasts relative to that of the actual earnings, measured by the year-quarter decile-rank of the absolute value of the semi-partial $R^2$ of the economic component ($\hat{\Gamma}\,\hat{B}'M$ in Eq.2) over the semi-partial $R^2$ of the firm-specific component ($\hat{\gamma}\,\hat{m}$ in Eq.2) minus the model $R^2$ over $(1 - R^2)$ from estimating Eq.1 |
| *EconInf* | Quality of managers' economic information, measured by the year-quarter decile-rank of the semi-partial $R^2$ of the economic component of earnings ($\hat{\Gamma}\,\hat{B}'M$ in Eq.2) times the variance of $\hat{B}'M$ |
| *FirmInf* | Quality of managers' firm-specific information, measured by the year-quarter decile-rank of the semi-partial $R^2$ of the firm-specific component ($\hat{\gamma}\,\hat{m}$ in Eq.2) times the variance of $\hat{m}$ |
| *Variables in additional discussion* | |
| *Forecast_Accuracy* | Management earnings forecast accuracy, measured by management earnings forecast errors multiplied by minus 1 |
| *CEO_Ability* | CEO's managerial ability, measured as -100 multiplies the market-adjusted abnormal returns of the CEO's prior employer during [-1,+7] centered at the CEO's departure announcement date (ExecComp, CRSP) |
| *Log(CEO_Tenure)* | Natural logarithm of the number of quarters in CEO tenure with the current employer (ExecComp) |

## Appendix B

Sample selection process and distribution of observations

| **Panel A**: Sample selection process | | |
|---|---|---|
| All quarterly management earnings forecasts (*pdicity* = 'QTR' and *measure* = 'EPS') issued following U.S. GAAP (*act_std* = '01') on a comparative basis (*diff_code* ≠ '58') in U.S. dollars (*curr* = 'USD'); the forecasts should have nonmissing forecast form (*range_desc* ≠ 'NA'), forecasted value (*val_1*), forecasting period (*prd_yr* and *prd_mon*), and forecast announcement date (*anndats*); sampling period is from 2006 to 2017 | | 33,596 |
| Require: | | |
| Management forecasts bundled with earnings announcement: issued within one day of the earnings announcement date for the prior quarter's earnings | (9,288) | |
| | | 24,308 |
| Management forecasts made by regular forecasters: at least 10 forecasts during the prior 12 quarters | (10,172) | |
| | | 14,136 |
| Remove: | | |
| Unavailable financial variables from Compustat or negative book equity | (332) | |
| Unavailable stock variables from CRSP or penny stocks with prices below $1 | (234) | |
| Less than three analysts following the firm-quarter | (737) | |
| Unavailable variables for regressions | (45) | |
| Unavailable industry classification or in financial/utility industries | (358) | |
| Less than 10 firms in the industry | (1,534) | |
| **The Final Sample** | | **10,896** |

**Panel B**: Distribution of observations by year

| Year | Frequency | Percent |
|---|---|---|
| 2006 | 873 | 8.01 |
| 2007 | 911 | 8.36 |
| 2008 | 907 | 8.32 |
| 2009 | 888 | 8.15 |
| 2010 | 926 | 8.50 |
| 2011 | 917 | 8.42 |
| 2012 | 936 | 8.59 |
| 2013 | 915 | 8.40 |
| 2014 | 942 | 8.65 |
| 2015 | 938 | 8.61 |
| 2016 | 915 | 8.40 |
| 2017 | 828 | 7.60 |
| Total | 10,896 | 100.00 |

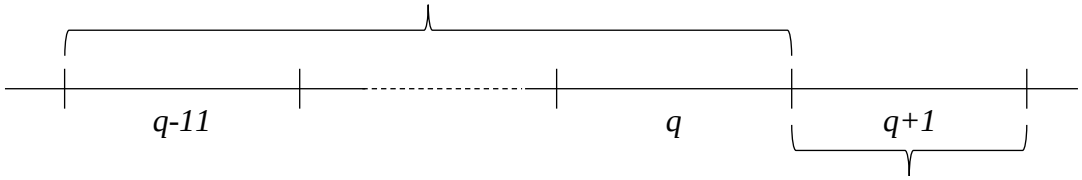
**Panel C**: Distribution of observations according to Fama and French's (1997) 48-industry classification

| | Industry | Frequency | Percent |
|---|---|---|---|
| 10 | Apparel | 345 | 3.17 |
| 12 | Medical Equipment | 485 | 4.45 |
| 13 | Pharmaceutical Products | 205 | 1.88 |
| 14 | Chemicals | 222 | 2.04 |
| 21 | Machinery | 565 | 5.19 |
| 22 | Electrical Equipment | 128 | 1.17 |
| 33 | Personal Services | 211 | 1.94 |
| 34 | Business Services | 2,812 | 25.81 |
| 35 | Computers | 1,152 | 10.57 |
| 36 | Electronic Equipment | 1,919 | 17.61 |
| 37 | Measuring and Control Equipment | 672 | 6.17 |
| 40 | Transportation | 333 | 3.06 |
| 41 | Wholesale | 379 | 3.48 |
| 42 | Retail | 1,246 | 11.44 |
| 43 | Restaurants, Hotels, Motels | 222 | 2.04 |
| Total | | 10,896 | 100.00 |

**Figure 1.1**: Timeline for estimating managers' mis-weighting of economic factors

For each firm-quarter *i,q*:

1. Estimate Equation (1): $e_q = B'M_q + m_q$
2. Estimate Equation (2): $f_q = \mu_f + \Gamma \hat{B}'M_q + \gamma \hat{m}_q + \eta_q$
3. For the testing of H1a and H1b, measure the non-directional degree of managers' mis-weighting, i.e., $Abs(EconWeight_{i,q})$, by $Abs[(\hat{\Gamma} - 1)/StdErr(\hat{\Gamma})]$
4. For the testing of H2a and H2b, measure the directional degree of managers' mis-weighting, i.e., $EconWeight_{i,q}$, by $(\hat{\Gamma} - 1)/StdErr(\hat{\Gamma})$




Measurement period for $Investment_{i,q+1}$ and $InvestGrp_{i,q+1}$

**Figure 1.2**: Timeline for estimating the changes in managers' mis-weighting of economic factors

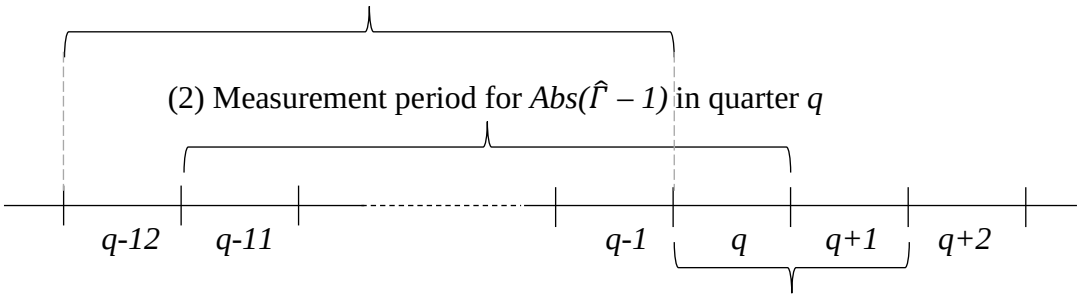
For each firm-quarter *i,q*,

$\Delta EconWeightDev_{i,q}$ is measured by the change

in $Abs(\hat{I} - 1)$ from quarter $q - 1$ to quarter $q$:

(1) Measurement period for $Abs(\hat{I} - 1)$ in quarter $q - 1$

(2) Measurement period for $Abs(\hat{I} - 1)$ in quarter $q$




Measurement period for $\Delta ROA_{i,q+1}$

from quarter $q$ to quarter $q + 1$

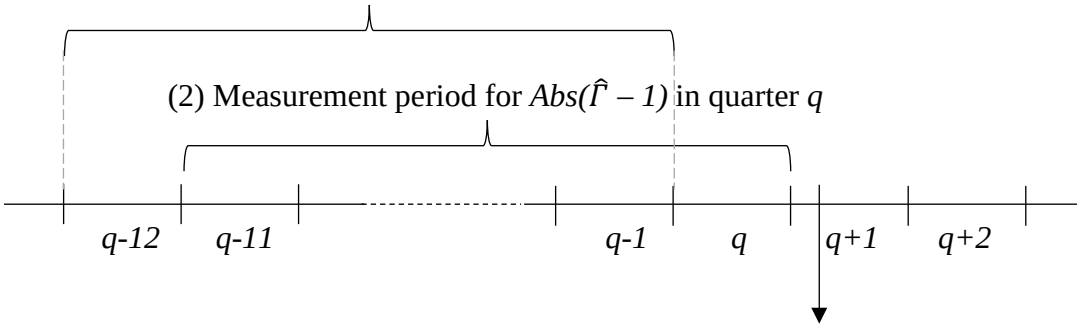
For each firm-quarter *i,q*,

$\Delta EconWeightDev_{i,q}$ is measured by the change

in $Abs(\hat{I} - 1)$ from quarter $q - 1$ to quarter $q$:

