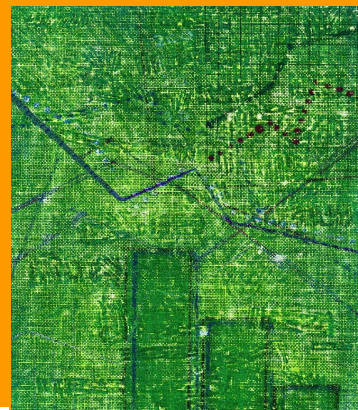


**McKINSEY WORKING
PAPERS ON RISK**



The Risk Revolution

**Number 1 | Kevin Buehler,
September 2008 | Andrew Freeman
and Ron Hulme**

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The Risk Revolution

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Introduction

In the past 18 months, we have witnessed a major credit and liquidity crisis in the banking system as losses from subprime mortgages, structured investment vehicles, and “covenant-lite” leveraged loans generated significant knock-on effects worldwide. Major financial institutions have taken more than \$500 billion in write-offs, and central banks around the globe have initiated emergency measures to restore liquidity. CEOs have been replaced at such venerable institutions as Citigroup, Merrill Lynch, and UBS. Bear Stearns, a firm once viewed as having a conservative approach to risk management, has been the target of a rescue by JPMorgan that was driven and to some extent sponsored by the Federal Reserve. Lehman Brothers has filed for bankruptcy. Goldman Sachs and Morgan Stanley have changed status to become bank holding companies. To the experience of the present crisis we can add our memories of many others: the savings and loan crisis in the 1980s, Black Monday in 1987, the Russian debt default and the related collapse of Long-Term Capital Management in 1998, the dot-com bust of 2000, and the Enron-led merchant-power collapse of 2001.

Interest in risk tends to come to the fore at times of crisis and then recede as conditions revert to normalcy. This rhythm is the outcome of risk being overwhelmingly discussed in terms of its downside. But the resounding message of such crises is that risk is always with us, for good as well as ill. And as recent events have demonstrated, a grave mistake is made, and a promising opportunity missed, in waiting until everybody else has perceived the problem.

If this tendency is to change, financial and strategic risks must be managed in an integrated fashion, with ownership vested at the CEO level. The tools and techniques to make this possible are well established. What has been missing in most organizations is a practical process that makes such integrated management possible.

The subjects of this working paper are understanding risk and implementing risk tools. The paper is organized into four sections. The first discusses the historical emergence of risk management. The second reviews some of the theoretical and market developments that allowed financial institutions to transfer risk and examines the enormous impact of these developments on the financial sector. A third section on risk in the corporate sector focuses on developments in the energy industry to exemplify how risk management can transform the fortunes of nonfinancial companies. Finally, the paper sets out a comprehensive framework for how institutions can employ a disciplined, strategic risk-return management process.¹

Another article, “A Primer on Tools and Techniques of Risk Management” (ID# 737072), complements this paper and provides a more detailed discussion of some of the basic

¹ This working paper is a revised and updated version of McKinsey Staff Paper No.68 published in July 2008. It is not a history of risk, although it covers some important developments. Anyone interested in the long history of risk should read Peter L. Bernstein’s entertaining *Against the Gods: The Remarkable Story of Risk*, New York: Wiley, 1996, which remains the most accessible book on the subject. Those seeking a deeper understanding of some of the financial theory that underpins modern risk management should read Bernstein’s book *Capital Ideas: The Improbable Origins of Modern Wall Street*, New York: Free Press, 1992, in which the author explains the emergence of portfolio theory and the capital asset pricing model, among other important innovations.

concepts, tools, and techniques of risk management. It is recommended both to beginners, as helpful general background, and to seasoned practitioners in a single area of risk management, providing context for the more holistic, integrated approach we advocate.

At one level, this paper is a description of risk management as practiced in the financial sector and the presentation of a process to bring that rigor to nonfinancial companies. But the paper is also more than that. In the wake of recent events, commercial and investment banks are themselves asking whether they have made systematic errors in their approach to risk. For many, the answer is yes. Banks certainly apply sophisticated algorithms and develop elaborate models in an effort to manage risk effectively. Yet they tend to underestimate the importance of robust cultural risk processes, including incentives to encourage good behavior among key business managers and top management.

As such, there is much in the paper, and in the last section in particular, that should be as useful to financial as to nonfinancial institutions.

Acknowledgements

In an effort to map the evolution of thinking about risk and its practical applications in companies, we have interviewed leading thinkers and practitioners in the field. How did the underlying ideas develop? How were they being used in business settings? Thanks are due to Kenneth Arrow, professor emeritus at Stanford and Nobel laureate; Myron Scholes, Nobel laureate and co-author of the Black-Scholes option pricing formula; Steve Ross, MIT professor, author of *Neoclassical Finance*, and developer of arbitrage pricing theory and binomial options pricing; Bill Sharpe, Nobel laureate and author of the capital asset pricing model; Peter Bernstein, author of *Against the Gods and Capital Ideas*; Anthony Santomero, senior adviser to McKinsey, professor emeritus at Wharton, and former president of the Philadelphia Federal Reserve Bank, where he served as a member of the Federal Open Market Committee; Peter Fisher, a director of BlackRock and former head of markets at the New York Federal Reserve Bank; Glenn Koller, risk manager at Schlumberger, and author of *Risk Assessment and Decision Making in Business and Industry and Modern Corporate Risk Management*; Tom Skwarek, managing director of Swiss Re and an expert in structured finance; Mark Lawrence, McKinsey partner and former chief risk officer of ANZ Bank; Lloyd Blankfein, CEO, Goldman Sachs; and John Wilder, former CEO, TXU. Interested McKinsey consultants can gain access to a video library through the Know portal that includes interviews with most of these participants. We would like to acknowledge the many colleagues who have contributed to the ideas and frameworks described below. We would also particularly like to thank our colleagues in the Risk Practice and four reviewers for the helpful feedback they offered. Special thanks to Saul Rosenberg, who edited the original staff paper with insight and skill and who made a major contribution to its development. Any errors in this paper are, of course, our own.

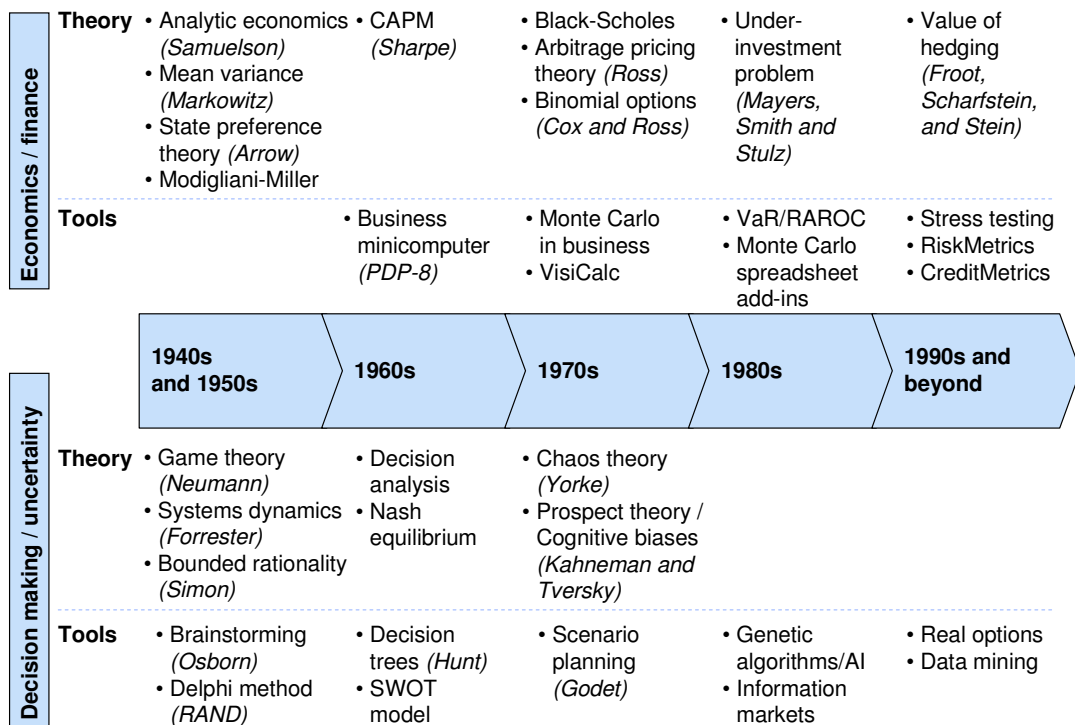
The emergence of modern risk management

Before the 1970s, risk management in most corporations was largely defined by the purchasing of insurance – a strategy to manage downside risk, with no attention paid to upside. Risk management was also rudimentary in the financial sector. Bank regulators lacked broadly applicable tools for measuring risk in the system, making constructive intervention difficult. Banks themselves lacked the tools to shape the interest-rate risks in their loan portfolios, and so could do little to protect themselves from swings in interest rates. They also lacked tools for quantifying and managing credit risk, and had only the most elementary understanding of operational risk.

In the university setting, however, some important theoretical foundations had already begun to be laid. From the 1940s onward, academics started to advance their understanding of risk-return trade-offs in investment management and to develop tools to apply their findings (some of which are included in Exhibit 1 and Table 1).

Exhibit 1

Foundations of modern risk management



Sources: Peter Bernstein, *Capital Ideas*; Philippe Jorion, *Value at Risk*; *Derivatives Quarterly*; McKinsey analysis

Table 1
Important theories and their application

Name	Essence of theory	Relevance
Allocation efficiency, state preference theory (Kenneth Arrow, Gerard Debreu)	Demonstrates that an efficient allocation of resources and risks requires a “complete” set of securities that permits agents to hedge all risks, thus laying the groundwork for general equilibrium theory	Underpins derivatives markets, explains decision making under uncertainty, and shows that the ultimate role of securities markets is the efficient allocation of risk across society
Mean-variance (Harry Markowitz)	Investors choosing portfolios should consider the risks as well as the making investment choices	Efficient frontier concept for returns from their choices
Capital asset pricing model, or CAPM (Bill Sharpe)	Subject to some limitations, markets compensate firms for systematic (or market) risk but do not discount for idiosyncratic risks, which investors can diversify	Directly relevant to discussion about whether a firm should hedge its idiosyncratic risks or leave them alone because the market will not reward it for mitigating them
Capital structure (Franco Modigliani, Merton Miller)	Subject to strong constraints (e.g., no taxes), a firm’s capital structure makes no difference to its valuation by the market because the overall riskiness of the firm is the same	When constraints are removed, the model breaks down, introducing the idea of efficient capital structure and the role of risk mitigation through hedging
Options pricing (Fischer Black, Myron Scholes, Robert Merton)	Volatility is the key to consistent pricing of options	The concept of real options essentially allows companies to put a value on waiting
Binomial options pricing (John Cox, Stephen Ross, Mark Rubinstein)	Models the underlying instrument over time, as opposed to at a particular point, increasing accuracy, particularly for longer-dated options	Allows better pricing of options that contain greater flexibility
Arbitrage pricing theory (Stephen Ross)	Less restrictive alternative to CAPM, defines the expected return of a financial asset as a linear function of various macroeconomic factors or theoretical market indices	Allows investors to segment CAPM’s systematic risk into factors or components that influence correlations

This research began filtering into the business community in the early 1970s via two seminal developments: the publication of the option pricing model by Fischer Black and Myron Scholes (along with its independent confirmation and enhancement by Robert Merton), and the introduction of Bill Sharpe's capital asset pricing model (CAPM).² These contributions marked the beginning of modern risk management: the moment at which risk could start to be effectively priced and mitigated. Suddenly, what had existed as latent demand materialized into a need – a need suddenly made more urgent by the end of the Bretton Woods exchange-rate regime and the OPEC oil shock.³

The core concept addressed by Black and Scholes was *optionality*. Embedded in all financial instruments, capital structures, and business portfolios are options that can expire worthless, or be exercised or sold. In many cases, an option is both obvious and bounded, such as an option to buy GE stock at a given price for a given period. In other cases, options are subtler. In their original publication, Black and Scholes observed that the holders of equity in a firm with debt in its capital structure have an option to buy back the firm from the debt holders at a strike price equal to the firm's debt. Similarly, the still-emerging field of "real options" identifies options implicit in a firm's operations – for example, the option to cancel or defer a project based on information from a pilot. The theory of real options puts a value on managerial flexibility – a factor overlooked in straightforward net-present-value (NPV) calculations, which assume an all-or-nothing attitude to a project.⁴

Sharpe's model, the CAPM, suggests that a company's shares bundle two types of risk. Only one of these, systematic risk, is compensated by the market. Systematic risk is measured by the firm's "beta," which reflects the stock's correlation with the overall market. Sharpe argued that beta is the sole differentiator of the cost of equity across corporations. The other type of risk, known as nonsystematic or idiosyncratic risk, is unique to the company. Sharpe demonstrated that these risks should not affect the company's cost of capital because investors can hold other shares and investments that diversify away this exposure.

