Managing Corporate Risk

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Abstract

Recent developments in corporate risk management include an expansion of the available instruments, a material reduction in the costs of risk management products, and a more sophisticated understanding of their benefits.

I examine the underlying theory of how risk management increases firm value. I then summarize the evidence on the use of risk management instruments.
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1. INTRODUCTION

Risk management by firms has expanded substantially over the past two decades. This expansion has produced both a more sophisticated understanding of the benefits of an appropriate risk-management program as well as a material reduction in the cost of risk-management products. Much of the risk-management literature focuses on the use of derivatives—futures, forwards, swaps, and options—in hedging corporate exposures to interest rates, foreign exchange rates, and commodity prices. But the array of risk-management instruments is much broader. Both financially engineered hybrid instruments as well as engaging in specific real production activities represent important alternative methods of managing risk.

Devising and implementing an effective risk-management strategy involves several steps: (1) the identification and quantification of risk exposures, (2) the design of potential risk management instruments and an assessment of their respective effectiveness, (3) an assessment of the potential benefits and costs of risk management, and (4) the selection and implementation of the strategy.

Much of my discussion focuses on the underlying theory of the mechanisms through which risk management can increase the value of the firm. This is a critical step in the design of an effective corporate risk-management strategy. For example, there is apparent disagreement on how one should measure a firm’s risk exposures: Should management focus on cash flows, firm value, or reported earnings? I would argue that why a firm hedges has direct implications for how one should measure these corporate exposures as well as what instruments the firm should employ to hedge. Finally, I summarize the evidence on the use of risk-management instruments.
2. **RISK EXPOSURES AND HEDGING**

Some of the risks to which firms are exposed affect only individual firms, while others affect a broad cross-section of firms in the marketplace. In Figure 1, I array these risks along a spectrum. At one end of this risk spectrum are market wide risks; these risks—for example, the impact of unexpected changes in interest rates, FX rates, or oil prices—are not localized to a specific firm or industry. At the other end are firm-specific risks; these include fires, lawsuits, outcomes of research and development projects, and outcomes of exploration and development activities for firms in natural resource industries.

**RISK MANAGEMENT INSTRUMENTS.** An advantage of arraying the sources of risk as in Figure 1 is that it illustrates the fact that different risks are managed with different hedging instruments. In the second column, for example, insurance policies are employed to manage firm-specific risks like fires. Market-wide risks, such as exposures to interest rates, can be managed with specialized derivative instruments like forwards, futures, swaps and options.¹

Over the past two decades, many new financially engineered securities have been introduced to provide customized solutions to corporate risk-management problems.

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¹ Although forward, futures, and simple swap contracts differ in administration of the contract, liquidity, and settlement terms, all three instruments have similar exposure profiles. In buying a forward, futures or swap contract the value of the contract appreciates with unexpected increases in the underlying asset price, and falls with unexpected reductions. Writing a forward, futures, or swap contract produces the opposite exposure; the value of the position falls with unexpected increases in the underlying asset price (see Smith, Smithson, and Wilford [1989]).
Since these hybrid securities are structured around bonds or preferred stock, they normally are carried on the firm’s balance sheet. In creating these hybrids, financial engineers operate much like General Motors in producing automobiles to meet specific customer demands: GM customizes their cars by assembling various combinations of off-
the-shelf components—frames, engines, trim packages, interior appointments, and so on. Similarly, hybrid securities are customized, but the components that make up these instruments are themselves fairly basic off-the-shelf debt instruments, preferred stock contracts, swaps, forwards, and options.²

As illustrated in Figure 1, the firm’s choice of real production activities also can be used to manage its risk exposures. For example, moving production overseas changes a firm’s foreign-exchange exposure. But producing in a new market with new suppliers, new workers, and different labor laws is a major strategic decision. One material advantage offered by financial risk-management products is that they allow more effective separation of production and risk-management activities. Moreover, financial contracts are more liquid, so if market conditions and exposures change, this added flexibility permits more rapid adjustments.

**RISK EXPOSURE.** In analyzing a firm’s hedging incentives, it is important to understand the relation between an underlying risk and firm value. Some relations are straightforward; for example, an uninsured casualty loss directly reduces firm value. However, other exposures can be more subtle.