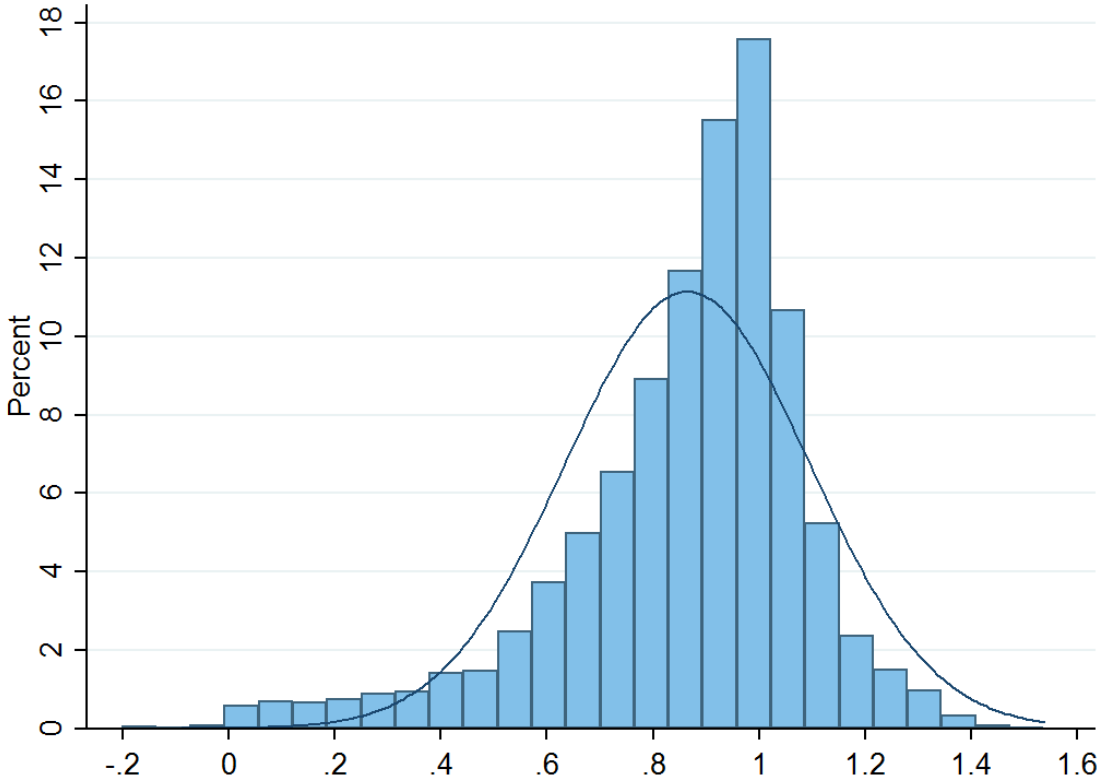
(1) Measurement period for $Abs(\hat{I} - 1)$ in quarter $q - 1$

(2) Measurement period for $Abs(\hat{I} - 1)$ in quarter $q$




Measurement window for stock market's and financial analysts' reactions: earnings announcement for $q$ and management forecast on $q + 1$

**Figure 2**: Histogram of managers' weighting of economic factors




**Note**: Figure 2 presents the distribution of managers' weighting of economic factors implied in their earnings forecasts, i.e. $\widehat{\Gamma}$ estimated from Equation (2).

**Table 1**: Descriptive statistics and correlation matrix

**Panel A**: Descriptive statistics

| | | N | Mean | Median | Std | p25 | P75 |
|---|---|---|---|---|---|---|---|
| (1) | *Abs(EconWeight)* | 10,896 | 5.503 | 6.000 | 2.862 | 3.000 | 8.000 |
| (2) | $Investment_{i,q+1}$ | 10,896 | 6.376 | 4.342 | 7.035 | 2.317 | 7.600 |
| (3) | $EconUp_{i,q+1}$ | 10,896 | 0.267 | 0.000 | 0.443 | 0.000 | 1.000 |
| (4) | $EconDown_{i,q+1}$ | 10,896 | 0.252 | 0.000 | 0.434 | 0.000 | 1.000 |
| (5) | $Log(AT_{i,q})$ | 10,896 | 7.377 | 7.222 | 1.535 | 6.225 | 8.424 |
| (6) | $MTB_{i,q}$ | 10,896 | 3.449 | 2.522 | 4.176 | 1.588 | 3.895 |
| (7) | $PPE\_AT_{i,q}$ | 10,896 | 0.181 | 0.112 | 0.182 | 0.060 | 0.231 |
| (8) | $Age_{i,q}$ | 10,896 | 21.470 | 17.000 | 16.568 | 11.000 | 26.000 |
| (9) | $Dividend_{i,q}$ | 10,896 | 0.354 | 0.000 | 0.478 | 0.000 | 1.000 |
| (10) | $Debt\_AT_{i,q}$ | 10,896 | 0.148 | 0.127 | 0.149 | 0.000 | 0.248 |
| (11) | $Ind\_Debt\_AT_{i,q}$ | 10,896 | 0.148 | 0.135 | 0.085 | 0.093 | 0.183 |
| (12) | $Cash\_PPE_{i,q}$ | 10,896 | 3.764 | 1.484 | 7.681 | 0.435 | 4.121 |
| (13) | $Z\text{-}Score_{i,q}$ | 10,896 | 0.318 | 0.266 | 0.181 | 0.191 | 0.401 |
| (14) | $CFO\_Sales_{i,q}$ | 10,896 | 0.309 | 0.239 | 0.379 | 0.088 | 0.472 |
| (15) | $OperateCycle_{i,q}$ | 10,896 | 5.951 | 6.033 | 0.762 | 5.567 | 6.436 |
| (16) | $Loss_{i,q}$ | 10,896 | 0.160 | 0.000 | 0.367 | 0.000 | 0.000 |
| (17) | $\sigma(Investment_{i,q\text{-}11\sim i,q})$ | 10,896 | 5.448 | 3.574 | 6.277 | 1.950 | 6.621 |
| (18) | $\sigma(CFO_{i,q\text{-}11\sim i,q})$ | 10,896 | 0.052 | 0.047 | 0.027 | 0.035 | 0.062 |
| (19) | $\sigma(Sales_{i,q\text{-}11\sim i,q})$ | 10,896 | 0.044 | 0.032 | 0.039 | 0.018 | 0.056 |
| (20) | $MF\_AvgAcc_{i,q}$ | 10,896 | 5.503 | 6.000 | 2.862 | 3.000 | 8.000 |
| (21) | $InstituteOwn_{i,q}$ | 10,896 | 0.111 | 0.000 | 0.275 | 0.000 | 0.006 |
| (22) | $Log(N\_Analyst_{i,q})$ | 10,896 | 2.332 | 2.398 | 0.621 | 1.946 | 2.773 |
| (23) | $InvG\text{-}Score_{i,q}$ | 10,896 | -4.576 | -6.000 | 3.652 | -8.000 | 0.000 |
| (24) | $G\text{-}ScoreDum_{i,q}$ | 10,896 | 0.371 | 0.000 | 0.483 | 0.000 | 1.000 |

