

## CHAPTER SEVEN

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### *Incentive Problems in Financial Contracting*

Impacts on Corporate Financing, Investment,  
and Risk Management Policies

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The functions discussed thus far in this volume are features of all financial systems. Even the perfectly frictionless, idealized systems that operate only in economists' models require the performance of these functions—the aggregation and disaggregation of wealth, the transfer of resources across time and space, the redistribution of risks, the accumulation and dissemination of information, and the settling and clearing of transactions. A perfectly efficient financial system by definition performs these functions costlessly. While perfection is impossible to accomplish in practice, advances in technology and communications may in the foreseeable future make the costs of performing these functions almost negligible.

Incentive problems are different. They are not features of a perfect financial system, but rather *barriers* to such perfection. Incentive problems arise because parties to financial contracts cannot easily observe or control one another, and because contractual enforcement mechanisms are not costless to invoke. Like transactions and communication costs—the other main barriers to a frictionless financial system—incentive problems associated with financial contracts can be attenuated through improvements

in technology and contracting. However, unlike these frictional costs, incentive problems are fundamental. That is, even after technology has become so advanced as to make transactions and communications essentially costless, incentive problems will continue to impose major costs on the financial system and society. As a result, the mitigation of incentive problems will remain a major area for financial innovation.

We can liken the financial-contracting response to incentive problems to individuals' attempts to protect themselves against a social problem, such as theft. The prospect of theft induces people to purchase locks. It also influences their decisions about where to live, work, and recreate. Improvements in lock production technology can reduce costs and improve security, but locks will never provide complete protection against theft anywhere and anytime. Theft will remain a real and costly problem, and people will continue to alter their behavior in a myriad of ways (in addition to buying locks) to reduce the likelihood of theft.

The functional approach to the financial system interprets both incentive problems and the financial system's response to them as endogenous. To understand better the relationship between the financial system and incentive problems, this chapter focuses on one specific area of interaction: the contractual relationships between corporations and their capital providers. The discussion develops two basic points. The first is that the incentive problems that affect these relationships are pervasive in scope—their impacts are diffused into virtually all the financing and investment decisions firms make. Incentive issues affect the amount of external financing as well as its contractual nature; the benefits and goals of corporate risk management programs; the types and sizes of businesses in which firms invest; and the hurdle rates firms use for evaluating investments. Thus, as predicted by the functional approach, corporate financial policies can be interpreted as endogenous given the nature of incentive problems. This endogeneity has fundamental implications for corporate financing policies, investment policies, and risk management policies.

The second theme is that the reverse relationship is also very powerful—that the state of contracting and the financial system evolves endogenously in response to incentive problems. As the functional approach would predict, corporate securities and investment policies can be designed with incentive problems in mind. Derivative instruments, in particular, can be used to help firms deploy financial resources more effectively. Indeed, I argue that good financing, investment, and risk management policies go a long way toward reducing the costs of incentive problems (although they can rarely achieve first-best results). Because many of these policies would not be possible in the absence of derivatives and many

new securities, the process of innovation has added considerable private value.<sup>1</sup>

This argument suggests not only that the corporate use of derivatives is likely to be a historically durable antidote to corporate financial contracting problems, but also that a motivating force behind the growth of derivatives is the need to reduce incentive problems. Furthermore, at the level of specific instrument innovation and design, there is evidence that incentive problems are an important driving force.

Take, as an example, convertible bonds. Convertibles have a long history of being issued by companies as a form of outside financing. Why have firms historically raised money in this way? After all, the returns on a convertible bond can in many circumstances be replicated by a portfolio of bonds and stock. The functional approach answers this question by showing how convertible bond financing can reduce incentive problems in a way that straight debt and equity cannot. This argument becomes particularly interesting in historical perspective. While convertibles have been around for a long time, I argue that there are a number of newer securities (such as put warrants) that also can reduce incentive problems. The functional approach predicts that the selection of such instruments will broaden as transactions costs fall and valuation technologies rise. This means that, both today and in the future, firms will have an increasingly flexible arsenal of securities, each of which can help reduce different mixtures of incentive problems.

### **Corporate Financing Policies in the Presence of Incentive Problems**

Incentive problems have implications for capital structure and other corporate financing policies. We first focus on the determinant of "target" capital structure—i.e., the best long-run mix of debt and equity finance.

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1. While this process of synergistic innovation has added considerable private value, its social rewards are harder to identify. Cost-reducing innovation, while good in the small, does not necessarily make the financial system better or more efficient. Indeed, in many instances rapid innovation by agents seeking and receiving private gain can destroy public goods, thereby possibly making society worse off. For example, medical insurance innovations that allow policyholders to pay less if they are healthy may be profitable for companies to offer. However, they also raise premiums for those who are sick. Taken to an extreme, this kind of innovation would clearly undercut the value of medical insurance. This chapter does not attempt to evaluate the impact that corporate financial innovation has on public goods, such as systemic stability and the institutional mechanisms through which managers communicate with capital providers.

We then examine how incentive problems generate a kind of dynamic trade-off between debt and equity. This dynamic trade-off can help explain why firms depart so persistently from their optimal "static" or target financing patterns. We then show how a variety of more complex financing instruments (e.g., convertibles, PERCs, put warrants) can be understood as helping to solve problems.

### *Optimal Capital Structure: The Static View*

The static view of capital structure is a standard one in corporate finance. Assuming that markets are reasonably efficient, static trade-off theory says some combination of debt and equity is best for a given firm.<sup>2</sup> This static or "target" mix would trade off the benefits of debt (most commonly attributed to taxes and the discipline imposed upon management) against the costs of debt (usually financial distress).<sup>3</sup> Incentive issues help determine these benefits and costs.

**Incentive problems and the benefits of leverage.** Aside from generating tax shields, debt financing can be advantageous when there are conflicts of interest between owners and managers. For example, managers may have a tendency to divert the firm's discretionary funds, or "free cash flows," toward private perks, personal job entrenchment, or other activities that do not maximize firm value. Under such circumstances, debt can act as a disciplinary tool by helping to minimize funds that are at managers' discretion. Debt is "cheaper" than equity because it forces managers to pursue firm value maximization. Equity is more expensive because it gives managers the discretion to pursue goals other than value maximization. Thus, under the "free cash flow" view, the more equity a firm uses, the higher its average costs of capital will be.<sup>4</sup>

One problem with the free cash flow hypothesis is that managers themselves, and not owners, are usually responsible for choosing capital structure. If managers prefer not to maximize firm value in the absence of a disciplinary debt burden, it is not clear why they would choose to impose that burden on themselves in the first place. The free cash flow

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2. See, for example, Brealey and Myers (1991).

3. There is evidence that supports the importance of these static trade-off forces. For example, firms that are less able to take advantage of interest tax shields appear to use less debt finance (see Mackie-Mason (1990) for evidence on tax loss carryforwards, and Froot and Hines (1994) for evidence on excess foreign tax credits). Schwartz and Aronson (1967) among others show that industry effects are important in explaining debt ratios: Companies with stable earnings use more debt financing than those with less stable earnings.

4. See Jensen (1986) for a discussion of the free cash flow hypothesis.

hypothesis therefore applies best to companies whose capital structures are determined by owners or corporate charters, rather than by incumbent managers.

Of course, incumbent managers *are* often partial owners, and this ownership pattern may itself help mitigate incentive problems. Managers who hold a large fraction of their wealth in their companies' stock are more likely to pursue value maximization. In such a case, debt can emerge as a relatively beneficial source of financing because it avoids managerial dilution. Thus, if inside equity funding is limited (because of managerial wealth constraints), and outside equity is costly (because it dilutes managerial incentives), debt can emerge as a relatively inexpensive source of funding.<sup>5</sup>

**Costs of corporate leverage.** Obviously, too much debt can be costly. Some of the costs associated with excessive leverage or financial distress are generated by incentive problems as well. These costs arise because financial distress creates conflicts of interest between capital providers, and these conflicts become incentive problems when they involve managers.

To see this, note that one implication of excessive leverage is a conflict of interest between capital providers. For example, in highly levered firms, underinvestment might occur if the interests of debt and equity holders conflict: Equity holders may refuse to contribute new funds for "good" investments, knowing that the proceeds of the investment will accrue not to them, but rather to the debt holders, who will see their "underwater" claims rise in value. Similarly, when leverage is high, some "bad" investments might be implemented. Equity holders may want to "roll the dice" by biasing investments toward unnecessarily risky projects. When the firm is highly levered, such investments may raise the value of equity, but only by diverting value from the debt.

To the extent that investment patterns lead to underinvestment in good projects or overinvestment in bad ones, they lower the value of the firm. This fall in value can be thought of as a cost of financial distress, even if the firm is neither in bankruptcy nor experiencing difficulties in servicing its debt. Underinvestment can occur any time a levered firm has a reasonable probability of defaulting on its remaining debt obligations. In this sense, some amount of financial distress costs are experienced by any firm issuing risky debt. Thus, externally sourced debt capital will tend to be

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5. In the absence of incentive problems, a manager's only motivation for holding her own company's stock is as part of her diversified portfolio. Indeed, because managers' opportunities are already linked with their companies' success, they are already implicitly "long" their companies' stocks. In such a case, considerations of diversification would lead managers to go *short* their companies' stock in their financial portfolios.

