

THE REVOLUTION IN CORPORATE RISK MANAGEMENT: A DECADE OF INNOVATIONS IN PROCESS AND PRODUCTS

by Christopher L. Culp,
CP Risk Management LLC and
The University of Chicago*

World War I, most historians agree, could easily have been prevented. It was the calamitous byproduct of overreaction, miscommunication, and plain bad luck. But once the spark was thrown into the powder keg at Sarajevo, the chain of events that became The Great War was set in motion.

When economic historians get around to telling the story of the corporate risk management revolution of the 1990s, they will reach a similar conclusion. The explosion in popularity of “enterprise-wide” risk management in the early ’90s need not have happened—or at least not the way it did. The spark in this case was provided by sensational press accounts of the “great derivatives disasters,” which in turn prompted hasty, ill-advised reactions by companies anxious to avoid the fate of Barings and Procter & Gamble. Thus, rather than evolving gradually and methodically, the corporate risk management revolution of the ’90s got underway in a disorganized, *ad hoc* fashion, producing a curious amalgam of policies and procedures with no clear link to the corporate mission of maximizing value. Focused myopically on loss avoidance and technical risk measurement issues, the resulting risk management programs often bore little resemblance to the predictions (or certainly the prescriptions) of finance theorists.

But as the risk management revolution has unfolded over the last decade, the result has been “convergence”—convergence of various perspectives on risk management once divided by extreme differences in vocabulary, concepts, and methods; convergence of organizational processes for managing an extraordinary variety of risks; convergence of risk management products offered by hitherto completely separate industries like insurance and capital markets; and, finally, convergence of risk management with the quest for the corporate holy grail of optimal capital structure.

At the center of this convergence maelstrom is a fairly recent development called *alternative risk transfer* (“ART”). In my new book on the subject,¹ I define ART as the large and growing collection of “contracts, structures, and solutions” provided by insurance and/or reinsurance companies (a group henceforth referred to as “insurance companies” or “insurers”) that enable companies to transfer or finance some of their risks in non-traditional ways. So defined, ART forms represent the foray of the insurance industry into the corporate financing and capital formation processes that were once the near-exclusive domain of commercial and investment banks.

*The author is grateful to Don Chew, J. B. Heaton, Philippe Planchat, Angelika Schöchlin, Astrid Schornick, and Tom Skwarek for their comments on earlier drafts. The usual disclaimer applies, and all remaining errors are the author's alone. In particular, the views expressed here do not necessarily represent those of CP Risk Management or any of its clients.

1. C. L. Culp, *The ART of Risk Management: Alternative Risk Transfer, Capital Structure, and the Convergence of Insurance and Capital Markets* (New York: Wiley, 2002). Parts of this article draw heavily on this book.

To discuss risk management in a corporate finance context is still considered odd by some. Yet, as I argue in my new book—and as a handful of finance academics have suggested for well over a decade²—to discuss optimal corporate financing and capital structure without taking account of risk management opportunities is quite likely to lead to serious inefficiencies in how a firm manages risk or raises funds—if not both.

As I also argue in this article, a comprehensive approach to corporate finance must begin with a risk management process and strategy that aims explicitly at maximizing the value of the firm. Then, in executing that strategy, management must consider the full range of available risk management products, including new risk finance products such as “contingent capital” and “finite risk” contracts along with well-established risk transfer instruments like interest rate and currency derivatives. And because that range today encompasses both new and established products provided by insurance companies as well as commercial and investment banks, a comprehensive approach to corporate finance thus means taking account, and full advantage, of the convergence accomplished in the last decade. To some observers, particularly finance academics, such convergence has seemed slow in coming. But now that it has arrived, companies like Michelin and United Grain Growers that have adopted such a comprehensive approach will attest that there is no going back.

This article attempts to survey the last decade of innovations in risk management, from risk management as a process to risk management products, with emphasis throughout on the confluence of risk management and corporate finance. We begin with a discussion of where things stood *before* the series of financial scandals and disasters in the early 1990s. Specifically, we review different perspectives on risk management that, until the 1990s, happily co-existed in the almost eerily independent spheres of theory and practice. Next we discuss the forces of convergence that have worked together to unify these disparate risk management perspectives and practices in the last ten years. The remainder of the article then describes some of the most important innovations, first in risk management as a process and then in risk management products.

RISK MANAGEMENT BEFORE 1990—IN THE EYE OF THE BEHOLDER

Until the early 1990s, most people seem to have adopted the same approach to defining risk management that Justice Potter Stewart took when faced with the task of defining pornography: “I don’t know how to define it, but I’ll know it when I see it.” To an environmental scientist, risk management means reducing sulfur dioxide emissions or preventing hazardous chemicals from making their way into the food chain. To a healthcare professional, risk management means analyzing the tradeoff between deaths caused when drugs like Thalidomide come on the market too soon and deaths that result when drugs like penicillin are kept off the market by conservatism, delays, and overregulation. To a financial executive, risk management implies a range of concerns, from making the correct risk adjustment to the discount rate in a capital budgeting problem to protecting the principal invested in a pension plan. The lack of clear understanding about what risk management entails led to a seemingly chaotic variety of perspectives on risk management prior to the revolution of the 1990s.

“Non-Financial” vs. “Financial Risk”

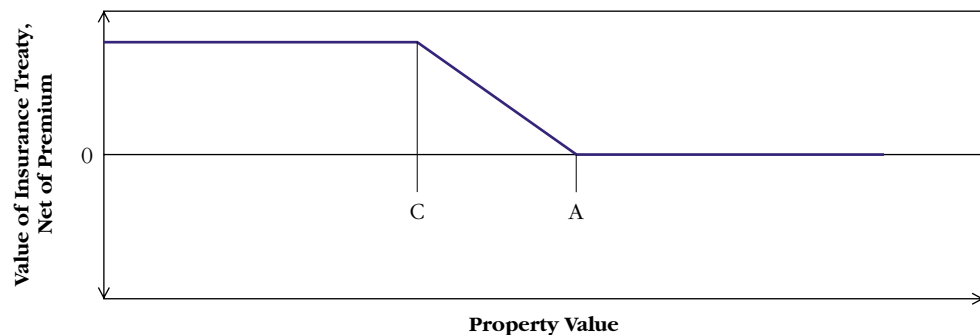
Until the 1990s, the idea that people would discuss “financial” and “non-financial” risks at the same time was nothing less than heretical. A financial risk is the possibility that certain events can unexpectedly and adversely affect a firm’s financial performance, whether by reducing its net asset value or cash flows, or by lowering its reported earnings. The best-known and most widely managed forms of financial risk are market, credit, and liquidity risk. But there are clearly other risks of a more “physical” nature that can also have a financial impact. And this tendency of risk categories to overflow their bounds has forced the financial and non-financial risk worlds to bump up against one another in often uncomfortable ways.

Consider, for example, the Exxon *Valdez* disaster in 1989. When the captain ran the ship aground in the Prince William Sound, causing the largest oil spill in history, the damage to Exxon included not only the costs of environmental clean-up and civil

2. See, for example, D. Mayers and C. W. Smith, Jr., “On the Corporate Demand for Insurance,” *Journal of Business* Vol. 55 (1982), and C. W. Smith, Jr., and R. M.

Stulz, “The Determinants of Firms’ Hedging Policies,” *Journal of Financial and Quantitative Analysis* Vol. 20, No. 4 (1985).

FIGURE 1
FIRE INSURANCE AS A
VERTICAL SPREAD



and administrative liability, but also the potential impact of the oil loss on the company's existing oil hedges—without the oil itself, any hedge suddenly became an outright position and thus a major source of risk. Needless to say, the effect of the *Valdez* incident on Exxon's hedge ratios was hardly a matter of concern for environmentalists intent on saving water fowl; but it also meant little or nothing to the company's legal and insurance staff. The two disciplines—finance and insurance—had almost no common ground.

As the above example is meant to suggest, a financial risk can be defined as any event that can reduce a company's value, cash flow, or earnings. Now let's compare that definition to the three other categories of risk most familiar to insurance theorists and practitioners:³

- *Peril*: a natural, man-made, or economic situation that may cause a personal or property loss;
- *Accident*: an unexpected loss of resources arising from a peril; and
- *Hazard*: something that increases the probability of a loss arising from a peril.

In the parlance of insurance, when a bad outcome occurs, it is no longer a type of risk—at that point, it becomes a loss. In the case of the *Valdez* disaster, the risk of an oil spill was thus both a peril and a financial risk. The disaster itself was an accident, the hazard in question was the captain's apparent penchant for alcohol—and in every way the risks translated into a loss.

For a long time, the world of perils, accidents, and hazards was an actuarial and physical world, whereas the world of financial risk was the province of accounting and finance. Expertise in one world implied a near total lack of expertise in the other. And

this division of risks into “insurance” and “financial” was reflected not only in major differences in the training, expertise, and conceptual approach of individuals, but in the near-total separation of two entire industry groups—industries that, as people eventually recognized, were performing a similar economic function.

