



Dealing with the Unexpected

Lessons for risk managers
from the credit crisis

Preface

A first draft of this paper was written for Zurich's Global Risk Summit, which was held on September 11 and 12, 2008, in Lucerne, Switzerland.

The report was coordinated under the general direction of Daniel M. Hofmann, Group Chief Economist of Zurich Financial Services. Major contributions were also made by a team from Oxford Analytica comprised of Jens Tholstrup (lead), Elizabeth Barker and Mark Elsner. Zurich contributors were Linda Conrad, Raymond Mathieu, and Adrian Sweeney. We also benefited from suggestions from Douglas Niemann. Much encouragement, and above all financial support, came from the Global Corporate business division under the lead of its Chief Executive Officer, Geoff Riddell, and congenially represented by David Martin and Gregory Renand.

The report also benefited from the input of the speakers at the Global Risk Summit. Major presentations were made by Claudio Borio (Bank of International Settlements), Paul Embrechts (ETH), Nigel Lightfoot (UK Health Protection Agency), Kevin Norrish (Barclays Capital), and Herbert Oberhänsli (Nestlé).

The first draft of the report would not have been written without our target audience in mind, the risk managers attending the Global Risk Summit. We are thankful for their active participation. Their stimulating comments found their way into the final version.

This report is dedicated to the community of risk managers.

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Introduction

If risk sets the price of reward, why has the credit crisis weakened so many financial institutions, and even driven a few into bankruptcy? After all, they took plenty of risks, so shouldn't they have been rewarded handsomely?

Of course, taking risk in itself is not enough. A better question would be to ask which risks, and how much risk, should we take? Or more specifically: how many risks over which range of options can we afford to take, given the capital at our disposition?

Framing the question in this way will give us more meaningful answers. Dealing with risk goes beyond looking at a series of random events. It also goes beyond mere risk-avoidance. To deal with risk properly means to look for opportunities based on well-informed risk thinking.

But that's not always easy, as the current financial crisis keeps reminding us. At the outset of the crisis many risks were poorly anticipated, and some were flatly unexpected. The world of structured finance has been debilitated by the rapid and widespread occurrence of events that had been considered one in 10,000-year events. In addition, the belief was widely held that slicing and dicing risk in a myriad of new ways had made the world less risky.

That was a fallacy, of course. While it may be true that modern financial markets are generally more stable most of the time, they may also be excessively unstable in really bad times. And those once in 10,000-year events seem to be occurring all the time.

The remarkable compression of risk time horizons is not limited to the financial sector. In this decade, we have witnessed terrorist attacks such as 9/11, and in 2005 three back-to-back hurricanes hit the US Gulf coast. All these events were considered outside the normal distribution of experience. All imposed severe human and economic costs which impacted people, regions, supply chains and industries far removed from the epicenters of the catastrophes.

This paper aims to sensitize us to the increased frequency of so-called fat tail events. Financial and nonfinancial corporations alike should accept that low-frequency, high-severity events do occur every once in a while. We must anticipate them as a normal step in risk management, and make our organizations fit for the challenge.

That's why we put the credit crisis in a broader context. It is an instructive case for what can happen when extreme events are poorly anticipated. And there are lessons for all industries about strategic resilience.

Clearly, the credit crisis places the need for enterprise risk management (ERM) squarely in the center. It drives home the point that risk management must be anchored at the top. And it underscores the importance of an integrated approach to ERM that cuts through all layers of an organization.

At a time when risks have become complex and interrelated, risk management can no longer be tucked away in a far corner of our firms. Risk does not respect silos. It reaches all industries and geographies, and therefore demands broad anticipation and mitigation efforts.

While ERM is certainly not a panacea, it does provide an active framework for uncovering and understanding many exposures that threaten the viability and capital efficiency of our corporations.

It is in the nature of the by now proverbial 'Black Swans' to be unpredictable. But if the unpredictable should strike, sound ERM will have contingency plans in place to make our organizations more resilient.



Geoff Riddell

Member of the Group Executive Committee
Chairman, Zurich Global Corporate

Chapter 1

Extreme events – examining bubbles

"...our world is dominated by the extreme, the unknown, and the very improbable (improbable according to our current knowledge) – and all the while we spend our time engaged in small talk, focusing on the known and the repeated."¹

1.1 Unexpected events

Global business is growing in complexity, as are the number and types of risks and opportunities that companies face. Extreme events that cannot be fully predicted or understood until they occur, such as terrorist attacks or natural disasters, will continue to confound us. While it is unlikely that we will ever be able to anticipate such extreme events precisely, we can mitigate their effects by trying to identify them in advance, and ensuring that robust risk management structures are in place to absorb such events when they occur.

At Zurich's Global Risk Summit in September 2008, it was highlighted how risk managers can often become caught up analyzing routine risks and do not allocate resources and time to the identification of the now infamous 'Black Swans.' As the quote from Nassim Taleb's book emphasizes, it is all too easy to focus on the day-to-day 'knowns, for which there are many tools.

By devoting attention to unexpected events, we can limit the size of their potentially damaging effects

Dealing with the unexpected is more demanding. However, by devoting attention to unexpected events, we can certainly limit the size of their potentially damaging effects. Further, potential risks can be transformed into opportunities if managed in the right way, and some of the 'Black Swans' of today may eventually become the routine risks of tomorrow.

1.2 Financial bubbles

Throughout recent history, financial bubbles have provided instructive examples of such extreme and poorly anticipated events. From the South Sea bubble to the subprime bubble, manias and speculation are not new phenomena, and seem almost inherent in market-based economies. Since the late 1980s in particular, bubbles have developed and burst – some country-specific, some regional, and others global. They have involved different asset classes, and recently they have occurred with perhaps greater consequences than in the past.

The deepening of the credit crisis that has followed the subprime crisis makes this an opportune time to assess bubbles in general as recurrent examples of extreme, poorly anticipated events from which risk management lessons can be drawn. Although the credit crisis may have been predicted by some, its timing and impact were far from clear before the development in 2008.

What is a bubble?

Definitions vary, but all generally focus on prices rising far above market fundamentals. Andrew Farlow of Oxford University observes that, in a bubble, the normal mechanisms that lead prices to align with demand and supply fail:

"Bubbles cause assets and liabilities to become improperly valued, and balance sheets give a false impression of the true situation. Incorrect price signals cause misallocation of resources."²

Peter Garber, author of 'Famous First Bubbles', noted that the 1929 Palgrave Dictionary of Political Economy states that a bubble is "any unsound undertaking accompanied by a high degree of speculation."³

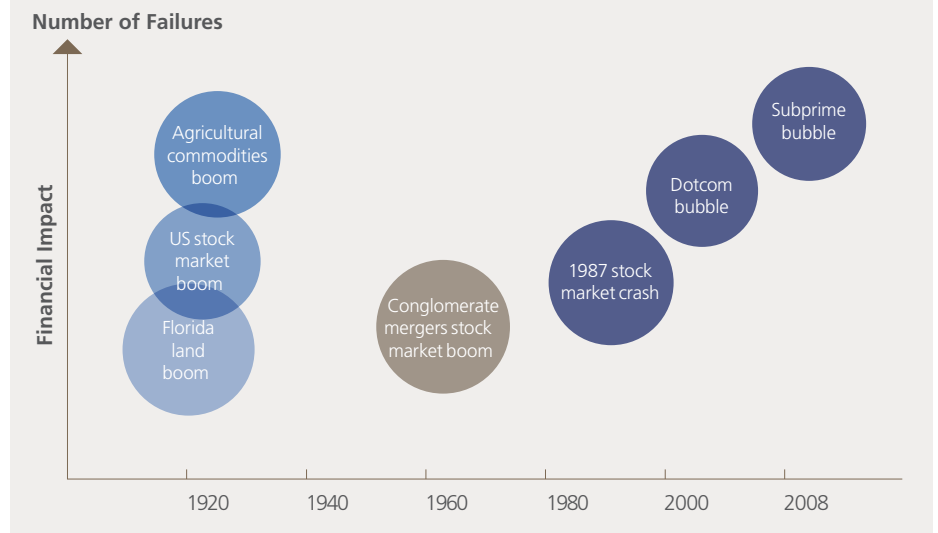
Financial bubbles appear to be inherent in market-based economies

¹ Taleb, Nassim Nicholas, "The Black Swan" Allen Lane, Penguin Books, 2007, p. xxvii.

² Farlow, Andrew: "Bubbles and emerging market crises", University of Oxford, 2003.

³ Garber, Peter, "Famous First Bubbles: The Fundamentals of Early Manias" Cambridge, MA: MIT Press, 2000, p. 7.

Figure 1: Economic bubbles in the United States 1900 – 2008



Source: Andrei Shleifer

Evolution of bubbles

Bubbles develop in similar patterns and move through distinct stages

Former US Federal Reserve Chairman Alan Greenspan and others claim that bubbles can be identified with certainty only after they have burst. They suggest that, during the formation of a bubble, it is very difficult to distinguish between true fundamentals and speculation. However, there have recently been some developments in measuring the growth of bubbles and developing early warning systems.

Andrei Shleifer, in his book 'Inefficient Markets,' collects examples of famous bubbles over the last 400 years, noting five separate phases in the lifetime of a bubble (see also Figure 1 and table 1):⁴

- 1) The initial cause of the bubble – normally some form of good news or major innovation – causes sophisticated investors to enter the market (e.g. the breakthrough technologies that heralded the creation of the dotcom bubble).
- 2) The development or growth of the bubble, sometimes fuelled by sophisticated investors creating financial instruments to increase supply (e.g. in the Dutch Tulipmania, speculative contracts were developed).
- 3) Inflation of the bubble by provoking less-experienced investors to 'jump on the bandwagon,' perhaps by stimulating positive feedback to encourage trading (e.g., in the South Sea bubble, a coffee house 'network of speculators' was created).
- 4) Possible further inflation of the bubble by an 'authoritative blessing' (e.g. government legislation or policy).
- 5) The post-pop policy reaction or regulatory backlash (e.g. the 1720 Bubble Act in reaction to the South Sea bubble).

The impacts of bubbles

The impact of individual financial bubbles has varied in terms of the price variation of financial assets, the effect on the markets in which those assets traded, and the impact on the real economy (see Figure 1). The bursting of the Japanese asset price bubble saw the Nikkei index lose some 75% of its value. It peaked at 38,900 in 1989, but then fell sharply. It has yet to recover (see Figure 2).

⁴ Shleifer, Andrei, "Inefficient Markets: An Introduction to Behavioral Finance", Oxford University Press, 2000.

