Optimal Bank Interest Margin and Shareholder Interest Conflicts under CEO Overconfidence: A Constrained Option-Pricing Model

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Abstract: Less is known about how equity returns allocated between current and new shareholders are altered to react to chief executive officer (CEO) overconfidence. This paper uses a nonlinear constrained contingent claim methodology of Black and Scholes (1973) and Merton (1974) to explore interest conflicts between current and new shareholders when an overconfident bank CEO overestimates returns on investment projects, and sequentially raises too much in external funds when internal resources become scarce. We show that low levels of bank interest margins or equity returns, which decrease the claims of current shareholders, are associated with investment distortions; but high levels of bank equity returns, which dilute the claims of current shareholders, are associated with external financing distortion.

Key-words: CEO Overconfidence, Bank Margin, Call Pricing

1 Introduction

Although considerable research effort has been put toward modeling investment distortions for the purpose of explaining the misalignment of managerial and shareholders interests, [1] little attention has been paid to the effects of investment distortions on interest conflicts between current and new shareholders due to chief executive officer (CEO) multiple overconfidence. Heaton (2002) first showed that common distortions in investment may be the result of managers overestimating the returns to their investment. We expand on Heaton's (2002) insight in two ways. First, we model the managerial decisions of a bank CEO who overestimates returns to investment and then raise too much in external funds. Second, what are the consequences of such behavior on equity returns are allocated between current and new shareholders in the bank?

The banking industry provides an excellent setting for the study of interest conflicts among stakeholders and shareholders in the banking deregulation environment. While all firms may face potential conflicts of interests, the situation is exacerbated in banking due to the nature of the industry. The existence of deposit insurance, high debt-to-equity

[1] For example, see Jensen and Meckling (1976), and Malmendier and Tate (2005), among others.
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ratios, and asset-liability issues, among others, may lead to greater conflicts (Becher, Campbell, and Frye, 2005).
Uncertain environments tend to exacerbate overconfidence (Hayward, Shepherd, and Griffin, 2006), and biased decision-making is exacerbated by uncertainty (Chen, Greene, and Crick, 1998). The changing regulatory environment of the banking industry in the 1990s altered the structure of banks by removing barriers and increasing the investment opportunity set of banks. However, for example, Deyoung and Roland (2001) find that commercial bank earnings grow more volatile as banks tilt their product mixes away from traditional intermediation activities and toward fee-based activities, after a banking deregulation. The banking setting may be characterized by many of the environmental factors that increase overconfidence and biased decision-making, especially uncertainty.

Changes in CEO overconfidence in investment decisions (the misalignment of managerial and shareholders interests) and decisions on issuing new shares (asymmetric information between bank insiders and the new shareholders) can affect bank margins and investment levels, and thus bank profits. The purpose of this paper is to propose a constrained option-based model that demonstrates the effect of managerial overconfidence on bank liquidity management.

The results show that increased investment distortion with strong overconfidence causes weak bank equity returns. However, increased external financing distortion, resulting from overconfidence, causes greatly increased returns, which in turn dilute the claims of current shareholders when external funds and investments are not perfectly correlated. Our results imply that CEO overconfidence may not harm new shareholders, but does harm the current shareholders. This result implies that overconfident CEOs can send potential benefits to outsiders at the expense of bank insiders.

Our theory of bank CEO overconfidence is related to four strands of literature. This first is literature on the definition of overconfidence. In extensive research, overconfidence has been defined as occurring when individuals overestimate the accuracy of their predictions (Simon and Houghton, 2003), over-valuate their ability to learn about a project (Gervais, Heaton, and Odean, 2005), or have positive optimistic biases about their future prospects (Odean, 1998, Malmendier and Tate, 2005). Overconfidence is greater for challenging judgment tasks, and individuals tend to be more overconfident when feedback on their information or decisions is deferred or inconclusive (Griffin and Tversky, 1992). In this paper, overconfidence is defined as excessive confidence in relation to investment-cash flow sensitivity under multiple sources of overconfidence. This is a broader definition that has been used in other research that focuses on a specific aspect of overconfidence (Forbes, 2005, Malmendier and Tate, 2005). The banking industry provides a setting for the study of multiple sources of overconfidence since there is a synergy between lending investment supply and cash inflow demand when banks function as liquidity providers (Kashyap, Rajan, and Stein, 2002).

