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Integrated Risk Management for the Firm: A Senior Manager's Guide

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Abstract

This paper is intended as a risk management primer for senior managers. It discusses the integrated risk management framework, emphasizing the connections between the three fundamental ways a company can implement its risk management objectives: modifying the firm's operations, adjusting its capital structure, and employing targeted financial instruments. "Integration" refers both to the combination of these three risk management techniques, and to the aggregation of all risks faced by the firm. The paper offers a functional analysis of integrated risk management using a wide set of illustrative situations to show how the risk management process influences, and is influenced by, the overall business activities and the strategy of the firm. Finally, the paper provides a risk management framework for formulating and designing a risk management system for the firm, concluding with a perspective on the future evolution of risk management.

Introduction

Managers have always attempted to measure and control the risks within their companies. The enormous growth and development in financial and electronic technologies, however, have enriched the palette of risk management techniques available to managers, offering an important new opportunity for increasing shareholder value. "Integrated risk management" is the identification and assessment of the collective risks that affect firm value, and the implementation of a firm-wide strategy to manage those risks. For some managers, "risk management" immediately evokes thoughts of "derivatives," and strategies that magnify, not reduce, risk. Derivatives, as a risk management tool, are only a small part of the integrated risk management process. Moreover, a proper risk management strategy does not involve speculation, or betting on the future price of oil, corn, currencies, or interest rates, and indeed is antithetical to such speculation. Instead, the goal of integrated risk management is to maximize value by shaping the firm's risk profile, shedding some risks, while retaining others.

Companies have three fundamental ways of implementing risk management objectives: modifying the firm's *operations*, adjusting its *capital structure*, and employing *targeted financial instruments* (including derivatives). "Integration" refers both to the combination of these three risk management techniques, and to the aggregation of *all* the risks faced by the firm. While managers have always practiced some form of risk management, implicit or explicit, in the past, risk management was rarely undertaken in a systematic and integrated fashion across the firm. Integrated risk management has only recently become a practical possibility, because of the enormous improvements in computer and other communications technologies, and because of the wide-ranging set of financial instruments and markets that have evolved over the past decade. A sophisticated and globally-tested legal and accounting infrastructure is now in place to support the use of such contractual agreements on large scale and at low cost. Equal in importance to this evolution in capital markets is the cumulative experience and success in applying modern finance theory to the practice of risk management. Today, managers can analyze and control various risks as part of a unified, or integrated, risk management policy.

Integrated risk management is by its nature “strategic,” rather than “tactical.” Tactical risk management, currently more common, has a narrower and more limited focus. It usually involves the hedging of contracts or of other explicit future commitments of the firm such as interest rate exposures on its debt issues. Consider a U.S. dollar-based firm that buys steel from a Japanese firm for delivery in three months. The U.S. firm may decide to “tactically” hedge the dollar price of its steel purchase. By using forward currency contracts, the firm locks-in the dollar cost of its steel purchase, offsetting the effect of dollar-yen exchange rate movements that may occur before delivery and payment. The treasurer’s office of the firm typically executes such tactical currency hedging, which is generally undertaken in a non-integrated fashion without consideration of other hedging or insuring activities carried out in the firm. This is so even when the risks across units are significantly correlated. In contrast, strategic currency hedging addresses the broader question of how exchange rate fluctuations affect the value of the *entire* firm. It takes into account how those fluctuations affect the firm’s competitive environment, including the pricing of its products, the quantity sold, the costs of its inputs, and the response of other firms in the same industry.

Exchange rate risk is, of course, only one potential risk a firm faces. Managers using an integrated risk management approach must depart from the standard practice of viewing each risk in isolation. Instead, managers must devise a strategy to respond to the full range of risks a firm faces, taking into account that a risk management policy designed solely to respond to exchange rate risk may have other, unintended, consequences on the firm’s other business operations. This article presents a managerial overview of integrated risk management, using a series of examples to illustrate the range of management decisions that it can influence and the benefits for the firm from its implementation.

By applying integrated risk management, managers will benefit from new insights about the interplay among different types of risk and traditional financial decision areas, connections easily missed without a comprehensive framework. Because the three ways to manage risk are functionally equivalent in their effect on risk, their use connects

seemingly-unrelated managerial decisions. For instance, because capital structure is one component of a firm's risk management strategy, effective capital structure decisions cannot be made in isolation from the firm's other risk management decisions. Consequently, a firm's capital structure choice is inextricably linked to its capital expenditure plans, along with many other operational decisions. This paper's discussion of the integrated risk management framework emphasizes the connection between the ternary mechanisms to alter the firm's risk profile, and offers guidance on their practical application.

There are those that question whether firm-wide risk management can add value to the firm. Certainly in the hypothetical Modigliani-Miller world of corporate finance, neither capital structure choices nor corporate risk management affects the value of the firm. Indeed, if there were no value added, then direct expenses and distraction of management's attention would make risk management a negative net-present-value proposition for the firm. Thus, the next section describes the various ways that risk management can enhance the value of the firm in the non-frictionless environment of the real world. With this value-proposition established, I offer a functional analysis of integrated risk management that uses a wide set of illustrative situations to show how the risk management process influences, and is influenced by, the overall business activities and strategy of the firm. Finally, I present an overall managerial framework for formulating and designing a risk management system for the firm, and conclude by providing a perspective on the evolution of risk management going forward.

II. How risk management for the firm adds value: Understanding and measuring its benefits

A cascade of basic decisions about objectives faces the manager who seeks to implement a risk management program. Is the goal of the program to reduce earnings fluctuations, or to reduce fluctuations in firm value? Should the firm fully hedge its risk exposures, or only partially hedge them? Should it hedge only the downside risk, while retaining the upside (as with an option or more traditional insurance contract)? Or should it hedge both the downside and the upside (as a forward contract would permit)? None of these

questions can be answered in the abstract, because the answers will vary from firm to firm. Still, the fundamental goal of risk management is unambiguous: As with the other facets of firm management, the goal of risk management is to maximize shareholder value. Having the capability to reduce risks does not automatically imply that the firm *should* reduce its risk. Because the benefits (and costs) of risk management vary by firm, a risk management strategy must be tailored to the individual company. For some firms, targeting a particular level of earnings fluctuations will increase the value of the firm. For other firms, the value maximizing strategy is to target a particular level of fluctuations in market value of the firm or shareholder equity.[1] To determine the optimal risk management policy, the manager must begin by understanding how uncertainty surrounding expected future earnings and how uncertainty surrounding expected future firm value affect the market value of the firm. That is, to assess whether and to what extent the firm should target its risk, the manager must first understand the channels through which risk management can potentially affect firm value. This understanding forms the critical underpinnings of any risk management strategy: without it, attempts to evaluate the costs and benefits of risk management within the context of a particular firm will prove fruitless.

A. Risk management by the firm can facilitate risk management by the firm's equity holders

Financial theory distinguishes between *systematic* (market or beta) risk, and *total* risk. Investors can reduce the amount of total risk they bear by diversifying their holdings. Systematic risk is the risk that remains after such diversification is fully utilized. If such diversification opportunities are widely available to investors, systematic risk is the only risk for which investors must be compensated with a risk premium. By definition, diversification, by either the firm or its investors, cannot reduce systematic risk. Investors can control their exposures to systematic risk by adjusting the mix of risky asset and safe cash holdings or by using futures, forwards, or swap contracts. By holding a larger fraction of cash or hedging with futures, forwards and swaps, investors decrease their

[1] Stulz (1996) offers another take on how risk management maximizes firm value; he argues that risk management should eliminate "costly lower-tail outcomes," that is, limiting the downside while preserving as much of the upside as possible.

systematic risk exposures, but at the cost of decreasing expected returns. The availability of these targeted financial instruments greatly enhances the efficiency of investors in managing systematic risk exposures for themselves, *provided* however that they know the firm's risk exposures.

The apparent ability of outside investors in the firm to adjust their own systematic risk exposures may seem to leave no role for firm-based risk management. Indeed, some observers thus conclude that attempts by managers of the firm to manage risk are at best redundant, and at worst wasteful, because if investors wanted to increase or decrease their risk exposures, they could easily do it themselves. Estimating the firm's risk, nevertheless, can be difficult for investors, especially if a firm's risk changes over time and if the firm's operations are opaque to outsiders. Outside investors can estimate the systematic risk of the firm by using historical equity return volatility. However, investors typically do not have other information which managers of the firm do have, information that may greatly improve that estimate. Managers, for example, have prospective proprietary information about the current and future activities of the firm, both in scale and scope, which bear on the firm's systematic risk. It may not be feasible or prudent for managers to simply reveal this private information, as this revelation might disclose proprietary information to its competitors. Thus, managers can use such private information to manage the firm's risk in a way that shareholders cannot, because shareholders do not know the exposures. For that reason, the classical Modigliani-Miller argument for invariance of firm value to such activities does not always apply. Firms can manage risk to lower their cost of capital if investors cannot hedge for themselves easily or cheaply. More precisely, investors may accept a smaller risk premium on the firm's equity in return for greater certainty about their own exposure to systematic risks from holding that equity.