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Figure 2: The Nikkei 225, 1988-2008



Source: Thomson Datastream

It takes more than the bursting of a bubble to create a significant recession

Like the crash in Japan, the dotcom bubble implosion also saw huge losses in value on the NASDAQ, although recovery was swifter. At the height of the dotcom boom in March 2000, the NASDAQ's value peaked at 6.7 trillion dollars, but by October 2002 it had lost 75% of its value, crashing to 1.6 trillion dollars. In the process, it wiped out 5.1 trillion dollars in paper wealth, 500 dotcom companies and 500,000 high-tech jobs. However, outside the equity markets, the impact was relatively mild, partly as a result of an expansionary monetary policy. Robert Shiller, author of 'Irrational Exuberance', is one of many experts who argue that this subsequently helped stimulate the boom in the US housing market. "Once stocks fell, real estate became the primary outlet for the speculative frenzy that the stock market had unleashed. Where else could plungers apply their newly acquired trading talents?"⁵ Several studies suggest that boom-and-bust cycles in asset prices and credit have severe consequences for the economy, although the causal relationship is difficult to establish empirically.⁶

Adam Posen at the Peterson Institute for International Economics believes that the damage caused by financial bubbles is often overstated, using the case of Japan's asset price bubble to argue that it takes more than the bursting of a bubble to create a significant recession:

*"Japan's recession of 1990–94 was far milder than is commonly recognized and easily explicable by factors outside of the asset price decline – only a combination of policy mistakes turned this normal recession into... extended stagnation... and thereby gave time for the asset price declines to have large real effects."*⁷

⁵ Laing, Jonathan R.: 'The Bubble's New Home', *Barron's*, June 2005.

⁶ IMF Global Financial Stability Report; September 2003 Ch. 3; IMF World Economic Outlook; May 2000 Ch. 3; Bordo and Jeanne 2002; Borio and Lowe 2002; Helbling and Bayoumi 2003.

⁷ Posen, Adam: "It takes more than a bubble to become Japan", Institute for International Economics, WP 03-09, 2003.

The increasing complexity of global markets can create the conditions for a perfect storm

Risk managers may be lured into mispricing risk if disaster has not struck for an extended period of time

Are bubbles becoming more likely?

Some bubbles develop in the context of a seemingly stable system of transactions. However, when that system is placed under stress by extreme, poorly anticipated events or developments, the system can prove unstable. Then, bubbles can burst or deflate.

In 2005, well before the US subprime crisis started, Raghuram Rajan of the University of Chicago argued that the increased complexity of the global financial system could create a condition of greater stability during normal times, while the underlying probability of systemic risk may be quietly growing.⁸ In other words, complexity can distribute risk at the same time that it creates the conditions for more unique and 'perfect' storms.

Indeed, the complexity of the global financial system has made it difficult for regulators or even risk managers to identify key sources of risky behavior. When the system is stable for a long time, yesterday's risky behavior can become the norm, and competitive pressures may drive risk-taking activities to increase. In such a scenario, the probability of tail risks rises.

We observe this in financial markets when investment managers try to outperform peers by ignoring small probability, severe-impact events. This strategy is frequently followed by young and unproven managers. Such managers collect premiums in ordinary times for what could be called disaster insurance. Provided the disaster never strikes, they can pocket those premiums. However, what happens when disaster does strike? Will the people that engage in this behavior be prepared to meet their obligations? Parallels can be drawn between investment managers and risk managers: risk managers may be lured into mispricing risk if disaster has not struck for an extended period of time.

Making matters potentially worse, the impact of those risks, should they materialize, may be exacerbated by herding behavior – the tendency of individuals to believe that it is safer (and more profitable) to be part of the herd. Thus actors would rather adopt popular but incorrect assumptions, rather than be an outlier who's right. For example, investment managers may buy stocks contained in market benchmarks – even if they suspect the stocks are overvalued – because they know poor performance will be excused by clients (and they can keep their jobs) if the benchmark performs poorly. In this way, investment managers – as well as risk managers – may be influenced by how their peers are pricing risk, and once-audacious models may become perceived as standard practice.

More generally, Rajan's analysis of the potential consequences of investor behavior can be paralleled at the operational level of a company, where systems that have become increasingly complex and have functioned well during normal times, like supply chains that cross national borders, are subject to serious malfunction, interruption or collapse when affected by extreme, poorly anticipated events. Mispricing of risk leaves us unprepared for extreme shocks.

⁸ Rajan, Raghuram: "Has Financial Development Made the World Riskier?" NBER Working Papers 11728, National Bureau of Economic Research, Inc, September 2005.

Chapter 1

Bubble	Initial displacement	Smart-money response
Dutch Tulipmania (1630s)	Mosaic viruses produce interesting looking tulips; prosperity of Holland	Selective breeding of tulips; purchase by 'insiders' of broken tulips that can only reproduce slowly and asexually
South Sea Bubble (1710-20)	Profits from conversion of government debt; supposed monopoly on trade with Spanish ruled parts of America	Insiders buy up debt in advance of the conversion scheme, then profit by presenting debt for full conversion
Mississippi Bubble (1717-20)	Rapidly growing trade with the New World; Law's success as a financial organizer	Law's plan to make money and acquire power by securitizing the French debt
British first railway boom (1845-6)	End of depression; excitement over the new means of transportation	Many new railroad projects
US 1873 railway boom and crash	End of the Civil War; settlement of the American West	Construction of government subsidized railroads
Argentine loans (1880s)	Strong demand on world markets for the staple products of Argentinean agriculture; large profits made by early investors	Investment flows from Britain to Argentina; expansion of railway network; construction of social overhead capital
1920s Florida land boom	Great winter climate; closeness to centres of American population; prosperity of the 1920s	Building of railroads; development of Miami; land development projects
1920s US Stock Market boom	Decade of fast growth in the 1920s; end of fears of post WWI deflation; rapid expansion of mass production	Expansion of supply of shares; creation of new closed end funds
1920s US utility stocks boom	Expansion of demand for power; economies of scale	High leverage; expansion of scale to capture economies
1960s conglomerate mergers in the US	Two decades of a rising stock market during which investing in growth stocks had been profitable	Emergence of professional conglomerates; Harold Geneen's ITT, Textron, Teledyne, etc.
1980s Japanese asset price bubble	Expansionary monetary policy and deregulation of financial markets	Low interest rates and easy access to credit, land and 'zaitech' or financial speculation
1995-2001 dotcom bubble	Low interest rates, founding of new internet based companies or 'dotcoms'	Easily available venture capital, stock market speculation
2002-2007 US housing bubble and sub-prime mortgages	Financial innovation in mortgage bond markets, low interest rates.	Investment banks buying up mortgages in the form of securitized products, construction boom

Source: Shleifer, Andrei, "Inefficient Markets: An Introduction to Behavioral Finance", Oxford University Press, 2000, p170-171 and Oxford Analytica (later bubbles).

Sustaining the bubble	Authoritative blessing	Crash	Political reaction
Development of tulip speculation contracts, which can be signed before notaries; appearance of trading		1637	
Development of coffee house network for speculation; new subscriptions	Government approval; royal involvement	1720	Ex post facto punishment for directors; restrictions on use of the corporate form
Government support; large expansion of credit by Law's bank to support further purchases	Official government support. Duke of Orleans imprisons critics of Law – the president of the Parlement de Paris and others	1720	Fall of Law; end of efforts to reform French finances until 1787
Ponzi schemes by George Hudson (i.e. use this railroad's capital to pay the last railroad's dividends)	Parliamentary bills passed for every railroad suggesting government approval; close links between George Hudson and London Society	No crash, gradual decline	Reform of accounting standards; requirement that dividends be paid only out of earnings, not out of capital
Additional railroad charters; expectation that subsidies would continue	Railway Act of 1862	1873 – Bankruptcy of Jay Cooke & Co., beginning of mid-1870s depression	Moves to facilitate some industry consolidation
New issues on the London exchange; creation of joint-stock companies to speculate in Argentine land	Foreign investors 'grossly misled... by Argentinean president'; Barings' express optimism that the situation might improve (hoping to avoid bankruptcy)	Baring Bros. bankruptcy November 1890	Coup d'état in Argentina; laws discriminating against foreign investment
Subdivisions; creation of a network of real estate offices selling Florida land	William Jennings Bryan boosts Florida land; close connections between mayors and developers	1926	Fraud prosecutions
Regional exchanges; growth of margin accounts and brokers' loans	Blessings from Coolidge, Hoover, Mellon and Irving Fisher	October 1929 and subsequent Great Depression	Glass-Steagall Act; creation of SEC; public utility holding company act; election of FDR
Creation of public utility holding companies with cascades of control		October 1929	Breakup of large utilities, TVA a by-product; substantial government regulation of utility industries
Stock swaps to create apparent growth	Harvard endowment takes large positions in National Student Marketing; McGeorge Bundy urges institutions to invest aggressively	1970-1971	Reform of accounting practices; Williams Act
Speculation dominated the activities of some businesses. Speculative profits made were reported as profit, which was then reinvested back into further speculation.		1989-1990	Initial increase in interest rates. Then, as the economy stagnated, monetary policy was loosened again, eventually to a zero-interest rate policy, but with little effect. Eventual bank bailout and tackling bad loans.
Stock market speculation by less well-informed investors piling on the bandwagon	Growth of 'equity culture' within large state-sponsored pension funds	2000	Sarbanes-Oxley Act of 2002; fraud prosecutions
Increasing house prices, continued expansion of mortgage bond market; overly generous bond ratings	Federal Housing Administration push to expand home ownership, President Bush's emphasis on 'ownership society', overly loose monetary policy and lax financial regulation	2007	New standards for mortgage loans, but wider picture not yet clear

Chapter 1

Box 1

The credit crisis



Genesis and spread of credit problems

The seeds of the US subprime crisis and ensuing global credit crisis were sown during the sustained low real interest rate environment in the US following the end of the dotcom boom. During the ensuing expansion, inflation was restrained, partly by the rapid rise in the volume of low-cost imports from emerging markets, especially China. In this benign environment, market participants' fears of severe future economic downturns lessened, and behavioral norms took hold that – with the benefit of hindsight – were increasingly risky. Risk metrics became skewed and the price of risk became too low. One manifestation of this pattern was the easing of mortgage credit standards. Another, highlighted by Claudio Borio of the Bank for International Settlements, presenting in a personal capacity at the Global Risk Summit, was the spectacular growth of credit risk transfer instruments.

The implosion in the mortgage sector, which started in 2007 and has worsened this year, contributed to uncertainty about the size and location of toxic assets in the financial system, generating a mutual loss of confidence among financial market participants. During 2008, this has led to interbank markets becoming dislocated, and, following the collapse of Lehman Brothers, has severely curtailed global credit availability. As noted by Borio, there has been “a sharp repricing of risk that, given leverage, led to, and was exacerbated by, evaporation of liquidity.” The worsening of the credit crisis since mid-September has darkened the outlook for the overall economy.