The second strand is literature on the overconfidence measurement, which has varied among studies. Overconfidence in prediction occurs when the respondent's confidence in his/her answers exceeds the accuracy of his/her answers. Busenitz and Barney (1997), and Forbes (2005) measure overconfidence by comparing the accuracy of answers to difficult general-knowledge questions to reported confidence level. Simon and Houghton (2003) measure the overconfidence of CEOs as the difference between the

ex-ante certainties of achieving success for product introduction related tasks and the ex-post success in achieving each of these tasks. Lowe and Ziedonis (2006) operationalize differences in overconfidence exhibited in managers through a dichotomy of businesses that are entrepreneurial startups versus established firms. Malmendier and Tate (2005) infer confidence from personal portfolio decisions of CEOs, whereby overconfident CEOs have greater personal exposure to company-specific risk through holding options longer than required or buying additional company stock. To construct measures of overconfidence, we exploit the overexposure of bank CEOs to the risk of their liquidity management, and operationalize differences in overconfidence exhibited in CEOs through liquidity synergy, if a switch to overconfidence from a benchmark of rationality (without overconfidence) leads to large inefficiencies in bank liquidity management.

The third strand is the literature on overconfidence manifested in an uncertain environment. Studies have found that overconfidence is manifested more strongly in some types of decision environments. Uncertain environments tend to exacerbate overconfidence (Hayward, Shepherd, and Griffin, 2006), and biased decision-making is exacerbated by uncertainty (Chen, Greene, and Crick, 1998). Overconfident CEOs who buy and sell funds aggressively in response to valid information signals may exploit the liquidity of traders more profitably than rationally CEOs (Hirshleifer, 2001). The 1990s was a dynamic period for the banking industry dominated by deregulation and changing technology. These changes have reshaped the landscape of the industry. This restructuring led to an environment that, by the end of the 1990s, is different than at the beginning of the decade (Becher, Campbell, and Frye, 2005). In light of previous studies, bank setting are characterized by many of the environmental factors that increase CEO overconfidence and biased decision-making, especially uncertainty in liquidity management after a banking deregulation.

The fourth strand of the literature on which our work is most directly related is overconfidence and conflicts of interests. Numerous studies have focused on the role of overconfidence increasing agency problems. Banks are institutions where owner-manager agency problems may flourish from a few tangible assets, large off-balance sheet positions, and a weak market lacking corporate control (Demsetz and Saidenberg, 1999). Despite greater potential conflicts of interests among stakeholders in banks (Becher, Campbell, and Frye, 2005), this paper further examines the affects of overconfidence on conflicts of interests between current and new shareholders, on which less attention has been placed. We study two aspects of bank CEO overconfidence related to investment-cash flow sensitivity, including the uses of internal funds and external capital. This implies that our study will have to incorporate two distinct frictions between the current and the new shareholders. First, low levels of bank equity returns, which decrease claims of current shareholders, are associated with an ex-post flow cost of raising new external capital. Second, high levels of bank equity returns, which dilute the claims of current shareholders, are associated with external capital.

To explain the deviation from market efficiency, behavioral models must decide what form or mode of irrationality is behind the decision-maker behavior. The rational approach is being subsumed by a broader approach based on the psychology of investors. In this approach, equity expected returns are determined by risk and misevaluation. Our paper sketches a theoretical framework for understanding bank CEO overconfidence decisions,

evaluates the "a priori" arguments, and links the investment-cash flow sensitivity to capital market imperfections bearing the importance of CEO overconfidence in equity pricing. Our expected findings suggest that this link may not suffice to address managerial discretion. A CEO, whose incentives are perfectly aligned and who does not face any informational asymmetries may still invest suboptimally if he/she is overconfident and believes that he/she is acting in the best interest of shareholders. One immediate application of this paper is to evaluate the plethora of overinvestment and over external funding proposed as alternatives for distortion incentives. Our overconfidence-based explanation for distortions has a policy implication; overconfident CEOs who buy and sell aggressively may exploit liquidity traders more profitably than rational CEOs (Hirshleifer, 2001). Furthermore, this paper argues that shareholders from over external financing may benefit from the liquidity exploitation.

