

CHAPTER 19

***Five Reasons Why Companies  
Should Manage Risk\****

Clifford W. Smith, Jr., Charles W. Smithson and D. Sykes Wilford

The World Has Become a Riskier Place  
By Managing Risk a Company Can Reduce Expected Taxes  
Hedging Can Reduce Potential Costs of Financial Distress  
Hedging Can Increase Debt Capacity  
Managing Risk Can Reduce a Firm's Borrowing Costs

\*Reprinted by permission of Intermarket. Originally entitled "Why Hedge?," July 1989, pp. 12-16.

The financial environment in which the modern corporation operates has become dramatically more volatile in the last two decades. With this volatility comes greater financial risk. Thus, corporations today are exposed to greater risk in interest rates, currency exchange rates, and commodity prices. Ultimately, this risk can affect the value of a firm itself.

The value of managing financial price risk is illustrated in Figure 19.1. Obviously, volatility—risk to the firm—can be reduced by using these products.

It would seem that every firm exposed to increased risk should hedge. Of course, matters are far more complicated than they first appear. Even with the recent increase in risk, not all firms use risk management products to reduce risk by hedging. In what follows we want to focus on the primary question: Why should a company hedge its financial price risk? Or, to rephrase the question, which firms have the best reasons for hedging?

#### THE WORLD HAS BECOME A RISKIER PLACE

This is such an obvious answer that it makes the question seem frivolous. Since a great many companies are subject to financial price risk, and

since individuals are risk averse, it would seem that shareholders would want management to reduce financial price risk.

But this doesn't necessarily follow. For firms, as opposed to individuals, portfolio theory tells us that not managing risk may be the best policy. For individuals such risks are diversifiable, and can be eliminated if the investor holds a well-diversified portfolio. Risk aversion per se can be regarded as a rationale for hedging only if the owner of a firm doesn't hold a diversified portfolio. Hence, risk aversion is a compelling reason for hedging only if the firm is a proprietorship or a closely held corporation.

The basic insight inherent in portfolio theory is simple. If assets are combined in a portfolio the riskiness of the resulting portfolio is less than the linear combination of risks for the assets (unless the assets are perfectly and positively correlated).

For the individual investor, managing exposure to financial risks at the level of the firm may not be wise, because the individual can more efficiently manage such risks individually by properly diversifying his or her investment portfolio.

Managing financial price risk, if it is to be adopted, must make sense because it adds to a company's value, not because it is inherently wise to reduce risk to the firm (again, unless the firm is held by undiversified owners). But we can draw an even more specific conclusion.

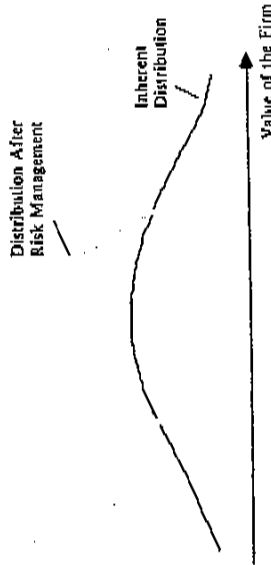
As the above formula makes clear, if a company's expected present value is to increase, it must be caused either by an increase in expected net cash flows or by a decrease in the discount rate.

Since we're talking about risk, it seems that we might see an effect on value through a decrease in the discount rate. But portfolio theory says that such an effect won't occur. Altering diversifiable risks—and financial price risks are generally diversifiable—can have no effect on a company's discount rate.

Thus, the gains from hedging must show up in expected net cash flows. But how can a financial policy increase the real cash flows of an organization?

We can understand how this can occur by recalling a basic canon of modern finance theory. The relation between a firm's real cash flows and its financial policies has been demonstrated by Franco Modigliani and Merton Miller in what has become known as the M&M proposition. In its original form, this proposition states: If there are no taxes, if there are no transaction costs, and if the investment policy of a firm is fixed, then the financial policies of the firm are irrelevant.

Figure 19-1.



since off-balancesheet instruments are readily available, it would seem to follow that firms with exposures to interest rates, foreign exchange rates or commodity prices clearly would want to use forwards, futures, swaps or options to manage risks.

