

The Rise of Risk Management

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RISK MANAGEMENT CAN BE ROUGHLY DEFINED AS ANY SET OF ACTIONS TAKEN BY INDIVIDUALS OR CORPORATIONS IN AN EFFORT TO ALTER THE RISK ARISING FROM THEIR PRIMARY LINE(S) OF BUSINESS. VIEWED FROM THIS PERSPECTIVE, RISK MANAGEMENT IS NOTHING NEW, DESPITE THE INCREASED ATTENTION GIVEN TO THE SUBJECT BY ACADEMICS AND MANAGERS AS FINANCIAL DERIVATIVE MARKETS HAVE EVOLVED OVER THE PAST DECADE OR TWO.

For well over one hundred years farmers, for example, have engaged in risk management as they attempted to hedge their risks against price fluctuations in commodity markets. Their preferred risk-management strategy has been to sell some or all of their anticipated crop, before harvest time, to another party on what is called futures markets. This strategy guarantees the farmer a known price for his crop, regardless of what the commodity's actual price turns out to be when the harvest comes in. Risk management along these lines makes sense for farmers for at least two reasons. First, agricultural prices are volatile. Moreover, many of these family farmers are not diversified and, in addition, must borrow in order to finance their crops. Therefore, setting the sale price now shifts their risk of price fluctuations to other participants in the futures market better able or willing to bear this volatility.

Contrast the above story with that of a large corporation, owned by a large number of shareholders, facing similar commodity price risk. For concreteness, consider

a firm primarily engaged in the extraction and sale of copper. Given that copper prices are relatively volatile, the first rationale for risk management might seem similar to the farmer's. However, unlike in the farmer's circumstance, this firm is owned by a large number of shareholders, who can, if they so wish, greatly reduce or eliminate the risk that copper prices will be low simply by holding a diversified portfolio that includes only a small fraction of assets invested in the copper extraction corporation. More generally, if investors can freely trade securities in many firms, they can choose their exposure to volatility in copper prices. Indeed, in two studies Modigliani and Miller (1958; Miller and Modigliani 1961) showed that, in a world with no transactions costs or taxes and with equal information, managers could not benefit their shareholders by altering the risk profile of the firm's cash flows. Essentially, in this situation shareholders can already do whatever they choose at no costs; actions by managers are redundant.

Although the Modigliani and Miller studies considered the option of changing the firm's risk profile only through the use of debt financing (1958) or the distribution (or lack thereof) of dividends (Miller and Modigliani 1961) and not through the use of financial derivative securities, the powerful intuition here is the same as that outlined earlier. If managers of the firm wished to increase their use of debt financing (say, because they thought it was cheaper than equity), investors could undo this transaction by, for example, taking equal positions in the firm's debt and equity. This move would leave investors facing the same risk from the firm's operations as they had before the increase in debt financing.

Given the above discussion, one is tempted to ask, Why are managers doing for shareholders what shareholders apparently can do for themselves? In other words, why do managers of corporations find it worthwhile to engage in risk-management activities, and why has interest in this topic mushroomed over the past decade or two?

This article is intended to provide a review of the rationales concerning when firms should engage in risk management. The first section lays the groundwork for that discussion by defining more precisely what risk management is in terms of the alternative instruments available to managers. The second section provides a discussion of the reasons firms might have for managing risk, while the third section summarizes the empirical evidence concerning the actual economic factors associated with using one such set of instruments, namely, derivative securities. Since derivatives exist solely for purposes of managing risk, studies of this type are relatively "clean" tests of the various rationales put forth for why corporations manage risk.

What Constitutes Risk-Management Activities?

The term *risk management*, at its most general level, simply denotes a situation in which an individual or firm makes decisions to alter the risk/return profile of future cash flows. The terminology typically used is that if managers are attempting to reduce risk through their actions, they are said to be hedging; if managers are trying to increase the firm's risk exposure because they believe that such a strategy will yield abnormal profits, they are said to be speculating.

To put the decision about engaging in risk management in some perspective, this section of the article outlines the types of activities most commonly thought of as risk management. For concreteness, again consider the

problem faced by the firm engaged in copper extraction. Because commodities markets are competitive in the sense that one firm's activities will typically have a very small impact on market prices, the underlying risk—copper price fluctuations—facing this firm can be generally seen as given.

How might the firm alter this risk?¹ One approach would involve diversifying its product line. That is, management could divert some of the firm's resources to the extraction of some other commodity—silver, perhaps—and to the extent that copper and silver prices do not move in perfect unison, doing so would lower the firm's net risk.

