CEOs overconfidence and investor sentiment

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Abstract

We analyze firms' investment decisions in a world where both managers and investors are affected by sentiment. In equilibrium, we show that higher managerial optimism leads to an increase in employment growth, especially in times of low investor sentiment. If managers are initially overcautious, however, this mechanism is value-enhancing for the firm. Using data on U.S. publicly traded companies, we find strong support for the model's predictions. We also show that the stock market does not correctly price managerial optimism, which generates profitable investment opportunities.

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1. Introduction

There are two seemingly contradictory frameworks in corporate finance. On the one hand, the primary source of irrationality seems to be on the investor side, which leads rational managers to maximize the short-term share price (Chirinko and Schaller, 2001; Baker, Stein, and Wurgler, 2003; Bolton, Scheinkman, and Xiong, 2006; Polk and Sapienza, 2009). On the other hand, however, managers can be overconfident, and then get punished by a rational capital market for destroying firm value (Malmendier and Tate, 2005; Brown and Sarma, 2007; Malmendier and Tate, 2008).

These two approaches take very different views about the role and quality of managers (Baker, Ruback, and Wurgler, 2004; Baker and Wurgler, 2011). When investors are prone to sentiment, managers should be insulated to achieve the flexibility necessary to make decisions that may be unpopular in the marketplace. If managers are overconfident, instead, they should be obligated to respond to market price signals. The stark contrast between the normative implications of these two approaches indicates that more work in the area is needed, possibly through a model that...
features both managerial and investor sentiment (Baker, Ruback, and Wurgler, 2004).

On the theoretical side, the main hurdle is to distinguish between overconfidence and agency issues (Baker and Wurgler, 2011). In Stein (2003), an empire-building manager will consider $(1 + \gamma)f(K)$ rather than $f(K)$ alone, which reflects the preference for the private benefits that come with presiding over a larger firm (Jensen and Meckling, 1976; Grossman and Hart, 1988), rather than optimism. However, this specification is essentially identical to the objective function of an optimistic manager. To test the behavioral theories, then, one must separate the $\gamma$ related to overconfidence and optimism from the $\gamma$ that arises from agency issues.

Building on the moral hazard model of Pagano and Pica (2012), we tease out these two stories. We analyze firms’ investment decisions in a world where both managers and investors are affected by sentiment. In equilibrium, we show that higher managerial optimism leads to an increase in employment growth, and the effect is particularly strong in times of low investor sentiment. This is because in the presence of optimistic investors, the firm receives additional funding and hires more workers. If, on top of that, the manager is also overconfident, he will face a higher wage than in the case where investor sentiment is low, which implies a smaller marginal effect of managerial sentiment on employment.

We also show that managerial optimism is not necessarily detrimental to shareholders. If managers are initially overcautious, an increase in optimism is actually value-enhancing for the firm. Ultimately, this mechanism should also affect the returns on the company stock. If the manager’s type is unobservable ex-ante, stock returns should be higher for firms run by value-enhancing optimistic managers, who would then surprise the market with the positive impact of their investment policies.

To test these hypotheses, we consider data on U.S. publicly traded companies. In particular, we follow Malmendier and Tate (2005) and primarily define an optimistic manager as one who fails to exercise a five-year-old option that is at least 67% in-the-money in the fifth year. The intuition is that it should be optimal for the CEO to have exercised at least some portion of the package during or before the fifth year.

We acknowledge the fact that in 2006 the U.S. Securities and Exchange Commission (SEC) modified the disclosure requirements for executive compensation and stock ownership. In particular, the ruling’s aim was to hinder managers’ self-interested actions by mitigating the information asymmetry between investors and managers. In light of this consideration, we restrict our sample to the period from 2007 through 2016.

