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DISAGREEMENT COSTS, CONTROL AND CORPORATE FINANCE

by
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Abstract

This paper examines capital budgeting and dividend policy in an environment in which firms need to raise equity financing from new investors to fund projects, and different generations of shareholders may openly disagree over what maximizes value. The standard value maximization objective is incomplete in this setting. I show that the manager's objective should be to maximize his expectation of the net present value accruing to the *current* shareholders, thereby attending to the dilution of these shareholders' claims when equity is sold to new investors. This framework, which isolates the effect of disagreement by abstracting from both agency and asymmetric information problems, generates numerous implications. First, the hurdle rates firms use for project acceptance/rejection decisions will always be higher than the expected rate of return shareholders demand based on asset pricing models. These hurdle rates will vary across firms so that one firm may accept a project that another firm rejects even though shareholders in both firms demand the same expected return. Second, despite the absence of agency or asymmetric information problems, the manager faces "disagreement costs," represented by the difference between the firm's hurdle rate and shareholders' expected return. The disagreement costs are increasing and convex in the likelihood of disagreement between existing and new shareholders, and affect the firm's investment policy. Third, the firm's dividend policy can be used to optimize the allocation of control over investment policy between the manager/existing shareholders on the one hand and the new shareholders on the other, thereby lowering disagreement costs and the capital budgeting hurdle rate, and allowing the manager to achieve a Pareto superior outcome. That is, dividend and investment policies are inseparable.

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"What has been done has the sharp-edged reality of all the things we have seen and experienced; the new is only the figment of our imagination…The history of science is one great confirmation of the fact that we find it exceedingly difficult to adopt a new scientific point of view."

Joseph A. Schumpeter (1934)

1. INTRODUCTION

A bedrock principle in finance is that managers should maximize net present value which, in the absence of shareholder-bondholder agency conflicts, is equivalent to maximizing shareholder value (e.g. Fama and Miller (1972) and Jensen and Meckling (1976)). This is an extremely useful organizing principle that helps generate benchmark equilibrium outcomes for calibrating distortions caused by agency problems, asymmetric information and other frictions in an environment in which all agents have rational expectations. The power of the rational expectations assumption is that it helps to unambiguously identify *what* maximizes firm value. The manager may choose actions that deviate from value maximization because he enjoys private benefits from doing so or wishes to exploit his private information to expropriate wealth from certain groups of investors, but everybody agrees on the actions that maximize firm value, regardless of whether these actions are actually chosen.

This neat organizing principle breaks down, however, in an environment in which agents openly disagree on *what* maximizes firm value, even when they share the common objective of maximizing firm value. How can value maximization be an objective when we cannot agree on what action maximizes value? A small step away from rational expectations lands us in precisely such a world. Kurz (1994a, 1994b) argued that when agents have *rational beliefs*, but not necessarily rational expectations, they may have heterogeneous priors. A rational belief is one that *cannot* be invalidated by historical data. For example, a belief that the probability of snowfall in Chicago in January is zero is clearly *not* rational. But a belief that a particular acquisition will be successful is rational if some fraction of similar acquisitions in the past were successful. Rational beliefs will converge to rational expectations when the underlying economic environment that agents are revising their beliefs about is stationary. But with non-stationarity, rational beliefs need not converge to rational expectations. Kurz showed that an infinity of rational beliefs may be consistent with a particular time series of historical date, thus supporting heterogeneous priors as rational.[1] Morris (1995) provides a thoughtful discussion of why heterogeneous priors represent a realistic assumption in many economic settings.

[1] Kurz (1994a, 1994b) pointed out that in non-stationary environments, rational expectations require agents to know more than they learn from historical data.

With heterogeneous prior beliefs, agents may observe the same signal and have the same objective and yet interpret the signal differently because their beliefs about the informativeness of the signal differ. Different interpretations of even commonly-observed signals could generate different opinions about the actions that maximize value. Note that the assumed common objective and commonly-observed signal mean that open disagreement is possible even when agency and asymmetric information are precluded. I refer to this as “honest disagreement” (“disagreement” for short).

The real world abounds with examples of honest disagreement. When the HP-Compaq merger was proposed a few years ago, some shareholders sided with the CEO, Carly Fiorina, in backing the proposed merger. Other shareholders sided with a dissident, the son of one of the founders, Walter Hewlett, in opposing the merger. Given that shareholders were involved on both sides of the debate, agency problems were unlikely to be the cause of the wedge between the preferences of the two sides. And since a company founder was on one side of the debate and the CEO was on the other, it is also difficult to turn to asymmetric information for an explanation. Another example is Eli Lilly’s acquisition of Hybritech in 1985. Because the two sides could agree on everything except the purchase price, a post-acquisition contingent payment was negotiated to permit the transaction to go through even though both sides continued to have different beliefs about Hybritech’s value. This contingent payment to Hybritech’s shareholders was predicated on Hybritech’s post-acquisition operating performance and Lilly’s post-acquisition stock price. The main disagreement was over whether Hybritech’s intellectual property would allow it to develop a monoclonal-antibodies-based cure for cancer by 1995 and the size of the potential market such a product would serve. As it turned out, neither party’s belief about Hybritech’s value was correct, and Eli Lilly sold Hybritech 10 years later at a fraction of what it paid for it. Yet a third example of honest disagreement is the decision that Brazil made many years ago to build the infrastructure for large-scale dependence on sugarcane-based ethanol, whereas the U.S. did not. These decisions reflected different beliefs about the future availability and price of oil. A common feature of all these examples is that it was difficult, if not impossible, to eliminate the disagreement simply on the basis of the available facts, including historical data. That is, these are examples of *new* situations in a non-stationary economic environment in which convergence to a common set of beliefs by learning from commonly-observed signals has not occurred.

In a corporate finance setting, all sorts of groups may have honest disagreement with each other, but it may be useful to begin by mentioning two major forms of disagreement. One is between current shareholders and future shareholders. If current shareholders anticipate that they will not provide additional capital to the firm in the future either due to diversification concerns or wealth endowment constraints, then they know that the firm’s ownership base will change as it raises new equity financing in the future. And if the beliefs of the new shareholders differ from those of the current shareholders, they may disagree on the actions that maximize firm value. This is the disagreement I focus on in this paper. Another possible disagreement is between the manager and the current shareholders. While this is undoubtedly important, I suppress it for now in order to delineate the ramifications of just focusing on disagreement *among* shareholders.[2] That is, I assume that the manager has the same beliefs as existing shareholders. Agency and asymmetric information problems are also suppressed for similar reasons.

In such a setting, value maximization is a useful organizing principle, but it is *incomplete*. In fact, I show that the manager may make strictly *Pareto-dominated decisions* if he is instructed to maximize net present value (NPV) when two sets of owners—current and future—have different opinions about what maximizes firm value. A Pareto dominance criterion reveals that the manager's objective should be to maximize *his expectation* of the NPV for the firm's *current* shareholders. With respect to the firm's original shareholders, because their beliefs coincide with the manager's, this is equivalent to maximizing their expected wealth using their beliefs, taking into account expected future dilution in their ownership due to additional outside financing. The key difference between this objective and the usual objective function is that this objective function attends to the dilution of current shareholders. Thus, with the usual objective, the manager should accept all positive-NPV projects. But, a disagreement framework recognizes that financing a positive-NPV project may result in "excessive" dilution for the current shareholders, implying that rejecting the project Pareto dominates accepting it. When current and future shareholders have the same beliefs and the firm is unlevered, any project that maximizes total firm value also maximizes the NPV accruing to current shareholders, so dilution of current shareholders is *not* an issue. But when different groups of shareholders value the firm differently because of disagreement, current shareholders care not only about their own valuation of the firm but also about how their claims will be diluted by the valuation of new shareholders who purchase equity.[3]

With this principle in place, I attempt to examine a variety of corporate finance issues. Capital budgeting is the starting point of the analysis since the practical manifestation of value maximization is identifying and investing in positive-NPV projects. The analysis produces a number of interesting results. First, there is a difference between the cost of capital as measured by the expected return demanded by shareholders[4] and the internal hurdle rate used by the manager to decide whether to accept or reject a project. The hurdle rate is higher. The stylized fact that firms set their capital budgeting hurdle rates above

[2] Whenever I say "disagreement among shareholders," it means disagreement between existing (or original) and new shareholders.
[3] A similar issue arises also in Myers and Majluf (1984) due to asymmetric information. Sections 2 and 6 provide a comparison of the disagreement model with Myers and Majluf (1984).
[4] This expected return would be associated with an asset pricing model that governs the cross section of expected returns, and it refers to the expected return *all* shareholders (old and new) need on their investment.

the expected returns demanded by their shareholders has been noted before (see, for example, Jagannathan and Meier (2002)). But is difficult to explain with rational expectations, although there have also been attempts—not based on disagreement—to understand how hurdle rates should be set when the usual rationality assumptions are dropped (e.g. Stein (1996)). What the analysis here shows is that an "internal" cost of capital (the hurdle rate) that is higher than the "external" cost of capital (the expected return demanded by all shareholders) is a natural consequence of disagreement among shareholders. Moreover, it turns out that to an outside observer it will appear that this hurdle rate depends on the firm's stock price, falling on average as the stock price rises and rising on average as the stock price falls. Since book value may be viewed as a "size deflator" or "normalization" variable that is not perfectly correlated with the stock price, this effect will make it seem that the firm cares about the ratio of its stock price to book value in deciding whether or not to accept a project and raise external financing for it. In particular, the analysis sheds light on why managers seem to believe that the equity cost of capital associated with external financing depends on the relationship between the firm's stock price and its per-share book value of equity, something that corporate finance theory typically dismisses as utter nonsense. Consider, for example, the following quote from Miller (1995), in which he asserts that the cost of external financing has nothing to do with the relationship between the market and book values of equity:

> "The banker sitting next to me was lamenting the profitable lending opportunities being passed up by capital-constrained banks, when I broke in to ask: "Then, why don't they raise more capital?". "They can't," he said. "It's too expensive. Their stock is selling for only 50 percent of book value". "Book values have nothing to do with the cost of equity capital," I replied. "That's just the market's way of saying: We gave those guys a dollar and they managed to turn it into 50 cents."

Second, I label the spread between the internal and external costs of capital as "disagreement costs," and show that disagreement costs are convex and increasing in the expected disagreement between current and future shareholders. I obtain closed-form expressions for the firm's internal cost of capital and disagreement costs as functions of the firm's external cost of capital and other parameters, so the approach provides a simple way for managers to correctly calculate the hurdle rate for project acceptance rather than adjusting it upward from the external cost of capital by an *ad hoc* amount. Moreover, since disagreement costs depend on both the firm's external cost of capital as well as idiosyncratic factors, they can vary across firms that have identical risks as assessed by any of the asset pricing models in use today, including the CAPM and the Fama-French factor-pricing model. Thus, some of these firms may choose to accept a project that others would reject. This is in contrast to the textbook prescription that two firms that have identical expected returns demanded by shareholders should make the same accept/reject decision on a project. Firms with higher levels of disagreement invest less *ceteris paribus*.

Third, the analysis reveals that, in the cross-section, managers of firms with relatively low stock prices will make smaller capital expenditures and issue less equity than managers of firms with relatively high stock prices. That is not a new result. It is a prediction that appears along with supporting empirical evidence in Dittmar and Thakor (2007).

Fourth, disagreement costs can predict when a dollar of cash in the firm will be worth more and when it will be worth less than a dollar in market value (see Faulkender and Wang (2006) for an empirical analysis of the market value of a dollar of cash). It also explains why firms may have a precautionary demand for cash.

The model is then extended to address optimal dividend policy. In the base model, all decision-making control rests with the manager whose beliefs are aligned with those of the original shareholders but differ from those of new shareholders. The effect of this control allocation shows up in a higher internal cost of capital as perceived by the manager or original shareholders, relative to a situation with no disagreement. Since the control allocation was simply imposed on the model, I now ask whether dividends could be used to modify this allocation to the benefit of the original shareholders.

If the manager precommits to paying dividends, he also precommits to paying out cash to the shareholders over time, which leaves less cash within the firm for investments in *future* projects than would be the case if no dividends were paid. The higher the dividends paid, the stronger this effect. That is, an increase in dividends will drain operating cash flows and increase the probability that external financing will be needed to either fund future projects or infuse additional capital into an existing project. This provides new shareholders an opportunity to withhold funding if they disagree with the manager's assessment of the investment opportunity. In other words, control shifts to the new shareholders. And the larger the dividend, the bigger is the shift in control to the new shareholders. This reduces the dilution of the original shareholders' claim. In other words, disagreement costs and hence the internal cost of capital computed by the manager are lowered.

In this way, dividends allow the manager to trade off the two forces in his objective function: (i) firm value maximization using original shareholders' (and the manager's) beliefs, which calls for the manager to retain maximum control over future investment decisions by paying no dividends; and (ii) minimization of the dilution suffered by the original shareholders (so as to maximize the net present value accruing to these shareholders), which calls for the manager to pay dividends to relinquish control over future investment decisions in order to reduce disagreement costs. The tension produced by these two opposing forces generates an optimal dividend policy that varies in the cross-section of firms depending on the likelihood of disagreement between current and future shareholders.