Secondly, the firm could try to manage its expenditures so that they would tend to increase when revenues are high and fall when copper prices (and sales dollars) are abnormally low. For example, the firm could shift extraction methods away from those relying heavily on capital assets (with their fixed costs) to those methods depending more on labor or other inputs that would be viewed as variable costs. Under this scenario, when copper prices increase the firm can hire more workers and when prices fall unusually low they can lay off some of the workforce. In this situation, fluctuations in investors' net income are less than if the firm uses a more automated technology, which requires payments on the machines whether copper prices turn out to be high or low. Thus, changes in operating leverage could be viewed as a form of risk management.

A third possibility would be for the firm to reduce its leverage—its percentage of financial capital raised through the sale of debt securities. In this case, fluctuations on the firm's return on invested capital result in smaller fluctuations in the return-to-equity capital. In short, the firm's choice of debt versus equity financing can be viewed as a form of risk management.

Another way that management can alter the distribution of cash flows involves the use of derivative securities, so named because their price depends on the price of some underlying instrument (such as stocks or interest rates). While modern derivatives contracts can be, in many ways, exceedingly complex, almost all these types of instruments essentially consist of some combination of options and forward contracts. Moreover, the claims are linked, in the sense that one can, for example, replicate the cash flows from a forward contract by simultaneously buying certain options and selling others.² Options are contracts that, for an up-front fee, give the purchaser the opportunity, over some period of time, to buy or sell something (for example, a share of

1. The examples discussed here focus on reducing risk. Of course, if managers wanted to increase the risk faced by a firm's shareholders, they could reverse these actions.
2. Cox and Rubinstein provide an excellent discussion of options and a detailed analysis of how the prices of these securities are determined as a function of the prices of underlying securities. They also provide a concise treatment of the cash flow replication idea discussed in the text (1985, 59–60).

If Derivatives Are Used to Hedge Risk, Why Do Some Firms Lose So Much Money?

Is there a significant downside to the use of derivatives in risk management? A casual glance at press reports over the past few years seems to indicate that derivatives are excessively risky and, in fact, dangerous to the financial health of corporations and other derivatives traders. Among the most widely publicized derivatives debacles are the losses of Proctor and Gamble (\$137 million) and Gibson Greetings (\$20 million) as a result of transactions in interest rate swaps.¹ Orange County, California, and the Orange County Investment Pool (OCIP) declared bankruptcy in 1994 following a \$1.7 billion drop in the market value of the pool due to transactions in leveraged intermediate-term fixed-income securities. And perhaps the most spectacular example is the 1995 collapse of Barings Bank, a highly respected British merchant bank, due to losses of \$1.3 billion on options and futures transactions in the Japanese stock and bond markets. Barings financed the U.S. Louisiana Purchase from France in the early nineteenth century and was banker to the royal family. The collapse of such a historically significant financial institution was all the more surprising given that it reported record profits for 1994.

These examples reveal the truism that derivatives, like other risky securities, can expose traders to the risk of substantial losses. However, the proper conclusion to be drawn from these cases is not that derivatives should be avoided but rather that participants should have the expertise and oversight systems that would be common for other investment and trading activities. In each of the cases cited above, the losses can be traced to inappropriate behavior on the part of one or more parties involved in the derivatives transactions. Some authors (see, for example, Smith 1997) argue that, at least in the case of Proctor and Gamble, lack of expertise by managers in assessing market risk seems to have played a role. However, both Proctor and Gamble and Gibson Greetings collected substantial damages from the counterparty in their interest rate swap contracts (Bankers Trust Company). The Securities and Exchange Commission

(SEC) concluded that Bankers Trust had defrauded Gibson Greetings, and the Proctor and Gamble case was settled out of court. The SEC later cited Gibson Greetings for failing to disclose properly its derivatives-related profits and losses. The company was also sanctioned for having inadequate internal controls to ensure that its derivatives transactions were accounted for in accordance with generally accepted accounting principles. In the case of Orange County, the investment manager for the investment pool entered into inappropriate speculative transactions.² And, in the Barings Bank case, inadequate supervision and controls allowed a rogue trader to run up millions of dollars in losses while concealing his positions from superiors.