In early 2008, economists Kenneth Rogoff and Carmen Reinhart, of Harvard University and the University of Maryland respectively, warned of a long and severe recession in the United States. Their assessment is based on an analysis of 18 financial crises in developed economies, including Japan, Sweden and Finland in the 1990s. In the average of these three cases, annual economic growth fell by 5% and recovery took three years. The United States, according to these authors, could be on a similar trajectory.

A more sanguine view emphasizes that losses from the credit crisis are globally dispersed and distributed to many financial market participants as a result of a combination of financial market liberalization and financial innovation (including securitization). The impact of the crisis has indeed been almost as significant in Europe as in the United States. Overall, the dispersal of financial losses may yet help to diminish the long-term impact for any one economy.

Economic impact

In October 2008, the International Monetary Fund estimated that the total potential writedowns and losses from the broad credit market deterioration were approximately USD 1.4 trillion, over half of which would be absorbed by the banking industry. Financial institutions have suffered huge falls in market capitalization and, after the demise of Lehman Brothers, volatility of financial stocks reached extreme levels. This contributed to the failures or nationalizations of several major financial institutions in the United States and Europe.

Box 2

The credit crisis and the insurance industry

While the credit crisis is having a deep impact on the financial services industry, most insurers, at least initially, escaped the crisis largely unscathed. Insurance companies manage about USD 18.5 trillion, or 11% of global financial assets, which ranks them closely behind pension funds and mutual funds in the league of the world's largest institutional investors.

Despite their exposure to financial markets, the initial impact of the credit crisis on core insurance businesses (excluding financial guarantors or monoline insurers) has been relatively limited. Writedowns on investments related to subprime mortgage instruments are likely to be less than 1% of invested assets and less than 4% of the global (re)insurance industry's capital. The two most important reasons why the insurance industry was initially less affected than most banks relate to lower liquidity risk and a strengthened focus on asset-liability management.

- Insurers are prefunded by premiums; they generally do not rely on short-term market funding. While premiums are invested to support future claims, insurers do not employ leverage to enhance expected investment returns. Similarly, claims follow a predictable pattern. Hence, insurers are less subjected to liquidity risk, and general insurers are not faced by the systemic deterioration of liabilities that tends to force banks into large-scale asset sales.
- One lesson the industry relearned in the 2001-2003 financial market crisis was the role of asset-liability management and the necessity of focusing on a well diversified investment portfolio. This resulted in a reduction of the proportion of equities in the investment portfolio of most insurers and a curtailment of investment in potentially illiquid structured products.

It is also worth noting that insurers played marginal roles in the systemic challenge facing many banks today. Insurers displayed resilience in the face of adverse markets; they absorbed market volatility. In this sense, the insurance industry was a stabilizing factor at a time of considerable stress in the global financial system.

The exception was the American International Group (AIG), which in September 2008 had to be rescued by the US government to prevent a collapse of potentially systemic proportions. But the systemic risk that AIG posed was attributable to its financial services unit, which had engaged heavily in the sales of risky, complex derivatives. In contrast, the core insurance business of AIG was and is considered healthy. Consequently, it is fair to say that insurers do not pose the same kind of systemic risk as banks do.

Despite AIG's demise, the credit crisis has not brought into question the insurance business model. While banks are reconsidering the securitization and originate-to-distribute business model, the securitization of general insurance liabilities has not been contested. There is no shortage of cover for life or non-life insurance, and there are no plans to curtail business due to capital constraints.

However, continued market turbulence and the likely protracted slowdown in global economic activity may generate further, substantial declines in asset values with corresponding adverse consequences for the solvency of insurers. By October 2008, shares of a number of life insurers had indeed come under market pressure. This was not the result of direct exposures to subprime investments, but rather the impact of severe stress in global financial markets.

Chapter 1

Rapid changes in the financial landscape in recent years may have increased systemic risk

Risk managers need to assume strategic industry-wide and global perspectives

1.3 Increased systemic risk?

Greenspan and others had argued that the modern globally interlinked financial system is fundamentally less prone to systemic risk than the older, bank-focused, national market systems of the 1960s and 1970s. They also maintained that the emergence of a global financial industry had allowed broad geographical risk sharing. And some would claim that the newfound ability to 'slice and dice' risk from corporate bonds to mortgage debt and then structure and bundle the instruments for investors around the world – from German savings banks to Chilean pension funds – had diversified risk and made the overall global system safer. However, there are a number of reasons why these arguments appear to be at least partially flawed. Indeed, the global credit crisis of 2008 has highlighted a number of systemic risk concerns.

As outlined by Rajan in 2005, rapid changes in the financial landscape have taken place in recent years:

- Innovation and technical change, including rapid dissemination of financial engineering techniques, from securitization to credit scoring, allows new – and in many cases untested – products and processes to enter the marketplace.
- Deregulation increased the competition between products, institutions, markets, and jurisdictions.
- Institutional change created new entities, such as large complex financial institutions, private equity firms and hedge funds, as well as new legal and regulatory arrangements.

Consequently, more arm's length financial transactions have taken place in recent years than in more bank-centered periods, and risks were dispersed more widely throughout the global economy. But new entities may also operate at the fringes of regulators' capacity to monitor activities, and competitive pressure as well as financial sector incentive structures may have actually increased systemic risks.

Furthermore, global markets are now more intertwined than ever – through faster information flows, trade linkages, and capital flows. As a result, much of the protection that investors expect from geographical diversification may actually be a mirage. Taking equities, the correlation coefficient between annual equity market returns in the US market (about 45% of global equity market capitalization) and a group of 20 leading emerging market equity markets was about 0.1 in the early to mid 1980s, but it had sharply increased to more than 0.8 in 2005, 2006, and 2007.

This means that when a systemic risk emerges in a major market like the US, it could rapidly have a domino effect on other markets around the globe. Investors must take a global perspective as they prepare their investment strategies, rather than a narrow industry or geographical perspective. Similarly, risk managers need to assume strategic industry-wide and global perspectives more than they had previously – including both financial and non-financial systemic risks (see Box 3).

Box 3

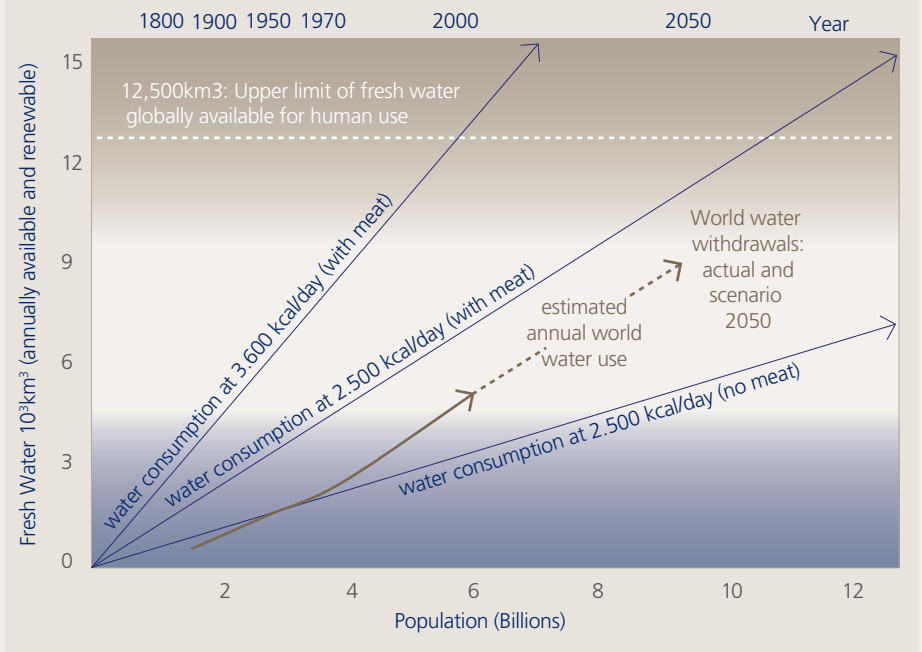
Non-financial systemic risks



At the Global Risk Summit, Herbert Oberhänsli of Nestlé illustrated the potential scale of systemic risks that – at least in their origin – are non-financial. Given current demand trends, he argued, future shortages of energy, food and water are a real possibility. For example, with regard to potential future water shortage, Oberhänsli highlighted how the high water-intensity of meat production dramatically quickens the pace at which freshwater

resources are being used, bringing forward the date at which the upper limit of freshwater globally available for human use is reached (see Figure 3). Extreme events such as natural disasters, infrastructure chokepoint disruptions and crop disease – but also man-made disruptions caused by the production of bio-fuels, for example – could help to precipitate such shortages even sooner than current trends suggest.

Figure 3: Scenario of limits to global water withdrawals through 2050



Source: A. Zehnder, Swiss Federal Institute of Aquatic Science and Technology ETHZ 1999

Chapter 1

1.4 Spotting the next crisis

Indicators

Macroeconomic trends in financial crises

At the macroeconomic level, economists have tried to develop early warning systems that attempt to identify risks of financial crises in emerging markets – of the sort suffered by the Asian economies in the late 1990s or Argentina in the early 2000s. Economists Coudert and Gex, and Bussière and Fratzscher have developed such early warning modeling systems for emerging markets. They take into account macro-economic variables, such as:

- international reserves;
- inflation rates;
- import cover; and
- the ratio of the current account deficit to GDP; and also financial risk measures, such as:
- equity market volatility; and
- risk aversion of investors.⁹

While these models have some utility in identifying trends, they suffer from numerous limitations. Most models produce a lot of false positive signals of impending trouble that limit their usefulness. Many models work better with ex post data and have difficulty identifying turning points in real time.

Bubble trends

Although many economic series (such as GDP) can grow without bound, virtually all economic series that could represent bubbles are logically bounded. The first step is to try to determine when an economic or investment factor grows out of line with its context or natural comparator. Trends in housing, for example, can be judged by looking at measures of housing prices in comparison to measures of affordability, such as the trend in average wage levels.

By these measures, Japan's real estate bubble in the early 1990s was off virtually all charts. In stock markets, one might detect a bubble in a particular sector by examining that sector's share of total market valuation. So if oil companies traditionally constitute 5% of stock market valuation, for example, and this increases to 15%, it may suggest that the sector is poised for a correction. And with currencies, economists may use fundamental equilibrium exchange rate (FEER) modeling to look at how an exchange rate moves relative to a basket of goods that those currencies can buy.

Technological change

When technologies change, some activities or factors can disappear, or jump to 100% of their appropriate category. For example, whale oil lamps could go from 35% of the lighting segment to zero percent, while the incandescent light bulb could go from zero percent of the market to 100%. Likewise, a company that only produced crude oil could go out of business if new and superior energy sources were developed. This is meant to caution that not all extreme price movements are bubbles waiting to bust, but simply a rational reaction to new or dying technologies. However, it should also be said that the advent of new technologies can often cause bubbles, as the dotcom bubble in the late 1990s illustrated all too well.