The results lend strong support to the model’s predictions. We show that higher managerial sentiment is positively associated with employment growth. The results are robust to the inclusion of standard predictors such as cash flow and Tobin’s $q$, and to a variety of fixed effects and clustering specifications. We also find that the effect is indeed inversely related to Baker and Wurgler’s...
measure of investor sentiment. Interestingly, higher managerial sentiment is positively associated with the rate of growth of sales and earnings. This indicates that optimistic managers seem to run their firms better. Consistent with this interpretation, we find that the companies run by such managers earn positive risk-adjusted stock returns, and therefore generate profitable trading strategies.

This present work makes a number of contributions. To the best of our knowledge, this is the first paper that analyzes the interplay between managerial and investor sentiment, following the suggestion from Baker, Ruback, and Wurgler (2004). In particular, our focus on employment complements the results from Malmendier and Tate (2005), and adds new insights to the literature on finance and labor (Pagano and Pica, 2012; MacLean and Zhao, 2014; Benmelech, Bergman, and Seru, 2015).

The findings also speak to the literature on the underpricing of intangibles, such as employee satisfaction (Edmans, 2011), R&D expenditures (Lev and Sougiannis, 1996; Chan, Lakonishok, and Sougiannis, 2001), advertising (Chan, Lakonishok, and Sougiannis, 2001), patent citations (Deng, Lev, and Narin, 1999), and software development costs (Aboody and Lev, 1998). In this paper, we find a similar empirical pattern for companies run by optimistic managers. The results, then, lend support to the idea that the market does not price managerial skills correctly (Mueller, Ouimet, and Simintzi, 2017).

In what follows, we introduce the model first, and then the empirical strategy.

2. The model

We consider the economy from Pagano and Pica (2012), where a manager-entrepreneur with initial wealth $A$ needs to fund a project. However, we introduce two differences. First, the project is risky and can fail with probability $\pi$. Second, we replace the banking sector with a stock market. The manager, then, launches an IPO to fund the project.

Upon receiving external funding, the manager hires workers and starts production. Workers, as insiders, can observe the firm’s cash flow, but shareholders cannot, which creates a moral hazard problem. In particular, the manager can appropriate a fraction $1 - \lambda$ of the firm’s operating profits. Therefore, $\lambda$ can be thought of as a measure of the quality of governance of the firm.

Production is stochastic, and depends on the parameter $\tilde{\theta}$, which represents the profitability of the project. Without loss of generality, we consider a binary outcome, where profitability is equal to $\theta$ with probability $1 - \pi$, and zero with probability $\pi$, so that the expected value is $\bar{\theta} \equiv (1 - \pi)\theta$. The manager, however, estimates the firm’s probability of default as $\pi_m$. If $\pi_m < \pi$, he exhibits

\footnote{Note that the arguments that follow would hold for SEOs as well, but we use the IPO setting for ease of exposition.}
overconfidence.

If the project is profitable, the manager pays workers, extracts private benefits, and leaves the remainder to shareholders. In particular, the revenues of the representative firm are generated by the Cobb-Douglas production function

\[ \hat{y} = \hat{\theta}K^{1-\alpha}L^\alpha, \]  

(1)

where \( K \) is the firm’s capital, given by the sum of the manager’s initial wealth \( A \) and the amount of equity funding \( F \), and \( L \) is the labor demand of the firm. To maximize his expected private benefits, the manager solves:

\[ \max_L E(\hat{y} - wL) = (1 - \lambda) \left( E(\hat{y}) - wL \right), \]

(2)

subject to the participation constraint \( E(\hat{y}) \geq A \), where \( w \) represents workers’ wage in a perfectly competitive labor market. The first-order condition yields the manager’s optimal choice of labor, as a function of capital, wages, and the expected profitability of the project:

\[ \hat{L} = \left( \frac{\alpha}{w} \theta(1 - \pi_m) \right)^{\frac{1}{1-\alpha}} K, \]

(3)

Therefore, managerial sentiment can be defined as the ratio between biased and first-best labor demand:

\[ S_m = \left( \frac{1 - \pi_m}{1 - \pi} \right)^{\frac{1}{1-\alpha}}, \]