The message from recent derivatives debacles thus seems clear: derivatives positions need to be carefully designed and managed and controls should be in place to ensure that positions taken are fully understood by and consistent with the objectives of the organization. The need for expert management and control is the source of most of the fixed costs of entering derivatives markets, discussed in the text. That is, organizations planning to enter derivatives markets must put in place a team of investment managers who can structure an effective derivatives program, and monitoring and control systems must be created that prevent fraud and mismanagement. Of course, the same cautionary message applies to other activities undertaken by firms that involve substantial sums, such as investments in new projects, capital structure decisions, and mergers and acquisitions. In this regard, derivatives are not really different from other transactions conducted by firms. They are simply newer, and therefore many firms have acquired less experience in their management or have failed to implement appropriate accounting and control systems. The message from the derivatives debacles is that firms should acquire the appropriate human expertise in the areas of both trading and control before entering the market.

1. For more on the Proctor and Gamble and Gibson Greeting cases see Smith (1997) and Overdahl and Schachter (1995), respectively.
2. There is also evidence that mismanagement after the decline in the market value of OCIP exacerbated Orange County's losses. Miller and Ross (1997) suggest that OCIP was neither insolvent nor illiquid in December 1994. They argue that OCIP should not have been liquidated and that the suspect financial instruments should have been held to maturity. This strategy would have enabled the county to avoid some of its losses and realize substantial net cash inflows during 1995.

stock), with the sale price fixed today. A forward contract is an agreement between two parties to engage in a trade at some point in the future, with the terms of trade (for example, the sale price) set today.³

Although derivatives problems have made the news in recent times (see Box 1), they are no more or less risk-management tools than the other available alternatives discussed above. Indeed, Peterson and Thiagarajan (1997), among others, have argued that one cannot meaningfully assess whether one firm is more or less engaged in risk management without knowledge of all important operating, financial, and accounting decisions. They find evidence in their case studies to suggest that some managers use accounting practices that tend to smooth earnings, along with decisions concerning operating and financial leverage, as substitutes for trading in derivative securities.

Recent Advances in the Theory of Risk Management

The puzzle the introduction outlined involves the question of why managers of widely held corporations, acting in the interest of their stockholders, should manage risk that their shareholders could presumably manage themselves. Given the nature of this statement, the answer must, roughly speaking, lie in one of two areas: either there are some risks that shareholders cannot manage for themselves as inexpensively or managers are acting in their own interests, rather than those of the stockholders of the firm. There are proponents for each of these points of view, as discussed below.

Managerial Motives for Risk Management.

Managers themselves may engage in risk-management activities because they have disproportionately large investments (their skills or human capital) in the firm they manage and, unlike shareholders, cannot easily diversify this personal risk. Being averse to risk, they are concerned about negative shocks to profits, particularly those that might bring the firm to the brink of bankruptcy. Bankruptcy or, more generally, times of financial distress are often associated with the replacement of current management. Thus, these undiversified managers are in much the same position as the farmers discussed in the introduction, and they might well be willing to engage in risk-management practices that will generate positive cash flows should the firm fall on bad times, at the cost of reducing cash flows in the good times.

Consider again the firm primarily engaged in the extraction of copper. According to traditional finance theory (for example, Sharpe 1964), shareholders care only about the systematic risk of their holdings, that is, only that risk that cannot be eliminated by having small investments in many different types of firms. Given that hedging copper prices may be costly in terms of lower average future income (after all, insurance is not typically free), stockholders would not be inclined to support actions by management that reduce risk that is viewed as diversifiable; namely, they would not share management's consternation about the financial difficulties or even the failure of one particular corporation. Smith and Stulz (1985) provide formal discussions of this issue. It is also intuitively clear why the manager would favor such activities—job protection. To the extent that managers have an excess investment in human capital in the firm and it is costly to transfer these skills should they need to seek other work, they have an economic incentive to have the firm continue as a going concern.

Shareholders may tolerate such potentially value-reducing activities if their managers are viewed as having other unique value-enhancing skills, bankruptcy is not costless, managers demand higher compensation in return for the risk they face, or confronting management is costly in terms of time and effort. Individual shareholders with, by design, relatively small stakes involved in a given firm may simply attempt to “free ride” and hope that some other group of stockholders will take up the cause of replacing management. But, of course, the other shareholders may be thinking the same thing, and often no action is taken.⁴

Rationales for Risk Management that Enhances Value. Numerous reasons have been put forth to argue that it really may be in shareholders' interests for certain types of enterprises to manage risk. The following is an incomplete sampling of the specific rationales, but the two general points are that there may be some risks

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3. In some cases the terms of trade allow one or another of the parties some latitude concerning, for example, what exactly will be exchanged.