**Panel B**: Correlation matrix among continuous variables

| | | (1) | (2) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|
| **(1)** | ***Abs(EconWeight)*** | **1.000** | **0.008** | **-0.116*** ** | **0.010** | **-0.084*** ** | **-0.072*** ** |
| **(2)** | ***Investment$_{i,q+1}$*** | **0.015** | **1.000** | **-0.132*** ** | **0.159*** ** | **0.108*** ** | **-0.100*** ** |
| (5) | *Log(AT$_{i,q}$)* | **-0.118*** ** | **-0.108*** ** | 1.000 | 0.105*** | 0.146*** | 0.513*** |
| (6) | *MTB$_{i,q}$* | **-0.013** | **0.051*** ** | 0.000 | 1.000 | 0.000 | -0.072*** |
| (7) | *PPE_AT$_{i,q}$* | **-0.068*** ** | **0.020** ** | 0.166*** | -0.030*** | 1.000 | 0.156*** |
| (8) | *Age$_{i,q}$* | **-0.095*** ** | **-0.066*** ** | 0.500*** | -0.076*** | 0.083*** | 1.000 |
| (10) | *Debt_AT$_{i,q}$* | **-0.062*** ** | **0.006** | 0.412*** | 0.104*** | 0.237*** | 0.199*** |
| (11) | *Ind_Debt_AT$_{i,q}$* | **-0.029*** ** | **-0.021** ** | 0.292*** | 0.021** | 0.323*** | 0.211*** |
| (12) | *Cash_PPE$_{i,q}$* | **0.077*** ** | **-0.019** ** | -0.175*** | 0.053*** | -0.328*** | -0.172*** |
| (13) | *Z-Score$_{i,q}$* | **-0.029*** ** | **-0.111*** ** | -0.138*** | 0.125*** | 0.133*** | -0.050*** |
| (14) | *CFO_Sales$_{i,q}$* | **0.026*** ** | **0.013** | 0.189*** | 0.094*** | -0.006 | -0.005 |
| (15) | *OperateCycle$_{i,q}$* | **-0.028*** ** | **-0.036*** ** | 0.039*** | -0.091*** | -0.272*** | 0.158*** |
| (17) | *σ(Investment$_{i,q-11\sim i,q}$)* | **-0.007** | **0.162*** ** | -0.064*** | -0.045*** | -0.090*** | -0.051*** |
| (18) | *σ(CFO$_{i,q-11\sim i,q}$)* | **0.044*** ** | **0.030*** ** | -0.151*** | 0.285*** | 0.055*** | -0.118*** |
| (19) | *σ(Sales$_{i,q-11\sim i,q}$)* | **0.014** | **-0.007** | -0.149*** | 0.099*** | 0.029*** | -0.165*** |
| (20) | *MF_AvgAcc$_{i,q}$* | **-0.168*** ** | **0.024** ** | 0.331*** | 0.210*** | 0.031*** | 0.126*** |
| (21) | *InstituteOwn$_{i,q}$* | **0.001** | **0.006** | -0.042*** | 0.117*** | -0.038*** | -0.021** |
| (22) | *Log(N_Analyst$_{i,q}$)* | **-0.108*** ** | **0.032*** ** | 0.578*** | 0.204*** | 0.036*** | 0.164*** |

| | | (10) | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|---|---|
| **(1)** | ***Abs(EconWeight)*** | **-0.079*** ** | **-0.042*** ** | **0.127*** ** | **-0.025*** ** | **0.020** ** | **-0.025*** ** |
| **(2)** | ***Investment$_{i,q+1}$*** | **-0.104*** ** | **-0.057*** ** | **0.047*** ** | **-0.080*** ** | **0.046*** ** | **0.025*** ** |
| (5) | *Log(AT$_{i,q}$)* | 0.468*** | 0.313*** | -0.284*** | -0.183*** | 0.187*** | 0.017* |
| (6) | *MTB$_{i,q}$* | 0.034*** | 0.038*** | 0.148*** | 0.105*** | 0.258*** | -0.075*** |
| (7) | *PPE_AT$_{i,q}$* | 0.158*** | 0.178*** | -0.751*** | 0.261*** | -0.054*** | -0.007 |
| (8) | *Age$_{i,q}$* | 0.258*** | 0.255*** | -0.245*** | -0.063*** | 0.027*** | 0.184*** |
| (10) | *Debt_AT$_{i,q}$* | 1.000 | 0.519*** | -0.408*** | -0.296*** | 0.007 | 0.070*** |
| (11) | *Ind_Debt_AT$_{i,q}$* | 0.572*** | 1.000 | -0.301*** | -0.198*** | 0.036*** | 0.174*** |
| (12) | *Cash_PPE$_{i,q}$* | -0.174*** | -0.144*** | 1.000 | -0.244*** | 0.187*** | 0.007 |
| (13) | *Z-Score$_{i,q}$* | -0.270*** | -0.193*** | -0.161*** | 1.000 | -0.313*** | -0.193*** |
| (14) | *CFO_Sales$_{i,q}$* | 0.028*** | 0.044*** | 0.107*** | -0.248*** | 1.000 | -0.076*** |
| (15) | *OperateCycle$_{i,q}$* | 0.031*** | 0.054*** | -0.074*** | -0.206*** | -0.084*** | 1.000 |
| (17) | *σ(Investment$_{i,q-11\sim i,q}$)* | 0.235*** | 0.047*** | -0.057*** | -0.183*** | 0.028*** | -0.065*** |
| (18) | *σ(CFO$_{i,q-11\sim i,q}$)* | -0.240*** | -0.196*** | 0.038*** | 0.368*** | 0.032*** | -0.146*** |
| (19) | *σ(Sales$_{i,q-11\sim i,q}$)* | -0.155*** | -0.173*** | -0.060*** | 0.577*** | -0.236*** | -0.132*** |
| (20) | *MF_AvgAcc$_{i,q}$* | 0.090*** | 0.119*** | -0.089*** | 0.005 | 0.220*** | -0.010 |
| (21) | *InstituteOwn$_{i,q}$* | 0.072*** | 0.145*** | -0.005 | -0.010 | -0.016* | 0.011 |
| (22) | *Log(N_Analyst$_{i,q}$)* | 0.066*** | 0.018* | -0.025** | -0.028*** | 0.180*** | -0.049*** |

| | | (17) | (18) | (19) | (20) | (21) | (22) |
|---|---|---|---|---|---|---|---|
| **(1)** | ***Abs(EconWeight)*** | **-0.009** | **0.023**** | **-0.004** | **-0.168***** | **0.017*** | **-0.107***** |
| **(2)** | ***Investment$_{i,q+1}$*** | **0.187***** | **0.097***** | **-0.007** | **0.016*** | **0.010** | **0.094***** |
| (5) | *Log(AT$_{i,q}$)* | -0.081*** | -0.123*** | -0.203*** | 0.340*** | 0.076*** | 0.582*** |
| (6) | *MTB$_{i,q}$* | -0.031*** | 0.350*** | 0.044*** | 0.380*** | 0.075*** | 0.329*** |
| (7) | *PPE_AT$_{i,q}$* | -0.022** | 0.180*** | 0.114*** | 0.035*** | -0.023** | 0.041*** |
| (8) | *Age$_{i,q}$* | -0.100*** | -0.099*** | -0.221*** | 0.130*** | 0.120*** | 0.164*** |
| (10) | *Debt_AT$_{i,q}$* | 0.139*** | -0.261*** | -0.189*** | 0.111*** | 0.026*** | 0.082*** |
| (11) | *Ind_Debt_AT$_{i,q}$* | 0.028*** | -0.208*** | -0.234*** | 0.121*** | 0.164*** | 0.020** |
| (12) | *Cash_PPE$_{i,q}$* | -0.109*** | 0.039*** | -0.102*** | -0.105*** | 0.042*** | -0.008 |
| (13) | *Z-Score$_{i,q}$* | -0.173*** | 0.398*** | 0.633*** | 0.000 | -0.024** | -0.070*** |
| (14) | *CFO_Sales$_{i,q}$* | 0.092*** | 0.046*** | -0.324*** | 0.250*** | 0.017* | 0.175*** |
| (15) | *OperateCycle$_{i,q}$* | -0.091*** | -0.127*** | -0.159*** | -0.024** | 0.059*** | -0.081*** |
| (17) | *σ(Investment$_{i,q-11\sim i,q}$)* | 1.000 | -0.019** | 0.057*** | 0.029*** | -0.044*** | -0.034*** |
| (18) | *σ(CFO$_{i,q-11\sim i,q}$)* | -0.081*** | 1.000 | 0.428*** | 0.044*** | 0.004 | 0.144*** |
| (19) | *σ(Sales$_{i,q-11\sim i,q}$)* | 0.081*** | 0.485*** | 1.000 | -0.154*** | -0.076*** | -0.016 |
| (20) | *MF_AvgAcc$_{i,q}$* | 0.011 | 0.009 | -0.139*** | 1.000 | -0.033*** | 0.314*** |
| (21) | *InstituteOwn$_{i,q}$* | 0.037*** | -0.029*** | -0.038*** | -0.018* | 1.000 | 0.046*** |
| (22) | *Log(N_Analyst$_{i,q}$)* | -0.043*** | 0.130*** | 0.023** | 0.315*** | -0.049*** | 1.000 |

**Note**: Table 1, Panel A, presents the descriptive statistics for the variables used in the main analyses. Panel B presents the correlation matrix among continuous variables. Pearson correlations and Spearman correlations are presented above and below the diagonal, respectively. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. All variables are defined in Appendix A.