(4)

where \( S_m > 1 \) (\( S_m < 1 \)) identifies positive (negative) sentiment. In turn, the manager’s expected private benefits are:

\[ E(\hat{B}) = (1 - \lambda) \left( E(\hat{y}(\hat{L})) - w\hat{L} \right) = (1 - \lambda)\phi_m K, \]

(5)

where

\[ \phi_m \equiv \left( \frac{1 - \pi}{1 - \pi_m} - \alpha \right) \left( ((1 - \pi_m)\theta)^{\frac{1}{1-\pi}} \left( \frac{\alpha}{w} \right)^{\frac{1}{1-\pi_m}} \right) \]

(6)

represents the profit per dollar invested. Note that the complement to Eq. (5) represents pledgeable income, i.e., expected cash flow to external financiers:

\[ E(\hat{\nu}) = \lambda\phi_m K. \]

(7)

Hence the capacity of the firm to rely on external finance increases with the profitability of the project. Note that the cash flow to equity is positive as long as managerial optimism is below the following threshold:

\[ 1 - \pi_m < \frac{1}{\alpha}(1 - \pi). \]

(8)

In particular, the expected payment to external financiers varies with the manager’s bias as follows:

\[ \frac{\partial E(\hat{\nu})}{\partial \pi_m} \propto (1 - \pi_m)^{\frac{\alpha}{1-\alpha}} \frac{\alpha}{1 - \alpha} \frac{1}{1 - \pi_m} (\pi - \pi_m), \]

(9)

that is, when the manager is optimistic \((\pi - \pi_m > 0)\), an increase in his estimate of the probability of default is value-enhancing for the firm, in that it reduces the optimism bias.

Investors are risk-neutral and can be either arbitrageurs or noise traders, whose populations
are of mass $\delta$ and $1 - \delta$ respectively. The difference between these two groups is that arbitrageurs know the exact probability of default of the project, whereas noise traders estimate it with a bias, i.e., $\pi_0 \neq \pi$. Neither class of investors, however, can observe the manager’s estimate of $\pi$, but they know that on average it is correct, i.e., $E(\pi_m) = \pi$.

We consider a stock market from Hong and Sraer (2013), in which investor $j$ solves:

$$\max_{n_j} n_j (\bar{v}_j - p) - \frac{1}{2} \frac{n_j^2}{\gamma},$$

where $n_j$ is the number of shares traded by investor $j$, $\gamma$ captures transaction cost, $p_1$ is the stock price, and $E_j(\bar{v})$ is investor $j$’s subjective evaluation of the firm’s cash flow from Eq. (7), which is equal to $\bar{v}(\pi)$ for arbitrageurs and $\bar{v}(\pi_0)$ for noise traders. Note that the ratio between these two evaluations reduces to:

$$S_0 = \frac{\bar{v}(\pi_0)}{\bar{v}(\pi)} \equiv \frac{(1 - \pi_0)^{1 - \alpha}}{(1 - \pi)^{1 - \alpha}},$$

which can be thought of as a measure of investor sentiment, where a ratio greater (less) than one implies an upward (downward) bias in the probability of survival of the firm.

The first-order condition yields the optimal stock demand for investor $j$:

$$n_j^* = \gamma(\bar{v}_j - p).$$

Given stock supply $q$, the equilibrium price is:

$$p^* = (1 + \delta(S_0 - 1))\bar{v} - \frac{q}{\gamma}.$$  

Therefore, a positive bias in noise traders’ evaluations also inflates the equilibrium price. Since $F = qp^*$, and $\bar{v} = \lambda \phi K$, then the firm’s equilibrium level of capital is:

$$K^* = \frac{A - \frac{q^2}{\gamma}}{1 - q\lambda \phi(1 + \delta(S_0 - 1))},$$

which, in turn, determines the firm’s demand for labor:

$$\hat{L}(K^*) = \left(\frac{\alpha}{w} \theta(1 - \pi_m)\right)^{1 - \alpha} \frac{A - \frac{q^2}{\gamma}}{1 - q\lambda \phi(1 + \delta(S_0 - 1))},$$

or, using the definition of managerial sentiment from Eq. (4):

$$\hat{L}(K^*) = S_m \left(\frac{\alpha}{w} \theta(1 - \pi)\right)^{1 - \alpha} \frac{A - \frac{q^2}{\gamma}}{1 - q\lambda \phi(1 + \delta(S_0 - 1))},$$