The paper is organized as follows. Section 2 develops the basic structure of the model, and Section 3 derives the solution of our model. Sections 4 develops the comparative static analysis. Section 5 offers conclusions.

2 The Basic Model

We consider a single-period model of a banking firm $0 \le t \le 1$. At $t = 0$, the bank makes term loans L, which mature and are paid off at $t = 1$. We follow Zarruk and Madura (1992) and assume that loan demand faced by the bank is a downward-sloping function of the loan rate, R_L.

In addition to lending activities, we demonstrate the effects of managerial overconfidence on bank investment decisions. The only friction in the model originates from the CEO's inflated perception of the bank's investment opportunities. The CEO of the bank chooses the level of investment $I \in [0, \infty)$. The investment generates a (weekly positive) stochastic future return, which is realized at $t = 1$. We denote the expected return to investment I as $(1 + R_I)I$, in which R_I is the rate of the investment return. The overconfident CEO overestimates future returns by percentage α_I. Hence, for all levels of investment I, the CEO perceives the expected return to be $(1 + R_I)(1 + \alpha_I)I$, with $\alpha_I = 0$ in the benchmark case of a rational CEO.[2] The bank can also hold on its balance sheet during the period amount B of liquid assets. These assets earn a security-market interest rate of R.

The total assets financed at $t = 1$ are $L + (1 + \alpha_I)I + B$, which are financed, in part, by demand deposits (internal funds). The bank accepts D dollars of deposits and provides depositors with a market rate of return equal to the risk-free rate R_D. In addition to deposits, the bank can also issue claims in the public market at $t = 0$. These claims mature at $t = 1$, and can be thought of as equity capital (external finance). At $t = 0$, there is the potential for adverse selection in the capital market, and thus the overconfident CEO distorts the need for future investment. We model this adverse-selection problem explicitly, but for the sake of transparency, we adopt a linear formulation in which the total amount of incremental funds K is given by $(1 + \alpha_K)K$, with $\alpha_K = 0$ in a benchmark case of a rational CEO. Here, α_K measures the degree of capital market imperfections and the larger it is, the more costly is external financing relative to the frictionless case.

Concern about bank asset quality has prompted regulatory authorities to adopt a risk-based system of capital standards.

[2] For empirical measures of overconfidence in corporate investment, see Malmendier and Tate (2005).

In this model, we follow Zarruk and Madura (1992) and assume that the bank's equity capital is tied by regulation at a fixed proportion q of its deposits, $(1+\alpha_K)K \geq qD$. The required capital-to-deposits ratio q is an increasing function of the amount of the risk assets, $L+I$, as held by the bank at $t=0$ to be, $\partial q/\partial L = \partial q/\partial I = q' > 0$.

When the capital constraint is binding, the bank's liquidity constraint is given by:

$$\begin{aligned} &L+(1+\alpha_I)I+B = D+(1+\alpha_K)K \\ &= (1+\alpha_K)K(\frac{1}{q}+1) \end{aligned} \quad (1)$$

At $t=0$, we consider the bank with s current shares outstanding. The CEO chooses the amount of investment I and a means of financing. At $t=1$, the value of the bank's earning-asset repayments is:[3]

$$A\begin{cases} = A_0, \text{if the default risk does not occur} \\ < A_0, \text{if a default risk occurs} \end{cases} \quad (2)$$

where

$$A_0 = V+(1+R)B$$

$$V = (1+R_L)L+(1+R_I)(1+\alpha_I)I$$

$$B = (1+\alpha_K)K(\frac{1}{q}+1)-L-(1+\alpha_I)I$$

In equation (2), V is the value of the bank's risky-asset repayments. $(1+R)B$ is the repayment from the liquid assets. During the period, the bank's total repayments earned from the earning-asset portfolio are less than A_0 if a default risk occurs, and is equal to A_0 if the default risk does not occur.

