Abstract

We develop a theoretical model of managerial myopia based on the Q theory of investment. In this model, the manager chooses both investment quantity and the investment horizon. The manager may be myopic, causing an excess weight to be placed by the manager on short term profits, relative to firm-value maximizing behavior. In such a case, investments may be expected to be of a shorter time horizon, even if there are advantages to longer term investing. Our model yields a new important testable implication. The sensitivity of investment to growth opportunities is lower for myopic managers.
1. Introduction

Managerial myopia in several potential forms have been reported in the literature. Financial constraints, executive bonuses, executive stock holdings, and takeover threats are all sources of managerial myopia documented in the literature. Despite the evidence of managerial myopia in various forms that exists in the literature, robust tests of its presence are difficult. We appeal to theory to provide the foundation for a simple test of a particular form of managerial myopia. Specifically, we demonstrate theoretically that when the manager of a firm has an excessively high discount rate, a crucial manifestation of this agency issue is a decreased sensitivity of firm investment to growth opportunities.

Certainly if markets are perfectly efficient and transparent, managers should not be able to systematically deceive the market. Early arguments made by Jensen (1986) maintain that short-term behavior by corporate executives is not a significant problem. Myopic managers lead to less valuable firms, and the market will remove them.

However, more recent literature demonstrates the potentially significant investment distortions that managerial myopia induces. Early models in this strain of the literature are found in Narayanan (1985, 1987) and Stein (1988, 1989). Lundstrom (2002) uses CEO age as a proxy for myopia, and finds that it is negatively related to research and development (R&D) expenditures of the firm between 1991 and 1993. Dechow and Sloan (1991) find in an older sample (1974 to 1988) that CEOs reduce R&D spending in their final years in office. Graham et al. (2005) provide the results of a fascinating survey in which almost 80% of managers suggest they would sacrifice positive net present value projects if adopting them resulted in a firm missing quarterly earnings expectations. Edmans (2009) demonstrates theoretically that large blockholders may engage in behavior to mitigate the effects of managerial myopia, while Bolton et al. (2006) suggest that managers may have an overly short-term focus as a result of the speculative behavior of investors. Chakravarty and Grewal (2011) find that past stock returns and volatility can induce managers to behave myopically.

We develop a theoretical model of managerial myopia in this paper. In this model, the manager chooses both investment quantity and the investment horizon. The manager may be myopic, causing an excess weight to be placed by the manager on short term profits, relative to firm-value maximizing behavior. In such a case, investments may be expected to be of a shorter time horizon, even if there are advantages to longer term investing.

Our model yields a new important testable implication. The sensitivity of investment to growth opportunities is lower for myopic managers. This result suggests that empirical tests that include only levels of firm investment regressed on proxies for myopia, such as Lundstrom (2002), may not be effectively modeling the nature of myopic behavior. For example, Lundstrom estimates a regression of firm investment on CEO age and Tobin’s q, finding a negative coefficient on CEO age. However, there is a positive relationship between a firm’s age and the CEO’s age, and a negative correlation between a firm’s age and its growth opportunities. The negative coefficient on CEO age of Lundstrum (2002), while consistent with managerial myopia, may simply be reflective of lower growth opportunities available to older CEOs, who are disproportionately represented at older firms. What is necessary to confidently detect the presence of managerial myopia is to test whether the myopic behavior directly influences the link between firm investment and growth opportunities. Our model provides this testable hypothesis. A myopic manager will invest less than a non-myopic manager when faced with the same marginal increase in growth opportunities.
In our model, myopic managers discount the future cash flow(s) more than non-myopic managers do. Previous literature has established directly the link between age and a greater discounting of the future. Read and Read (2004) find that older people (an age group they define roughly as over sixty years of age) discount the future more than younger ones (aged 20 to 35 years). This makes CEO age a natural proxy for myopia. The findings of Read and Read (2004) are in line with the finding of Trostel and Taylor (2001), who find that discounting increases over the life cycle. Further, Harrison et al (2002) find that retired individuals discount the future more heavily than others (though they use a binary indicator for retirement not directly related to age). In the biology literature, Sozou and Seymour (2003) construct a model in which the time-preference rate increases with old age.