When identifying potential bubbles, the first step is to try to determine when an economic or investment factor grows out of line with its natural comparator

⁹ Coudert, Virginie; Gex, Mathieu: "Can risk aversion indicators anticipate financial crises?" *Financial Stability Review, Banque de France, No. 9, Dec 2006*; Bussière, Matthieu; Fratzscher, Marcel, "Towards A New Early Warning System of Financial Crises", *European Central Bank, Working Paper 145, May 2002*.

Measures of investor sentiment could be valuable

Measuring investor sentiment

Robert Shiller has had considerable success predicting bubbles using investor attitude surveys. There have also been other efforts to try to measure investor sentiment. Malcolm Baker of Harvard and Jeffery Wurgler of New York University developed an index of investor sentiment using six proxies: trading volume, dividend premium, equity share in new issues, closed-end fund discount and the number and first-day returns on IPOs. They find that stock market crashes tend to occur in periods of 'high sentiment', although it is difficult to predict the exact timing of the crash within these periods.¹⁰

And even if a bubble can be definitively spotted, we can't rely on the market to halt its course. A group of Princeton economists observed that even rational investors might not bet against a bubble unless they felt that others would, too.¹¹

Box 4

Commodities – the latest bubble suspects?



Are commodities the latest bubble suspects? This question was seized upon by many governments and media as they sought culprits for the recent spikes in oil and food prices. For example, in March the Prime Minister of Peru, Jorge del Castillo, stated that the government had declared war on food price speculation.

Are speculators to blame?

While recent commodity prices may have shared some of the characteristics of a bubble, the role of speculation has likely been exaggerated. In recent papers, the International Monetary Fund (IMF) has said that speculation has had little effect on prices of oil or other commodities beyond inducing short-term price volatility.¹² At the Global Risk Summit, this view was supported by Kevin Norrish of Barclays Capital, whose presentation illustrated the fundamentals underlying many of the commodity price rises of the last several years. The fundamentals underlying recent changes in grain prices, for example, are well understood. Prices rose due to a number of factors, including weather-related conditions reducing output, land conversion to increase bio-fuel production, heightened demand from emerging markets, followed by some speculation by investors.

Norrish emphasized that speculators had not been hoarding supplies and that inventories of many commodities remained at low levels. For example, copper inventories have almost never been lower, despite the sharp rises in price. This implies that supply and demand are determining prices more than speculation. Meanwhile, economic growth in emerging markets has played, and will continue to play, a significant role in increasing the demand for commodities, though the current economic downturn should slow global demand somewhat.

The steep rise in oil prices until July 2008 to USD 147/barrel was also driven primarily by fundamentals, according to research undertaken by an Interagency Task Force on Commodity Markets¹³ convened by the US Commodity Futures Trading Commission.

The end of cheap food?

The rise (in real terms) in the price of almost every food item, which culminated – at least temporarily – in the summer of 2008, has revived fears of a return to global food insecurity. Since 1974, the real price of food had been drifting gradually downwards, and by 2005 had declined by a remarkable 75%. During these three decades,



¹⁰ Baker, Malcom and Wurgler, Jeffery: "Investor sentiment in the stock market": *Journal of Economic Perspectives*, 21 (2007), 2, p129-152.

¹¹ Lahart, Justin; "Bernanke's Bubble Laboratory" *Wall Street Journal*, May 16, 2008.

¹² IMF "Regional Economic Outlook – Middle East and Central Asia" May 2008; IMF "World Economic Outlook Update" July 2008; IMF "Food and Fuel prices – recent developments, macroeconomic impact, and policy responses" 30 June 2008.

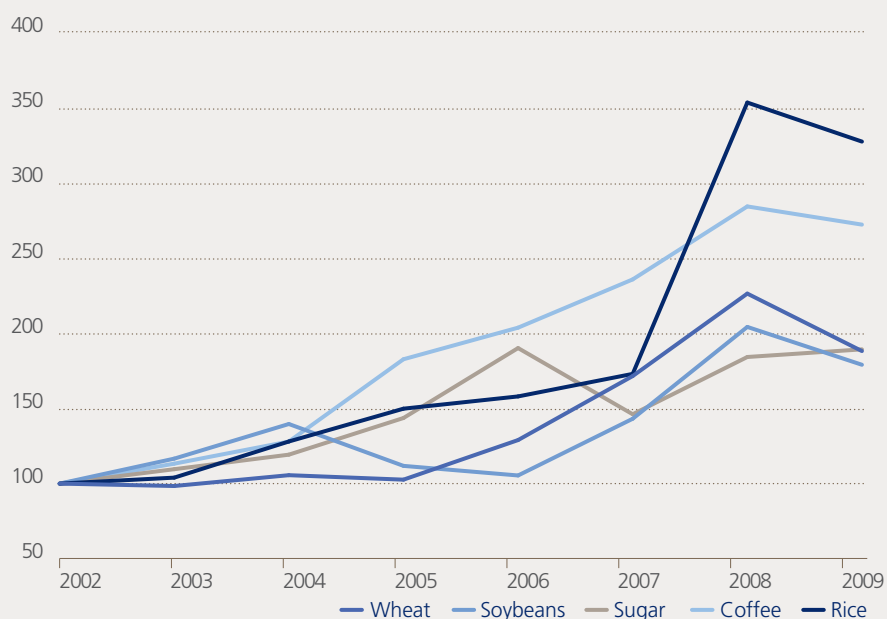
¹³ Interagency Task Force on Commodity Markets, "Interim Report on Crude Oil," CFTC, July 2008.

Chapter 1

Box 4

Commodities – the latest bubble suspects? continued

Figure 4: The Real commodity prices: Index 2005 = 100



Source: IMF

parts of the world became accustomed to cheap food, even if it was still too expensive for many of the poor in developing countries. But from 2005 until this summer, real food prices rose dramatically (see Figure 4).

Three historical high price periods

High price periods for agricultural products are not uncommon. Recent high price periods for cereals have included 1973-75 (the 'world food crisis'), 1979-81, and 1996-97. In each of these cases, prices dropped considerably within five years. The main difference between the first two and the third of these historical grain crises is that, in the 1996-97 period, price controls were removed in major producing and consuming countries in response to tight world markets. Grain and other commodities markets are much more open today than they were in the 1970s and 1980s, spreading the burden of adjustment more widely.

Outlook

Kevin Norrish showed that, in 2008, the average real prices of some agricultural commodities (e.g. wheat and sugar) have remained well below the peaks registered in the 1970s and 1980s. This gives reason to expect that their prices could remain relatively high for several years, unless the global economic downturn becomes very severe. Barring this, demand is likely to remain relatively robust, while supply is constrained and stocks of many commodities remain low. Nonetheless, in the longer term, a slow decline in the relative price of grains and other basic foodstuffs is likely to occur, in line with long-term trends. Eventually, the increase in production from the Americas, Russia and Ukraine, coupled with price-induced demand shifts, is likely to ease prices.

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What can risk managers do?

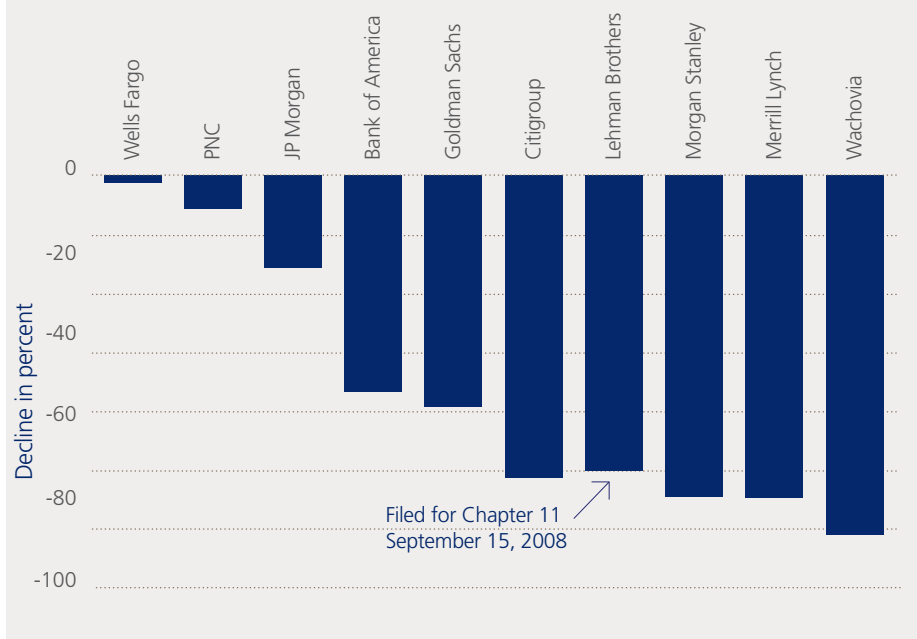
As in earlier financial crises, the credit crisis exposed a number of weaknesses in risk management practices. Proper assessment of the risks inherent in the potential collapse of a bubble or occurrence of another type of extreme event is not the only challenge for risk managers. They also face the difficult task of convincing an organization to limit its risk exposure in good times, when many individuals in the organization have incentives to increase risk exposures in order to keep benefiting from rises in asset prices and profitable businesses.

2.1 Risk management practices

Performance differences may be the result of differences in risk management practices

While the credit crisis is affecting most global financial institutions, some have fared better than others. Figure 5 shows the returns of several US financial firms from the start of the mortgage crisis in June 2007 to June 2008. Three of the four worst performing companies displayed here have since either failed (Lehman Brothers) or been taken over (Merrill Lynch and Wachovia). Among the five big investment banks, only Goldman Sachs and Morgan Stanley have survived, and only then by transforming into commercial bank holdings. This may simply reflect a combination of luck and good timing. Goldman Sachs, for example, had reportedly reduced its positions in subprime mortgages and hedged against the mortgage-related securities it held while those markets were still going strong.¹⁴ But some differences in performance may also be due to differences in risk management practices – emphasizing the critical importance of establishing a robust enterprise risk management (ERM) framework.

Figure 5: Return on common equity of US banks from June 2007 to October 2008



Source: Thomson Datastream

¹⁴ Anderson, Jenny, and Landon, Thomas Jr., "Goldman Sachs Rakes In Profit in Credit Crisis," *New York Times*, 19 November 2007.