To assist investors in managing risk and in return lower the firm's cost of capital, managers of the firm can target specific levels of systematic and total risk. Using risk management techniques, they can amplify or dampen the risk of the firm's operations to stabilize it at this targeted level. If the firm's risk level is held constant, investors can

more easily adjust their own risk exposures, even if the firm's operations are otherwise opaque to them. Moreover, if economies of scale in managing risk are present, then firm-level risk management is less expensive than investor-level risk management. Thinking about the firm's risk profile in these terms may be new to many managers. However, such targeting has a clear analogue to the more familiar territory of decision-making of setting debt policy: unlike risk targets, firms routinely use target debt ratios. So, as will be developed further in the discussion to follow, even in the case where investors assume much of the responsibility for managing risk, firm-level risk management can increase shareholder wealth by facilitating investor-based risk management.

B. Risk management by the firm can create value in ways that investors cannot duplicate for themselves

Even if the firm's operations *were* fully transparent and unchanging, and investors *could* manage risk just as cheaply and easily as managers, firm-level risk management can *nevertheless* create substantial shareholder value in ways that risk management by outside investors cannot. Specifically, firm-based risk management can increase shareholder wealth by reducing the costs associated with financial distress, moderating the risk faced by important non-diversified investors, decreasing taxes, reducing monitoring costs, and lowering the firm's funding costs.

C. Risk management can increase firm value by decreasing financial distress costs

Risk management has the potential to increase firm value through several channels. First, and most importantly, by reducing the firm's total risk, risk management makes financial distress less likely. Even successful businesses are vulnerable to the tentacular reach of financial distress, Microsoft Corp. being a case in point. Microsoft competes in a rapidly-changing and volatile industry. If a bad turn of events were to create uncertainty about Microsoft's continuing viability and ability to set industry standards, customers, suppliers, or employees might alter their behavior, worsening the impact of the initial negative shock. If this shock is big enough, customers may defect, questioning Microsoft's ability to provide future service and upgrades. Other software developers may be less likely to tailor their products to Microsoft's operating platform. Key

employees may leave for a more stable environment. In short, financial distress, by introducing uncertainty about Microsoft's continuing existence and dominance, has the ability to destroy substantial value.

Microsoft's financial distress may be only a prospective possibility, but consider the fate of Thinking Machines Corp., a pioneer in massively-parallel supercomputers. When government supercomputer funding evanesced, Thinking Machines encountered financial difficulties. Although it had a reputation for good technology, financial distress greatly hobbled Thinking Machine's ability to compete in the lucrative market for banking and retailing supercomputer software. Intel and IBM entered that business, luring customers away from smaller and less stable companies like Thinking Machines. The president of Thinking Machines explained that "…the issue of our viability kept arising. No one wants to spend $4 million on a machine from a company that may not be around." In other words, the state of financial distress itself impaired the firm's ability to compete, causing further erosion in firm value (Thinking Machines subsequently filed for bankruptcy).

The potential destructiveness of financial distress is not limited to technology firms. Retailers, for example, rely heavily upon their suppliers for financing. These suppliers, in turn, regulate their own risk exposures through their selection of customers, and tend to respond rapidly to changes in customer creditworthiness. Just so with Hechinger Co., a U.S.-based retailer of do-it-yourself home products. In 1999, Hechinger defaulted on an interest payment. Anxious suppliers cut back on credit, intensifying Hechinger's cash crunch. During the critical warm months when do-it-yourself sales typically peaked, potential Hechinger customers were greeted by nearly empty stores, leading to rapid deterioration of the firm's condition as customers left to shop elsewhere. Hechinger was soon forced to liquidate its operations.

The preceding examples illustrate the firm's costs *once in distress*. However, even the mere *prospect* of financial distress can cast a costly shadow over the firm. Hence, managers must also estimate the *probability of reaching distress*. Again, this estimate

will vary from firm to firm. The value of a company in a cyclical industry may be more volatile than non-cyclical industries, and its probability of distress higher. Before engaging upon a campaign to extirpate risk, such a firm also needs to evaluate its costs once in distress. If financial distress would not be too disruptive to the business, a firm may choose to accept a relatively high probability of distress. At the other end of the distress cost spectrum are those financial firms with large customer liabilities like insurance companies and banks. Risk management is central to their operation. Their probability of financial distress may be low because their assets are often closely matched to their liabilities, but the costs of financial distress in such credit-sensitive businesses are enormous. A consumer purchasing a retirement life annuity, for example, is unlikely to buy the annuity from an insurance company that is perceived as vulnerable to financial distress. No matter what the initial "savings" and how favorable terms are offered, few customers would willingly risk default on their retirement annuities. If the insurance company fails, the annuity will be in jeopardy. In sum, a proper analysis of the costs of financial distress must consider *both* the probability of reaching distress, and the expected costs once in distress.

D. Risk management can add value by lowering the risk faced by important non-diversified investors

Another way that risk management can add value is by lowering the risk faced by managers who have most of their wealth invested in their company's stock. The dramatic increase in stock and option-based compensation, and the long-running bull market, has created tremendous "paper" wealth for managers, in the form of stock and options in their firms. Without the ability to diversify their holdings, however, managers find that the value of their personal wealth fluctuates in tandem with their company's equity. Such fluctuations can be substantial, and especially so in highly volatile technology stocks, where, ironically enough, stock and option compensation reigns supreme. By reducing firm risk, risk management lowers the risk faced by managers.

But extreme volatility in the value of personal wealth is not a problem limited to managers in technology firms. In the first few months of 2000, the stock price of blue-

chip Proctor and Gamble dropped by nearly 50%.[2] Ninety percent of the value of the employees' retirement plans had been invested in a single stock, namely, Proctor and Gamble. In less than one quarter, this unanticipated stock price drop halved the accumulated value of employees' retirement funds. Again, risk management can help prevent such severe fluctuations.

Of course, having managers and employees who are not well-diversified investors can be beneficial to the firm. Financial theory has long made the case for the use of equity-based compensation plans as an effective means to align managers' incentives with those of shareholders. But, if managers own significant stakes in the firm, they will, by necessity, have poorly diversified portfolios. In essence, the exposure to firm-specific risk that is essential for generating the right managerial incentives also imposes a cost on managers by compelling them to hold less-than-fully-diversified investment portfolios.

Managers holding a disproportionately large fraction of their wealth in their firms bear the *total* risk of the firm, including its non-systematic risk component that would normally be diversified away in an efficient passive portfolio. Risk-averse managers will thus require compensation for bearing this "non-systematic" or diversifiable risk that ordinary investors do not face. With a higher required-return for holding the firm's equity, managers will apply a larger discount rate to the expected future earnings of the firm in privately valuing their holdings. That is, they will typically place a lower *private* value on their holdings of the firm than the *market* value of the shares.[3] To induce managers to have concentrated holdings of firm equity, the firm must either offer the shares at a discount or pay a higher total value in shares than would be required for straight cash compensation. This "deadweight wedge in value" between the market price and managers' private valuation is the cash cost to the firm for this compensation policy.[4] For risk-averse managers, the larger the *total* risk of the firm, the larger the managers' private discount rate, and the larger the component of non-systematic risk, the greater is

[2] P&G's stock price dropped from $115 in January to $54 in March.
[3] This is so assuming the same expectations about future earnings.
[4] Meulbroek (2001) derives a method to estimate this deadweight loss, finding that in volatile firms, the private value an undiversified manager places on her stock options is only half their market value.

the value wedge. The firm's deadweight loss is greatest for high volatility firms where managers have most of their personal wealth tied up in the firm. Note that the same type of costs apply to all forms of performance-based compensation including options, phantom stock, and earnings-based bonuses. Therefore, a firm with a large portion of its compensation based on pay-for-performance may be able to reduce the deadweight cost of that compensation by implementing a risk management policy that reduces the total risk of the firm without reducing the net present value of its projects. In that case, risk management of the total risk of the firm increases firm value by reducing the risks faced by its non-diversified investors, specifically managers.