2. Managerial Myopia and the Neoclassical Model

Our model uses the framework of neoclassical model of Hubbard (1998), which provides a discrete time formulation of the model in Hayashi (1982). This model posits the value of the firm to be the maximization of the present value of firm profits, by choosing a dynamic investment path. This maximization is subject to a capital accumulation constraint, where the level of investment, along with the degree of depreciation, dictates capital accumulation. In our model, however, we provide a slightly different specification for the capital accumulation constraint that more appropriately reflects the flexibility of managers in temporally allocating the investments made by the firm.

In our model, the value of a firm is given by

\[
V_t(K_t, I_t) = \max \left\{ E \left[ \sum_{s=0}^{\infty} \beta^s \left( \pi(K_{t+s}) - C(I_{t+s}, K_{t+s}, \gamma_{t+s}) - \gamma_{t+s} I_{t+s} \right) \right] \right\}
\]

where \( K_t \) and \( I_t \) are the capital and investment levels at time \( t \), respectively. \( \beta \) is the discount factor, \( \pi \) is the profit function and \( C \) is the cost of adjustment function (we discuss this function in detail below). \( \gamma_t \) is an exogenous shock to the cost of adjustment function at time \( t \). \( r_t \) is the cost of capital goods, while \( s \) provides an index of future time periods.

Following Hubbard (1998), we assume a functional form for the cost of adjustment that is linearly homogenous in investment and capital. Tobin’s neoclassical framework posits investment as a function of marginal \( q \). When we make the assumption that the cost of adjustment is linearly homogenous in investment and capital, marginal \( q \) and average \( q \) are the same. This assumption is equivalent to assuming that the firm is a price taking firm with constant returns to scale in both production and capital installation. This is an important assumption for any empirical exercise, as average \( q \) is observable (and even this quantity is measured with caveats), while marginal \( q \) is not. Specifically, our cost of adjustment function is

\[
C(I_t, K_t, \gamma_t) = \alpha \left( \frac{I_t}{K_{t-1}} - \gamma_t \right)^2 K_{t-1}
\]

where \( \alpha \) is a functional parameter.

We introduce myopia into the model in the form of a simple principal-agent problem between the manager and investors. The utility function of the manager is

\[
U_t = a_t [\pi(K_t) - C(I_t, K_t, \gamma_t) - r_t I_t] + (1-a_t) E_t \sum_{s=1}^{\infty} \beta^s \left[ \pi(K_{t+s}) - C(I_{t+s}, K_{t+s}, \gamma_{t+s}) - \gamma_{t+s} I_{t+s} \right]
\]

This utility function consists of a fraction \( a_t \) of the current earnings of the firm, and fraction \( (1-a_t) \) of the future earnings of the firm. \( a_t \) is the managerial preference parameter which is known only...
to the manager.\textsuperscript{1} The utility maximization problem will coincide with the firm value-maximization problem when $\alpha_t$ is 0.5 in which case the manager is indifferent between current earnings of the firm and discounted value of future earnings of the firm. The higher the value of $\alpha_t$ relative to 0.5, the greater the manager’s preference for current earnings of the firm over the future earnings of the firm. Values of $\alpha_t$ less than .5 indicate a hyperopic manager.

The literature has identified several sources of myopic behavior on the part of managers. For example, Schleifer and Vishney (1990) suggest that the source of myopia is takeover threats to the firm, while managerial reputation motivates myopic behavior in Narayanan (1985). By introducing myopia through the utility function as we have done in equation 3, we take a stand on the particular source of myopia – a higher weight placed on present earning of the firm by its CEO. Myopic managers have higher discount rates. These managers prefer more of current earnings of the firm which get manifested through their utility function in terms of higher $\alpha_t$. These managers with higher discount rates put more emphasis on current earnings of the firm and have a higher $\alpha_t$.