“Capital Markets” vs. “Insurance” Perspectives on Risk Management

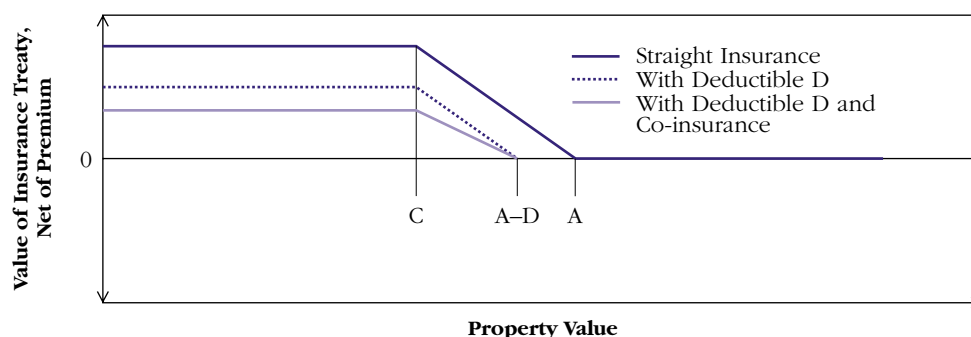
Until the 1990s, the worlds of capital markets and insurance were about as far apart as Mozart's Vienna and the Nashville of the Dixie Chicks. Even the basic vocabularies used by participants in these areas seemed like two distinct languages. Classical insurance deals with perils, hazards, and accidents and is populated by people who use terms like “retrocessionaires” and “funded retentions” and “attachment points.” Financial risk has been the domain of treasurers and traders familiar with concepts like “duration,” “convexity,” “delta,” and “gamma.” And to this day, most college and graduate insurance texts pay at most cursory attention to financial instruments while best-selling finance texts regularly fail even to mention insurance.

But on closer inspection, the actual *products* offered by the two industries are not that different. Consider the simple example of a firm that purchases fire insurance for its headquarters building. Suppose the building is initially worth \$A and the firm buys insurance with a policy limit up to \$C. The solid colored line in Figure 1 depicts the value of this insurance contract to the company, net of the premium paid for the policy. An options user would immediately recognize that the payoff indicated by

3. See, for example, J. F. Outreville, *Theory and Practice of Insurance* (Boston: Kluwer, 1998).

ART forms represent the foray of the insurance industry into the corporate financing and capital formation processes that were once the near-exclusive domain of commercial and investment banks.

FIGURE 2
FIRE INSURANCE WITH A DEDUCTIBLE AND CO-INSURANCE



the solid colored line is exactly the same as the terminal payoff of a short “vertical option spread” written on the value of the firm’s property—that is, a long put struck at $\$A$ and a short put struck at $\$C$.

Traditional insurance contracts are characterized by several important features, one of which is that the purchaser of insurance must have an “insurable interest”—that is, the purchaser must sustain some economic loss in order to receive compensation under the contract.⁴ The firm in Figure 1 has an insurable interest in its headquarters office building because it sustains direct and material damage from a fire. But there is a potential “moral hazard” problem that stems from the fact that the payout on insurance is based on actual damages sustained, and that actions taken by the insured party are not perfectly observable by the insurer. Once insured, the firm may take fewer or less costly precautionary measures to reduce fire hazards, invest too little in fire risk management, or, in the extreme, burn down its own building.

To mitigate moral hazard, insurers include terms like co-payment or co-insurance provisions and deductibles. Figure 2 shows how these features alter the payoff structure (and hence the incentives) of the insured from the straight insurance policy shown in Figure 1. If the building is worth $\$A$ and the insurance has a deductible of $\$D$, the insurance is akin to an out-of-the-money vertical spread. And if the insured party must pay a certain percentage (call it $\alpha\%$) of all damages above $\$(A-D)$ and up to limit $\$C$ (that is, an $\alpha\%$ co-insurance provision), then the insurance is equivalent to a short vertical option

spread comprising α long puts struck at $\$(A-D)$ and α puts sold at $\$C$.

The insurance and option spreads are truly identical, however, only if the options are also written specifically on the value of *this firm’s property*.⁵ Most derivatives transactions are not written this way and instead involve an *optionable interest* rather than an insurable interest. This means that the risks transferred in a derivatives contract need not be risks to which the derivatives counterparties are naturally exposed. In a typical pay fixed/receive LIBOR interest rate swap, for example, the fixed-rate payer need not have a natural exposure to rising LIBOR as a pre-condition for doing the swap. If LIBOR rises relative to the fixed swap rate, the fixed-rate payer is entitled to a net payment from the swap counterparty *regardless* of whether the fixed-rate payer has sustained any economic damage from the interest rate increase. This would be impossible in a traditional insurance contract.

Because the payments on derivatives are optionable and generally *not* based on specific economic losses sustained by specific firms, derivatives counterparties need not worry about moral hazard. But the benefit of vanquishing moral hazard is attained at the cost of introducing *basis risk*. Because most derivatives and traditional capital market solutions have payments based on market indexes, the payment on the derivatives contract may not be perfectly correlated with the exact risk its user is trying to hedge.

The distinction between an insurable and an optionable interest is a critical one that separates

4. This requirement originally was intended to distinguish insurance contracts from gambling. Especially with the proliferation of financial instruments excluded from anti-gambling laws through provisions other than insurable interest requirements, the insurable interest issue has become progressively less important over time. See, for example, C. A. Williams, M. L. Smith, and P. C. Young, *Risk Management and Insurance*, 7th ed. (New York: McGraw-Hill, 1995), R. Phifer,

Reinsurance Fundamentals: Treaty and Facultative (New York: Wiley, 1996), and Outreville, *op. cit.*

5. Note that property ownership is not the key driver here, but rather the direct connection of the loss the property owner takes with the indemnity offered through the insurance contract.

traditional insurance and the risk management *products* offered in the capital markets. But the risk management *process* a firm undertakes to decide which solution makes sense should be the same regardless of which products are ultimately chosen to manage the exposure. Only vocabulary and culture continue to separate two industries whose outward differences have long obscured their common function. But, as we shall see below, all that is changing.

Risk Management “Process” vs. “Products”

In addition to the gaps in corporate risk management stemming from differences in the type of risk and the industries supplying the risk products, still another chasm made it hard to reconcile different perspectives on risk management: the rift between risk management *as a process* and risk management *as products*. The extent of this separation could be seen most clearly in the distance between the worlds of corporate strategy and financial trading. Risk strategists were forever trying to define risk management in terms of business processes like corporate governance, information production and communication, product development, and management of customer relations. To traders, however, risk management was mainly just a code word for market timing and hedge ratio calculations.

For companies developing a risk management program, neither a process nor a product orientation is likely to prove disastrous. But, as I will argue below, a company’s product choices should follow logically from its process. Unfortunately, companies prior to 1990 that failed to grasp this logic also generally lacked a common and consistent framework for answering questions like the following:

- How do I choose from among several similar risk management products?
- Should my reason for managing risk affect the products I use?
- Are substitutes for external risk management products available either on my balance sheet or in the context of my broader corporate financing decisions?

A “process,” according to the *American Heritage Dictionary*, is a “series of actions, changes, or functions that bring about a result.” In the case of risk management, the desired result is that the risks to which a company is *actually* exposed are the same as the risks to which the firm’s security holders *want and expect the firm to be* exposed.⁶ Like most business processes, this is an active and dynamic exercise that is never “complete” in any meaningful sense. Changes in the firm’s assets and liabilities or changes in prevailing market conditions can easily cause a firm’s actual risk profile to deviate from its “risk tolerance,” making the risk management process an essentially continuous one. But even so, a company’s risk management process can be viewed as having several distinct stages:⁷

- Identification of all material “natural” risk exposures—that is, those financial and non-financial risks to which the firm’s primary businesses naturally expose the company;
- Risk retention decision by the firm’s security holders (or, more precisely, their representatives, the top managers and directors);
- Measurement or quantification of the firm’s actual risk exposures for comparison to risk tolerances;
- Monitoring and reporting deviations between actual risk exposures and risk tolerances;
- Actions, processes, and systems required to control deviations between the firm’s actual risk exposures and its tolerances; and
- Oversight, audit, tuning, and re-alignment of risk management as a continuous process—that is, regularly ensuring that the process accomplishes what it is supposed to *and* ensuring that the objectives of the process remain consistent with security holders’ objectives.

The Retention Decision. One aspect of this process merits a bit more attention—namely, deciding which exposures to transfer and which to retain. A key part of this process requires companies to separate their risks into “core” and “non-core” risks. The former are those risks that the firm is “in business to take,” whereas the latter are risks the firm has no clear perceived comparative advantage in bearing. For each company, this classification

6. Throughout this article, a firm’s optimal investment and financing policies are presumed to have the goal of maximizing the market value of the firm, which is the same as maximizing the combined wealth of the firm’s security holders. This is *not* the same as maximizing shareholder or stakeholder value—either of which can be shown to be suboptimal and unstable in a long-run equilibrium. See E. F. Fama, “The Effects of a Firm’s Investment and Financing Decisions on the Welfare

of Its Security Holders,” *American Economic Review* Vol. 68, No. 3 (1978), and M. C. Jensen, “Value Maximization, Stakeholder Theory, and the Corporate Objective Function,” *Journal of Applied Corporate Finance* Vol. 14, No. 3 (Fall 2001).

7. For a much more detailed discussion of the different parts of this process, see my earlier book, *The Risk Management Process: Business Strategy and Tactics* (New York: Wiley, 2001).

Many non-financial companies learned the hard way that although VaR could be quite useful in helping dealers price exotic options and measure daily trading risk, it was of limited use (and in some cases positively misleading) for managing exposures in less liquid markets over longer time horizons.

may be different, thus underscoring the importance of a *formal determination* by a firm's board of what those core risks are.