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2.2 Risk management culture

Formal rules and limits alone may not be enough to align individuals' incentives with those of the firm. Rather, a strategic risk management culture should integrate broad business analytics into risk-aware decision making. Furthermore, risk management cannot be left to a specialized function – it has to penetrate the culture of the entire organization to be effective in controlling risk. As seen below, risk must be integrated at the board level, and risk awareness should run both top-down and bottom-up to encourage the understanding of risk a way to evaluate opportunities.

It was argued, for example, that the culture Goldman Sachs inherited from its days as a partnership has helped it to achieve an alignment of incentives. In this view, an important part of Goldman's risk management culture is that partners engaged in risk-control functions have as much prestige, status, and compensation as those in the directly profit-focused businesses. Decisions are often made collectively and partners get rotated back and forth between risk-control and business functions.¹⁵

2.3 Risk reporting and governance

The structure of risk reporting is key. At Goldman Sachs, the Chief Financial Officer (CFO) is either in charge of risk or closely involved, and each sector risk officer reports directly to him on issues from liquidity risk to credit risk, from market risk to operational risk.

What also appears to have set Goldman Sachs apart from other institutions is the collective expertise on financial markets and risk management among the members of its board and audit committee. According to Risk Metrics Group, such expertise may be crucial to helping senior management maintain oversight of the firm's overall risk exposure when markets and securities become increasingly complex and opaque.¹⁶ It is not sufficient for the board to offer oversight, as this double-entendre can mean to either carefully supervise or to miss out on key issues. Instead, boards should cease providing simple oversight in favor of providing strategic insight, supported by broad risk intelligence.

2.4 Risk modeling and extreme risk management

Model failure

The credit crisis also revealed a number of serious problems in the modeling of risk exposures. Many financial institutions faced subprime-related mortgage losses that their risk models had told them were virtually impossible prior to the onset of the crisis. Some of the problems of model failure resemble those that appeared in previous crises, such as the Long Term Capital Management crisis in 1998, although the impact on global financial institutions has been much more severe in the current crisis.

Model uncertainty

It is often difficult to predict extreme and rare events or the possible impact of such events. Forecasts are typically based on historical data, and predictions are, at best, supplemented with confidence intervals – upper and lower bands of possible outcomes. But models give a false sense of security if they allow for inappropriate interpretation of data, or promote false assumptions about the underlying data.

Paul Embrechts, professor of mathematics at the Swiss Federal Institute of Technology (ETH), Zurich, illustrated this point at the Global Risk Summit with the example of the Challenger space shuttle explosion in the US. Due to extreme weather – temperatures were below freezing on launch day in January 1986 – a seal failed in one of the Challenger's rocket

Successful firms have embedded risk management expertise at the most senior levels

The perils of relying on historical data

¹⁵ Plender, John, "Market Insight: Goldman Offers Example of Governance," *Financial Times*, 4 December 2007.

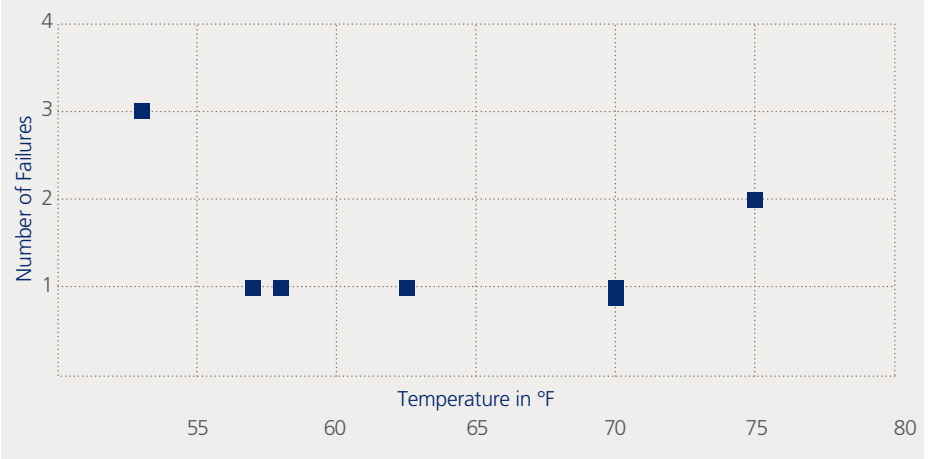
¹⁶ RiskMetrics Group "Credit Crisis and Corporate Governance Implications" April 2008.

boosters at liftoff, causing the shuttle to disintegrate almost immediately after takeoff, killing all seven crew members aboard.

In the subsequent investigation it emerged that engineers from Morton Thiokol, the manufacturer of the boosters, had recommended aborting the flight. They were concerned about the impact freezing temperatures could have on the viscosity of the seals (called "O-rings"). Their concerns were based on data that related ambient temperatures at launch and subsequent O-ring failures.

NASA proceeded with the launch. Its staff had also analyzed the data on previous incidents, but unfortunately, the analysis focused only on those 6 out of 24 cases where O-rings had failed. The findings were represented in a graph that neglected the launches where no failures had occurred (see Figure 6). It was later termed one of the most tragically misleading graphs in history.

Figure 6: NASA space shuttle: O-ring failures in relation to launch temperatures



Source: York University

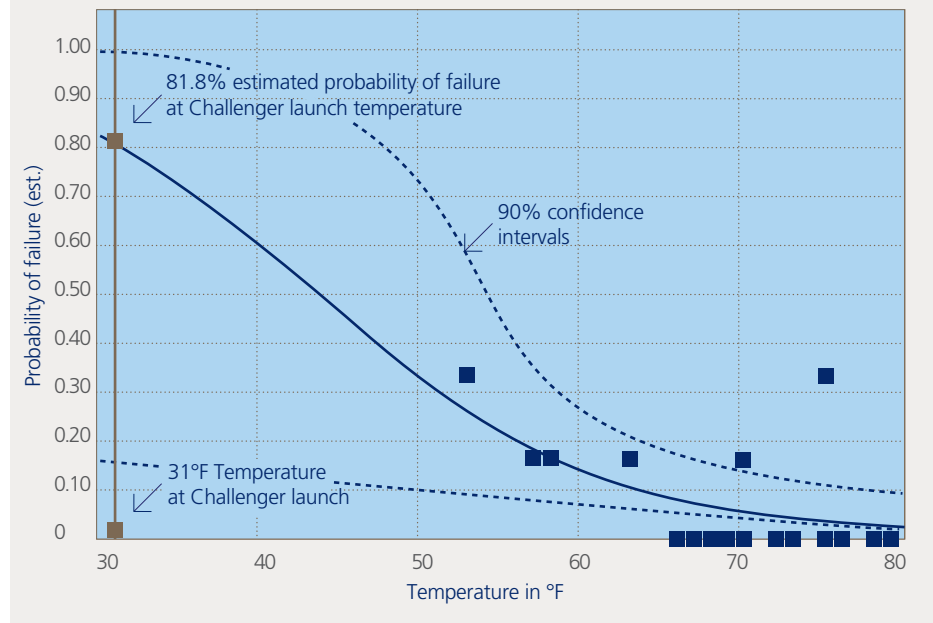
A more appropriate graph would have represented data from all launches and shown the probability of failure estimated from a logistic regression model that included 90% confidence intervals. Figure 7 makes it immediately clear that the probability of O-ring failures increases dramatically with declining launch temperatures.

The graph highlights the importance of communication and the need for careful presentation of information. Or as physicist Richard Feynman and famous member of the Challenger commission observed, "reality must take precedence over public relations, for nature cannot be fooled."¹⁷

¹⁷ See Richard Feynman's observation in the Rogers Commission Report on the Space Shuttle Challenger Accident.

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Figure 7: NASA space shuttle: O-ring failures including no-incident observations



Source: York University

Quantitative analysis must be complemented by qualitative judgments

Data problems

The analysis of the Challenger episode shows that perspective matters when considering historical data. However, historical data is not much help if the fundamentals change substantially. For example, the originate-to-distribute (OTD) banking model helped create the subprime mortgage market. It greatly expanded the availability of mortgages to borrowers with poor credit quality who did not have access to mortgages before. As a result, the pool of borrowers in the market changed substantially. However, most models did not provide much guidance on the likelihood that these new market participants would default in a house price downturn.

Similar problems arise in the assessment of tail risks (see also Chapter 1). For example, while defaults of mortgage borrowers may be idiosyncratic in normal times, they are likely to be much more correlated during economic crises. However, as severe crises happen only rarely, it is difficult to estimate this correlation from historical data. In a session at the Global Risk Summit, experts highlighted that in the absence of adequate and reliable data, a risk manager must find other ways of assessing risk rather than relying on unreliable model estimates. Qualitative judgments will have to complement, or in some cases replace, quantitative analysis.

Risk management needs to consider the aggregate effects of, endogenous events and systemic risk

Risk correlation

Moreover, in the financial world, correlations may be magnified in times of crisis by liquidity risk. If one financial institution looks at its books and decides it needs to reduce its risk exposure, other institutions may well look at their own situation and draw the same conclusion. If the same class of assets is implied throughout the financial system, a collective flight to safety will only add to the downward pressure on the prices of those suspect assets. If this situation obtains in a highly leveraged financial system operating under a mark-to-market accounting regime, the problem may be compounded: as the prices of those assets drop, many institutions will be forced to reduce their leverage abruptly, with consequences for the entire financial system.¹⁸

¹⁸ Adrian, Tobias; Hyun Song Shin, "Liquidity and Leverage," Working Paper, Princeton University, 2008. Available as Federal Reserve Bank of New York Staff Reports No 328.

Timothy Geithner, President of the New York Federal Reserve Bank, has made a case for why financial institutions were not adequately prepared for this possibility. Risk management has focused too much on modeling idiosyncratic risks, he argues, and not enough on systemic or endogenous risks. Good risk management should factor in the aggregate effects of individual institutions' actions as well.¹⁹

Reflexivity and model correlation is also a problem. Boris Holzer at Ludwig-Maximilian University, Munich, and Yuval Millo of the Centre for Analysis of Risk and Regulation at the London School of Economics argue that "the management of risk may become a source of new risk itself." The transformation of dangers into risks by risk managers leads to the creation of new uncertainties and manufactured dangers, or "second-order dangers." Moreover, the proliferation of individually sound risk strategies quickly becomes unsound:

*"Mathematical risk assessment in financial markets is confronted with a problem of reflexivity: models of the markets do not include the models in the market... and cannot account for the aggregate effects of synchronized decision-making."*²⁰

In addition to these problems, risk modeling is handicapped by the fact that problems rarely present exactly the same way twice, so sampling from historical data might not always help. To handle these kinds of risks, alternative modeling methods that are less dependent on historical data, such as scenario analysis (as used by, for example, catastrophe insurers), may prove more useful. Finally, this offers yet another reason why the judgment of experienced risk managers is indispensable.