Ironically, given the intellectual achievements Black-Scholes and CAPM represent, the third important risk-related development in the 1970s was probably the emergence of the handheld electronic calculator familiar to a particular generation of schoolchildren. Texas Instruments marketed its new product with the tag line "Now you can find the Black-Scholes value using our . . . calculator."⁵ The rapid acceptance of this calculator by options traders cemented the arrival of derivatives and the broad development of standard pricing models. In 1975, the first personal computers were launched. In 1979, Dan Bricklin and Bob Frankston released VisiCalc, the first spreadsheet designed to work on a PC. This gave managers a simple tool for running "what if" scenarios. Financial instruments for managing different types of risk were rapidly developed and trading was begun both on exchanges and in emerging over-the-counter (OTC) derivative markets.

² Other researchers, notably Jack Treynor, arrived independently at some of Sharpe's conclusions, but Sharpe was the first and his name is associated with CAPM.

³ It is worth noting that the combined phenomenon of high oil prices, general volatility in the market, exchange-rate volatility, and inflation is with us again in 2008.

⁴ See the companion piece to this paper, "A Primer on Tools and Techniques of Risk Management" (ID# 737072), for a fuller exploration of this idea.

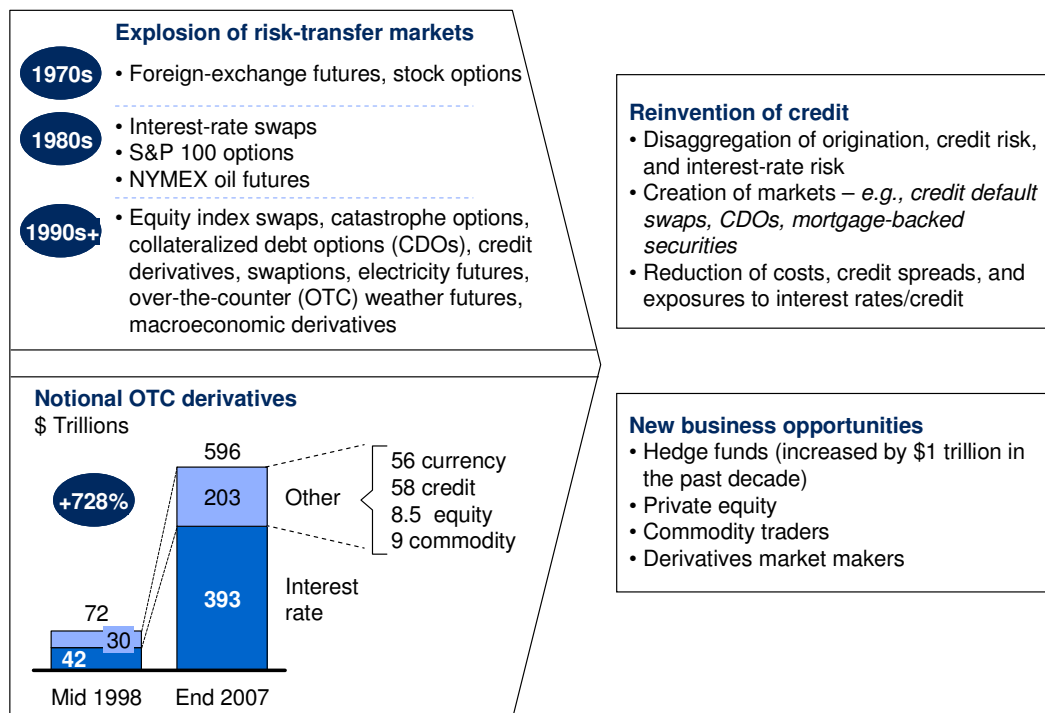
⁵ Bernstein, *Against the Gods*, p. 316.

By the 1980s, greater computing power was inexorably adding calculating muscle directly to trading desks, allowing complex calculations to be run ever faster and pricing to move closer to real time. Among the most influential machines were the workstations developed by Sun and DEC and the Bloomberg terminal, which revolutionized price calculation in derivatives and fixed-income markets respectively. Software developed by companies such as Crystal Ball allowed traders to run Monte Carlo simulations – complex calculating processes that undertake thousands of iterations to produce distributions of outcomes – in a matter of minutes on laptops, rather than overnight on mainframe computers. The upshot was an unprecedented growth in liquidity and the integrity of pricing.

As Exhibit 2 suggests, these innovations enabled a revolution in financial services that included the emergence of stock options, foreign-exchange futures, interest-rate swaps, commodity futures, index swaps, credit derivatives, and even more sophisticated instruments. The market for OTC derivatives grew fourfold from 1998 to 2006. All in all, the notion of credit was essentially reinvented, as entire markets and enormous business opportunities developed around concepts that had hitherto been inseparable from the underlying assets being traded. The market has since become so sophisticated that synthetic collateralized debt obligations

Exhibit 2

Risk innovations set off a revolution in the financial services industry



Sources: U.S. Treasury, BIS

(CDOs), or derivatives of derivatives of derivatives, are now being sold – and were in fact the fastest-growing part of the multitrillion-dollar CDO market until the credit crunch of late 2007.⁶

Stimulated by these developments, a new generation of academics⁷ looked at the case for risk mitigation and confirmed that it could indeed create shareholder value in three main ways: by reducing the probability and expected costs of financial distress, by enabling a more suitable level of debt and thereby reducing a firm's income taxes and financing costs, and by mitigating agency costs and preserving management's ability and incentives to carry out profitable investments. These conclusions gave validity to the growing field of risk management and provided a counterbalance to the indifference theory, articulated by Modigliani, Miller, and others, that had schooled generations of MBAs to think that capital structure and hedging had minimal impact on a company's cost of capital and value. Wall Street and its clients, of course, had already embraced financial engineering – largely relegating the indifference theory debate to academia.

Risk in the financial sector

Innovations in risk management

Many of the important innovations in risk management originated in the banking and securities industries, for three reasons. First, financial institutions are effectively risk-intermediation businesses. Many of the more sophisticated players (generally securities houses and investment banks) realized that their ability to describe and manage risk was a core competence, and they were the earliest non-academic institutions to think systematically about risk.

Second, as Peter Bernstein pointed out, financial industries are rich in data and so were able, early on, to quantify risk using new technologies. Third, because banks were dealing with citizens' money, they were pushed by regulators to consider the potential impact of failure and to improve their risk-management capabilities. The fear of financial-institution failure went back to the Herstatt Bank collapse in 1974. Herstatt, a German bank, failed, and many international banks were badly hurt because of the time lag related to cross-border settlements during that period.⁸

Today, risk management in banking is a core function, and virtually all banks have chief risk officers. But many of the advances we now take for granted are in fact relatively recent. In the

⁶ It remains to be seen how the recent drying up of liquidity in the markets will unfold. But even a backlash against the complexity of some structured instruments would be unlikely to cause a retreat from the underlying technology, i.e., the ability to slice and repackage risks.

⁷ Examples include work on the underinvestment problem by David Mayers, Clifford W. Smith, René M. Stulz, and on the value of hedging by Kenneth A. Froot, David S. Sharfstein, Jeremy C. Stein.

⁸ Essentially, foreign-exchange transactions executed in Germany before the bank was declared insolvent had not cleared in New York because the markets there were not yet open, leaving enormous exposures. This was one of the big "wake-up" events of modern risk management. It ultimately took nearly 20 years to solve what became known as Herstatt risk.

early 1990s, the American banking system faced severe difficulties. Citibank was in danger of collapse and was rescued by a Saudi prince, who came to own the equivalent of 15 percent of the company's equity.⁹ Other banks, including Bank of New England, did go under. At root, poor risk management was to blame. Banks had only a limited understanding of the credit risks in their loan portfolios, typically had mismatched assets and liabilities, and retained loss-making exposures on their balance sheets. A typical bank took deposits and originated loans. But the deposits were of shorter duration than the loans, which meant that a sharp rise in interest rates could immediately jeopardize a bank's financial health.

In the early 1990s, most commercial banks lacked now-commonplace tools such as value at risk, risk-adjusted return on capital, economic capital, risk-adjusted regulatory capital, credit-risk models, and enterprise risk management.¹⁰ By contrast, securities firms and investment banks had become quite sophisticated in their use of risk management. They realized that many traditional commercial banking activities could benefit from techniques similar to those used for trading shares and bonds. Bank loans could be "marked to market" – priced as if they had to be sold that day, even though they might not mature for years to come – turned into securities, and traded. Portfolios of loans could be packaged into tranches bearing different levels of risk, interest-rate risk could be separated from credit risk, and so on.

Partly because securities firms and investment banks were skilled in packaging and trading, and because commercial banks had capital and credit-origination skills, a wave of mergers began until the distinctions blurred and became less relevant. Over a 20-year period beginning in the mid-1980s, the financial sector became a gigantic risk clearinghouse. It remains a work in progress. For instance, the convergence of capital markets and insurance, essential for the development of new risk-transfer mechanisms and structured risk-management solutions, is not yet complete but is well under way – as evidenced by the market for catastrophe bonds.

The impact of risk transfer markets

In a risk-transfer market, contracts are exchanged that allow a specified risk or bundle of risks to change hands. Risk-transfer markets have been major enablers of dramatic growth in four key segments – mortgages, wholesale credit, alternative risk transfer (ART), and hedge funds/private equity.

1. Mortgages

Clearly, the current crisis was propelled by financial institutions' failure to understand certain mortgage-derived instruments. Yet overall, the market for mortgage-based securities remains the most readily understood example of how risk instruments can transform the scope and nature of a business. The mortgage market has grown from a retail-finance backwater, in which banks originated and held their mortgages as a single portfolio, into one of the largest and most innovative sectors of the financial industry, particularly in the U.S. (Exhibit 3). Many

⁹ Interestingly, Prince Alwaleed bin Talal stepped in with a Citigroup equity purchase in 2008.

¹⁰ See "A Primer on Tools and Techniques of Risk Management" (ID#737072) for a fuller description of VaR, RAROC, and credit-risk models.