"expensive" because of the implied costs of financial distress, which are generated by conflicts between capital providers.

### *Optimal Capital Structure: The Dynamic View*

The static view of capital structure is useful for thinking about long-run target capital structures. But the static view is incomplete because it misses several important features of actual behavior. For example, the most important explanatory variable for the leverage ratio of a firm in a particular industry is past profitability.<sup>6</sup> The more profitable a firm has been, the lower its debt ratio, all else equal. Indeed, one study finds that firms resort almost *exclusively* to debt finance when they lose money.<sup>7</sup>

**The relationship between cash flow and external finance.** The sensitivity of leverage to profitability and cash flow suggests that the static optimal capital structure story is incomplete. Instead, it appears that firms deviate from their target capital structures, and that they do so for long periods of time. Furthermore, their deviations follow a kind of "pecking-order" pattern. That is, firms seem to build cash and/or pay down debt relative to their targets during times when they are profitable. They then draw on this buffer during leaner times. In other words, firms often pay for investments out of internally generated funds first, if such funds are available. Failing that, they tend to turn to outside debt next. Outside equity is typically used only as a last resort.

Indeed, it is striking how infrequent secondary equity offerings occur in comparison with net debt issues. Equity issues by mature corporations occur in only 2% of firm years, a very low rate of equity financing compared with that of debt.

Of course, the distance that firms stray from their target capital structure is not unlimited. Firms that earn less cash than their investments require may at first make up the shortfall with borrowing, but ultimately they must either cut back on investment or bite the bullet and issue equity. Similarly, firms that experience cash flows that are well above desired investment levels may at first delever. But over time, they also increase payouts to shareholders, either in the form of dividends or repurchases.<sup>8</sup> Thus, the static view is not irrelevant. But it is much less useful for explaining firm financing policies than it is for explaining long-run industry financing norms.<sup>9</sup>

As a consequence, most firm financing decisions fall squarely within

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6. See, for example, Kester (1986) and Titman and Wessels (1988).

7. Shyam-Sunder and Myers (1993).

8. Marsh (1982) argues that the conditional probability of an equity issue rises with leverage.

9. In the original statements of the pecking-order hypothesis, Myers (1984) and Myers and

the pecking-order band. And there, financing patterns are very different from what the static trade-off would predict. Within the band, firms are happy to "strengthen" their balance sheets when they experience operating cash flows in excess of their investment needs. But they are much less willing to achieve the same amount of delevering through equity issuance. That is, under the dynamic view of capital structure, companies act as though there are two kinds of equity—retained funds and outside capital raised—to balance against debt. This is in contrast with the static capital structure view, which does not distinguish the source of a company's equity funds.

To understand what gives rise to pecking-order behavior, it is useful to appeal to a specific kind of incentive problem—that induced by informational asymmetries between value-maximizing managers and outside capital providers. Consider first why firms may be reluctant to adjust their capital structure by issuing equity. In an ideal world, companies would seek equity finance whenever they needed it; there would be no frictions (other than simple transactions costs) to prevent firms from keeping their capital structure at the static optimum. But when there are information asymmetries—i.e., when managers know more about their companies than outside investors do—there is a "lemons" problem that interferes with such easy recourse to the equity market.

This lemons problem occurs because outside investors cannot determine whether a given firm is relatively "good" or "bad." Yet firm insiders can. This means that, all else equal, the market will value the stock of the good and the bad firm at the same, intermediate price. In these circumstances, managers of bad firms will find their stock price to be above their perception of true value; managers of good firms will find their firm's stock prices too low. This leads to a kind of adverse selection in equity finance: Bad firms will rush to take advantage of outside equity, and good firms will hesitate. An equity issue is therefore perceived by the market at large as a negative signal, indicating that better-informed management is likely to view the stock price as too high.

This reasoning suggests that stock prices will fall upon announcement of an equity issue. The static trade-off theory, on the other hand, predicts the opposite: Since firms use equity to move back to their static optimums, the value of the firm should *rise* with the announcement of an equity issue.<sup>10</sup> The empirical evidence favors the lemons story. Specifically, announcement of a seasoned equity issue leads to a permanent stock price

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Majluf (1984) argue that there is *no* optimal static capital structure. See also Shyam-Sunder and Myers (1993) who argue that the pecking-order model has greater explanatory power than a static trade-off model.

10. Note that static agency theory (in which managers hold equity to align their interests

fall of 3% on average.<sup>11</sup> Furthermore, the size of this decline seems to accord roughly with the degree of informational asymmetry. For example, the stock price decline for equity offerings by utilities and firms in other regulated industries (where the degree of public disclosure is unusually high) is much smaller.<sup>12</sup> The lemons story also applies to sales of equity by insiders, but not to block sales of shares by outsiders.<sup>13</sup> That is, the more informed the seller of equity appears to be, the larger the ultimate price effect.<sup>14</sup>

The case is different, of course, for debt finance. Debt issues do not create a "lemons" problem *per se*.<sup>15</sup> Indeed, for firms that initially have plenty of spare debt capacity, debt issuance sends a *positive* signal to the extent that it indicates an unwillingness to sell equity at prevailing prices. Increasingly high levels of debt, however, clearly raise the prospects of financial distress, which ultimately creates its own costs. Firms that have come down the pecking order by using up their preexisting debt capacity will find that *both* equity and additional debt finance are costly to use. That is, new creditors will anticipate the increased likelihood of distress, and will raise their premiums accordingly; new equity holders will lower their expectations of future performance and purchase the equity only at a lower price. Even if firms with high initial levels of indebtedness find additional debt finance to be cheaper than equity finance, they will find both considerably more expensive than internal funds.

These dynamic considerations can be summarized in a relatively simple maxim: Firms for the most part act as though external finance is more expensive than internal finance. Furthermore, as a firm relies on external financing to a relatively greater extent, the disparity between the cost of internal and external funds increases. This suggests a critical principle of the impact of information problems on corporate financing patterns:

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with value maximization and use debt to support a substantial managerial ownership stake) also predicts that firm value should rise when an overlevered firm issues equity.

11. See, for example, Asquith and Mullins (1986). There is some evidence that the market does not fully comprehend just how negative a signal an equity issue is. Loughran and Ritter (1993) show that firms that make secondary equity offerings exhibit stock price underperformance over the subsequent five years of 20%–30%.
12. See Smith (1986) for details.
13. See Seyhun (1986).
14. Several papers find that trading by informed insiders moves stock prices by much more than trading by uninformed traders (see Meulbroek (1992)). The means by which the market *knows* these trades to originate with insiders is unclear.
15. The empirical evidence corresponds roughly with this hypothesis. There is no strong evidence that stock prices change at all when a debt issue is announced. As one might expect, announcement of issues of hybrid instruments (e.g., convertible bonds, preferred stock) result in a negative stock-price impact, with a magnitude in between that of straight debt and equity. See Smith (1986).

*Principle 1: In the presence of informational asymmetries between managers and outsider capital providers, incentive problems exist. In these circumstances, the marginal cost of external finance is greater than that of internal finance, and is increasing in the amount of external finance raised.*

I argue that this principle has surprisingly wide-ranging implications for corporate investment behavior, security innovation, and risk management policies, as well as for corporate financing patterns.<sup>16</sup>

What are the most important determinants of the cost of external funds? First, and probably foremost, is the degree of incentive problems a firm faces. In particular, companies that invest in "tangible," easy to evaluate assets (e.g., utilities) may find external finance relatively cheaper to access—their assets make better collateral for debt finance. Companies that invest in "intangible" assets may find external financing more costly. This is because the return on investments in intangible assets—such as price cutting for market share, R&D, or spending on human resources—is likely to be subject to large information asymmetries.

A second important influence on the marginal costs of external finance is a firm's preexisting capital structure. Firms that have large amounts of unused debt capacity will not find external debt finance very expensive. This is particularly true if the debt capacity arises from highly transparent assets. A firm that has already collateralized its transparent assets—and therefore has much less remaining debt capacity—will find that additional external funds are considerably more expensive than scarce internal funds. Thus, all else equal, leveraged firms will face higher marginal costs of external finance than less leveraged firms.

**Security design.** We have seen how incentive problems can help explain static and dynamic choices between debt and equity. Firms that follow pecking-order patterns of financing may be doing so in an effort to mitigate the costs of information problems, thereby raising firm value. Yet the implications of these problems do not end with the choice between debt and equity. Indeed, the presence of incentive problems (informational asymmetries in particular) helps us understand why specific instruments—even those that appear highly complex—add value.

*a. Convertible Bonds.* One example of a hybrid instrument that generates value through its effect on incentive problems is the convertible bond. The argument for convertibles comes from the same kind of informational asymmetries that give rise to the lemons problem.<sup>17</sup> To see this, recall that the lemons problem has good firms issuing debt and bad firms issuing

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16. See Froot, Scharfstein, and Stein (1993) for the implications for risk management, and Stein (1992) for the implications for corporate security design.

17. Stein (1992) derives a formal "lemons" model of convertibles.

equity. Bad firms do not want to issue debt because additional leverage would generate potential costs of financial distress. Good firms can finance with debt without experiencing such potential distress costs, and in any case, they wish to avoid the bad signal associated with issuing equity.