Consider, for example, a trucking company whose financial risks include both rising gasoline prices that reduce operating margins and rising metals prices that increase the cost of replacement parts. The firm is naturally exposed to both fuel and metal price risks, but its management and board (again, as representatives of its security holders) may conclude that good management of the fleet—which *is* part of the core business—can keep the demand for metal parts under control. Accordingly, the firm's risk management strategy might dictate a focus on fuel price risk while leaving metal price risk to operating managers. As this example is meant to suggest, most of the risks that are explicitly addressed in the firm's risk management process are likely to be non-core risks. But in some cases management will decide to manage core risks as well, especially when such risks expose the firm to the possibility of financial distress.

For those risks the firm chooses not to bear, there are two alternatives. First, the firm can *transfer* the risk to another participant in the market, either by selling or securitizing assets or liabilities, or by using derivatives and other hedging instruments. Alternatively, the firm can *neutralize* the risk using techniques such as balance sheet or operational hedging, structured notes (including commodity- and currency-linked debt), and risk controls.⁸

Another critical component of a firm's retention definition concerns whether or not to secure *advance funding* for any losses resulting from risks the firm retains. To draw on insurance terminology again, an *unfunded retention* is a retained risk for which any losses are financed as they are incurred, whereas a *funded retention* involves the allocation of specific funds to specific expected losses. If funds are allocated to losses based on a price negotiated before the loss occurs, the funds are called *pre-loss financing*. Funds can also be obtained to finance losses from a specific risk but on *variable* price terms, in which case the firm has arranged *post-loss financing*.⁹

THE CONVERGENCE DECADE

In the wake of the derivatives disasters in the early 1990s, suggestions and formal proposals for reforming corporate risk management policies and procedures came quickly from all quarters. Some were constructive, but most were not. On the positive side, industry groups like the International Swaps and Derivatives Association and "The Group of Thirty" published recommended best practices in risk management that gave some badly needed uniformity to an extremely disparate field. Less helpful, a large number of regulators, legislators, and media commentators were lying in wait for the next finance scandal to replace the Milken/Boesky witch hunt that was at long last subsiding. The "evils of derivatives" and the need for draconian risk management became the new populist rallying cry.

As a consequence, the first part of the 1990s was more crisis management than risk management. Many companies jumped headlong onto the risk management bandwagon, more out of fear—both of losses and crusading politicians—than because the risk management process actually *made sense* as part of an overall corporate strategy to increase firm value. Many corporations hastily installed (often outrageously priced) value-at-risk (VaR) systems, for example, without paying much attention to how such systems fit their specific business requirements. Quite a number of my non-financial clients that purchased such software ended up putting it back on the shelf. They learned the hard way that although VaR could be quite useful in helping dealers price exotic options and measure daily trading risk, it was of limited use (and in some cases positively misleading) for non-financial corporates attempting to manage exposures in less liquid markets over longer time horizons.

Complicating matters was the sudden huge demand for risk management professionals and technicians generated by political and regulatory pressure. What was needed at the beginning of the 1990s was greater integration between classical insurance and capital markets risk management, but what emerged was yet a third category of risk

8. As an example, if British Airways expects a larger amount of dollar/sterling risk to arise on its expected U.S. ticket sales than its security holders want to bear, the company can (and does) issue dollar-denominated debt to help neutralize that exposure. See C. L. Culp, D. Furbush, and B. T. Kavanagh, "Structured Debt and Corporate Risk Management," *Journal of Applied Corporate Finance* Vol. 7, No. 3 (Fall 1994).

9. For a discussion of when pre-loss financing makes sense and when it does not, see Chapters 9-13 of N. A. Doherty, *Integrated Risk Management* (New York: McGraw-Hill, 2000).

manager often better trained in physics than economics. Fueled by the need many boards felt to “be doing something,” the risk management focus went straight to issues that were purely technical in nature—what distributional assumptions to make, how to model time-varying correlation matrices, and the like. Although useful in many risk management applications—especially at financial institutions with rapidly changing exposures in traded financial instruments—little thought and effort was devoted to harmonizing corporate risk management practice with the corporate objective of value maximization.

But this would begin to change over the next five years. The sheer amount of money being poured into risk management—reports of “chief risk officers” being hired for more than a million dollars a year were not unusual—ensured that corporations and academics alike would begin the struggle to plant risk management on a more solid foundation of corporate finance and business strategy. With the technology of risk measurement now firmly in their grasp, the question then became how to *use* such risk measurement in a manner consistent with the firm’s business and risk management strategy—the question that should have come first.

Convergence in Risk Management as an Organizational Process

One direct outgrowth of publications like the Group of Thirty report was the widespread establishment by active derivatives dealers of independent risk management units that were segregated from “front office” risk-taking activities. But even within the realm of financial risk, these early risk management units were responsible mainly for *market* risk management—for example, administering a set of trading limits based on some analytical measure of market risk. This was the primary function of the so-called “middle office.”

Slowly but surely, many financial institutions began to recognize that analytical risk measurement requirements alone created considerable economies of scope from merging market and credit risk management. The obvious next step was to measure and coordinate the management of *all* of a company’s major risks in a manner consistent with the fundamental business objectives of the firm.

Enterprise-wide risk management, or ERM, aims to *consolidate* and *integrate* both the process by which a firm manages its risks *and* the risks that are targeted in that process. Arthur Andersen usefully defines ERM as

*a structured and disciplined approach [that] aligns strategy, processes, people, technology and knowledge with the purpose of evaluating and managing the uncertainties the enterprise faces as it creates value...It is a truly holistic, integrated, forward-looking and process-oriented approach managing all key business risks and opportunities—not just financial ones—with the intent of maximizing shareholder value for the enterprise as a whole.*¹⁰

There are four basic differences between ERM and other less formal, more *ad hoc* approaches. First, ERM seeks to consolidate exposure types not just across financial risks but also across non-financial perils and hazards. In so doing, ERM seeks to differentiate between core risks and non-core risks—and, as part of that process, between those risks in which the firm has some perceived comparative informational advantage and those where it views itself as no better informed than other market participants.

A second distinguishing feature of ERM is that it involves viewing all risks facing a company through some form of common lens, such as that provided by risk measurement frameworks like VaR and RAROC (risk-adjusted return on capital, discussed in more detail below). But at a more general level, ERM implies the ability of management to transform the chaotic variety of financial instruments into an orderly array of related—and in some respects interchangeable—tools for accomplishing the firm’s overarching risk management goals. From this vantage point, what matters is *not* whether a risk is best managed through “swaps,” “insurance,” or “trading limits,” but whether the company’s resulting enterprise-wide risk exposure conforms to the risk tolerances of its security holders *and*, in the process, enables the firm to minimize its cost of capital.

A third characteristic of ERM is its attempt to consolidate the risk management process organizationally across systems, processes, and people. In other words, the “enterprise-wide” in ERM refers not

10. J. W. DeLoach, *Enterprise-Wide Risk Management* (London: Financial Times-Prentice Hall, 2000), p. 5.

A company intent on finding its value-maximizing capital structure cannot do so without first assessing its major risks and determining, at least to a first approximation, its plan to transfer or retain them.

just to a company's view of the risks it is facing, but also the degree of coordination and consolidation with which the firm manages those risks.

Finally, enterprise-wide risk managers are constantly looking for more integrated risk management products and solutions. Capital and insurance markets have been converging over the last decade on both the demand and supply sides. On the supply side, an investment banker might solicit a once-unheard-of meeting with the head of a corporation's captive insurance company instead of its chief financial officer (CFO). At the same time, several reinsurance companies now boast of relationships with corporate CFOs that are deeper than those most CFOs now have with their derivatives dealers. On the demand side, corporations with a growing ERM focus are increasingly seeking one-stop shopping for their risk management solutions, prompting insurance and reinsurance companies like AIG and Swiss Re to offer earnings per share insurance, and derivatives participants like Goldman Sachs and Lehman to set up licensed reinsurance subsidiaries.

Convergence on a Common Theme— Capital Structure Optimization

The recent trend toward convergence in risk management processes and products across different lines is much more fundamental than just growing similarities among institutions or the progressive integration of once separate markets like swaps and Eurodollar futures strips. The *real* convergence—the one that underlies and to a great extent is driving the others just discussed—is the integration of *corporate finance* and *risk management*. As I suggested at the outset of this article (and as Prakash Shimpi demonstrates in the article that follows this one), a company intent on finding its value-maximizing capital structure cannot do so without first assessing its major risks and determining, at least to a first approximation, its plan to transfer or retain (and perhaps pre-fund) them.¹¹ By the same token, a company's risk management policy, particularly its product choices, will generally have to be coordinated with its financing decisions, including the design of its securities.

At the most basic level, the company's capital structure decision is where corporate risk management converges with the theory and practice of corporate finance. After all, instead of transferring a given risk, a company can simply issue more equity to absorb the larger expected losses. And instead of using a risk financing product, a firm can borrow the old-fashioned way by issuing new debt or arranging a line of credit. In a very real sense, most risk transfer products are thus *synthetic equity*—and risk financing can be viewed as *synthetic debt*.