**Table 2**: Unconditional effects of managers' mis-weighting of economic factors (logistic and multinomial logistic estimation)

| **Panel A**: Estimation results of Equation (4) | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | $Ineff\_Invest_{i,q+1}$ | $Ineff\_Invest_{i,q+1}$ | $Ineff\_Invest_{i,q+1}$ |
| ***Abs(EconWeight$_{i,q}$)*** | | **0.028*** ** | **0.021** ** |
| | | **(2.79)** | **(2.12)** |
| **Marginal Effect** | | **0.007** | **0.005** |
| Control variables | | | |
| *Log(AT$_{i,q}$)* | -0.022 | | -0.023 |
| | (-0.49) | | (-0.52) |
| *MTB$_{i,q}$* | -0.013* | | -0.014* |
| | (-1.72) | | (-1.70) |
| *PPE_AT$_{i,q}$* | -0.988*** | | -0.968*** |
| | (-3.43) | | (-3.38) |
| *Age$_{i,q}$* | -0.001 | | -0.001 |
| | (-0.42) | | (-0.37) |
| *Dividend$_{i,q}$* | -0.152* | | -0.142 |
| | (-1.73) | | (-1.61) |
| *Debt_AT$_{i,q}$* | 0.516 | | 0.533 |
| | (1.45) | | (1.51) |
| *Ind_Debt_AT$_{i,q}$* | -0.107 | | -0.148 |
| | (-0.20) | | (-0.27) |
| *Cash_PPE$_{i,q}$* | 0.001 | | 0.001 |
| | (0.26) | | (0.25) |
| *Z-Score$_{i,q}$* | -0.206 | | -0.195 |
| | (-0.56) | | (-0.53) |
| *CFO_Sales$_{i,q}$* | 0.052 | | 0.045 |
| | (0.65) | | (0.56) |
| *OperateCycle$_{i,q}$* | -0.276*** | | -0.272*** |
| | (-4.63) | | (-4.59) |
| *Loss$_{i,q}$* | -0.052 | | -0.048 |
| | (-0.65) | | (-0.61) |
| *σ(I$_{i,q-11\sim i,q}$)* | 0.017*** | | 0.017*** |
| | (2.98) | | (2.97) |
| *σ(CFO$_{i,q-11\sim i,q}$)* | -1.185 | | -1.330 |
| | (-0.76) | | (-0.85) |
| *σ(Sales$_{i,q-11\sim i,q}$)* | -0.640 | | -0.617 |
| | (-0.53) | | (-0.51) |
| *MF_AvgAcc$_{i,q}$* | 0.026** | | 0.029** |
| | (2.00) | | (2.20) |
| *InstituteOwn$_{i,q}$* | -0.108 | | -0.106 |
| | (-1.05) | | (-1.03) |
| *Log(N_Analyst$_{i,q}$)* | -0.103 | | -0.095 |

| | | | |
|---|---|---|---|
| | (-1.42) | | (-1.31) |
| *InvG-Score*$_{i,q}$ | -0.021 | | -0.020 |
| | (-0.60) | | (-0.57) |
| *G-ScoreDum*$_{i,q}$ | 0.226 | | 0.221 |
| | (0.85) | | (0.83) |
| Constant | 2.022*** | -0.160** | 1.868*** |
| | (3.49) | (-2.23) | (3.21) |
| Cluster SE | Firm | Firm | Firm |
| *N* | 10,896 | 10,896 | 10,896 |
| *Pseudo* $R^2$ | 0.020 | 0.001 | 0.021 |

**Panel B**: Estimation results of Equation (4)'

| | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| | $InvestGrp_{i,q+1}$ | | $InvestGrp_{i,q+1}$ | | $InvestGrp_{i,q+1}$ | |
| | Under-Invest | Over-Invest | Under-Invest | Over-Invest | Under-Invest | Over-Invest |
| ***Abs(EconWeight$_{i,q}$)*** | | | **0.034**** | **0.021*** | **0.026**** | **0.020*** |
| | | | **(2.39)** | **(1.85)** | **(2.02)** | **(1.65)** |
| **Marginal Effect** | | | **0.005** | **0.002** | **0.004** | **0.002** |
| Control variables | | | | | | |
| $Log(AT_{i,q})$ | 0.183*** | -0.268*** | | | 0.182*** | -0.270*** |
| | (2.96) | (-5.31) | | | (2.94) | (-5.32) |
| $MTB_{i,q}$ | -0.053*** | 0.004 | | | -0.055*** | 0.004 |
| | (-2.92) | (0.62) | | | (-2.95) | (0.60) |
| $PPE\_AT_{i,q}$ | -2.958*** | 0.436 | | | -2.936*** | 0.455 |
| | (-6.19) | (1.24) | | | (-6.16) | (1.30) |
| $Age_{i,q}$ | -0.004 | 0.001 | | | -0.004 | 0.001 |
| | (-1.00) | (0.24) | | | (-0.96) | (0.27) |
| $Dividend_{i,q}$ | -0.055 | -0.192* | | | -0.042 | -0.182* |
| | (-0.42) | (-1.75) | | | (-0.32) | (-1.65) |
| $Debt\_AT_{i,q}$ | 1.271** | -0.146 | | | 1.295*** | -0.129 |
| | (2.56) | (-0.37) | | | (2.63) | (-0.33) |
| $Ind\_Debt\_AT_{i,q}$ | -0.208 | -0.033 | | | -0.258 | -0.075 |
| | (-0.29) | (-0.05) | | | (-0.36) | (-0.11) |
| $Cash\_PPE_{i,q}$ | 0.012* | -0.029*** | | | 0.012* | -0.029*** |
| | (1.73) | (-2.84) | | | (1.76) | (-2.86) |
| $Z\text{-}Score_{i,q}$ | 0.902 | -1.693*** | | | 0.916* | -1.684*** |
| | (1.63) | (-4.77) | | | (1.65) | (-4.75) |
| $CFO\_Sales_{i,q}$ | 0.174 | 0.001 | | | 0.166 | -0.005 |
| | (1.27) | (0.02) | | | (1.22) | (-0.06) |
| $OperateCycle_{i,q}$ | -0.433*** | -0.138 | | | -0.428*** | -0.136 |
| | (-4.81) | (-1.61) | | | (-4.80) | (-1.58) |
| $Loss_{i,q}$ | -0.175* | -0.000 | | | -0.170 | 0.003 |
| | (-1.67) | (-0.00) | | | (-1.63) | (0.03) |
| $\sigma(I_{i,q\text{-}11\sim i,q})$ | 0.011 | 0.021*** | | | 0.011 | 0.022*** |
| | (1.43) | (3.38) | | | (1.45) | (3.37) |
| $\sigma(CFO_{i,q\text{-}11\sim i,q})$ | -4.543* | 2.423 | | | -4.744** | 2.292 |
| | (-1.89) | (1.30) | | | (-1.97) | (1.22) |
| $\sigma(Sales_{i,q\text{-}11\sim i,q})$ | -3.119* | 1.414 | | | -3.093* | 1.437 |
| | (-1.82) | (1.03) | | | (-1.80) | (1.05) |
| $MF\_AvgAcc_{i,q}$ | 0.007 | 0.049*** | | | 0.011 | 0.051*** |
| | (0.41) | (2.97) | | | (0.70) | (3.08) |
| $InstituteOwn_{i,q}$ | -0.279** | 0.056 | | | -0.281** | 0.060 |
| | (-2.01) | (0.45) | | | (-2.02) | (0.48) |
| $Log(N\_Analyst_{i,q})$ | -0.442*** | 0.256*** | | | -0.433*** | 0.265*** |
| | (-4.28) | (2.89) | | | (-4.19) | (2.97) |
| $InvG\text{-}Score_{i,q}$ | -0.030 | -0.018 | | | -0.029 | -0.017 |
| | (-0.58) | (-0.44) | | | (-0.55) | (-0.42) |
| $G\text{-}ScoreDum_{i,q}$ | 0.395 | 0.102 | | | 0.390 | 0.097 |
| | (1.01) | (0.33) | | | (1.00) | (0.32) |
| Constant | 1.756** | 1.365* | -0.891*** | -0.816*** | 1.559* | 1.220 |
| | (2.12) | (1.75) | (-9.13) | (-9.63) | (1.87) | (1.56) |
| Cluster SE | Firm | | Firm | | Firm | |
| *N* | 10,896 | | 10,896 | | 10,896 | |
| *Pseudo* $R^2$ | 0.057 | | 0.001 | | 0.057 | |

**Note**: Table 2, Panel A, presents the results of logistic estimation of Equation (4). Panel presents the results of multinomial logistic estimation of Equation (4)'. Column (1) reports the results for baseline regression. Column (2) and (3) report the results for regressions without and with control variables, respectively. Standard errors are clustered by firm. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. The estimation timeline is presented in Figure 1.1. All variables are defined in Appendix A.