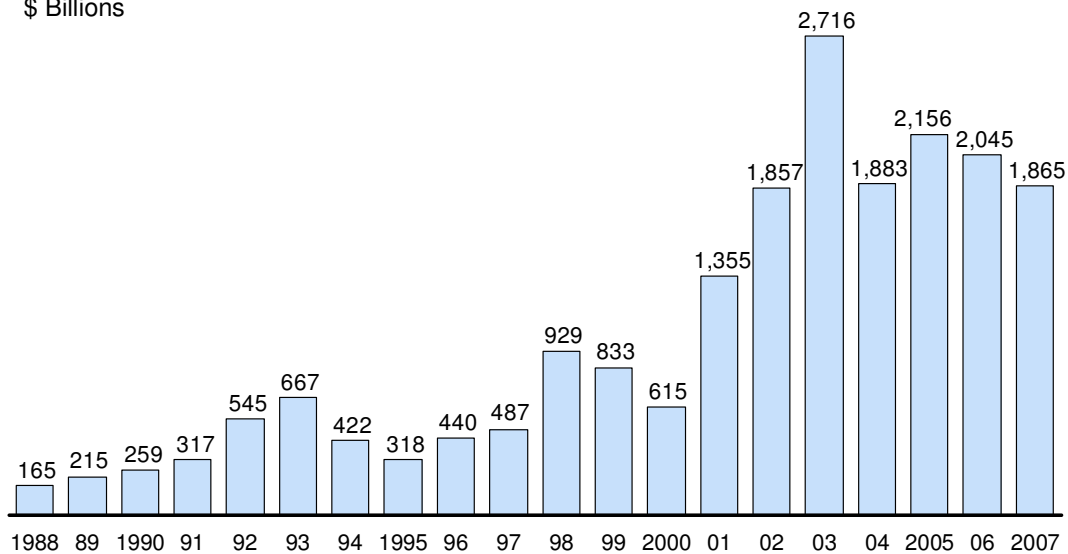
of the tools of modern risk management have been embraced, from securitization (the pooling of loans that are then sliced into tranches to create different risk-bearing structures that can be sold) to the creation of new products that explicitly recognize the optionality built into long-term products such as the 30-year mortgage (the most obvious option being to repay early).

Exhibit 3

Risk innovations set off a revolution in the financial services industry: mortgage-backed securities issuance

Mortgage-backed securities issuance 1988-2007*

\$ Billions



* Includes Ginnie Mae, Fannie Mae; Freddie Mac and Non-agency

Source: Inside Mortgage Finance MBS database; Ginnie Mae; Fannie Mae; Freddie Mac

The effects on the banking industry have been profound. Growth coupled with more effective risk management led to unprecedented profitability. Derivatives and pass-through mechanisms that transfer elements of risk in a pool of mortgages allowed mortgage originators to avoid taking interest-rate or credit risk, removing a major hazard from their portfolios and encouraging further origination, which expanded the market and drove demand for mortgage products.

As we have now been reminded, the ability to transfer risk does not lead automatically to the elimination of risk. In some circumstances, it merely moves the risk elsewhere. By mid-2007, it had become apparent that the underwriting associated with the subprime segment of the U.S. mortgage market had become far too lax, and a major financial crisis ensued. Rising default rates and falling house prices quickly had an effect on pricing, first on the lower-rated tranches of mortgage securitizations and then on more senior tranches. In turn, declining confidence led to a general withdrawal of liquidity from the banking system and a consequent reduction of available credit. Many mortgage institutions failed or were sold. Some of the world's biggest banks wrote off billions of dollars and fired some of their top managers. Most famously, in an emergency deal Bear Stearns was sold to JPMorgan for a fraction of its traded

value. Lehman Brothers filed for bankruptcy. Fannie Mae and Freddie Mac were nationalized. The so-called “credit crunch” changed the policy landscape for central banks, creating pressure for interest-rate cuts and special lending facilities for liquidity-starved banks and securities firms.¹¹

2. Wholesale credit markets

A similar transformation has swept the wholesale credit markets, or the markets for large corporate loans made by commercial banks.

Roughly speaking, the risk profile of a typical commercial bank breaks down into 60 percent credit risk, 20 percent market risk, and 20 percent operational risk. The past 35 years have seen a sharp rise in a bank’s ability to mitigate these risks. The growth in credit derivatives, greater depth and liquidity in the secondary market for corporate loans, and securitization have transformed the management of credit risk by hugely expanding the scope for risk transfer.

Increasingly, banks can refine their portfolios to retain only those risks in which they have a competitive advantage (i.e., those risks of which they are the “natural owner”). They use credit portfolio management techniques to decide which combinations of risks to retain. For example, although they might retain exposure to a corporate customer, they can use credit default swaps – derivative instruments that protect against a given company experiencing financial distress – to mitigate that exposure. They can also use index products to raise or lower their overall exposure to credit as an asset class, depending on whether they believe credit to be too cheap or too expensive. Who buys the assets that an individual bank decides to shed? To some extent, other banks with offsetting risks of their own. The main buyers, however, are pension and hedge funds, insurers, and other alternative investors seeking assets not directly correlated with stock and bond markets.

During the past year, it became evident that some instruments, although theoretically sound, were difficult to manage in practice. In particular, vehicles that pool loans together and then repackage them, as well as derivatives of the pools themselves, are highly complex. Banks have discovered the hard way that credit risks thought to be independent often subtly interact.

3. Insurance and alternative risk transfer (ART)

There is a great deal of literature on the evolution of the insurance and reinsurance industries.¹² Insurance concepts have been and remain of enormous influence the development of risk-transfer products and markets. As with other areas, however, this field is seen by many as forbiddingly technical and not clearly connected to risk management.

¹¹ The crisis does not invalidate the importance or influence of the ability to slice risks into discrete elements, although it does reinforce the fact that even the largest markets depend on the quality of the underlying assets and the continued supply of liquidity.

¹² Some of the best summaries can be found in *sigma*, published by Swiss Re and available on its Web site. The richest single source is Christopher L. Culp, *Structured Finance and Insurance: The ART of Managing Capital and Risk*, New York: Wiley, 2006.

ART is simply the creation of a risk-transfer solution that combines capital markets and insurance such that some of the insurable risks are transferred to non-insurers.¹³ Consider a company that is trying to understand its risk capacity. A simple starting point is to ask how much risk the company wants to insure and how much it wishes to retain as direct exposure – effectively, to self-insure.¹⁴

One well-known deal that demonstrates the power of these concepts dates to late 2000, when Swiss Re and Société Générale developed an innovative facility for Compagnie Financière Michelin, the Swiss holding company of the French tire maker. At the heart of the transaction was what is called contingent capital, which gives a company the right to issue new debt, equity, or some structured securities at a predefined price during a set period of time. In effect, the company buys the option to issue securities in the future, subject to the trigger (or triggers) of an unwanted outcome or loss arising from the risks specified in the terms of the deal. Michelin wanted to lock in the option of raising capital in the event that the world's largest economies suffered a slowdown, causing its earnings to fall.

There are many other examples involving financing structures that package options in the form of insurance contracts. This is an area of ongoing innovation.

4. Financial services industry: hedge funds and private equity

As soon as the kinds of instruments discussed here became available, professional investors wanted to take advantage of them to separate and transfer many different kinds of risks in order to optimize their risk exposures. But traditional funds, being open to the general public, were regulated for the public's protection – the public having appropriately been deemed lacking in the knowledge required to engage in elaborate risk-transfer mechanisms. Enter hedge funds, investment pools neither subject to the Investment Company Act of 1940 nor governed as mutual funds, and open only to high-net-worth and institutional investors. Hedge funds have rapidly evolved to allow investors to be extremely precise about the kinds of exposure they seek across different asset classes, time horizons, and so on. In addition, they have become important providers of liquidity to the banking system through their role as investors in a range of asset-backed securities.

Hedge funds are not without controversy. Do they really control the risks they run, or are they vulnerable to liquidity shocks and gaming by their competitors – concerns that recent events have sharpened? Does the leverage they use to boost their returns introduce new risks into

¹³ It is widely accepted that there is an ongoing convergence between insurance and capital markets, but, as Culp has argued, “even the most similar concepts in the two worlds are often not recognized as being essentially the same thing” (*Structured Finance and Insurance*, p. xv). Culp makes an important distinction between structured finance – the use of nontraditional financing methods to lay off risk that cannot be dealt with in conventional markets – and structured insurance (which includes, but is not limited to, ART), or the use of nontraditional risk-finance and risk-transfer techniques to manage risk in a way that also affects the firm's capital structure and/or weighted average cost of capital.

¹⁴ Over the past 20 years, many large companies embraced self-insurance, setting up “captive” vehicles that essentially took insurance in-house on the basis that meeting any losses would be cheaper than buying insurance in the market. But the underlying motive was often tax rather than risk efficiency. Captives have been effective but are also controversial. Critics argue that they create new risks by removing third-party monitoring (in the form of an insurer).

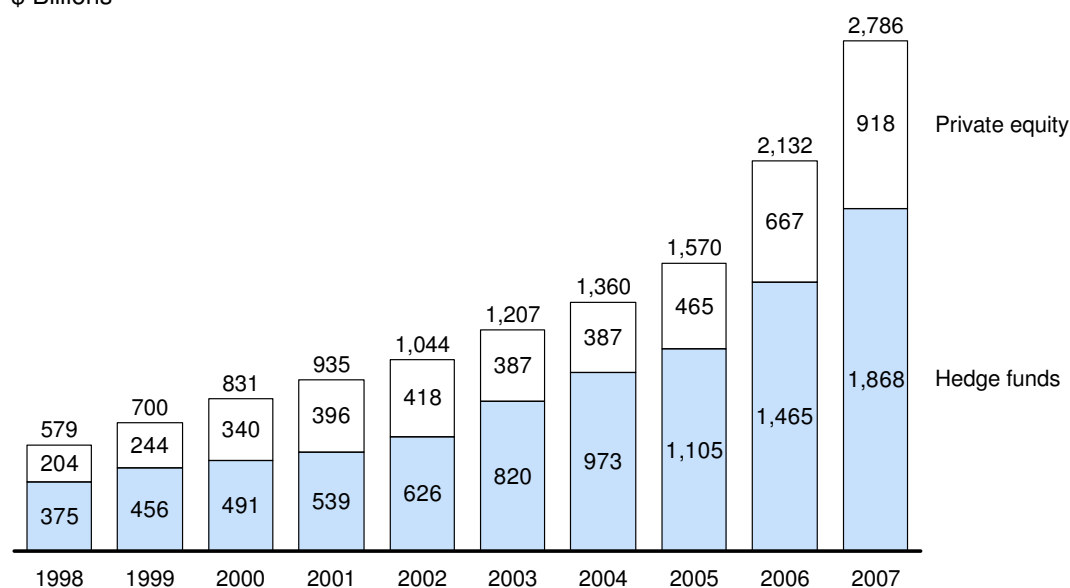
financial markets? These questions surfaced after the high-profile failure of Long-Term Capital Management in 1998-2000, and again when Amaranth lost billions of dollars on natural gas futures contracts in 2006, and most recently when the Federal Reserve underwrote JPMorgan's purchase of Bear Stearns. Despite these concerns, however, the sector has been dynamic and has grown strongly, even through the market fluctuations of late 2007-early 2008 (Exhibit 4).

Exhibit 4

Risk innovations set off a revolution in the financial services industry: private equity and hedge funds

Private equity and hedge funds – global assets under management*

\$ Billions



* Hedge fund: all assets under management at the time; Private equity: sum of all buyout AUM raised over previous 5

Source: HFR, PE Intelligence

Private equity has proved equally dynamic. Private equity firms purchase companies and then restructure them to focus on the risks the company naturally owns. As with hedge funds, what was once a marginal activity became a mainstream one. Aggressive, capital-rich private equity firms stalked the world's capital markets looking for opportunities to make profits by taking listed companies into private ownership. By adding leverage through the assumption of debt and by shaping each company's risk exposure, private-equity buyers increase the odds of a large payoff. In 2007 we witnessed a string of large deals, culminating in the \$45 billion buyout of TXU (see the case study of this important example of a leading-edge nonfinancial company's management of risk in the sidebar below).