I illustrate the exposure profile for an oil company in Figure 2. Because this corporation owns substantial oil reserves, higher oil prices raise revenues and increase firm value. The exposure profile relating the unexpected change in firm value that results from an unexpected change in oil prices thus has a positive slope. (I illustrate this relation as a straight line only for simplicity.)

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² For example, an oil producer might issue bonds that include a forward contract on oil, a silver mining firm might issue bonds incorporating an option on silver, and a copper producer might issue a bond giving investors a strip of copper options, one at every coupon payment (see Smith and Smithson [1990]).
Figure 2: Exposure profile for an oil company relating the unexpected change in firm value resulting from an unexpected change in oil prices.
But the exposure profile would look quite different for a petrochemical firm: higher oil prices would raise the costs of a major input. Thus the exposure profile relating the unexpected change in firm value that results from an unexpected change in oil prices has a negative slope. This exposure profile is illustrated in Figure 3.

With the firm’s exposure identified, I now can illustrate a basic impact of risk management on firm value. For example, to hedge its exposure to oil prices, the chemical company in Figure 3 must employ a hedging instrument that appreciates in value if oil prices increase. Because gains on such a hedge would offset losses in the firm’s core business, risk management reduces the volatility of firm value.

Richard Breeden, former Securities and Exchange Commission chairman, notes that “derivatives are the moving vans of risk—they shift risk from place to place by substituting one type of risk for another.” Yet this analysis suggests that such a characterization of derivatives ignores a critical aspect of these instruments. The differences in exposures across firms offer potentially important gains from the use of derivatives. For example, an oil swap with our petrochemical firm as one end-user and our oil company as the other allows both firms to hedge. Therefore, derivatives do more than just shift risk from place to place—they also can reduce the total risk in the system.

It is important to note that although this hedging activity reduces the exposure of firm value to oil prices of our chemical firm, hedging generally will not affect the firm’s optimal pricing or production decisions. Basic economic theory implies that optimal production and pricing occur where marginal cost equals marginal revenue. Relevant costs reflect opportunity costs, and the opportunity cost of the oil is its spot price. For this reason, hedging affects neither the firm’s relevant marginal costs nor marginal
Figure 3: Exposure profile for a petrochemical company. The Core Business curve relates the unexpected change in firm value resulting from an unexpected change in oil prices. The Hedge curve illustrates the payoff to an oil swap which receives cash-flow based spot oil prices. The net exposure curve reflects the modification in exposure to oil prices from the hedge.
revenues. Therefore, pricing and production decisions and their decisions to use financial instruments to hedge their exposures generally are separable.

3. **Benefits of Risk Management**

Because financial risk management reduces the volatility of firm value, one might presume that all firms would want to engage in risk management. Yet there is wide variation in the use of risk-management instruments across firms, even among firms that have similar exposures. There are firm characteristics that can provide firms with strong economic incentives to hedge.

**Ownership Structure.** In analyzing risk-management benefits, I generally assume that the objective of the firm is to maximize its current market value. In their personal affairs, risk-averse individuals have incentives to manage risk because doing so lowers the required rate of return in order to engage in a particular risky activity. Thus, for example, an insurance company has a competitive advantage over most individuals in bearing risk and hence is willing to do so at a price lower than the individual would demand. Similarly, for an individual proprietorship, a partnership, or a closely held corporation, the risk aversion of the firm’s owners is sufficient to motivate the firm to engage in risk-management activities. But for a widely held corporation this logic fails. Portfolio theory implies that a corporation’s required rate of return does not depend on total risk, but on the systematic risk of its cash flows. Thus, a hedging instrument that works primarily on diversifiable risk does not provide a lower discount rate for a widely held firm whose owners hold well-diversified portfolios. And even if risk management affects systematic risk, so long as the investment is appropriately priced, risk management still will not affect firm value. To illustrate, consider a capital asset pricing
model framework. To increase firm value, the firm must acquire an asset that plots above the security market line. But a fairly priced asset will plot on the line. Thus even if hedging changes the firm’s beta, a fairly priced hedge would simply move the firm along the security market line — it would not increase firm value.

Risk management increases the value of a widely held firm by increasing the firm’s expected net cash flows – not by reducing its required rate of return. To understand how this might occur, recall the Modigliani-Miller proposition: The firm’s financing decisions, including its risk-management activities, will not affect firm value assuming the firm’s investment decisions are fixed and so long as there are no taxes and no contracting costs. For my purposes, it is useful to restate this proposition in a logically equivalent way that emphasizes its managerial implications: If financial decisions — including risk-management decisions — affect firm value, they must do so through their effect on investment decisions, taxes, or contracting costs.