As straightforward as this logic may appear, the conclusion doesn't follow. What does follow is that firms could reduce their risk by using these instruments, not that they should do so.

To understand why and when a company should manage financial price risk, let's begin by assuming its objective to be the maximization of expected present value. We'll express expected present value (following most corporate finance textbooks) as follows:

$$E(V) = \sum_{t=0}^T \frac{E(NCF_{t,t})}{(1+r)^t}$$

(The discount rate for a firm is the rate at which the firm's present value is derived by discounting the value of future cash flows.)

Given this assumption, a company should manage its financial price risk if that risk management strategy increases expected present value. Let's examine why.

It's natural to think about corporations as if they were individuals. Individuals should want to manage, or reduce, risk because they are risk averse. But companies aren't individuals. They might be described as legal fictions, as creations of individuals who hold claims on them. Since shareholders, the ultimate owners of a corporation, are individuals, and

Risk management is one of the firm's financial policies. So one way to understand Modigliani and Miller is that, in a world with no taxes, no transaction costs, and with fixed investment policies, investors can create their own risk management by holding diversified portfolios. This is precisely the conclusion we arrived at earlier.

But we can also stand the M&M proposition on its head: If financial policies—one of which is risk management policy—affect value, they must do so because of their impact on transaction costs, taxes or investment decisions.

We can use the M&M proposition to determine areas where we expect to see the effect of risk management on net cash flows. It tells us specific reasons why a firm should hedge financial price exposure. It also tells us which firms we can expect to hedge.

**BY MANAGING RISK A COMPANY CAN REDUCE EXPECTED TAXES**

To see how a risk management strategy can reduce expected taxes, consider a naive example. Say a firm has an equal probability of a pretax income of either -400 or +600. (See Figure 19-2.) This gives it an expected pretax income of 100:

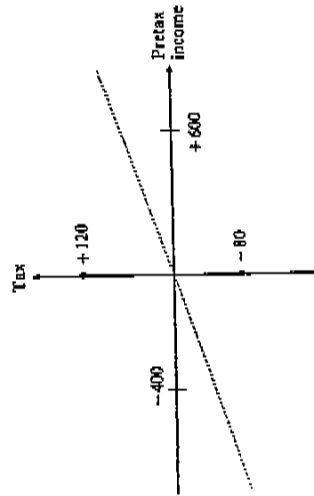


Figure 19-2.

$$E(PTI) = 1/2(-400) + 1/2(600)$$

We are concentrating on the tax effect, so we assume there are no transaction costs and that the investment decision is fixed. For simplicity we'll also assume a zero interest rate.

Suppose that the tax rate on pretax income is 20% and that the government will refund to the firm 20% of its losses. (In a multiperiod world, this is equivalent to a 100% tax-loss carryforward.) The resulting tax schedule is illustrated in Figure 19-3.

With this tax code, the tax on expected income,

$$\pi E(PTI) = \pi(100) = 20,$$

is the same as expected tax,

$$E(T) = 1/2[T(-400)] + 1/2[T(600)] = 1/2(-80) + 1/2(120) = 20$$

Consequently, there is no benefit to the firm from hedging.

Suppose that the tax rate on pretax income remains at 20% but that the government will refund to the firm only 10% of its losses. (In a multiperiod world this is equivalent to a 50% tax-loss carryforward.) As illustrated in Figure 19-4, the tax schedule has a kink at zero; it has become convex.

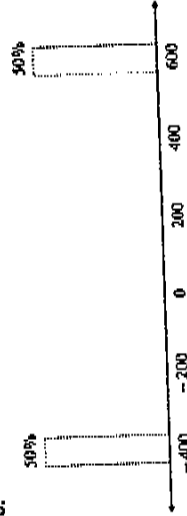
With this convex tax schedule, tax on expected income and expected tax are no longer equal. The tax on expected income remains at 20,

$$\pi E(PTI) = \pi(100) = 20.$$

But the expected tax rises to 40,

$$E(T) = 1/2[T(-400)] + 1/2[T(600)] = 1/2(-40) + 1/2(120) = 40$$

Figure 19-3.



the tax rate on profits is 20% and that none of the losses are refunded. (Again, in the multiperiod world, the tax-loss carryforward drops to 0%.) In this case, the tax benefit rises from 20 to 40.