E. Risk management can increase firm value by reducing taxes

Risk management also creates value by reducing a firm's tax burden. A progressive tax structure gives firms an incentive to smooth earnings to minimize taxes, and risk management enables such smoothing. It also increases a firm's debt capacity, thereby capturing the incremental tax shield associated with that debt.

Specifically, if tax rates rise as income increases, a firm should smooth earnings to minimize taxes. That is, progressive tax rates mean that a firm will do better by trying to stay consistently in the lower tax-rate region, rather than have negative earnings one year, and earnings that result in a higher tax rate the following year. Suppose that the tax rate for $10 million or less in earnings is 20%, and above $10 million, the marginal tax rate is 30%. If a firm earns $10 million in two consecutive years, its total tax will be $ 4 million over the two-year period. Consider a firm with the same $10 million average earnings over the two-year period, but now assume that its first year earnings are $0, and its second-year earnings are $20 million. Its total tax bill will now be $5 million, or $1 million higher than the firm will with the same average earnings, but whose earnings are evenly distributed over the two-year period.

As a practical matter, the "penalty" for volatility in taxable earnings is even greater than in the preceding example, whenever the ability of a firm to carry its losses forward or backward are limited. For instance, if a firm has negative earnings for an extended

period of time, it may never have enough positive earnings to offset its losses and use its tax credits. Hence, smooth earnings help to reduce taxes. Through risk management, a firm can smooth its earnings and reduce its tax bill.

Risk management can also decrease the firm's taxes by increasing its debt capacity. In particular, a firm that increases its optimal debt level could increase its after-tax expected cash flows by the amount of the marginal tax shield of debt. By decreasing firm volatility, risk management makes just such a debt increase possible. Holding expected cash flows constant, debtholders care about total firm volatility, because it is the total volatility and not just the systematic-risk component of that volatility that determines whether the debt holder will be repaid. The larger the total risk, the higher the probability that the firm will default (*ceteris paribus*). Likewise, the lower a firm's total risk, the lower the probability that the firm will default. If risk management can reduce the firm's total risk without reducing the net present value of its operations, then its application can increase the firm's debt capacity. With lower risk, a firm can support a greater debt-to-equity ratio, and a higher debt capacity means that the firm can capture a greater tax shield.[5]

The value of the incremental tax shield created by increased debt capacity will vary by firm. Many start-up firms, for example, have negative profits during their early years. Even if the risk of start-up firms can be reduced enough for them to carry some debt, on the margin these firms cannot capture the tax benefits of debt until they have used their net operating losses.[6] In contrast, new risk management techniques and instruments might present an opportunity for an established, profitable firm to reconfigure its capital structure. A target debt ratio that was appropriate in the past may no longer be optimal; the ability to manage risk may mean that managers can safely increase that target. Indeed, in the oil and gas industry, such a transformation seems to be occurring:

[5] The increased tax shield need not be the only useful side effect of an increased debt load, if one thinks that debt acts as a disciplinary device to curb value-reducing expenditures, and reduce agency costs.

[6] Of course, even if a start-up firm is unable to increase its debt capacity enough to generate significant tax savings, managers of a start-up firm may well decide to manage risk for other reasons. Two compelling motives for managing risk (explained in greater detail, below) are the ability to decrease financial distress

Haushalter (1999) shows that oil and companies with greater financial leverage manage price risks more extensively.[7]

Another way risk management can contribute to a firm's debt capacity, and therefore to its tax shield, is through its effect on managerial incentives. A traditional area for potential conflict between debtholders and equityholders concerns the possibility that managers, acting in the interests of equityholders, will increase asset volatility. Managers may increase asset volatility by adopting a riskier business strategy than the one anticipated by the bondholders. The potential for such conflicts becomes more severe the larger is the debt-to-equity ratio. As the firm approaches conditions nearing default, the riskier strategy increases the likelihood that the equityholders will receive some return on their investment, but decreases the amount that bondholders are likely to receive. The customary approach to minimizing this potential conflict is for the bondholders to make their loan conditional on debt covenants that make it more difficult for the managers to engage in large risk-shifting behavior. Risk targeting facilitates another approach to minimizing the potential for bondholder-equityholder conflict. By committing themselves to targeting a total risk level, management decreases their opportunity for risk shifting at the expense of debtholders. In return, the firm should be able to increase its debt capacity, as debtholders become more willing to accept larger debt-to-equity ratios.

F. Risk management can lead to easier and better performance evaluation, thereby reducing external monitoring costs and consequently, the firm's capital costs

The benefits of having a target risk exposure extend beyond the investors' ability to manage risk exposures. Risk targeting can lower the costs of monitoring and evaluating firm performance for investors, creditors, and customers. Performance evaluation requires a measure of the firm's risk in order to construct an appropriate benchmark for gauging performance.[8] If the firm's risk exposures are changing or if the firm's

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costs and to reduce the overall level of risk faced by important non-diversified investors (i.e. the founders). Smith and Stulz (1985) discuss all three of these reasons firms might want to manage risk.

[7] Using data less detailed than that available for oil and gas companies, Dolde (1995) finds that after controlling for primitive risk exposure, hedging and leverage are positively related.

[8] Risk measurement is an integral part of performance evaluation. High-risk ventures may be accompanied by high returns, but investors cannot evaluate whether the firm has earned excess returns without an

operations are opaque to outsiders, constructing such a benchmark is difficult. If outsiders (e.g. investors, creditors, or customers) find monitoring and evaluation difficult and costly, they will require an additional expected return premium to offset this higher monitoring cost. Some times a firm can avoid paying this premium by full-disclosure of information about the firm's operations. Other times, such disclosures may not be practical, perhaps for competitive reasons, or perhaps because the firm's operations and projects tend to have (or have the potential for) significantly changing volatility through time. As an alternative to full-disclosure, managers may decide instead to target a specific level of risk, using various risk management tools to offset the changes in volatility that would otherwise obtain. By setting a "benchmark" level of either systematic or total risk, the managers facilitate investor monitoring without disclosing proprietary information about the firm's operations.

Another way that risk management can contribute to better performance evaluation is by making firm disclosures more informative, or at least more accessible. Closely related to the risk-targeting policy just outlined, if a firm hedges as many of the risks not directly under management's control as is feasible, then the resulting earnings and cash flows will be more reflective of managerial ability and performance. Generally, the easiest risks to hedge are systematic risks, which are neither controllable by management nor necessary contributors to the positive net present value of the firm.

The financial-services industry is one in which risk-exposure targeting can be particularly valuable. The asset and liability portfolios of banks, securities firms, and insurance companies are typically quite opaque to outsiders. Furthermore, relative to most non-financial firms, these firms have the ability to change the compensation of their assets and liabilities rapidly without public detection, suggesting that an efficient way for investors to manage their risk is for the firm to target a specific risk level. Of course, the high leverage typical in this industry can mean that firm performance is very sensitive to

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estimate of how much risk the firm took to achieve those returns. The S&P 500 Index, for instance, is neither an appropriate benchmark if the firm invests in low-risk, market-neutral or counter-cyclical projects, nor is it an appropriate benchmark if the firm invests in well-above average risk, pro-cyclical projects.

its underlying risk exposures, providing another reason why financial firms may want to manage risk. It is therefore not surprising that financial institutions have been the pioneers in implementing sophisticated, integrated risk management. Industries which are rapidly evolving and changing, and which have few tangible assets (and therefore less transparency) might also be good candidates for risk-exposure targeting.

G. Risk management can add to firm value by providing internal funding for investment projects

Under certain conditions, a firm may find it costly to raise outside funds for an investment project. Consider, for example, a research and development project for which managers have private information about the likelihood of the project's success. When the managers' private information is positive, the information disparity between managers and other market participants means that the firm's equity will be undervalued. When the managers' private information is negative, the equity will be overvalued. If the firm's equity is undervalued by the market *and* managers cannot credibly convey their positive information about the project's outcome to investors (perhaps for competitive reasons, they cannot release enough information), issuing new equity will be costly. Investors will pay less for the firm's equity than is warranted by the project's true value, because they have lower expectations about the project's outcome, then if those expectations were conditioned on management's information. If an undervalued firm needs funding for a potentially profitable project, and issuing debt is not feasible or is too expensive, then to avoid issuing equity at a discount, the firm must fund the project internally for the project to go forward. Internal funding requires that the firm either stockpiles cash, or have steady cash flows from other projects. One way that risk management can be valuable for such a firm is that it can smooth out cash flow volatility, helping to ensure that the firm will be able to fund profitable projects internally. [9] Again, the benefit of internal funding will vary from firm to firm, but the larger the information gap between managers and investors, the greater the potential for undervalued equity. Ex ante, one would expect that larger firms are relatively unlikely to suffer from such an

[9] See Froot, Scharfstein and Stein (1994) and Lewent and Kearney (1990) for more complete descriptions of how risk management enhances the firm's ability to internally-fund valuable new investments.

information asymmetry between managers and investors. Larger firms are more likely to have greater analyst coverage than smaller firms, perhaps reducing the probability of asymmetric information problems. Larger firms are also less likely than smaller firms to be capital constrained. Consequently, the value of using risk management to secure internal funding might be greater for smaller, more specialized firms.