**RISK SHIFTING WITHIN THE FIRM.** Thus far, I have viewed the firm from the perspective of its investors. Of course, the corporation is a vast network of contracts between various parties with conflicting as well as common interests. In addition to bondholders and stockholders, a corporation has other constituencies, such as employees, managers, suppliers and customers. All have vested interests in the company's success.

Like the owners of private or closely held companies, the firm's managers, employees, suppliers, and customers may not be able to diversify their risks; if not hedged, these risks can affect their future payoffs in their respective relationships with the firm. Because they are also risk-averse, these groups are likely to require extra
compensation to bear any risk that is not assumed by the owners or transferred through hedging to a counterparty (see Smith/Stulz, 1985 and Stulz, 1990).

Employees will demand higher wages (or reduce their loyalty or perhaps their work effort) at a company where the probability of layoff is greater. Managers with alternative opportunities will demand higher salaries (or maybe an equity stake in the company) to run firms where the risks of insolvency and financial embarrassment are significant. Suppliers will be more reluctant to enter into long-term contracts, and trade creditors will charge more and be less flexible with companies whose prospects are more uncertain. And customers concerned about the company's ability to fulfill warranty obligations or service their products in the future may be reluctant to buy those products.

Because of limited liability, the amount of risk that can be allocated to stockholders is limited by the capital stock of the company. Companies in service industries, for instance, often employ limited capital. And for such companies, where the claims — and thus the risks — of managers and employees are likely to be large relative to the claims of investors, there may be substantial benefits to be gained from hedging those risks.

Note, however, that there is one important aspect of achieving these potential risk-management benefits that has received little attention — a firm's ability to pre-commit to a hedging strategy. This is less of a problem with some firm-specific risks: supplier, employment, and customer contracts have long stipulated levels of insurance coverage. But it is rare to see a supplier contract that specifies that interest rate risk be managed on an ongoing basis.
Without an ability to pre-commit to hedge, the realized gains to a firm in these dimensions will be lower. It is difficult to rely on implicit reputational effects to support an ongoing hedging policy because of potential incentive incompatibility problems. In some circumstances where these claimholders might value hedging quite highly, the firm's stockholders face big incentives to unwind the hedge. (Morellec/Smith, 2004 examine conditions under which shareholders have incentives to maintain the firm’s hedging policy after fixed claims have been issued.)

Consideration of comparative advantage in risk-bearing also has implications for the design of compensation contracts. Effective compensation plans achieve an appropriate balance between two potentially conflicting goals — strengthening employees' performance incentives and insulating them from risks beyond their control. Incentive considerations dictate that firms link compensation to performance measures such as share price changes or earnings. Yet a potential problem with such performance proxies is that they contain significant variation that is unrelated to employees' actions. Because financial price risks are a potential source of such noise, companies may also achieve economies in risk-bearing by excluding them more effectively from performance measures that serve as the basis for employee evaluations and bonuses. (see also DeMarzo/Duffie, 1991, 1995 and Breeden/Viswanathan, 1998).

**TAXES.** With progressivity in the tax structure, after-tax payoffs are concave; thus hedging reduces the expected tax liability, increases after-tax liability, and increases after-tax cash flows and value (Mayers/Smith, 1982; Smith/Stulz, 1985). In their analysis of more than 80,000 COMPUSTAT firm-year observations, Graham/Smith (1999) find that in approximately 50 percent of the cases, corporations face convex
effective tax functions and thus have tax-based incentives to hedge. In approximately 25 percent of the cases, firms face linear tax functions and thus have no tax-related incentives to hedge. The remaining firms face concave effective tax functions, which provide a tax-based disincentive to hedge. Of the cases with convex tax functions, roughly one-quarter of the firms have potential tax savings from hedging that appear material — in extreme cases exceeding 40 percent of the expected tax liability. For the remaining firms, the tax savings are fairly small. Thus, the distribution of potential tax savings from hedging appears quite skewed.

Firms are most likely to face convex tax functions when (1) their expected taxable incomes are near the kink in the statutory tax schedule (i.e., taxable income near zero), (2) their incomes are volatile, and (3) their incomes exhibit negative serial correlation (hence the firm is more likely to shift between profits and losses).