The tax benefit of hedging is a positive function of the percentage of the distribution of pretax income in the convex region of the tax schedule. Let's keep volatility of pretax income the same, but move the distribution to the right. Instead of  $-400$ ,  $+600$ , let the distribution be  $-200$ ,  $+800$ . Now less of the distribution lies around the kink in the tax schedule, and the tax benefit of hedging declines from 20 to 10. Finally, the tax benefit of hedging is a positive function of the volatility of pretax income. If we reduce the range of pretax income to  $-200$ ,  $+400$  (instead of  $-400$ ,  $+600$ ), the tax benefit falls from 20 to 10.

This illustrates that, for a risk management strategy to produce tax benefits, the tax schedule must be convex in the range of the firm's pretax income. And, the more convex the tax schedule, the greater the tax benefits. As illustrated in Figure 19-6, tax-schedule convexity means simply that the marginal tax rate exceeds the average tax rate.

Hence the tax benefit of risk management is improved by increases in the progressivity of the tax code, tax-loss carryforwards and tax credits. And, since the alternate minimum tax makes the individual firm's tax schedule convex, the tax benefit of risk management is also increased by the introduction of an alternate minimum tax.

Figure 19-6.

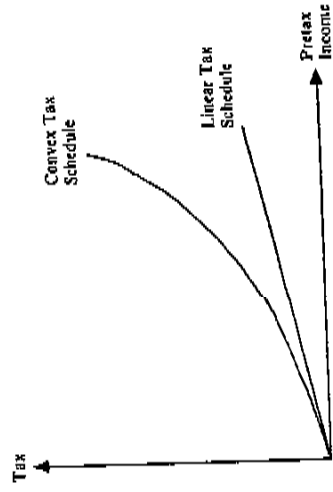
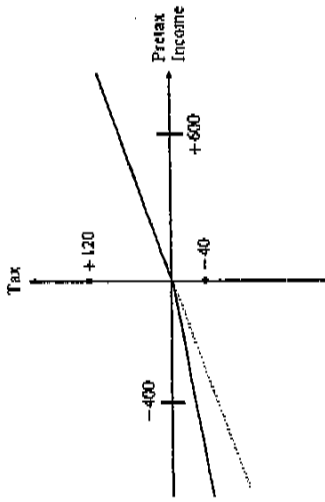


Figure 19-4.

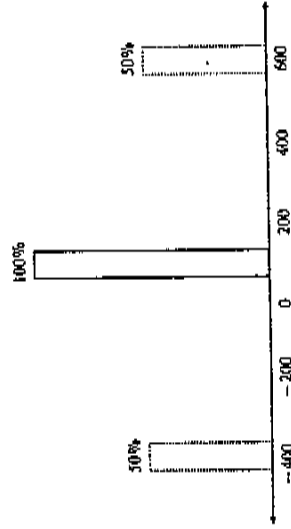


Clearly, the firm would prefer the tax on expected income to the expected tax—it would prefer to pay 20 rather than 40. As illustrated below, this is done by completely hedging the firm. Instead of a 50-50 probability of a pretax profit of 600 or a loss of 400, the firm would have a 100% probability of a pretax income of 100. (See Figure 19-5.)

With the convex tax schedule, hedging has provided a tax benefit. In the case in point, the benefit is 20.

The tax benefit of hedging is a positive function of the convexity of the tax schedule. Let's make the tax schedule more convex. Suppose that

Figure 19-5.



icant direct legal and accounting costs. These attendant costs of bankruptcy tend to have a substantial fixed component—it doesn't take many more accountants or lawyers to reorganize a large firm than it does to reorganize a small one. Hence the per-dollar costs are higher for small firms than for large ones. So small companies should have greater incentive to hedge.