Internal funding, however, can be a double-edged sword. External funding of an investment project will ordinarily entail an outside review and assessment of the firm's investment project. This "extra" review can sometimes provide managers with useful information about the prospective investment's prospects. In some cases, the discipline of an outside review that accompanies external capital raising will prevent the firm from proceeding with a bad project. Firms that rely upon internal funding of investment projects escape the extra hurdle that accompanies external funding. This interpretation of the market's role in investment decisions would imply that the financial slack produced by risk management can have the perverse effect of decreasing firm value.[10]

Another potential but unintended consequence of risk management for the purpose of generating internal funding is that risk management can increase the disparity between internal and external funding costs. If a firm manages risk, and therefore has sufficient internal funding for a particular project, but chooses instead to use external funding, one would expect outside investors to be even more wary about providing equity for that project. The outside investors will know that the firm has sufficient internal funds, but chooses to raise them externally, leading the outside investors to lower their estimates of the project's value, thereby increasing their required return.

In the hypothetical Modigliani-Miller world of corporate finance, neither capital structure nor firm risk management affect the value of the firm. The series of examples presented above, involving tax and transactional frictions, costly information gathering, information asymmetries, and agency costs, none of which exist in the Modigliani-Miller world, show

[10] See Tufano (1998) for an argument suggesting that the absence of capital market scrutiny for new investments leads to the acceptance of sub-optimal projects.

how risk management can contribute significantly to the objective of maximizing firm value. The next section discusses the multi-faceted ways to implement integrated risk management policies.

III. A Functional approach to integrated risk management

Examples drawn from Microsoft and Salomon Brothers illustrate how integrated risk management extends across functional boundaries within the firm, and how a risk management perspective yields insight into seemingly-unrelated managerial decisions for the firm. Consider Microsoft's use of a greater proportion of temporary employees in the organization that one might normally expect. By reducing operating leverage (here the fixed costs of a more permanent workforce), Microsoft has more flexibility to respond to unexpected shocks in demand, technology or regulation, thereby improving its chances of survival, and mitigating the potential for even more severe collateral effects. This operational flexibility is particularly important for Microsoft, as it competes in a rapidly changing, volatile industry, whose future shape is uncertain.

Microsoft's personnel officer, Doug McKenna, explains that "we count on them [temps] to do a lot of important work for us. We use them to provide us with flexibility and to deal with uncertainty."[11] This flexibility, in turn, adds to Microsoft's capability to compete effectively, and under extreme conditions, to maintaining its value as a going-concern. Referring to the temporary workers, Microsoft's director of contingent staffing, Sharon Decker, says that "we want to be very flexible as a company, to be able to react to competitive challenges and react quickly."[12] Without such flexibility, a bad turn of events could create uncertainty about Microsoft's competitive ascendancy and its ability to continue setting the industry standards. This uncertainty alone might lead Microsoft's customers, suppliers, or employees to alter their behavior, worsening the impact of the initial negative shock. If this shock is big enough, customers may begin to defect, as they question Microsoft's ability to provide future service and upgrades. With further

[11] *Los Angeles Times*, 12/7/97, p. D1.

deterioration, software developers may be less likely to tailor their products to Microsoft's operating platform. Key permanent employees may leave for a more stable environment. Microsoft's policy of using temporary workers allows Microsoft to respond more rapidly to such shocks, thereby improving Microsoft's chances of remaining a lead player in its industry as well as mitigating the potential for even more severe collateral effects. In this manner, Microsoft reduces both its exposure to the myriad risks it faces and the risk borne by its permanent workforce, providing them with more job security than they would otherwise have in a volatile industry.

Microsoft's financial policies complement its operational policies, at least in the sphere of risk management. It has no outstanding debt, and indeed, it currently holds approximately $18 billion in cash. If Microsoft were highly leveraged, it might, at times, have difficulty meeting the large fixed interest and debt repayments, especially when faced with demand or other shocks. Instead, its no-leverage (or negative leverage) policy gives Microsoft flexibility that is particularly valuable when the costs associated with financial distress are high. The low debt policy may also reflect an attempt to reduce the risk borne by some of its senior executives, who together own a substantial fraction of the outstanding shares. Microsoft's operational policy of using temporary employees, and its financial policy of low leverage both serve to reduce its overall level of fixed-cost operating leverage, increase its flexibility, and thereby, reduce the firm's total risk. Both types of policies, although quite different in their application, are functionally equivalent. To that extent, they may be considered substitutes for one another. Even if similar in function, each policy, of course, has its particular costs as well as benefits. Thus, temporary workers, for example, may not be as motivated as permanent employees.[13]

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[12] *The News Tribune* (Tacoma, WA), 2/21/99, p. G1.

[13] In the words of one Microsoft permanent employee (a former temp) "Temps are temps – they come and go. They are probably not working as hard. They aren't invested in the company, so it's not in their interest to work 70-hour weeks." *Los Angeles Times*, 12/7/97, p. D1. Microsoft seems fully aware of the incentive problem, and tries to compensate: "what they lack in status and benefits, temps often make up in salary; typically, their paychecks are 30 percent higher than a comparable Microsoft employee. And many nontraditional workers enjoy the flexibility of the arrangement." *Seattle Times*, 12/16/97, p. A1. Sometimes the short-term nature of Microsoft's commitment to its temporary employees can engender dissatisfaction and resentment, "As a part-timer, you are like a tool," said Philip Hirschi, a Web designer who recent left a temporary job at Microsoft to take a full-time position elsewhere. "If you are a Phillips screwdriver, and

Without debt, Microsoft loses out on the tax advantage of the interest-deductibility of debt. The integrated risk management approach recognizes that a firm has many ways to manage its risk, and that both the optimal amount of risk retained, and the tools used to achieve that level of risk will differ from firm to firm. What integrated risk management provides is a systematic way of thinking about risk and identifying its multi-dimensional effects on the firm, coupled with a framework for deciding upon the best strategy for implementation.

A. "Integration" means integration of risks and integration of ways to manage risk

Integrated risk management evaluates the firm's total risk exposure, instead of a partial evaluation of each risk in isolation, because it is the total risk of the firm which typically "matters" to the assessment of the firm's value and of its ability to fulfill its contractual obligations in the future. Furthermore, by aggregating risks, some individual risks within the firm will partially or completely offset each other (thereby reducing the total expense of hedging or otherwise managing those risks). Thus, in implementing hedging and insuring transactions to manage the risk of the firm, one need only address the *net* exposures instead of covering each risk separately. This netting can significantly reduce transaction costs. Considering the firm's total risk exposure from all sources, however, saves more than transaction costs. Such an analysis is essential in charting an effective risk management strategy. By focusing narrowly on one specific risk, the manager may create or exacerbate other types of risk for the company. Such interactions between risks are not always obvious, especially when they occur among unrelated businesses within the firm.

A subtle instance comes from the late 1980s. In 1988, Salomon Brothers, the investment bank, attempted to move into the merchant-banking business on a large scale by leading an investment group in an unsuccessful effort to acquire control of RJR Nabisco in a leveraged buyout. Although it did not succeed, the attempt signalled to bond-rating agencies and other stakeholders that Salomon was prepared to increase the total risk it

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they need a flat head, they just get rid of you, they won't retool you." *Los Angeles Times*, 12/7/97, p. D1. This perception suggests that at least some temporary employees may be less willing to invest in firm-specific human capital.

faced. This change in Salomon's risk profile hurt its existing customer-based derivatives business, which had been a significant source of profits.

Salomon's prospective merchant-banking business would seem to have little connection to its existing customer-based derivatives business: the employees were different, the technology was different, the customers were different, even the buildings housing the businesses were different. Because Salomon owned both businesses, however, its shift into a riskier business affected the overall risk and creditworthiness of the company. The derivatives business was particularly sensitive to Salomon's credit risk; Salomon's strong and stable credit rating was essential to its customers. By its attempt to move into the merchant-banking business, Salomon showed its willingness to increase the company's overall risk exposure. That perception greatly impaired its ability to compete in the credit-sensitive customer-based derivatives business. Furthermore, the connection of Salomon's prospective merchant-banking business to the customer-based derivatives business did not materially benefit its merchant-banking business, because merchant banking is *not* a credit-sensitive business.