The Graham/Smith methods also allow them to decompose the basic structure of the tax code to examine the incremental impact of statutory progressivity, net operating loss carrybacks and carryforwards, investment tax credits, the alternative minimum tax, and uncertainty in taxable income. They find that most of the convexity is induced by the asymmetric treatment of profits and losses in the tax code. Carry-back and carry-forward provisions effectively allow firms to smooth their losses, thereby reducing tax-function curvature at its most convex points but making the function convex over a broader range of taxable income. In contrast, the alternative minimum tax and investment tax credits have only modest effects on the convexity of the tax function.
THE UNDERINVESTMENT PROBLEM. Although well-diversified stockholders and bondholders may not be concerned about the prospect of unhedged losses per se, they will become concerned if such losses raise the likelihood of insolvency. For example, companies that wind up in Chapter 11 face considerable involvement by the bankruptcy court in their operating decisions as well as substantial direct costs of administration and reorganization. And short of the formal bankruptcy process, financial difficulty can impose large indirect costs. One such cost is the underinvestment problem identified by Myers (1977).

If a company’s effective leverage is high enough, management can have incentives to reject an available positive net present value project. As Myers demonstrates, if enough of the value of the new investment is captured by the fixed claimholders so that what is left for the shareholders fails to provide them a normal return given the capital employed and the risk, then the stock price will fall. Taking the project would generate a wealth transfer from stockholder to lenders. To illustrate, again consider our petrochemical firm from Figure 3. Without hedging, an unanticipated increase in oil prices would raise costs, lower profits, and reduce firm value. But this reduction in firm value causes an induced increase in leverage; higher leverage exacerbates the underinvestment problem and further reduces firm value. This is depicted by the shaded wedge below the core business line in Figure 4. (One can think of the original “core business” line as one that holds investment policy fixed and the steeper line reflects the underinvestment costs.)

Now if this petrochemical firm were to hedge its oil price exposure, the reduction in operating cash flows from an unexpected increase in oil prices would be offset by the
Figure 4: Underinvestment and Hedging. For a petrochemical firm, an increase in oil prices raises costs and lowers firm value which induces an increase in leverage, an exacerbation of underinvestment problems, and a further fall in value — the shaded wedge. Hedging reduces these underinvestment costs.
increased value of the hedge. Thus, the induced increase in leverage and the exacerbation of the underinvestment problems would be smaller. In Figure 4, this is illustrated by the smaller shaded area associated with the firm’s net exposure. Note that this benefit of hedging is that this wedge is reduced, not that the curve is flatter.

Hedging can be an important mechanism for controlling underinvestment costs. This can be a more effective method than reducing leverage. So, an additional benefit of hedging is that it can increase the firm’s debt capacity (see Stulz 1984). This benefit of controlling underinvestment problems should be more pronounced for firm’s whose value is comprised primarily of growth opportunities.

**INFORMATION PROBLEMS.** Froot/Sharfstein/Stein, (1993) note that a similar result is obtained when one considers the information asymmetry issues raised by Myers/Majluf (1984). Froot/Sharfstein/Stein note that raising external capital is costly because of this information asymmetry and thus a firm like our petrochemical firm in Figure 4 might hedge. Without hedging, higher oil prices would lower firm value, raise leverage, and thus induce management to raise expensive external equity. By reducing the fall in firm value when oil prices rise, hedging reduces the induced increase in leverage and thus the likelihood that the firm would have to access external capital markets. Note however that these information asymmetry costs are likely to be small in the specific cases where hedging opportunities are greatest. Because investors can observe events like a fire, lawsuit, or a fall in oil prices, informational asymmetries are smaller and managers who raise external capital in these circumstances face more limited costs. This benefit of hedging should be greatest for firms with substantial informational asymmetries between managers and external investors.
Figure 5: Free Cash Flow and Hedging. For a petrochemical firm, a reduction in oil prices reduces costs and raises firm value which induces a reduction in leverage and less effective control of the free cash flow problem and a fall in firm value — the shaded wedge. Hedging reduces the free cash flow costs.
**FREE CASH FLOW PROBLEMS.** Hedging also can control the free cash flow problem. Jensen (1986) defines free cash flow as cash flow generated by the firm in excess of that required to fund available positive net present value projects. He argues that financing a firm generating substantial free cash flow with debt allows managers to make believable promises to distribute the free cash flow. But, if we again return to our petrochemical firm in Figure 3, unexpectedly lower oil prices lowers costs, increases firm value, reduces the firm’s effective leverage and thus exacerbates the free cash flow problem. In Figure 5, this free cash flow cost is illustrated by the shaded area. (Again, one can think of the original ‘core business’ line as one that holds investment policy fixed and the flatter line reflects the induced overinvestment because of the free cash flow incentives.)