Now add to this a third kind of firm, a medium firm—one that is known by managers (but not by outside investors) to have average future prospects. Its prospects may not be so good as to allow it to issue debt without incurring any potential costs of financial distress, as the good firm is able to do. So the medium firm is unlikely to want to mimic the behavior of the good firm by issuing debt. On the other hand, the strong negative signal sent by bad firms' equity issues would result in a low equity issue price, and therefore an aversion to issuing equity.

A convertible bond (or convertible preferred stock issue) provides the middle ground the medium firm is looking for. Managers' private knowledge may tell them that the stock price will soon rise sufficiently to allow the firm to call the bond and force its conversion to equity. Once the bond is converted, it cannot generate potential costs of financial distress. Also, its issuance does not send a strongly negative signal. This is because managers of bad firms would not expect to be able to convert the bond, and therefore would not choose it over equity. Thus, convertible bonds can allow the medium firm to economize on potential costs of financial distress by issuing a "backdoor" form of equity, which does not send the strong negative signal associated with a direct equity issue.<sup>18</sup>

As Stein (1992) argues, there is also empirical evidence for this interpretation of convertibles. First, surveys of managers suggest that the motivation for convertible issues is not so much to "sweeten" a regular bond, but to provide a mechanism for "delayed equity issue."<sup>19</sup> Managers therefore don't look to convertibles so much as bonds (which generate potential costs of financial distress), but more as indirect equity issues that help mitigate lemons problems.

Second, firms that issue convertibles and not stock presumably do so

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18. Note that this medium signal cannot be replicated by a firm that issues a combination of debt and equity. To see this, compare a firm that issues a convertible with a firm that simultaneously issues both debt and equity. The downside signal for the former firm is obviously stronger, as it has been willing to commit to a larger debt downside. Thus a "bad" firm would prefer to issue a combination of debt and equity rather than a convertible. On the other hand, a "good" firm would also prefer to sell a combination of debt and equity (although it prefers a higher amount of debt in comparison with a bad firm) as, conditional on good news, the convertible is likely to sell off more of the firm. Thus it is more costly for other firms to mimic the medium firm by issuing a convertible, making the convertible a more reliable signal of medium firm status.

19. See, for example, Brigham (1966).

because they have trouble convincing the market that their prospects are brighter than those of the "bad" firm. This suggests that informational asymmetries are likely to be important for convertible issuers. While it is difficult to measure such asymmetries convincingly, there is evidence that firms with higher R&D/sales are, all else equal, more likely to issue convertibles. This seems consistent with the lemons theory of convertibles, at least to the extent that R&D quality is difficult to verify and its output hard to collateralize.

Third, the negative price shock associated with convertibles is considerably less than that for straight equity issues. Several studies have found that the average price reduction resulting from an equity announcement is about 3%, reducing firm value by an average of 30% of the equity issue amount.<sup>20</sup> For convertibles, the numbers are much smaller: Stock prices fall on average by about half as much, a reduction in value of somewhat under 10% of the convertible issue amount.<sup>21</sup>

MCI's classic experience with convertibles during the late 1970s and early 1980s demonstrates the lemons rationale.<sup>22</sup> In 1978, MCI had considerable opportunities to expand, yet had already built up a debt-to-capital ratio of over 80%. With such high preexisting leverage, the potential costs of financial distress associated with debt-financed expansion were high. The firm was also reluctant to issue equity, as such an issue would be a bad signal—the CFO stated that an equity issue would "knock the props out from under the stock." MCI thus turned toward convertible bonds and preferred stock. It managed five offerings without large negative stock price impacts, and was able to convert the issues into equity over time.<sup>23</sup>

*b. PERCs* Convertible bonds and preferreds are not the only kind of instruments whose value can be traced at least partially to incentive problems. Other examples are PERCs and put warrants.

Consider PERCs first. These are convertible preferred securities that convert into a fixed *dollar* amount of common stock if the stock price is above a given conversion price, and into a fixed *number* of common shares if the stock price falls below the conversion price. PERCs usually also

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20. See, for example, Asquith and Mullins (1986) and Mikkelsen and Partch (1986).

21. See, for example, Eckbo (1986).

22. Greenwald's (1986) case study depicts MCI's experience, and discusses the lemons rationale for issuing convertibles.

23. An additional pair of offerings in the mid-1980s did not convert, as MCI fared poorly in competition with AT&T. This negative change in opportunities then forced MCI to return to equity issuance those years. This demonstrates that the more positive signal of convertibles compared to equity comes with a potential cost: Potential financial distress costs remain.

carry higher dividend yields than the corresponding common stock. The higher yield could by itself generate a rationale for issuing PERCs if there is a clientele of investors who will pay more for a higher-yielding stock than a lower-yielding stock with the same total value.

But PERCs also may generate value for firms that face informational asymmetries. Like convertibles, PERCs generate near-term repayment requirements that trigger costs if they are not met.<sup>24</sup> This discourages firms with bad private information from issuing PERCs, which in turn makes a PERCs issue a relatively positive signal compared to a straight equity issue. As with convertibles, very good firms would prefer to issue debt rather than PERCs (since PERCs are still positively linked to equity performance). However, PERCs may work well for medium firms. These firms can signal that they wish to retain some upside in their common stock while committing to high preconversion dividend payments. Thus, PERCs, like convertibles, are a way of getting equity into the capital structure without sending the strong negative signal associated with an equity issue.<sup>25</sup>

*c. Put Warrants* A very similar rationale exists for the issuance of put warrants. Put warrants are in a way the opposite of a convertible bond—that is, put warrants are to equity repurchases just as convertibles are to equity issues.

To understand how put warrants work, let us first consider stock repurchases. Stock repurchases send a good signal about firm prospects in much the same way that equity issues send a bad signal. That is, good firms are willing to sacrifice cash (or borrow) to purchase what managers perceive as undervalued shares; alternatively, bad firms' managers perceive the current stock price as too high, and in any case may not wish to return funds as quickly to shareholders because of concerns of financial distress.

The empirical evidence on stock repurchases is consistent with this signaling story. Tender offers to repurchase stock generate permanent stock price increases of approximately 20%. Tender offers have somewhat larger positive price impacts than other types of repurchases, such as Dutch auctions (in which potential sellers submit schedules of how much they would sell at different prices) or open-market repurchases (in which there is no public buyback announcement).

Different clienteles will have different preferences for one form of repurchase over another. From a long-run shareholder's perspective, the

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24. If required PERC dividend payments are not made, they cumulate, and often permit holders to exercise greater control over management.

25. Tiemann (1989) explores the nature of PERCs.

firm should repurchase equity at the lowest possible price. This argues in favor of open-market repurchases and against splashy tender offers. However, short-run shareholders will have just the opposite preference, as they want to maximize short-term stock prices for given long-term value. In such instances, firms may choose tender offers as the preferred means of repurchasing equity.

Put warrants are simply a *conditional* equity repurchase. That is, put warrants commit a firm to repurchase a given quantity of shares, provided that at expiration the stock price is below the conversion price. If the stock price exceeds the conversion price, investors keep their shares, and the right to "put" them back to the company expires worthless.

Because put warrants result only in conditional future repurchases, they don't send as strong a positive signal as a direct repurchase. Like direct repurchases, however, they are unattractive to managers who anticipate firm performance poorer than that expected by the market. Managers of these firms will avoid issuing put warrants because they view the market price for the warrants as too low. Thus, put warrants are likely to be issued by medium firms, whose prospects aren't strong enough to merit the strong positive signal of an unconditional repurchase, but are good enough to risk the issue without excessively raising the potential costs of financial distress.<sup>26</sup>

### *Summary*

I have argued that incentive problems make external finance costly. The more money firms must raise externally, and the more equity that they need to issue, the greater the perceived or actual deadweight costs of external finance are likely to be. Firms do not passively accept the additional costs of external finance: They alter their financing and investment policies as well as financial instrument selection in ways that help them mitigate the loss of value generated by these problems.

In spite of firms' ability to manage the costs of incentive problems, resort to innovative instruments may not be enough to eliminate altogether the deadweight costs of external finance. Convertible bonds, as we note above, are a "cheaper" financing alternative for medium firms than either debt or equity, although convertibles cannot fully eliminate deadweight financing costs as long as firms face costs of financial distress.

The fact that even innovative securities leave firms saddled with dead-

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26. Intel Corporation's sale of put warrants on \$1 billion worth of stock shows where signaling issues seem to have been at work. See Froot (1992) for a discussion of Intel's circumstances.

weight costs of external finance is important in two respects. First, it points toward the prospect of additional security innovation that might further minimize deadweight costs. It also gives a guide to criteria that will drive the innovation process. Securities that can solve or mitigate specific information or incentive problems along the lines we have discussed will raise firm value, and therefore should readily find niches in the global marketplace.

Second, financing and investment policies will generally be linked as long as external financing is costly. That is, the distortions that increase the cost of external finance will also raise (and otherwise alter) investment hurdle rates that firms should use in evaluating investment opportunities.