The Salomon example shows that when different businesses share the same corporate umbrella, the risk of each business is shared among all businesses. For Salomon, the combination of the businesses destroyed value until financial engineering created an AAA-rated derivatives subsidiary that effectively de-coupled the shared capital structure.

The Salomon example also underscores that risk considerations permeate every major decision of the company. When a company changes its business strategy, it likely changes its risk profile, thereby either creating or destroying value. Risk management almost always requires making trade-offs. These trade-offs sometimes involve comparing the costs of reducing a particular risk with the benefits of that reduction; at other times, managers must trade off risks among businesses. Risk management decisions must be made on a company-wide level because the consequences of managing any particular risk affect the value of the *entire* company.

Integration of risk management can add value to the firm by permitting the purchase of more efficient insurance contracts that provide a lower cost way to manage its overall or "enterprise" risk. Consider a hypothetical firm that faces non-operating risks of three types: losses from product liability, losses from fire, and losses from foreign exchange rate exposures. Suppose that the firm is willing to "self-insure" against these risks up to a maximum total loss of $3 million. If, as is typical, responsibility for each type of risk is delegated separately and a separate policy is purchased to protect for each, then to meet the overall firm maximum-loss constraint, the maximum deductible on each of the three policies is $1 million. That follows because, although unlikely, all three types could suffer losses in excess of $1 million. However, this collection of separate policies provides more insurance than the firm wants. For example, suppose that the firm experiences a product liability judgment of $2.5 million and no losses from either fire or foreign exchange. Then, the separate-policy approach covers it for all but $1million even though the firm was prepared to take the entire $2.5 million loss within its maximum loss limit. Of course, after the fact, the firm would be happy to have the greater coverage. But, beforehand when it makes its risk management decisions, the firm will pay higher insurance premiums for that extra, unwanted coverage. If instead the firm could purchase a comprehensive policy covering all three types of risks, it could have a deductible of $3 million and receive the coverage it actually wants. Because the three types of risks are not perfectly correlated with one another, the premium for the comprehensive policy with a $3 million deductible will be less than the sum of the three separate policies with $1 million deductible on each, even when all premiums are absolutely actuarially fair. The point is very much analogous to buying an individual put option on each security in a portfolio versus buying a put option on the portfolio of securities itself. As is well known, the sum of premium charges for a portfolio of individual put options on each security is going to be larger than the premium for a put option on the overall portfolio. If all the investor cares about is protecting against losses on the overall portfolio value and not on each part separately, then the portfolio of put options provides too much coverage. Just so, the firm buys too much insurance when it buys a separate policy, or put option, for each risk. When the firm buys a comprehensive policy that insures against all three risks, it buys a different (and lower cost) product. Exposure of the firm's value, after all,

does not depend on the source of the risk per se; instead, it depends on the total risk. So, the type of insurance needed by the firm is one that pays off when the effect of the aggregated risks exceeds a certain, pre-specified, amount. If what the firm really wants is to insure that the risks do not lead to a drop of more than $3 million in value, then it should insure against the joint event that the combined risks do not lead to a drop of more than $3 million. Multi-risk policies are just beginning to be used in practice. Honeywell Corp., for example, bought insurance that provided protection against currency risks, along with other, more traditionally-insurable risks. Rather than a separate deductible for each individual risk, the new policy used one aggregate deductible for the combined risks, saving about 25% of the premiums it was paying for separate risk coverage. Reliance Insurance is offering an "omni-risk" policy that insures earnings against all sorts of risks that are outside of management's control. However, the firm cannot use these comprehensive policies effectively unless it is organized around a firm-wide integrated risk management approach.

Just as important as risk aggregation is integration of the ways to manage risks. Turning back to our Microsoft example, just as different categories of risks can affect firm value in a similar fashion, so different ways of managing risks can be combined to collectively achieve a common objective. Thus, Microsoft can reduce its risk via the operational policy of using temporary workers; it can also reduce its risk by carrying a low level of debt.[14] The goal of risk management is <u>not</u> to minimize the total risk faced by a firm per se, but to choose the <u>optimal</u> level of risk to maximize shareholder value. Effective risk management requires a thorough understanding of both the firm's operations, as well as its financial policies. Given the breadth of firm-specific knowledge required and the potential for impact on overall firm value, risk management is a direct responsibility of senior managers. It should neither be delegated exclusively to outside risk experts,[15] nor

[14] Debt actually has a two-fold affect. First, lowering debt means lowering fixed costs, thereby reducing the firm's chances of getting into financial distress. Second, debt acts as a magnifier of other risks. So, while changing the debt level does not affect *whether* an operational risk occurs or not, if an operational risk *does* occur, a low debt level will cushion the impact of an operational risk, but a high debt level will exacerbate its effect.

[15] Derivatives and other outside experts will be involved to the extent that they must provide information about whether it's feasible to manage a particular type of risk, and how costly it might be. Other consultants might be helpful in providing guidance on the type of information needed before embarking on

be delegated internally by type of risk (e.g. one policy for exchange rate risk, another for product obsolescence), nor be delegated by type of business. Senior management must decide on which risks are essential to the profitability of the firm, taking into account cross-risk and cross-business effects, and then develop an integrated strategy to manage those risks.[16]

IV. Tools for integrated risk management: managing risk using operations, targeted financial instruments, and capital structure

At the foundation of risk management is the integration of the ternary mechanisms to alter the firm's risk profile. These three ways to manage risk, by modifying the firm's operations, by adjusting its capital structure, and by employing targeted financial instruments, interact to form the firm's risk management strategy. Managers must weigh the advantages and disadvantages of any particular approach in order to find an optimal mix of the three. As in the preceding section, we explore each of these mechanisms in a series of examples.

A. Operational risk management

Managers typically have many different ways to operationally address risk. Microsoft's use of temporary workers discussed in the last section is an example, but there are many others. Consider the effect of weather on Disney's theme parks and their customers. Bad weather dramatically reduces the number of visitors, exposing the theme park's owners to considerable weather-related risk. This risk extends to customers as well. A vacation destination with unpredictably unpleasant weather compels potential visitors to bear some weather risk; a vacation destination without these characteristics lessens their weather exposure. One would not expect Disney's customers to be exceptionally skilled weather forecasters (especially along the extended time-horizon associated with vacation

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a risk management program. But, the one thing consultants do not typically have is an intimate understanding of the firm's business, the competitive landscape, and how the various risks feed back and affect firm value.

[16] Of course, senior managers will rely upon the managers of a specific business unit or project to provide them with information to measure the firm's exposures. Likewise, the estimation of the costs of addressing

planning) suggesting that customers may not be the ideal bearers of weather risk. Disney's 1965 decision to build Disney World in a warm and sunny location (Orlando, Florida) reduced both its own exposure, and that of its customers, to inclement weather. Like many operational approaches to risk management, Disney's decision to locate in Florida, while reducing weather risk, also altered its risk exposure along other dimensions. At the time of Disney's 27,500-acre purchase, Orlando was not particularly near any population centers, and air travel was relatively expensive. So, one cost of Disney's location choice was that most of its customers had to travel long distances to visit, increasing Disney's exposure to fuel prices, the cost of air travel, and fluctuations in the economy.

Of course, Disney's location decision is only one of many possible operational ways to manage risk. An alternative operational model is to have multiple theme parks close enough to major population centers that customers can observe the day's weather forecast and then decide whether to visit the theme park. In this model, inclement weather reduces park visitors (a risk to the firm), but also lessens the customer's weather risk exposure. Because this type of theme park is likely to draw mostly singe-day visitors, rather than multiple-day visitors who treat the park as a vacation destination, bad weather on any particular day will not lead to a ruined vacation. By locating in Florida, Disney reduced the overall exposure to weather risk for the firm and its customers, at the expense of creating an exposure to the risk that it needed to become a stand-alone destination theme-park to succeed.

The issue of who is better equipped to bear risk arises again with respect to the production of Fresh-Samantha fruit-juices. When first introduced, the hallmark of Fresh-Samantha juices was their freshly squeezed taste. The key to their fresh taste rested in the production process: the juice was not pasteurized, a departure from standard industry practice. By forgoing pasteurization, the producers of Fresh-Samantha juices distinguished their beverages, but at the cost of exposing themselves to a tremendous

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those risks operationally necessitates business and project-specific information. The firm's senior management must then integrate the risks and their effects across businesses or projects.

product-liability risk. Without pasteurization, the risk of contamination increases. Furthermore, consumers, typically not the best bearers of risk, cannot easily detect contaminated product, meaning they too shared the contamination risk. In 1995, the magnitude of this risk became obvious. Odwalla, a California-based fresh (non-pasteurized) juice maker, sold juice contaminated with E. coli bacteria, resulting in the death of one child, and illness in sixty others. This incident raised consumer-awareness of the potential heath risks associated with non-pasteurized juice, and had an immediate impact on sales of Fresh Samantha, even though Fresh Samantha was not involved in the episode. Forbes reported that "retailers demanded to know if Fresh Samantha was safe. Some threatened to cancel orders; several new accounts delayed payment."[17] Fresh Samantha's managers decided that the firm's product liability risk exposure (and that of its customers) was simply too high, and responded by upgrading the firm's quality control department and pasteurizing its juice.