Although not often described in the language of risk management, as most private equity firms stress their financial and management skills, private equity can be seen as a cutting-edge application of risk-management techniques. Many private equity deals utilize complex structured-finance tools that capitalize on risk markets to provide a lower cost of capital

through debt and hedging than would have been available through the traditional use of public equity.¹⁵

Goldman Sachs and the culture of risk

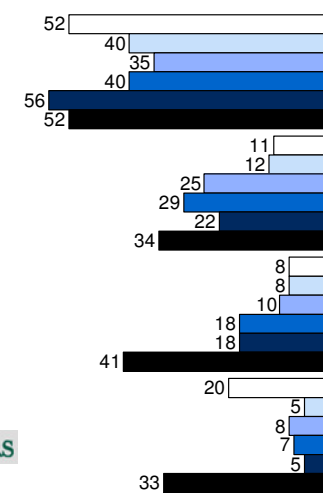
Goldman Sachs, generally recognized as the world's leading investment banking, securities, and investment management firm, exploits risk to achieve attractive returns in a prudent fashion. The results have been formidable. During the financial turmoil of 2007-08, Goldman notably avoided the large losses that afflicted its main competitors, perhaps the strongest evidence yet that its risk-based culture creates superior performance. But there was a strong case before this that the bank had taken risk management to a new level. In 2006, Goldman set aside a total of \$16.5 billion for salaries, bonuses, and benefits, or an average of \$622,000 for each of its 26,000 employees. Goldman obtained 68 percent of its net revenues from trading and principal investments, including a substantial amount from gains earned trading on its own account. Only 17 percent of net revenues came from the traditional investment banking and advisory business for which it was once best known.

Goldman Sachs risks money to make money

2002
 2004
 2006
 2003
 2005
 2007



Negative trading days



“People who have left Goldman say that its [risk management] is unmatched at rivals. One consequence is that Goldman seems confident that it can take more risks than its competitors do. Its trading revenues are the most volatile among big investment banks and it has the most days when it loses money. Overall, however, it makes the most money.”

Sources: *The Economist* 2006, Moody's; SNL Financial

¹⁵ It remains unclear how far the private-equity model will suffer from reduced liquidity. By early 2008, wider credit spreads and stiffer covenants had essentially halted the momentum of large buyouts.

Intriguingly, these results – and 2006, albeit the best, was one of many good years – were built on the back of a firm with trading revenues more volatile than those of all its peers. Goldman has the most days when it loses money, with a daily trading value at risk (measured at the 95% confidence level) that increased from less than \$50 million in 2002 to more than \$100 million today. In short, Goldman makes money by being willing to lose it. When securities markets become more volatile, options rise in value; naturally, the value of experienced risk management rises also. Goldman ensures that its managers are familiar and comfortable with risk, can debate it freely without fear of sanctions, and are willing to take decisions quickly when necessary. The company's aggressive hedging in 2007 in the markets related to subprime mortgages was a striking example of this. Goldman was both skillful and lucky. It was skillful in sensing that trouble was brewing and deciding to move quickly to reposition itself. It was lucky in getting both the decision and the timing correct on that bet.

Creating a culture so contrary to people's instincts and fears is not easy. In our view Goldman's success stems from four factors. None is unique to the firm, but Goldman has deployed them all very effectively:

Partnership heritage. Goldman was funded largely by its own partners from its origins in 1869 to its IPO in 1999. While other private investment banks distributed more than 80 percent of their earnings annually, Goldman partners traditionally left as much as 80 percent of their earnings with the firm, withdrawing significant capital only at the end of their careers. Partners acted as careful stewards of the firm's capital because it was their own. This partnership heritage continues to inform the interactions of the most senior people within the firm, aided by the substantial portion of equity still owned by employees.

Risk and quantitative professionals. Beginning early in the 1980s, Goldman began to invest in distinctive risk professionals and "quants." Most notable was Fischer Black, of Black-Scholes fame, who was brought over from MIT by Robert Rubin in 1984. He led the firm's Quantitative Strategies Group, working on topics ranging from modeling interest-rate movements to valuing fixed-income options to modern portfolio management. Other quants and risk professionals at Goldman have included Emanuel Derman, a Ph.D. in physics who headed the Quantitative Strategies Group after Black, and Bob Litterman, a Ph.D. in economics and co-developer of the Black-Litterman global asset allocation model. These people brought an early quantitative and intellectual rigor that gave Goldman the basic risk skills to manage its complex trading and derivatives businesses.

Risk oversight, organization, and processes. In 1994, when a sudden unexpected rise in global interest rates caused severe losses on many bond trading desks, the firm's large proprietary positions led to a substantial decline in profitability and a crisis in morale. In response, Jon Corzine restructured Goldman's risk control systems, establishing a firmwide risk committee to oversee market and credit risk. The committee meets weekly with the goal of ensuring that certain risk-return standards are being applied consistently across the firm worldwide. It follows that risks are carefully reported. Daily reports detail the firm's exposures, with top sheets showing the potential impact of movements in various macroeconomic risk factors; stress tests showing potential losses under a variety of scenarios (e.g., a stock market crash on the order of October 1987, a credit spread widening of the kind that occurred in autumn 1988, a bond market sell-off as seen in 1994); and replicating portfolios (e.g., what portfolio of a limited number of securities would most closely replicate the firm's overall position?). Some Goldman executives claim they can estimate the firm's daily P&L simply

based on these risk reports and market movements that day. Other kinds of risk are taken equally seriously. Operational and reputational risks are addressed by the business practices committee, loan and underwriting risks are addressed by its firmwide capital and commitments committees, and liquidity risk is managed by the finance committee.

Values and business principles. Finally, Goldman's values, as embodied in the firm's 14 business principles, reinforce many of these risk-management lessons. The firm's reputation is prized most of all. Individuals who join Goldman are quickly taught that, while no one person will make the firm a success, anyone can do enormous damage to the firm's reputation. When potentially controversial choices arise, individuals are encouraged to "escalate, escalate, escalate," drawing in independent views from risk, compliance, legal, and other powerful control functions. The fastest way to lose a position at Goldman is not to lose money but to make a decision that endangers the reputation of the firm without consulting others.

* * *

This is not to say that Goldman is immune from getting things wrong. But were the firm to stumble, it would not be for lack of a powerful, risk-informed culture that combines intelligence, discipline, and common sense. In that respect, Goldman is a model for all firms.

Risk for nonfinancial companies

Risk management does not mean always getting things right. It means getting them less wrong, less often, with less damaging consequences. This is most obvious in a financial company making buy and sell decisions in liquid markets for traded instruments. It is less obvious but often more significant in an industrial company wondering whether to invest in a multibillion-dollar project that will take 5 to 10 years to complete and another 10 to 15 to show a profit.

Indeed, risk management is only now beginning to emerge as a corporate priority in large nonfinancial companies. Although more than 80 percent of industrial corporations hedge using derivatives, most do so only in the context of currency and interest-rate trades made by their treasury departments (Exhibit 5). While most nonfinancial companies assess risk-and-return trade-offs qualitatively when making strategic decisions, few have properly developed risk-adjusted hurdle rates or risk-adjusted performance standards across business units. And few adequately value their risks based on quantitative models or traded risk markets. As a result, these companies generally lag far behind the financial players that treat strengthening risk capabilities as a core strategic priority.

Exhibit 5

Most nonfinancial companies have been slow to embrace modern risk-management tools



Source: Deutsche Bank/GARP Corporate CFO survey of 232 CFOs in 39 countries (2005)

Examples abound of poorly understood strategic risks faced by nonfinancial companies. How might demand for a product change depending on a competitor's behavior, or slow if China's economy were to deteriorate? Are there unrecognized reputational risks inherent in a course of action? What is the probability distribution of a cost or time overrun on a project? What are the implications of keeping a particular supply chain tighter or looser than it is today? How will the company be affected by a rise in oil prices, an increase in interest rates, or a dramatic change in the dollar?

Faced daily with such questions, nonfinancial firms that lack strong risk processes tend to gravitate toward one of two extremes. At one end of the spectrum, they overspend their risk capacity, and, if problems occur and credit sources dry up, slash important cash outflows – and in some instances even experience difficulty meeting debt obligations. Far more common, at the opposite end, corporations hold excess risk capacity – often in order to maintain an arbitrary target credit rating. These companies typically maintain capital structures with little or no debt and excess cash, a funding strategy that can raise a company's cost of capital and lower its value by as much as 10 to 15 percent.¹⁶ They also often employ risk-averse decision processes such as inflated investment hurdle rates or conservative price and margin forecasts

¹⁶ The 10 to 15 percent value impact reflects a foregone interest tax shield applied to a potential 30 to 40 percent debt level as against a 0 percent debt level (net of cash) and assumes a 35 percent tax rate.

to ration investment capital, choking off value-creating growth opportunities. In some cases, they go further by hedging interest-rate, currency, or commodity exposures.

The beginning of good risk management is to embrace sophisticated financial firms' fundamental attitude to risk: risk is neither good nor bad; individual risks are good or bad for your company. Once a management team has made this shift in mindset, it can begin to position the company to benefit from risk by implementing appropriate controls and protocols.

What should these controls and protocols look like for a typical nonfinancial firm? A good model is the energy industry, whose players have been in the vanguard among nonfinancial firms with regard to their active management of risk.

Risk in the energy sector

The energy sector embraced risk-management techniques earlier and more thoroughly than other corporate sectors, for three principal reasons.

First, energy companies face substantial commodity risk: oil and natural gas producers experience prices that are typically much more volatile than interest rates, credit spreads, and exchange rates. Energy processors such as oil refiners face even greater volatility than producers because they are exposed to fluctuations in prices for refined products as well as those for crude oil. Deregulated power generators, which produce electricity – a commodity that cannot be stored and so must be sold the moment it is produced – face the greatest volatility of all.

Second, energy companies must make very large investment commitments (a single refinery, offshore oil platform, or power plant costs several billion dollars) involving time horizons of 30 to 50 years, covering multiple industry cycles and technological discontinuities.

Third, enabled by the creation of spot physical markets for most energy commodities, the energy industry has undergone a dramatic unbundling, as the vertically integrated market of 30 years ago has given way to a world of independent gas producers, independent refiners, and merchant power generators.

Given this context, the rapid growth of energy futures markets such as the New York Mercantile Exchange (NYMEX) and the IntercontinentalExchange (ICE), as well as OTC derivative markets, is not surprising. In the 1990s, major oil companies (e.g., BP, Shell), large electric utilities (e.g., Duke Energy, Sempra, RWE, Southern), and leading natural gas companies (e.g., Dynegy, El Paso, Williams) invested heavily in building commodity trading and risk intermediation businesses. The most notable player was Enron, which had more than 1,000 energy traders and (even after post-scandal income restatements) more than \$2 billion of annual trading profits. At the time of Enron's collapse, its Enron Online trading platform was regularly settling commodity transactions in excess of \$4 billion per day.

Following Enron's bankruptcy in late 2001, the liquidity of energy commodity markets dried up. Several trading-oriented companies (Dynegy, El Paso, Reliant, and Mirant) suffered big losses, and some narrowly avoided bankruptcy. Credit concerns and the absence of liquidity essentially eliminated trading profits. Wanting to distance themselves from risk and derivatives, many of the remaining industrial participants shut down their trading floors.

But the retrenchment was short-lived because the fundamental need to reduce volatility and secure financing had not disappeared. Major investment banks quickly stepped in, and after them hedge funds, hiring former employees of Enron and other energy players. By the end of 2005, liquidity levels once again approached those of 2001. Many big investment banks acquired trading desks from industry players. Two such banks together reported more than \$3 billion in profits from energy commodity trading and risk management over just the 2 years 2005 and 2006.