### Corporate Investment Policy

The fact that, when incentive problems are present, firms are likely to find external financing costly has obvious implications for investment. High-cost financing will reduce the level of investment, and will also affect the mix of investments. The connection between financing and investment has implications for the performance of the macroeconomy as well as for the behavior of individual firms.

There are basically two ways incentive problems influence investment. The first mechanism occurs when incentive problems separate outside investors and managers, but managers nevertheless pursue firm value maximization. Under these conditions, managers will wish to pursue an investment policy in which all positive-net present value (NPV) investments are undertaken. However, the hurdle rates used to calculate NPV will not be determined entirely by systematic risk, as would be the case under traditional capital budgeting procedures. By raising hurdle rates above traditional levels, managers can increase firm value. But, incentive problems will give value-maximizing managers an incentive to *underinvest* compared to what would be optimal in the absence of such problems.

The second possible linkage between incentive problems and investment occurs when managers' objectives differ from those of shareholders. This may occur when managers are not compensated according to firm value—for example, when their salary and reputation grows with the size (rather than the total profitability) of the operations they oversee. Clearly, this can lead to *overinvestment* relative to what would maximize value. Overinvestment is likely to be more severe when firms have large amounts of discretionary free cash flow, and less of a problem when they are cash constrained.

At one level, these mechanisms have opposite implications for investment: One view predicts investment will be too high, while the other

predicts investment will be too low. At another level, however, both mechanisms predict that investment will be "excessively" sensitive to cash flow and other measures of corporate liquidity. Capital spending will rise too quickly with increases in corporate liquidity, and fall too fast with decreases. Furthermore, both mechanisms lead to distortions in the mix of investment spending, as capital budgets will be skewed toward projects that help diversify corporate cash flows.

### *The "Underinvestment" Problem*

We first consider the underinvestment problem, assuming for the time being that managers pursue the goal of value maximization. Because external finance is more expensive than internal finance, an increase in internal cash flow or corporate liquidity will reduce the cost of capital and increase investment, all else equal. In the extreme case, when a firm has *no* access to external finance, investment spending is capped by internal cash flow. Either way, firm value is reduced, and, if the effect on investment is sufficiently widespread, macroeconomic growth is reduced as well.<sup>27</sup>

This reasoning brings us to a second principle that follows from the presence of information asymmetries between managers and capital providers:

*Principle 2: When external finance is more expensive than internal finance, investment spending will be excessively sensitive to internal cash flow, liquidity, and other measures of corporate financial slack.*

Principle 2 states that costly external finance generates a relationship between measures of corporate liquidity and investment spending. The scope of the principle is quite broad in two senses.

First, shortages in internal liquidity generate cutbacks in all kinds of corporate investments: purchases of fixed assets, inventory accumulation, and investments in worker training and employment, as well as basic strategic objectives. However, the precise nature of the cutbacks will differ by *type* of investment. For example, it may be relatively cheap for a firm to raise outside funds to purchase raw land or certain fixed assets that

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27. The pecking-order theory does not imply that cash flow, *per se*, affects investment; rather it predicts that the tightness of financing constraints matters. A firm may find that it has expanded access to inexpensive debt finance when its stock price rises, due, say, to an increase in future expected cash flows on existing assets. Such an increase in financial slack will reduce borrowing costs, and therefore tend to increase investment spending. Changes in cash flow are often used because they are easily measured and a good proxy for changes in financial slack.

can be mortgaged or collateralized at relatively low cost. The key to low-cost collateralizability is that an asset be very "informationally unintensive"—that is, its value is beyond the control of firm managers, observable and verifiable by outside investors, and segregatable from the other assets of the firm.<sup>28</sup> "Informationally intensive" assets—such as R&D, investments in employee expertise, market share, etc.—are controlled and best observed by managers, hard to redeploy, often intangible, and, as a result, almost impossible to collateralize. This type of investment is therefore more costly to fund externally, so spending on it is likely to be more sensitive to fluctuations in internal funds than spending on readily collateralizable assets.

The second sense in which the principle is broad is in its reference to internal funds. In the narrowest sense, operating cash flows are the main source of internal finance. Yet changes in the value of a firm's easily collateralizable assets can be an important source of internal finance as well. For example, a firm that discovers oil on land that it owns will see that land increase in value. To the extent the land can be easily sold for a higher price or used more readily as collateral for funds, the need for costly external financing is decreased.<sup>29</sup>

If Principle 2 and its implications are correct, we should be able to find evidence that costly external finance exists and that it reduces investment. Testing this is tricky, however. Even in a perfect world—one that poses no incentive problems—a positive correlation between internal finance and investment is likely to emerge. That is, increases in cash flow are likely to be associated with increases in profitable investment *opportunities*, so it should not be surprising that investment spending increases, even in a perfect world. Thus, to construct a valid test of the underinvestment hypothesis, it is necessary to hold a firm's investment opportunities constant, and only then check for correlations between internal finance and investment.

An example of one such test appears in Lamont (1993). Lamont begins by looking at the oil price shock of 1986 and its effects on oil companies and their subsidiaries. When oil prices collapsed in early 1986, oil companies around the world cut back on their investment spending. Of

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28. Note, however, that because many fixed assets are not easily redeployable, their liquidation values are far below their initial cost. This makes it more costly to collateralize these assets, and therefore increases the potential for underinvestment in them.

29. Of course, if *all* types of wealth could be costlessly converted into internal finance, there would be no distinction between external and internal financing costs. The point is that it is costly or impossible to raise funds with internal assets that are subject to incentive problems. For example, the entrepreneur who has an idea for a better widget cannot easily "collateralize" the idea by borrowing against its value.

course, oil investment opportunities probably fell with the price of oil, so the decline in oil investment cannot be attributed to costly external finance.

Lamont's innovation is to look at the *non-oil* subsidiaries of these oil companies. For example, Montgomery Ward is wholly owned by Mobil, relying on its parent to finance its investments. Lamont finds that the oil shock reduced Mobil's cash flows, and that this led to a decline in Montgomery Ward's investment spending. This decline in investment is unlikely to have been associated with a fall in MW's investment opportunities. Moreover, MW's product market competitors—who are *not* owned by oil companies—experienced no similar cutback in investment spending. The implication is that MW's decline in investment spending resulted from the decline in Mobil's internal cash flow. This implies that even a large firm like Mobil faces financing constraints that make external funds more expensive than internal funds. That is, if external funds were not costly, Mobil could have profitably funded MW's investments by raising external funds.

While this test of the underinvestment hypothesis is especially crisp, there is also evidence that suggests underinvestment is much more pervasive. For example, one study finds that the sensitivity of investment spending to fluctuations in cash flow is greater for low-dividend-paying firms than for high-dividend-paying firms.<sup>30</sup> Another study finds that the investment spending of Japanese firms associated with *keiretsus* is less sensitive to cash flow shocks than is the investment spending of firms that are not *keiretsu* members.<sup>31</sup>

Further evidence of the presence of financing constraints and their effects on investment comes from the literature on foreign direct investment. One paper finds that increases in financial slack, which can be driven by exchange rate changes or changes in stock market values, can give foreign firms an advantage in bidding against domestic rivals for domestic target companies.<sup>32</sup> Thus, for example, when the Japanese yen appreciated relative to the dollar in the late 1980s, Japanese firms more frequently outbid others in acquiring target companies. When the value of the Japanese stock market subsequently declined, the levels of foreign direct investment declined rapidly as well.

Finally, there is evidence that corporate financing constraints amplify the impact of monetary policy on economic activity and investment. That is, when a central bank contracts the supply of credit, interest rates rise,

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30. See Fazarri, Hubbard, and Petersen (1988).

31. See Hoshi, Kashyap, and Scharfstein (1991).

32. See Froot and Stein (1991).

and bank lending typically contracts. In a world of perfect financial markets, any slowdown in activity from a monetary policy-induced increase in interest rates could be attributed only to the direct effect of higher interest rates on investment.

In a world where there are incentive problems, there are at least two other channels through which monetary policy affects the level of economic activity and investment. The first is the effect of higher interest rates on corporate cash flow and borrowing opportunities. That is, discretionary cash flows fall when interest rates rise, worsening the balance sheet and lowering the level of internal funds. Moreover, some borrowers may face quantity rationing constraints during monetary contractions. The rise in interest rates may accelerate expected net debt repayment schedules, thus intensifying the impact of monetary policy on cash flow. Note that this channel is not unique to monetary policy—any shock to corporate cash flow is likely to have similar kinds of effects on investment spending in the presence of incentive problems.<sup>33</sup> Note also that this monetary policy channel does not depend on whether companies use bank or capital market financing tools. As long as outside financing sources face some informational or agency disadvantage, this channel will be present.

The second monetary policy channel created by corporate incentive problems is known as the “credit” or “lending” channel, and it is specific to bank borrowings. The effect is that bank liquidity is reduced during monetary contractions, as the central bank forces banks to shift the mix of their assets toward government securities and away from loans.<sup>34</sup> This raises the cost or limits the supply of bank borrowing relative to capital market-based borrowing during monetary contractions. The implication is that firms that are bank-dependent for financing all, or part, of their balance sheet, will suffer additional adverse effects of a monetary policy contraction. In this sense, banks add an additional channel through which monetary policy impacts investment.