The financial cost of product liability can be staggering as we see reported routinely in the news. At the extreme, some very large firms have been forced to declare Chapter 11 bankruptcy to resolve these liabilities. However, even when the direct cost is not large, the impact of product failure or mismanagement on the reputation of a firm can be devastating, especially for those reputation-sensitive firms involved in financial services, food, medicine, or anything else that goes inside our bodies.

Jaguar Cars faced a different product market risk: their limited product line was focused on a very narrow segment of the luxury car market. The narrow product line made Jaguar more exposed to economic fluctuations than other luxury car manufacturers whose customers might shift down to one of their less expensive luxury cars in more difficult economic times. Jaguar recently expanded its product line by introducing a less-expensive model, the S-type model. Jaguar surely had multiple reasons for broadening its product line. But whether intended or not, this decision has risk-management implications for the firm. Introduction of the S-type helps buffer Jaguar against a softening of the luxury car market and volatility in the overall state of the economy. The

[17] *Forbes*, April 6, 1998.

new less-expensive line will make a Jaguar accessible to a wider segment of the population. It also provides a "gateway" of experience and familiarity for these customers to "move up" as their economic conditions improve. Furthermore, by providing a lower-cost alternative, it also reduces the risk of losing existing customers for its traditional higher-end cars when tougher economic times dictate cut backs on luxury goods. This operational decision is not without its own risks: one potential cost of Jaguar's product-expanding operational change is that the S-type may dilute Jaguar's high-end image: Jaguar's ultimate decision to produce the S-type required that Jaguar evaluate whether reductions in exposure to economic fluctuations offset the possible dilution of brand-image.[18]

Sometimes, the optimal way to respond to risk is to exit the business producing the risk exposure. Such is the case with many U.S. manufacturers of certain contraceptives, specifically intrauterine devices (IUD's). Although the IUD was originally considered an ideal form of birth control, in the 1970's women developed serious problems with one type of IUD, the Dalkon Shield. The Dalkon Shield was banned in 1974, and liability and insurance concerns led many manufacturers to remove most of the other IUDs from the market (although still available in other countries). Today, only two types of IUD's are legal in the United States. The operational approach to risk management chosen by most IUD manufacturers was to simply stop distribution of their product.

Disney's theme park locations, Fresh Samantha's pasteurization decision, Jaguar's expanded product line, and the termination of IUD distribution illustrate how changes in the firm's operations can alter its risk exposure. The above examples also make clear that risk management is not only a decision about how must risk the firm should bear, it is also a decision about how much risk the firm's customers or suppliers are prepared to bear. As a more general matter, suppliers, customers, community members, firm shareholders, and employees are all potential risk bearers for the firm. Ultimately, no one

[18] Jaguar is entirely owned by Ford, which surely affects its risk profile and thus its risk management strategy. The text to follow offers another example drawn from Jaguar when it was an independent company that illustrates the application of financial instruments as an alternative risk management tool to operational actions.

rule will fit each situation. Therefore, managers must determine the optimal level of risk for all parties, and for this assessment, managers must consider not only how each individual risk affects the firm's total risk exposure, but also evaluate the optimal way of managing and distributing those risks.

B. Risk management using targeted financial instruments

The operational adaptations to risks outlined above are changes that managers have actually implemented. Some risks cannot be managed effectively through the operations of the firm, either because no feasible operational approach exists, or because an operational solution is simply too expensive to implement or it is too disruptive of the firm's strategic goals. Targeted financial instruments such as derivatives (futures, swaps, or options) or insurance can be an alternative to using operations directly to reduce risk. Such instruments are available for many commodities, currencies, and stock indices, interest rates, and the menu is continually expanding to reflect a variety of other risks including even the weather. Through an operational approach, managers can either reduce the probability of a risk occurring (e.g. build Disney World in a warm and sunny climate), or decrease the risk's impact on the firm, should it occur (e.g. Jaguar's expanded product line). Targeted financial instruments affect the firm's risk profile in this latter sense: if a risk does occur, targeted financial instruments can attenuate or eliminate its effect on firm value. Returning to the Disney example, purchasing insurance against bad weather is a substitute for locating in a warm and sunny climate.[19] Whether buying weather insurance dominates physically locating in a temperate climate depends upon the relative cost of the insurance versus the cost of putting the theme park in the middle of Florida where disruptive weather would not be a concern.

To illustrate how financial contracts can be used as an alternative to operational solutions, we again draw on Jaguar, prior to its acquisition by Ford, when Jaguar was an independent British company. Almost all of Jaguar's production, as well as the majority of its investors, were located in the United Kingdom. Yet more than fifty-percent of its revenue came from sales in the United States, subjecting the firm to sterling-dollar

[19] Such insurance was not available in 1965 when Disney made its decision.

exchange-rate risk. Moreover, Jaguar's main competitors in the luxury car market in the United States, Daimler-Benz, BMW, and Porsche, were German car manufacturers that produced their cars in Germany. The German car manufacturers' U.S.-based sales, both individually and collectively, swamped those of Jaguar. Jaguar therefore had little influence on market prices of luxury cars sold in the United States, which depended more on prices set by the German car manufacturers, prices that were sensitive to the mark-dollar exchange rate. The competitive environment in U.S.-luxury cars, then, exposed Jaguar to substantial exchange-rate risk from movements in mark relative to the dollar, even though Jaguar had neither sales nor production in Germany. In Jaguar's case, its risk exposures were substantial, affecting its sales and profits in a country that accounted for over half its revenue. These risks could, however, potentially be hedged using derivatives, such as currency future or forward contracts.[20]

The value of implementing such strategic currency hedging has perhaps diminished as a result of Jaguar's subsequent acquisition by Ford. There remain, however, material risk management issues for post-Ford Jaguar. In the example of the preceding section, could Jaguar have managed effectively its product risk exposure by using targeted financial instruments instead of expanding its product line? Recall that the introduction of the S-type car could be seen as reducing Jaguar's exposure to downturns in the overall economy and weakness in the luxury car market. No explicit financial instruments currently exist for hedging these risks directly. However, suppose that the demand for Jaguars is found to be sensitive to the stock market, both because many potential owners work in financial services and because employees often use bonuses and stock option gains to buy luxury cars. Then, a partial hedge could be constructed using futures, swaps or options on the stock market. Similarly, if interest rates and the price of gasoline were found to be linked to consumer demand for luxury cars, then derivatives on interest rate and gasoline may usable to buy Jaguar further protection. To be sure, integrated risk management requires more than an observation that Jaguar *can* manage its risk using targeted financial instruments. Integrated risk management calls for a continual assessment of the firm's total risks, and the costs of the various ways to manage those

[20] See Luehrman (1990) for a more detailed description of Jaguar and its risk exposures.

risks. After engaging in an integrated risk management evaluation, Jaguar's managers may decide that using contractual agreements to decrease Jaguar's product line exposure to overall economic fluctuations in this fashion is too costly, or too difficult to execute. Instead, they may conclude that to achieve the optimal level of total firm risk, they can more profitably moderate some of Jaguar's other risks.

That risk exposures individually can be difficult to hedge directly using existing financial instruments is not of course limited to luxury car manufacturers. As mentioned earlier, Microsoft's risk profile has a number of significant idiosyncratic risks. Microsoft's continued success will depend upon the future evolution of the Internet, on the technology sector more broadly, and perhaps on the outcome of the government's antitrust suit. Hedging each of these type risks *individually* would be difficult using traditional derivative instruments. Instead, Microsoft might choose to buy put options on its own stock to reduce its *aggregate* risk of loss in stock value from all sources, or perhaps it might buy insurance to protect just its operating earnings against adverse events that are beyond management's control. Although companies do sometimes buy limited quantities of put options on their own stock, such strategies also have significant shortcomings in implementation. Firms may find it difficult to buy puts on their own stock in any size at a fair price, because market participants may view the firm's decision to buy puts as negative information, either about the firm's future prospects, or about its future volatility.[21] How does Microsoft convincingly demonstrate that it is in fact buying puts only for hedging purposes, and that its actions do not convey any information about the firm's future prospects?[22] A similar issue arises with earnings-protection insurance. As noted previously, Reliance Group has announced that it will sell such an insurance product covering events outside management's control. Determining what is or is not

[21] Because a firm can also issue or buy stock to convert its puts to calls and vice versa, inferring a directional signal from its actions may be difficult. Still, the firm's purchases of puts *does* convey information about its belief concerning expected future volatility.