**Table 3**: Conditional effects of managers' mis-weighting of economic factors (OLS estimation)

| | (1) $Investment_{i,q+1}$ | (2) $Investment_{i,q+1}$ | (3) $Investment_{i,q+1}$ |
|---|---|---|---|
| $EconWeight_{i,q}$ | | 0.031 | 0.025 |
| | | (1.14) | (0.88) |
| $\mathbf{EconWeight_{i,q} \times EconUp_{i,q+1}}$ | | **0.109*** | **0.136**** |
| | | **(1.86)** | **(2.27)** |
| $\mathbf{EconWeight_{i,q} \times EconDown_{i,q+1}}$ | | **-0.073**** | **-0.067*** |
| | | **(-2.00)** | **(-1.82)** |
| Control variables | | | |
| $EconUp_{i,q+1}$ | 3.926** | 1.104*** | 3.512** |
| | (2.51) | (3.18) | (2.23) |
| $EconDown_{i,q+1}$ | -1.094 | -1.103*** | -0.768 |
| | (-1.12) | (-4.20) | (-0.77) |
| $Investment_{i,q}$ | 0.391*** | 0.400*** | 0.391*** |
| | (9.47) | (9.50) | (9.52) |
| $Log(AT_{i,q})$ | -0.811*** | | -0.810*** |
| | (-9.10) | | (-9.13) |
| $MTB_{i,q}$ | 0.043*** | | 0.045*** |
| | (2.69) | | (2.83) |
| $PPE\_AT_{i,q}$ | 2.753*** | | 2.728*** |
| | (6.11) | | (6.05) |
| $Age_{i,q}$ | 0.011*** | | 0.011*** |
| | (2.71) | | (2.70) |
| $Dividend_{i,q}$ | -0.337* | | -0.345* |
| | (-1.85) | | (-1.88) |
| $Dividend_{i,q} \times EconUp_{i,q+1}$ | -0.250 | | -0.288 |
| | (-0.71) | | (-0.81) |
| $Dividend_{i,q} \times EconDown_{i,q+1}$ | 0.230 | | 0.273 |
| | (1.09) | | (1.28) |
| $Debt\_AT_{i,q}$ | -0.412 | | -0.502 |
| | (-0.67) | | (-0.83) |
| $Ind\_Debt\_AT_{i,q}$ | -1.222 | | -1.055 |
| | (-1.34) | | (-1.15) |
| $Cash\_PPE_{i,q}$ | -0.022*** | | -0.022*** |
| | (-2.79) | | (-2.78) |
| $Z\text{-}Score_{i,q}$ | -3.748*** | | -3.799*** |
| | (-7.42) | | (-7.52) |
| $CFO\_Sales_{i,q}$ | -1.206*** | | -1.193*** |
| | (-4.39) | | (-4.34) |
| $CFO\_Sales_{i,q} \times EconUp_{i,q+1}$ | 0.905 | | 0.951 |
| | (0.77) | | (0.82) |
| $CFO\_Sales_{i,q} \times EconDown_{i,q+1}$ | -0.370 | | -0.407 |
| | (-1.09) | | (-1.20) |

| | | | |
|---|---|---|---|
| $OperateCycle_{i,q}$ | -0.158 | | -0.166 |
| | (-1.22) | | (-1.28) |
| $OperateCycle_{i,q} \times EconUp_{i,q+1}$ | -0.360 | | -0.377 |
| | (-1.48) | | (-1.56) |
| $OperateCycle_{i,q} \times EconDown_{i,q+1}$ | -0.034 | | -0.038 |
| | (-0.23) | | (-0.25) |
| $Loss_{i,q}$ | -0.464** | | -0.468** |
| | (-2.30) | | (-2.31) |
| $\sigma(I_{i,q-11\sim i,q})$ | -0.011 | | -0.012 |
| | (-0.90) | | (-0.93) |
| $\sigma(CFO_{i,q-11\sim i,q})$ | 2.106 | | 2.268 |
| | (0.75) | | (0.81) |
| $\sigma(Sales_{i,q-11\sim i,q})$ | 0.501 | | 0.620 |
| | (0.22) | | (0.28) |
| $MF\_AvgAcc_{i,q}$ | 0.115*** | | 0.109*** |
| | (3.62) | | (3.38) |
| $MF\_AvgAcc_{i,q} \times EconUp_{i,q+1}$ | -0.067 | | -0.105 |
| | (-0.98) | | (-1.52) |
| $MF\_AvgAcc_{i,q} \times EconDown_{i,q+1}$ | -0.048 | | -0.032 |
| | (-1.33) | | (-0.88) |
| $InstituteOwn_{i,q}$ | -0.579** | | -0.558* |
| | (-2.01) | | (-1.93) |
| $Log(N\_Analyst_{i,q})$ | 1.172*** | | 1.153*** |
| | (8.12) | | (8.02) |
| $InvG\text{-}Score_{i,q}$ | 0.014 | | 0.009 |
| | (0.25) | | (0.17) |
| $G\text{-}ScoreDum_{i,q}$ | -0.566 | | -0.547 |
| | (-1.37) | | (-1.33) |
| Fixed Effects | Industry, Year-Quarter | Industry, Year-Quarter | Industry, Year-Quarter |
| Cluster SE | Firm, Year-Quarter | Firm, Year-Quarter | Firm, Year-Quarter |
| $N$ | 10,896 | 10,896 | 10,896 |
| $R^2$ | 0.357 | 0.356 | 0.358 |
| Adjusted $R^2$ | 0.351 | 0.351 | 0.352 |

**Note**: Table 3 presents the results of ordinary least squares (OLS) estimation of Equation (5). Column (1) report the results for baseline regression. Column (2) and (3) report the results for regressions without and with control variables, respectively. All regressions are estimated with industry and year-quarter fixed effects and two-way clustered robust standard errors by firm and by year-quarter. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. The estimation timeline is presented in Figure 1.1. All variables are defined in Appendix A.

**Table 4**: Changes in managers' mis-weighting of economic factors and return-on-assets

**Panel A:** Change in return-on-assets through increase likelihood of inefficient investing

| | (1) $ROA_{i,q+1}$ | (2) $Inc\_Ineff\_Invest_{i,q+1}$ | (3) $ROA_{i,q+1}$ |
|---|---|---|---|
| **$\Delta EconWeightDev_{i,q}$** | **-0.0010*** ** | **0.0002*** ** | **-0.0010*** ** |
| | **(-6.18)** | **(11.21)** | **(-6.04)** |
| **$Inc\_Ineff\_Invest_{i,q+1}$** | | | **-0.128** ** |
| | | | **(-2.01)** |
| Control variables | | | |
| $Log(AT_{i,q})$ | 0.093* | 0.007* | 0.094* |
| | (1.70) | (1.72) | (1.71) |
| $MTB_{i,q}$ | 0.044* | 0.001 | 0.044* |
| | (1.81) | (1.51) | (1.82) |
| $PPE\_AT_{i,q}$ | 0.394 | -0.016 | 0.392 |
| | (1.46) | (-0.67) | (1.45) |
| $Age_{i,q}$ | -0.002 | -0.000 | -0.002 |
| | (-0.78) | (-0.28) | (-0.78) |
| $Dividend_{i,q}$ | 0.325*** | -0.000 | 0.325*** |
| | (3.02) | (-0.06) | (3.02) |
| $Debt\_AT_{i,q}$ | -1.016*** | -0.083** | -1.026*** |
| | (-2.65) | (-2.41) | (-2.69) |
| $Ind\_Debt\_AT_{i,q}$ | 0.040 | 0.130** | 0.057 |
| | (0.07) | (2.54) | (0.10) |
| $Cash\_PPE_{i,q}$ | 0.006 | -0.000 | 0.006 |
| | (0.69) | (-0.94) | (0.69) |
| $Z\text{-}Score_{i,q}$ | 2.072*** | -0.127*** | 2.055*** |
| | (5.18) | (-4.13) | (5.14) |
| $CFO\_Sales_{i,q}$ | 0.796*** | 0.024* | 0.799*** |
| | (4.89) | (1.74) | (4.89) |
| $OperateCycle_{i,q}$ | 0.201*** | 0.013** | 0.203*** |
| | (2.90) | (2.42) | (2.94) |
| $Loss_{i,q}$ | -2.427*** | -0.008 | -2.428*** |
| | (-16.26) | (-0.73) | (-16.26) |
| $\sigma(I_{i,q-11\sim i,q})$ | 0.007 | -0.002*** | 0.006 |
| | (1.24) | (-2.66) | (1.20) |
| $\sigma(CFO_{i,q-11\sim i,q})$ | 19.651*** | 0.174 | 19.674*** |
| | (6.28) | (1.17) | (6.28) |
| $\sigma(Sales_{i,q-11\sim i,q})$ | -4.119** | 0.268** | -4.085** |
| | (-2.38) | (2.09) | (-2.37) |
| $MF\_AvgAcc_{i,q}$ | 0.066*** | 0.001 | 0.066*** |
| | (4.48) | (1.00) | (4.49) |
| $InstituteOwn_{i,q}$ | -0.160 | -0.036*** | -0.165 |
| | (-1.31) | (-3.05) | (-1.34) |
| $Log(N\_Analyst_{i,q})$ | 0.142 | -0.027*** | 0.139 |