The challenge confronting today's CFO is thus to maximize firm value by choosing the mixture of securities and risk management products and solutions that gives the company access to capital at the lowest possible weighted cost. Corporations and suppliers of capital and risk management products increasingly recognize that the quest for optimal capital structure and the design of a risk management program are often driven by the same underlying economic considerations. And as we shall see later, the rising demand for products that allow firms to manage their risks and their capital *at the same time* is in large part responsible for the development of the rapidly evolving ART market.

ADVANCES IN RISK MANAGEMENT AS A PROCESS

Let's now turn to some of the major advances in risk management as an enterprise-wide process over the past decade. Although there have been countless incremental improvements in many aspects of the process, our focus here will be on major innovations that have strengthened *the entire process*.

Risk Management Should Aim to Increase Value

The most fundamental change in the process of corporate risk management has been the growing recognition that risk management must contribute to the overarching corporate goal of value maximization. But this begs the question: how does risk management increase value? In the M&M world of perfect capital markets that many of us were introduced to in business school, corporate risk management was

11. See Prakash A. Shimpi, *Integrating Corporate Risk Management* (New York: Texere, 2001), as well as the article in this issue that draws heavily on Chapter 3 of the book.

largely a matter of indifference to the company's stockholders. Because such investors could diversify away the risks associated with fluctuations in interest rates or commodity prices simply by holding well-diversified portfolios, they would not pay a higher P/E multiple (or, what amounts to the same thing, lower the cost of capital) for companies that chose to hedge such risk. So if hedging was unlikely to affect a firm's cost of capital and value, then why do it?

Two decades of theoretical and empirical work on the issue of "why firms hedge" have produced a number of plausible explanations for how risk management can increase firm value—that is, how it can increase the firm's expected cash flows even after taking account of the costs of setting up and administering the risk management program.¹² Summarized briefly, such research suggests that risk management can help companies increase (or protect) their expected net cash flows mainly in the following ways:¹³

- By reducing expected tax liabilities when the firm faces tax rates that rise with different levels of taxable income.
- By reducing the expected costs of financial distress caused by a downturn in cash flow or earnings, or a shortfall in the value of assets below liabilities. Although such costs include the out-of-pocket expenses associated with any formal (or informal) reorganization, more important considerations are the diversion of management time and focus, loss of valuable investment opportunities, and potential alienation of other important corporate stakeholders (customers, suppliers, and employees) that can stem from financial trouble.
- By reducing potential conflicts between a company's creditors and stockholders, including the possibility that "debt overhang" results in the sacrifice of valuable strategic investments.
- By overcoming the managerial risk aversion that (in the absence of hedging) could lead managers to invest in excessively conservative projects to protect their annual income and, ultimately, their job security.

■ By reducing the possibility of corporate underinvestment that arises from unexpected depletions of internal cash when the firm faces costs of external finance that are high enough to outweigh the benefits of undertaking the new investment.

As this list suggests, value-increasing risk management has little to do with dampening swings in reported earnings (or even, as many academics have suggested, minimizing the "variance" of cash flows). For most companies, the main contribution of risk management is likely to be its role in minimizing the probability of *costly*¹⁴ financial distress. In this sense, the optimal risk management policy may be one that provides a kind of insurance against "worst-case" scenarios or, to use an actual insurance term, "catastrophic" outcomes. And even when the company has relatively little debt, management may choose to purchase such catastrophic insurance to protect the company's ability to carry out the major investments that are part of its strategic plan. In the process of insuring against catastrophic outcomes and preserving a minimal level of cash flow, companies will generally discover that they can operate with less capital (or at least less equity capital) than if they left their exposures unmanaged. And to the extent that hedging proves to be a cheap substitute for capital, risk management is a value-adding proposition.¹⁵

Besides economizing on a firm's use of capital while protecting its strategic plan, there is another potentially value-increasing application of risk management—one that has largely escaped the attention of finance theorists. Increasingly, companies are also recognizing that the expertise required to reduce their own catastrophic risks can sometimes be leveraged into opportunities to increase expected revenues. Such revenues come *not* from taking open positions in financial markets, but from the risk management unit's ability to provide (and even sell) other valuable products and services without changing the net risk exposure of the firm.

The Risk Management Unit as a "Service Bureau." Having incurred the costs of setting up a risk management process and infrastructure, companies

12. In principle, risk management can also reduce the firm's cost of capital. For example, managing risk can lower the capital cost for a partnership whose shareholders have most of their own wealth tied up in the firm.

13. See Part I of Culp (2001) for a reasonably thorough summary of the different major theories, including some not explicitly mentioned here.

14. As the italics are meant to suggest, the possibility of financial distress is not necessarily value-reducing for all firms; in fact, for mature companies with large

and stable operating cash flow and limited investment opportunities, high leverage, which of course raises the probability of financial distress, is likely to be a value-increasing strategy by reducing managers' natural tendency to spend (and thereby waste) excess cash flow.

15. For an example of how insurance has the potential to reduce a company's cost of capital, see Prakash Shimpri's article in this issue.

Value-increasing risk management has little if anything to do with dampening swings in reported earnings. For most companies, the main contribution of risk management is likely to be its role in minimizing the probability of costly financial distress.

whose risk management units rely on diverse valuation and risk measurement models may discover that those units can function as an internal “service bureau” that provides financial modeling capability throughout the firm.¹⁶ As one example of the kind of analysis that some risk units now can and do provide, many companies evaluate business opportunities with value-based management (VBM) concepts like economic value added (EVA) and shareholder value added (SVA). The systems required to measure EVA and SVA are essentially just large cash flow forecasting and risk-adjusted discounting systems, which are almost certainly *already housed* in a comprehensive ERM risk measurement system. Also found in many ERM systems are tools for capital budgeting, risk-adjusted capital allocation, capital structure optimization, and scenario analysis that the firm’s risk management unit could make accessible to other parts of the firm.

The Risk Management Unit as an Internal “Bank.” Some companies have also discovered that significant efficiency gains can be achieved—both within and outside the internal risk management process—by allowing the risk management unit to function as a type of internal treasury department, or “internal bank,” for the business units of the firm. In such arrangements, Treasury is still responsible for *external* finance, but risk management increasingly takes care of the analytical service and financial product demands of business units for *internal* financial transactions.

Such risk management-cum-internal banking units also typically offer their analytical services to other business units, including risk management products and solutions. Mirroring risk control transactions, for example, are often executed between the risk unit and individual business units before being executed by and between the risk unit and an external counterparty like a swap dealer. This enables all risks to be transferred from the business units to the internal bank, which in turn gives the internal bank the comprehensive view of and control over the firm’s total risks that are necessary to achieve enterprise-wide exposure management and portfolio-based risk measurement and control.

The trend in this area seems to be confined mainly to non-financial corporates, including com-

panies like Novartis, ABB, Michelin, and Siemens. In the case of ABB (and several other firms whose names I’m not at liberty to disclose), risk units that serve as internal banks have also begun to offer *external* banking services. Both capital structure and banking products like letters of credit and risk management products like derivatives are routinely supplied to outside customers of the firm. In some cases, these external banking divisions also provide advisory services to customers in the area of risk and treasury management.

Why a Firm Manages Risk Should Affect How

From a practical standpoint, risk management can add to firm value when the risk management process is aimed at protecting value, cash flows, or earnings—but *not usually all three at once*. Hedging to reduce expected taxes is an earnings-based strategy, for example, while hedging to prevent a shortfall of assets below liabilities is value-based. And hedging to reduce underinvestment stemming from prohibitive costs of external finance is designed to ensure minimal levels of internal funds.

Finance theorists, to be sure, have long maintained that the value of the firm is linked directly to its cash flows. And a firm’s earnings are basically just its operating cash flow with the appropriate accounting rules overlaid. But despite the close relations of these three measures, they can be quite different when viewed through a risk manager’s eyes. The difference between value on the one hand and either earnings or cash flows on the other, for example, is at bottom the difference between a *stock* and a *flow*. The value of the firm is its value *at any specific point in time*; the cash flows or earnings of a firm occur over some *interval* of time. As some firms have learned the hard way, controlling one of these variables does not always mean controlling the other.

Increased corporate awareness of the linkages between *why* risk is managed and *how* it should be managed has been one of the major advances in the risk management process over the last decade. A company’s underlying rationale for risk management—that is, its understanding of how risk management is expected to add value—should in turn influence key aspects of the firm’s risk management

16. See C. L. Culp and P. Planchat, “New Risk Culture: An Opportunity for Business Growth and Innovation,” *Derivatives Quarterly* Vol. 6, No. 4 (Summer 2000).

approach, including how it distinguishes between core and non-core risks and what measure of financial condition serves as the basic building block for the rest of the risk management process. As one example, a multinational corporation intent on maintaining sufficient cash flow to carry out its strategic investments is unlikely to hedge with futures, which are marked to market at least daily and thus can actually increase cash flow volatility even while locking in net asset value and earnings.

Consistency in Risk Measurement Methods

As we saw earlier, one major reason for the rapid growth in risk management “as a discipline unto itself” was the explosion of research on risk measurement and the use of summary risk measures as the basis for reporting, monitoring, and control systems. Progress over the past decade in the technology of risk measurement and reporting has been impressive, both for specific risk types as well as across different exposures.