One implication of this is that investment policy and dividend policy are inherently *inseparable.*[5] Dividend policy is in fact the mechanism by which the allocation of control over investment decisions is made. The analysis thus shows that dividends facilitate the fine-tuning of the allocation of control over real investment decisions to maximize firm value and minimize the dilution of the ownership claims of the original shareholders by lowering the hurdle rate for project acceptance. In other words, the manager's goal is to find projects that he thinks will maximize firm value, and the role of dividend policy is to maximize his operating flexibility to do so, subject to dilution constraints related to the claim of the original shareholders. This perspective on dividends enables one to reconcile with the theory some stylized facts that have proven to be bothersome for both of the dominant paradigms: agency and asymmetric information. For example, the disagreement model, unlike the asymmetric-information justification for dividends as signals, is compatible with the documented higher correlation of dividends with past rather than future earnings (e.g. Benartzi, Michaely and Thaler (1997)). And, in contrast to the agency model, the disagreement model can also explain why growth firms may pay lower dividends.

Section 2 summarizes what is new about disagreement relative to agency and asymmetric information. Section 3 contains the base model. Section 4 has the analysis of the base model and results. Section 5 extends the base model to examine dividends. Section 6 discusses the related literature. Section 7 concludes. All proofs have been placed in the Appendix.

2. COMPARISON OF RESULTS BASED ON DISAGREEMENT WITH AGENCY AND ASYMMETRIC INFORMATION

The results in this paper show that manager-investor disagreement can be a significant force in affecting firms' investment and financing policies. So, an obvious question is: "what is really new that we learn from disagreement that the familiar workhorses, agency and asymmetric information, don't teach us?" To this end, I collect the main results in *this* paper and compare them to those from agency and asymmetric information models. Later in the paper (Section 4), I compare the predictions of the disagreement-costs model with those of the Myers and Majluf (1984) model.

[5] The cynical reader may say that this is hardly news since we know that the classical Fisherian separation results do not hold with asymmetric information and agency problems. Note, however, that the result here obtains even without those frictions and highlights a different role of financial policy.

Results from this Paper	Do the Following Models Yield Similar Results?	
Disagreement Costs Model	**Agency-Costs Models**	**Asymmetric Information (Myers and Majluf (1984)) and Signaling**
1. The internal hurdle rate for capital budgeting exceeds the firm's cost of capital.	No.	No, if signaling is allowed. Possibly yes if all the firms that are financing projects by raising equity are pooled together in equilibrium (as in Myers and Majluf (1984)).
2. Disagreement costs are increasing and convex in expected disagreement. Firms with higher levels of disagreement invest less.	No.	No.
3. Firms with higher stock prices are more likely to issue equity and make capital expenditures.	No.	No, unless one assumes in Myers and Majluf (1984) that asymmetric information is lower at higher stock prices.
4. Market value of $1 of cash on the balance sheet may be worth more or less than $1.	Yes.	Yes.
5. Dividend policy and investment policy are inseparable. Controlling for manager-investor agreement, firms with higher levels of dividends have lower capital budgeting hurdle rates.	No.	No.
6. Firms with higher levels of agreement pay lower dividends.	No. Firms should maximize dividend payments, subject to meeting investment needs. Firms with bigger agency problems pay higher dividends.	No. Firms pay higher dividends to signal higher future cash flows.
7. Dividends will appear to be negatively correlated with stock prices.	No.	No.
8. Dividends may be correlated with past cash flows.	Only if past cash flows convey information about agency problems.	No.
9. Firms with higher dividends have less volatile cash flows.	No.	No.
10. Firms with more volatile values of their agreement parameter will keep higher levels of cash.	No	No.

3. THE BASE MODEL

This section lays out the basic model, describing the timeline and sequence of events, the manner in which disagreement arises, and the manager's objective and decisions. It also summarizes the key assumptions.

A. Model Description

Think of a firm that starts out at date $t=0$ with no leverage and original owners who have provided the firm's equity. The assets in place have a sure terminal payoff of V_A at date $t=2$. To avoid unnecessary distractions, I assume an extreme form of illiquidity, so the assets in place cannot directly be sold prior to $t=2$ without losing all value. This means that the firm cannot raise financing for a new project at dates prior to $t=2$ by directly selling some of the firm's assets in place.[6] There is universal risk neutrality. The capital market is perfectly competitive and every security sold in the market is priced to yield to investors their required rate of return between $t=0$ and $t=2$ of $r>0$. So, $V_A/[1+r]$ is the present $(t=0)$ value of the assets in place.

The firm needs $\$I$ at $t=0$ to finance a new project that will arrive with probability $\theta \in (0,1)$ at date $t=1$. The time that elapses between $t=0$ and $t=1$ is considered so short as to not require any discounting. Because the original shareholders are wealth-constrained, the firm must raise the $\$I$ via external equity financing by selling a fraction $\alpha \in (0,1)$ of ownership in the firm to the new investors who purchase the equity.

At $t=0$, the owners decide whether to hire a professional manager who has the skill to discover new project ideas. If the manager is not hired, the probability of arrival of a new project is zero, and all that the firm produces is the payoff V_A from assets in place. If the manager is hired, there is separation of ownership and control, so the manager has control over the decisions of whether or not to issue equity at $t=0$ and whether or not to invest in the new project at $t=1$.[7] Corporate taxes are assumed to be zero because they have no effect on the analysis.

At date $t=1$, conditional on the manager having been hired, either the new project arrives or it does not. If it does not arrive, the $\$I$ raised from investors is kept idle and added to V_A to yield a terminal wealth of V_A+I for distribution to shareholders at $t=2$. The same is true if the project arrives but is rejected. If the project arrives and is accepted, then $\$I$ is invested in the project and the project cash flow is added to V_A for distribution to the shareholders at $t=2$. Since control over the investment decision at $t=1$ rests with the manager, he can reject a project he does not like and pretend as if the project never

[6] The results would be unaffected if it is assumed that new investors disagree with the original shareholders about the held-until-the-end value of the assets in place.

[7] The assumption that equity is raised first (at *t*=0) and the decision of whether to invest in the project is made next (at *t*=1) merely reflects the natural sequence of events in practice. A firm will typically raise external financing when it expects to have a project that it cannot internally finance, but it may receive post-financing information that results in the project being cancelled. That is, the possibility always exists that the manager will learn something of value relevance about the project after raising financing for it.

arrived. If he likes it, he reveals the project to investors.[8]

A project is either good (G) or bad (B). A type-G project pays off $\widehat{H}>0$ with probability p and 0 with probability $1-p$. A type B project pays off 0 almost surely. Thus, the firm's payoff distribution at $t=2$ is as follows:

Project Type	**Payoff with probability** p	**Payoff with probability** $1-p$
G	$\widehat{H}+V_A$	$0+V_A$
B	$0+V_A$	$0+V_A$

No one knows the project's type. Once the project arrives, the manager has the task of determining whether it is *G* or *B*. The prior probability at $t=0$ is $q\in(0,1)$ that the project is *G* and $1-q$ that it is *B*. Everybody has the same priors and this is common knowledge. I assume

$$qp\widehat{H}<I \tag{1}$$

which means that the project has a negative NPV, conditional on prior beliefs. The manager thus needs additional information if he is going to invest in the project. Information about the project's type is provided by a signal $S\in\{S_G,S_B\}$. The signal is commonly observed, i.e. the manager and all the investors observe the signal S at $t=1$.

Although the manager and the new investors have the same prior beliefs about the project's type and observe the same signal about the type, they may have different prior beliefs about its *informativeness* that could lead to honest disagreement over whether the project should be accepted. The prior beliefs, τ, about the informativeness of *S* are drawn randomly at $t=1$ from the set $\{i,u\}$, where $\tau=i$ represents an "informative" signal and $\tau=u$ represents an "uninformative" signal. The probability of the manager drawing i is $\beta\in(0,1)$ and that of drawing u is $1-\beta$. When the prior belief is that *S* is informative, it is perfect, so the agent's posterior belief about the project type is

$$\Pr\left(project=G\middle|S=S_G,\tau=i\right)=\Pr\left(project=B\middle|S=S_B,\tau=i\right)=1.$$

When the prior belief is that the signal is uninformative, the agent's posterior belief about project quality coincides with his prior belief about project quality. That is,

$$\Pr\left(project=G\middle|S=S_G,\tau=u\right)=\Pr\left(project=G\middle|S=S_B,\tau=u\right)=q \text{ and}$$

$$\Pr\left(project=B\middle|S=S_G,\tau=u\right)=\Pr\left(project=B\middle|S=S_B,\tau=u\right)=1-q.$$

[8] In the present model, it matters little whether the manager reveals the project to investors. But dividends will be introduced later, and the payment of dividends will give investors an opportunity to block a project the manager likes. In this case, the manager's revelation is important.

The original shareholders are assumed to have the same prior beliefs about the informativeness of S as the manager, for simplicity,[9] so the beliefs of the original and new shareholders may diverge. The differences in the prior beliefs shared by the manager and original shareholders and those held by the new investors come about as follows. The manager (including the original shareholders) and new investors (as a group) randomly draw prior beliefs τ_m and τ_n, respectively from $\{i,u\}$ and these beliefs may be correlated. That is, $\Pr\left(\tau_n = j \middle| \tau_m = j\right) = \rho$ and $\Pr\left(\tau_n = j \middle| \tau_m = k\right) = 1-\rho$, where $j \neq k$ and $j,k \in \{i,u\}$. This agreement parameter ρ is common knowledge at $t=0$.

The heterogeneous prior beliefs assumed here lead to honest disagreement. There are many reasons to assume agents may have possibly different beliefs. One is to use the argument put forth by Kreps (1990) that economic theory has nothing to say about how prior beliefs are arrived at, and thus these should be taken as part of the primitives, like preferences and endowments that are routinely assumed to vary across individuals. He goes on to argue that the assumption of homogeneous priors has "little basis in philosophy or logic." Another reason why agents may have different beliefs is that when projects are new and the economic environment is not stationary, there is a paucity of historical data on which individuals can condition their beliefs. There is little reason to imagine that everybody will share the same beliefs about something that is unlike what any individual has encountered in the past.[10] For those who honestly disagree in such instances, "the new is only the figment of our imagination," as noted by Schumpeter (1934). *Ex ante* the "facts" or historical data cannot settle who is wrong and who is right. This is the essence of *rational* heterogeneous beliefs (Kurz (1994a, 1994b)).

B. The Manager's Objective Function

We have a situation in which the manager's prior beliefs about the precision of the signal S coincide with the beliefs of the original shareholders who hired the manager, but differ from those of investors who become shareholders when external financing is raised at $t=0$. The standard rule of asking the manager to make decisions to maximize Net Present Value (NPV) is incomplete here. The reason is that it can lead to a decision that is Pareto dominated by another decision.

We can see this with a simple example. Suppose the firm has assets in place that everybody agrees are worth \$3 for sure today. Everybody is risk neutral and the riskless rate is zero. Suppose further that a

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[9] Later in the paper, I will discuss what happens if we complicate the model by dropping this assumption.

[10] It seems somewhat far-fetched to assume that everybody shares the same beliefs about the probability of humanity discovering a cure for cancer within the next three years or the probability of making contact with an alien civilization within the next decade or the probability of Google's new phone being more successful than any of its competitors. Even the recent history of financial market phenomena (e.g. the collapse of major U.S. investment banks and AIG or the earlier LCTM meltdown) provides examples of events that were not anticipated by all based on historical data.

new project will arrive for sure and everybody agrees that the signal about its value will be viewed by the manager and current shareholders as good with probability 0.75 and bad with probability 0.25. A good project has a (present) value of \$3 and a bad project has a value of −\$4.5.

The project needs an investment of \$1 that must be raised from new investors. If the manager chooses not to invest in the project, the \$1 raised from new investors is kept idle. Conditional on the manager and current shareholders viewing the project as good, suppose the probability that the new investors will view it as good is 1/3 and the probability they will view it as bad is 2/3. It is easy to see now that the total NPV of the project, as assessed by the manager, is 0.75[3] + 0.25[1] – 1 = \$1.50 > 0, since the manager avoids the project when his signal says it is bad. Thus, if the manager's goal is simply to maximize NPV, he will prefer to issue equity and invest in the project when his signal says it is good.