| | | | |
|---|---|---|---|
| | (1.44) | (-3.28) | (1.40) |
| *InvG-Score*$_{i,q}$ | -0.003 | -0.001 | -0.004 |
| | (-0.09) | (-0.19) | (-0.09) |
| *G-ScoreDum*$_{i,q}$ | -0.315 | 0.021 | -0.312 |
| | (-1.09) | (0.81) | (-1.08) |
| Constant | -2.639*** | 0.108** | -2.625*** |
| | (-4.06) | (1.97) | (-4.04) |
| *var*(e.*ROA*$_{i,q+1}$) | 4.367*** | 4.365*** | |
| | (18.12) | (18.13) | |
| *var*(e.*Inc_Ineff_Invest*$_{i,q+1}$) | | 0.138*** | |
| | | (55.93) | |
| Cluster SE | Firm | Firm | |
| *N* | 9,723 | 9,723 | |

**Panel B:** Change in return-on-assets through increase likelihood of over- and under-investing

| | (1) $Inc\_Over\_Invest_{i,q+1}$ | (2) $Inc\_Undr\_Invest_{i,q+1}$ | (3) $ROA_{i,q+1}$ |
|---|---|---|---|
| **$\Delta EconWeightDev_{i,q}$** | **0.0001*** ** | **0.0002*** ** | **-0.0010*** ** |
| | **(6.69)** | **(8.45)** | **(-6.00)** |
| **$Inc\_Over\_Invest_{i,q+1}$** | | | **-0.214** ** |
| | | | **(-2.53)** |
| **$Inc\_Undr\_Invest_{i,q+1}$** | | | **-0.063** |
| | | | **(-0.97)** |
| Control variables | | | |
| $Log(AT_{i,q})$ | -0.011*** | 0.020*** | 0.092* |
| | (-2.89) | (4.26) | (1.67) |
| $MTB_{i,q}$ | 0.002** | -0.002** | 0.044* |
| | (2.56) | (-2.16) | (1.83) |
| $PPE\_AT_{i,q}$ | 0.081*** | -0.124*** | 0.403 |
| | (3.21) | (-5.40) | (1.49) |
| $Age_{i,q}$ | -0.000 | -0.000 | -0.002 |
| | (-0.37) | (-0.58) | (-0.79) |
| $Dividend_{i,q}$ | -0.000 | -0.004 | 0.325*** |
| | (-0.01) | (-0.43) | (3.02) |
| $Debt\_AT_{i,q}$ | -0.088*** | 0.059 | -1.031*** |
| | (-2.73) | (1.61) | (-2.69) |
| $Ind\_Debt\_AT_{i,q}$ | 0.081 | -0.007 | 0.057 |
| | (1.45) | (-0.15) | (0.10) |
| $Cash\_PPE_{i,q}$ | -0.000 | -0.001 | 0.005 |
| | (-0.76) | (-1.55) | (0.68) |
| $Z\text{-}Score_{i,q}$ | -0.131*** | -0.014 | 2.043*** |
| | (-4.53) | (-0.49) | (5.12) |
| $CFO\_Sales_{i,q}$ | -0.016 | 0.079*** | 0.798*** |
| | (-1.51) | (3.82) | (4.85) |
| $OperateCycle_{i,q}$ | 0.011** | -0.002 | 0.204*** |
| | (2.21) | (-0.31) | (2.95) |
| $Loss_{i,q}$ | -0.018* | 0.012 | -2.430*** |
| | (-1.91) | (1.13) | (-16.29) |
| $\sigma(I_{i,q-11\sim i,q})$ | -0.001 | 0.000 | 0.006 |
| | (-1.58) | (0.23) | (1.22) |
| $\sigma(CFO_{i,q-11\sim i,q})$ | 0.309 | -0.086 | 19.712*** |
| | (1.64) | (-0.54) | (6.26) |
| $\sigma(Sales_{i,q-11\sim i,q})$ | 0.152 | 0.137 | -4.078** |
| | (1.12) | (1.07) | (-2.36) |
| $MF\_AvgAcc_{i,q}$ | 0.003** | -0.000 | 0.066*** |
| | (2.54) | (-0.38) | (4.53) |
| $InstituteOwn_{i,q}$ | -0.008 | -0.034*** | -0.164 |
| | (-0.76) | (-3.13) | (-1.34) |

| | | | |
|---|---|---|---|
| *Log(N_Analyst$_{i,q}$)* | 0.005 | -0.054*** | 0.140 |
| | (0.59) | (-5.73) | (1.40) |
| *InvG-Score$_{i,q}$* | -0.001 | -0.001 | -0.004 |
| | (-0.16) | (-0.43) | (-0.10) |
| *G-ScoreDum$_{i,q}$* | 0.003 | 0.025 | -0.312 |
| | (0.13) | (0.96) | (-1.08) |
| Constant | 0.103** | 0.099* | -2.610*** |
| | (2.10) | (1.90) | (-4.02) |
| *var*(e.*ROA$_{i,q+1}$*) | | 4.363*** | |
| | | (18.12) | |
| *var*(e.*Inc_Over_Invest$_{i,q+1}$*) | | 0.093*** | |
| | | (32.34) | |
| *var*(e.*Inc_Undr_Invest$_{i,q+1}$*) | | 0.098*** | |
| | | (34.22) | |
| Cluster SE | | Firm | |
| *N* | | 9,723 | |

**Note**: Column (1) of Table 4, Panel A, reports the results of regressing a firms' future return-on-assets on the change of managers' mis-weighting of economic factors. Column (2) and (3) in Panel A presents the results from estimating Equation System (6a) and (6b). Table 4, Panel B, reports the results from estimating Equation System (6) except that over- and under-investing are separately considered. The number of observations is smaller than that in the main sample since the first year of the sampling period is dropped for estimating the change variables. All regressions are estimated with clustered robust standard errors by firm. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. The estimation timeline is presented in Figure 1.2. All variables are defined in Appendix A.