Market Risk. A major byproduct of the early years of the risk management revolution was the widespread adoption of forward-looking measures of market risk that express potential losses in terms of their probabilities. Such measures have been used to supplement, if not replace, less reliable risk measures such as static risk sensitivities like duration or the net interest income gap. Easily the most popular forward-looking market risk measure is value-at-risk (VaR) (or its flow equivalent, cash flow-at-risk (CaR)). Apart from the adoption of VaR and related risk measures, most advances in market risk measurement have been methodological improvements. Notable among such advances are better parameter estimation methods for volatility and correlation used in the parametric normal VaR implementation, better “primitives” for use as proxies of actual positions, the use of “extreme value theory” (to take account of the possibility of low-probability, catastrophic events) for summary risk

measurement,¹⁷ and the use of non-parametric methods for loss measurement.¹⁸

Credit Risk. Significant advances have also been made within the area of credit risk measurement. In commercial banking applications, the core of any credit risk measurement model has always been *expected loss*.¹⁹ Traditional transactional models define expected loss for any asset as the product of three terms: the expected default rate (DR) of an obligor, the expected loss (net of recoveries) in the event of default, and the potential credit exposure (PCE). Numerous improvements have been made in the past decade in the measurement of each of these terms. Two examples of such improvements are reasonably advanced credit scoring models and analytical models for DR estimation (including models that allow the DR to “migrate” across rating changes rather than remain constant)²⁰ and option-theoretic approaches for modeling the PCE of derivatives.²¹ The last decade has also seen the development of *portfolio* measures of credit risk that capture interactions between the components of expected loss that were traditionally treated as independent.²²

Operational Risk. The International Swaps and Derivatives Association, British Bankers’ Association, and the Risk Management Association all define operational risk as “the risk of loss resulting from inadequate or failed internal processes, people, and systems or from external events.”²³ Interest in “op risk” measurement has grown significantly since the promulgation in 1999 of a major revision in the Basel Capital Accord for banks. Among other things, the proposed revision creates a “whole capital charge” that reflects *all* the major risks facing banks, including op risk. On the one hand, the attempt to measure op risk seems to indicate greater integration between financial risk and classic insurance perils and hazards. On the other hand, the current preoccupation with *measuring* op risk has led some to contend that more attention is paid to modeling op risk for its own sake than to *managing* op risk, which is arguably all that matters.

17. See, for example, F. M. Longin, “From Value at Risk to Stress Testing: The Extreme Value Approach,” *Journal of Banking and Finance* Vol. 24 (2000).

18. See, for example, Y. Ait-Sahalia and A. W. Lo, “Nonparametric Risk Management and Implied Risk Aversion,” *Journal of Econometrics* Vol. 94 (2000).

19. See C. Matten, *Managing Bank Capital* (New York: Wiley, 2000).

20. See M. Crouhy, D. Galai, and R. Mark, “A Comparative Analysis of Current Credit Risk Models,” *Journal of Banking & Finance* Vol. 24 (2000).

21. See, for example, C. W. Smithson, *Managing Financial Risk* (New York: McGraw-Hill, 1998).

22. For surveys of the major advances in credit risk measurement, see J.B. Caouette, E. I. Altman, and P. Narayanan, *Managing Credit Risk* (New York: Wiley, 1998), M. Ong, *Internal Credit Risk Models* (London: Risk Books, 1999), A. Saunders, *Credit Risk Measurement: New Approaches to Value at Risk and Other Paradigms* (New York: Wiley, 1999), D. Shimko, *Credit Risk: Models and Management* (London: Risk Books, 1999), and M. Crouhy, D. Galai, and R. Mark, *Risk Management* (New York: McGraw-Hill, 2001).

23. International Swaps and Derivatives Association, British Bankers’ Association, and Risk Management Association, *Operational Risk: The Next Frontier* (December 1999).

Financial institutions are capable of creating virtually any kind of synthetic derivative to circumvent product-specific trading limits. And thus as ERM momentum replaced derivatives paranoia, companies began to realize that their internal controls should focus on controlling *exposures* rather than products whose names change and whose effects on key variables are impossible to infer from terminology alone.

Integration across Risks. In addition to advances in measuring and summarizing specific risk types, the last few years have also seen significant attention paid to *consolidated* measures of risk across types. Much of the interest in integrated risk measures can be attributed to the growth in corporate adoptions of ERM. Enterprise-wide risk *measurement*, after all, is a virtual necessity for enterprise-wide risk *management*. In addition, the desire by some firms to use risk measurement as the primary basis for explicitly tying internal capital allocation to capital structure has been a further impetus for integration in measures of different risk types.

Several portfolio-based measures of credit risk, for example, attempt to express credit exposure in a VaR-like fashion. And in some cases, risks have been explicitly integrated into a VaR framework, such as liquidity risk-adjusted VaR (L-VaR), a risk measure that reflects both market risk and the risk of widening spreads associated with selling an asset during illiquid market conditions.²⁴

But far and away the most popular of the risk-based capital allocation systems are those that come under the name of RAROC, or risk-adjusted return on capital.²⁵ RAROC is the expected net economic profit of a business line or activity divided by its economic capital at risk (CaR). Net economic profit is generally defined as the expected revenues of a business unit less expected costs and expected losses arising from that business line. CaR is a measure of the capital necessary to support *all* risks that are associated with that business line's expected economic profit.

In order for RAROC to prove useful, CaR must be an integrated risk measure. Although some companies use measures like VaR as a measure of capital at risk, this does not work particularly well in allocating capital to, say, a lending business, where the major risk is credit risk. A much more comprehensive risk measure is required. As interest in integrated risk measures like CaR continues to rise, methodological improvements will doubtless continue to follow, as happened in the '90s first with market risk and then with credit risk.

Risk Control without Financial Instruments

A sound and comprehensive system of internal controls based on the risk exposures associated with the firm's assets and liabilities can go a long way toward keeping firms within their risk tolerances. Before the 1990s, firms often misconstrued this prescription as a call for internal controls on *specific* financial instruments, such as pre-trade authorization requirements. And the derivatives policies set up in response to the derivatives disasters of the '90s actually compounded the problem. More aptly called "anti-derivatives policies," such policies had the effect of depriving risk managers of the hedging benefits of derivatives without actually helping to control the risks associated with derivatives use. As the shareholders of companies like Procter & Gamble learned to their dismay, financial institutions are capable of creating virtually any kind of synthetic derivative to circumvent product-specific trading limits.²⁶ And thus, as ERM momentum gradually replaced derivatives paranoia, companies began to realize that their internal controls should focus on controlling *exposures* rather than products whose names change and whose effects on firm value, cash flows, and earnings are impossible to infer from terminology alone.

The risk-adjusted capital allocation that is perhaps the most important output of a RAROC system can also be used to help companies keep their risks within the established tolerances. But if the number of non-financial corporate users of RAROC as a risk control tool has grown significantly in recent years, financial institutions continue to be by far the largest user group—one that includes Bank of America,²⁷ BankAustria, HypoVereins Bank, First Union, and Canadian Imperial Bank of Commerce.

ADVANCES IN RISK MANAGEMENT PRODUCTS

Now let's turn to new risk management *products*. Rather than attempt to cite every new instrument developed in the last ten years, we focus here on several major *themes* in the product innovations of the 1990s.

24. For a discussion of this and other related risk measurement extensions, see P. Jorion, *Value at Risk* (New York, McGraw-Hill, 2000), and Crouhy, Galai, and Mark (2001), *op. cit.*

25. Alternatively, some focus on return on risk-adjusted capital. For a good discussion of alternative capital measures, see Matten, *op. cit.*

26. Even in the case of actual derivatives like notional interest rate swaps, embedded options often make such instruments much riskier than the name "swaps" would suggest. See Chapters 13, 14, and 22 of Culp (2001), *op. cit.*

27. See E. J. Zaik, G. Walter, G. Kelling, and C. James, "RAROC at Bank of America: From Theory to Practice," *Journal of Applied Corporate Finance* Vol. 9, No. 2 (Summer 1996).

“Equitized” Risk Transfer Products

When a company is seeking to reduce the expected costs of financial distress or reduce the underinvestment costs of debt overhang,²⁸ it can issue new equity. But given the costs associated with equity offerings, the firm may instead choose to use derivatives to manage certain major financial exposures—an action that, as we saw earlier, can reduce the firm’s need for equity capital. But if these two approaches are similar in effect, they are not exact equivalents. Equity will absorb losses arising from *any* risk, whereas risk transfer products are usually aimed at one or two risks, such as commodity price or interest rate fluctuations. Issuing equity, moreover, results in an immediate inflow of paid-in capital, whereas risk transfer products effectively provide what amount to *options* on paid-in capital—that is, the firm receives the funds only in specific circumstances, such as the decline of LIBOR below the fixed rate in a pay floating/receive fixed swap.

One of the most important risk management product trends of the last decade has been the increasing popularity of “equitized” risk transfer products—products that have some of the distinctive features of an equity issue that are not generally found in conventional risk products. Examples can be found in the worlds of both derivatives and insurance.