Therefore, positive managerial sentiment ($S_m > 1$) leads the firm to seek an employment level above the first-best, while negative sentiment ($S_m < 1$) leads to the opposite effect. This mechanism has an important consequence in the labor market, as

**Proposition 1.** Higher managerial sentiment increases the equilibrium rate of employment growth:

$$\frac{dL^* S_m}{dS_m L^*} \left[1 + \frac{1}{1 - \alpha} \left(1 + \alpha \frac{q\lambda \phi(1 + \delta(S_0 - 1))}{1 - q\lambda \phi(1 + \delta(S_0 - 1))}\right)\right] > 0,$$

Note that a type of transaction cost that is characterized by a convex function is the bid-ask spread, as larger trades are typically associated with more unfavorable price movements.
where $\epsilon$ is the elasticity of labor supply, which we model as a generic upward-sloping function of wages, as in Pagano and Pica (2012).

Note that the effect is decreasing in the quality of corporate governance $\lambda$, the profitability of the project $\phi$, the proportion $\delta$ of noise traders in the market, and investor sentiment $S_0$. This is because when these parameters are high, the firm receives more funding and hires more workers. If, on top of that, the manager is also overconfident, he will face a higher wage than in the case where such parameters are low, which implies a smaller effect of managerial sentiment on employment. This mechanism decreases with the elasticity of labor, and completely disappears when labor supply is infinitely elastic ($\epsilon = \infty$).

The effect is similar for wages:

**Proposition 2.** Higher managerial sentiment increases the equilibrium rate of real wages growth:

$$\frac{dw^*}{dS_m} w^* = \frac{1}{\epsilon + \frac{1}{1-\alpha} \left( 1 + \alpha \frac{q \lambda \phi (1 + \delta(S_0 - 1))}{1-q \lambda \phi (1 + \delta(S_0 - 1))} \right)} > 0,$$

except that the magnitude is inversely related to the elasticity of labor supply.

On the other hand, investor sentiment also affects labor as follows:

**Proposition 3.** Higher investor sentiment increases the equilibrium rate of employment growth:

$$\frac{dL^*}{dS_0} S_0 = \frac{q \lambda \phi S_0}{1 - q \lambda \phi (1 + \delta(S_0 - 1)) + \frac{1}{1-\alpha} \left( 1 - (1-\alpha)q \lambda \phi (1 + \delta(S_0 - 1)) \right)} > 0.$$

Note that, unlike with managerial sentiment, the effect is increasing in the quality of corporate governance $\lambda$, the profitability of the project $\phi$, and the proportion $\delta$ of noise traders in the market. This is because when these parameters are high, the firm receives more equity funding, which amplifies the impact of investor sentiment on its operations. This mechanism is at work even when labor supply is infinitely elastic, because the benefits of cheaper capital hold regardless of the level of wages.

Much like investor sentiment, managerial overconfidence should also have an effect on the company’s stock price. To look into this, we follow Chen et al. (2002), and define returns as the difference between the fundamental value of the firm and the current stock price:

$$\bar{r} \equiv \bar{v} - p^* = \frac{q}{\gamma} + \lambda(\phi_m - \phi S_0) \frac{A - \frac{q^2}{\gamma}}{1 - q \lambda \phi (1 + \delta(S_0 - 1))}.$$  

which implies

**Proposition 4.** Managerial overconfidence is followed by lower stock returns:

$$\frac{d\bar{r}}{dS_m} = \frac{\partial \phi_m}{\partial S_m} \frac{A - \frac{q^2}{\gamma}}{1 - q \lambda \phi (1 + \delta(S_0 - 1))} < 0.$$  

as an increase in managerial sentiment decreases the profitability of the project, but the investors only learn about it after the investment has been made.
2.1. Testable implications