There is considerable evidence supporting the existence of these channels. First, the decline in bank lending during recessions does help to explain reductions in investment even after controlling for interest rates. This implies that there are at least some firms that find bank lending an imperfect substitute for other sources of finance. Indeed, those firms with access to commercial paper appear to *increase* their CP issuance when

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33. This monetary-policy channel is discussed by a number of authors. See, for example, Bernanke and Gertler (1989), Calomiris and Hubbard (1990), and Greenwald and Stiglitz (1993).

34. See Kashyap, Stein, and Wilcox (1995).

bank-sourced financing dries up. That is, they substitute capital market financing for bank financing because bank borrowing becomes relatively more expensive or less available. Of course, those with little or no access to such markets have nowhere else to go. These latter firms—small firms in particular—witness the greatest declines in investment.<sup>35</sup>

The *mix* of reduced investment across different asset classes is also consistent with the presence of incentive problems. Take, for example, investment in inventories. Inventories appear to be disproportionately funded by bank loans in comparison with other assets on the balance sheet. Thus, one might expect the inventories of bank-dependent firms to decline more than the inventories of firms that have ready access to the commercial paper and other borrowing markets when monetary policy is tightened.

Kashyap, Lamont, and Stein (1992) show that this is indeed the case. They examine the behavior of inventories across firms during the monetary policy-induced recession of 1981–1982, and find that bank-dependent firms witnessed far greater declines in inventory holdings. To test whether this result is due to some other unobserved difference between bank-dependent and other firms, the authors compare their results with those from the 1985–1986 period of easy money. In the latter period, inventory behavior of bank-dependent firms is no different from that of other firms. This suggests that monetary contractions do indeed impact firms through a “credit” channel. It also suggests that, because inventory fluctuations are the single most important element of the business cycle, these effects are broadly important for the economy.

These examples suggest that a linkage between internal finance and investment, if it exists, may have important macroeconomic implications, not implications for just the financial system or a restricted group of nonfinancial corporations. To see this, note that if a decline in internal finance and availability of external finance triggers broad reductions in investment, there is likely to be a feedback effect as well: The fall in investment is likely to reduce the amount of internal finance further, both through a decline in economic activity and a fall in the value of easily collateralized assets.<sup>36</sup>

This leads to what Bernanke, Gertler, and Gilchrist (1993) call the “financial accelerator.” The accelerator takes what would otherwise be small shocks to internal finance, and magnifies them into more major economic disturbances. This logic suggests that much of the amplitude of business cycle fluctuations could be attributable to incentive problems in

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35. See Gertler and Gilchrist (1994).

36. Kashyap, Scharfstein, and Weil (1990) argue that this is the case for assets such as land.

corporate finance. In the absence of these problems, internal finance has no independent effect on investment spending, so the accelerator linkage would be broken.

Clearly, the potential costs of incentive problems for the entire economy can be very large. This suggests that the gains from security innovation, both from a micro- and macroeconomic perspective, can be large. Innovation in security design and intermediation practices helps to lower the costs of external finance, and thereby mitigates the effect of fluctuations in internal funds on investment.

One might argue that the financial system has already eliminated many of these effects, particularly for big companies that appear to have ready (and inexpensive) access to external markets. However, as the impact of oil price declines on Montgomery Ward's investment spending suggests, even big firms like Mobil continue to alter current investment on the basis of current cash flow. Incentive problems, which arise both between the firm and its investors as well as within the firm, may be too complex and ubiquitous to eliminate through financial innovation.

### *The "Overinvestment" Problem*

It is not always the case that managers will underinvest when faced with costly external finance. As we mention above, managers may use investment to promote their own private objectives rather than the objective of value maximization. Such incentive problems may result in managers undertaking negative-NPV investments that help satisfy their private objectives. For example, managers may attempt to diversify their firms into unrelated industries in an attempt to provide corporate stability and expand the boundaries of their firm. To the extent that managers carry out these private agendas, corporate investment may be too high rather than too low.

The overinvestment view shares many predictions with the underinvestment view discussed above. For example, both views suggest that firms will exhibit a preference for internal over external funds. The two views do make different behavioral predictions in some cases. Consider, for example, firms that already have built up a very comfortable amount of financial slack. For such firms, the underinvestment view predicts that managers will return cash to shareholders in response to an unexpected increase in cash flow (with no change in investment opportunities). This would maximize firm value, because retaining the extra funds would only add another layer of taxation in comparison with a share repurchase. Alternatively, the overinvestment view predicts that managers will not return the funds to shareholders. Instead, they keep them within the firm

under managerial control. In such a case, a cash windfall will not increase firm value one-for-one.

Blanchard, López-de-Silanes, and Shleifer (1993) try to distinguish between these two views.<sup>37</sup> They examine firms that had recently won lawsuits in lines of business from which they had previously exited. This particular group was selected because its investment opportunities are unlikely to be influenced by the cash awards. The authors find that firms did not typically return the cash to investors by paying down debt, increasing dividends, or repurchasing shares. Instead they tended to use the funds to make acquisitions, to continue existing loss-making operations, and to increase executive compensation. These results are inconsistent with the perfect capital markets model, which predicts that the cash should be paid out to investors. Given that the firms are small (and therefore likely to face financing constraints), the results appear to fit the overinvestment view.

Bernheim and Wantz (1992) succeed better in distinguishing between the over- and underinvestment views. They look at the effect of corporate dividend announcements on stock prices. Under the information/underinvestment view, announcement of a dividend increase raises stock prices because it signals higher expected future earnings. The higher the tax rate on dividend income, the more potent the signal. Thus, under the information view, higher tax rates should be associated with a greater sensitivity of stock prices to dividend announcements. Under the overinvestment view, on the other hand, higher dividends do not signal anything, so higher tax rates should *reduce* the sensitivity of stock prices to dividend announcements. That is, higher tax rates make dividends a more costly means of returning cash to shareholders (in comparison with repurchases) with no positive information effect to offset it. The empirical results for large numbers of firms strongly support the information/underinvestment view—investors treat dividend increases as conveying positive information about the company's prospects.

While the differences between these views are important for understanding the relative importance of incentive problems, the similarities are also important. For one thing, both views are consistent with Principle 2. That is, a reduction in cash flow will tend to reduce investment, whether on average investment is too low or too high. In this sense, the overinvestment and underinvestment views suggest very similar predictions about the correlation between cash flow and investment. They both,

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37. They also distinguish both views from the perfect markets view, which says that firms *never* allow investment to be affected by cash windfalls, and use the windfalls instead to pay off debt and return cash to shareholders.

therefore, can give rise to financial accelerator models, in which financing imperfections are a major force behind firm-specific as well as economy-wide fluctuations in activity.

Furthermore, note that whether the average level of investment is too low or too high, *fluctuations* in investment spending are bad for shareholders. That is, the sensitivity of investment to cash flow lowers firm value *regardless* of under- or overinvestment. To see this, suppose that when cash flow is low, a firm will take its best investment project, one that provides a 20% internal rate of return. Suppose further that when cash flow is average, the firm will take this project plus the next best (equal-sized) project, which offers a 15% return. Finally, if cash flow is high, the firm will add the least desirable (again equal-sized) project to these, offering a 10% return. If the firm follows this rule, its investment spending is obviously sensitive to cash flow. To determine whether the firm is under- or overinvesting, we would need to know shareholders' hurdle rates for these investments. The firm would on average be underinvesting relative to value maximization if the cost of internal funds is 10%, and overinvesting if the proper hurdle rate is 20%.

Either way, if cash flow is always at the average level, the firm would always take both the 15% and 20% projects, for a total dollar profit of 35% (relative to the cost of a single investment). If cash flow is low or high with equal probability, however, the firm would have a total profit of 20% when cash flow is low and 45% (20% + 15% + 10%) when cash flow is high. The average total profit from this latter investment strategy is 32.5%  $[(20 + 45)/2]$ , as the two outcomes are equally likely. This is *less* than the 35% profit that results from steady investment spending. Higher profits therefore result from investment spending that remains steady and is not driven by fluctuations in internal cash. Furthermore, this is true whether the firm over- or underinvests (i.e., whether the appropriate hurdle rate for an individual project is 10% or 20%).

This argument implies that incentive problems, regardless of their precise manifestation, generate costs to individual firms and to the economy, and that these costs are related to the sensitivity of investment to cash flow and the availability of external finance.

### *The Investment "Project Mix" Problem*

There is a third type of distortion in investment introduced by incentive problems: an inferior mix of investment activities. That is, compared to the optimal mix of investments chosen by a firm that faces no incentive problems, the mix of investments is inferior in the presence of these problems. Why would investment spending become distorted in such

cases? When external funds are costly, investment policies that conserve on external funds are, all else equal, better than those that don't. By selecting their investments in certain ways, firms can mitigate the need for external funds and therefore raise firm value. This creates distortions:

*Principle 3: In the presence of incentive problems, firms' optimal investment decisions mixes are biased in that they rationally: (1) value investments more highly, the less positively (more negatively) correlated their cash flows are with existing cash flows; and (2) value investments less highly, the greater the idiosyncratic risk of the cash flows. These biases become stronger as a company has less financial slack.*

This proposition provides an economic rationale for the intuition of managers that investment projects with highly volatile returns ought to receive a higher hurdle rate, even if the volatility is purely nonsystematic. (The Capital Asset Pricing Model, CAPM, which is frequently used to determine hurdle rates, ignores the volatility of nonsystematic risks.)