Total Return Swaps. In the first half of the decade, the market for credit derivatives—over-the-counter transactions that effectively allow companies or investors to transfer credit risks—went from virtually nothing to a notional amount outstanding of around \$40 billion.²⁹ By the end of June 2001, notional amounts of credit derivatives outstanding had exploded to almost \$700 billion.³⁰

One of the most popular types of credit derivatives is called a total return swap (TRS). In a TRS, a firm pays a fixed financing spread over LIBOR in exchange for receiving LIBOR plus all the income *and* the change in value on some underlying asset(s) or portfolio. The cash flows can be based on a

representative index (like the Citibank loan index) or, provided the two parties to the swap can agree on an objective, clearly specified measurement method for the change in value of the asset(s), on actual income and values.³¹

Intended to help firms manage the risk of either an actual default or a downgrade on the reference asset (or assets), the “total return” nature of a TRS makes the transaction economically equivalent to a sale of the asset. That is, the TRS removes *all* the risk and *all* the return of an asset in exchange for a fixed payment based on the *expected* income on the asset. And in the sense that it effectively provides funding in the case of a credit loss, a TRS can be viewed as providing a synthetic new equity issue.³²

Multi-line Integrated Risk Management Policies and Earnings Per Share Insurance. Multi-line, or integrated, risk management products (also called “IRM”) are a type of alternative risk transfer product designed by insurance (and reinsurance) providers in a specific effort to target corporate customers pursuing ERM. They provide combined coverage for *all* the risks an institution may wish to bundle together under the same aggregate limits and deductible—risks like interest rate and professional indemnity that normally would be insured or hedged separately. In an IRM policy, losses arising from *any* of the individual risks can be used to satisfy the deductible and make a claim against the aggregate policy limit.³³

The idea behind IRM programs is that a company that measures and manages risks on an enterprise-wide basis may find it economical to manage its net exposures with an enterprise-wide risk management *product*. The basic reason is this: Because losses on different risks (for example, casualty and interest rate) will be imperfectly correlated over time, the total amount of capital required to support all the risks in one program will typically be less than the capital required to support each risk in a separate policy.

Sometimes replacing a series of individual policies with a single IRM program results in less

28. Underinvestment in this context is a result of the agency costs of debt. See S.C. Myers, “The Determinants of Corporate Borrowing,” *Journal of Financial Economics* Vol. 5 (1977).

29. A. S. Kramer, *Financial Products: Taxation, Regulation, and Design* (New York: Aspen Publishers, Inc., 2001).

30. Bank for International Settlements, *Press Release: The Global OTC Derivatives Market at End-June 2001* (20 December 2001).

31. A TRS thus represents one of the very few derivatives whose payment may be based on actual economic values of one of the firms’ assets, hence resembling an insurable interest.

32. For a numerical example, see my forthcoming article in this journal, “The Economics of Contingent Capital,” *Journal of Applied Corporate Finance* Vol. 15, No. 1 (Spring 2002, forthcoming).

33. The discussion of the IRM of United Grain Growers later in this issue by Scott Harrington, Greg Niehaus, and Kenneth Risko provides an illustration of this point.

The idea behind IRM programs is that a company that measures and manages risks on an enterprise-wide basis may find it economical to manage its net exposures with an enterprise-wide risk management product.

coverage in the catastrophic layers for certain risks. For example, if a company has six risks insured up to \$300 million each and a seventh risk insured up to \$1 billion, the IRM policy likely will have an aggregate limit of less than \$1 billion. Although these numbers appear to suggest that the firm now has a “gap” in its coverage, the aggregate deductible and limits will be set to cover the firm’s desired retention *on a portfolio basis* and thus reflect the recognition that all risks will not result in losses *at the same time*.³⁴ Thus, in a well-structured IRM, apparent gaps in coverage are not gaps at all, but rather efficiency enhancements that prevent capital from being parked idly in one risk silo when it could be covering a loss in another (or returned to shareholders).

Although multi-line programs can cover as few as two risks,³⁵ they can also be comprehensive enough to provide *earnings per share* (EPS) *insurance*. Examples are the Commodity-Embedded Insurance (“COINSM”) and STORMSM programs provided by AIG Risk Finance (which helped AIG win *Risk* magazine’s 1999 Alternative Risk Management House of the Year award) and the Structured Finance EPS management program of Swiss Re. By including essentially all the major risk exposures that a firm faces, EPS insurance functions as a very close substitute for an infusion of equity. Any time EPS falls below a trigger (set relative to some deductible), the firm essentially obtains capital to cover that shortfall on pre-loss terms.

But despite the theoretical appeal of IRM programs, their track record has been marked by several notable failures. When Honeywell merged with Allied Signal, for example, an assessment of Honeywell’s IRM program (covering its insurance and foreign exchange risks) revealed that Honeywell would have paid less overall if it had instead purchased separate insurance policies and engaged in conventional hedging solutions to address its exchange rate risk. The program was thus dismantled, as was Mobil Oil’s IRM program in 1999—and for the same reasons. Utah-based petrochemical company Huntsman claims it opted not to buy an IRM product because its silo-by-silo coverage with 30 different insurers was simply cheaper.

But if IRM programs successfully bundle risks and involve set attachment points that reflect the correlation across those risk types, why are they more expensive? Part of the explanation, of course, is that insurers generally set premium as an “actuarial price” plus a “load.” The former is the “true price” of the cash flow bundle; the latter reflects the insurer’s cost of hedging or reinsurance. So, although IRM programs may involve actuarial prices that are lower than the sum of the component policies’ actuarial premiums, the problem is likely to come in the hedging costs built into the load. Especially when an IRM program includes financial risks, the insurer will rarely retain 100% of the loss exposure across all risks. But if the insurer cannot hedge its underwriting risks on the same portfolio basis it offers to customers, the cost to the insurer of hedging will be the sum of the premiums of the risk transfer solutions *for each risk managed separately*—thus wiping out the actuarial cost savings. In other words, many IRM products merely push the unbundled pricing problem back one level.

Despite such setbacks, however, some multi-line policies have proven successful as of this date. Union Carbide recently renewed a major multi-line IRM product, and both Mead Corp. and Sun Microsystems claim to have saved more than 20% by consolidating their numerous risk transfer policies into a single structure.³⁶ This suggests that the providers of these policies either retained a big chunk of the risk, thus avoiding the hedging costs that render such programs uneconomic, or had much lower hedging costs than their customers.

Other multi-line success stories can be attributed to situations where the primary benefit of an integrated policy is optimized coverage rather than reduced costs. For example, Winnipeg-based United Grain Growers (“UGG”) was concerned that weather-related risks could adversely affect its grain volume and hence its revenues. Working with the insurance broker Willis, UGG entered into a three-year deal with Swiss Re that effectively provides coverage of credit, counterparty, weather, environmental, inventory, property/casualty, and grain price risk. The key provision in UGG’s policy (as discussed by Scott Harrington, Greg Niehaus, and Kenneth Risko later

34. The purveyors of IRM products—such as Swiss Re’s Multi-line Aggregated and Combined Risk Optimization (“MACRO”)—emphasize that a key to their success is careful analysis of clients’ actual loss experiences and risks, which in turn leads to “optimal” limits and deductibles.

35. For a discussion of a range of different multi-line policies, see Culp (2002), *op. cit.*, and Shimpi, *op. cit.*

36. Gerling Global Financial Products, Inc., *Modern ART Practice* (London: Euromoney Institutional Investor, 2000).

in this issue) is one that effectively guarantees payments from Swiss Re whenever UGG's grain shipments—and hence its expected earnings and cash flow—fall below a level deemed necessary to protect the company's ability to make strategic investments. As the UGG case illustrates, IRM products can be appealing because they allow companies to tailor their capital planning to their own risk profile.

The Appeal of Risk Finance

The 1990s also saw significant growth in risk management products aimed at helping companies finance their retained risks *on pre-loss terms* rather than transferring those risks.³⁷ Pre-loss risk finance makes particular sense for firms seeking to avoid underinvestment problems that can arise when a shortage of internal funds is accompanied by high external financing costs.³⁸ Under these circumstances,³⁹ rather than engaging in a risk transfer or an expensive new equity issue, the firm could issue new debt or arrange committed letters of credit *before* a loss occurs—or it could choose risk financing products.⁴⁰

Risk finance can be secured either through derivatives or ART forms. Income swaps, for example, can be used to exchange one stream of cash flows for another stream that is approximately equal in present value terms but with different timing. An income swap can convert a pool of assets paying interest semiannually into a quarterly cash flow stream—or it may be used to convert a pool paying interest on an Actual/365 bond-equivalent basis to an Actual/360 money market basis. Credit and market risk on the assets are not borne by the swap counterparty; the transaction affects only the timing of cash flows on the reference asset(s), and the swap dealer's only risk is that timing risk.

Before the 1990s, the principal way for companies to pre-fund losses was through the use of internal reserves, earmarked funds, self-insurance, or wholly owned insurance affiliates known as "captive" insurance companies. Captives deserve special mention since several of their features—including limited risk transfer, shared participation in any premium investment income, and premium rebate in the event of a favorable loss experience—are also found in most of the alternative risk transfer (ART) products created in the '90s. What's more, the captive itself has evolved into more flexible forms of risk finance, including vehicles like rent-a-captives and protected cell companies.⁴¹

More recently, the insurance industry has developed specific products known as "finite risk" products and structures designed to help companies finance losses from retained risks.⁴² For example, "loss portfolio transfers" (LPTs) are used by companies like Johns Manville and Hanson/Beazer to manage the timing risk of a known liability for which reserves have already been set aside. Even if the reserves are equal to the expected liability *in present value terms*, the firm still bears the risk that losses arrive faster than the reserves grow in value. To address that risk, the firm cedes both its reserves and its liability up to the amount of its reserves. If losses exceed total reserves, the firm is still on the hook, but it is now protected from the risk of an unexpectedly rapid loss development period.⁴³ In sum, loss portfolio transfers are the insurance analogues of income swaps.