Using Propositions 1, 2, and 3 above, we derive the following three hypotheses on labor:

**Hypothesis 1** Higher managerial sentiment leads to an increase in employment growth.

**Hypothesis 2** Higher managerial sentiment leads to an increase in real wages growth.

**Hypothesis 3** Higher investor sentiment leads to an increase in employment growth.

In particular, we derive the following cross-sectional predictions:

**Hypothesis 4** In companies with better corporate governance, the effect of managerial (investor) sentiment becomes less (more) pronounced.

**Hypothesis 5** In companies with higher profitability, the effect of managerial (investor) sentiment becomes less (more) pronounced.

**Hypothesis 6** In companies whose stocks exhibit higher noise trader demand, the effect of managerial (investor) sentiment becomes less (more) pronounced.

Finally, from Proposition 4 we derive

**Hypothesis 7** Stocks of companies with overconfident managers exhibit negative risk-adjusted returns.

In the empirical analysis, we take these predictions to the data.

3. Methodology

To test Hypotheses 1 to 3, we run a modified version of the regression equation from Malmandier and Tate (2005):

\[ y_{it} = \beta_0 + \beta_1 q_{it-1} + \beta_2 C_{it} + \beta_3 \Delta_{it} + \beta_4 C_{it} \Delta_{it} + \beta_5 C_{it} S_t + \delta Z_{it} + \epsilon_{it}, \]  

(22)

where the dependent variable is employment growth, real wages growth, or investments scaled by assets; \( q_{it-1} \) is Tobin’s q, lagged one year; \( C_{it} \) if the firm’s cash flow; \( \Delta_{it} \) is managerial overconfidence, defined as in Malmandier and Tate (2005); \( S_t \) is Baker and Wurgler’s index of investor sentiment; and \( Z_{it} \) is a vector of controls.

To test Hypotheses 4 to 6, we split our sample into firms with high and low corporate corporate governance, high and low profitability, and high and low noise trader shareholder base respectively, and re-estimate Eq. (22) in each subsample.

In particular, we define opaqueness in two ways: (1) the degree of dominance of the CEO within the firm; (2) the degree of transparency of the firm, defined as either R&D expenses over
price or as the cash flow problem measure from Lang et al. (1991). The former can be thought of as a measure of entrenchment. The latter, instead, captures the fact that it is easier for the CEO to extract private benefits from an opaque firm, other things being equal.

To test Hypothesis 7, we estimate Carhart’s (1997) four-factor model:

$$R_{it} = \alpha_i + \beta_i MKT_t + s_i SMB_t + h_i HML_t + u_i UMD_t + \epsilon_{it},$$

(23)

where $R_{it}$ is the returns on a portfolio of stocks with overconfident CEOs, and the regressors are the market, size, book-to-market, and momentum factor respectively. The model’s predictions imply $\alpha < 0$.

In robustness checks, we also estimate the following panel regressions:

$$R_{it} = \beta_0 + \beta_1 d_{it-1} + \delta Z_{it} + \epsilon_{it},$$

(24)

where $R_{it}$ is the return on stock $i$ in month $t$; $d_{it-1}$ is a dummy variable that takes on value one if the CEO of company $i$ in the previous year is overconfident; and $Z_{it}$ is a vector of firm characteristics from Brennan et al. (1998), which includes: size, defined as the log of market capitalization at the end of month $t - 2$; the log of the book-to-market ratio, calculated each July and held constant through the following June; the ratio of dividends in the previous fiscal year to market value at calendar year-end, calculated each July and held constant through the following June; the log of cumulative returns over months $t - 3$ through $t - 2$, months $t - 6$ through $t - 4$, and months $t - 12$ through $t - 7$; the log of the dollar volume of trading in the stock in month $t - 2$; the log of the stock price at the end of month $t - 2$. In this specification, the model’s predictions imply $\beta_1 < 0$. 