Model specificity

Finally, one of the failings of risk assessments behind the credit crisis was the misuse of models in generating 'AAA' ratings for CDO products, which did not give adequate weight to the possibility of extreme events, and which relied on historic data covering a period of largely benign macroeconomic conditions. At the Global Risk Summit, Paul Embrechts highlighted that the pricing of CDO products relied heavily on models assuming a normal distribution.

In such a world, there is an emphasis on the typical or average events. There are, in essence, no extreme or so-called 'six sigma' events. However, the world is not always governed by normal distributions, and the statement that an extreme event like the 'Black Monday' stock market crash of October 19, 1987, was a 20-sigma event – and therefore considered an impossibility – is meaningless. In models giving more importance to tail risk, events such as the credit crisis have a much higher chance of occurrence and therefore appear on the risk management radar screen.

Extreme value theory (EVT), which was first established around the 1920s, offers a sound set of statistical techniques for the understanding and estimation of rare events, beyond the well-behaved world of the bell curve or normal distribution. It describes the statistical behavior of the largest observation, the biggest loss, the worst case, rather than the average observation, the average loss, or the average case.²¹

However, Paul Embrechts emphasized that without good data and sound judgment, even EVT does not offer a panacea, but it appears to offer a more appropriate tool for the analysis of what are so-called low-probability events and their consequences for decision-making in risk management. The conclusion is that assumptions should always be challenged and metrics must be applied in the correct context if they are to matter at all.

¹⁹ Geithner, Timothy F., "Reducing Systematic Risk in a Dynamic Financial System," Remarks at the Economic Club of New York, 9 June 2008.

²⁰ Holzer, Boris and Millo, Yuval: "From Risk to Second-order Dangers in Financial Markets: Unintended Consequences of Risk Management Systems". ESRC Centre for Analysis of Risk and Regulation, LSE, Discussion paper No.29, p.1 and p.17, 2005.

²¹ See for example the contribution on extreme events modeling by Embrechts, Küppelberg and Mikosch (2008).

Metrics only matter in the correct context

Chapter 2

Box 5

Culture and process



In April 2008, UBS released a report to its shareholders seeking to explain the reasons why, at that point in time, total writedowns associated with exposure to subprime loans amounted to USD 37 billion. The report highlighted, among other things, a reliance on a limited number of modeling tools and measures calibrated on the basis of five years' worth of relatively benign growth, a lack of challenge to their assumptions, and failure to provide for holistic risk assessment to manage strategic choke points.

In a subsequent report the Swiss Federal Banking Commission (SFBC) confirmed these conclusions in all relevant aspects. Specifically, the SFBC stated that

*"UBS was not aware of the extent and the nature of its risk exposure to the Subprime mortgage and related markets until the beginning of August 2007, and was thus unable to take appropriate measures in a timely manner. This lack of awareness was the result of significant organizational weaknesses (...). In retrospect, insufficient attention to the inherent risk related to the balance sheet growth and the over-confidence in the existing risk management and risk control mechanisms appear as significant failures on the part of the bank."*²²

With the benefit of hindsight, it appears that UBS, like many others, had confused risk management with the operation of risk modeling tools, and given insufficient focus to one of the most important aspects of risk management: the creation of a risk aware culture within the firm.

While the use of risk management tools and methods provides significant input into the risk management process, ultimately the culture, or in this sense, how the organization reacts to the information it is identifying, is as important as the underlying information itself.

What is apparent is that in the majority of risk management failures – including the concentration of risk exposure that appears in any form of bubble – there is a significant gap between the risk information available and the ability and willingness of the organization to react to it. Interestingly, examples such as WorldCom, Enron, the Lloyds spiral in the early 1980s (eerily reminiscent of the current issues in the financial markets) all share similar patterns of cultural failure:

- An overarching leadership defined by a small number of strong personalities;
- An abundance of risk information that indicated that businesses were highly concentrated or exposed to inadequately understood risks;
- A market environment (bubble) that seemed to hold the prospect of a growth phase that far exceeded historic growth patterns; and
- No internal or external governance bodies (regulatory or otherwise) that could provide appropriate challenge.

In recent years, risk management has focused a significant amount of time and energy on the development of risk management capability partly as a result of increasing pressure and oversight from regulators. However, it is not compliance, but strategic direction and operational excellence that fuels value creation.



²² Swiss Federal Banking Commission: "SFBC Investigation into the Causes of the Write-downs of UBS AG", p. 2.

Box 5

Culture and process continued

Most regulatorily driven risk management frameworks focus on three specific issues:

1. The development of appropriate risk modeling capabilities;
2. The development of appropriate qualitative risk management techniques, e.g. risk profiling; and
3. The development of appropriate challenge and oversight processes that ensure that the data and information from 1 and 2 are transparent and available to both executive and non-executive management, as well as governance bodies.

What we learn from the history of corporate failures is that many organizations tend to prioritize risk management investment in the same order as above. But unless an organization focuses on the development of all three risk management capabilities, a significant gap can open up between the information provided and the ability to understand and react intelligently to the information.

Much has been written about the development of a risk-aware corporate culture, but one common theme centers on the messages being sent from and demonstrated by leadership. An organization that shows that management is capable of understanding the information presented to it reacts positively to what can be seen as difficult news. Such an organization shares this information widely internally and, as appropriately, externally. It can be shown to be an organization with a potentially lower risk of failure.

Many organizations, when doing post-mortem evaluations of their response to crises, will usually find that lack of information was not the problem. Instead there were cultural reasons that blocked the right decisions from being taken. Critical risk information was not raised up and incorporated into strategic decision making at the highest levels of the corporation. Risk management culture is important.

Chapter 3

Aftermath and adaptation

Companies must leverage ERM to help innovate, not just comply with regulations.

Risk management is also capital management

3.1 Need to know

Never before has the need to know your corporate exposures been more crucial to business resilience and shareholder value. The current credit crisis has left corporations reeling over huge exposures that caught them unawares and caused adverse impacts to their reputation, bottom line and, in certain cases, their very survival. Globalization is accelerating, legislation is becoming ever more complicated, and stakeholder groups are making ever greater demands. Moreover, the effective management of both hazards and business risks has become an increasingly important part of capital efficiency and, ultimately, competitiveness. This is where enterprise risk management (ERM) has a role to play. Handled well, ERM can help companies innovate, not just comply with regulations.

Firms typically desire to protect both tangible and intangible assets. This cannot occur unless – or until – all vulnerabilities have been identified across the whole enterprise. Ultimately, senior management must give more priority to the use of economic capital in their decision-making processes. In this perspective, enterprise risk management (ERM) will become an integral part of the planning and management practices of organizations, incorporating both rational calculations and subjective choices based on the perception of risk. This ERM integration can be seen below in key learnings from the recent financial crisis.

Key Issues

- Breakdown of processes and links in identifying, measuring and managing risk
- “Silo” approach to risk management and lack of integrated view
- Deficiencies in the use of risk tools and metrics and disconnect between risk management and businesses
- Management did not have a complete picture of exposures, concentrations and correlations
- Lack of adequate scenario and extreme event analysis
- No clear articulation of risk tolerance and no adjustment of risk appetite over time and for changing market conditions

Key Learnings

- Need for clear link among risk appetite, strategy and financial management
 - Top down ownership of the risk profile
 - Risk appetite and tolerance based on Group strategy
- Executive management is responsible for risk management:
 - Embed risk awareness across all levels of the organization
 - Overall risk culture and tone from the top
- Need for a comprehensive and integrated risk management approach
 - “Three lines of defense”
 - Risk integration through strong modeling and quantitative analysis

3.2 Regulation and enterprise risk management

Tighter regulation ahead

In the wake of the global financial crisis, pressure on policymakers has been growing to tighten regulations governing the activities of market participants, financial institutions in particular. Responses to the recent crisis are likely to be mainly in the financial and real estate sectors. Although these would likely reduce the chance of similar types of credit and real estate bubbles repeating themselves, the risk of different types of bubbles recurring will remain.

The likely strengthening of regulation may generate a corporate backlash, similar to that which occurred in response to the Sarbanes-Oxley (SOX) Act, passed in July 2002 following the bankruptcies of companies including Enron and WorldCom. SOX requires the US

Chapter 3

Loss of momentum for principles-based regulation likely

Securities and Exchange Commission (SEC) to impose strict regulations. The advisory, legal, and accounting costs related to complying with the new regulation rose for affected companies, and a negative perception took hold about onerous burdens placed in the US in terms of auditing, corporate governance and reporting requirements. As a result, London appears to have become more attractive than New York for launching initial public offerings.

The credit crisis has come at a time when a more principles-based approach had been gaining ground in the US. However, since principles-based regulation tends to be equated with deregulation, such a reform would run against the trend in the current climate. Legislators around the world are likely to call for more rules-based rather than for a more principles-based approach to regulation. Business, and particularly innovative financial services providers, may suffer as a result.

A fine balance between the desire to grow and the necessity to manage risks

However, risk has a wide scope, so good risk management must necessarily cut a wide swath. ERM needs to cover many different types of risk, from day-to-day operational risk to emerging risks and unexpected events. One of the lessons learned from the credit crisis has been that in their effort to comply with Basel II, financial firms may have been induced to neglect the process for identifying new risks or the management of new emerging risks, devoting ever more attention and resources to basic compliance procedures. As Debra van Opstal noted:

“The interdependencies between the public good and private risk management tend to see swings between extremes and a failure to chart a strategic path that takes into consideration the changing challenges of a global economy, the changing interdependencies and potential for cascading failures, and the benefits of having competitive leadership in financial services (which gives us the ability to innovate more rapidly in service offerings and new instruments). Despite the regulation and the cornucopia of highly sophisticated risk management models and talent in this sector – all of that failed to capture what was a profound systemic risk and in some cases, greed clearly overtook prudent risk management.”²³

Obviously, compliance with regulation does not necessarily mean complete avoidance of risk. Regulation will always be one step behind, people will always find new innovative ways to get around rules, and regulation is often a reactionary rather than a preventative measure.

²³ Debra van Opstal, personal communication to Linda Conrad.

Risk management and business strategy must be linked

Understanding risks is an effort

ERM demands a holistic, 360-degree view of risk

3.3 Understanding risk across the business

At the Global Risk Summit, an expert panel on “Risk Management in a Fat-tailed World” emphasized the difference between firms that have been able to weather the financial crisis and those that have not. A prime differentiator was the extent to which organizations had integrated their business arms with their risk arms, and the extent to which these groups communicated.

During the housing bubble, it apparently escaped UBS senior management’s attention that the bank was piling up exposure to US mortgages in at least three different parts of the bank: internal hedge funds, the CDO desk, and the treasury division.²⁴

This unidentified risk accumulation multiplied the negative impact, which could possibly have been mitigated by better risk intelligence within a holistic management framework. It is vital to establish multiple lines of defense to cover risk and to continually revalidate an organization’s trade-off between risk and reward.

