

Risk Management: Definition and Historical Development

Risk management began to be studied after World War II. Several sources (Crockford, 1982; Harrington and Niehaus, 2003; Williams and Heins, 1995) date the origin of modern risk management to the 1955–1964 period. Snider (1956) observed that there were no books on risk management at the time, and no universities offered courses in the subject. The first two academic books were published by Mehr and Hedges (1963) and Williams and Hems (1964). Their content covered pure risk management, which excluded financial risk. In parallel, engineers developed technological risk management models. Operational risk partly covers technological losses; today, operational risk has to be managed by firms and is regulated for banks and insurance companies. Professionals and academics also consider the political risk of projects.

Risk management has long been associated with the use of market insurance to protect individuals and companies from various losses associated with accidents (Harrington and Niehaus, 2003). In 1982, Crockford wrote: “Operational convenience continues to dictate that pure and speculative risks should be handled by different functions within a company, even though theory may argue for them being managed as one. For practical purposes, therefore, the emphasis of risk management continues to be on pure risks” (p. 171). In this remark, speculative risks were more related to financial risks than to the current definition of speculative risks, and pure risks were related to insurable risks.

New forms of pure risk management emerged during the mid-1950s as alternatives to market insurance when different types of insurance coverage became very costly and incomplete. Several business risks were costly or impossible to insure. During the 1960s, contingent planning activities were developed, and various risk prevention/self-protection and self-insurance activities against certain losses were put into place. Protection activities and coverage for work-related illnesses and accidents also began within companies during this period.

The use of derivatives as instruments to manage insurable and uninsurable risk began in the 1970s, and developed very quickly during the 1980s.¹ It was also in the 1980s that companies began to consider financial risk management or portfolio risk management. Financial risk management became complementary to pure risk management for many companies. Financial institutions, including banks and insurance

¹Before the 1970s, derivatives were rarely used to cover financial products. They were mainly limited to agricultural products.

companies, intensified their market risk and credit risk management activities during the 1980s. Operational risk and liquidity risk management emerged in the 1990s.

International regulation of risk also began in the 1980s. Financial institutions developed internal risk management models and capital calculation formulas to protect themselves from unanticipated risks and reduce regulatory capital. At the same time, governance of risk management became essential, integrated risk management was introduced, and the chief risk officer (CRO) position was created.

In the wake of various scandals and bankruptcies resulting from poor risk management, the Sarbanes-Oxley regulation was introduced in the United States in 2002, stipulating governance rules for companies. Stock exchanges, including the New York Stock Exchange (NYSE) in 2002, also added risk management governance rules for listed companies (Blanchard and Dionne, 2004). However, all these regulations, rules, and risk management methods did not suffice to prevent the financial crisis that began in 2007. It is not necessarily the models of risk management that were inefficient, but rather their application and enforcement. It is well known that managers in various markets regularly skirt the regulation and rules. However, it seems that deviant actions had become much more common in the years preceding the financial crisis, a trend the regulatory authorities did not anticipate, notice, or, evidently, reprimand.

In this chapter, we review the history of corporate financial and nonfinancial risk management. We present the major milestones and analyze the main stages and events that fueled its development. Finally we propose a general definition of risk management.

1.1 HISTORY OF RISK MANAGEMENT

Risk management is a relatively recent corporate function. Historical milestones are helpful to illustrate its evolution. Modern risk management started after 1955. Since the early 1970s, the concept of financial risk management has evolved considerably. Notably, risk management has become less limited to market insurance coverage, which is now considered a competing protection tool that complements several other risk management activities. After World War II, large companies with diversified portfolios of physical assets began to develop self-insurance against risks, which they covered as effectively as insurers for many small risks. Self-insurance covers the financial consequences of an adverse event or losses from an accident (Ehrlich and Becker, 1972; Dionne and Eeckhoudt, 1985). A simple self-insurance activity involves creating a fairly liquid reserve of funds to cover losses resulting from an accident or a negative market fluctuation. Ex ante risk mitigation, now frequently used to reduce financial consequences related to natural catastrophes, is a form of self-insurance.

Self-protection activities have also become very important. This type of activity affects the probabilities of losses or costs before they arise. It can also affect the conditional distribution of losses ex ante. Accident prevention is the most natural form of self-protection. Precaution is a form of self-protection applied to suspected but undefined events for which the probabilities and financial consequences are unknown. For example, a pandemic is one such event (Courbage et al., 2013). All protection and prevention activities are part of risk management.