**Table 5**: Market reaction to changes in managers' mis-weighting of economic factors

| **Panel A**: Stock price reaction to management earnings forecasts | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | $CAR[-1,1]_{i,q+1}$ | $BHAR[-1,60]_{i,q+1}$ | $BHAR[2,60]_{i,q+1}$ |
| $\Delta EconWeightDev_{i,q}$ | **0.012** | **-0.019*****| **-0.018***** |
| | **(1.64)** | **(-3.07)** | **(-3.74)** |
| Control variables | | | |
| $MF\_Surp_{i,q}$ | -0.078 | -0.057 | -0.040 |
| | (-0.18) | (-0.23) | (-0.16) |
| $MF\_Point_{i,q}$ | 1.391*** | 0.182 | 0.242 |
| | (2.77) | (0.20) | (0.27) |
| $MF\_Point_{i,q} \times MF\_Surp_{i,q}$ | 1.018* | -1.862* | -1.948* |
| | (1.75) | (-1.83) | (-1.92) |
| $MF\_AvgAcc_{i,q-1}$ | -0.149* | -0.537*** | -0.539*** |
| | (-1.94) | (-5.96) | (-5.91) |
| $MF\_AvgAcc_{i,q-1} \times MF\_Surp_{i,q}$ | 0.706** | -0.291** | -0.309** |
| | (2.00) | (-2.28) | (-2.26) |
| $MF\_Surp_{i,q} \times \lvert MF\_Surp_{i,q} \rvert$ | -0.002 | 0.001 | 0.001 |
| | (-1.60) | (1.18) | (1.07) |
| $EA\_Surp_{i,q}$ | 3.602*** | 1.065** | 1.037** |
| | (5.80) | (2.01) | (1.99) |
| $EA\_Loss_{i,q}$ | 0.657 | 1.256 | 1.196 |
| | (1.08) | (1.18) | (1.11) |
| $EA\_Loss_{i,q} \times EA\_Surp_{i,q}$ | -3.762*** | -0.800 | -0.803 |
| | (-5.69) | (-1.41) | (-1.43) |
| $EA\_Surp_{i,q} \times \lvert EA\_Surp_{i,q} \rvert$ | 0.004 | -0.005 | -0.005 |
| | (0.84) | (-1.31) | (-1.19) |
| $Log(AT_{i,q-1})$ | -2.094*** | -2.627*** | -2.566*** |
| | (-7.23) | (-5.71) | (-5.59) |
| $MTB_{i,q-1}$ | -0.166*** | -0.351*** | -0.354*** |
| | (-4.06) | (-5.60) | (-5.60) |
| Fixed Effects | Firm, Year-Quarter | Firm, Year-Quarter | Firm, Year-Quarter |
| Cluster SE | Firm, Year-Quarter | Firm, Year-Quarter | Firm, Year-Quarter |
| $N$ | 9,723 | 9,723 | 9,723 |
| $R^2$ | 0.094 | 0.017 | 0.017 |
| Adjusted $R^2$ | 0.092 | 0.016 | 0.016 |

| **Panel B**: Analyst forecast revisions following management earnings forecasts | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | $REV[0,2]_{i,q+1}$ | $REV[0,10]_{i,q+1}$ | $REV[0,30]_{i,q+1}$ |
| **$\Delta EconWeightDev_{i,q}$** | **-0.0002*** ** | **-0.0002*** ** | **-0.0002*** ** |
| | **(-2.74)** | **(-2.72)** | **(-2.90)** |
| Control variables | | | |
| $MF\_Surp_{i,q}$ | 0.902*** | 0.893*** | 0.892*** |
| | (26.75) | (26.02) | (26.22) |
| $MF\_Point_{i,q}$ | 0.013 | 0.009 | 0.009 |
| | (1.37) | (0.91) | (1.00) |
| $MF\_Point_{i,q} \times MF\_Surp_{i,q}$ | -0.063 | -0.028 | -0.030 |
| | (-1.20) | (-0.61) | (-0.64) |
| $MF\_AvgAcc_{i,q-1}$ | -0.004 | -0.003 | -0.003 |
| | (-1.56) | (-1.37) | (-1.15) |
| $MF\_AvgAcc_{i,q-1} \times MF\_Surp_{i,q}$ | -0.023* | -0.020 | -0.020 |
| | (-1.83) | (-1.61) | (-1.60) |
| $MF\_Surp_{i,q} \times \lvert MF\_Surp_{i,q} \rvert$ | 0.001** | 0.001** | 0.001** |
| | (2.29) | (2.51) | (2.53) |
| $EA\_Surp_{i,q}$ | 0.125*** | 0.120*** | 0.136*** |
| | (3.49) | (3.44) | (3.90) |
| $EA\_Loss_{i,q}$ | -0.001 | -0.013 | -0.013 |
| | (-0.03) | (-0.52) | (-0.54) |
| $EA\_Loss_{i,q} \times EA\_Surp_{i,q}$ | -0.048 | -0.046 | -0.059 |
| | (-0.87) | (-0.83) | (-1.09) |
| $EA\_Surp_{i,q} \times \lvert EA\_Surp_{i,q} \rvert$ | -0.001 | -0.002* | -0.002* |
| | (-1.29) | (-1.69) | (-1.71) |
| $Log(AT_{i,q-1})$ | -0.030*** | -0.024*** | -0.024*** |
| | (-3.47) | (-2.81) | (-2.80) |
| $MTB_{i,q-1}$ | 0.002*** | 0.002*** | 0.002*** |
| | (3.79) | (3.72) | (3.76) |
| Fixed Effects | Analyst-Firm, Year-Quarter | Analyst-Firm, Year-Quarter | Analyst-Firm, Year-Quarter |
| Cluster SE | Analyst-Firm, Year-Quarter | Analyst-Firm, Year-Quarter | Analyst-Firm, Year-Quarter |
| $N$ | 85,284 | 91,429 | 93,466 |
| $R^2$ | 0.922 | 0.899 | 0.899 |
| Adjusted $R^2$ | 0.922 | 0.899 | 0.899 |

**Note**: Table 5 presents the results of ordinary least squares (OLS) estimation of Equation (7). Panel A reports the results for stock market price reaction with Column (1), (2) and (3) presenting the [-1,1], [-1,60], and [2,60] trading-day window centered at the management guidance announcement date (day 0), respectively. The number of observations is smaller than that in the main sample since the first year of the sampling period is dropped for estimating the change variables. Panel B reports the results for individual analyst revisions with Column (1), (2) and (3) presenting the [0,2], [0,10], and [0,30] calendar-day window centered at the management guidance announcement date (day 0). The numbers of observations differ in each column since only analysts who revised during the specified window are included. All regressions in Table 5 are estimated with firm and year-quarter fixed effects and two-way clustered robust standard errors by firm and by year-quarter. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. The estimation timeline is presented in Figure 1.2. All variables are defined in Appendix A.

**Table 6**: Controls for managers' mis-weighting of firm-specific factors

| **Panel A**: Unconditional effects of managers' mis-weighting of economic factors | | | |
|---|---|---|---|
| | (1) | (2) | |
| | $Ineff\_Invest_{i,q+1}$ | $InvestGrp_{i,q+1}$ | |
| | | Under-Invest | Over-Invest |
| ***Abs(EconWeight$_{i,q}$)*** | **0.021*** ** | **0.024*** | **0.022*** |
| | **(2.15)** | **(1.90)** | **(1.79)** |
| **Marginal Effect** | **0.005** | **0.003** | **0.003** |
| *Abs(FirmWeight$_{i,q}$)* | -0.000 | 0.011 | -0.009 |
| | (-0.01) | (0.91) | (-0.82) |
| Marginal Effect | -0.000 | 0.002 | -0.002 |
| Controls | Included | Included | |
| Cluster SE | Firm | Firm | |
| *N* | 10,896 | 10,896 | |
| *Pseudo $R^2$* | 0.021 | 0.057 | |

| **Panel B**: Conditional effects of managers' mis-weighting of economic factors | |
|---|---|
| | (1) |
| | $Investment_{i,q+1}$ |
| *EconWeight$_{i,q}$* | 0.026 |
| | (0.91) |
| ***EconWeight$_{i,q}$×EconUp$_{i,q+1}$*** | **0.114*** |
| | **(1.92)** |
| ***EconWeight$_{i,q}$×EconDown$_{i,q+1}$*** | **-0.068*** |
| | **(-1.84)** |
| *FirmWeight$_{i,q}$* | -0.004 |
| | (-0.15) |
| *FirmWeight$_{i,q}$×EconUp$_{i,q+1}$* | 0.095* |
| | (1.70) |
| *FirmWeight$_{i,q}$×EconDown$_{i,q+1}$* | 0.005 |
| | (0.14) |
| Controls | Included |
| Fixed Effects | Industry, Year-Quarter |
| Cluster SE | Firm, Year-Quarter |
| *N* | 10,896 |
| $R^2$ | 0.358 |
| Adjusted $R^2$ | 0.352 |

**Note**: Table 6, Panel A, presents the results of logistic and multinomial logistic estimation of Equation (4) and (4)' with managers' mis-weighting of firm-specific factors, i.e., $Abs(FirmWeight_{i,q})$. Standard errors are clustered by firm. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. The estimation timeline is presented in Figure 1.1. All variables are defined in Appendix A.

Table 6, Panel B, presents the results of ordinary least squares (OLS) estimation of Equation (5) with managers' mis-weighting of firm-specific factors, i.e., $Abs(FirmWeight_{i,q})$. The regression is estimated with industry and year-quarter fixed effects and two-way clustered robust standard errors by firm and by year-quarter. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. The estimation timeline is presented in Figure 1.1. All variables are defined in Appendix A.