Morellec/Smith (2004) argue that hedging can control this free cash flow problem. For example, if this petrochemical firm now hedges its oil price exposure, the increase in operating cash flows from an unexpected reduction in oil prices is offset by the reduced value of the hedge. Thus, both the induced reduction in leverage and the exacerbation of the free cash flow problems are smaller. In Figure 5, this is illustrated by the smaller shaded area associated with the firm’s net exposure. This benefit should be more pronounced for firms whose value is comprised primarily of assets in place.

**HEDGING MOTIVES AND METHODS.** Understanding the motives for risk management is a critical step in designing an effective hedging program for a firm. If the primary consideration for a particular firm in hedging is taxes, this firm should focus on hedging its taxable income. If hedging is prompted by risk-sharing concerns, then a firm where the bonus is linked accounting returns might focus on hedging
accounting earnings. If the cost of financial distress and the underinvestment problem are the primary factors that motivate hedging, the firm should hedge firm value.

It is important to note that, in general, hedging value and hedging earnings are not the same thing. FASB rules have evolved to a point where it is typically difficult to obtain hedge-accounting treatment for an off-balance-sheet hedge. Most firms that use standard derivatives are thus required to mark the hedge to market in each accounting period. Yet accounting rules also generally prohibit the firm from marking to market the value of its core assets or liabilities that give rise to the exposure. This means that a firm can engage in risk-management activities that, while reducing the volatility of firm value, increase the volatility of reported earnings.

As access to hedge-accounting treatment for derivatives has been restricted, there has been an increase in the use of structured notes and other hybrid securities. This has occurred in part because accounting rules generally do not require that a risk-management contract bundled with a loan or preferred stock issue be marked to market.

Finally, note that with three independent instruments, three different targets can be achieved. Therefore, in principle, with the appropriate choice of hedging instruments a firm could simultaneously manage the impact on its value, reported earnings and taxable income.

4. THE COSTS OF RISK MANAGEMENT

It is important to identify those aspects of the risk management transactions which represent real costs. Basically, the relevant cost of hedging is the sum of any out-of-pocket fees, the implicit cost of the bid-ask spread, and the opportunity cost of management's time in the administration of the program. For standard swaps, many of these costs have fallen dramatically over the past two decades. In the early 1980s, the
bid-ask spread for swaps at times exceeded 100 basis points. In 2006 it can be as low as two basis points for a standard interest rate swap. Thus profound reduction in hedging costs, which reflects the material increase in the liquidity of these markets, makes the net benefit from accessing the market greater and explains part of the observed growth in these markets. Moreover, standardization and increased familiarity with these instruments and their uses have lowered the administrative costs.

In addition to this variation in cost over time, there is also important variation in costs across hedging instruments at a given date. In general, the costs of hedging will be lower: (1) the greater the volume of transactions in a given market, (2) the lower the volatility of the underlying asset price, and (3) the less private information is relevant for pricing the underlying asset. Therefore, hedging costs are generally lower for derivatives on interest rates and major currencies but higher for more customized hedging instruments.

5. EVIDENCE ON CORPORATE HEDGING

Derivative instruments can be used either to speculate on financial price movements or to hedge. Thus, a basic question to be addressed is: do firms use derivatives to hedge or to speculate? Although the evidence is still preliminary, the answer appears to be, for the most part, to hedge.

An early survey of the corporate use of derivatives was conducted by Dolde (1993). The overwhelming majority of the 244 Fortune 500 companies that responded to Dolde's questionnaire reported that their policy was to use derivatives primarily to hedge their exposures. At the same time, however, only about 20% of the responding firms reported that they attempted to hedge their exposures completely. Moreover, smaller
firms — those likely to have lower credit ratings and, hence, greater default risk — reported hedging larger percentages of their exposures than big companies.

About 90% of the firms in Dolde's survey also said that they sometimes took a view on the market direction of interest rates or exchange rates. And although roughly one in six of even these companies hedged its exposures completely, the rest claimed to modify their positions to accommodate their view.