Insurers' traditional role was seriously questioned in the United States in the 1980s, particularly during the liability insurance crisis characterized by exorbitant

premiums and partial risk coverage. In that decade, alternative forms of protection from various risks emerged, such as captives (company subsidiaries that insure various risks and reinsure the largest ones), risk retention groups (groups of companies in an industry or region that pool together to protect themselves from common risks), and finite insurance (distribution of risks over time for one unit of exposure to the risk rather than between many units of exposure).

The concept of risk management in the financial sector was revolutionized in the 1970s, when financial risk management became a priority for many companies including banks, insurers, and non-financial enterprises exposed to various price fluctuations such as risk related to interest rates, stock market returns, exchange rates, and the prices of raw materials or commodities.

This revolution was sparked by major increases in price fluctuations for the risks mentioned above. In particular, fixed currency parities disappeared, and prices of commodities became much more volatile. The risks of natural catastrophe also increased considerably. Historically, to protect themselves from these financial risks, companies used balance sheets or real activities (liquidity reserves). To increase flexibility or to reduce the cost of traditional hedging activities, derivatives were then increasingly used.

Derivatives are contracts that protect the holder of an underlying asset from certain risks. Their value depends on the value and volatility of the underlying asset, or of the value indices on which the contracts are based. The best-known derivatives are forward contracts, options, futures, and swaps. Derivatives were first viewed as forms of insurance to protect individuals and companies from major fluctuations in risks. However, speculation quickly emerged in various markets, creating other risks that are increasingly difficult to control or manage. In addition, the proliferation of derivatives made it very difficult to assess companies' global risks (specifically aggregating and identifying functional forms of distribution of prices or returns).

At the same time, the definition of risk management became more general. Risk management decisions are now financial decisions that must be evaluated based on their effect on firm or portfolio value, rather than on how well they cover certain risks. This change in the definition applies particularly to large public corporations, which, ironically, may be the companies that least need risk protection, because they are able to naturally diversify much more easily than small companies. In particular, shareholders can diversify their portfolios on financial markets at a much lower cost than that of managing the risk of companies whose shares they hold.

1.2 MILESTONES IN FINANCIAL RISK MANAGEMENT

The following tables present the important dates in the evolution of risk management (Table 1.1) and of derivatives or structured financial products (Table 1.2). The birth of modern financial theory is generally associated with the seminal work of Louis Bachelier in 1900; he was the first to use the concept of Brownian motion to analyze fluctuations in a financial asset. However, it was only in the 1930s that research on prices of financial assets began. The American Finance Association (AFA) met for the first time in 1939, in Philadelphia. Its first journal, *American Finance*, appeared in 1942. It became *The Journal of Finance* in 1946. At that time, research in finance specifically dealt with price setting, financial market efficiency, and detection of profitable strategies (including anticipation of stock prices). The year 1932 marked the

TABLE 1.1 Milestones in the history of risk management.

1730	First futures contracts on the price of rice in Japan
1864	First futures contracts on agricultural products at the Chicago Board of Trade
1900	Louis Bachelier's thesis "Théorie de la Spéculation"; Brownian motion
1932	First issue of the <i>Journal of Risk and Insurance</i>
1942	First issue of the <i>Journal of Finance</i>
1952	Publication of Markowitz's (1952) article "Portfolio Selection"
1961–1966	Treynor, Sharpe (1964), Lintner, and Mossin develop the CAPM
1963	Arrow (1963) introduces optimal insurance, moral hazard, and adverse selection
1972	Futures contracts on currencies at the Chicago Mercantile Exchange
1973	Option valuation formulas by Black and Scholes (1973) and Merton (1973)
1974	Merton's default risk model (1974)
1977	Interest rate models by Vasicek (1977) and Cox, Ingersoll, and Ross (1985)
1980–1990	Exotic options, swaptions, and stock derivatives
1979–1982	First OTC contracts in the form of swaps: currency and interest rate swaps.
1985	Creation of the Swap Dealers Association, which established the OTC exchange standards
1987	First risk management department in a bank (Merrill Lynch)
1988	Basel I
Late 1980s	Value at risk (VaR) and calculation of optimal capital
1992	Article by Heath, Jarrow, and Morton (1992) on the forward rate curve
1992	Integrated Risk Management
1992	RiskMetrics
1994–1995	First bankruptcies associated with misuse (or speculation) of derivatives: Procter & Gamble (manufacturer, rates derivatives, 1994), Orange County (management funds, derivatives on financial securities, 1994), and Barings (bank, forward contracts, 1995)
1997	CreditMetrics
1997–1998	Asian and Russian crisis and LTCM collapse
2001	Enron bankruptcy
2002	New governance rules by Sarbanes-Oxley and NYSE
2004	Basel II
2007	Beginning of the financial crisis
2009	Starting of CDS central clearing operations
2010	Basel III
2010	Dodd-Frank Act for regulating the US financial markets (including the Volcker Rule)
2011–2013	New rules for the governance of risk management
2016	Solvency II came into effect
2016	CVaR replaces VaR in Basel III regulation for market risk