Effective risk management requires more than navigation around the high rocks in the water. Given the increasing complexity of the global economic and financial system (see Chapter 1), even highly experienced managers will have a limited view of the many risks they are facing. When Robert Rubin, former co-chairman of Goldman Sachs and former US Treasury Secretary, and acting head of Citibank, was asked in 2007 why the bank had not trimmed its exposure to risky collateralized debt obligations earlier, he said that he “just had not understood the risks represented.”

Risk does not respect silos. Clearly, there is a need for increased risk communication, both horizontally and vertically within an organization. The correlation of risks in times of crisis requires risk managers to have a clear idea about exposures across all parts of the business. It points to the need for a comprehensive enterprise risk analysis to achieve risk optimization. A holistic assessment of risk will uncover the characteristics of a business, including management styles and strategies, operations and procedures, industry issues, emerging risks and more. Enterprise risk intelligence should provide a 360-degree view of corporate opportunity.

²⁴ Hughes, Chris; Larsen, Peter and Simonian, Haig: “Corroded to the core: How a staid Swiss bank let ambitions lead it into folly”, *Financial Times*, 20 April 2008.

Chapter 3

Box 6

The strategic aspect of risk management



Zurich's internal risk management process involves applying the proprietary Total Risk Profiling® (TRP) methodology to identify a wide range of risks top-down, i.e., from Group level, to business segment (BS), to business division (BD), down to regional and business unit (BU) levels on a short to medium time horizon.

One of the major strengths of this annual process is that it involves senior management on all levels, and thus provides risk awareness and transparency. This leads to a better understanding of the dynamics of these risks and of how they can be managed by establishing clear priorities and action plans. Group risk management (GRM) handles the identified risks, and develops the plans and reports that are sent to senior management on a quarterly basis. Together with the work of

Group's Audit and Risk Committees, Zurich is able to make better informed decisions.

The TRP methodology encourages analysis of a broad spectrum of risk, including Asset Liability Management, investment, credit, brand and reputation, insurance and operational risks. Each risk scenario is semi-quantitatively assessed in terms of probability of occurrence (frequency) and its severity (financial impact). The risks are then plotted on a risk matrix, graphically highlighting their interrelationship as well as priorities to address these risks.

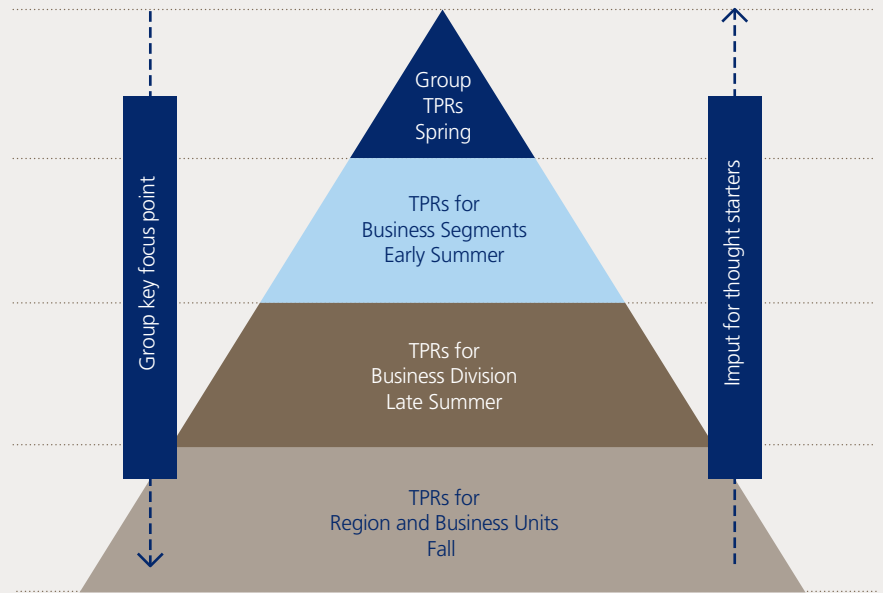
Taking a BU as an example, the goal of such an exercise is to raise awareness of key risks that could negatively affect long-term sustainability when trying to achieve its strategic and operational goals.



Box 6

The strategic aspect of risk management continued

Figure 10: Total Risk Profiling



Source: Zurich

In order to leverage the impact of this risk analysis, the TRPs are executed as close as possible to the delivery date for the budgets and plans.

The graph above illustrates:

- What the focus (GKFP) for the annual strategic risk assessment is;
- When, i.e. the 'timing' of TRPs executed; and
- How the strategic TRP risk assessments are embedded in the organization.

The key risks of the Group embrace all the risks identified by the Group Executive Committee (GEC)/Group Management Board (GMB). These Group key focus points (GKFP) are drilled down into the organization in order to ensure that the key risks from a Group perspective are addressed at all organizational levels.

Once the regional and BU TRPs are available, the results are analyzed and compared to the GKFPs:

- Ensuring that no gaps exist regarding the perception of the key risks in the BUs (top-down approach); and
- Delivering feedback to the GEC/GMB with respect to topics that are currently not covered in their strategic risk assessment. This may lead to new input or thought starters for next year's TRP (bottom-up approach).

This comparison will allow GRM as well as Senior Management to detect systemic risks throughout the organization that might affect the strategic objectives.

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3.4 Increasing pressure for embedding ERM

A comprehensive ERM framework has two principal objectives: to strengthen business performance, and to facilitate strategic, operational, and organizational change. It offers a continuous and systematic top-down risk identification and prioritization process that provides a practical approach to blending financial and technical risk management disciplines. Over the last few years, ERM has moved to center stage. The global financial crisis has brought it even more attention.

ERM captures the collective knowledge of in-house experts and applies it effectively to risk control and improvement across a business by “assigning responsibility throughout the organization with each manager and employee responsible for the management of risk as part of their job description. It supports accountability, performance measurement and reward, thus promoting operational efficiency at all levels.”²⁵ By right-sizing the risk profile, ERM will also protect reputation, which is said ‘to be gained in inches per year and lost in feet per second.

Legislator, regulator, ratings agency and investor concerns have all created a stronger urgency for organizations to consider ERM. ERM provides the framework for the identification of both organizational risks and opportunities, assessing them in regards to probability and possible impact, developing a response strategy and monitoring the intervention objectives. By proactively addressing risks and opportunities through the use of ERM, organizations can create value for their shareholders, employees and clients by analyzing strategic, operational and financial risks.

Figure 8: Many forces are moving enterprise risk management to center stage



Source: Zurich

²⁵ A Risk Management Standard, AIRMIC, ALARM, IRM, 2002, p.2.

Retooling Risk Management

The draft ISO 31000 standard will serve as the new international standard for ERM. It addresses organizational commitment to risk management, priority setting, explains the principle that risk management should create value, and stresses the importance of context and common risk terminology.

The New York Stock Exchange now requires audit committees of its listed companies to review policies in relation to risk assessment and management. Similarly, the Turnbull Report in the United Kingdom spells out the internal control measures that companies listed with the London Stock Exchange must take to ensure a high level of quality in financial reporting.

Recently, the Committee of Sponsoring Organization of the Treadway Commission (COSO) has expanded on its internal control focus to develop an integrated ERM framework. It is designed to help companies move toward a fuller risk management process, by delineating its risk tolerance boundaries as it achieves objectives and creates stakeholder value. COSO states that:

“Enterprise risk management enables management to effectively deal with uncertainty and associated risk and opportunity, enhancing the capacity to build value. Value is maximized when management sets strategy and objectives to strike an optimal balance between growth and return goals and related risks, and efficiently and effectively deploys resources in pursuit of the entity’s objectives.”²⁶

3.5 Ratings agencies will demand ERM

Rating assessments of Enterprise Risk Management maturity is gaining ground

Ratings agencies like Standard & Poor’s (S&P) have begun to develop a framework for evaluating ERM practices, which incorporates this broad scope. An assessment framework was applied to financial companies in 2005²⁷ and a slightly different framework is now in place for non-financial companies. Firms are scored from ‘weak’ to ‘excellent,’ with best performers demonstrating strong capability to identify, measure and manage all types of risk exposures, and showing ability to keep losses within a predetermined loss tolerance band.

It is significant that ERM is now assessed by S&P as a separate evaluation criterion that can impact a company’s rating, and hence its ability to raise capital. The S&P ERM proposal for nonfinancial institutions was initially published in November 2007²⁸ and subsequently revised in May 2008.²⁹ It focuses mainly on risk management culture and strategic risk management, which S&P calls “universally applicable aspects of ERM.”

Specifically, the analysis will include an examination of the risk management framework or structures; the roles of risk management staff and reporting lines; broad policies and metrics; and the influence of risk management on budgeting and management compensation. In addition, S&P said that its review of strategic risk management would include management’s view of ‘consequential’ risks, the frequency and nature of updating the identification of these risks, and the role of risk management in strategic decision making.

Within these pillars, S&P has tailored its analysis to specific sectors, identifying the risks and necessary risk controls unique to each of them.

S&P has stated that ERM is “not a passing fad” and businesses will now need to take notice of evaluations such as theirs if they are to improve their capital efficiency and gain a competitive advantage. Ultimately, this type of ERM ratings assessment could have a beneficial impact on risk management, encouraging the adoption of best practices and greater corporate transparency. ERM will also help establish a common risk lexicon and shift the focus of risk management toward assessing risk versus reward.

²⁶ COSO, *Enterprise Risk Management – Integrated Framework*, September 2004.

²⁷ Standard & Poor’s “*Enterprise Risk Management for Financial Institutions*”.

²⁸ Standard and Poor’s “*Enterprise Risk Management Analysis for Credit Ratings of Non-financial Companies*”, November 2007.

²⁹ Standard & Poor’s “*Enterprise Risk Management*”, May 2008.

Chapter 3

3.6 Strategic resilience

To prepare for change, be ready to change the way you prepare

It is often said that “to prepare for change, you should be ready to change the way you prepare.” This is also good advice for organizations, which should implement ‘early warning systems’ based on wide sets of economic and financial variables, while recognizing that the predictions of such models are likely to include many false positives.

At the company level, improving crisis prevention might necessitate adjusting models to diminish risk exposure in good times, precisely when many individuals in a company have financial incentives to maintain or even increase it. Beyond this, a critical factor in preparing for extreme but poorly anticipated events is that an appropriate ERM culture and business continuity plan is instilled within the organization.

Ultimately, predicting the infinite number of unknowable ‘Black Swans’ is less important than preparing to manage outcomes and effects of those extreme risks. Organizations must match the speed of issue onset with the velocity of response, if they are to both survive and thrive. Situational awareness becomes paramount. We attribute the insight to Charles Darwin that “it is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.” To this end, it is essential that management use risk intelligence to develop activities that promote strategic resilience. Quantitative risk data should be used to inform qualitative decision making that favors adaptive management strategies.