Although the bias in investment is costly from the perfect markets perspective, it can be either a cost or a benefit once incentive problems are involved. If, for example, managers tend to be empire builders, investment mix distortions are bad for investors. They result from managers' ability to entrench themselves and pursue objectives other than value maximization.<sup>38</sup>

If managers are value maximizers, however, then outside investors prefer the distorted mix, which reduces the deadweight costs of external finance. To see this, suppose that outside debt finance is cheaper than outside equity, so that firms limit their leverage only because of the potential costs of financial distress. If a firm can reduce the volatility of its overall cash flows (through undertaking low-volatility and diversifying investments), it lowers the likelihood of financial distress. It can then finance itself more cheaply by using a higher fraction of debt finance. This in turn raises firm value.

This kind of argument provides a rationale for corporate insurance policies. Under the perfect markets paradigm, companies should be indifferent between self-insuring and buying fairly priced insurance (against fire, confiscation of assets, for example) through explicit policies. Of course, on average insurance premiums are set above fair value, since at a minimum insurance companies need to pay overhead expenses. Insur-

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38. Corporate experiments with unrelated acquisitions of the 1960s and 1970s would seem an obvious example of the latter mechanism for distorted mix.

ance policies can therefore be thought of as an NPV-negative investment that is desirable because its payoffs are negatively correlated with cash flows net of investment. That is, when a profitable factory burns to the ground, the insurance contract removes the need to tap the costly outside funds needed to rebuild it.

Merton (1993), Froot and Stein (1994), and Merton and Perold (1993) discuss how value-maximizing firms would want to alter capital budgeting rules in the face of incentive problems. Froot and Stein derive a kind of multifactor pricing model to provide hurdle rates for such firms. The model says that the hurdle rate is a linear function of market risk and firm-specific risk. The market risk factor works exactly as it does in the CAPM—the price of risk is the expected return on the market, and the risk measure is the covariance of the asset's returns with that of the market. The firm-specific risk premium also contains a price of risk—the excess sensitivity of firm value to fluctuations in internal funds—and a quantity of risk—the covariance of new project cash flows with existing cash flows. All else equal, the greater this sensitivity, the more the value-maximizing firm should adjust hurdle rates as described in Principle 3.

We have noted that adjusting the level of investment as well as the mix of investment projects can help minimize fluctuations in internal funds. When access to external finance is costly, this form of internal funds management is valuable. Of course, investment policy is not the only way to manage internal funds. As we argue above, capital structure policies as well as security design can aid in efforts to align the supply of and demand for internal funds. Firms therefore have a variety of weapons that allow them to manage fluctuations in internal funds, thereby lowering the costs of external finance generated by incentive problems.

## Risk Management

In addition to capital structure and investment policies, firms have a third means of mitigating costly fluctuations in internal funds—financial risk management programs. Corporations can use financial risk management instruments not simply to raise external funds, but also to shift the availability of internal funds from one possible future scenario to another. I argue that this motivation for risk management follows directly from the presence of incentive problems. Moreover, these problems also generate precise prescriptions about what and how much to hedge and about which derivative instruments to use.<sup>39</sup>

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39. Portions of this section are taken from Froot, Scharfstein, and Stein (1993).

### *The Relation Between Risk Management and Incentive Problems*

In practice, corporations take risk management very seriously. Recent surveys reveal that risk management is ranked by financial executives as one of their most important objectives.<sup>40</sup> Yet in spite of its practical prominence, there is little agreement on the rationale for undertaking corporate risk management. To some observers it may seem unnecessary to appeal to incentive problems to provide a motivation for corporate hedging. But given the proliferation of efficient, low-transactions cost markets, it is surprisingly difficult to come up with solid alternative rationales for corporate risk management.

Why do low-cost, efficient markets make corporate hedging harder to justify? The traditional argument is that, in such an environment, corporate shareholders can hedge themselves. As a result, they will not pay more for the stock of a company that has hedged for them. Indeed, investors may want to engage in hedging their portfolios regardless of what companies do. That is, it is unlikely that corporate risk management policies will result in aggregated stock portfolios that embody investors' preferred exposures to market risk variables. For example, if investors prefer to hold a certain amount of foreign exchange exposure in their portfolios, corporate hedging will eliminate the need for shareholder hedging only if the total portfolio exchange rate exposure happens to be exactly what shareholders desire.

By what mechanism, then, might corporate risk management add value? While there are undoubtedly many possible rationales for corporate hedging, we are particularly concerned here with arguments based on incentive problems. And indeed, these problems provide a convincing rationale—perhaps one of the most convincing—for the desirability of corporate hedging.

The reasoning goes as follows.<sup>41</sup> Because these problems make externally raised funds more expensive than internally generated funds, corporations can minimize their capital costs by generating *internally* the cash required to make positive-NPV investments. Often, however, corporations will generate surplus internal funds in some scenarios and face shortages of internal funds in other scenarios. Corporate risk management programs allow a firm to use its cash flow more effectively, by permitting it to shift the internal funds from excess scenarios toward deficit scenarios. This avoids the need in deficit scenarios either to raise

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40. See Rawls and Smithson (1990).

41. This reasoning is spelled out in more detail in Froot, Scharfstein, and Stein (1993 and 1994).

Table 7-1 Value of Ajax's Investment Opportunities with No Hedging

|                     | Internal<br>Cash flow | Desired<br>Investment | Actual<br>Investment<br>(no hedge) | NPV of<br>Investment<br>(no hedge) |
|---------------------|-----------------------|-----------------------|------------------------------------|------------------------------------|
| Dollar Appreciation | \$ 50                 | \$100                 | \$ 50                              | \$30                               |
| Dollar Stable       | \$100                 | \$100                 | \$100                              | \$45                               |
| Dollar Depreciation | \$150                 | \$100                 | \$100                              | \$45                               |
| Average Outcome     | \$100                 | \$100                 | \$ 83                              | \$40                               |

external funds or to cut investment spending, both of which are costly. Thus, by eliminating these costs, risk management programs can raise corporate values, locking in a firm's ability to undertake *all* its positive-NPV investments.<sup>42</sup>

**An example.**<sup>43</sup> To see this argument more clearly, it is best to work with a hypothetical example, Ajax Inc. Let us assume that, to be competitive, Ajax must spend heavily on R&D, which it performs principally in the United States. In the coming year, Ajax would like to spend \$100 million, based on what it perceives to be positive-NPV opportunities for product development. Company analysts expect this spending to have a net present value of \$45 million to shareholders. If Ajax is forced to cut back to \$50 million of investment spending, the NPV would fall to \$30 million; if it increases investment to \$150 million, again the NPV would be only \$30 million.

Of course, there are a number of things that could prevent Ajax from spending \$100 million on R&D and realizing the (expected) NPV of \$45 million. The corporation could be preempted by a competitor; lose a large lawsuit, or experience some natural disaster. Ajax buys insurance against some of these risks (fire, theft).

Ajax also faces foreign exchange risk, in that half of the company's sales occur abroad. An appreciation of the dollar would lead to a reduction in cash flow from \$100 million to \$50 million; a depreciation would increase cash flow to \$150 million (see Table 7-1). Ajax's managers are concerned

42. An often-mentioned reason for corporate hedging is avoidance of bankruptcy. As long as bankruptcy is costly, such a rationale is legitimate. As discussed above, though, the costs of bankruptcy are, in many instances, a result of incentive barriers between outside capital providers and insider managers. Thus, hedging to avoid bankruptcy may be thought of as an example of hedging to reduce incentive problems.

43. This section draws on the discussion in Froot, Scharfstein, and Stein (1994).

Table 7-2 Value of Ajax's Investment Opportunities with Hedging

|                     | Internal<br>Cash flow | Desired<br>Investment | Hedge<br>Payout | NPV of<br>Investment<br>(with hedge) |
|---------------------|-----------------------|-----------------------|-----------------|--------------------------------------|
| Dollar Appreciation | \$ 50                 | \$100                 | +\$50           | \$45                                 |
| Dollar Stable       | \$100                 | \$100                 | \$ 0            | \$45                                 |
| Dollar Depreciation | \$150                 | \$100                 | -\$50           | \$45                                 |
| Average Outcome     | \$100                 | \$100                 | \$ 0            | \$45                                 |

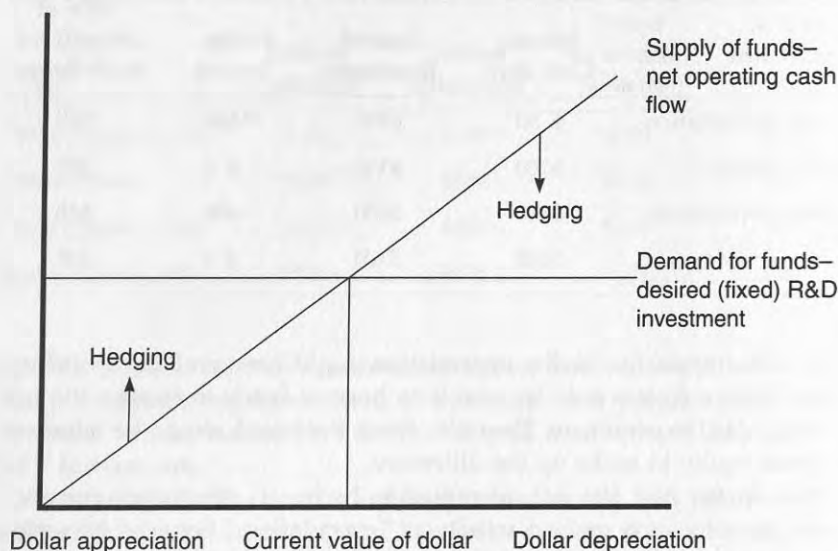
about the impact that dollar appreciation might have on R&D spending. They believe Ajax would be unable to borrow funds to finance the full desired R&D expenditure. They also think the board would be reluctant to issue equity to make up the difference.