Since equity is defined as the residual value of the bank in this paper, after meeting all its obligations, its value at $t=1$ is given by:

$$E = A-(1+R_D)\frac{(1+\alpha_K)K}{q} \quad (3)$$

where the depositors are offered a market risk-free rate R_D on their deposits. The total promised payments to depositors at $t=1$ are $(1+R_D)(1+\alpha_K)K/q$ by arranging equation (1).

The market value of equity E in equation (3) has the feature of a contingent claim written on the market value of the bank's risky-asset repayments, V. With this approach, the model of risky-asset price behavior is sometimes known as a geometric Brownian motion of the form, $dV = \mu V dt + \sigma V dW$, in which μ is an instantaneous drift, σ is an instantaneous volatility, and W is the standard Wiener process. This form shows that dV/V is normally distributed with mean μdt and standard deviation $\sigma\sqrt{dt}$; in other words, $dV/V \sim \phi(\mu dt, \sigma\sqrt{dt})$.[4]

In the following, we model the case of stochastic interest rates, as specified in Merton (1974), viewing the equity value as a call option on V after all other net-obligation payments have been met. The value of the net-obligation payments Z is defined as the difference between the promised payments to depositors and the repayments from the risk-free liquid assets. Z is treated as the strike price of the call option in our model. The market value of equity E will then be given by

[3] The results of our paper do not extend to the case where bond is not treasury bond, but high-yield bond. This is a case presented by Lee and Chen (2008).

[4] The lending behavior influenced by customer acceptance, which usually reflects a fat-tail distribution, is ignored. For this particular case, (see Asosheba, Bagherpour, and Yahyapour, 2008). Further, the structural equation model is not presented in our model (see Shih, Lin, Hsiao, Huang, Chiu, and Chen, 2009). However, adding this complexity affects none of the qualitative results in our paper.

the call option:[5]

$$E = VN(d_1) - Ze^{-\delta}N(d_2) \qquad (4)$$

where

$$Z = (1+R_D)\frac{(1+\alpha_K)K}{q}$$
$$-(1+R)[(1+\alpha_K)K(\frac{1}{q}+1) - L - (1+\alpha_I)I]$$
$$d_1 = \frac{1}{\sigma}[\ln\frac{V}{Z} + \delta + \frac{1}{2}\sigma^2]$$
$$d_2 = d_1 - \sigma$$

In the equation, σ^2 is the variance of the natural logarithm of the ratio V/Z. $N(\cdot)$ is the cumulative standard normal distribution. δ is the spread rate between R and R_D.

We further model the value of the bank's equity with $\alpha_I = \alpha_K = 0$, in the benchmark case of a rational CEO. With the benchmark case, the value of equity during the horizon period horizon is written as:

$$\overline{E} = \overline{V}N(\overline{d}_1) - \overline{Z}e^{-\delta}N(\overline{d}_2) \qquad (5)$$

where

$$\overline{V} = V(\alpha_I = 0)$$
$$\overline{Z} = Z(\alpha_I = 0, \alpha_K = 0)$$
$$\overline{d}_1 = \frac{1}{\sigma}[\ln\frac{\overline{V}}{\overline{Z}} + \delta + \frac{1}{2}\sigma^2]$$
$$\overline{d}_2 = \overline{d}_1 - \sigma$$

The selection of this model's objective function follows Malmendier and Tate (2005), and it is assumed that the overconfident CEO maximizes the current shareholder value. The bank's objective is to set R_L and I to maximize the expected current shareholder value of a Merton's (1974) equity function, subject to the constraint that new shareholders demand an equity stake equal in value to the amount of capital they provide to the bank, $I - K \geq 0$. The maximization problem of the CEO is thus

$$\underset{R_L, I}{Max} \quad J = \frac{s}{s+s'}E \qquad (6)$$
$$s.t. \quad \frac{s'}{s+s'}\overline{E} = I - K$$

where s' is the number of new shares, and $s+s'$ is the number of total shares. The value of the objective J in equation (6) represents the current shareholder value, and the constraint represents the new shareholder value, expressed as the CEO's rational investment decision. Substituting the constraint condition into the objective, we can rewrite the value of objective J in equation (6) as:

$$J = E[\overline{E} - (I-K)]/\overline{E} \qquad (7)$$

3 Optimal Solutions

Partially differentiating equation (7) with respect to R_L and I, the first-order conditions are given by:

$$\frac{\partial J}{\partial R_L} = \overline{E}[\overline{E} - (I-K)]\frac{\partial E}{\partial R_L} - \overline{E}E\frac{\partial I}{\partial R_L} + (I-K)E\frac{\partial \overline{E}}{\partial R_L} = 0 \qquad (8)$$

$$\frac{\partial J}{\partial I} = \overline{E}[\overline{E} - (I-K)]\frac{\partial E}{\partial I} - \overline{E}E + (I-K)E\frac{\partial \overline{E}}{\partial R_L} = 0 \qquad (9)$$