The relationship between the manager and the investors is that of a principle agent problem. In our model, the investor does not take decisions. In line with Cleary, Povel and Raith (2007) and Povel and Raith (2004), the investor is an outsider and does not decide the amount of investment, which is decided by the manager of the firm. The manager decides on two things. First, the manager chooses the total investments to be made in a period. Second, he also decides what fraction of the investments will be allocated to projects that create capital immediately in the current period (short term projects) and what fraction of the investments will be allocated to projects that create capital in the next period (long term projects). The manager maximizes his own utility, given by equation (3). Myopic managers put more weight to the current earnings of the firm, compared to the future earnings of the firms and hence invest more in the short term projects than in the long term projects. Managerial myopia persists because investors do not have perfect information. First, they are not able to observe the managerial utility function – specifically the $\alpha_t$ parameter. This parameter is also time-varying, further complicating investor oversight. We denote the firm value-maximizing investment choice to be $I_t^*$. We also assume investors do not have enough information to determine $I_t^*$. Let $I_t$ be the level which maximizes $U_t$. Unless $\alpha_t$ is exactly .5, $I_t^* \neq I_t$, and investors do not have enough information to determine the extent of the suboptimal choice by the manager.

Our assumptions concerning the limited information available to investors are reasonable. While many tangible investments made by the firm may be relatively easy to observe, similar quality observations of intangible investments may not be available (Edmans 2011). A manager may be able to divert investments from hard-to-measure assets, for example investments that generate customer satisfaction, to short-term projects in order to boost the current earnings of the firm. In this environment, $I_t^*$ is quite difficult to observe.\textsuperscript{2}

Our capital accumulation equation is given by
\begin{equation}
K_t = (1-\delta)K_{t-1} + \lambda_t I_t + (1-\lambda_t)\theta I_{t-1}.
\end{equation}

\textsuperscript{1} The firm’s earnings are included the managerial utility function because of the following reason. A significant portion of managerial compensation consist of restricted stocks and stock options which, in turn, depends on firm’s current and future earnings (See Murphy 2013, Hays et al. 2012).

\textsuperscript{2} Stein (1989) demonstrates that even if the market is efficient, incentives exist for managers to behave myopically, given information asymmetry between managers and investors.
In equation (4), $\delta$ is the rate of depreciation. In our model, we allow for investment that creates capital in the next time period. So, while the manager makes total investment $I_t$, $\lambda_t$ is the fraction of the investment at time $t$ allocated to projects that create capital immediately. $(1-\lambda_t)$ is the fraction of investment is long-term investment – investment allocated to projects that create capital in the next period. So $(1-\lambda_{t-1})$ fraction of investment $I_{t-1}$ made last year creates capital $K_t$ this year. An underlying assumption in our model is that the long term investments create more capital as compared to short term investments. $\theta$ is a parameter that multiplies the effect of investment intended to pay off next period (we refer to it as the long term investment multiplier). We generally expect that this multiplier is greater than one. When it is, long-term investments will produce more capital than investment put into place in the current time period.3 R&D investments have higher uncertainty but likely to generate higher returns to the firm compared to current investments with more certainty but with lower returns. Therefore we assume that long term investments, say for example R&D investments, will generate greater returns. Our assumption seems reasonable given that several papers have reported future benefits from R&D investments. Grabowski and Mueller (1978) find that firms earn above-average returns on their R&D investment. Eberhart (2004) reports that the firm who increase R&D investment exhibit higher future operating performance. Ali et al. (2012), Lev and Sougiannis (1996), Lev and Sarath (2005), Guo et al. (2006) report a positive association between R&D investment and subsequent abnormal returns.

The manager chooses both the level of investment $I_t$ and the fraction of investment designated for immediate capital generation, $\lambda_t$. These two decision variables give the manager control over the investment horizon as well as the quantity of investment. By contrast in Hubbard (1998), $\lambda=1$, and all investment creates current capital by assumption.

Allowance for the creation of capital in the future at an advantageous rate relative to current capital production is a key component of our model. Managerial myopia is the temporal distortion of firm investment for greater profitability in the current period, at the expense of subsequent periods. In order to capture this possibility in the model, there must be some profit benefit to deferred capital formation. In our model, the fraction of investments that is deferred for the next period generates greater capital than it would have generated had the investment not been deferred. We introduced a parameter $\theta$ in equation (4) which refers to the long term investment multiplier. Greater capital formation next period guarantees higher return in the next period. A manager has a choice to make. He chooses the fraction of investment to be deferred for the next period’s capital formation, represented by the parameter $\lambda_t$ in the model. A myopic manager’s preference for the current earnings of the firm over the future earnings of the firm will result in the myopic manager allocating a greater fraction of the total investment to capital formation in the current period compared to a non-myopic manager.