Even if financial distress didn't lead to bankruptcy the firm should expect to encounter a number of indirect costs. These result from higher contracting costs with customers, employees and suppliers. Firms that provide service agreements or warranties have a higher degree of contracting with their customers. These firms would consequently face higher costs if the company had financial problems. The value consumers place on service agreements and warranties depends on the firm's financial viability. If it is less viable, consumers will place less value on service agreements and warranties.

In the same way, contracting costs are higher for those firms that produce credence goods—goods for which quality is important but for which the quality is difficult to judge prior to consumption (e.g., pharmaceuticals or air travel). Consumers of credence goods must use other characteristics to determine product quality. If the firm is in financial trouble, the consumer's concern is that product quality is being reduced.

Contracting costs of the firm with its employees are higher as the firm uses more specialized labor or as it spends more time and money training workers. And, if the firm is perceived to have financial difficulties, it would experience more turnover in employees. So the cost of financial distress rises.

Contracting costs with suppliers are higher as the firm requires more customization from its suppliers or as the firm has fewer potential suppliers. As it encounters financial distress, it is more likely to receive unfavorable credit terms, delivery schedules and service. Moreover, its suppliers may be less willing to tailor their production facilities to meet custom requirements.

**HEDGING CAN INCREASE DEBT CAPACITY**

Modigliani and Miller assumed a world in which a firm's investment policy was fixed. And, if the objective is to maximize shareholder value, the optimal fixed investment policy is simple: accept all positive net present value projects and reject all negative ones.

**HEDGING CAN REDUCE POTENTIAL COSTS OF FINANCIAL DISTRESS**

As illustrated in Figure 19-7, risk management reduces the probability of a company encountering financial distress by reducing the volatility of its value. Consequently, risk management reduces the costs the firm would face if it met with financial distress. Let's consider the positive benefits of hedging as the reduction in a company's expected costs as a result of financial distress.

The magnitude of the cost reduction depends on two obvious factors: the probability that the firm will encounter financial distress if it doesn't hedge, and the costs it will face if it does run into financial distress. The cost savings—the benefit from risk management—will vary directly with the probability of financial distress if the firm doesn't hedge, and also directly with the cost of financial distress (if encountered).

Two factors determine the probability of default. First, since default results when a firm is unable to pay its fixed claims, the larger the ratio of service on fixed claims to cash inflows, the higher the probability of default. As the coverage of fixed claims declines, the probability of default rises. Second, since default is triggered when income is too low to pay fixed claims, volatility of a firm's income is important. The more volatile the income, the more likely the prospect of default.

The cost of financial distress itself depends on a number of factors. Financial distress can lead to bankruptcy or to reorganization or liquidations. These are obviously situations where a company would face signif-

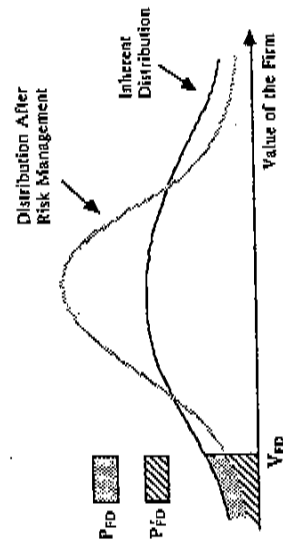


Figure 19-7.

	Period One			Period Two			Project Undertaken?
	Value of Firm	Value of Debt	Value of Equity	Value of Firm	Value of Debt	Value of Equity	
1000 { Undertake	1200	350	850	1000	350	650	Yes
200 { Do not	400	350	50	200	200	0	Yes

With less debt in the capital structure the positive net present value project will always be undertaken. The debt sells at its face value of \$350, the proceeds of which will go to the shareholders. The expected present value of the equity is \$450, so the total value of the shareholders' position is (including dividends) \$450 + \$350 = \$800, rather than the \$700 when the face value of the debt was \$500. By reducing the face value of the debt, the shareholders have gained \$100.