It is required that the second-order conditions $\partial^2 J/\partial R_L^2 < 0$ and $\partial^2 J/\partial I^2 < 0$ be satisfied. The first term on the right-hand side of equation (8) represents the overconfident marginal

[5] A default risk associated with this call pricing model is ignored since such the concern is beyond the scope of this paper (see Lin, Lin, and Jou (2009)). In addition, we do not consider a barrier on the market value of the bank's risky-loan repayments for triggering default prior to the maturity. This is the case of the down-and-out call pricing, model (see Chou and Wang (2007)).

equity effect of the loan rate. The second term captures the risky-asset portfolio substitutions effect from change in the loan rate. The third term demonstrates the rational marginal equity effect of the loan rate. The third term demonstrates the rational marginal equity effect of the loan rate. The interpretation of the three terms in equation (9) follows a similar argument as in the case of a change in R_L of equation (8).

Equations (8) and (9) dictate that the loan rate investment decisions are no longer straightforward. There is a relevant scenario in the following situation where equations (8) and (9) can be vastly simplified. Supposing that $I = K$, this scenario demonstrates that the overconfident CEO uses only the external equity financing strategy to meet the investment demand.

Equations (8) and (9) can be simplified as:

$$\frac{\partial J}{\partial R_L}\Big| I=K = \overline{E}\frac{\partial E}{\partial R_L} - E\frac{\partial I}{\partial R_L} = 0 \qquad (10)$$

$$\frac{\partial J}{\partial I}\Big| I=K = \overline{E}\frac{\partial E}{\partial I} - E = 0 \qquad (11)$$

The condition determines the optimal loan rate, expressed as R_L^f and I^f, respectively. The result of equations (10) and (11) are stated in the following proposition.

Proposition 1: When the overconfident CEO uses the external financing strategy, E is increasing in R_L^f and I^f under the constrained current-shareholder equity maximization.

In equation (10), the condition of $\partial E / \partial R_L > 0$ demonstrates that one way the bank may try to augment the total equity returns is by shifting the risky-asset portfolio to its investment and away from its loan at an increased loan rate. The ratio of $s/(s+s')$ decreased as s' increases when the investment independent of internal funds is financed by issuing new shares. In this strategy, $\partial E / \partial R_L > 0$ implies that there is an insufficient risky-asset portfolio since increasingly issuing new shares will dilute the claims of current shareholders. Thus, the overconfident CEO is unwilling to increasingly issue shares to finance the desired investment by increasing its loan rate for the objective of the constrained current-shareholder equity maximization.

In equation (11), the condition of $\partial E / \partial I > 0$ demonstrates that one way the bank may attempt to augment the total equity returns is by increasing its investment. This implies that the investment level is insufficient, even though the CEO is overconfident if this investment decision is independent of internal funds. To the extent that an increase in issuing new shares dilutes the claims of current shareholders, our results imply that an external financing strategy of CEO overconfidence may be harmful to the current shareholder.

4 Overconfidence Effects

Implicitly differentiating equation (10) with respect to α_I yields:

$$\frac{\partial R_L^f}{\partial \alpha_I} = -(\overline{E}\frac{\partial^2 E}{\partial R_L \partial \alpha_I} - \frac{\partial E}{\partial \alpha_I}\frac{\partial I}{\partial R_L}) / \frac{\partial^2 J}{\partial R_L^2}\Big| I=K \qquad (12)$$

where

$$\frac{\partial^2 E}{\partial R_L \partial \alpha_I} = \frac{\partial^2 V}{\partial R_L \partial \alpha_I} N(d_1) - \frac{\partial^2 Z}{\partial R_L \partial \alpha_I} e^{-\delta} N(d_2)$$

$$+ \frac{\partial V}{\partial R_L}\left(\frac{\partial N(d_1)}{\partial d_1} - \frac{N(d_1)}{N(d_2)}\frac{\partial N(d_2)}{\partial d_2}\right)\frac{\partial d_1}{\partial \alpha_I}$$

$$\frac{\partial E}{\partial \alpha_I} > 0$$

The result of equation (12) is stated in the following proposition.