Note: This table presents the main dates related to the history of risk management.

birth of the American Risk and Insurance Association. The first academic studies of insurance were published in *Journal of Insurance*, which was renamed *The Journal of Risk and Insurance* in 1964 (Weiss and Qiu, 2008). Other specialized journals followed, including *Risk Management* (formerly *The National Insurance Buyer*), published by the Risk and Insurance Management Society (RIMS), a professional association of risk managers founded in 1950, along with *The Geneva Papers of Risk and Insurance*, published by the Geneva Association since 1976.

TABLE 1.2 Main dates of the launching of derivatives and structured financial products.

1970s	Currency swaps
1972	Foreign currency futures
1973	Equity options
1979	Over-the-counter currency options
1981	Cross-currency interest rate swaps
1983	Equity index options
1983	Interest rate caps/floors
1983	Swaptions
1985	Asset-back securities (ABS)
1987	Path-dependent options (Asian, lookback, etc.)
1987	Collateralized debt obligations (CDO)
1992	CAT and futures insurance options
1993	Captions/Floortions
1994	Credit default swaps (CDS)
1994	CAT bonds
1997	Weather derivatives
2002	Collateralized fund obligations (CFO)
2017	Crypto derivatives

Note: This table presents the main appearance dates of derivative and structured financial products.

It was only in the 1950s and 1960s that researchers (Markowitz, Lintner, Treynor, Sharpe, and Mossin) undertook fundamental studies of financial decisions. This resulted in the modern theory of portfolio choice based on the Capital Asset Pricing Model (CAPM). This period was marked by revolutionary articles in finance, whose lead authors earned Nobel Prizes. Yet, it was only in the early 1970s that the main financial risk management products appeared and that the initial theoretical models of modern risk coverage were published.

Black and Scholes's model is undoubtedly the most popular of these early models. These authors were the first to propose an explicit formula for the pricing of a derivative, namely an option. This model was so revolutionary that the major finance journals refused to publish its first version. It was finally published in the *Journal of Political Economy*, in 1973. Later that year, Merton published an extension in the *Bell Journal of Economics and Management Science*. After that, risk coverage derivatives expanded quickly, spawning currency and interest rate swaps, and over-the-counter options (OTCs). Mathematical finance and the popularity of computers accelerated the growth and use of derivatives.

This period is the starting point for the intensive development of research on derivatives pricing. Although coverage of agricultural products began in Chicago in 1864 (and in Japan in 1730 for rice prices), it was only in 1972 that derivatives on financial assets surfaced in that American city (Chicago Board of Trade, CBOT). The year 1973 marked a turning point in financial history for another reason: the creation of the CBOE (Chicago Board Options Exchange), together with a clearinghouse.

The growth of the options market accelerated after the CBOE standardized contracts and developed secondary markets needed to generate sufficient liquid assets for market effectiveness (Smith, Smithson, and Wakeman, 1990). During the 1980s

and 1990s, the implementation of these hedge products sensitized market players to the risk they incur in their regular investment activities.

Concomitantly, new statistical tools were put in place in banks and rating agencies to select the clientele (e.g., credit scoring) and manage credit risk. These tools facilitated assessment of default/credit and pricing risks. The Basel Accord of 1988 imposed an international regulatory vision of credit risk.