As an alternative to altering the debt/equity ratio, the underinvestment problem can be controlled by using risk management techniques. Suppose a company could hedge its exposure to oil prices so that regardless of what happens to oil prices, the value of the firm will remain \$600. With the firm's value hedged against oil prices, the positive net present value project will always be undertaken.

	Period One			Period Two			Project Undertaken?
	Value of Firm	Value of Debt	Value of Equity	Value of Firm	Value of Debt	Value of Equity	
600 { Undertake	800	500	300	600	500	100	Yes
600 { Do not	600	500	100	600	500	100	Yes

With the hedge against oil prices, the firm can issue debt with a face value of \$500 and still avoid the underinvestment problem. In this case the total value of the shareholders' wealth is \$800—the dividend paid from the proceeds of the debt issue (\$500) plus the value of equity (\$300).

The more debt a firm has in its capital structure, the greater the benefit from using risk management to control the underinvestment problem. Alternatively, the more risk management a firm does, the more debt it can support.

But there are cases where a firm will reject a positive net present value project. Consider a firm subject to oil price risk:

Outcome	Probability	Firm Value in Period One
Price of oil rises	0.5	1000
Price of oil falls	0.5	200

The firm has available a positive net present value project. An outlay of \$600 in period one will result in a certain income of \$800 in period two.

The firm plans to issue bonds with a face value of \$500 in period one and pass on the proceeds to the shareholders. For simplicity, assume no transaction costs, no taxes and risk-free interest rate of zero.

As shown below, if the price of oil falls, this firm will pass up the positive net present value project—that is, if the value of the firm in period one is \$200, the shareholders will not undertake the positive net present value investment project.

	Period One			Period Two			Project Undertaken?
	Value of Firm	Value of Debt	Value of Equity	Value of Firm	Value of Debt	Value of Equity	
1000 { Undertake	1200	500	700	1000	500	500	Yes
200 { Do not	400	500	-100	200	200	0	No

As noted, the debt will sell for \$350, not \$500, the proceeds of which will be distributed to the shareholders. The expected present value of the equity is \$350. The total value to the shareholders (including dividends) is \$700.

This illustrates a classic conflict between shareholders and bondholders. Financial economists call it the underinvestment problem. If the firm's value is low, the shareholders will opt not to undertake the positive net present value project because the gains accrue to the bondholders. The problem is the amount of debt in the firm's capital structure. As illustrated below, if it reduces its debt/equity ratio, the underinvestment problem disappears. Suppose that a firm had issued debt with a face value of \$350 instead of \$500:

### MANAGING RISK CAN REDUCE A FIRM'S BORROWING COSTS

The underinvestment problem is but one difficulty resulting from the conflict between bondholders and shareholders—a conflict that is a special case of what is sometimes called the agency problem. This problem refers to conflicts of interests that occur in virtually all cooperative activities among self-interested individuals. It results from different claims held by bondholders and shareholders. The bondholders hold fixed claims while shareholders hold claims that are like call options on the firm's value.

We have already seen that an increase in debt/equity ratio increases the probability of conflict between shareholders and bondholders—and that it thereby increases the value of a hedging strategy to reduce the cost of this conflict. Another determinant of the conflict (and consequently of the value of a hedging strategy) can be found in the range of investment projects available for a firm. Like any other option, the value of shareholders' equity rises as volatility in the returns of the underlying asset increases. If shareholders could switch from low-variance investment projects to high-variance ones, the shareholders would transfer wealth from the bondholders to themselves. But since bondholders realize that this opportunistic behavior could occur, they protect themselves against the shareholders' temptation to select high-variance projects by lowering the price they are willing to pay for bonds. To get the bondholders to pay more for the bonds, the shareholders must assure them that these wealth transfers won't take place. These assurances can take the form of restrictive covenants or, most importantly for our purposes, hedging.

It then follows that, in addition to the level of debt in the firm's capital structure, the value of the risk management program to a firm depends on the range of available investment projects. The wider the range of investment projects (i.e., the greater the variance in returns for an available project), the greater the potential for conflict between shareholder and bondholder. But it also increases the value of a hedging program that would reduce the conflict.