4. Of course, if things get bad enough in terms of too many value-reducing activities, outsiders with large amounts of capital may try to take over the firm, for example, by offering to buy up the shares of the firm's stockholders. Grossman and Hart (1981) note that there is a free rider problem here as well (“I will not sell my shares now. Rather, I will hold my shares until the new management improves firm performance and then sell at a profit.”).

that are not tradable and that there exist situations in which there are informational differences among owners and managers. The existence of nontradable risk limits the degree of homemade diversification that shareholders can achieve; managing these risks is *not* something the shareholders can do for themselves. Informational differences can result in undervaluation of some firms, which is clearly not in the interests of the corporation's shareholders.

What are some of the noninformational frictions that might lead to a demand for risk management? First, whatever the underlying, value-related motive for risk management, the existence of fixed costs associated with using derivative instruments may make it more likely that only larger firms, with the resources to pay these large up-front costs, will manage risk through derivatives trading.⁵ Second, if bankruptcy or financial distress imposes costs on the firm, shareholders may be willing to hedge profits in an effort to forgo these costs (see for example, Smith and Stulz 1985). These costs include both the direct legal and regulatory costs of bankruptcy as well as the indirect costs resulting from deteriorating relationships with key employees, suppliers, or customers. The indirect costs can have an adverse impact on the firm's cash flows even in the event bankruptcy is not the ultimate outcome. This dynamic suggests that firms with more fixed obligations—for example, debt obligations—will be willing to hedge more, other things held constant (see Brennan and Schwartz 1988).

It is also the case that many tax write-offs, such as depreciation, are not independently tradable, although they may be carried forward. However, given the time value of money, it may make sense for the firm to hedge against situations (for example, extremely low copper prices) in which it cannot exploit its tax deductions because income is low or negative.⁶ Furthermore, the very fact that, other things held constant, corporate taxes are increasing at a nondecreasing rate in before-tax corporate profits provides another potential motivation for hedging. Smith and Stulz (1985) show that the firm can minimize its expected tax bill by keeping the volatility of income low (staying in the middle of the tax schedule). For example, given today's corporate tax code (and ignoring the alternative minimum tax), a firm with a fifty-fifty chance of having taxable income of \$70,000 or \$0 will have an expected tax bill of \$6,250 while one with a sure taxable income of \$35,000 will pay a tax of \$5,250, an expected tax savings of \$1,000.⁷ While this factor might appear to be unimportant for most corporations (the marginal tax rate flattens out at taxable income of around \$18,000,000), Graham and Smith (1996) provide evidence that, because of factors such as tax-loss carry provisions, tax effects may be more pronounced than would appear at first glance, especially

for firms whose before-tax incomes tend to fluctuate between large positive and negative values.

In both of the above cases, shareholders might rationally support managers in their attempt to moderate income fluctuations by using risk-management tools, such as locking in at least some component of future income by being short forwards or futures contracts in copper or reducing fixed costs so that there is less fluctuation in pretax income. Using the same reasoning as above, firms that finance themselves with generally illiquid, if not outright nontradable, debt securities (for example, privately placed bonds) or hold particularly illiquid assets (such as collateralized mortgage obligations with unconventional repayment schedules) might find hedging their fluctuations in income or value worthwhile.

One might be tempted to ask why, if a firm is fundamentally sound but in temporary distress, managers do not simply keep these assets and liabilities on the books and raise additional outside funds. Froot, Scharfstein, and Stein (1993) argue that in a world of differential information between managers and potential outside investors, firms may encounter situations in which funds are needed but outside capital either is not available or is too costly. In such a case, managers may increase the current value of their firms by entering into contracts (the example they use is forward contracts) that generate positive payoffs when the firms' cash flows from operations turn out to be low.

The essence of the argument by Froot, Scharfstein, and Stein and others is that if there is asymmetric information between those who manage the firm and outside investors, better-than-average firms will have to sell securities to outsiders at a discount (less than the full-information value of the claims on the firm). By engaging in risk-management activities, these firms can avoid having to go to capital markets to acquire funds during a period of temporarily poor performance. This follows from the fact that their risk-management contracts are designed to pay off when the firm is otherwise doing poorly.⁸ Notice, however, that if the firm keeps relatively large cash balances, there is less need to worry about times when the company is "short cash," and one would therefore expect larger levels of liquidity to be associated with less risk-management activity.

What Kinds of Firms Manage Risk and Why Do They Do It?