Several innovative players took advantage of liquid commodity markets and turned aggressively to strategic risk management.¹⁷ Among them, the most dramatic example is TXU Corporation.

Case study: TXU Corporation

TXU was the incumbent electric utility in North Texas when the state fully deregulated wholesale and retail electricity markets in 2002. Competition, capacity overinvestment, and commodity price exposures triggered by deregulation put TXU under severe pressure, reducing its market capitalization by more than half between late 2002 and late 2003 and burdening the company with debt above 70 percent of its market capitalization.

When John Wilder became CEO in February 2004, he realized that even a small decline in wholesale power prices would put the company at risk of bankruptcy. Wilder responded by initiating TXU's highly successful risk-and-return restructuring program, which was built on two core principles: embracing risks of which TXU was the natural owner while actively mitigating all others, and dynamically managing TXU's risk capacity to ensure continued solvency and liquidity.

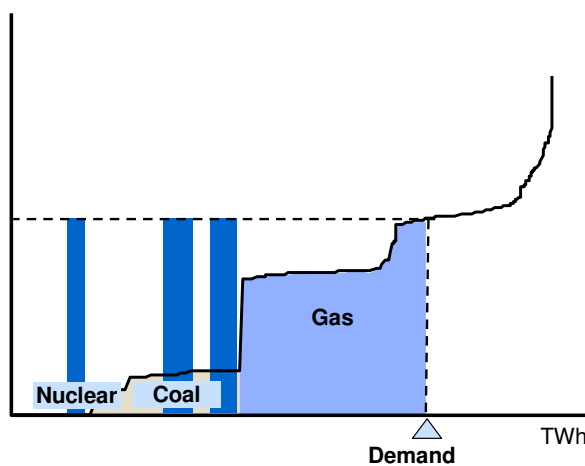
Wilder's primary Texas competitor abandoned its integrated retail and generation business in response to deregulation and experienced lackluster equity returns. Other deregulated generators moved to hedge their risks by entering highly discounted power purchase agreements (PPAs). But Wilder, against example and advice, determined that TXU was in fact the natural owner of its generation business, despite the apparent risks of a downturn in the wholesale market. Wilder recognized that wholesale power price levels were heavily influenced by TXU's own investment and pricing decisions. He also realized that TXU's vertically integrated retail business provided the company with a natural hedge: Should the wholesale market turn down, TXU could compensate by keeping its retail prices proportionately high so long as it could maintain a large portion of its market share through

¹⁷ Flores & Rucks (later Ocean Energy and now merged into Devon Energy) grew from a start-up to become one of the most successful independent producers using structured financing vehicles such as loans secured on underlying oil and gas assets. Chesapeake Energy has grown into an industry leader in exploration and production on a business model built around fully hedging its natural gas exposure. Refiners such as Valero, Tosco, and Premcor have used hedging and risk strategies to fund dramatic acquisition- and merger-based growth. Suncor, a pioneer in extracting oil from Canadian oil sands, has in the past used hedging to maintain its capital-intensive program through industry down cycles. Anadarko used creative bridge financing and hedging to enable two largely debt-funded simultaneous acquisitions whose total cost exceeded Anadarko's own market capitalization.

strong marketing and customer service. (In this sense, TXU's exposure was a natural call option on higher prices, rather than a simple long position.) Taken together, he determined that generation and wholesale power, including the related risks, were worth more to TXU than to any other owner or hedge counterparty – that is, any other player would charge more to take on the risk than the value of any loss TXU might expect to incur by retaining it.

Gain transparency into true economic exposures: TXU example

ERCOT dispatch curve
\$/MWh



Company	Equivalent North American gas reserves TCF	Impact of a \$1/MMBtu change in gas price on equity value %
TXU	11	38
AEP	7	16
Exelon	7	10
Exxon	15	2
BP	14	2
Anadarko	7	18
Chevron	6	4
Conoco	6	4
Shell	4	4

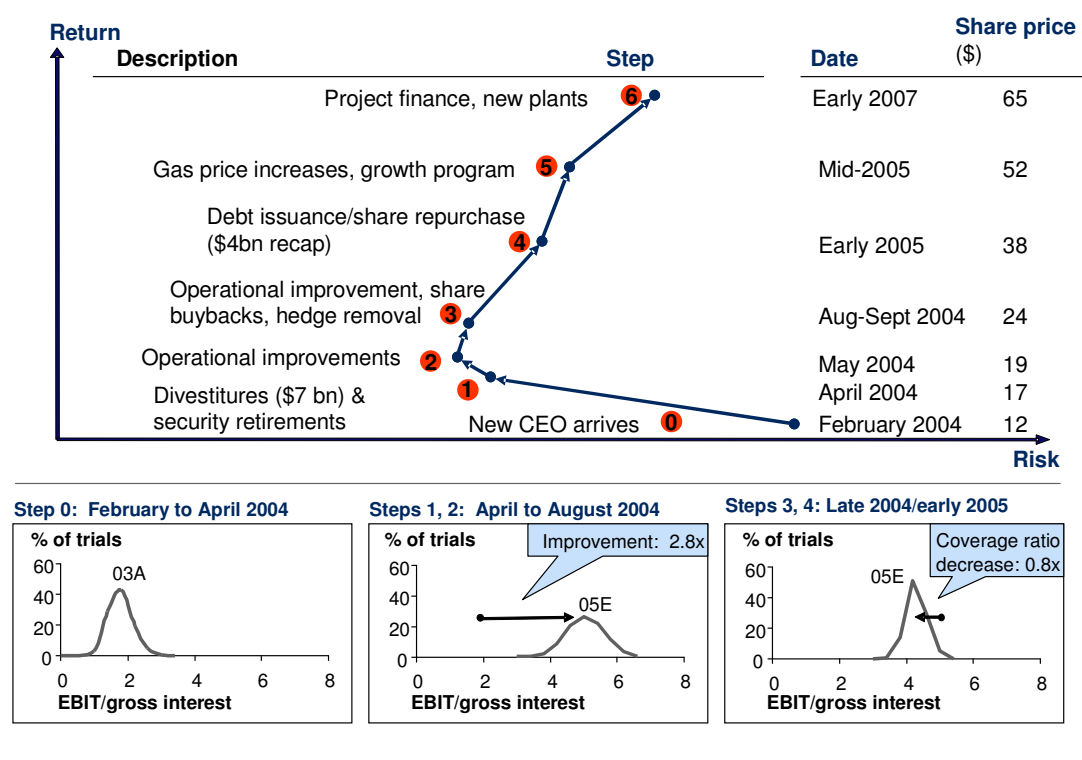
But in committing to the generation business, TXU faced a formidable risk-capacity problem: it would need to fund the capital investment required to maintain its generation business while keeping an adequate cushion against a material chance of bankruptcy should power prices decline. Wilder's response was to create additional risk capacity through a program of divestitures, capital-structure changes, outsourcing, and operational improvements. In his first 60 days, he divested four businesses and used the \$7 billion in proceeds to repurchase debt and convertible securities. He outsourced TXU's call centers and billing operations, and he launched a major lean-operations improvement initiative in the company's plants and mines.

Wilder used some of this newly created risk capacity to restore TXU's exposure to wholesale prices, unwinding expensive commodity hedges entered into by TXU's prior management team. His market foresight paid off. Wholesale power prices more than doubled from early 2004 to the end of 2005, yielding profits unmitigated by unnecessary hedging. Wilder used the remainder of his excess risk capacity to repurchase stock. Over the next year, he bought back almost 40 percent of TXU's outstanding shares at an average price of \$25 per share. When financial models indicated that the company was carrying excess risk capacity in late 2004,

TXU entered the bond market to borrow \$4 billion for the express purpose of buying back even more shares.

Over the following 2 years, TXU continued to optimize its risk capacity dynamically, actively managing commodity hedging, corporate debt, project finance, outsourcing, and share buybacks. For example, in late 2006, when TXU embarked on a major capital-expenditure program to build new coal-fired generation plants, it locked in favorable market terms by hedging the resulting increase in its exposure to natural gas and by making large-scale, fixed-price equipment purchase commitments so that it could project its costs with confidence. Even though plans for several of its new plants were cancelled following TXU's 2007 LBO, the company still profited from these commitments (e.g., it recorded almost \$1 billion in hedging gains). The exhibit below shows how TXU dramatically reduced its risk exposure in 2004, before Wilder's aggressive strategy allowed it to increase its risk-taking from a much sounder financial base. The distributions in the small charts show Monte Carlo simulations of TXU's interest-coverage ratio, a key financial measure for industrial companies (note that this ratio shifted from minimal coverage to a much stronger position as TXU's strategy developed).

TXU example: dynamic management of risk capacity



Wilder's use of risk mechanisms and markets allowed TXU to focus its portfolio on risks of which it was the natural owner, and its financial returns grew rapidly. In 2006, TXU generated EBITDA of \$5.3 billion (up by more than \$2.5 billion from 2003, despite a 40 percent reduction in the company's asset base) and earnings per share of \$5.55 (up more than fourfold from 2003). Its share price increased from \$12 in early 2004 to \$69 when it was taken private via leveraged buyout (LBO), creating more than \$32 billion in value, and placing it fourth among

S&P 500 companies in terms of stock performance. TXU estimates that its risk-return restructuring program contributed some 75 percent of this value.

In October 2007, TXU was taken private in the largest-ever LBO, a \$45 billion deal led by KKR, TPG, and Goldman Sachs. Interestingly, the transaction economics hinged in part on the buyers' ability to continue to manage TXU's exposure to commodity price risk. After hedging virtually all the company's commodity risk for the next few years, the private-equity owners tripled debt levels (from \$12 billion to \$37 billion). The largely annuitized operating cash flows (achieved by hedging the commodity risk) are expected to ensure debt coverage and allow the new owners to recover most of their \$8 billion equity investment. The use of hedges and non-amortizing debt have effectively provided the new owners with a low-cost call option on wholesale power prices. In effect, via this clever structure, they own the upside while the debt holders bear most of the risk of a decline in value – although the latter, too, are protected in part by the commodity hedges. The buyers took aggressive advantage of an extremely LBO-friendly market, in which the combination of hedging and debt was thought to create a lower cost of capital than public equity. Time will tell how TXU's new owners and their creditors adapt to the new risk environment.

A practical corporate risk-management process

Just as many risks faced by financial institutions have been well understood in the academic context for decades, so too has academia long possessed the management and decision-theory insights that nonfinancial companies must master.¹⁸ But if the individual tools are well understood in academia, the challenge is applying them effectively to a company's situation.

The fullest approach to corporate risk management is known as enterprise risk management (ERM). Rather than seeing and tackling risks one by one, ERM aspires to view all risks "together within a coordinated and strategic framework."¹⁹ While sound in concept, many companies have found that their ERM processes have failed to deliver on their promise. As a result, many have become skeptical of the concept, and there is now a widespread sense that "today, ERM largely exists in name only."²⁰

We believe that ERM's shortfalls stem from the lack of a practical approach that can be integrated with a corporation's other core managerial processes. As such, our best service to our clients is to provide them with the background offered here, along with a straightforward five-step program that will allow them not merely to anticipate and respond to risk events but to

¹⁸ Five of the most influential strands of this theory – scenario planning, game theory, decision trees, real option value, and behavioral heuristics – are described in "A Primer on Tools and Techniques of Risk Management" (ID# 737072).

¹⁹ This definition comes from Brian W. Nocco and René M. Stulz, "Enterprise Risk Management: Theory and Practice," *Journal of Applied Corporate Finance*, vol. 18, no. 4, pp. 8-20.