Many investments do not create usable capital in the current period - for example, investment in human capital or research and development. Interestingly, these investments overlap to some extent with intangible investments which are hard to measure (see for example Edmans 2011 and Lev and Sougiannis 1996). These important investments are not handled adequately in the setup of Hubbard (1998). Our generalization is important to appropriately model the flexibility the managers have in temporally allocating the investments made by the firm.

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3 $\theta$ may be generalized to be time-varying without any substantive change in the model. We restrict it to be a constant for ease of exposition.
We assume firm wealth from last period, \( W_{t-1} \), to be exogenous when making the investment decision in current period, which is period \( t \). Total investment is funded by this internal wealth, and by borrowing \( B_t \). The borrowing constraint is given by

\[
I_t = W_{t-1} + B_t. \tag{5}
\]

The manager maximizes utility \( U_t \) by choosing \( \lambda_t \) and \( I_t \) subject to the capital accumulation and borrowing constraints given in equations 4 and 5.

The first order condition of managerial utility maximization with respect to \( I_t \) is

\[
\lambda_t a_t [\pi_k (K_t) - C_k (K_t, I_t, \gamma_t)] + (1 - a_t) [\lambda_t + \frac{(1 - \lambda_t) \theta}{1 - \delta}] q_{t+1} = a_t (r_t + C_f (K_t, I_t, \gamma_t)) \tag{6}
\]

where we define \( q_{t+1} \equiv E_t \sum_{k=1}^{\infty} \beta^k (1 - \delta)^k [\pi_k (K_{t+k}) - C_k (K_{t+k}, I_{t+k}, \gamma_{t+k})] \) as marginal Tobin’s \( q \) following Hubbard (1998). Several prominent papers in the literature including Hayashi (1982), Hubbard (1998), Abel and Eberly (1994, 1996, 1998) and Eberly, Rebelo and Vincent (2008) have used \( q \) as a proxy for growth opportunities. \( Q \) is defined as the present discounted value of future profits from new fixed capital investment. In other words, \( q \) measures the valuation of an additional unit of capital invested in the firm, which in the finance literature is closely linked to the notion of growth options. Higher are the growth opportunities of a firm, higher will be the marginal valuation of a unit of invested capital and higher will be the value of \( q \). Following these papers mentioned above, we refer to \( q \) as a proxy for growth opportunities and thereby include growth opportunities in our model. We note that our definition of \( q \) here is for the time \( t+1 \) period. The sum in our definition indexes time periods 1 to infinity, whereas in Hubbard (1998), this index runs from 0 to infinity. This notational change is made for mathematical and expositional simplicity. Our references to \( q_{t+1} \) therefore refer exclusively to future growth opportunities. The first order condition of managerial utility maximization with respect to \( \lambda_t \) is

\[
a_t [\pi_k (K_t) - C_k (K_t, I_t, \gamma_t)] = \frac{1 - a_t}{1 - \delta} (\theta + \delta - 1) q_{t+1}. \tag{7}
\]

Simplifying equations 6 and 7, and using the functional form of cost of adjustment function \( C(K_t, I_t, \gamma_t) \), we have

\[
\frac{I_t}{K_{t-1}} = \frac{1 - a_t}{a_t} \frac{\theta}{1 - \delta} \frac{1}{\alpha} q_{t+1} + \gamma_t - r_t \frac{\gamma_t}{\alpha} = A q_{t+1} + B
\]

where \( A = \frac{1 - a_t}{a_t} \frac{\theta}{1 - \delta} \frac{1}{\alpha}, B = \gamma_t - r_t \frac{\gamma_t}{\alpha} \). Equation 8 provides us with a solid theoretical grounding for our testable hypothesis. We find the well-known relationship that (scaled) investment is directly related to \( q \). Further, the sensitivity of investment to \( q \) is directly related to the degree of managerial myopia, as given by \( a_t \). Specifically, we see that

\[
\frac{\partial A}{\partial a_t} = -\frac{\theta}{1 - \delta} \frac{1}{\alpha} a_t < 0. \tag{9}
\]