Ajax in the past has not attempted to hedge its substantial currency risks, viewing such trading activity as "speculation." Some of its senior executives wonder whether this is the right decision. They argue that if the dollar appreciates, Ajax would have only \$50 million of cash flow it could allocate to R&D, and that this would lower the NPV of the investment program by \$15 million (from \$45 to \$30 million). A dollar depreciation, on the other hand, would not impair Ajax's ability to spend \$100 million on R&D. Indeed, with a cash flow of \$150 million, Ajax would wind up with surplus cash of \$50 million (see Table 7-1).

If Ajax were to hedge away all of the foreign exchange risk imbedded in its cash flows, the company could lock in the ability to spend \$100 million on R&D. It could do this by going long dollars (against a basket of foreign currencies). If the dollar appreciates, the hedge would bring in \$50 million, just the amount needed to supplement Ajax's internal cash flow deficit of \$50 million. If the dollar depreciates, the hedge would lose \$50 million. Since the loss would come out of excess cash, Ajax will still have \$100 million left for R&D. Thus, by buying additional cash flow in shortfall scenarios with excess cash elsewhere, Ajax can lock in its value-maximizing R&D expenditure of \$100 million (see Table 7-2).

How much more valuable is it for Ajax—as opposed to its shareholders—to do the hedging? The answer can be found by comparing the last columns of Table 7-1 and Table 7-2. If Ajax hedges, shareholders receive the NPV of \$45 million regardless of how the dollar turns out. This is \$5 million more than if the firm does not hedge: The average no-hedging outcome is \$40 million, reported in Table 7-1.

Figure 7-1 Ajax Inc.'s Hedging Strategy (fixed R&D investment)



With this example in mind, we can summarize the role of risk management as:

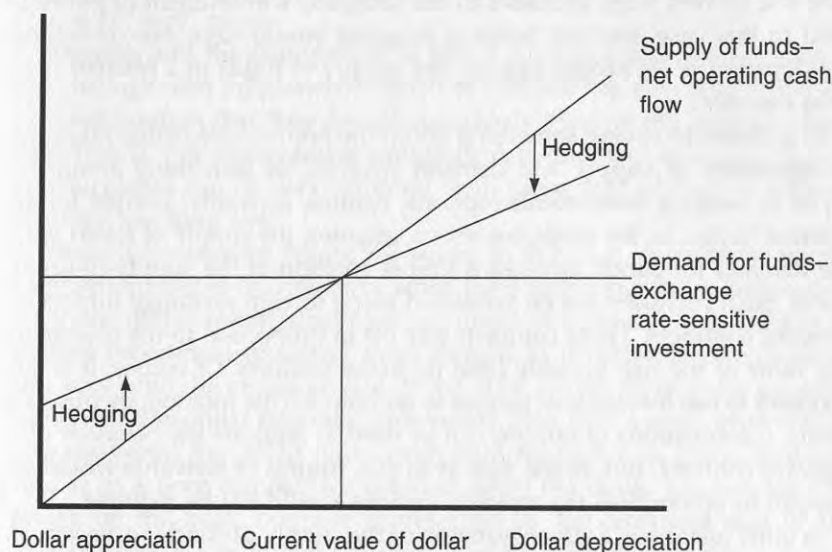
*Principle 4: When incentive problems make external finance more expensive than internal finance, risk management can add value to corporations through better alignment of the demand for funds with the internal supply of funds.*

Figure 7-1 provides a graphical demonstration. As the dollar depreciates, the supply of internal funds—Ajax's cash flows—rises; this is the sloped line. The demand for funds—the desired level of investment—is fixed and independent of the exchange rate; this is the horizontal line. If Ajax doesn't hedge, the supply of and demand for funds are equal only if the dollar is stable. By hedging, Ajax reduces supply just when there is an excess, and supplements supply just when there is a deficit. The sloped line pivots clockwise. With proper hedging, the company has the funds precisely when it needs them.

This discussion shows generally how corporate risk management can add value. In fact, there are a number of more precise implications about hedging behavior that come out of the incentive approach.

**Hedge ratios and hedging instruments.** The Ajax example also provides a framework for evaluating what hedge ratios and types of instru-

Figure 7-2 Ajax Inc.'s Hedging Strategy (exchange rate-sensitive investment)



ments to use. First, let us look at how hedge ratios are determined. Suppose that, when the value of the dollar falls, Ajax's investment opportunities improve, as it is in a low-cost position vis-à-vis its foreign competitors. Similarly, if the dollar appreciates, Ajax's investment opportunities worsen. In view of this, suppose that Ajax will want to spend \$125 million on R&D if the dollar depreciates and only \$75 million if the dollar appreciates.

In this case, Ajax will not want to hedge as much as it did in the first example. That is, its "hedge ratio" will be reduced. Figure 7-2 provides a graphical depiction. As before, the supply of funds is upward-sloping, reflecting the sensitivity of Ajax's existing business to the value of the dollar. Now, however, the demand for funds is upward-sloping as well, reflecting the improvement in the value of Ajax's investment opportunities as the dollar declines. The net result is that the amount of hedging needed for Ajax to lock in its desired investment spending is reduced. Essentially, Ajax is naturally hedged to some extent because its investment opportunities are positively correlated with its currency cash flows.

Of course, Figures 7-1 and 7-2 show only two examples of the many possible configurations for demand and supply. For example, it is possible that the demand for funds is even more steeply sloped than the supply of funds in Figure 7-2. (This might be the case if Ajax were, say, an oil

company, and the horizontal axis is the oil price—i.e., high oil prices could give rise to very large increases in the company's investment opportunities.) In that case, the best hedging program would have Ajax reversing the direction of its hedge, rotating the supply of funds in a *counterclockwise* direction.

In addition to saying something about the appropriate hedge ratio, the configuration of supply and demand may tell us something about the types of hedging instruments (options, futures, forwards) needed for an optimal hedge. In the examples above, aligning the supply of funds with the demand for funds involves a simple rotation of the supply-of-funds curve. Such rotations can be generated using foreign exchange futures or forward contracts. These contracts pay off in proportion to the change in the value of the risk variable from its initial position. Of course, it is not *necessary* to use forwards or futures to accomplish the rotation; by put-call parity, combinations of options can be used to replicate the behavior of a forward contract. But, in the Ajax example, futures or forwards would be enough to accomplish the rotation; options would not be required.

In other instances, a simple rotation of the supply-of-funds curve would not be enough to align it with the demand for funds. For example, the supply and demand curves may not be straight lines. In many instances, the upward-sloping demand-for-funds curve in Figure 7-2 would level off for large dollar appreciations, because a minimum amount of capital spending for repair and replacement purposes is always desirable if the firm is to maintain capacity. In such cases, the proper hedge will no longer need simply to rotate the supply-of-funds curve; it will have to change its shape as well. Forward and futures contracts, in any amount, will not be able to accomplish this. But options contracts (with strike prices at "kinks" in the demand-for-funds curve) can be used to align the two curves completely. With a complete set of options contracts available, a company can create a hedge portfolio to align *any* supply-of-funds curve with *any* demand-for-funds curve.

**Hedging for "soft" versus "hard" investment spending.** The example above uses investments in R&D as the investment expenditure. But the term "investment expenditure" should not be interpreted so narrowly to mean R&D or even capital expenditures in general. It applies to "softer" investments in intangible assets (even when they are expensed), such as a well-trained workforce, brand-name recognition, and market share.

In many instances, hedging will be most important for firms that invest more in intangibles than they do in plant and equipment. The reason is that capital-intensive companies can collateralize newly purchased plant and equipment. Service firms, on the other hand, will find it difficult to collateralize investments in human capital. These "soft" investments are

subject to large incentive and information problems. This makes it especially expensive to use externally raised funds to finance hard-to-collateralize or "soft" assets.

**Hedging and the elimination of risk.** An important characteristic of risk management programs designed to mitigate the effects of expensive external funds is that they do not completely insulate the company from risk. That is, risk management programs that eliminate cash flow deficits and surpluses can be very different from those that attempt to insulate shareholders from risk.