But consider now the welfare of each group, assessed using the beliefs of that group. New investors who purchase the equity must receive their expected return of zero in a competitive capital market. These investors receive an ownership share α in the firm that is a solution to:

$$\alpha\left\{0.75\left[1/3\right]\left[3+3\right]+0.75\left[2/3\right]\left[-4.5+3\right]+0.25[1+3]\right\}=1$$

where the first term in the curly brackets is the probability of a good signal as interpreted by the manager and the original shareholders (0.75) times the probability that the investor believes the project is good (1/3) times the total value of the firm in this state (the value of the project which is \$3 plus the value of the assets in place which is \$3). The second term in the curly brackets is derived similarly, with investors recognizing that there is a state in which the manager will invest in what they will view as a bad project. The third term captures the state in which investors know that the manager will view the project as bad and will thus not invest. The probability of this state is 0.25 and the payoff in this state is the value of the assets in place (\$3) plus the idle capital (\$1). Solving this equation yields $\alpha=4/7$. If the firm issues equity, the new shareholders receive 4/7$^{\text{th}}$ of the ownership in the firm and they assess their expected return from purchasing the equity as zero, the competitive return in this economy. This is exactly the same return that they receive if the firm issues no equity. In both the equity-issuance and no-issuance cases, the manager simply receives his reservation wage, whatever it is. But what about the original shareholders? Their expected payoff if the firm issues no equity is the value of the assets in place, \$3. And if equity is issued, they assess it as:

$$\left[1-\alpha\right]\left[\$3+0.75\left\{3\right\}+0.25\left\{1\right\}\right]=\left[3/7\right]\left[5.25\right]=\$\frac{66}{28},$$

where $\left[1-\alpha\right]$ is the original shareholders' ownership after the equity issue, \$3 is the value of the assets in place, 0.75 is the probability that the manager will see a good signal, in which case the value of the new project is \$3, and 0.25 is the probability that the manager will view the project as bad and reject it so the \$1 raised stays idle. Thus, the original shareholders are worse off if equity is issued because the equity issue is "too costly."

This example shows that the standard NPV maximization goal leads the manager to make a decision to issue equity that is strictly Pareto dominated by the decision not to issue equity. Thus, a different objective is needed for the manager when current and future shareholders may disagree over project value. An important property this objective should satisfy is that it always produces decisions that can *never* be Pareto dominated. In the next section, I will prove that the following objective achieves this goal: *the manager's objective at every date is to maximize the expected* NPV *to those who own the firm at that date, as perceived by the manager*. The manager thus cares solely about those who currently own the firm, and his preferences are perfectly aligned with theirs. If new shareholders are added at a subsequent point in time, then the manager's decisions after these shareholders come on board will seek to maximize the expected NPV accruing to those shareholders *as well as* the original shareholders, with the expectation computed using the manager's beliefs.[11]

With this set-up, the manager's objective function always coincides with that of those who own the firm at that point in time, although beliefs may diverge.[12] Moreover, the manager has no informational advantage over either existing shareholders or new investors in that they know as much as the manager about a project that the manager chooses to invest in and also as much about it *ex ante* when the manager issues equity to raise financing for it.[13] Thus, there are no agency (e.g. Jensen and Meckling (1976)) or adverse selection (e.g. Myers and Majluf (1984)) problems here. I will have something to say about how these problems might affect the results, but for now it is useful to see the implications of the model when these usual frictions are absent.

C. A Comment on the Assumption at the Manager and Original Shareholders Agree

One could legitimately object to my assumption that the beliefs of the manager and the original shareholders coincide. Obviously, this is not always the case in practice. It is true, however, that the beliefs gap between the manager and the original/existing shareholders will generally be *smaller* than that

[11] It makes no sense to ask the manager to use anyone's beliefs but his own.
[12] This assumption is also shared by other papers such as Baker and Wurgler (2002) and Myers and Majluf (1984) which assume that managers attempt to serve *current* shareholders at the expense of new investors. The assumption has support from survey evidence as well as that on earnings management. The contribution of the analysis here is to *endogenize* this as the Pareto-efficient objective for the manager.
[13] What they do not know that the manager knows is whether the manager saw a project and rejected it or the project never arrived, in cases in which the manager does not invest in a project at $t=1$. However, this is an issue of decision control rather than asymmetric information about future payoffs.

between the manager and the new shareholders. There are three reasons for this. First, if the original shareholders are involved in selecting the manager, they have an interest in selecting someone with similar beliefs. Van den Steen (2005a) shows that a manager with strong beliefs about the right course of action will attract, through sorting in the labor market, employees with similar beliefs. The original shareholders will do the same in selecting the manager. Once the manager is in place, the new shareholders do not have the same opportunity. Second, to the extent that there is a gap between the beliefs of the manager and the original shareholders, they have an incentive to close it through the use of compensation contracts. Third, it is theoretically untenable to assume anything else. To see this, suppose counterfactually that the investors who don't currently own the firm have a higher ρ than the existing shareholders. Then these investors will value the firm more highly than those who currently own it. But this creates an incentive for those who currently own the firm to sell their shares to the investors who then become the "existing shareholders." This means we always end up with a situation in which the firm's existing shareholders have higher ρ's than those who are not existing shareholders but may purchase new equity issued by the firm. In short, the assumption made here is meant to simplify and is a reasonable approximation to reality.

D. The Manager's Decisions

The manager has only two decisions to make. At $t=0$, he decides whether or not to issue equity for financing the project. And at $t=1$, he decides whether or not to invest in the project. The equity issuance decision will be analyzed in Section 4. What is discussed here is the project acceptance decision at $t=1$. This decision rests entirely on the signal S that is observed by the manager and all the investors (old and new) and the prior belief the manager and original shareholders draw about the precision τ of the signal.

Note that when the manager observes $S=S_G$ and draws a prior belief $\tau=i$ (informative signal) about the precision, he believes the project is *G* with probability 1 and assesses the expected project cash flow to be $p\widehat{H} \equiv H > I$. When he observes $S=S_G$ and draws a prior belief $\tau=u$ (uninformative signal) about the precision of S, he assesses the expected project cash flow to be $qH+[1-q][0]<I$ (by (1)). Let $qH \equiv L < I$, so an uninformative signal leads to project rejection.

It is clear that a signal $S=S_B$ always leads to a decision to reject the project, regardless of τ. The reason is that if $\tau=i$, then the project is believed to be *B* for sure, whereas if $\tau=u$, the expected cash flow is $L<I$ and the project is rejected. If a signal $S=S_G$ is observed, then the decision depends on τ. If the manager's prior belief $\tau_m=i$, then the manager assesses the expected project cash flow as H and the project is accepted by the manager. With probability ρ, new investors draw a prior belief $\tau_n=i$ and agree

with this assessment. With probability $1-\rho$, new investors draw a prior belief $\tau_n = u$ and thus believe that the expected project cash flow is *L*, so they disagree with the manager's decision. If the manager's prior belief about signal precision is $\tau_m = u$, then the project is rejected and investors never see it.

What is the consequence of this potential disagreement? Since the investors who purchase equity at $t = 0$ recognize the possibility of disagreement in the future, they reflect in their valuation of the firm's equity the possibility that the manager may choose a project at $t = 1$ that they view as bad. Thus, as we saw in the earlier numerical example, the possibility for disagreement affects the pricing of equity.

E. Collection of Key Assumptions

I now gather all the key assumptions of the model and briefly discuss them.

A.1. The capital market is perfectly competitive and securities issued by firms deliver to the investors who purchase these securities an expected return of *r*, where the expectation is computed using the beliefs of the investors purchasing the securities.

A.2. All agents are risk neutral.

*A.*3. The managerial labor market is perfectly competitive, and the manager earns exactly his reservation wage.

A.4. There are no taxes, agency problems or asymmetric information about future project payoffs. The manager's objective at any point in time is to make decisions that cannot be Pareto dominated.

A.5. The manager has the same beliefs as the original shareholders, but the beliefs of the new investors may be different, raising the possibility of disagreement. Beliefs of all agents are rational in the sense of Kurz (1994a, 1994b), but do not necessarily satisfy rational expectations.

A.6. Contracts are incomplete in the sense that agents cannot make "side bets" when they disagree.

A.1 is a standard assumption. It just states that in equilibrium, securities are competitively priced to yield investors an expected return that is exactly what is needed to satisfy their participation constraint. One noteworthy departure from the standard paradigm is that investors may compute their expected return using different beliefs from those used by the manager.

A.2 is also standard. Relaxing it would do little to change the results, but would add complexity.

A.3 is standard too and is routinely used in principal-agent models in which the agent's reservation utility constraint binds in equilibrium.

A.4 is intended to provide a characterization of outcomes even when the usual frictions are absent. In particular, it seeks to focus on cases in which managerial actions are not influenced by self-interest or private information, either because managers are intrinsically motivated to do well or because contracts have been designed to eliminate a divergence in either objectives or information between managers and owners.

A.5 is a key assumption which states that agents can have different beliefs and yet these heterogeneous beliefs can be rational. Thus, this assumption departs from the usual common priors assumption.

If two parties have different beliefs, then is it not the case that one is right and the other wrong? Perhaps. The model does not preclude this possibility. But it is also possible that neither party is right. The point is that when they disagree, each party believes it is right. Subsequent events may prove one or both of them wrong, but this is not known when the disagreement occurs.

A.6 rules out side bets. When the manager and the new investors disagree, one can imagine that they could make side bets on outcomes. For example, when the manager thinks the project is bad and investors think it is good, investors could offer to pay the manager a big sum if he invests in the project and it turns out to be bad. As a practical matter, such side bets are likely to be illegal in the context being considered here.

The sequence of events in the model is summarized below.

Figure 1: Sequence of Events

0	1	2
• Firm owned by initial shareholders. • Assets in place that produce sure cash flow of V_A at *t*=2. • Manager is hired by the initial shareholders. • Manager and initial shareholders have same objective and beliefs. • Manager decides whether to issue equity to finance a project that may arrive at *t*=1. • Equity issuance raises \$*I* in exchange of giving up α ownership.	• Manager either gets a project idea (probability θ) or not. • If project arrives, manager observes signal $S \in \{S_G, S_B\}$. • Manager draws prior belief $\tau_m \in \{i, u\}$ about signal precision. • With probability ρ, new investors draw the same signal precision as the manager $(\tau_n = \tau_m)$. With probability $1-\rho$, they draw a different precision $\tau_n \neq \tau_m$. • Manager accepts or rejects project.	• Payoff on assets in place, V_A, realized. • Project pays off $\widehat{H}$ with probability *p* and 0 with probability $1-p$ if *G*. Pays off 0 if *B*. • Total payoffs are distributed to all shareholders in accordance with their ownership shares.

4. ANALYSIS OF THE BASE MODEL: CAPITAL BUDGETING WITH DISAGREEMENT

This section examines capital budgeting with disagreement. I first show that with disagreement the manager's objective should be to maximize the expected NPV of those who are the firm's shareholders at that point in time. I then turn to capital budgeting hurdle rates and show that these must be set higher than the firm's cost of capital, a real-world practice that has been difficult to explain. The reason for the wedge between the hurdle rate and the cost of capital is that there are "disagreement costs," so the wedge cannot be explained in a standard asymmetric information or agency setting without disagreement. I also provide a detailed comparison of the disagreement-costs model with Myers and Majluf (1984). The section ends with a discussion of two extensions. I show that in a disagreement framework: (1) firms with higher agreement levels issue more equity and make higher capital expenditures, and (2) the market value of a dollar of cash on the balance sheet will depend on the agreement parameter, ρ.

A. The Manager's Objective Function

I will first prove that the Pareto dominance criterion with disagreement leads to an objective function that differs from the standard NPV maximization objective.

Theorem 1: *The manager's objective at any point in time is to maximize the expected NPV of those who are the firm's shareholders at that point in time, using the manager's beliefs.*

This theorem says that the manager's objective is to maximize the NPV of the firm's *current* shareholders. The intuition behind Theorem 1 rests on the assumptions ((A-1) and (A-3)) that the labor and capital markets are competitive. These assumptions guarantee that the manager and the new investors coming in at any point in time are always indifferent across different *equilibrium* allocations; the manager gets his reservation wage and the new investors who buy equity are promised their reservation expected return. Hence, Pareto dominance requires maximizing the welfare of those who are shareholders at that point in time subject to the participation constraints of the manager and the new investors coming in at that point in time.

Working backwards from the end, we see that there are two groups of shareholders who comprise the current shareholders at $t=1$: the original shareholders and the new shareholders who provided financing at $t=0$. The manager makes his project choice decision at $t=1$ to maximize expected NPV accruing to both groups of shareholders. However, in computing this expected NPV the manager will use his beliefs since he views his beliefs as rational. This means even when he observes that the new shareholders disagree with his project choice, he believes his choice maximizes the value of *their* claim. Thus, accepting the project when $S=S_G$ and $\tau_M=i$ and rejecting it otherwise is viewed by the manager as maximizing the expected NPV for *all* current shareholders at $t=1$.

At $t=0$, before equity is issued, the only owners of the firm are the original shareholders. To maximize the expected NPV accruing to them, the manager should issue equity whenever the ownership share the original shareholders have to relinquish in order to raise $\$I$ is such that the present value of their share of the expected terminal payoff (expected project payoff + the value of the assets) at $t=2$ is at least as great as the value of the assets in place, i.e. the value the original shareholders receive if they issue no outside equity. That is, the manager should issue equity whenever

$$\left[1-\alpha\right]W_m \geq V_A\left[1+r\right]^{-1} \tag{2}$$

where W_m is the total value of the firm at $t=0$ as assessed by the manager.