Proposition 2: Within the constrained current-shareholder equity maximization setting, an increase in the degree of the CEO's overconfidence in investment decision decreases the bank's interest margin when the CEO uses only the external financing strategy.

In equation (12), the first term on the right-hand side of the numerator is positive and the second term is positive as well. For the current-shareholder equity maximization, low levels of bank equity returns are associated with larger investment distortions. What is significant is that the lower claims of current shareholders, the higher and more distorted are the bank's investment. A forced switch to the rational total equity maximization within the current-shareholder equity maximization setting harms the current shareholders.

Implicit differentiation of equation (10) with respect to α_K yields:

$$\frac{\partial R_L^f}{\partial \alpha_K} = -(\bar{E}\frac{\partial^2 E}{\partial R_L \partial \alpha_K} - \frac{\partial E}{\partial \alpha_K}\frac{\partial I}{\partial R_L}) / \frac{\partial^2 J}{\partial R_L^2}\Big| I=K \tag{13}$$

where

$$\frac{\partial^2 E}{\partial R_L \partial \alpha_K} = -\frac{\partial^2 Z}{\partial R_L \partial \alpha_I} e^{-\delta} N(d_2) + \frac{\partial V}{\partial R_L}(\frac{\partial N(d_1)}{\partial d_1} - \frac{N(d_1)}{N(d_2)}\frac{\partial N(d_2)}{\partial d_2})\frac{\partial d_1}{\partial \alpha_K}$$

$$\frac{\partial^2 Z}{\partial R_L \partial \alpha_I} = \frac{(R - R_D)Kq'}{q^2}(\frac{\partial L}{\partial R_L} + \frac{\partial I}{\partial R_L}) < 0$$

$$\frac{\partial d_1}{\partial \alpha_K} = -\frac{1}{\sigma Z}\frac{\partial Z}{\partial \alpha_K} < 0$$

$$\frac{\partial Z}{\partial \alpha_K} = \frac{(1 + R_D)K}{q} > 0$$

$$\frac{\partial E}{\partial \alpha_K} = -\frac{\partial Z}{\partial \alpha_K} e^{-\delta} N(d_2) < 0$$

The result of equation (13) is stated in the following proposition.

Proposition 3: Within the constrained current-shareholder equity maximization setting, an increase in the degree of the CEO's overconfidence in external financing decision increases the bank's interest margin when the CEO uses only the external financing strategy.

For the current-shareholder equity maximization, high levels of bank equity returns are associated with larger investment distortions when the overconfident CEO uses the external equity financing strategy. As noted in Proposition 1, the total equity value of the bank is increasing in loan rate. The overconfident may exploit current shareholders more profitably than the overconfident CEO pursing the total-shareholder equity maximization. In other words, the overconfident CEO creates a potential benefit for the new shareholders who provide external funds to the bank at an opportunity cost to the current shareholders. This insight is an important aspect of CEO overconfidence, since we are not aware of the "dark sides" of this overconfidence feature, such as potential benefits intentionally created for outsiders.

Implicit differentiation of equation (11) with respect to α_I yields:

$$\frac{\partial I^f}{\partial \alpha_I} = -(\bar{E}\frac{\partial^2 E}{\partial I \partial \alpha_I} - \frac{\partial E}{\partial \alpha_I}) / \frac{\partial^2 J}{\partial I^2}\Big| I=K \tag{14}$$

The result of equation (14) is stated in the following proposition.

Proposition 4: Within the constrained current-shareholder equity maximization setting, an increase in the degree of the CEO's overconfidence in investment decision has an indeterminate effect on the bank's investment when the CEO uses only the external financing strategy.