To see this, consider Figure 7-2 again. In that case, Ajax wants investment opportunities that improve when the dollar depreciates, and worsen when the dollar appreciates. Ajax can undertake a hedge that locks in its desired investment spending, even though its investment opportunities still vary with the exchange rate. If the NPV of this investment program rises when the dollar falls (and vice versa), then Ajax's stock price should also rise when the dollar falls—even with the hedge in place. Basically, Ajax is in a poor competitive position when the dollar appreciates. The return on the basic business represented by the left-hand side of the balance sheet is low in that situation. There is nothing that clever financing can do to change this. All the hedging in the world won't make Ajax's business any better when its basic business prospects are poor.

Next note that a complete hedge—one that would fully insulate Ajax's market value from fluctuations in the dollar—would fail to align the supply of funds with the demand for funds. That is, an overly aggressive hedging program would reduce Ajax's value. To see this, note that a complete hedge could be achieved by making the supply-of-funds curve perfectly horizontal in every period; that way, Ajax's cash flows would be completely protected from exchange rate fluctuations. Yet, although Ajax's value would not fluctuate when the currency changes, its ability to meet its desired investment would. That is, with a horizontal supply-of-funds curve, Ajax will find it can invest up to only \$100 million, regardless of the value of the dollar. (This is assuming that the company remains reluctant to issue equity.) This leaves it \$25 million short of its desired investment spending when the dollar depreciates. Thus, a complete hedge would reduce the NPV of Ajax's investments below their opportunity values.

### *Summary*

It should be clear that incentive problems create a number of motives for companies to manage risk actively. The basic goal of these risk management programs is to align a firm's supply of internal funds with the

demand for internal funds. In this way, hedging will support a company's attempt to "do good investment," i.e., undertake all positive-NPV investment strategies that it finds.

I also argue that derivative instruments can increase firm value when used to help support a "do-all-good-investments" policy. Hedging creates value through the interaction of financing and investment, with fairly specific, and sometimes unexpected, implications for hedging programs.

For example, this paradigm would predict that a broker/dealer, like Goldman Sachs or Bankers Trust, might want to invest the company's capital in derivatives that are "long" volatility. Why does this constitute prudent risk management rather than outright "speculation"? Basically, dealers can trade on their own accounts more profitably when markets are volatile. This means that their investment opportunities expand when volatility is high. Thus, going long volatility may actually be a hedge for such dealers; it would deliver liquidity at just the moment when the profitable opportunities to use liquidity are greatest.

### **Putting Financing, Investment, and Risk Management Policies Together<sup>44</sup>**

Thus far we have looked independently at three policy areas in which a firm can respond to the incentive problems it faces: financing policy, investment policy, and risk management policy. I argue that each set of policies can help reduce the burden created by incentive problems. But these policies also are not independent of one another—for example, the availability of sophisticated risk management tools may alter the financing and investment policies that a firm would otherwise wish to undertake. We need to explore this interdependence in order to understand more clearly how firms might create policies to minimize incentive costs.

As a first step, we need to distinguish between two broad classes of risks that companies face—what we call "marketable" risks and "non-marketable" risks. Marketable risks are those that are exogenous to the firm, and observable and verifiable by market participants. In the case of Ajax Inc., the exchange rate clearly qualifies as a marketable risk. Other obvious marketable risks are exposure to fluctuations in commodity prices, interest rates, and aggregate stock indexes. Because these risk variables are exogenous and observable, investors and corporations have more or less equal access to knowledge about them. As a result, derivative financial instruments based on them can be created and traded, allowing investors to adjust their exposures as they see fit. Even risks that are not

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44. This section draws on work from Froot and Stein (1994).

typically traded in financial markets—such as who will win the World Series—are, in principle, marketable, and therefore could be the basis for low-cost derivative financial contracts.

Nonmarketable risks, on the other hand, are risks that are not exogenous or observable by everyone. For example, in addition to facing exchange rate risk, Ajax Inc. is likely to face risks on the effectiveness of its new product pipeline, or of ongoing sales of its current products. Before sales or research results are announced to the public, managers will know much more about them than outsiders. As a result of this information asymmetry, derivative contracts based on nonmarketable risks are harder to trade; the playing field with respect to the risk variable is not level. For now, we can think of nonmarketable risks as those that are impossible (or prohibitively expensive) to write contracts on.<sup>45</sup>

With this distinction in mind, we can create a kind of hierarchical approach for mitigating the costs of incentive problems. The first step is that of risk management. Hedging techniques can be used to adjust the *marketable* risks of a firm's cash flows. As we argue above, the internal supply of funds should be aligned as much as possible with the demand for funds. If a firm faces *only* marketable risks—this is the case of Ajax, which we assume faces only exchange rate exposure—then risk management techniques allow the firm to align internal funds' supply and demand perfectly. Once this is accomplished, there are no occurrences of future cash shortfalls, and, therefore, the costs of incentive problems are eliminated.

*Principle 5: If a firm faces only marketable risks, then it can completely eliminate the costs of incentive problems. In these instances cash flow supply and demand can be perfectly aligned in every state of nature using marketable derivative instruments (options, futures, swaps, etc.). Having eliminated incentive problems, the firm can go on to use standard capital budgeting techniques to determine the optimal amount and mix of investment.*

Principle 5 suggests that incentive problems need not spill over into suboptimal financing or investment policies. The distortion created by these problems can be nipped in the bud, if the risks are marketable and derivative instruments based on those risks are available. In these cir-

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45. Of course, the distinction between marketable and nonmarketable is not so precise as this suggests. Many risks—such as individual employee disability—can be insured against despite having some nonmarketable characteristics. However, it may be “expensive” to insure against these risks, as insurers have to charge a premium to compensate for their inferior access to information.

cumstances, investment policy should mirror standard capital budgeting methods, which disregard both the volatility of an investment's cash flows and the correlation with firm cash flows. Similarly, financing policy need not hold in reserve additional debt capacity for cash shortfalls. If the prospect of these cash shortfalls can be eliminated by risk management techniques, then less of an equity buffer is needed.

Of course, in reality there are no firms that actually face only marketable risks. All firms face nonmarketable risks, although to greater or lesser extents. In such circumstances, while risk management cannot *perfectly* align supply and demand across all scenarios, it can remove the portions of nonmarketable risks that are *correlated* with marketable risks. This reduces, but can't eliminate, the costs of incentive problems.

To see this, consider again the example of Ajax. Suppose that, as in Figure 7-2, when the dollar depreciates, Ajax will need more cash to fund its investments *on average*. Of course, unrelated product market developments may lead to investment opportunities that turn out to be either above or below the average. The presence of these nonmarketable risks implies that Ajax will not be able to use exchange rate derivatives to avoid all cash shortfalls. Sometimes these shortfalls will occur, although not as a result of an exchange rate movement (against which the firm can hedge). Risk management will have helped Ajax eliminate the effects of the exchange rate on supply-demand alignment, but it will not be sufficient to eliminate the costs of incentive problems altogether.

In such a case, Ajax will wish to alter its capital budgeting rules and its financing patterns if it is to reduce incentive costs further. It will want to penalize investment projects that have very volatile returns by raising the hurdle rate such investments must meet. Similarly, Ajax will have a relative preference for "diversifying" investments, to include some whose payouts are not so highly correlated with existing cash flows. On the financing side, Ajax may wish to alter its target capital structure as a means of "hedging" against otherwise unhedgeable cash shortfalls. It might reserve some debt capacity for these shortfalls, employing a larger equity buffer that absorbs negative cash flow shocks. Overall, this implies:

*Principle 6: Firms that face nonmarketable risks will not be able to eliminate incentive problems through risk management alone. These firms will wish to alter financing and investment policies as in Principles 2 and 3 in order to reduce the costs of these problems further.*

Clearly, firms in these circumstances will wish to adjust *both* investment and financing policies. How much they adjust each depends on their circumstances. For example, a firm that has little room to adjust investment cannot reduce its exposure to costly cash flow shortfall by changing

the mix of investments. All else equal, this firm will wish to use a more conservative capital structure. On the other hand, firms that have little flexibility in choice of financing may place more emphasis on adjusting investment policies in order to reduce the risk of cash shortfalls. This implies:

*Principle 7: Once a firm has used risk management techniques to remove the marketable portion of net cash flow risk, it should consider adjustments in financing policies (i.e., a less levered target capital structure) and investment policies (i.e., a risk-reducing mix of investments) as substitutes. These are adjustments that reduce the costs of incentive problems without the use of financial derivatives. They should be used only to offset nonmarketable risks. Marketable risks are better dealt with through the use of financial derivatives.*

## Conclusions

This exploration of incentive problems for corporations that must rely on arm's length capital markets for financing indicates that these problems have a wide range of implications for corporate decisions: financing, investment, and risk management. Incentive problems have the effect of making external finance increasingly costly, the more is used. This in turn creates an incentive for firms to mitigate their use of equity financing and reduce the "lumpiness" of their external financial needs.

Innovations within the financial system have provided new ways of managing incentive problems. Firms today have at their disposal a wide variety of derivative instruments that allow for far better financial risk management. The result is that firms can reduce the frequency with which they raise external equity, at the same time as they maintain, or even increase, their use of debt. In this way, firms reduce their average cost of capital. Firms can also issue a range of securities that are designed to reduce incentive or information gaps between shareholders and managers. Both types of innovations help to eliminate the incentive barriers that separate management from the market.

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