Letting $x=1$ denote "yes" to an equity issue and $x=0$ "no," the manager's maximization problem at $t=0$ can be written as:

$$\max_{x\in\{0,1\}} x\left[1-\alpha\right]W_m+\left[1-x\right]V_A\left[1+r\right]^{-1} \tag{3}$$

$$\text{subject to } \alpha W_n = I \tag{4}$$

where W_n is the value of the firm as assessed by the new investors using their beliefs. The constraint (4) is an equilibrium pricing constraint that follows from assumption *A.1:* investors' assessment of their share of firm value $\left(\alpha W_n\right)$, where W_n is arrived at by discounting investors' expectation of the terminal payoff at their expected return *r*, must equal the funds raised from the equity issue, *I*. This implies that when $\left[1-\left\{I/W_n\right\}\right]W_m \geq V_A\left[1+r\right]^{-1}$, the manager will choose $x=1$ and issue equity at $t=0$ to raise *I*. Similarly, when $1-\left\{I/W_n\right\}W_m < V_A\left[1+r\right]^{-1}$, the manager will choose $x=0$ and not issue equity.

B. Capital Budgeting, Hurdle Rates and Disagreement Costs

Under what circumstances will the manager raise external financing at $t=0$ in order to retain the option to invest in the project at $t=1$? The standard capital budgeting answer is that he will do so if the expected rate of return on the project exceeds the internal hurdle rate for investing in the project. Theoretically, this hurdle rate should equal the expected rate of return demanded by shareholders, or what I will refer to as the firm's "external" cost of capital. In practice, managers often set the internal hurdle rate higher than the external cost of capital, although it is not easy to theoretically explain why using the standard framework. I show below that disagreement leads naturally to a simple explanation.

To examine this, let us write down the expressions for the values of the firm as assessed by the manager (W_m) and investors (W_n). First,

$$W_m=\left[1+r\right]^{-1}\left[V_A+\theta\left\{q\left[\beta H+(1-\beta)I\right]+\left[1-q\right]\left[\beta I+\left[1-\beta\right]I\right]\right\}+\left[1-\theta\right]I\right] \tag{5}$$

In (5), V_A is the value of assets in place. There is a probability θ that the new project will arrive, in which case there is an option to invest in it (the term in $\{\ \}$ multiplying θ), and a probability $1-\theta$ that the new project will not arrive, in which case the payoff is *I* (investment capital stays idle). If the project arrives, then the probability is *q* that it is good. Conditional on a good project, the manager receives a signal he views as precise with probability β, in which case he invests and the expected project payoff is *H*; the probability is $1-\beta$ that the manager receives a signal he views as uninformative, so he rejects the project and the payoff is the idle investment capital I.[14] The probability is $1-q$ that a project that arrives is a bad project, in which case the manager will reject it when his signal is precise (so the signal will be $S=S_B$) or uninformative (in which case the project is rejected regardless of whether $S=S_G$ or $S=S_B$). Rearranging terms and defining $A_H \equiv H-I$, we can write (5) as:

$$W_m = \left[1+r\right]^{-1}\left[V_A + \theta q \beta A_H + I\right] \tag{6}$$

Similarly, the new investors' valuation of the firm can be written as:

$$W_n = \left[1+r\right]^{-1}\left[V_A + \theta q \beta A_{HL}\left(\rho\right) + I\right] \tag{7}$$

where $A_{HL}\left(\rho\right) \equiv \rho H + \left[1-\rho\right]L - I$, and ρ is the agreement parameter. The key difference between (6) and (7) is that (6) has A_H and (7) has $A_{HL}\left(\rho\right) < A_H$ for any $\rho < 1$. That is, new shareholders know that the manager will only invest when his signal is good and precise, but their valuation of the firm in this state will depend on their probability of agreement (ρ) with the manager.

The manager's goal at $t=0$ is to maximize the NPV accruing to the original shareholders. By issuing equity, the original shareholders give up ownership α. Thus, the return that these shareholders surrender to the new investors in order to raise external financing is

$$\frac{\alpha\left[\text{Original shareholders' assessment of the terminal payoff}\right]}{I} - 1.$$

Since W_m is the present value of the original shareholders' valuation of the terminal payoff, their assessment of the terminal payoff is $W_m\left[1+r\right]$. Moreover, given that the beliefs of the manager and the original shareholders coincide, this return, which I refer to as the "hurdle rate" or the "internal cost of capital" is:[15]

$$\hat{r} = \frac{\alpha W_m\left[1+r\right]}{I} - 1 \tag{8}$$

The following result can now be proved:

Theorem 2: *The hurdle rate for capital budgeting, $\hat{r}$, exceeds the external cost of capital or the minimum expected rate of return demanded by shareholders, r, for all $\rho \in \left[0,1\right)$.*

[14] There are no agency problems, so cash kept idle is not wasted by the manager.

[15] While this hurdle rate has been derived for a project with a single-period cash flow, it is easy to extend this to a project with multiple periods. Suppose the cash flow at date *t* as valued by the manager is CF_{mt}. Then the hurdle rate or internal cost of capital, $\hat{r}$, is the solution to: $\alpha\left\{\sum_{t=1}^{n}\frac{CF_{mt}}{\left(1+\hat{r}\right)^t}\right\} = I$.

This result means that whenever disagreement is present (i.e. $\rho < 1$), the firm's hurdle rate, $\hat{r}$, which serves as its *internal* cost of capital for capital budgeting, will always exceed the external cost of capital, r, given by the minimum rate of return shareholders demand. The difference between the two, $\hat{r} - r \equiv D$, can be viewed as a *disagreement cost*.

The reason for the existence of the disagreement cost is easy to see. Because the manager may make a project choice in the future that new investors think is bad, these investors ask for a correspondingly higher share of equity in response to their potential disagreement with the manager, which increases the dilution suffered by the original shareholders relative to the case without disagreement. This disagreement-induced dilution increases the expected payoff the project must deliver in order to be acceptable to the manager, raising the hurdle rate $\hat{r}$ above r. The analysis indicates precisely how both the hurdle rate and the disagreement cost can be computed. For any investment *I*, the manager can compute the α that will need to be promised to new investors at the firm's prevailing stock price. The manager can then proceed to calculate $\hat{r}$ using (8) to obtain the hurdle rate to apply to the project. Note that since α depends on the firm's external cost of capital, *r*, it is clear that the hurdle rate will depend on *r*. The following result is useful.

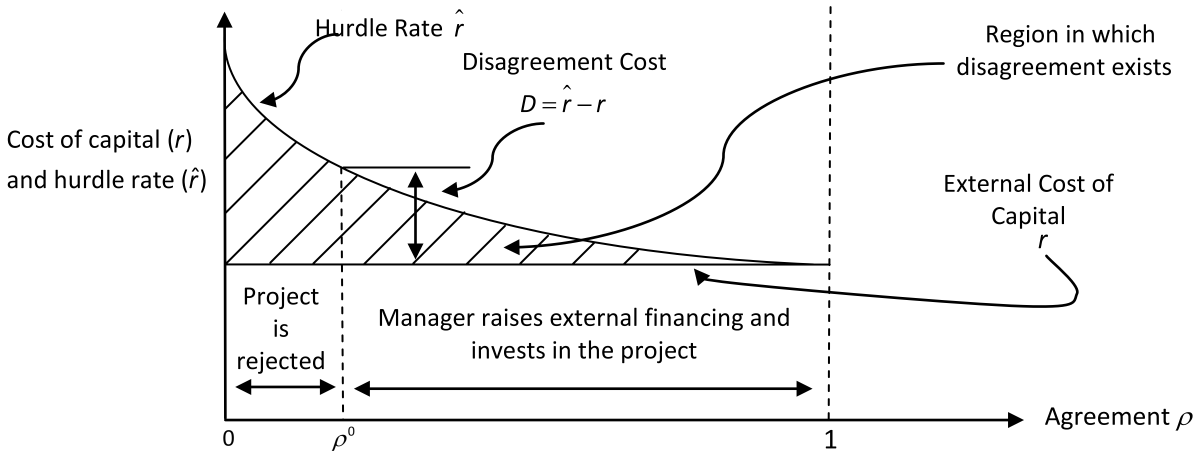
Lemma 1: *The amount of ownership that must be surrendered to new shareholders, α, is decreasing and convex in the agreement parameter, ρ.*

This is intuitive. New shareholders demand a premium for providing funds to a firm that may invest in projects these shareholders do not like. This premium declines as the likelihood of disagreement decreases. A related result is given below.

Theorem 3: *The disagreement cost, D, is decreasing in the agreement parameter ρ, whereas the firm's external cost of capital is unaffected by ρ. For ρ low enough ($\rho < \rho^0$), the manager rejects a project that would have been funded if the original shareholders were funding it.*

What this theorem implies is a picture of the disagreement cost, *D*, that looks like this:

Figure 2: Disagreement Cost as a Function of the Agreement Parameter



As this figure illustrates, the disagreement cost *D* declines from its peak as ρ increases and drops to zero at $\rho = 1$. This means that the premium in the cost of capital as perceived by the firm (*D*) gets smaller as the disagreement between the manager/current shareholders on the one hand and future shareholders on the other diminishes.

The import of disagreement costs is that they can cause firms to underinvest in projects. The figure shows a cut-off value of ρ, say ρ^0, such that if the agreement parameter is lower than ρ^0 the manager may choose not to raise equity to finance the project. This is because the project hurdle rate $\hat{r}$ for $\rho < \rho^0$ is so high that it exceeds the *incremental* return to the original shareholders from investing in the new project. Clearly, such a project would be funded if the firm had a higher ρ.

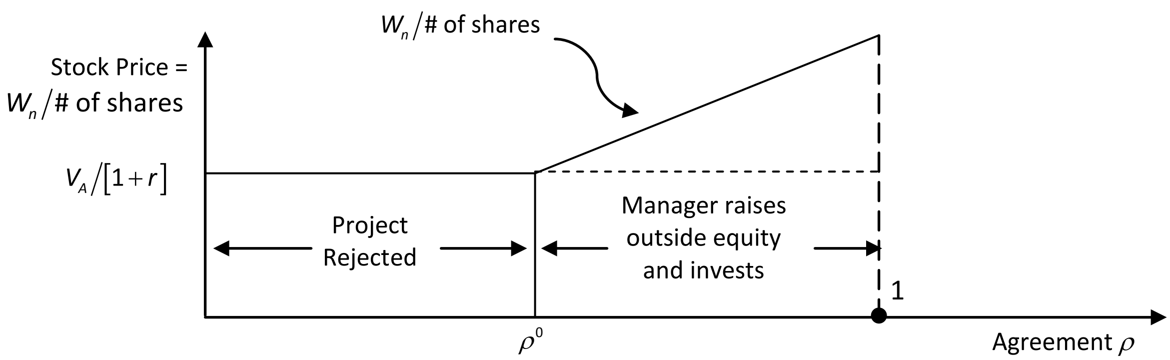
This means that project selection will be firm-specific. Even if two firms have exactly the same forecast of future cash flows and their shareholders have identical expected rates of return, one firm may wish to invest in the project and the other may not. This is because the *dilution* of the original shareholders' claim *does* matter for capital budgeting and the extent of potential dilution varies in the cross-section with the agreement parameter ρ. Moreover, there is an unavoidable wedge between the hurdle rate for projects and the minimum expected rate of return demanded by shareholders available from say the *CAPM*). The following result is now easy to derive.

Corollary 1: *The firm's hurdle rate,* $\hat{r}$, *depends on its current stock price. The higher is the stock price, the lower is the hurdle rate.*

The intuition is straightforward. The higher is agreement ρ, the higher is the value of the firm to new investors, W_n, which yields the stock price when divided by the number of shares. A higher ρ also leads to a lower hurdle rate $\hat{r}$ (Theorem 3). The observation that project selection should depend on the firm's stock price is a departure from what we teach in Corporate Finance textbooks, but it follows immediately from the result that dilution is a concern to current shareholders.

Figure 2 also implies a relationship between the firm's stock price at $t = 0$ and its agreement parameter looks like this:

Figure 3: Stock Price and Agreement



The strictest interpretation of Theorem 3 and Corollary 1 is that they only apply when the firm needs external financing for projects. This is not true. In a dynamic sense, any dollar of internally-available funds invested in a project today is a dollar that will have to be raised through external financing tomorrow. So using $\hat{r}$ as the hurdle rate for projects makes sense even when internal funds are available.

C. Empirically Distinguishing Disagreement Costs from the Pecking Order Theory

It is useful to compare the analysis based on disagreement costs with the famous "pecking order" theory of Myers and Majluf (1984) adverse selection model. In that model, there are two types of observationally-identical firms with different values of assets in place *as well as* access to a positive-NPV project. Myers and Majluf (1984) assume that there is asymmetric information in that each firm's manager knows the NPV of his firm's project as well as the value of the assets in place, but investors know neither. As in our paper, the goal of the manager is to maximize the wealth of the existing shareholders. It is shown that in this setting only the lower-valued firm issues equity in equilibrium. The higher-valued firm passes up the positive-NPV project because financing it would dilute too much of the ownership of current shareholders. This is a Nash equilibrium because investors price the equity issue believing that it can come only from the lower-valued firm. And given those beliefs on the part of investors, it is indeed optimal for only the lower-valued firm to issue equity. Thus, equity issues always precipitate price declines.