Implicit differentiations of equation (11) with respect to α_K yields:

$$\frac{\partial I^f}{\partial \alpha_K} = -(\overline{E}\frac{\partial^2 E}{\partial I \partial \alpha_K} - \frac{\partial E}{\partial \alpha_K})/\frac{\partial^2 J}{\partial I^2}\Big|_{I=K} \quad (15)$$

The result of equation (15) is stated in the following proposition.

Proposition 5: Within the constrained current-shareholder equity maximization, an increase in the degree of the CEO's overconfidence in external financing decision increases the bank's investment when the CEO uses only the external financing strategy.

In equation (15), the first term on the right-hand side of the numerator is positive and the second term is negative. The overconfidence-based explanation for multiple distortions of investment and external financing has a number of implications. Traditional theories are largely dependent on the misalignment of managerial and shareholder interests or asymmetric information between corporate insiders and the capital market to explain investment distortions. Our findings suggest that these provisions may not suffice to address managerial discretion, since both cause investment to be sensitive, to both the amount of cash between stakeholders and between shareholders in the banking firms. A CEO who incentives are perfectly aligned, and who does not face any informational asymmetries may still invest suboptimally if he/she is overconfident. Even though he/she believes that he/she is acting in the best interest of shareholders, the bank interest margin is negatively related to the CEO overconfidence in investment distortion, but positively related to the CEO overconfidence in external financing. In addition, the bank's investment is positively related to CEO overconfidence in investment distortion, but negatively related to overconfidence in external financing. Since CEOs tend to be more overconfident when feedbacks on their information or decisions are deferred or inconclusive (Griffin and Tversky, 1992), and bank directors are more important to firm success than counterparts at industrial firms (Macey and O'Hara, 2003), refined corporate governance structures, involving a more active board of directors and constraints on the use of external funds, may be necessary to achieve the first-best solutions.

5 Conclusion

Our model demonstrates that changes in the CEO's overconfidence in investment and external financing decisions have direct effects on the bank's optimal interest margins. Within the setting of the current shareholder maximization, the optimal interest margin is suboptimal, since the CEO's overconfidence may be the reason for deviations from market efficiency. Previous studies explain that decision makers are more likely to attribute good outcomes to their actions, but bad outcomes to bad luck, because they expected their behavior to produce success. This paper argues that possible bad outcomes are not from bad luck, but from biases in the CEO's beliefs, and within this setting, conflicts of interests inevitably arise. Our findings provide alternative explanations of evidence concerning an overconfident CEO's behavior.

Thus, our model should be viewed as confirmation, rather than a contradiction, of the current behavioral finance theory.

Less attention has been focused on the role of corporate governance in the banking industry than other non-regulated industries (Becher, Campbell, and Frye, 2005). Our results have important implications for corporate governance

design in the banking industry. Specifically, CEOs tend to be more overconfident when feedbacks on their information or decisions under multiple distortions of investment and external financing. As a result, the board of directors may need to employ alternative disciplinary, such as debt overhang, which can suffice to constrain overconfident CEOs in reducing agency problems.

References

[1]. Asosheha, A., S. Bagherpour, and N. Yahyapour (2008), "Extended Acceptance Models for Recommender System Adaption, Case of Retail and Banking Service in Iran," ***WSEAS Transactions on Business and Economics***, 5, 5, 189-200.

[2]. Becher, D. A., T. L. Campbell II, and M. B. Frye (2005), "Incentive Compensation for Bank Directors: The Impact of Deregulation," ***Journal of Business***, 78, 5, 423-443.

[3]. Black, F., and M. Scholes (1973), "The Pricing of Options and Corporate Liabilities," ***Journal of Political Economy***, 81, 2, 637-659.

[4]. Busenitz, L. W., and J. B. Barney (1997), "Differences between Entrepreneurs and Managers in Large Organizations: Biases and Heuristics in Strategic Decision-Making," ***Journal of Business Venturing***, 12, 1, 9-30.

[5]. Chen, C. C., P. G. Greene, and A. Crick (1998), "Does Entrepreneurial Self-Efficacy Distinguish Entrepreneurs from Managers?" ***Journal of Business Venturing***, 13, 4, 295-316.