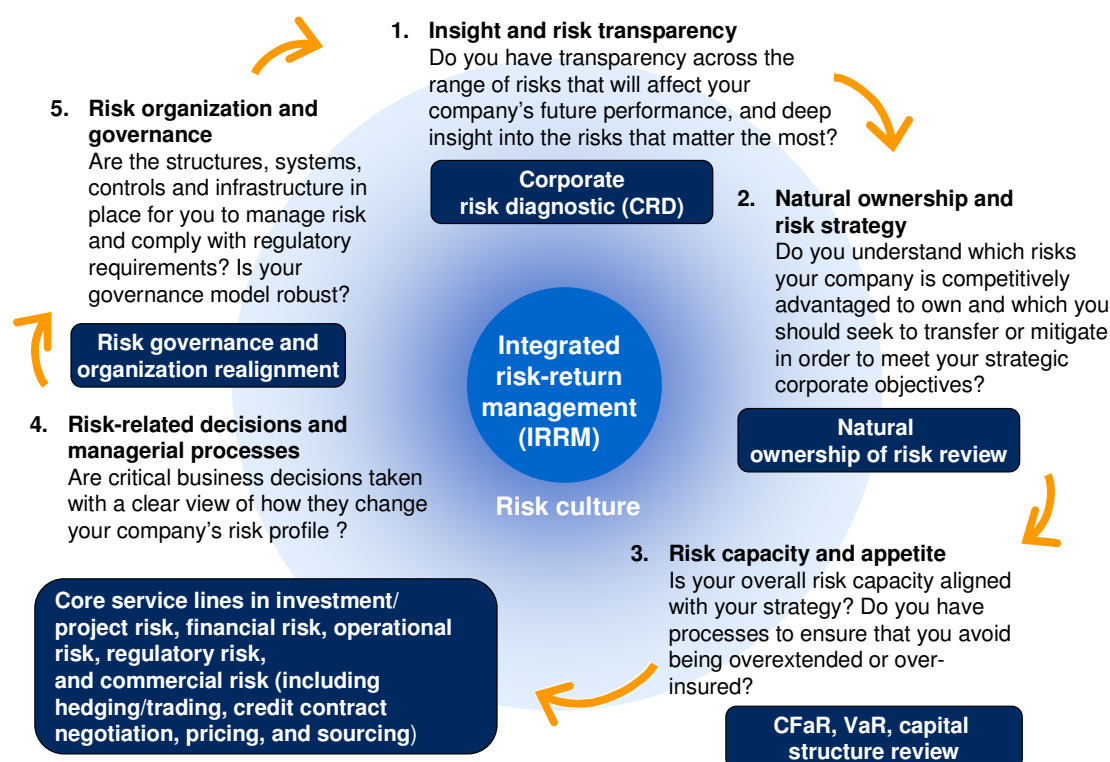
²⁰ Quoted from Michael Crouhy, Dan Galai, and Robert Mark, *The Essentials of Risk Management*, New York: McGraw-Hill, 2006, p. 387.

use risk as a strategic and operational organizing principle. The five steps, also illustrated in Exhibit 6, are as follows:

1. **Develop risk transparency.** What are the corporation's major risks, and what is the magnitude of those risks?
2. **Determine whether you are the natural owner of the risks you are running.** Which risks should the corporation hold, and which should it mitigate or transfer?
3. **Determine your capacity and appetite for risk.** Is the corporation maintaining the proper amount of risk capital, or is it overinsured or underinsured? How much risk would it like to own?
4. **Embed risk awareness in all decisions and processes.** Are risk-return trade-offs fully embedded in the company's strategic, operational, commercial, and financial decision-making processes?
5. **Establish a risk-appropriate culture, organization, and governance model.** Is there proper risk oversight at all levels of the organization?

Exhibit 6

An integrated approach to managing risk and return



These steps make most sense at the enterprise level, although they can be applied to business units within a company. Sound implementation of the full program will strengthen a company's risk-return situation. And each step can form the basis for a conversation with the CEO.

1. Developing risk transparency

It is easy to grasp that an uncertain future is better expressed by a probability distribution than by a single-point forecast. In practice, however, single-point forecasting is still the norm. Best-practice risk assessment requires adopting a probabilistic view of a company's key risks. In some cases, the probabilities can be ascertained from traded markets (e.g., by deriving implied volatility from options traded on commodity futures markets). In other cases, they can be extrapolated from an analysis of historical data. For example, companies can compile data from past projects and model the statistical likelihood of the success of future projects. Of course, in many situations, risk probabilities are more difficult to quantify and require more subjective assessments. Fortunately, an array of decision tools can help, including scenarios, agent-based modeling, and Delphi surveys.²¹

In our experience, just a few types of risk typically drive the exposure of a given company. Contrary to the exhaustive list that many ERM processes churn out, we advocate a strategic conversation on the several types that matter – typically, demand, commodity, country, operational, and foreign-exchange risk. The list will vary slightly by company, industry, and geography. In one example, we advised a diversified metals company which had identified sixty risks across its business units. We found that six of these risks contributed more than 90 percent of the overall cash-flow volatility.

Once individual risk assessments have been made, companies can use a number of approaches developed by leading financial institutions, including Monte Carlo simulations, which aggregate risk at the enterprise level, or value-at-risk measures, which enable the company to estimate the maximum downside it is likely to face and to value the impact of various risk-mitigation actions.

A dynamic perspective is crucial. If the industry evolves unfavorably, will it be possible to pass risks on? In the 1990s, U.S. airlines faced relatively limited fuel-cost risk since fuel-price changes could be passed on in fares. But beginning around 2002, low-cost carriers such as Southwest Airlines began to hedge their fuel purchases and offer fares that no longer floated with the oil markets. Major carriers could no longer raise their fares when oil prices increased and suffered billions of dollars in losses from their “new” exposures. Similarly, in the aluminum industry, the arrival of Chinese producers meant that rising labor costs in developed economies could no longer be passed on to customers.

A second aspect of risk assessment identifies “portfolio effects” within the company: risks that are effectively diversified away within the company itself. Common examples are foreign-

²¹ One other tool that is becoming increasingly popular is offered by so-called information or prediction markets. Essentially, these have been adapted from futures markets originally designed to predict the outcome of elections. “Voters” can use an organized exchange to place bets on which candidates they think are most likely to win. These have proved to be far more accurate than opinion polls. In corporate settings, such markets have already found some interesting applications. One leading U.S. retailer found that the accuracy of its sales forecasts was substantially greater using a prediction market that tapped the direct knowledge of its regional sales teams rather than relying on a centrally generated forecast. Google has been a pioneer in this area, creating markets on dozens of occasions to test ideas and monitor project performance. For more on this, see Bo Cowgill, Justin Wolfers, and Eric Zitzewitz, “Using Prediction Markets to Track Information Flows: Evidence from Google,” at <http://bocowgill.com/Google PredictionMarketPaper.pdf>.

exchange netting across a multinational or vertical integration across markets for inefficient factor costs.

Finally, a diagnosis must address the big “what ifs” facing the company. As Myron Scholes pointed out, it is helpful to divide risks into three categories: those that are known, those that are unknown, and those that are unknowable (the “KUU” framework). This ensures that outlying risks that could have a meaningful impact on future performance are identified.

There are challenges to a risk diagnosis that go beyond its technical aspects. Internal dynamics can interfere: business unit heads may push to secure funding for certain projects, whether or not the company has better options elsewhere, or problems of definition could arise (e.g., the legal and financial departments might have different views of risk and no shared language or measures with which to discuss them). So implementation is not straightforward. Nevertheless, the process itself is an essential and eye-opening foundation for risk-management decisions.

2. Are you the natural owner? Holding, acquiring, mitigating, and divesting risk

In the 1970s, a revolution occurred in the field of corporate strategy. A boom in mergers and acquisitions launched new professions in M&A banking, M&A law, and strategy consulting. Given an active and efficient market for corporate control, companies shifted their corporate strategy focus from owning the most attractive businesses to owning those businesses for which they were competitively advantaged – of which, that is, they were the natural owners. If an owner were not advantaged, then even its fastest-growing or most profitable businesses could be divested at prices above the company’s “hold case.” Conversely, if the company were a competitively advantaged owner, it was typically sensible to keep even its least exciting businesses.


A similar revolution is now occurring in the field of strategic risk management. Once again, the catalysts are emerging marketplaces: risk-transfer markets such as those for financial derivatives, commodity derivatives, business process outsourcing, reinsurance and contingent capital, and so on. Companies can now seek out not only businesses for which they are the natural owner (which represent a bundle of risks), but also those risks for which they would be the natural owner. Such risks should be kept and, if possible, acquired. All others should be hedged or transferred.

How does a management team assess natural ownership? We have found three questions helpful. First, does the corporation’s business portfolio contain natural offsets? Second, does the company have differentiated capabilities to manage the risk (e.g., information advantages in traded commodities, project-management skills for large investments)? Third, are the accessible risk-transfer markets reasonably efficient (e.g., the market for interest-rate derivatives is so efficient that even the most sophisticated banks derive no benefit from natural ownership)?

Exhibit 7

**Which risks are you competitively advantaged to hold?
Airlines and jet fuel risk example**

✓ Advantaged
✗ Disadvantaged
— Neutral



	Consideration	Assessment of advantage		
		Refiner	Trader	Airline
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> A natural owner has superior insight into a risk or an advantage in holding/mitigating the risk </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Industry knowledge and insight </div> <ul style="list-style-type: none"> Oil price level Refining economics Local basis & logistics in jet fuel 	—	✓	✗
	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Natural offsets in portfolio </div> <ul style="list-style-type: none"> Refiners regularly pass through cost increases Airlines only pass through 30% 	✓	—	✗
	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Physical flexibility (real option) </div> <ul style="list-style-type: none"> Refiners change run rate & product slates Traders focus on building logistic and commercial flexibility 	✓	✓	✗
	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Cost advantage in holding the risk </div> <ul style="list-style-type: none"> Most refiners backed by oil major AAA balance sheet or National Oil Co 	✓	—	✗
	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Alignment with investors' appetite </div> <ul style="list-style-type: none"> Investors in refiner and trader want price exposure 	✓	✓	—

The natural-ownership assessment yields a clear risk strategy for the company (Exhibit 7 above illustrates this assessment using the airline industry as an example). Advantaged risks create superior returns and (subject to the risk-capacity issues addressed below) should not be hedged or transferred. In fact, the company should seek to acquire such risks, whether in risk-transfer markets or embedded with assets or commodities in physical markets. Disadvantaged risks should be mitigated wherever there are efficient risk-transfer markets. Even when such markets are not available, it may be possible for companies to develop risk-transfer opportunities (e.g., long-term contracts or tolling arrangements with customers or suppliers, joint ventures with partners that have offsetting risk positions).

In a well-known case that illustrates the concept of natural ownership, Southwest Airlines persevered through the industry-wide downturn in the airline business following September 11, 2001, maintaining three decades of profitable performance. A contributing factor was a sophisticated fuel hedging strategy begun in the 1990s, which allowed Southwest to reduce its fuel costs by as much as 50 percent compared with competitors. The strategy has generated gains in excess of \$4 billion. In 2005 alone, hedging gains represented \$1 billion (105 percent) of Southwest's operating income. Less well known, however, is the reasoning behind Southwest's hedging decision. For its executives, thinking about fuel-cost risk was only part of a larger strategy centered on the principle of stability of costs, service levels, and fares. They knew that rising fuel prices were the biggest threat to the company's business model as a low-cost carrier. The decision to lock in those prices was not a decision to place a bet on oil markets. Rather, the executives reasoned that whatever happened, Southwest needed to

remain a low-cost provider. If fuel prices rose, the hedge meant they would win in the market because existing labor and productivity advantages would be further strengthened by an edge in fuel prices. If prices fell or stayed flat, Southwest would still be the low-cost leader, because its cost advantage in nonfuel areas was greater than any reasonable expectation of a fall in fuel prices.