At a superficial level, this seems quite similar to the outcome with disagreement characterized in this paper. A manager who is maximizing the wealth of existing shareholders prefers to pass up positive-NPV projects because raising equity to finance them would excessively dilute the ownership of existing shareholders. However, a closer look at the two models reveals many important differences.

The "pecking order" theory of Myers and Majluf (1984) has the following empirical predictions:

$(\mathrm{P1})$ Equity issues should be rare. In fact, as Myers and Majluf (1984) acknowledge, there is no role for equity issues in their model, since the firm would prefer internal cash and debt over equity. For equity to be issued, one would need to step outside their model and assume, for example, the existence of high agency costs of debt.

$(\mathrm{P2})$ Stock prices fall when equity is issued.

$(\mathrm{P3})$ Cross-sectionally, firms facing higher levels of asymmetric information are less likely to issue equity than firms facing lower levels of asymmetric information.

$(\mathrm{P4})$ Intertemporally, a firm should issue equity when information asymmetry is at its lowest. Moreover, information asymmetry should be eliminated immediately after an equity issue. Thus, if equity issues for a firm are clustered, the price drop for equity issues after the first one should be negligible.

What about the disagreement model? Suppose we assume that investors are heterogeneous and are associated with different values of the agreement parameter, ρ. They are also wealth-constrained, so each can only invest a limited amount in any stock. Then, in equilibrium the firm will have to sell its stock to enough investors for its supply of stock to be fully subscribed. The marginal investor will be the one with the *lowest* ρ among those investors who purchase the secondary equity offering. All the inframarginal investors will have higher ρ's. Combined with our earlier analysis, this now generates the following predictions.

$(\hat{\mathrm{P}}1)$ Equity issues should be more prevalent among high-ρ firms than among low-ρ firms.

$(\hat{\mathrm{P}}2)$ Stock price should fall when equity is issued. This is because selling additional equity requires the firm to get lower-ρ investors to buy its stock. The ρ of the marginal investor drops, and so does the market-clearing stock price.

$(\hat{\mathrm{P}}3)$ Cross-sectionally, even firms with high levels of asymmetric information will issue equity if they have high agreement parameters, ρ.

$(\hat{\mathrm{P}}4)$ If a firm's equity issues are clustered, later equity issues should suffer bigger price drops than earlier equity issues. This is because later issues must pull in investors with lower ρ's.

As is apparent, some predictions overlap. $(\mathrm{P2})$ and $(\hat{\mathrm{P}}2)$ are identical. However, the disagreement model leaves far more room for equity issues than the Myers and Majluf (1984) model. Compare (P1) and $(\hat{\text{P}}1)$.

$(\hat{\text{P}}3)$ is in sharp contrast to (P3). Firms with lots of growth options and proprietary research and development knowledge would be good candidates for being in the group of firms with high asymmetric information. The "pecking order" theory predicts that such firms will not issue equity. The disagreement model predicts that they will issue equity if they have high ρ's.

$(\hat{\text{P}}4)$ is also in sharp contrast to (P4). $(\hat{\text{P}}4)$ is essentially saying that the supply of equity by the firm affects its price. This means that if a firm issues equity, subsequent issues will be at lower prices even though the information asymmetry is declining. By contrast, (P4) says that the price decline with an equity issue should be limited to the first issue in a cluster of issues. Why? Note that in Myers and Majluf (1984), the act of issuing equity acts as a *signal*, so issuing equity as part of a separating equilibrium *eliminates* the information asymmetry that existed prior to the equity issue. This means that information asymmetry should not be an impediment to an equity issue once this asymmetry has been dissolved by a *prior* equity issue. Consequently, subsequent issues should not be accompanied by price declines as long as these are part of a cluster of issues during a time period in which significant new information was not acquired privately by the manager.[16]

To sum up, one could empirically distinguish between the pecking-order theory and the disagreement-cost theory by asking the questions shown in the table below.

[16] Given transactions costs, it may not make a lot of sense for firms to issue equity in dribs and drabs. So one can ask: would a clustering of equity issues ever be observed? Not typically, but this will happen if a firm issues equity and then has another opportunity come up unexpectedly that requires an additional equity issue. As Harris and Raviv (1991) explain, the Myers and Majluf (1984) result only requires asymmetric information about assets in place, not the NPV of the new project. Since the *first* equity issue resolves the information asymmetry about assets in place, subsequent issues do not trigger asymmetric-information-related price declines.

Empirical Question	Answer if Pecking Order is Right	Answer if Disagreement-Cost Theory is Right	Any Existing Evidence
1. Are equity issues rare for all firms at all times?	Yes.	No. Firms issue equity when stock prices are high, reflecting high values of manager-investor agreement, (ρ), and when ρ is high even independently of stock prices.	• Baker and Wurgler (2002) and Welch (2004) provide evidence of prevalent equity issues when stock prices are high. • Dittmar and Thakor (2007) provide evidence of equity issues when ρ is high even independently of stock prices.
2. If equity issues for a firm are clustered, are the price drops for later issues smaller than for earlier issues?	Yes.	No.	• Not yet tested.

D. Distinguishing the Hurdle Rate with Asymmetric Information from that with Disagreement

In the Myers and Majluf (1984) model, it is the equity issue that serves as a signal. This means that if observationally-identical firms with different values issue equity, they must all be pooled together. It is the prospect of pooling that deters some (high-valued) firms from issuing equity. This is different from papers such as Ross (1977) where firms separate themselves from each other via signaling with financial policy choices. So I now compare the disagreement-costs theory with a signaling model. In particular, the question is: would the internal hurdle rate $\hat{r}$ for projects exceed the (external) cost of capital *r* even in an adverse-selection setting with signaling? To examine this, suppose there are say *n* firms, each of which has assets in place worth $V_A\left[1+r\right]^{-1}$ in present-value terms and a new project worth V_i, $i \in \{1,\cdots,n\}$. There is asymmetric information in that even though $V_1 < V_2 < \cdots < V_n$, all firms are observationally identical to investors. Investors are, however, aware that *n* types of projects exist with different values and they assign each project a prior value of $\sum_{i=1}^{n} Z_i V_i = \overline{V}$, where Z_i is the common prior probability all investors attach to a firm being of type *i*.

We know that in such situations, firms have an incentive to separate themselves from each other by using signals with attribute-dependent costs (see Spence (1976)). Let k_i be the signaling cost associated with type *i,* and assume that this cost satisfies the signaling-cost properties needed for a separating equilibrium in Spence (1976). In a separating equilibrium, the firm of type *i* will be valued at $\left[V_i - k_i\right]\left[1+r\right]^{-1} + V_A\left[1+r\right]^{-1}$, the present value of the project and the assets in place. Thus, to raise financing *I*, shareholders will have to sell share α of ownership such that

$$\alpha\left\{\left[V_i-k_i\right]\left[1+r\right]^{-1}+V_A\left[1+r\right]^{-1}\right\}=I.$$

Since $\partial k_i/\partial V_i<0$ for a Spencian signaling equilibrium, there may exist some V_j such that

$$\left[1-\alpha\right]\left\{\left[V_i-k_i\right]\left[1+r\right]^{-1}+V_A\left[1+r\right]^{-1}\right\}<V_A\left[1+r\right]^{-1}$$

for all $V_i\le V_j$, where the left-hand side of the above inequality is the post-signaling value of the firm to current shareholders. That is, there may be firms with sufficiently low values that face such a high signaling cost that their value to the original shareholders with signaling is less than if they reject the project, do no signaling and just hold on to their assets in place. In this case, the only firms that will issue equity to finance the new project are those for which $V_i>V_j$. That is, the set of firms that will issue equity belong to the set $n^*=\left\{i\in\{1,\cdots,n\}\middle|V_i>V_j\right\}$. Now, the original shareholders compute the return that they surrender to the new investors in order to raise external financing as:

$$\begin{aligned}&\frac{\alpha\left[\text{original shareholders' assessment of the terminal payoff}\right]}{I}-1\\&=\frac{\alpha\left[V_i-k_i+V_A\right]}{I}-1\\&=\hat{r}_i,\text{ where } i\in n^*.\end{aligned}$$

Note that since $\alpha\left\{\left[V_i-k_i\right]\left[1+r\right]^{-1}+V_A\left[1+r\right]^{-1}\right\}=I$, we can write:

$$\begin{aligned}\hat{r}_i&=\frac{I\left[1+r_i\right]}{I}-1\\&=r_i.\end{aligned}$$

This means that with asymmetric information, there is no wedge between the hurdle rate (internal cost of capital) $\hat{r}_i$ and the rate of return demanded by the shareholders, r_i.

Thus, disagreement and asymmetric information both represent frictions that cause some firms to avoid issuing equity. But where the two frictions part company is in their effect on the hurdle rate for project acceptance, $\hat{r}$, relative to the shareholders' expected rate of return, r. Disagreement causes these two to diverge so that $\hat{r}>r$, whereas asymmetric information does not.

The intuition for this result is as follows. With disagreement, $\hat{r}>r$ because the manager's assessment of firm value exceeds the new investors' assessment *even in equilibrium*. So a project that just satisfies the minimum-expected-return constraint of investors—it delivers an expected return of *r* using the valuation of investors—will have a higher expected return using the manager's assessment. Hence, if *r* is the investors' hurdle rate, the manager's corresponding hurdle rate $\hat{r}$ is higher. By contrast, with asymmetric information and signaling, both the manager and investors assess the signaling cost identically and their *valuations coincide* in a perfectly-separating signaling equilibrium. This means there is *no* wedge between $\hat{r}$ and *r in equilibrium*.

E. Further Implications Corporate Investments and the Value of Cash

In this sub-section I examine a variety of additional implications that emerge from the simple framework developed in the previous subsection.

The Relationship between Disagreement and Capital Expenditures and Equity Issues

So far we have looked at a single-project firm. But suppose the manager faces a portfolio of projects $j \in \{1,...,n\}$, with the expected payoff on the good project, H_j, potentially distinct for each *j*. Then we have the following result.

Corollary 2: *A manager with a lower ρ invests in fewer projects on average than a manager with a higher ρ but an identical project portfolio. Thus, managers with higher values of ρ (and hence higher stock prices) issue more equity and make higher capital expenditures.*

The intuition is related to Corollary 1. As ρ increases, there is a lower likelihood that the ρ for any project in the portfolio will fall below the cut-off ρ^0 that triggers project rejection. Thus, a manager with a higher ρ enjoys a higher stock price and is able to invest more, and finances this with more equity. For empirical evidence on this, see Dittmar and Thakor (2007).

If we normalize the firm's stock price by the book value of its equity, then it will appear that managers only want to issue equity and finance projects when their price-to-book ratio is high enough. That is, the price-to-book ratio may be used by managers as a proxy for ρ.

It is well documented that firms tend to issue equity when their stock prices are relatively high (e.g. see Baker and Wurgler (2002)). Corollary 2 is consistent with that finding since the firm's stock price is monotonically increasing in the agreement parameter, ρ. However, Corollary 2 also implies that, even after controlling for the stock price, which is a proxy for market timing, a higher ρ (proxied by non-price-related distinguishing measures) leads to an incrementally higher probability of equity issuance.[17] That is, while higher agreement works in concert with higher stock prices to induce firms to issue equity, it also exerts an independent influence in the same direction. A reverse prediction (not derived here) is that a sufficiently low ρ could induce firms to repurchase stock.

[17] Dittmar and Thakor (2007) provide supporting evidence.

The Market Value of On-Balance-Sheet Cash and a Precautionary Motive for Hoarding Cash

The model can also speak to the issue of how much $\$I$ on the firm's balance sheet will be valued at by new investors in the market.

Corollary 3: $1 *on the firm's balance sheet will be valued at less than $1 by investors if* $\rho < [I-L]/[H-L]$ *and at more than $1 if* $\rho > [I-L]/[H-L]$.

The intuition is that new investors consider two factors when assessing the market value of a dollar on the firm's balance sheet. One is that the dollar may be invested in a project that they agree increases the value of the firm; this pushes them in the direction of valuing a dollar on the balance sheet at more than a dollar. The other is that it may be invested in a project that the manager believes has positive NPV but is actually a bad project; this pushes investors in the direction of putting a value of less than a dollar on the balance sheet. The force of the second effect gets weaker as ρ increases, so a dollar on the balance sheet will be valued at more than a dollar when ρ is high enough.

This result provides one possible explanation for the empirical finding documented by Faulkender and Wang (2006) that a dollar of cash on a firm's balance sheet is worth $0.94 on average.[18] The result here also provides a new testable prediction, namely that the market value of a dollar of cash on the balance sheet will be increasing in agreement.

This analysis also indicates that cash has value because it allows the firm to avoid issuing equity and hence avoid the accompanying drop in ρ. The original shareholders will want the manager to hoard cash so that projects can be taken in the future during periods of low agreement (ρ) with new investors. In fact, firms that have high volatility in ρ will display a stronger precautionary demand for cash. This is another testable prediction of the model.