[22] One possible way that Microsoft may try to avoid the negative signal conveyed by the purchase of puts is to establish a regular purchase program, where it announces far in advance its intended schedule of purchases.

under management's control is no easy task.[23] If Microsoft cannot adequately manage its risks using derivative or other contractual instruments, it must either alter its operations or adjust its capital structure to manage its risk.[24]

Targeted financial instruments are especially suited for firms with large exposures to commodity prices, currencies, interest rates, or the overall stock market. These exposures derive not only from the firm's inputs, outputs, or production processes, but also from risks passed along from its suppliers, employees, customers or competitors. A candy producer, for instance, may have a substantial risk exposure to sugar prices, and can hedge this risk using sugar futures. Likewise, an oil producer can sell its production forward to reduce its exposure to oil price risk. A manufacturer of recreational vehicles typically has substantial exposure to oil and gasoline price risk; it can hedge these risks contractually through oil or gasoline futures or forwards.

Managers can also manage risk by changing the payment form of the firm's debt. A case in point is the ability to issue debt denominated in a foreign currency or to issue debt denominated in an asset other than money, such as debt denominated in gold or oil. The foreign currency denominated debt can lower the firm's exchange-rate exposure and gold- or oil-denominated debt can reduce the firm's exposure to oil or gold prices. Catastrophe bonds (*CATS*) are another example of debt tailored to address a specific type of risk, namely that of a catastrophic event, which can reduce the risk exposure of the issuing insurance company. CATS pay off only if the pre-specified event risk does not occur. Such structured approaches to risk management might just as easily be classified as a capital structure tool as a financial instrument tool. The boundaries between the two are indeed both permeable and imprecise.

The benefit of risk management via targeted financial instruments is that firms are able to focus on a specific risk at a low cost without disrupting the firm's operations. Ironically,

[23] Of course, earnings insurance could introduce a substantial moral hazard problem, as managers who have such insurance might have little incentive to work hard. Also, the insurance company will face significant asymmetric information problems when it tries to sort out the "bad" managers from the "good" ones.

this ability to precisely target risk is the source of its primary shortcoming: namely, risk management using targeted financial instruments is effective only against the specific risk it is explicitly targeted at. Therefore, a currency hedge will only protect against earnings losses from exchange rate changes. Their targeted nature limits their effective use to offsetting risks that managers are able to foresee both in type and magnitude. The range of currently available contracts of course limits the feasibility of this application tool.

C. Risk adjustment via the capital structure

The third tool to manage risk does *not* require managers to precisely forecast the source or magnitude of a specific risk. By decreasing the amount of debt in the capital structure, managers reduce the shareholder's total risk exposure. A reduction of debt does *not* reduce the probability of a risk occurring. Instead, a low level of debt serves to blunt the impact of risks that do occur. More specifically, lower debt means that the firm has fewer fixed expenses, which translates into greater flexibility in responding to any type of volatility that affects firm value. Lower debt also reduces the chance that the firm becomes financially distressed. In contrast, a firm with high leverage is more likely to default on its debt when faced with unexpected variations in demand for its product, or increases in its input costs. The leverage induced by debt magnifies the effect of nearly all types of risk. The primary advantage of managing risk by using a larger proportion of equity in the capital structure is that equity provides an all-purpose risk cushion against loss. There are some types of risks that a firm can both anticipate and measure relatively precisely and these can be shed through targeted risk management. Equity provides ideal protection against those other risks that cannot be readily anticipated or measured, or for which no specific targeted financial instrument exists. The larger the amount of risk that cannot be accurately measured or shed, the larger the firm's equity cushion should be.

A well-known disadvantage of using equity as a risk management tool, is that by reducing debt, a firm reduces the interest tax shield that debt provides. In contrast,

[24] In the near future, Microsoft may be able to buy comprehensive insurance which provides protection against earnings fluctuations.

managers using the other broad tools of risk management, operational adjustments and use of targeted financial instruments, typically have greater flexibility to avoid disadvantageous tax consequences of their risk management actions. As a corollary, managers can increase a firm's debt capacity by reducing risks operationally or with targeted financial instruments. Another disadvantage of managing risk via the capital structure is that a reduction in debt can create or exacerbate certain agency problems.[25]

V. Implementing integrated risk management: identify, measure, and optimize risk-bearing

Having explored the three basic tools for firm-wide risk management, we close with an integration of the preceding sections that frames the broad managerial issues surrounding the development and implementation of a risk management system for the firm. Risk reduction has the potential to increase firm value. Whether risk reduction actually increases firm value depends upon the cost of that reduction. As a general matter, managers should eliminate all risks that need not be borne by the firm in order to capture the positive net present value of its activities and that are costless to shed. If, however, risk reduction is costly, managers must evaluate whether the benefits of elimination justify the costs.

Such an analysis requires that managers estimate the effect of each risk on firm value, understand how each risk contributes to total firm risk, and determine the cost of reducing each risk. To formally calculate the value-maximizing risk management strategy, this information must be incorporated into a model of firm value. This model encompasses managers' knowledge about the economics underlying the firm and its competitive environment, as well as management's beliefs about the ways in which risk potentially affects firm value. By varying the inputs to the model, managers can observe how firm value changes when various risks are hedged or not. In this fashion, managers will be able to determine the optimal level of total risk for the firm, the configuration of risks constituting this level of risk (i.e. the risks to be divested, and the risks to be

[25] See Tufano (1998) on agency costs of risk management.

retained), and the best way to achieve the desired risk profile. Of course, creating such a valuation model requires extensive knowledge about consumer demand and the nature of competition in the industry. Building such a model is a process of constant refinement. Some of the information needed to construct such a model will already reside in the firm. Other information will need to be amassed over time, as managers become more aware of what information is necessary, and begin to collect the required data.

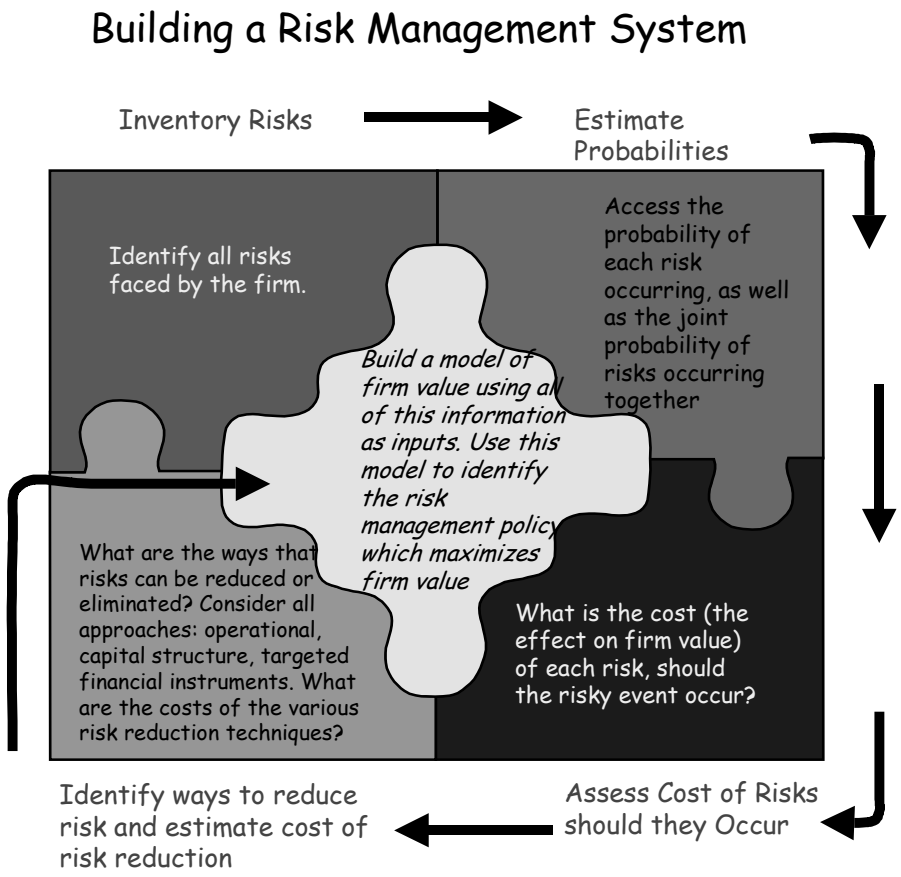

Figure 1

The key steps in the development of a risk management strategy appear in Figure 1. One begins by inventorying all the risks faced by the firm. The compendium in Figure 2 organizes risks into seven categories and may be useful in building the firm's lexicon of risk. Operational risk, product market risk, input risk, tax risk, regulatory risk, legal risk, and financial risk comprise the broad classes of risks faced by most firms. The seven spokes radiating towards the vertical underscore that individual risks aggregate to form the overall risk exposure of the firm. After management has both inventoried the various

risks, and assessed the probability of the risks occurring (both as separate events and concurrently), the next step is to estimate the effect of a particular risk on firm value.