3. Determining risk capacity and appetite

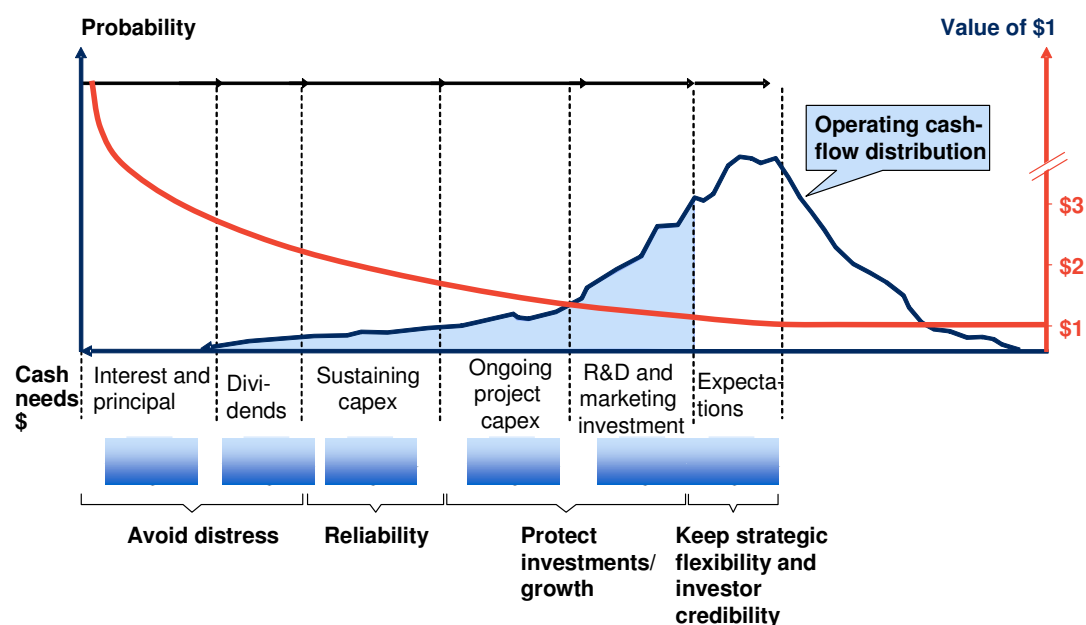
Once a company has identified the risks it should own and sought to mitigate all others, it should reexamine its risk capacity and potentially acquire more advantaged risks.

To understand whether it has the optimal level of risk capacity, a company must first quantify its operating-cash-flow risk. A Monte Carlo simulation to develop probability distributions of cash inflows over the next few years can be mapped against the company's projected cash-flow needs to determine the probability of shortages or surpluses over time.

Exhibit 8 illustrates how to apply this "cash flow at risk" concept. It maps a distribution of future operating cash flows against the company's cash needs. If the distribution falls too far to the right, there is a negligible chance of an outcome that does not easily meet anticipated needs, and the company is being unduly conservative. Too far to the left (as in Exhibit 8), and the company would be underinsured against events that could limit its ability to meet even

Exhibit 8

Assessing risk capacity using cash flow at risk



basic cash needs. This explains the second element of the chart: the idea that a dollar of cash flow does not always have the same value. Used to pay interest and principal, a cash-flow dollar is worth far more to shareholders than a dollar used for more discretionary purposes. In effect, the chart illustrates what is only a relatively recent ability to use quantitative methods to help a company think strategically about its risk-bearing capacity.

Exhibit 9 extends this idea by showing examples of two companies, both of which need to adjust their risk capacity so that the cash-flow distribution appropriately aligns with their strategic goals.

In addition to optimizing risk capacity against annual cash-flow requirements, many companies should manage their risk capacity against other dimensions of enterprise risk. A company in a cyclical industry might want to manage its overall equity value at risk, seeking to keep its expected stock-price volatility below an absolute level or below the expected level of a peer group. Alternatively, a company might place a high premium on meeting earnings-per-share guidance and thus want to assess and manage earnings at risk.

Exhibit 9

Risk capacity can be optimized to avoid inefficient risk-return management

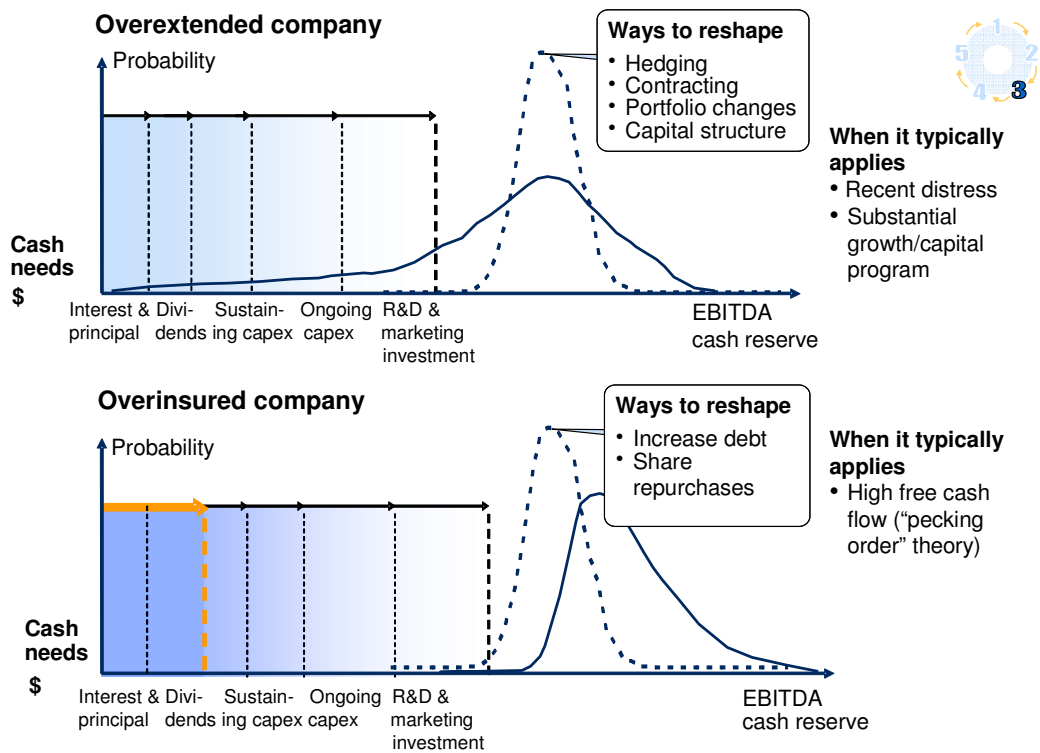
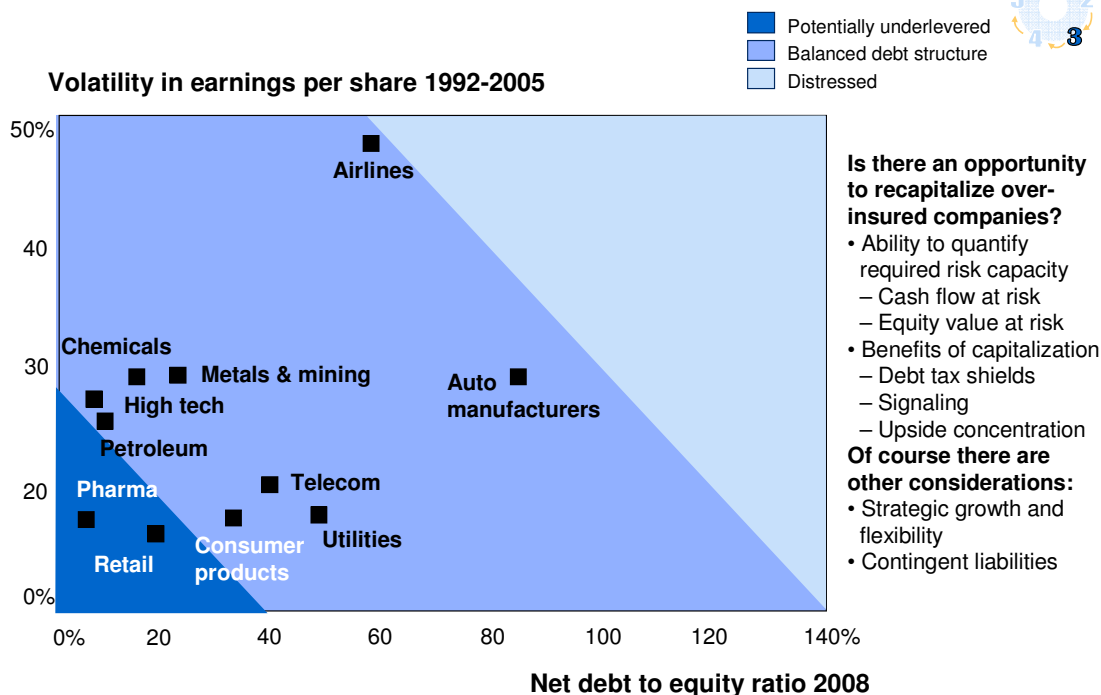


Exhibit 10 on the following page provides a simplified comparison of debt and risk levels in different industries and suggests that there is a huge scope for companies to rebalance their capital structures in light of their risk capacity.

Exhibit 10

Many companies are overinsured relative to their risk



Source: Bloomberg; Datastream; McKinsey analysis

Of course, none of these tools can absolutely ensure that a company won't suffer a shortfall. Extreme and unanticipated outcomes do occur. A sophisticated risk-management system, however, can often identify and rectify a strategic course that is taking a company toward the overextended or overinsured extremes that we find to be all too common.

4. Embedding risk awareness in decision-making and managerial processes

Risk management is not an exercise to be undertaken once, or once a year. It is an attitude to problems and decisions. Psychology and behavioral economics have established that we have difficulty correctly incorporating risk into our thinking. So companies must put in place formal processes for risk-informed decision making.

In some respects, this is more challenging than the earlier elements of the risk-management process this paper has outlined. It requires commitment, discipline, and senior leadership willing and able to communicate why risk is a critical metric for decisions. It also inevitably requires a willingness to apply risk thinking in new areas.

For this to happen, there must be a broad understanding of the range of decisions to which risk management is relevant. Four kinds of managerial decisions can benefit substantially from risk-enabled approaches:

- **Investment decisions.** By adopting a probabilistic approach to investments, companies can avoid many of the pitfalls inherent in more traditional evaluations. Instead of a single NPV point estimate, companies can determine the probability of a whole range of outcomes, including the probability of a negative NPV. The range of probabilities can then be compared with those under alternative project structures – e.g., turnkey engineering, procurement, and construction (EPC) contracts or hedged product prices. Companies can also quantify the value associated with real options – the ability to defer or accelerate an investment program based on unfolding events.
- **Commercial decisions.** Most industrial purchasing and pricing decisions, whether short-term spot or long-term contracts, can benefit from “risk-book” concepts common to financial asset management and trading firms. Risk books break complex risks into component parts, enabling more effective matching and measurement of exposures. For example, a chemical company that produces plastics for packaging could better understand its true exposure to oil prices, and whether higher costs for its feedstock will be more than offset by the higher prices resulting from higher costs for competing materials such as aluminum or paper.
- **Financial decisions.** Most financial policy decisions involve risk trade-offs that should be viewed in the context of enterprise cash flow and value trade-offs. Should the company employ greater hedging to increase its debt capacity? Should the capital budget be cut to provide a cushion? Should the company issue equity instead of debt to fund an acquisition? Too often, these decisions are based on arbitrary debt/equity guidelines or target credit ratings instead of cash-flow-at-risk and value-at-risk principles.
- **Operational decisions.** Decisions on a company’s manufacturing footprint, supply chain design, outsourcing, and inventory policy involve significant risk-return trade-offs that can also benefit from an enterprise risk perspective.