Consider the following application of an LPT product. In a typical merger, the seller places money in escrow to cover its representations and warranties (R&Ws), and violations of those R&Ws can result in claims against the escrow account. Companies concerned that an R&W claim may

37. Doherty, *op. cit.*, derives the conditions under which pre-loss financing is of any real benefit.

38. More precisely, underinvestment occurs when external financing costs rise at a faster rate than internal funding rates. See K. A. Froot, D. S. Scharfstein, and J. C. Stein, "Risk Management: Coordinating Investment and Financing Policies," *Journal of Finance* Vol. 48, No. 5 (1993), and K. A. Froot, D. S. Scharfstein, and J. C. Stein, "A Framework for Risk Management," *Harvard Business Review* (November-December 1994).

39. Note that this is a different kind of underinvestment problem than in the previous section, where we saw that if a company has too much debt for equity holders to benefit from new investments, the firm must engage in risk transfer or issue new equity to increase its debt capacity. Otherwise, the firm's stockholders are likely to reject positive NPV projects because most of the benefits of such projects go to retiring the firm's debt. Here we consider a different underinvestment problem, one involving a firm's *flow of funds* rather than the stock of its debt.

40. If the costs of external finance include adverse selection costs that give rise to a pecking order, risk finance instruments will be preferred to issuing new debt even during periods of strong earnings. See S. C. Myers, "The Capital Structure Puzzle," *Journal of Finance* Vol. 39, No. 3 (1984), and S. C. Myers and N. S. Majluf, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics* Vol. 13 (1984).

41. See P. Wöhrmann, "Swiss Developments in Alternative Risk Financing Models," *The European America Business Journal* (Spring 1998).

42. See R. G. Monti and A. Barile, *A Practical Guide to Finite Risk Insurance and Reinsurance* (New York: Wiley, 1995), and R. Carter, L. Lucas, and N. Ralph, *Reinsurance*, 4th ed. (London: Reactions Publishing Group in association with Guy Carpenter & Company, 2000).

43. Under several jurisdictions around the world, finite risk policies must involve *some* amount of underwriting risk as well, in order to receive tax, accounting, and regulatory treatment as insurance.

The second trigger often found in ART forms typically serves to reduce the cost of insurance in two main ways: (1) by limiting the moral hazard problem, and (2) by limiting the range of circumstances in which the policy pays off, in many cases just to situations when the firm is expected to have a significant need for funds.

scuttle an otherwise beneficial transaction can insure their reps and warranties directly.⁴⁴ Alternatively, the firms might wish to retain that risk but instead improve the terms on which it is financed. Escrow funds are usually given to a collateral trustee and left to earn little more than the money market rate during the M&A negotiations. But by means of an LPT, the escrow could instead be ceded to an insurer that, besides providing explicit R&W insurance with a policy limit equal to the size of the escrow, would invest the funds in its broader, higher-yielding technical reserve portfolio. As in the case of most ART products, the benefits in the form of a higher yield would be split between the insured firm and the insurer. There would be no real transfer of R&W risk, moreover, because the insurer can apply the escrow to claims up to the escrow amount and is protected from R&W claims above that amount by the policy limit. Thus, the insurer bears only the investment risk, but nothing else.

Two Distinctive Features of ART Forms

Having already discussed multi-line IRMs and finite risk products, let's now consider some of the features that often distinguish such ART products from more conventional insurance products and solutions. One distinguishing feature is the underwriting of financial risks together with non-financial perils—hence the classification of IRM programs as an ART form. Two other notable differences between ART and traditional insurance products are the former's extensive use of "double triggers" and "experience participation."

Double Triggers. A contract is considered an ART form if it contains two triggers, one of which is the occurrence of an economic loss by the insured; the second is in many cases tied to an index variable independent of the insured's performance and beyond its control or influence. The second trigger serves to reduce the cost of insurance in two main ways: (1) by limiting the moral hazard problem, and (2) by limiting the range of circumstances in which the policy pays off, in many cases just to situations when the firm is

expected to have a significant need for funds. Although the second trigger does not affect the amount of the payment to the insured party, it guarantees that the insured cannot *access* those funds unless something occurs that is beyond its control. The insured firm is thus making a tradeoff: in exchange for a reduction in moral hazard (and the associated savings in its insurance premium), the firm is exposing itself to "basis risk" from the second trigger—namely, the possibility that the specific risk the firm is attempting to insure against turns out to have a low correlation with the second trigger. The risk here is that although the risk and the firm's expected losses materialize, the second trigger fails to activate and the firm ends up "self-insuring."

The more equity-like a risk transfer product, the greater the potential for moral hazard problems and thus the greater the need for a second trigger. In the case of EPS insurance, for example, the moral hazard problem looms so large as to rule out the possibility of coverage for most companies. In the case of United Grain Growers discussed earlier, what allayed the insurer's concerns about moral hazard was the existence of an index of Canadian wheat shipments that, while highly correlated with the company's earnings, was clearly beyond the control of the insured.

In some cases, the second trigger on an ART form is used not so much to manage moral hazard as to help isolate and target the specific mixture of risks being managed. In such cases, the second trigger helps effectively provide customers with expanded risk coverage, which generally leads to an increase in the premiums. But in other cases, the second trigger is designed in large part to lower the overall cost of risk management to the customer. A good example of the latter is provided by Swiss Re's business interruption ("BI") protection program, which is aimed specifically at telecommunication firms attempting to protect against underinvestment.⁴⁵ The policy pays out only when two conditions are met: (1) the purchaser sustains a loss in revenue (above the deductible) attributable directly to a business interruption, and (2) the purchaser's EBITDA growth rate falls more than a certain percentage

44. "Transactional insurance products" for M&As are discussed in T. Boundas and T. L. Ferro, "The Convergence of Insurance and Investment Banking: Representations & Warranties Insurance and Other Insurance Products Designed to Facilitate Corporate Transactions," in Culp (2002), *op. cit.*

45. See D. Imfeld, "Keeping an Eye on Interruption Risk," *Alternative Risk Strategies: Special Supplement to Risk Magazine* (December 2000).

below the growth rate of an index based on other telecom firms' EBITDAs. *If* the policy pays out, it reimburses the purchaser for actual damages from the business interruption; but the policy pays out only when such damages contribute to cash flow underperformance by the insured. The second trigger appears designed to limit Swiss Re's exposure to the telecom sector because it ensures that the policy is not activated by industry-wide cash flow problems, but only by the insured's failure to stay even with its competitors.

Experience Participation. Unlike traditional insurance and reinsurance, ART forms often involve some profit-sharing provision that allows the insured and insurer to share in the risks and returns of the transactions. The mechanics by which profit and loss sharing is accomplished in a particular ART form depend on the nature of the transaction. In the case of the finite risk products mentioned earlier, sharing is accomplished through the use of an *experience account* that tracks the paper profits and losses on the actual underlying deal. Premiums paid by the insured to the insurer are credited to the account, as is interest on invested premium reserves. Losses and various charges incurred by the insurer are debited from the account. At the end of the term, the insurer and insured split the balance in the experience account. In some programs, the present value of expected future investment income may also be credited against the initial premium owed, which further reduces the total cost of the program.

Contingent Capital as a Risk Management Product

No innovation of the last decade serves to illustrate the convergence of risk management and corporate finance more clearly than contingent capital. Such capital is "contingent" in the sense that, like committed bank lines of credit, it effectively gives companies the *option* to raise capital (in some cases equity, in others debt) when they expect to need it most—for example, after the occurrence of an insurable loss *and* a depletion of internal funds. In this sense, contingent capital represents the new class of insurance products that enables firms to

engage in financing and risk management decisions at the same time.

Such products come in several different forms, most of which function like "knock-in" put options on debt or equity. The "barrier" in question is the second trigger (with the first represented by the fact that the cost of raising capital through the option must be lower than that available in the open market for the insured to want to exercise it). Unlike double-trigger insurance, however, the second trigger on most contingent capital products is *not* an index, but rather a risk or loss specific to the purchaser of the facility. And, as suggested above, the value of such products consists mainly in the option it gives companies to raise capital in difficult circumstances, generally (though not always) on "pre-loss" terms.⁴⁶

The best way to illustrate the design of contingent capital, as well as its advantages over old-fashioned lines of credit, is to focus on a specific product: the Committed Long-term Capital Solutions (CLOCS™) developed by Swiss Re New Markets in 1999. One recent CLOCS™ was placed by Swiss Re working together with Société Générale (SocGen) for Switzerland's Compagnie Financière Michelin, the financial and holding company for the well-known French tire manufacturer.

The Michelin deal is actually part bank debt and part CLOCS™. SocGen has granted Michelin the right for five years to draw on a deeply subordinated long-term bank credit facility. Swiss Re has given Michelin an option over the same five-year period to issue subordinated debt, at a pre-negotiated fixed spread, that matures in 2012. The bank line is a classic risk finance banking product with no second trigger. The CLOCS™ option, by contrast, can be exercised only when the combined average growth rate of GDP across the European and U.S. markets (Michelin's main markets) falls below 1.5% during the period 2001-2003 or below 2% during 2004-2005.