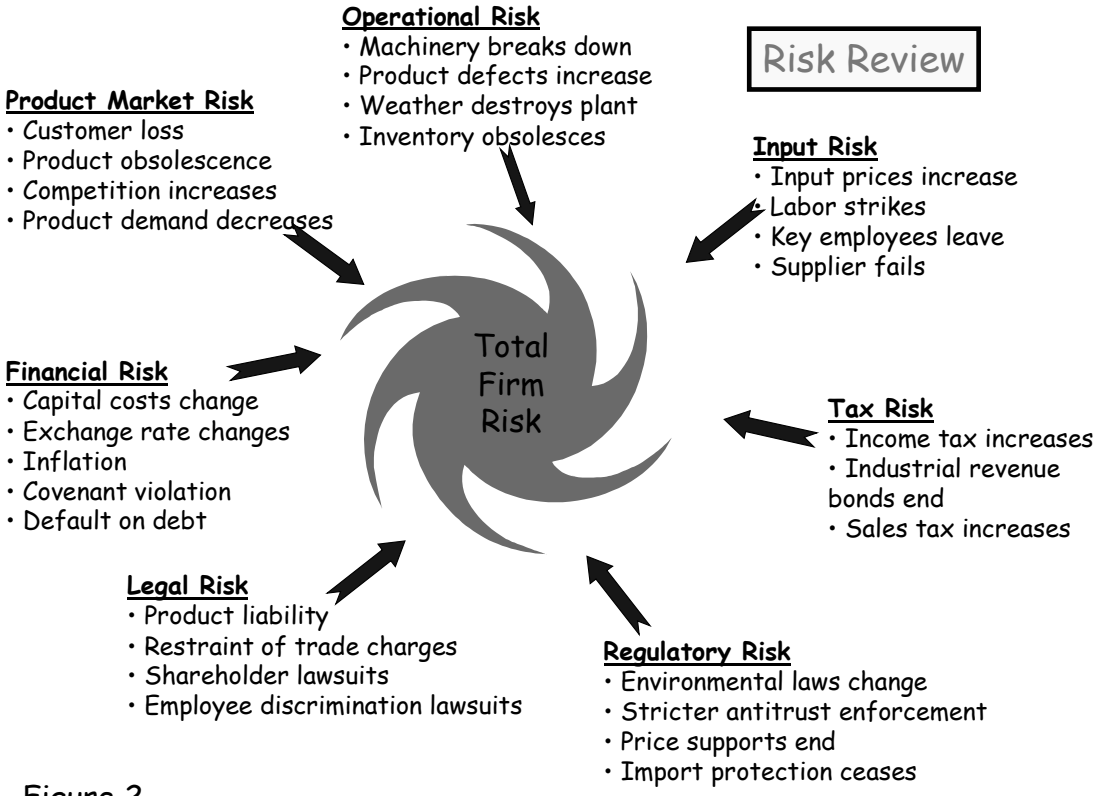

Figure 2

To illustrate how one might begin mapping a risk management strategy, consider the risks faced by a rapidly growing firm. The managers of this firm know that the firm's rapid growth introduces substantial risk. The goal of the risk inventory is to transform this general observation into a more detailed description of how the risks induced by growth might affect the value of this firm. Suppose the firm is a toy manufacturer, and the firm's rapid growth is a result of the success of one particular toy. The managers expect the demand for this toy to drop as the fad wanes, so volatile consumer demand is one major source of risk for this firm. Suppose further that the firm is a Japanese firm that exports much of its product to the United States. Then the firm's U.S. sales may depend upon relative yen/dollar exchange rates, where the nature of the competition in the United

States determines the relation between exchange rates and firm value. For simplicity, assume that the toy manufacturer has no other risks.

The managers of a toy company need to identify the precise ways that these risks might affect firm value. If consumers tire of the faddish toy, how much will demand decrease? What is the expected length of time before a sharp decrease in demand occurs? Can the toy company prolong the fad through advertising or by decreasing the price? Volatile demand also increases the possibility that the firm will be stuck with obsolete inventory after the toy fad ends, which will certainly be costly. If the firm has expanded by buying more toy-making machinery, does this machinery obsolesce as well, or can it be used in the production for other toys? If it can be used for other toys, how profitable are these other toys likely to be?[26] In sum, precision in specifying risks translates into greater ability to measure the effects of those risks.

Of course, none of this information is likely to be known with certainty. Lacking a crystal ball, managers cannot exactly predict how long the fad will last. They can, however, use their industry knowledge to form an estimate. Managers can analyze past fads, complementing this historical information with their insights about why their particular product might be either more long lasting or shorter-lived. The marketing area might be able to contribute information about expected length of high-demand, as well as information on how sales change in response to price decreases. Likewise, the operations area may be the best source for information on how practicable and costly it is to use the machinery producing the faddish toy for other purposes. Managers need to collect the necessary information about how both revenues and costs will shift with changing demands, finally arriving at an estimated probability, or, better yet, a probability distribution for the toy's life.

To evaluate the effect of the toy company's other major source of risk, exchange rates, the managers must first determine how sales are related to exchange rates, and then

[26] An operational approach to managing the risk of toy fads is that the machinery used to produce toys can be easily adapted to produce a variety of toys, rather than be specific to one toy.

explicitly link firm sales to exchange rates in their valuation model. Suppose that this linkage results from the effect of the yen/dollar exchange rates on market prices in the U.S., which in turn affect U.S. demand. A useful valuation model will specify how much the U.S. market price will change for a given percentage movement in the yen/dollar exchange rate, and then define how a shift in the market price will affect demand for the product in the U.S. The toy company's managers should also assess the probability of large and small exchange rate movements, and whether or how exchange rate risk is correlated to the expected life of the faddish toy.[27]

Challenges in Creating an Integrated Risk Management System

Corporate risk management is evolving rapidly, but the practice of risk aggregation is not yet widespread. Instead, the institutional organization of the typical firm tends to isolate and manage risks by type. The treasurer's office will manage exchange-rate exposures, and perhaps credit risk. Commodity traders, sometimes located within the purchasing area, will focus on commodity price risk. Production and operations management will consider risks associated with the production process. The insurance risk manager focuses on property and casualty risks. Human resources may address employment risks. So, as a practical matter, integrated risk management require the unification (at least for the function of risk management) of previously separate institutional units. The firm, rather than the type of risk, provides a frame of reference.

And, coordination of risk management across separate areas is only the first step. Managers must expand the often times narrow focus of their current risk management practices, moving from a "tactical" to a "strategic" approach. Where tactical risk management has limited objectives, usually the hedging of specific contracts or of other explicit future commitments of the firm, strategic risk management addresses the broader question of how risk affects the value of the *entire* firm. It takes into account how risk affects the firm's competitive environment, including the pricing of its products, the quantity sold, the costs of its inputs, and the response of other firms in the same industry.

[27] That is, they must estimate the probability density function of exchange rate changes and the covariance between exchange rate changes and the expected life of the toy.

Indeed, a firm can be completely hedged tactically, while still having substantial strategic exposure, so integrated risk management demands that managers look beyond the usual definition of “hedging.”

Because an integrated approach to risk management departs from the rigid compartmentalization of risks, and requires a thorough understanding of the firm’s operations, as well as its financial policies, risk management is the clear responsibility of senior managers. It cannot be delegated to derivatives experts, nor can management of each individual risk be delegated to separate business units. Although management will no doubt seek counsel from managers of business units or projects, it must ultimately decide which risks are essential to the profitability of the firm, taking into account cross-risk and cross-business effects, and develop a strategy to manage those risks. The rapidly expanding universe of tools available for risk measurement and management offer managers significant opportunities for value creation, but this growth also creates new responsibilities. Managers must understand how to use these tools, and actively decide on their selective application.

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