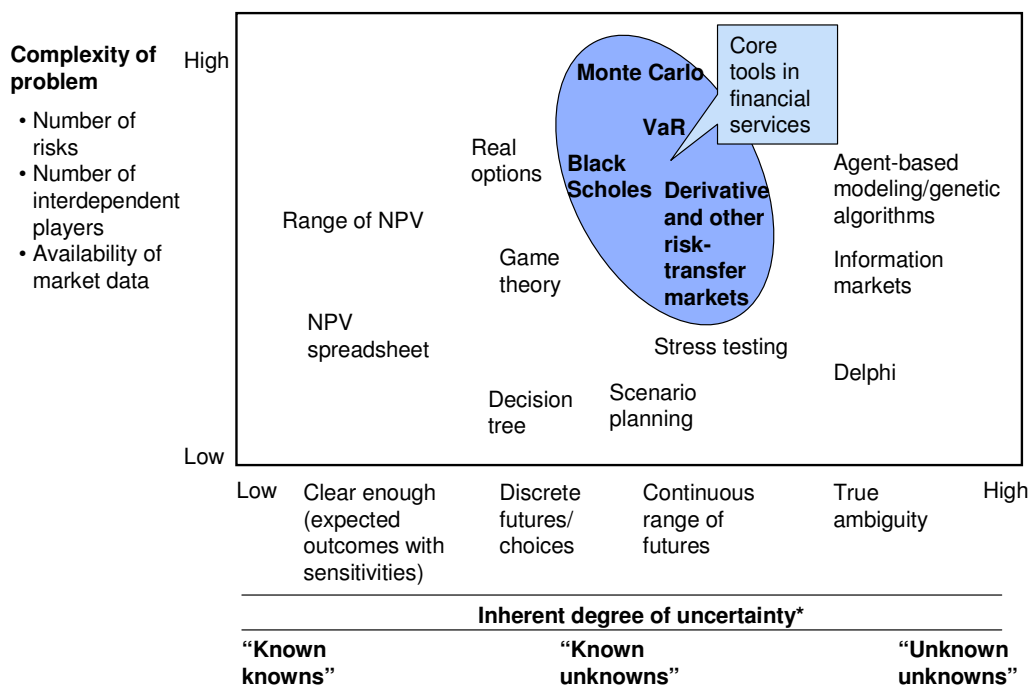
Generally, these decisions are neither coordinated across a company nor evaluated using risk decision tools. Investment and operational decisions are made by business unit managers; procurement decisions by purchasing; pricing decisions by sales-force management; and financial policy decisions by the CFO. Yet each decision consumes or creates risk capacity. Each involves uncertainty and risk exposure.

We cannot overstate the importance of this. Ask clients whether they struggle with big decisions such as whether to enter a new market, increase R&D spending, or whether to lower prices by squeezing their procurement processes. The typical approach is to take a base case, or perhaps a high and low case, and forecast accordingly. But these are to a large extent risk-management questions. Working off one case or even three ignores most of the probability distribution – ignores, that is, most of reality.

Exhibit 11 illustrates how the tools we have discussed might help across different types of risk. Table 2 lays out the impact this approach can have in a range of industries.

Exhibit 11

Strengthening decision making using all available tools



* Degrees of uncertainty (x-axis) from Courtney, Kirkland, and Viguierie, “Strategy Under Uncertainty,” *Harvard Business Review*, November 1997 Source: McKinsey analysis

Table 2
Examples of risk across industries

Industry	Where risk management can lead to better decisions
Pharmaceuticals	How robust is our R&D pipeline? Which drugs should we license?
Consumer goods	Should we lock in volatile materials and packaging costs? Will we be able to pass through commodity price increases?
Electric utilities	How should we invest in view of the controversy over greenhouse gas emissions or with regard to regulations on renewable power?
Telecom	How and where should we invest to compete in VoIP?
Software	Do our global sales justify multilocal manufacturing? Can we manage currency risks more effectively with derivatives?
Automotive	Should we continue to grow our call center in India or look for a lower-cost site that will take longer to become operational?
Railroads	Should we hedge our fuel costs? Are we helped or hurt by higher oil prices given their competitive impact on truckers?

5. Establishing a risk-appropriate culture, organization, and governance model

In an ideal world, all business managers or decision makers would analyze the impact of a proposed project or investment on the overall level of the company's risk and make precise trade-offs that would help the company maintain optimal risk exposure. In the real world, this is true only in companies that have a strong risk culture that informs how managers at all levels make decisions. This includes incentive systems that encourage individuals to value the whole enterprise rather than personal fiefdoms and to make decisions with an eye to long-term economic outcomes rather than short-term performance.

It is not easy to get managers thinking about risk in the way we have described. A highly motivated CEO who understands the power of managing both risk and returns can inspire an entire management team and shape corporate culture. But this requires a lot of education on the part of the CEO and the application of consistent discipline. It does not happen overnight, but rather takes years. Yet when it does occur, in our experience, it tends to have a lasting positive impact on how a company performs. One highly successful company that has very publicly put risk at the center of its culture is BHP Billiton, which has combined the sophisticated use of analytics to support its strategic decisions with unprecedented transparency about risk taking for stakeholders.

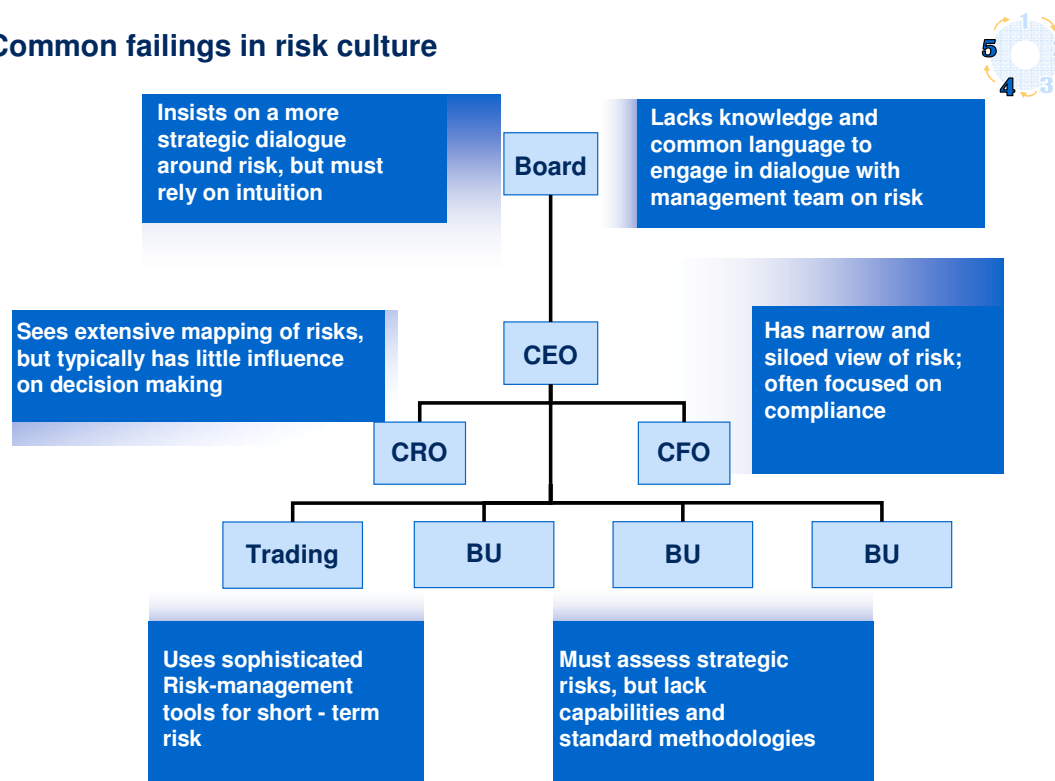
No discussion of risk would be complete without acknowledging that the oversight of a risk-return management effort requires constant vigilance from a company's executives and board. Companies with the best risk-management processes describe a culture of questioning and openness: information is simultaneously challenged and filtered in an organized fashion to minimize surprises. By contrast, in many companies there is no clear governance structure and the effort becomes segmented, just as risk is siloed and therefore not understood at the firm level. Exhibit 12 on the following page suggests some typical shortcomings – reminding us at the same time of the complexity of the organizational challenges that must be overcome to embed a risk-return-based culture.

Because a strategy must be formulated in the context of the organization that will execute it, systematic or strategic risk management can happen only if the organization is aligned from top to bottom so that everybody has a common understanding of the company's key risks and a clear line of sight into the overall level of exposure to those risks. Few companies achieve this. Most may try to identify the different aspects of risk, and perhaps take some mitigating steps, but lack genuine insight into the risks they are running. Although companies may employ a chief risk officer, they are unlikely to imbue the role with much power and tend to have only limited understanding of how risks interact. Many of these companies will be using capital sub-optimally and will also be running strategic risks of which they are unaware.²²

²² Nocco and Stulz suggest two essential organizational components. First, all business managers (or decision makers) should be required to “evaluate project returns in relation to the marginal increases in firmwide risk to achieve the optimal amount of risk at the corporate level.” Second, performance evaluations of business units should take into account their contributions to the total risk of the firm so that managers at every level have the incentive to refuse risks that are economically unattractive (“Enterprise Risk Management: Theory and Practice,” pp. 4-7, see note 19).

Exhibit 12

Common failings in risk culture



Even companies that have an appreciation of the risks they are taking, and some sophistication about managing them, usually fall short of what is required. The most common mistake is to adopt a decentralized approach, in which business units own risks with oversight from the corporate center, which has some degree of power over portfolio choices that aggregate risks in positive ways. This is typical of large, project-based companies with complex risks of long duration. Such companies tend to have only limited understanding of the real risk-reward trade-offs at the aggregate level and usually combine large equity cushions with heavy insurance to protect downside exposure. There is often tension between the center and the business units – the latter tends to perceive the risk function as internal “police,” determined to call a halt to independent activity.

In our experience with clients, we have found that the most effective model by far is a centralized one, with a powerful chief risk officer who reports to the chief executive and presents regularly at the board level. Companies with this structure tend to manage volatile risks that require vigilance and discipline. Risk is embraced for its upside potential because the corporate culture understands it and is in command of the trade-offs being made. As we have noted, successful risk-return managers such as Goldman Sachs ensure that the organizational functions responsible for risk are widespread. They also make sure that successful managers who rise through the organization spend some time working in the formal risk-return function, so that this experience will shape how they interact with the function from

subsequent positions as senior decision makers either in the corporate center or in business units. A risk-return philosophy becomes an integral part of the cultural norms of the organization.

* * *

The message is clear: companies must consider both the risks and returns of their strategies. The considerations are best done systematically. Those companies with good risk-return management systems and a culture of careful decision making will outperform less disciplined competitors. Top management, including the CEO and the board, should take the lead in introducing a dynamic risk-return management process. Strategically, this means understanding the risks being taken, determining which risks the company should own, and assessing whether the company's risk capacity is properly aligned with its strategy. Operationally, this means avoiding any tendency to rely on gut feeling and introducing and championing analytics and decision-support tools. For us as consultants, bringing the surgeon's tools offered by financial risk management, even at a time when many financial institutions appear to have lost some of their own discipline, together with the blunter but very practical tools of corporate leadership, can allow us to achieve a significant positive impact in helping companies through the evolution – or the revolution – required to improve their performance over the long term.

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Selected sources

There is an enormous breadth of literature, both popular and academic, on risk and risk management. This source list is intended as a guide to some of the most useful texts and is not meant to be comprehensive. It complements, rather than reproduces, the texts mentioned in the footnotes.

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