The linking of the deal to low GDP growth was done for several reasons. The first is that Michelin's earnings are highly correlated with GDP growth in these markets; and because GDP growth is outside Michelin's control, the trigger avoids moral hazard while providing a fairly reliable proxy for low earnings.⁴⁷ Second, the firm

46. As I explore in much more detail in my book, contingent capital seems to be a highly innovative response to adverse selection problems that give rise to a "pecking order" in the sense of Myers (1984), *op. cit.*, and Myers and Majluf, *op. cit.*

47. As noted, however, most contingent capital structures do not rely on the second trigger to mitigate moral hazard.

No innovation of the last decade serves to illustrate more clearly the convergence of risk management and corporate finance than contingent capital. Such capital is “contingent” in the sense that, like committed bank lines of credit, it effectively gives companies the *option* to raise capital when they expect to need it most.

is more likely to restructure in a low-earnings environment, and an infusion of fresh capital would facilitate any such restructuring. Third, the contingent capital will give Michelin access to adequate funds to exploit potential acquisition opportunities even following a transitory adverse earnings shock—that is, it enables the company to avoid underinvestment problems.

Viewed as a synthetic debt facility, the Michelin CLOCS™ structure can be regarded as a pre-loss risk financing solution for Michelin. If both facilities remain undrawn, Michelin pays a commitment fee of 35 basis points per annum and 30 basis points for the bank and sub-debt facilities, respectively. The lower arrangement fee for the sub debt option is the direct result of the inclusion of a triggering mechanism.⁴⁸

Advances in Structured Finance

As reported in a recent *New York Times* article, Citibank, a major lender to Enron, apparently protected itself from a significant portion of Enron’s credit risk by passing it on to investors in credit-linked bonds. What the article did not mention, however, was that Citibank accomplished this risk transfer not through credit derivatives or insurance, but through an innovative transaction that *combines* credit derivatives and insurance with traditional securitization.⁴⁹ Similar in spirit to the 1997-98 J.P. Morgan “Bistro” transactions, these “synthetic securitizations” are representative of a major new trend in structured finance—namely, the increasing use of securitization to manage risk rather than to sell assets or raise funds.

In the last several years alone, corporations and financial institutions alike have relied on securitization structures to manage a wide range of risks, in most cases “synthetically”—that is, without the actual sale of an asset that most of us associate with the securitization process. Risks managed in this manner have included the re-

sidual value risk on auto leases originated by Toyota and Lexus, mortgage default risk, trade credit default risk, and catastrophic risk.⁵⁰

Beyond Plain Vanilla

A final theme of the risk management product revolution of the '90s has been the development of risk transfer and risk financing solutions for exotic risks. As the sources of financial losses became more diverse in the 1990s, so too did insurance solutions. Following the rogue trader-related losses at Barings, Sumitomo, and other firms, Lloyd’s syndicate SVB began offering “rogue trader” insurance that reimburses a firm for damages sustained from unauthorized trading that has been concealed from management. The first reported buyer of such insurance was Chase Manhattan, which bought \$300 million in rogue trader cover for an annual premium of \$2 million.⁵¹

Op risk is also ripe for bundling into the multi-line IRM programs discussed earlier. Swiss Re New Markets offers several bundled op risk protection programs. One such program typically indemnifies only losses above a deductible of \$50 to \$100 million, but covers all losses arising from virtually any known risk, including unauthorized trading, professional indemnity, electronic computer crime, and employment liability. Contingent capital can also be used to help firms manage operational risk. For example, there is now an “op risk loss equity put” that enables buyers to fund any losses by issuing new securities at a pre-loss price.⁵²

Other risks that insurance, derivatives, and ART products can now be used to manage include weather risk (*i.e.*, arising from fluctuations in temperature and precipitation),⁵³ bandwidth price risk in emerging telecommunications markets, water price risk in emerging water markets, and unusual insurance risks such as aborted M&A bids and natural catastrophe property. The number and types of risks on which risk management products can be based seem virtually limitless.

48. For a more complete discussion of the economics of contingent capital and the other structures these products may take, see my forthcoming article in the next issue of this journal.

49. A special purpose vehicle set up and owned by Citibank issued credit-linked bonds to the public market that guaranteed payment of interest and principal as long as Enron made payments on its publicly traded bonds. But with Enron’s declaration of bankruptcy, Citibank’s SPV stopped payments to investors and substituted ownership of Enron bonds.

50. For a discussion of Cat bonds and their role in managing catastrophic risk, see the article in this issue by Angelika Schlöchin.

51. L. Cooper, “Help Is at Hand,” *Operational Risk Supplement to Risk Magazine* (July 1999).

52. A. Webb, “Controlling Operational Risk,” *Derivatives Strategy* (January 1999).

53. See A. S. Kramer, “Weather Derivatives or Insurance? Considerations for Energy Companies,” in Culp (2002), *op. cit.*, Gerling Global Financial Products, *op. cit.*, and Shimpi, *op. cit.*

CONCLUSION

Despite starting in a most accidental fashion, the risk management revolution of the 1990s now appears on an inevitable course of convergence with the modern theory of corporate finance. Companies today can focus selectively on risk finance or risk transfer, use features like triggers to control the cost of capital acquired through risk management products, integrate their financing and risk management

decisions through the use of enterprise-wide products, and replace expensive paid-in capital with cheaper sources of contingent capital that provide an infusion of funds only when truly necessary. Such expanded products are likely to be beneficial, however, only if a company has the right risk management *process* in place—one in which corporate financial and risk management decisions are no longer made separately, but in a fully integrated way that is clearly informed by the goal of increasing firm value.

■ CHRISTOPHER CULP

is Managing Director of CP Risk Management LLC and Adjunct Associate Professor of Finance at The University of Chicago's Graduate School of Business.

Journal of Applied Corporate Finance (ISSN 1078-1196 [print], ISSN 1745-6622 [online]) is published quarterly on behalf of Morgan Stanley by Blackwell Publishing, with offices at 350 Main Street, Malden, MA 02148, USA, and PO Box 1354, 9600 Garsington Road, Oxford OX4 2XG, UK. Call US: (800) 835-6770, UK: +44 1865 778315; fax US: (781) 388-8232, UK: +44 1865 471775, or e-mail: subscrip@bos.blackwellpublishing.com.

Information For Subscribers For new orders, renewals, sample copy requests, claims, changes of address, and all other subscription correspondence, please contact the Customer Service Department at your nearest Blackwell office.

Subscription Rates for Volume 17 (four issues) Institutional Premium Rate* The Americas† \$330, Rest of World £201; Commercial Company Premium Rate, The Americas \$440, Rest of World £268; Individual Rate, The Americas \$95, Rest of World £70, €105‡; Students**, The Americas \$50, Rest of World £28, €42.

*Includes print plus premium online access to the current and all available backfiles. Print and online-only rates are also available (see below).

†Customers in Canada should add 7% GST or provide evidence of entitlement to exemption

‡Customers in the UK should add VAT at 5%; customers in the EU should also add VAT at 5%, or provide a VAT registration number or evidence of entitlement to exemption

** Students must present a copy of their student ID card to receive this rate.

For more information about Blackwell Publishing journals, including online access information, terms and conditions, and other pricing options, please visit www.blackwellpublishing.com or contact our customer service department, tel: (800) 835-6770 or +44 1865 778315 (UK office).

Back Issues Back issues are available from the publisher at the current single-issue rate.

Mailing *Journal of Applied Corporate Finance* is mailed Standard Rate. Mailing to rest of world by DHL Smart & Global Mail. Canadian mail is sent by Canadian publications mail agreement number 40573520. **Postmaster** Send all address changes to *Journal of Applied Corporate Finance*, Blackwell Publishing Inc., Journals Subscription Department, 350 Main St., Malden, MA 02148-5020.

Journal of Applied Corporate Finance is available online through Synergy, Blackwell's online journal service which allows you to:

- Browse tables of contents and abstracts from over 290 professional, science, social science, and medical journals
 - Create your own Personal Homepage from which you can access your personal subscriptions, set up e-mail table of contents alerts and run saved searches
 - Perform detailed searches across our database of titles and save the search criteria for future use
 - Link to and from bibliographic databases such as ISI.
- Sign up for free today at <http://www.blackwell-synergy.com>.

Disclaimer The Publisher, Morgan Stanley, its affiliates, and the Editor cannot be held responsible for errors or any consequences arising from the use of information contained in this journal. The views and opinions expressed in this journal do not necessarily represent those of the Publisher, Morgan Stanley, its affiliates, and Editor, neither does the publication of advertisements constitute any endorsement by the Publisher, Morgan Stanley, its affiliates, and Editor of the products advertised. No person should purchase or sell any security or asset in reliance on any information in this journal.

Morgan Stanley is a full service financial services company active in the securities, investment management and credit services businesses. Morgan Stanley may have and may seek to have business relationships with any person or company named in this journal.

Copyright © 2004 Morgan Stanley. All rights reserved. No part of this publication may be reproduced, stored or transmitted in whole or part in any form or by any means without the prior permission in writing from the copyright holder. Authorization to photocopy items for internal or personal use or for the internal or personal use of specific clients is granted by the copyright holder for libraries and other users of the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, USA (www.copyright.com), provided the appropriate fee is paid directly to the CCC. This consent does not extend to other kinds of copying, such as copying for general distribution for advertising or promotional purposes, for creating new collective works or for resale. Institutions with a paid subscription to this journal may make photocopies for teaching purposes and academic course-packs free of charge provided such copies are not resold. For all other permissions inquiries, including requests to republish material in another work, please contact the Journals Rights and Permissions Coordinator, Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ. E-mail: journalsrights@oxon.blackwellpublishing.com.