5. EXTENSION OF THE MODEL: MANAGERIAL AUTONOMY AND DIVIDENDS

In this section I have two goals. One is to relax the assumption that the manager has complete project choice control, and the other is to explore the implications of this for dividend policy. To do this, I follow the approach in Boot, Gopalan and Thakor (2006, 2008) and introduce a *managerial autonomy* variable $\eta \in [0,1]$, which is the *ex ante* contractually-agreed upon probability that when there is disagreement between the manager and investors about whether a project should be accepted, the manager has control over project choice. That is, conditional on disagreement at $t=1$, the probability is η

[18] I do not claim disagreement is the only reason for this. Agency problems may also be playing an important role here.

that the manager will decide on the project and $1-\eta$ that the investors will decide.[19] In Subsection 5A managerial autonomy is first introduced as a general contracting variable, without talking about dividends. Then in Subsection 5B a firm's dividend policy is linked to managerial autonomy. By setting $\eta<1$, the manager gives up some project-choice control to new investors. Doing this may be beneficial because it lowers the cost of raising outside financing.

A. Managerial Autonomy as a Contracting Variable

Boot, Gopalan and Thakor (2006, 2008) interpret managerial autonomy η as a parameter of the firm's corporate governance and show that the endogenously-determined *ex ante* efficient η is renegotiation-proof under some conditions.[20] For now, I will take this merely as a contracting variable that is determined at $t=0$. Later, I will show how the firm's dividend policy can be designed to implement any η. In other words, it will be shown that the firm's dividend policy can be interpreted as implying a particular value of η, and can thus be used *ex ante* as a "control sharing" mechanism.

The manager now has two decisions to make at $t=0$: (i) determine η, and (ii) decide whether to issue equity, given the optimally-determined η. That is, the manager first solves:

$$\max_{\eta\in[0,1]}[1-\alpha]W_m(\eta) \tag{10}$$

subject to

$$\alpha W_n(\eta)=I \tag{11}$$

where

$$W_m(\eta)=[1+r]^{-1}\left[V_A+\theta q\beta\left\{\rho A_H+[1-\rho]\eta A_H\right\}+I\right] \tag{12}$$

$$W_n(\eta)=[1+r]^{-1}\left[V_A+\theta q\beta\left\{\rho A_H-[1-\rho]\eta A_L\right\}+I\right] \tag{13}$$

$$A_L\equiv I-L \tag{14}$$

where W_m is the manager's assessment of total firm value as defined in (12), and W_n is the investors' assessment of firm value as defined in (13). In the program above, (10) is the manager's expectation of the NPV accruing to the original shareholders and (11) is the investors' participation constraint. The manager first determines the solution $\eta^*\in[0,1]$ to this problem, taking (11) as a given. Since α is a function of η,

[19] In the case of debt, it is easy to interpret η —it is simply determined by the debt covenants that specify what the borrower can and cannot do and when lenders have control. In the case of equity, η will be related to the number of directors representing outside shareholders on the board and board's authority, if we link η to corporate governance.
[20] That means once η is set *ex ante*, the manager and investors do not have mutual gains from changing it *ex post*.

once η^* is determined, the corresponding α, call it α^*, is also determined. Let this solution be $\{\eta^*, \alpha^*\}$. The manager then solves the maximization problem in (3)-(4) to decide if he should issue equity. The following result can now be proved.

Lemma 2: *The manager's objective function, $[1-\alpha]W_m(\eta)$, representing the NPV accruing to the original shareholders, is concave in managerial autonomy η. There exists a unique $\eta^*(\rho)$, increasing in the agreement parameter ρ, that represents a solution to (10)-(11).*

The intuition for the manager's objective function to be concave in η is that it trades off the benefit of greater managerial autonomy in terms of an enhanced ability for the manager to invest in a project he likes against the higher cost of capital that accompanies a higher η. Note that a higher η leads to a higher ownership α that must be sold to outside investors to raise *I*, and a higher α leads to a higher internal cost of capital or hurdle rate, $\hat{r}$, which is evident from (8). The reason why α increases with η is that a higher η implies a higher probability that the manager will invest in a project the new investors who purchase equity do not like.

B. Dividends

The preceding analysis shows that it may be efficient for the firm to concede some project-choice control to the new investors, since a reduction in managerial autonomy (η) reduces α and hence the cost of capital, $\hat{r}$. We will now see how dividends may be used as a way for the firm to concede the desired control to new investors. To do this, the model needs to be extended.

Suppose the firm generates a cash flow $C > 0$ at $t = 1$ *after* investment in the new project has been made; this cash flow is only available after the time for investing in the new project has passed. Moreover, in addition to the amount *I* the firm invests in the new project at $t = 1$, it will need additional financing in the project at $t = 1.5$. How much additional financing will be needed is a random variable $\tilde{I}_{1.5} \in [0, C]$. The probability density function of $\tilde{I}_{1.5}$ is $f(I_{1.5})$. If this additional investment is not made, the project cash flow is always just *I*. If the investment is made, the cash flow is as described in the previous sections,[21] and it is assumed that $H - I - C > 0$, so the project is worth investing in even with the maximum possible additional investment, $I_{1.5} = C$, conditional on having observed a good signal $S = S_G$ and the signal is informative $(\tau = \tau_i)$ at $t = 1$.

With this set-up, it is clear that if all of the cash flow *C* is available for investments, the firm always

[21] That is, the expected cash flow is *H* for the good project and 0 for the bad project.

has enough cash on hand to meet its investment need $\tilde{I}_{1.5}$ at $t=1.5$. But if the firm precommits at $t=0$ to pay a dividend of *d* at $t=1$, then the dividend payment will come out of *C* and reduce the amount of cash available to make the additional investment at $t=1.5$. This may necessitate approaching shareholders for additional equity. Whether the firm will need to approach investors for any funds to meet its external financing need at $t=1.5$ depends on the size of the dividend and the realized value of $\tilde{I}_{1.5}$. We can calculate the probability that external funding will be needed at $t=1.5$ as:

$$\Pr\left(\tilde{I}_{1.5} > C-d\right) = \int_{C-d}^{C} f\left(I_{1.5}\right) dI_{1.5} \tag{15}$$

Now if there was disagreement between the manager and the investors at $t=1$ and the manager still wanted to invest in the project, investors have an opportunity to deny funds to the manager at $t=1.5$ and stop the project. Clearly, this opportunity only arises if $\tilde{I}_{1.5} > C-d$. And since denial of funds at $t=1.5$ leads to a project cash flow of *I* at $t=2$, whereas investors believe that the project will yield only $L<I$ if it is continued,[22] they will indeed withhold additional funding at $t=1.5$ if they disagreed with the manager at $t=1$. This means we can write:

$$\eta\left(d\right) = \Pr\left(\tilde{I}_{1.5} \le C-d\right) = \int_{0}^{C-d} f\left(I_{1.5}\right) dI_{1.5} \tag{16}$$

as the probability that the manager will be able to override the objection of new investors and invest in the project because he has enough internal funds to do so. Note that $\partial\eta/\partial d < 0$, i.e. a higher dividend reduces the manager's project-choice autonomy. The manager can thus choose whatever $\eta\left(d\right) \in \left[0,1\right]$ he wants to by setting *d* appropriately. For simplicity, suppose $f\left(\cdot\right)$ is uniform. This leads us to:

Theorem 4: *Firms use dividends as a control mechanism. The manager's objective function in (10) is concave in the dividend level d, and there exists a uniquely optimal dividend level $d^* \le C$ set by the manager at $t=0$. For a given interim cash flow C, firms with higher levels of agreement ρ pay lower dividends, set lower hurdle rates $\hat{r}$ in capital budgeting, issue more equity and invest more. That is, $\partial d^*/\partial\rho < 0$ and $\partial\hat{r}/\partial\rho \le 0$. Holding fixed the distribution of the interim investment need, $\tilde{I}_{1-S}$, and ρ, a reduction in C reduces the optimal dividend level d^*.*

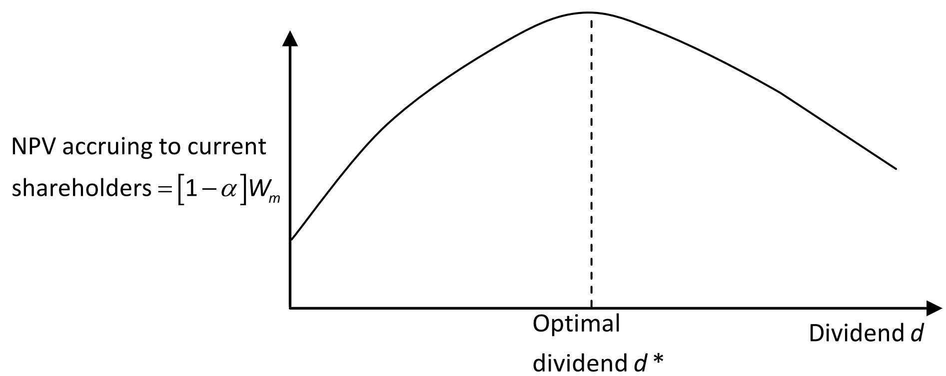
This result highlights a role for dividend policy that differs from current wisdom. According to the existing literature, dividends either: (i) do not matter (Modigliani and Miller (1961)), or (ii) are paid to

[22] Remember that we are in a state in which new investors have drawn a prior belief $\tau_n = \tau_u$ about the precision of the signal and thus believe that the expected project payoff is *L*.

resolve agency problems (Easterbrook (1984), Myers (2000) and Fluck (1998)), or (iii) signal future cash flows (e.g. Bhattacharya (1979)). Here dividends may matter, but for a different reason.

In a world in which people may openly disagree honestly on *how* to maximize value, an appropriate objective for the manager is to make decisions that maximize value accruing to the *current* shareholders. This requires minimizing dilution of their ownership claim when they are wealth-constrained and must bring in new shareholders. Dividends matter in such a setting even without asymmetric information or agency problems. What a dividend allows the manager to do is to maximize value by giving new investors enough control so as to lower the cost of capital for the original shareholders and reduce their dilution, but keep enough control to enable the manager to select, with a sufficiently high probability, the project that he believes will maximize firm value. That is, dividends represent a control allocation device when the firm faces disagreement costs and the manager's dividend choice enables him to optimally trade off disagreement costs against the manager's perceived freedom to pursue value maximization.

Figure 4: Relationship of Dividends to the Value of the Firm to Current Shareholders



The result that d^* is decreasing in the agreement parameter ρ means that firms that enjoy higher levels of agreement with investors pay lower dividends. Such firms are able to invest in new projects with a higher probability for two reasons. First, for any given dividend level, a higher agreement ρ means these firms have to sell a small ownership stake to raise financing (lower α), and hence face a lower hurdle rate, $\hat{r}$, in capital budgeting. They will thus choose to issue equity to finance projects that firms with lower levels of agreement would not. Second, a firm with a higher agreement level also sets a lower dividend level in equilibrium. This gives the manager greater autonomy (higher η) over project choice as it becomes less likely that the manager will need to turn to investors for additional funds for the project and more likely that internally-accumulated funds will suffice. This greater project-choice autonomy means that project investment occurs in firms with higher agreement.

Holding the level of agreement *fixed*, however, higher dividends will lead to lower capital budgeting hurdle rates since they lead to lower values of managerial autonomy η. Thus, capital budgeting and dividend policy are inextricably linked.

The optimal dividend, d^*, decreases as the interim cash flow, *C*, declines because a lower *C* increases the probability that the firm will need external financing for any given d^*. Thus, when *C* is smaller, it takes a lower d^* to achieve the same managerial autonomy, η.

Since the firm's stock price increases monotonically with the agreement parameter ρ while dividends decrease in ρ, when one looks at the data it will appear that dividend payments are negatively correlated with stock prices. Moreover, the finding that firms tend to initiate dividend payments when the market appears to value them more (the "catering" argument of Baker and Wurgler (2004)) is quite consistent with the disagreement-costs theory. When firms experience relatively low values of ρ, dividends will be valued relatively highly in the market, creating a stronger incentive for firms to pay dividends.[23] While consistent with catering, it should be noted that the theory here differs in the sense that a firm with a low ρ may pay dividends even when investors' preference for dividends has not gone up.

Holding everything else constant, a firm that pays a higher dividend will give its manager lower project-choice autonomy, η. Thus, fewer projects will be accepted, and the firm's cash flow volatility will be smaller. That is, firms with lower values of ρ will pay higher dividends and experience lower cash flow volatility.