As mentioned earlier, managers can manage risk using a wide variety of tools. However, unlike some traditional methods, like changing operating or financial leverage, derivative securities exist only for purposes of risk management. Tests with these data therefore provide somewhat "cleaner" results concerning why firms may choose to engage in risk management.⁹ It is also the case that the volume of activity in

derivatives contracts has grown dramatically over the past two decades. Box 2 provides some details on the overall growth of derivatives transactions and some summary data concerning what firms are actually engaging in these transactions. With these points in mind, this section first provides a review of results from some recent empirical studies that test the primary theoretical hypotheses relating to why firms actually do (or do not) use derivative securities for risk management.

Why Firms Manage Risk. A major study investigating the question of motive is by Tufano (1996), who looks at managerial compensation schemes and hedge ratios in the gold mining industry in an attempt to contrast managerial motives with those associated with value-maximizing theories of risk management. Hedge ratios are usually defined as the percentage of expected future production that the firm has effectively sold short through risk-management activities: in this case the firm is using derivative securities like short futures positions (that is, agreeing to sell gold forward with the price fixed today) or the purchase of put options (purchasing the right to sell gold in the future at a price fixed today) on gold.

Tufano argues that risk-averse managers whose compensation comes in large part through acquiring shares in the firm will want to hedge their risk. As discussed at length earlier, such a policy would not necessarily benefit diversified shareholders, so, to the extent that there are costs associated with hedging, the manager is better off and the shareholders worse (or at least no better) off than if the firm abstained from risk management altogether. He contrasts these managers with those who earn a relatively large portion of their compensation through the granting

of stock options (call option contracts on the stock of the firm). In this situation managers can walk away from the options should the firm do poorly, but if the firm does well their positions will provide high payoffs. In a “heads I win, tails you lose” environment like this, even risk-averse managers would be more willing to tolerate gold price, and therefore earnings, fluctuations. Thus, they would find it less advantageous to hedge.

Tufano finds support for this hypothesis in the data. In particular, his evidence suggests that managers with high option holdings manage risk less than those with high stock holdings. Such results are consistent with the managerial risk-aversion hypothesis of risk management.¹⁰ Tufano claims to find almost

no evidence in favor of the various rationales that would make risk management a value-maximizing decision and thus in the interests of shareholders. He does find, however, that firms with large cash balances tend to manage risk less. This finding is consistent with the hypothesis that firms with less risk of having to seek outside financing, other things being the same, will hedge less.¹¹

Contrary to Tufano’s results, some authors have provided evidence that they believe is consistent with value-maximization theories of risk management. The

The evidence from studies investigating the decision by financial companies to use derivatives as a way to avoid financial distress costs is mixed.

5. However, there is an offsetting notion that suggests that larger firms have more built-in diversification (more independent product lines) and therefore should have less need for the services provided by risk management. This hypothesis would be the alternative associated with the fixed-cost idea discussed in the text.
6. MacMinn (1987) provides a rigorous analysis of this issue.
7. These calculations follow from the fact that the first \$50,000 in taxable income is taxed at the rate of 15 percent, while the income between \$50,000 and \$70,000 is taxed at a rate of 25 percent.
8. Froot, Scharfstein, and Stein argue that another condition needed for this type of hedging to be valuable is that the firm’s production function display decreasing returns to scale—that is, the firm’s output is increasing in its inputs but at a decreasing rate. Alternative assumptions can substitute for this condition. For example, any type of asset that is indivisible (for example, it is difficult to sell one office in an office building), when combined with the scenario of asymmetric information, will do the job in the sense that a firm might rationally want to hedge against the possibility that they might end up having to sell all this valuable asset at an unfavorable price when they only need a small amount of cash to pay creditors or invest in some new growth opportunity.
9. However, even these are not perfectly unambiguous tests since it is difficult to control for all of the other risk-altering strategies undertaken by the managers of these firms.
10. As a substitute for these actions, managers could hedge their risk on their own personal accounts. However, effectively hedging the risk of adverse movements in the stock of the firm may require, for example, managers to short sell the stock of the firm for which they work. This, or economically similar actions such as buying puts on the firm’s stock, may be contractually prohibited or, at a minimum, send a bad signal to outside shareholders. Therefore, managers may choose to avoid hedging on personal accounts. Moreover, even if trading in, say, gold futures may not be prohibited, it is still the case that transacting at the firm level spreads the transactions costs across all shareholders.
11. Mian (1996), using a larger set of industrial firms, finds a similar negative relationship between the level of liquid balances and the degree of risk-management activities on the part of corporations.