Box 7

Risk management at Enron



Enron was a venerable company formed from a series of mergers in the 1980s with routes that traced back to the early 1930s. It had always been in the gas industry, owning exploration, production and transportation assets. It subsequently moved also into the production of electricity.

The deregulation of the pricing and transportation of gas led to increased volatility in supply and price. Enron adopted an intermediary position between buyers and sellers of gas and began to trade financial contracts rather than gas itself. However, in the process of the transformation a number of fundamental risk management mistakes were made.

- **Lack of understanding of the nature of the underlying business.** Profits from the gas business were used to fund new, unproven ventures and heavy asset-intensive operations that were seen by management to have some similarity to the core business. In reality they entailed entirely different risks for which they were unprepared.
- **Significant concentration of decision-making and failure to establish transparency or challenge by business management.** Enron was controlled by a small number of individuals who took all major decisions and acted as points of contact for financial suppliers and governance agencies. Risk management largely reported directly to the CEO and was often required to sign off transactions, raising inherent role conflicts.

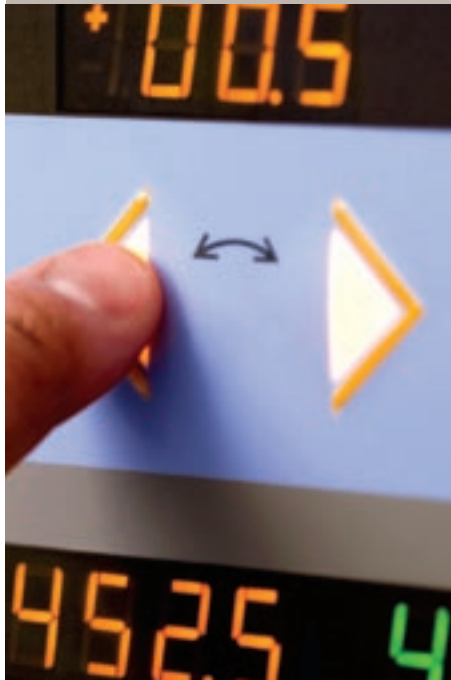
- **Significant exposure to financial risks that were not directly connected to the underlying business model.** The majority of investment funding (when not supported by the gas business) was off-balance sheet and directly linked to Enron's share price. There was a lack of transparency and artificial behavior towards both signaling future profits (to assist in share price management or manipulation) and to ensuring that the earnings guidance was always met.
- **Inappropriate incentives encouraged evasive business practices.** Market dynamics and increasing competition made it increasingly more difficult to achieve quarterly earnings targets without resorting to various manipulative financial mechanisms that appeared to generate profits, but in essence sheltered and deferred losses off-balance sheet. In the end, the business became extremely reliant on share price developments.
- **Failure to anticipate and manage emerging risks and lack of scenario planning.** When the failure of the Californian energy market in April 2001 caused the collapse of PG&E (a local buyer of energy) Enron was caught completely unaware, and left with a debt of USD 570 million.

In the end, industry analysts began to question the valuations put forward by Enron and its share price halved in eight months. This triggered various requirements to put additional funds into off-balance sheet vehicles, which had been based on share price valuations. Enron was forced to write down certain assets, causing a downgrade in its credit rating. In December 2001, Enron was forced into bankruptcy proceedings.

Chapter 3

Box 8

Risk management at Northern Rock



At the time of its demise, Northern Rock was the fifth-largest retail mortgage lender in the United Kingdom. It had been formed from the merger of various building societies (mutual entities relying on depositors' funds).

Following new legislation, building societies were allowed to become banks, which gave them access to new, mainly short-term funding pools.

Unfortunately, the ensuing period of rapid growth was characterized by a number of failures in risk management.

- Misidentification of strategic risk.** The business model concentrated on short-term (three month) bank funding which went into packages of mortgages to be securitized and sold off to third party investors. However, the originate-to-distribute business model entailed an excess of two strategic risks – exposure to lenders with a different risk appetite and exposure to short-term borrowing risk
- Concentration risk.** The business portfolio mix changed from being relatively diverse – which brought an ability to withstand some underlying housing market volatility – to a portfolio focusing more on the buy-to-let market segment and borrowers requiring loans worth 95% or more of the property value. The volume of the latter segment doubled in twelve months, exposing Northern Rock to a concentration of extreme credit risk.

- Pricing risk.** In order to grow the business, Northern Rock also cut the loan margins by approximately 0.05% on each £1.00 lent, reducing the cushion to absorb adverse market developments.
- Funding risk.** Although Northern Rock had no exposure to the US subprime mortgage market, the banks providing the short-term funding to Northern Rock collectively reacted to the crisis in the United States by withdrawing new lending to almost any other banks.
- Reputation risk.** The news that Northern Rock had applied for liquidity funding from the Bank of England was widely interpreted as an admission of pending failure, fostering a classic bank run. GBP 2 billion were withdrawn in three days and the share price collapsed by around 70%. Eventually, the UK government agreed to cover all deposits to ensure that Northern Rock did not collapse, but the lender's reputation was severely damaged.

The UK government, through the Bank of England, became both the deposit guarantor and the provider of short-term liquidity. As the total exposure to the government grew above GBP 26 billion, the bank was nationalized and placed in run-off. It is no comfort that the Financial Services Authority, which had regulatory oversight of Northern Rock, had to also recognize its own failings. It was not only a private sector entity that was revealed to have mismanaged risks; the supervisor had also failed to anticipate problems and order corrective actions.

Chapter 4

Lessons for risk management

The credit crisis underscores the importance of risk management. At the end of October 2008, the world's financial institutions have written off roughly USD 900 billion. This sum could double by the time the crisis ends. There is no doubt that risk management failures have destroyed value at a massive scale.

The challenge of extreme events should not lead to paralysis

Withdrawing from risk would be the wrong response. On the contrary, risk management has a strategic role to play and must continue to deliver value. Experience shows that skillful risk management creates significant pay-offs. After all, risk is the other side of the coin of reward. But to reap these rewards, risk managers must contemplate the lessons drawn from extreme events that have been discussed throughout this study. They can be summarized in five points.

Extreme events are likely to be more prevalent in the future

- **The starting point is risk assessment and risk aggregation.** Identifying and understanding individual risks is not enough. We must also account for inter-linkages and remote possibilities. One of the lessons the insurance industry drew after the terrorist attacks of 9/11 was that losses from business interruptions were as big as the losses directly attributed to the attacks. But the indirect losses had not been anticipated. Similarly, in the credit crisis banks learned at their peril that the underestimation of liquidity and accumulation of risk had created severe systemic risk.
- **Extremes must be factored in.** Time and again, events such as 9/11 or the global credit crisis remind us that low-probability, high-severity events do happen. The world does not follow a normal distribution and 'Black Swans' can appear at any time. But there is no reason for paralysis. Statistical and actuarial tools are capable of providing analytical support. Extreme value theory (EVT) comes to mind, but also scenario modeling and stress testing. If done judiciously and communicated broadly, they will help us better understand critical uncertainties.
- **Quantitative tools are important, but informed qualitative judgments are indispensable.** Today's arsenal of quantitative risk assessment tools is impressive. But models have their limits, which is particularly true for the standard value-at-risk tool kit. In such a world, extremes are meaningless; they do not show up on the radar screen. And that's precisely where the qualitative judgment of the experienced risk manager must weigh in. We must be mindful of the assumptions, sensitivities and limitations of the models used in the analysis and prediction of risk.
- **We must ascertain our risk appetite.** If risk management fulfills its strategic function it will determine the organization's choice of trade-off between risk and reward. This allows informed discussion on which risks to embrace and which ones to exclude. One lesson of the credit crisis is that risks that are not properly understood can be lethal. Structured products or the OTD business model in banking may have delivered growth and high earnings for some time. However, their complexities were ill understood and the losses exceeded the earnings accumulated over many years.
- **Finally, and most important, a risk culture must be entrenched in the organization.** Risks must be respected and risk management cannot be relegated to a back office. Stating that risk management is everyone's responsibility may serve to highlight that it should not be exercised in silos. But ultimately, there must be a strong top-down risk assessment, and risk management capability must be applied across the organization. It must have teeth, and its role within the structure of corporate governance and strategic planning must be defined clearly and enforced strongly so it can truly support corporate objectives.

To prepare for change, be ready to change the way you prepare

Current events have placed risk management and the role of risk managers squarely at the center of the corporation's strategy. Globalization has dramatically increased the correlation of stock markets across both developed and emerging economies. Similarly, the liberalization of product markets and the decline in transportation costs have encouraged outsourcing and

Chapter 4

ever tighter supply chain links. These developments raised the number and complexity of risks to which global corporations are exposed. The non-linear interactions among these risks virtually ensure that high-severity events will be more prevalent in the future. They will impact corporate profitability and may ultimately threaten a firm's ability to continue operating.

Nevertheless, we must continue to embrace risks. Risks are the price to be paid in order to reap rewards, and businesses must demonstrate mastery over those risks. In the face of the credit crisis, financial institutions' existing models for stress testing and contingency planning were shown to be inadequate in most cases. More generally, in light of previous extreme events, such models and business recovery plans may have been non-existent, very basic, or never practiced. The credit crisis highlights the need for business interruption impact analysis, anticipatory media policies, and better business continuity planning in order to protect the assets and reputation of any organization. While it may not be possible to predict all situations, companies should be held accountable for likely events and they should certainly plan for events that lie outside normal expectations.

Toward more efficient capital allocation

Considerable scope remains for improving the resilience of models used and developing best practices for risk management. Standard & Poor's inclusion of ERM in its analysis should encourage best practices within both financial and non-financial firms. ERM supports resilience and value creation by equipping senior executives and board members to effectively manage uncertainty, by responding with strategic guidance that mitigates the likelihood and impact of downsides and improves capital efficiency and opportunities for growth.

Be mindful of unintended consequences when regulating risk

The global credit crisis fueled the impression that markets are prone to failure and ill prepared to deal with an intrinsically risky world. In this situation governments around the world have stepped in to prevent the threat of systemic failure. Politicians are calling for more prudential regulation of banks and other industries in the financial services sector, but state intervention will probably not be limited to this sector alone. It appears that regulators are being given the task to curtail risks of all sorts and, if possible, eliminate them entirely.

However, one of the important lessons of past and current crises is that the impact of risks can be allocated to many parties, but risk can never be eliminated nor shifted to third parties. It would be ironic if endeavors to tighten financial regulation, presumably to reduce the risk of market failure, increase the risk of regulatory or government failure.

But that may be a story for another day.

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