Let me conclude this section by giving some real-world examples of firms with high levels of agreement ρ, and indicate what levels of asymmetric information and agency we should expect at these firms. In my analysis, I have taken ρ as exogenous, but in a broader sense one can imagine that it may depend in part on the manager's "track record" in selecting good projects. Thus, a regulated utility with modest growth prospects that produces consistent results year in and year out might have both a high ρ as well as low asymmetric information. But Microsoft under Bill Gates might have high values of ρ that go hand in hand with relatively high informational asymmetries or potentially high agency problems due to the large number of available projects linked to the firm's high growth prospects. Moreover, ρ is likely to be low at start-up firms that are using new and unfamiliar (to investors) technologies, but the interim cash flow, *C* is also likely to be low at such firms. These two effects pull the optimal dividend level in opposite directions. So dividends will be low if the effect of low cash flows is stronger, either because ρ is not too low and/or because *C* is very low. Dividends will be higher as cash flows rise relative to ρ. To the extent that managers are learning about how high future cash flows will be by observing past cash flows, dividends

[23] Nothing in the model precludes marketwide sentiment raising or lowering the agreement parameters of all firms.

will be correlated with past cash flows, as documented by Benartzi, Michaely and Thaler (1997). And if past earnings are very noisy in predicting future earnings, dividends will seem more highly correlated with past rather than future earnings.

6. RELATED LITERATURE

This paper has touched on a variety of themes, so the related literature is quite vast. I will not be able to do justice to all relevant papers in discussing the connections. Rather than attempting thorough coverage, I will briefly discuss the most directly-related papers.

A. Heterogeneous Prior Beliefs

On the broad issue of the importance of heterogeneous priors and disagreement, a nascent literature has examined various implications of relaxing the common-priors assumption. Abel and Mailath (1994) showed how "losers" may be financed in competitive markets with heterogeneous priors. Allen and Gale (1997) examine the firm's choice between bank and capital market financing. Boot and Thakor (2008) examine optimal capital structure. Boot, Gopalan and Thakor (2006, 2008) focus on the firm's choice between private and public ownership when there is potential disagreement over project choices. I have relied in many places on the analytical framework in Boot, Gopalan and Thakor (2006). Dittmar and Thakor (2007) provide empirical evidence that manager-investor disagreement explains which securities firms issue. Garmaise (2001) uses the concept of heterogeneous rational beliefs *á la* Kurz (1994a, 1994b) to analyze optimal security design. Song and Thakor (2007) use the approach to examine bank fragility and the matching of assets and liabilities along the "value-added" dimension. Van den Steen (2004, 2005a, 2005b, 2006) explores a variety of contracting issues using the assumption of heterogeneous prior beliefs. While none of these papers has focused on the specific issues of capital budgeting and dividend policy examined here, this paper owes an intellectual debt to this earlier work in that these papers have exposed the large number of issues on which fresh light can be shed by introducing heterogeneous priors, and have also helped put in place some of the analytical machinery to attack problems.

B. Capital Budgeting

There is a pretty sizeable literature on capital budgeting (e.g. Harris and Raviv (1996)), Hirshleifer and Suh (1992), Narayanan (1985), and Thakor (1990) to name just a few) that has focused on a range of issues including the choice between centralized and decentralized capital budgeting and the use of payback as a criterion in project selection. The focus in this literature has been on asymmetric information and agency frictions. This paper has focused on a different issue in an environment in which these frictions are absent. In particular, I enquire into the relationship between the expected rate of return demanded by shareholders (given by an asset pricing model) and the hurdle rate the firm should use internally for capital budgeting. I show that this hurdle rate will be higher than the shareholders' expected rate of return and will be negatively correlated with the firm's current stock price. That is, internal capital budgeting will unavoidably be predicated on the firm's stock price.

One might argue that essentially the same observation can be made in a setting in which there is asymmetric information. If a firm is overvalued and the manager knows this, he may profit from issuing overpriced equity and using the proceeds to invest in the project, just as a manager with a high agreement parameter ρ would be inclined to issue equity for project financing in my model. There is, however, a fundamental difference. Any time there is asymmetric information, there are powerful incentives for firms to signal their private information in order to separate themselves from lower-valued firms (e.g. Spence (1976) and Bhattacharya (1979)).[24] I have shown that this leads to there being *no* divergence between the firm's capital budgeting hurdle rate and its cost of capital. By contrast, honest disagreement cannot be dissolved just by communicating additional information, so a wedge opens up between the firm's hurdle rate and its cost of capital.

C. Dividends

The literature on dividends is truly enormous; see a review paper like Allen and Michaely (2003) for a comprehensive treatment. The contribution of the disagreement-cost model developed here is to highlight the following messages: (i) a firm's optimal dividend level will appear to depend in the data on its stock price, and firms will reduce dividend payments during periods of high stock prices and increase them during periods of low stock prices; (ii) firms that pay lower dividends also issue more equity and incur higher capital expenditures; (iii) dividends can be used by managers to optimally allocate control between themselves and new investors; and (iv) there is a value-maximizing level of dividends even in the absence of agency problems and asymmetric information.[25]

It is useful to contrast in some detail what dividends do in this disagreement model compared to what dividends do in other models, namely Modigliani and Miller (1961), signaling and agency. In Modigliani and Miller (1961), dividends do not matter because they affect neither the firm's cash flows nor its discount rate. In Bhattacharya (1979), dividends do not affect the firm's future cash flows, but signal information about them. The signaling model has two clean empirical predictions. One is that a dividend increase announcement conveys good news and should be greeted by an abnormally positive stock price reaction. This prediction has strong empirical support. The other is that dividend changes should convey information about *subsequent* earnings, and on this the evidence is weak. It appears that dividends convey

[24] See also the Revelation Principle which asserts that truthful, direct reporting mechanisms can implement any Nash equilibrium attainable with other mechanisms (Myerson (1979)).
[25] This is in contrast to Myers (2000) and Fluck (1998) who argue that with agency problems between managers and investors, outside equity is not feasible without dividends.

more information about past earnings than about future earnings (e.g. see Benartzi, Michaely and Thaler (1997)). In the disagreement-costs model, dividend policy and investment policy are inherently inseparable, and a dividend payment *changes* expected future cash flows because it alters the likelihood with which an accepted project that needs additional financing will be continued. Dividends can be just as easily correlated with past earnings as with future earnings, and to the extent that there is any uncertainty at all about whether the manager will actually implement the dividend policy that maximizes the NPV accruing to existing shareholders,[26] a dividend-increase announcement will trigger a positive stock price reaction. This is because a dividend increase reduces managerial autonomy η and thus increases the stock price, W_n.[27] Similarly, a cut in dividends increases η and decreases W_n. Thus, the disagreement-costs model is consistent with the existing empirical evidence. But more importantly, it generates additional predictions. Let us gather the new predictions discussed in Section 5 (the first three were discussed following Theorem 4):

1. Firms with higher levels of the agreement parameter ρ will pay lower dividends on average.[28]
2. *Ceteris paribus* firms with lower levels of ρ will have less volatile future cash flows.
3. Controlling for the level of agreement ρ, firms that pay higher dividends have lower capital-budgeting hurdle rates. This follows from the result that higher dividends means a lower η and hence a lower $\hat{r}$.
4. *Ceteris paribus* firms with smaller cash flows pay lower dividends (Theorem 4).

Let us now compare the disagreement model of dividends to the agency model. Easterbrook (1984), Fluck (1998) and Myers (2000) all imply that dividends should serve the role of reducing agency costs by denying the manager the opportunity to waste corporate cash for personal benefit. Myers (2000) and Fluck (1998) even predict the infeasibility of outside equity without dividends. The agency viewpoint has two strong implications. The first is that the firm should pay out all available cash as dividends, except that which is needed for value-enhancing corporate capital expenditure.[29] The second is that firms where agency problems can be expected to be bigger should have higher dividend payout ratios. A classic example of such a firm is one that has substantial growth opportunities. In the real world, however, we find plenty of counter-examples to both implications. As for the first implication, companies like Microsoft

[26] This uncertainty in the minds of investors could be viewed as a "trembling hand" argument.

[27] That is, any announcement of a higher dividend is a precommitment by the manager to concede greater project-choice control to investors. This causes investors to bid up the stock price.

[28] See Dittmar and Thakor (2007) for empirical proxies of ρ.

[29] It would behoove the shareholders to insist on an independent auditor to verify that only positive-NPV capital expenditures are made by the firm.

and Berkshire Hathaway have hoarded huge amounts of cash rather than paying the cash out as dividends. Based on Jensen (1986), one might argue that this is *prima facie* evidence of agency problems. But few would argue that Berkshire Hathaway is a "poster child" for agency problems. Moreover, if this is all that were going on, we should never observe a dollar of cash on a firm's balance sheet being worth more than $1, especially if it is a dollar of "excess cash."[30] The disagreement-costs theory suggests a positive role for keeping cash and not paying it all out via dividends. It can be value-maximizing from the manager's perspective and the value of every dollar of retained cash will be increasing in the agreement parameter ρ. As for the second implication, it is well-known that growth firms tend to be those that do *not* pay dividends, rather than be the high-payout firms (e.g. Allen and Michaely (2003)), a stylized fact that flies in the face of the agency model. In the disagreement costs model, a firm with high growth prospects and a high agreement will pay low dividends.[31]

7. CONCLUSION

This paper argues that when everybody does not have the same prior beliefs, managers and investors may honestly disagree over what projects maximize value. This potential disagreement has interesting implications for various corporate finance issues, including capital budgeting and dividend policy.[32]

Let me now return to the question I discussed in Section 2: why do we need a disagreement framework when the old faithfuls represented by asymmetric information and agency are available for building models? These two modeling approaches have certainly served us well. Nonetheless, I would argue that after three to four decades of research using these tools, the body of empirical support for models based on agency and asymmetric information is surprisingly not as overwhelming as one would expect (e.g. see Prendergast (2002), Rauh (2007), and Benartzi, Michaely and Thaler (1997)), and at the very least this leaves the door open for alternative approaches. Section 2 has highlighted the numerous results the disagreement-costs approach generates that neither agency costs nor asymmetric information generate. While it is too early to say if disagreement will find stronger empirical support in explaining various stylized facts, some of the early evidence is encouraging (e.g. Dittmar and Thakor (2007), Kandel and Pearson (1995), and Tagaki (1991)).

[30] Empirically, excess cash may be computed by measuring the firm's cash balance relative to the average cash balance of industry peers.

[31] In particular, the model predicts that firms with higher market-to-book ratios—which are the firms that have *both* high growth prospects and high agreement parameters since the market-to-book ratio will not be high unless ρ is high—will be the ones that pay lower dividends.

[32] Disagreement also has implications for optimal capital structure. See Boot and Thakor (2008).

More interestingly, we will learn more in the future if we view disagreement as simply another force that shapes corporate decisions, rather than as something that *competes* with agency and asymmetric information. Not much is known yet about how these different forces interact, but some conjectures are possible. Consider, for example, agency and disagreement. If agency problems are present, along with disagreement, investors will be prone to trust managers even less with project choices. Thus, managerial autonomy will become more expensive for firms, and dividend levels will be higher. In other words, agency and disagreement will work in concert. But they need not always. To see this, suppose the manager can choose which project to invest in and then choose how much effort to put into running the project. Instead of investing in the project that maximizes shareholder value, he may prefer a project that maximizes private benefits. With this agency problem but no disagreement over which project is best for value maximization, the original shareholders would give the manager *no* project-choice autonomy and simply tell him which project to invest in. His compensation would be tied to the project cash flow to provide the appropriate effort incentives. This will work as long as the manager and the original shareholders have the same beliefs, as I have assumed throughout this paper. But what if the manager and the original shareholders could potentially disagree over a project choice? Then, not giving the manager any control over project choice may cause him to value his payoff-contingent compensation less, and it may be optimal for shareholders to relinquish some project-choice control in order to increase the value the manager attaches to his incentive compensation and hence strengthen his effort incentives. See Van den Steen (2005a, 2005b, 2006) for models that explore these sorts of issues. More research along these lines will be interesting.

While the story in this paper revolves around all-equity firms, future work will also need to consider debt. Following the logic here, debt will be used when it allows the firm to decrease total disagreement costs. Which particular mix of debt and equity minimizes disagreement costs is likely to depend on the firm's specific circumstances, including its agreement parameter. Since these circumstances are likely to be time-varying, dynamic issues should be expected to crop up in such an analysis. But the story of debt will need to be told in another paper.