The Growth of Derivatives

The worldwide derivatives market has grown dramatically in the last decade to become a significant component of the world's financial markets. A 1996 survey, conducted by twenty-six central banks, estimated the worldwide volume of derivative contracts, measured as the total notional value of derivative contracts outstanding,¹ to be approximately \$55.7 trillion as of the end of March 1995 (Bank for International Settlements 1995). The market value of the potential cash flows from these contracts was estimated to be approximately \$2.2 trillion.

To get a better idea of how fast the market for derivatives has grown over the last decade, consider the chart, which displays the total worldwide notional value of all privately negotiated interest rate swap, interest rate option (including caps, floors, collars, and swaptions), and currency swap contracts outstanding over the period from 1987 to 1996. Based on the data in the chart, the average yearly growth rate of the notional value of these contracts is more than 40 percent annually. Likewise, in the United

States, the growth rate of derivative transactions by banks, insurers, and securities firms also has been impressive. Although not quite as high as the worldwide rate, the average annual growth rate of the notional value of derivative contracts outstanding over the 1990–95 period for the fifteen largest over-the-counter derivatives dealers in the United States was 27 percent, as reported by the U.S. General Accounting Office (1997).

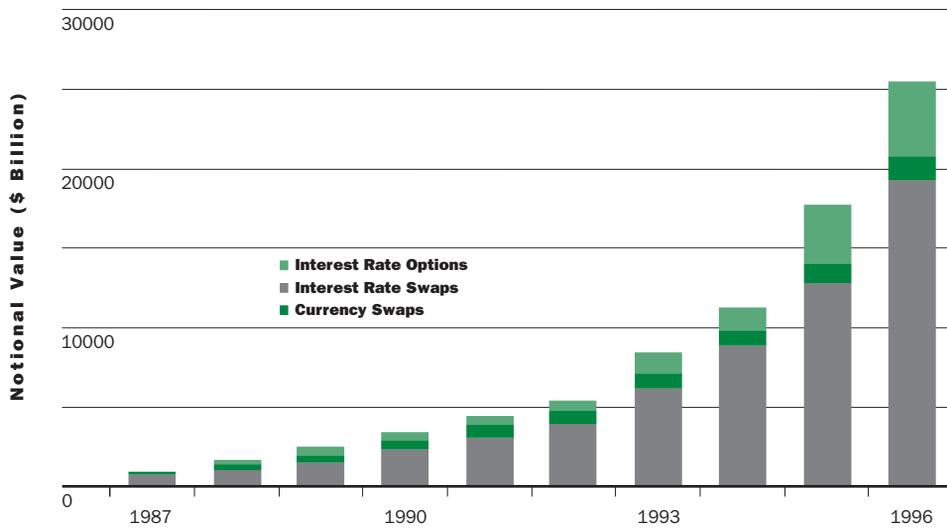
One of the reasons for such impressive growth rates in the volume of derivative transactions has been the ever-increasing demand for financial risk-management products by corporations. Although corporations from most industries report only very sketchy details of their risk-management strategies, there is a growing consensus that more and more firms are managing their exposure to various financial risks using derivative contracts. The top panel in the table reports the percentage of nonfinancial firms using derivatives contracts according to several recent empirical studies. For example, Dolde (1993) reports that 85 percent of

TABLE A
Users of Derivative Instruments

Author/Study	Firms Included/Surveyed	Percentage of Firms Reporting Derivatives Use
Nonfinancials		
1992 Mian	All nonfinancial firms with data on both LEXIS/NEXIS and Compustat. Number of firms: 3,022	25.5
1992 Dolde Survey	Survey of Fortune 500 companies Number of respondents: 244	85.0
1994 Wharton/Chase Survey	Survey of 2,000 nonfinancials not including Fortune 500 companies. Number of respondents: 530	35.0
1995 Wharton/Chase Survey	Survey of 2,500 nonfinancials including Fortune 500 companies. Number of respondents: 350	41.0
Banks		
Sinkey and Carter	All U.S. commercial banks, 1991 Number of banks: 11,308	5.4
	U.S. commercial banks with assets > \$1 Billion, 1991 Number of banks: 353	75.9
Insurance Companies		
Cummins, Phillips, and Smith	All U.S. life/health insurance companies, 1994 Number of life/health insurers: 1,202	9.8
	All U.S. life/health insurance companies with assets > \$1 Billion, 1994. Number of life/health insurers: 193	42.0
	All U.S. property/casualty insurance companies, 1994 Number of property/casualty insurers: 1,664	6.7
	All U.S. property/casualty insurance companies with assets > \$1 Billion, 1994. Number of property/casualty insurers: 112	30.4

Sources: Bodnar, Hayt, and Marston (1996); Cummins, Phillips, and Smith (1997a); Dolde (1993); Mian (1996); and Sinkey and Carter (1994).