So, the coefficient on \( q_{t+1} \) decreases as the parameter \( a_t \) increases. Sensitivity of investment to future growth opportunities is lower for myopic managers. Further, we note the nonlinearity of \( A \) in \( a_t \). As \( a_t \) approaches 0, the sensitivity of investment to Tobin’s \( q \) increases to infinity. However, when \( a_t \) is equal to 1, the sensitivity of investment to Tobin’s \( q \) falls to zero. The future profits of the firm are completely discounted, and so the manager invests exclusively for the short term.
Intuitively, why does myopia due to excess discounting of the future on the part of the manager cause a lower sensitivity of investment to \(q\)? It is natural to see the positive association of investment with marginal \(q\), which is the expected marginal discounted future profitability of the firm. If a manager’s utility function is such that less weight is placed on the future profitability of the firm, then, when faced with a one unit increase in future growth opportunities, the manager will initiate less than optimal investment today. Thus, managerial myopia distorts the relationship between investment and \(q\).

We can also see in equation (8) important implications for empirical tests. A regression in levels of investment on Tobin’s \(q\), a measure of myopia, and other control variables misses the crucial component of the model. Optimal investment relates directly to Tobin’s \(q\), and managerial myopia disrupts this relationship. Robust tests for myopia motivated by high managerial discount rates must be conducted on the interaction between Tobin’s \(q\) and the proxy for managerial myopia. Such tests do not currently exist in the literature.

3. Conclusion

In this paper, we develop a model of managerial myopia based on Q theory of investment. A manager is a myopic manager when he prefers short term profits more than the long term value of the firm. Our model offers a new testable hypothesis of managerial myopia. The sensitivity of investment to growth opportunities is lower for firms managed by myopic firms. We hypothesize that the myopic managers will invest less, compared to a non-myopic manager, when faced with the same incremental growth opportunities. In future work, we will further develop this model to a more general form of managerial myopia. Additional empirical work will involve identifying a proper proxy for managerial myopia. We will test our model’s testable hypothesis utilizing this measure of managerial myopia. It needs to be tested if the well-known relationship between investment and growth opportunities is disrupted by a suitable proxy for managerial myopia.

References


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Managerial economics is a stream of management studies which emphasizes primarily on solving business problems and decision-making. This takes into account the customers’ desires, expectations, preferences, and conditions to enhance the manufacturing process. Decisions on Production and Production Theory: This theory is primarily concerned with the volume of production, process, capital and labor, costs involved, etc. It aims to optimize production to meet customer demand.

Decisions on capital and investment theory: Capital is the most important business element. This philosophy takes priority over the proper distribution of the resources of the company and investments in productive programs or initiatives to boost operational performance. Investment and managerial preferences. January 2015. Economics Bulletin 35(1):392-399.

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We investigate how managerial preference characteristics, corporate governance, and financial markets affect important economic variables such as capital structure, ownership concentration, and credit spreads. Specifically, we analyze a complete market model in which a risk averse entrepreneur decides whether to invest in a project to set up a firm. The entrepreneur finances the investment cost by issuing equity and debt. Diversion creates inefficient investment and reduces equity value. However, legal protection of investors may reduce diversion activities. In addition, debt financing can mitigate the agency costs of equity because it raises the equity ownership of the entrepreneur and, in addition, reduces the free cash available to the entrepreneur for diversion.

1. Generate alternative capital investment project proposals. New capital investment ideas can originate from multiple revenues, inside and outside the company. Proposals can be initiated at different levels in the firm, from contract workers to the board of directors. Often, medium and large-sized firms consist of departments whose job involves studying and finding capital expenditure projects.

Keywords: Managerial/entrepreneurial characteristics, ownership and capital structure, private benefits of control, corporate governance. JEL Classification: D11, D91, G11, C61. Suggested Citation: Liu, Hong and Miao, Jianjun, Managerial Preferences, Corporate Governance, and Financial Structure (March 2006). Available at SSRN: https://ssrn.com/abstract=891414 or http://dx.doi.org/10.2139/ssrn.891414. Hong Liu (Contact Author). Investment, Consumption and Hedging Under Incomplete Markets. By Jianjun Miao and Neng Wang. Investment, Consumption, and Hedging Under Incomplete Markets.