For example, if they expected rates to move in a way that would increase firm value, they might hedge only 30% of their exposure; but if they expected rates to move in a way that would reduce firm value, they might hedge 100% of their exposure. Only two firms said that they would use hedge ratios outside the 0-100% range. In effect, this means that less than 1% of the firms said they would use derivatives to speculate and enlarge an existing exposure.

Of course, there are problems with surveys. For example, some companies might be reluctant to admit that they use derivatives to speculate. Yet other evidence on hedging also bears out this corporate propensity to hedge. For example, a mounting number of studies find that firms with operating characteristics that theory suggests should make hedging more valuable appear to use more derivatives. If derivatives were used primarily to speculate, no such associations should be expected.

Before I turn to examine those empirical results, however, I must note one caveat about the data examined by these studies. There are important limitations in our current ability to judge whether one firm hedges more than another. These limitations are of three basic varieties.
First, some firms hedge using derivatives while others employ hybrid debt and preferred stock issues. Many empirical studies of corporate hedging focus on hedging using derivatives but ignore the risk-management implications of hybrid securities issued by the firm.

Second, over the past decade there has been wide variation in the disclosure of corporate hedging activities. Prior to the adoption of SFAS 105, disclosure by firms was generally required only if a hedging activity was material. Yet, some firms voluntarily disclosed more than was required. This means that firms with essentially equivalent hedging policies might appear different simply because of different disclosure policies. The adoption of SFAS 105 reduced this problem, but did not eliminate it.

The third problem is more fundamental. Even with complete access to hedging data, if two firms employ different risk-management instruments, judging which firm hedges more can be difficult. For example, assume that firm A has $10 million (notional principal) of three-year interest rate swaps, firm B has $20 million of three-year swaps and firm C has $10 million of seven-year swaps. Firm A clearly hedges less than either B or C, but comparing B with C is more difficult. For the next three years, B hedges more than C, but for the following four years firm C hedges more.

And if we turn to options, the problems become dramatically more difficult — attempting to compare firms with contracts of different size and different exercise prices is quite difficult. In principle, one could estimate the contracts' deltas, but deltas depend on the prices at which they are evaluated. These data problems limit the power of all the empirical work in this area.
INVESTMENT POLICY. Geczy/Minton/Schrand (1997) Nance/Smith/Smithson (1993) and Mian (1994) examine whether firms with more growth opportunities in their investment opportunity sets are more likely to hedge. Nance/Smith/Smithson, who examine hedging activity by 169 Fortune 500 firms, conclude that firms with more growth options hedge more. Mian, analyzing data for 3,022 firms listed on Compustat, finds conflicting evidence across different measures. Geczy/Minton/Schrand, who examined the use of currency derivatives by 372 large firms, find no significant relation. Morellec/Smith (2004) suggest that one reason studies fail to find a robust relation between the firm’s investment opportunities and hedging is that hedging can control both underinvestment and free cash flow problems. Thus, both firms with substantial assets in place as well as growth options can have important incentives to hedge.

FINANCING POLICY. Several studies (for instance, Block/Gallagher 1986, and Geczy/Minton/Schrand, 1997) examine the association between hedging and leverage. Most report no significant association between hedging and leverage. This result potentially reflects a fundamental statistical problem. Both leverage and hedging decisions are endogenous. Thus simply putting leverage on the right hand side of an OLS regression to explain hedging choices introduces a potential simultaneous-equation bias in the reported coefficients. At our current state of knowledge, I believe that this will be a difficult problem to solve. It is not clear that our theory is sufficiently rich to identify structural equations so that simultaneous equation estimation methods can be employed.

Booth, Smith, and Stolz (1994), Wall and Pringle (1989), and Mayers and Smith (1990) examine the impact of the probability of financial distress on the incentive to hedge. Booth, Smith, and Stolz examine the use of interest rate futures by 238
financial institutions; Wall and Pringle examine hedging by 250 swap users from the NAARS database; and Mayers and Smith examine reinsurance purchases for a sample of 1,276 property-casualty insurance companies. Wall and Pringle find that firms with lower credit ratings use more swaps, Mayers and Smith report that insurers with lower Best’s ratings reinsure more, and Booth, Smith, and Stolz report that S&Ls hedge more than banks. These results suggest that with a higher probability of financial distress, firms have stronger incentives to hedge.