CHART A
Total Notional Value of Interest Rate Options, Interest Rate Swaps,
and Currency Swaps Outstanding, 1987-96



Source: International Swaps and Derivatives Association, Inc.

the Fortune 500 companies responding to his survey use derivatives to manage their risk exposure.

There are a number of rationales for the increased demand for financial derivatives at the corporate level. First, it could be argued that it is less costly to write these contracts than it is to change the firm's operating or financial leverage. If this argument is true, the same features would make these instruments useful for managers who are prepared to take on additional risk with the hope of generating additional profits. For example, an insurance company may try to achieve a higher yield on its asset portfolio by investing in long-term, low-grade bonds. By purchasing such a security the insurer has an exposure to both movements in interest rates and movements in the credit quality of the borrowers. This net exposure can, however,

be altered by purchasing interest rate derivatives, leaving the insurer with credit risk but not interest rate risk.

A second rationale for increased volume could involve the seminal work of Black, Scholes, and Merton on the pricing of options. These studies were published in the early seventies, about the same time that exchange-traded options were introduced in Chicago. Prior to this work, there did not exist a rigorous understanding of how to accurately price or use derivative securities. When combined with the fact that volatility in asset and commodity prices increased dramatically in the 1970s, '80s, and '90s (when compared with the earlier postwar years), one has all the ingredients needed to make these the popular financial instruments that they are today.

1. The notional value of a derivative contract is analogous to the par, or face, value of an underlying contract as it is used to calculate the cash flows that change hands. It is not, however, necessarily the amount that is exchanged.

Among the explanations that have been advanced to justify risk management as a value-maximizing decision is the need to mitigate the costs of financial distress, minimize taxes, and avoid costly external finance.

results of various studies investigating the primary value-maximization rationales are presented below.

Mitigation of Financial Distress Costs. Numerous authors have investigated whether firms more likely to incur financial distress costs engage in risk management in an effort to reduce the probability of incurring these costs. The evidence is not persuasive for nonfinancial companies. An early study by Wall and Pringle (1989) reports that firms

with lower credit ratings are more likely than higher-rated firms to use derivative contracts known as swaps.

Other authors have considered the more general question of whether the firm's capital structure is related to the likelihood that the firm will engage in risk management via derivatives contracting. For example, neither Mian (1996) nor Nance, Smith, and Smithson

(1993) report any evidence to suggest that derivatives trading is related to the capital structure of the firm. A more recent study by Geczy, Minton, and Schrand (1997) investigates the relationship between the capital structure of the firm and the decision to manage foreign currency exposures using derivatives. This study differs from its predecessors as the authors recognize the simultaneous nature by which managers make capital structure and risk-management decisions for their firms. Even after incorporating the joint decision-making process of managers in their estimation procedure, the authors conclude that there does not appear to be a relationship between the decision to use derivatives and capital structure choice.

One exception to these studies of nonfinancial firms is Dolde (1996). He finds that after controlling for the firm's underlying exposure to various financial risks, there is a significant complementary relationship between risk management and the leverage of the firm. That is, highly leveraged firms are more likely to use derivatives to avoid the expected costs of financial distress.

The evidence from studies investigating the decision by financial companies to use derivatives as a way to avoid financial distress costs is mixed. Sinkey and Carter (1994) provide only weak evidence suggesting that the capital structure and risk-management decisions of U.S. commercial banks are related. Likewise, Gunther and Siems (1995) report no significant relationship between the decision to use derivatives and the capital structure of the firm. In addition, focusing on only those banks that

are active in derivatives markets, Gunther and Siems note that banks reporting a higher volume of derivatives activity also have higher capital ratios. This result is in fact inconsistent with the financial distress hypothesis, at least as it is usually defined in the literature. Cummins, Phillips, and Smith (1997b) find a similar result regarding the volume of derivatives activities for U.S. life/health insurers although they also report a significant and negative relationship between the capitalization level of both life/health and property/casualty insurers and the decision to use derivative securities, consistent with the financial distress hypothesis.