APPENDIX

Proof of Theorem 1: Consider the manager's problem at $t=0$. Since the capital market is perfectly competitive, the new investors' participation constraint is always binding in equilibrium. Hence, regardless of the manager's decision, these investors always view their expected return as *r*. Similarly, the manager always receives exactly his reservation wage across all allocations. This means no managerial objective can produce a decision that strictly Pareto dominates the one produced by the objective of maximizing the welfare of the original shareholders subject to the participation constraints of the new investors and the manager. And given the risk neutrality, maximizing the welfare of the original shareholders is equivalent to maximizing the NPV accruing to them. The extension of this argument to $t=1$ is straightforward. Both groups of shareholders would like the project to be selected if it increases their wealth at $t=2$ and rejected otherwise. The manager thus uses his beliefs to make his project choice in that manner, which is the same as maximizing the NPV accruing to all the shareholders at $t=1$, as assessed by the manager. The new shareholders would view themselves as better off *ex post* if they had more control over the project choice, but this would increase their expected return above *r* since the control given to them over project choice at $t=1$ is the control they accounted for in pricing the firm's equity at $t=0$. Moreover, any additional control given to the new investors at $t=1$ beyond that reflected in the pricing of equity at $t=0$ would make the original shareholders worse off and hence not be Pareto superior. ■

Proof of Theorem 2: Combining the participation constraint of new investors ((4) and (7)), we can write:

$$\alpha = \frac{I[1+r]}{V_A + \theta q \beta A_{HL}(\rho) + I}. \tag{A-1}$$

Moreover, using (6) and (8), we have:

$$\hat{r} = \frac{\alpha[V_A + \theta q \beta A_H + I]}{I} - 1. \tag{A-2}$$

We need to show that $\hat{r} > r$. Substituting (A-1) in (A-2), this means showing that:

$$\frac{I[1+r][V_A + \theta q \beta A_H + I]}{I[V_A + \theta q \beta A_{HL}(\rho) + I]} > [1+r] \tag{A-3}$$

which is true since $A_{HL}(\rho) < A_H \forall \rho \in [0,1)$. ■

Proof of Lemma 1: Using (A-1), we see that

$$\partial\alpha / \partial\rho = \frac{-I[1+r][\theta q \beta \{H-L\}]}{[V_A + \theta q \beta A_{HL}(\rho) + I]^2}$$

$$< 0.$$

Moreover,

$$\partial^2 \alpha / \partial \rho^2 = \frac{2I[1+r]\left[\theta q \beta \{H-L\}\right]^2 \left[V_A + \theta q \beta A_{HL}(\rho) + I\right]}{\left[V_A + \theta q \beta A_{HL}(\rho) + I\right]^3}$$

$$>0.$$ ■

Proof of Theorem 3: Since $D = \hat{r} - r$, we see that $\partial D / \partial \rho = \partial \hat{r} / \partial \rho$, which means that to show that $\partial D / \partial \rho < 0$, we need to prove $\partial \hat{r} / \partial \rho < 0$. Using (A-2) and (A-3), we see:

$$\partial \hat{r} / \partial \rho = \frac{-[1+r][V_A + \theta q \beta A_H + I][\theta q \beta][H-L]}{\left[V_A + \theta q \beta A_{HL}(\rho) + I\right]^2}$$

$$< 0.$$

$$\partial^2 \hat{r} / \partial \rho^2 = \frac{2[1+r][V_A + \theta q \beta A_H + I][\theta q \beta]^2 [H-L]^2}{\left[V_A + \theta q \beta A_{HL}(\rho) + I\right]^3}$$

$$> 0.$$

Let us now solve for ρ^0, the value of ρ below which the firm chooses not to invest. This cut-off is given by:

$$[1-\alpha] W_m = V_A. \tag{A-4}$$

Substituting for α from (A-1) and for W_m from (6), we have:

$$\left[1 - \frac{I[1+r]}{\left[V_A + \theta q \beta A_{HL}(\rho) + I\right]}\right]\left[\frac{V_A + \theta q \beta A_H + I}{[1+r]}\right] = V_A. \tag{A-5}$$

Note that the left-hand side of (A-5) is increasing in ρ, so if $\rho < \rho^0$, then the left-hand side will exceed V_A and the manager will invest. On the other hand, if $\rho > \rho^0$, then the left-hand side will be less than V_A and the manager will not invest. Let $Q \equiv V_A + \theta q \beta A_H + I$. Then we can write (A-5), after some rearranging, as:

$$Q - V_A[1+r] = \frac{I[1+r]C}{\left[V_A + \theta q \beta A_{HL}(\rho^0) + I\right]}.$$

Substituting $A_{HL}(\rho^0) = \rho^0 [H-L] - I$ and rearranging gives us:

$$\rho^0 = \frac{\left[\dfrac{I[1+r]}{Q - V_A[1+r]}\right] - V_A - I}{\theta q \beta [H-L]}. \tag{A-6}$$

■

Proof of Corollary 1: The firm's stock price, W_n, is given by (7). Clearly, $\partial W_n / \partial \rho = [1+r]^{-1} \theta q \beta [H-L] > 0$. Moreover, from Theorem 2, we see that $\partial \hat{r} / \partial \rho < 0$. Thus, when ρ increases, W_n increases and $\hat{r}$

decreases, creating a negative relationship between W_n and $\hat{r}$. ■

Proof of Corollary 2: Consider two managers, with manager 1 having higher ρ than manager 2. Let each manager be faced with a portfolio of projects $j \in \{1,...,n\}$ with the corresponding vector of expected cash flows of the type *G* project $\{H_1,...,H_n\}$, where the expected cash flows are arranged in ascending order, this vector is the same for both managers. Let ρ_j^0 be the cut-off value of ρ corresponding to project *j* in the portfolio, such that the manager does not invest when his $\rho < \rho_j^0$. Again, the vector $\{\rho_1^0,...,\rho_n^0\}$ is the same for both managers. Now define

$$B_1 \equiv \left\{\rho_j^0 \,\middle|\, \rho_j^0 \in \{\rho_1^0,...,\rho_n^0\}, \rho_j^0 < \rho(1)\right\}$$

and

$$B_2 \equiv \left\{\rho_j^0 \,\middle|\, \rho_j^0 \in \{\rho_1^0,...,\rho_n^0\}, \rho_j^0 < \rho(2)\right\}$$

where $\rho(1)$ is the ρ for manager 1 and $\rho(2)$ is the ρ for manager 2. Note that $\rho(1) > \rho(2)$. This means that $B_2 \subset B_1$ and manager 1 invests more than manager, 2 issues more equity and makes higher capital expenditures. ■

Proof of Corollary 3: From (7) we know that \$1 on the balance sheet that is available for investment will be worth $\{\theta q \beta A_{HL}(\rho) + I\}/I$ to the new investors. Thus, \$1 on the balance sheet will be valued at more than \$1 by investors if

$$\theta q \beta \{\rho H + [1-\rho]L - I\}/I > 1$$

or if

$$\rho > \frac{[I-L]}{[H-L]}$$

\$1 on the balance sheet will be valued at less than \$1 if the above inequality is reversed. ■

Proof of Lemma 2: The first-order condition is

$$[1-\alpha]\frac{\partial W_m(\eta)}{\partial \eta} - \frac{\partial \alpha}{\partial \eta} W_m(\eta) = 0. \tag{A-7}$$

The second-order condition is

$$-2\frac{\partial \alpha}{\partial \eta}\left[\frac{\partial W_m(\eta)}{\partial \eta}\right] - \frac{\partial^2 \alpha}{\partial \eta^2}\left[W_m(\eta)\right] < 0$$

since $\partial\alpha/\partial\eta > 0$, $\partial W_m/\partial\eta > 0$ and $\partial^2\alpha/\partial\eta^2 > 0$. To prove that $d\eta^*/d\rho > 0$, define the manager's objective function as:

$$G \equiv \left[1-\alpha\left(\eta(\rho),\rho\right)\right]W_m\left(\eta(\rho),\rho\right).$$

Note that it has been shown that G is strictly concave in η for any ρ. Moreover, since $\partial\alpha/\partial\rho<0$ and $\partial W_m/\partial\rho>0$ for any fixed η, it follows that $G(\eta,\rho_1)>G(\eta,\rho_2)$ for $\rho_1>\rho_2$ and any fixed η. Thus, if $\partial G/\partial\eta=0$ at $\rho=\rho_2$ and $\eta=\eta_2^*$ (i.e. η_2^* satisfies the first-order condition (A-7) for $\rho=\rho_2$), then it follows that $\partial G/\partial\eta>0$ at $\rho=\rho_1$ and $\eta=\eta_2^*$. That means that if η_1^* is such at $\partial G/\partial\eta=0$ at $\rho=\rho_1$ and $\eta=\eta_1^*$, then $\eta_1^*>\eta_2^*$. Thus, we have proved that $d\eta^*/d\rho>0$. ■

Proof of Theorem 4: Recognizing that $\eta(d)$ is related to *d* by (16), we can write the first-order condition for d^* as

$$-[\partial\alpha/\partial\eta][\partial\eta/\partial d]W_m(\eta)+[1-\alpha][\partial W_m/\partial\eta][\partial\eta/\partial d]=0. \quad \text{(A-8)}$$

Recognizing that $f(\cdot)$ is uniform over $[0,C]$ allows us to write (A-8) as

$$-[\partial\alpha/\partial\eta][-1/C]W_m\left(\eta^*\right)+[1-\alpha][\partial W_m/\partial\eta][-1/C]=0. \quad \text{(A-9)}$$

Further recognizing that W_m is linear in η, the second-order condition is

$$-\left[\partial^2\alpha/\partial\eta^2\right][1/C]^2 W_m\left(\eta^*\right)-[\partial\alpha/\partial\eta][1/C]^2[\partial W_m/\partial\eta]<0. \quad \text{(A-10)}$$

Clearly, (A-10) is satisfied since $\partial^2\alpha/\partial\eta^2>0$ and $\partial W_m/\partial\eta>0$. Thus, there exists a unique d^* that maximizes $[1-\alpha]W_m(\eta)$ subject to the participation constraint of new investors. It is clear that setting $d^*>C$ is pointless since at $d^*=C$, we have $\eta^*\left(d^*\right)=0$.

The result that $\partial d^*/\partial\rho<0$ follows from the earlier result that $\partial\eta^*/\partial\rho>0$ and the observation that $\partial\eta^*/\partial d<0$. Now it will be shown that $\partial\hat{r}/\partial\rho<0$ even with dividends; Theorem 3 already showed this for the case without dividends where $\eta=1$. Consider two levels of ρ, say ρ_1 and ρ_2, with $\rho_1>\rho_2$. Let $\left\{d^*\left(\rho_j\right),\alpha\left(d^*\left(\rho_j\right),\rho_j\right)\right\}$ be the optimal dividend level and new-investor ownership fractions corresponding to ρ_j.

Let $\hat{r}\left(\rho_1,d^*(\rho_1)\right)$ and $\hat{r}\left(\rho_2,d^*(\rho_2)\right)$ be the values of $\hat{r}$ corresponding to ρ_1 and ρ_2, respectively, at the corresponding optimal dividend levels. Note also that the maximized value of the objective function with ρ_1 must exceed that with ρ_2, i.e.

$$\begin{aligned}&\left[1-\alpha\left(d^*(\rho_2),\rho_2\right)\right]W_m\left(d^*(\rho_2),\rho_2\right)\\ &<\left[1-\alpha\left(d^*(\rho_1),\rho_1\right)\right]W_m\left(d^*(\rho_1),\rho_1\right)\end{aligned}$$

for *any* project accepted by either the ρ_1 firm or the ρ_2 firm. This follows from the fact that

$$\begin{aligned}
&\left[1-\alpha\left(d^*(\rho_2),\rho_2\right)\right]W_m\left(d^*(\rho_2),\rho_2\right)\\
&<\left[1-\alpha\left(d^*(\rho_2),\rho_1\right)\right]W_m\left(d^*(\rho_2),\rho_1\right) \text{ since } \rho_1>\rho_2\\
&\leq\left[1-\alpha\left(d^*(\rho_1),\rho_1\right)\right]W_m\left(d^*(\rho_1),\rho_1\right).
\end{aligned}$$

So suppose counterfactually that $\hat{r}\left(\rho_1,d^*(\rho_1)\right)>\hat{r}\left(\rho_2,d^*(\rho_2)\right)$. Then, it is possible that a project is accepted by the firm with $\rho=\rho_2$ and rejected by the firm with $\rho=\rho_1$. So, the maximized value of the objective function for the firm with $\rho=\rho_2$ will be

$$\begin{aligned}
&\left[1-\alpha\left(d^*(\rho_2),\rho_2\right)\right]W_m\left(d^*(\rho_2),\rho_2\right)\\
&>V_A\\
&=\left[1-\alpha\left(d^*(\rho_1),\rho_1\right)\right]W_m\left(d^*(\rho_1)\rho_1\right)
\end{aligned}$$

since the ρ_1 firm does not issue equity to finance its project. Hence, our supposition is wrong and it must be true that $\hat{r}\left(\rho_1,d^*(\rho_1)\right)\leq\hat{r}\left(\rho_2,d^*(\rho_2)\right)$ for $\rho_1>\rho_2$.

Finally, to see that $\partial d^*/\partial C>0$, note that the first-order condition in (A-9) yields η^* that does not depend on *C*, but this η^* will be implemented via (16). Thus,

$$\begin{aligned}
\eta^*\left(d^*\right)&=\int_0^{C-d*}f\left(I_{.5}\right)dI_{1.5}\\
&=\frac{C-d^*}{C}=1-\frac{d^*}{C}
\end{aligned}$$

Since $\eta^*\left(d^*\right)$ obtained from the first-order condition does not depend on *C*, an increase in *C* increases the right-hand side of the above equation, $1-\dfrac{d^*}{C}$. If d^* remains unchanged, $\eta^*\left(d^*\right)$ would go up. Thus, for $\eta^*\left(d^*\right)$ to stay at the value yielded by the first-order condition, d^* must go up with *C* because we know $\partial\eta/\partial d<0$. ■

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