Managerial Incentives. Tufano (1996) examines managerial incentives to hedge. He concludes that firms that compensate managers with more stock, hedge more. Although firms that use more stock options hedge less. He argues that with more restricted stock, managerial risk aversion increases the incentives to hedge. But the impact of volatility on option values (see Black/Scholes, 1973) implies that managers who receive options should hedge less. Geczy/Minton/Schrand (1997) also look at managerial option ownership. The evidence suggests that firms that use currency derivatives grant more options to their managers than non-users.

Geczy/Minton/Schrand are appropriately concerned about simply inserting a measure of managerial compensation as an explanatory variable in a hedging equation. Compensation is endogenous and thus doing so would introduce simultaneous equation problems. Interestingly, Tufano’s analysis is less likely to suffer from such problems. He focuses on 48 firms in the gold mining industry. Because our theories are unlikely to be able to explain the observed variation in compensation structure across this reasonably homogeneous population of firms, any simultaneous equation bias is likely to be small in his analysis.
FIRM SIZE. Booth/Smith/Stolz, Block/Gallagher, Nance/Smith/Smithson, Mian, Geczy/Minton/Schrand, and Tufano (1996) all report that large firms are more likely to hedge than are small firms. This is consistent with the proposition that there are significant transaction and information costs as well as scale economies. Hedging instruments frequently are viewed as sophisticated products, and large firms are more likely to hire managers with the requisite expertise to manage a hedging program.

The analysis in Mayers and Smith, however, indicates that small insurers reinsure more. This result is consistent with size-related tax and financial distress incentives. Moreover, the information cost issues that are associated with derivative instruments for industrial or financial firms are likely to be less important for insurance companies’ reinsurance purchases.

TAXES. Geczy/Minton/Schrand, Graham/Rogers(2002), Mian, Nance/Smith/Smithson, and Tufano test the proposition that statutory progressivity of the tax function provides an incentive for firms to hedge. Some find that the greater the likelihood that a firm’s pre-tax income falls in the progressive region of the tax schedule, the more likely the firm is to hedge. The effective tax schedule can be convex because of limitations on the use of tax credits. Mian finds more hedging by firms with more foreign tax credits, and Nance, Smith, and Smithson document more hedging by firms with more investment tax credits. They report inconsistent evidence on the impact of tax-loss carryforwards.

Note, however, that these variables may proxy for things other than a firm’s tax status. For example, the presence of tax-loss carryforwards also might proxy for financial distress; similarly, ITCs may proxy for aspects of a firm’s investment opportunities; finally, foreign tax credits potentially proxy for a foreign currency exposure. (Both Mian
and Houston/Mueller (1988) find that firms with foreign operations are more likely to hedge.)

To the extent that these variables proxy for firm characteristics other than the progressivity of the firm’s effective tax schedule, we have a potentially important identification problem. More powerful tests of these tax hypotheses will require proxies that better isolate the firm’s tax status.

**OWNERSHIP STRUCTURE.** There has been little analysis of the use of forwards, futures, swaps, or options by closely held firms, largely because of data limitations. Within their sample of property-casualty insurance companies, however, Mayers and Smith are able to examine closely held insurance firms. In their analysis of hedging through reinsurance contracts, they find that closely held insurance firms buy more reinsurance. This is consistent with the proposition that firms with owners whose portfolios are more ill-diversified have stronger incentives to hedge.

**6. CONCLUSIONS.**

Derivative instruments represent a material addition to the corporate financial officer’s tool kit. These instruments provide incredible flexibility in structuring a customized risk management strategy for the firm.

To realize their potential requires a detailed understanding of the instruments and their uses. Used appropriately, they reduce risk and increase firm value. But used inappropriately, they have caused firms to collapse. I noted above that implementation of a risk identification strategy involves several steps: (1) exposure identification, (2) instrument design, (3) net benefit assessment, and (4) strategy implementation. Heretofore, the academic community has focused substantially all its attention on the first three steps. However, I believe that the implementation step is critical to an effective
strategy. As with other aspects of organizational design, it involves three critical aspects: (1) the assignment of decision rights — who has the authority to structure and implement the policy and who has the responsibility to monitor these decisions, (2) the methods of rewarding these key individuals, and (3) the structure of systems to evaluate the effectiveness of the policy including the details of its implementation (see Brickley/Smith/Zimmerman, 2004). To date this last step has received little academic attention, yet it may be the single most important in terms of creation of firm value.
References