[6]. Chou, H. C., and D. Wang (2007), "Performance of Default Risk Model with Barrier Option Framework and Maximum Likelihood Estimation: Evidence from Taiwan," ***Physica A***, 385, 270-280.

[7]. Demsetz, R. S., and M. R. Saidenberg (1999), "Looking beyond The CEO: ***Executive Compensation at Banks," Federal Reserve Bank of New York*** in its Series Staff Reports with number 68.

[8]. Deyoung, R., and K. P. Roland (2001), "Product Mix and Earnings Volatility at Commercial Banks: Evidence from A Degree of Leverage Model," ***Federal Reserve Bank of Chicago*** in its series Working Paper Series with number WP-99-6.

[9]. Forbes, D. P. (2005), "Are Some Entrepreneurs More Overconfident Than Others?" ***Journal of Business Venturing***, 20, 5, 623-640.

[10]. Gervais, S., J. B. Heaton, and T. Odean (2005), "Overconfidence, Investment Policy, and Executive Stock Options," ***National Bureau of Economic Research, Inc*** in its series NBER Working Papers with number 10807.

[11]. Griffin, D., and A. Tversky (1992), "The Weighing of Evidence and the Determinants of Confidence," ***Cognitive Psychology***, 24, 3, 411-435.

[12]. Hayward, M. L. A., D. A. Shepherd, and D. Griffin (2006), "A Hubris Theory of Entrepreneurship," ***Management Science***, 52, 2, 160-172.

[13]. Heaton, J. B. (2002), "Managerial Optimism and Corporate Finance," ***Financial Management***, 31, 1, 33-45.

[14]. Hirshleifer, D. A. (2001), "Investor Psychology and Asset Pricing," ***Journal of Finance***, 56, 4, 1533-1598.

[15]. Jensen, M., and W. Meckling (1976), "Theory of the Firm: Managerial Behavior, Agency Cost, and Ownership Structure," ***Journal of Financial Economics***, 3, 4, 305-360.

[16]. Kashyap, A. K., R. Rajan, and J. C., Stein (2002), "Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking," ***Journal of***

Finance, 57, 1, 33-73.

[17]. Lee, C. Y., and J. H. Cheng (2008), "A Fuzzy AHP Application on Evaluation of High-Yield Bond Investment," ***WSEAS Transactions on Information Science and Applications***, 6, 5, 1044-1056.

[18]. Lin, J. J., J. H. Lin, and R. Jou, (2009), "The Effects of Sunshine-Induced Mood on Bank Lending Decisions and Default Risk: An Option-Pricing Model," ***WSEAS Transactions on Information Science and Applications***, 6, 6, 946-955.

[19]. Lowe, R. A., and A. A. Ziedonis (2006), "Overoptimism and the Performance of Entrepreneurial Firm," ***Management Science***, 52, 2, 173-186.

[20]. Macey, J. R., and M. O'Hara (2003), "The Corporate Governance of Banks," ***Federal Reserve Bank of New York*** in its journal Economic Policy Review, 9.

[21]. Malmendier, U., and G. Tate (2005), "CEO Overconfidence and Corporate Investment," ***Journal of Finance***, 60, 6, 2661-2700.

[22]. Merton, R. C. (1974), "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," ***Journal of Finance***, 29, 2, 449-470.

[23]. Odean, T. (1998), "Volume, Volatility, Price, and Profit When All Traders Are Above Average," ***Journal of Finance***, 53, 6, 1887-1934.

[24]. Shih, M. L., S. H. Lin, S. H. Hsiao, L. M. Huang, C. C. Chiu, and K. Y. Chen (2009), "The Study of the Correlation among Personality Traits, Leadership Competence and Organizational Performance," ***WSEAS Transactions on Business and Economics***, 1, 6, 11-20.

[25]. Simon, M., and S. M. Houghton (2003), "The Relationship between Overconfidence and the Introduction of Risky Products: Evidence from A Field Study," ***Academy of Management Journal***, 46, 2, 139-149.

[26]. Zarruk, E. R., and J. Madura (1992), "Optimal Bank Interest Margin under Capital Regulation and Deposit Insurance," ***Journal of Financial and Quantitative Analysis***, 27, 1, 143-149.