Use of Risk Management to Lower Expected Tax Burdens. Evidence on using risk management via derivatives contracting as a way to lower the firm's expected tax burdens is more convincing. Nance, Smith, and Smithson (1993) conducted one of the earliest empirical studies investigating whether taxes were a significant determinant of a firm's decision to transact in derivative markets. From their sample of nonfinancial companies, they conclude that firms with higher investment tax credits are more likely to engage in derivative transactions. Cummins, Phillips, and Smith (1997b) also find evidence consistent with the tax hypothesis. For the life insurance industry, they report a significant and positive relationship between the decision to participate in derivative markets and proxies for insurers having tax-loss carry forwards. They also find a positive relationship between derivatives usage and proxies for having net income in the progressive region of the tax schedule. Finally, a paper by Graham and Smith (1996) develops a simulation model to empirically determine the convexity of the tax schedule faced by a large sample of COMPUSTAT firms. They conclude that approximately 50 percent of the firms in their sample face convex tax schedules and therefore have an incentive to reduce the volatility of their income stream. They use the estimated simulation model and report that, for the subsample of companies that they estimate are facing convex tax functions, a 5 percent reduction in the volatility of the firm's taxable income stream leads to a 4.8 percent reduction in their expected tax liability.

Avoiding Costly External Financing. A number of authors have found strong evidence documenting that firms use derivatives to reduce the variability of their income stream and thus help ensure that adequate internal funds are available to take advantage of attractive projects. Gay and Nam (1997), for example, investigate nonfinancial companies' use of derivatives and provide test results consistent with the hypothesis that firms with both low levels of liquidity and high growth opportunities, as measured by the ratio of the market value to the replacement value of the firm, tend to hedge more. This finding is consistent with managers' trying to mitigate the need to seek costly external funds or lose their opportunity to invest in valuable projects.¹²

Other authors have found similar results. Studies of nonfinancial firms by Geczy, Minton, and Schrand (1997) and Nance, Smith, and Smithson (1993) both found that companies with less liquidity or companies that use less preferred stock, as opposed to using straight debt, are more likely to use derivatives to avoid circumstances under which a shock to the internal capital resources of the firm might force the company to forgo profitable projects.

A recent study by Ahmed, Beatty, and Takeda (1997) investigating 152 U.S. commercial banks also finds support for the costly external finance hypothesis. The authors report that banks with less liquidity are more likely to use derivatives to manage their exposure to various price risks. Finally, Cummins, Phillips, and Smith (1997a, 1997b) report that insurers with large proportions of their assets invested in illiquid markets, such as real estate for the property/casualty insurers or privately placed bond and collateralized mortgage obligations for life insurers, are more likely to hedge the volatility of their income using derivatives.

Conclusion

This article has provided a review of the rationales that are often put forth concerning why corporations might engage in the practice of actively managing their exposure to a wide variety of risks—so-called risk-management practices. One school of thought is that managers attempt to reduce the volatility of cash flows because managers are personally averse to risk and their compensation is often tied to the firm's performance. Others have argued that managers attempt to overtly alter the risk profiles of their firms in an effort to increase the value of the firm's shares. However, basic finance theory says that, absent

frictions in capital markets, shareholders can manage their own risk exposure. Thus, the value-maximization rationale for the use of derivatives requires some specific notion of important market imperfections because the use of insurance of this type is typically not free. Among the explanations that have been advanced to justify risk management as a value-maximizing decision is the need to mitigate the costs of financial distress, minimize taxes, and avoid costly external finance.

The discussion of the empirical literature on risk management focuses on one particular set of tools, namely, derivative securities. These contracts exist only for purposes of risk management and, as such, provide a natural set of data from which to glean managers' motives for changing the distribution of future cash flows. Tufano (1996) has provided some evidence from the gold mining industry that is consistent with the idea that managers use derivatives to reduce the volatility of their own income stream. Thus there is some evidence consistent with the managerial demand for risk management. On the other side of this question, the empirical evidence on the relationship between derivatives transactions and firm value has so far been mixed. However, there is a growing body of literature that suggests that at least a portion of total derivatives contracting is related to activities known to increase firms' value—for example, avoiding costly external finance and lowering expected tax bills. Further research on this question is important because it gets to the heart of whether or not derivatives in particular, and risk-management techniques in general, are being used to enhance value in underlying securities markets or to provide benefits to parties other than the shareholders of the firm.

12. The market-to-replacement value (or Tobin's Q) is a measure of growth opportunities used by a number of researchers. The logic is that if investors are willing to pay more than what it would cost to start the firm over, then they must believe that the firm's future prospects are valuable in an economic sense.

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