**Table 7**: Other proxies for managers' use of economic information

| **Panel A**: Information content of management earnings forecasts (Bonsall et al. 2013) | | | |
|---|---|---|---|
| | (1) | (2) | |
| | *Ineff_Invest*$_{i,q+1}$ | *InvestGrp*$_{i,q+1}$ | |
| | | Under-Invest | Over-Invest |
| ***InfContent_BBF*$_{i,q}$** | **0.055*** ** | **0.057*** ** | **0.050*** ** |
| | **(4.11)** | **(3.29)** | **(3.07)** |
| **Marginal Effect** | 0.014 | **0.007** | **0.006** |
| Controls | Included | Included | |
| Cluster SE | Firm | Firm | |
| *N* | 10,896 | 10,896 | |
| *Pseudo* $R^2$ | 0.023 | 0.058 | |

| **Panel B**: Quality of managers' economic information | | | |
|---|---|---|---|
| | (1) | (2) | |
| | *Ineff_Invest*$_{i,q+1}$ | *InvestGrp*$_{i,q+1}$ | |
| | | Under-Invest | Over-Invest |
| ***EconInf*$_{i,q}$** | **-0.026*** | **-0.006** | **-0.047*** ** |
| | **(-1.91)** | **(-0.29)** | **(-2.93)** |
| **Marginal Effect** | **-0.007** | **0.002** | **-0.008** |
| *FirmInf*$_{i,q}$ | -0.032*** | -0.041** | -0.027* |
| | (-2.66) | (-2.57) | (-1.79) |
| Marginal Effect | -0.008 | -0.006 | -0.003 |
| Controls | Included | Included | |
| Cluster SE | Firm | Firm | |
| *N* | 10,896 | 10,896 | |
| *Pseudo* $R^2$ | 0.022 | 0.058 | |

**Note**: Table 7, Panel A, presents the results of logistic and multinomial logistic estimation of Equation (4) and (4)' with a measure for the information content of management earnings forecasts relative to that of the actual earnings, i.e., *InfContent_BBF*$_{i,q}$. Table 7, Panel B, presents the results of the logistic and multinomial logistic estimation of Equation (4) and (4)' with measures for the quality of managers' economic information, i.e., *EconInf*$_{i,q}$, and the quality of their firm-specific information, i.e., *FirmInf*$_{i,q}$. Standard errors are clustered by firm. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. All variables are defined in Appendix A.

**Table 8**: Predictivity of managers' mis-assessment of economic factors for future forecast accuracy

| | (1) | (2) | (2) |
|---|---|---|---|
| | *Forecast_ Accuracy$_{i,q+1}$* | *Forecast_ Accuracy$_{i,q+1}$* | *Forecast_ Accuracy$_{i,q+1}$* |
| ***Abs(EconWeight$_{i,q}$) (Unranked)*** | **-0.000 (-0.08)** | **-0.002 (-0.85)** | **-0.001 (-0.84)** |
| *MF_AvgAcc$_{i,q}$* | | -7.795 (-0.93) | -7.801 (-0.93) |
| *Log(AT$_{i,q}$)* | | | 0.009 (0.84) |
| *MTB$_{i,q}$* | | | 0.002 (1.19) |
| *Age$_{i,q}$* | | | -0.001 (-0.87) |
| *Dividend$_{i,q}$* | | | 0.010 (1.02) |
| *Loss$_{i,q}$* | | | -0.016 (-1.14) |
| *Log(N_Analyst$_{i,q}$)* | | | 0.000 (0.17) |
| *InstituteOwn$_{i,q}$* | | | 0.008 (0.83) |
| Fixed Effects | Firm, Year-Quarter | Firm, Year-Quarter | Firm, Year-Quarter |
| Cluster SE | Firm, Year-Quarter | Firm, Year-Quarter | Firm, Year-Quarter |
| *N* | 10,896 | 10,896 | 10,896 |
| $R^2$ | 0.107 | 0.115 | 0.115 |
| Adjusted $R^2$ | 0.106 | 0.114 | 0.114 |

**Note**: Table 8 presents the results of regressing future period's forecasting accuracy on managers' mis-weighting of economic factors. Column (1) to (3) report the results with different sets of control variables. All columns are estimated with industry and year-quarter fixed effects and two-way clustered robust standard errors by firm and by year-quarter. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. All variables are defined in Appendix A.

**Table 9**: CEO's influence on mis-assessment of economic factors

| **Panel A**: CEO's managerial ability and mis-assessment of economic factors | |
|---|---|
| | (1) |
| | $Abs(EconWeight_{i,q})$ |
| ***CEO_Ability*** | **-4.585*** |
| | **(-1.82)** |
| $Log(CEO\_Tenure_q)$ | 11.172 |
| | (1.65) |
| *CEO_Ability* × | |
| $Log(CEO\_Tenure_q)$ | 1.941* |
| | (1.89) |
| Control variables | |
| $Log(AT_{i,q})$ | -0.771 |
| | (-0.68) |
| $MTB_{i,q}$ | 0.425 |
| | (1.54) |
| $PPE\_AT_{i,q}$ | -4.926 |
| | (-0.49) |
| $Age_{i,q}$ | 0.209* |
| | (1.88) |
| $Dividend_{i,q}$ | 3.369 |
| | (1.31) |
| $Debt\_AT_{i,q}$ | 8.942 |
| | (0.96) |
| $Ind\_Debt\_AT_{i,q}$ | -45.969*** |
| | (-3.71) |
| $Cash\_PPE_{i,q}$ | -0.353 |
| | (-0.27) |
| $Z\text{-}Score_{i,q}$ | -7.971 |
| | (-1.17) |
| $CFO\_Sales_{i,q}$ | 3.106** |
| | (2.13) |
| $OperateCycle_{i,q}$ | -1.081 |
| | (-0.44) |
| $Loss_{i,q}$ | -0.882 |
| | (-1.28) |
| $\sigma(I_{i,q\text{-}11\sim i,q})$ | 0.007 |
| | (0.01) |
| $\sigma(CFO_{i,q\text{-}11\sim i,q})$ | 5.046 |
| | (0.22) |
| $\sigma(Sales_{i,q\text{-}11\sim i,q})$ | -15.721 |
| | (-0.49) |
| $MF\_AvgAcc_{i,q}$ | 0.013 |
| | (0.10) |
| $InstituteOwn_{i,q}$ | -0.132 |

| | |
|---|---|
| | (-0.14) |
| *Log(N_Analyst$_{i,q}$)* | -0.639 |
| | (-0.42) |
| *InvG-Score$_{i,q}$* | 0.512 |
| | (0.55) |
| *G-ScoreDum$_{i,q}$* | -4.281 |
| | (-0.57) |
| Constant | -9.212 |
| | (-0.38) |
| *N* | 66 |
| $R^2$ | 0.518 |
| Adjusted $R^2$ | 0.254 |

| **Panel B**: CEO's tenure and inefficient investing | | |
|---|---|---|
| | CEO tenure < 12 quarters | CEO tenure ≥ 12 quarters |
| | (1) | (2) |
| | *Ineff_Invest$_{i,q+1}$* | *Ineff_Invest$_{i,q+1}$* |
| ***Abs(EconWeight$_{i,q}$)*** | **0.022** | **0.020*** |
| | **(0.83)** | **(1.90)** |
| **Marginal Effect** | **0.005** | **0.020** |
| Controls | Included | Included |
| Cluster SE | Firm | Firm |
| *N* | 1,338 | 9,561 |
| *Pseudo* $R^2$ | 0.049 | 0.020 |
| | 1st quarter of CEO tenure | 12th quarter of CEO tenure |
| | (3) | (4) |
| | *Ineff_Invest$_{i,q+1}$* | *Ineff_Invest$_{i,q+1}$* |
| ***Abs(EconWeight$_{i,q}$)*** | **-0.035** | **0.160**** |
| | **(-0.48)** | **(1.99)** |
| **Marginal Effect** | **-0.009** | **0.040** |
| Controls | Included | Included |
| Cluster SE | Firm | Firm |
| *N* | 133 | 110 |
| *Pseudo* $R^2$ | 0.106 | 0.195 |

**Note**: Table 9, Panel A, presents the results of regressing managers' mis-weighting of economic factors on the CEO's managerial ability. Panel B reports the results of estimating Equation (4) with subsamples with different CEO tenure. All columns in Panel B are estimated with clustered robust standard errors by firm. *t*-statistics are reported in parentheses. *, **, and *** denote significance levels (two-sided) of 10%, 5%, and 1%, respectively. All variables are defined in Appendix A.