In the late 1980s, high market volatility spurred the large US investment banks to put in place risk management departments (Field, 2003). JP Morgan developed the two best-known internal risk management models—RiskMetrics for market risk and CreditMetrics for credit risk—in 1992 and 1997. These two models highlighted the idea of measuring risks in portfolio form by considering their dependencies and using value at risk to quantify aggregate portfolio risk. The publication of the RiskMetrics model prompted broad dissemination of the value-at-risk (VaR) measure among professionals and academics alike. It was imported from insurers, which used a similar risk measure to calculate their maximum losses (MPY, or maximum probable yearly aggregate Loss; Cummins and Freifelder, 1978). VaR is the maximum value that a portfolio or company can lose during a given period of time, at a specified level of confidence. This measure also allows one to measure the optimal capital required to protect companies or portfolios from anticipated and unanticipated losses (Scaillet, 2003).

These new risk measurement tools are important instruments for calculating banks' regulatory capital under Basel regulation. They were also used to analyze the first major losses sustained in 1994 and 1995 following the misuse of derivatives (Procter & Gamble, Orange County, and Barings). Three credit risk crises followed: the Asian crisis, the Russian crisis, and the collapse of Long-Term Capital Management (LTCM). The LTCM hedge fund was overexposed to various risks. When the Asians and Russians steadily defaulted on their obligations, LTCM began to run short of liquid assets to meet its obligations; this liquidity risk quickly turned into a default risk (Jorion, 2000).

Risk management became a corporate affair in the late 1990s. The major orientation decisions in firms' management policy (and monitoring) are now made by the board of directors. Most often, the audit committee monitors these decisions, although some large financial institutions have put risk committees in place. The position of Chief Risk Officer, or CRO, became more important.

Financial hedging products were developed to cover different types of risk. The four main risks for banks are credit risk (80% of the risk of banks, including default risk), market risk (5%), operational risk (15%), and liquidity risk (not yet well quantified). Market risk represents the risk of volatile prices or asset returns, and credit risk has been associated with default risk (although recent studies estimate that the default risk corresponds to a maximum ranging from 25% to 85% of the bond credit spread; Elton et al., 2001; Dionne et al., 2010). The Basel agreement of 2004 addresses these risks. Only credit risk was covered in 1988; market risk was considered years later, in 1996. It quickly became apparent that regulatory treatment (arbitrary capital) of market risk was ill-adapted to banks' portfolio management of this risk.

Regulatory authorities consequently authorized banks to use internal models to measure market risk. In contrast, the portfolio treatment of credit risk began only in 2004 under Basel II.

Adequate capital reserves became a major concern in the early 2000s following major defaults in the late 1990s and the Enron bankruptcy in 2001. Basel II introduced more rigorous rules for banks in 2004. In addition to modifying the credit risk management rules, the Accord introduced new rules for operational risk. However, the legislators have said little about managing the risks of various management and hedge funds, especially pension funds. Canada was equally lax: The Caisse de dépôt et placement du Québec, a major pension fund, lost over \$30 billion CAD in the last financial crisis, including a \$10 billion write-off caused by disastrous commercial paper risk management, involving misuse of this structured product with an AAA credit rating! US Federal Reserve Chairman Alan Greenspan was particularly negligent: he often gave contradictory speeches on the advantages and risks associated with the use of derivatives and on the financial market's capacity to absorb risks effectively, without additional regulation. In particular, OTC products proliferated without real or regulated verification of counterparty risk.

After the financial crisis, new rules for the governance of risk management were adopted in many countries. The firm board is now more involved in defining the risk appetite of the company and in adopting the main strategic decisions on risk-taking. Risk control is also under the responsibility of the board. Contrary to the 2002 rules, the emphasis is not limited to the presence of independent directors on the different committees but to their competencies in understanding different risks and risk management tools.

Table 1.2 presents the main dates that derivatives and structured products appeared. Its content is taken from Jorion (2001); Crouhy, Galai, and Mark (2000); Roncalli (2001); Field (2003); and electronic documents. Few derivatives and structured products have been launched since the 2000s. A special issue of *The Journal of Risk and Insurance* published in September 2009 focused on insurers' risk management and their use of derivatives, structured products, and their involvement in securitization. It featured survey articles by Cummins and Weiss (2009) and Cummins and Trainor (2009). On risk management and insurance demand, see MacMinn and Garven (2013) and on regulation of insurers, see Klein (2013).

1.3 CURRENT DEFINITION OF CORPORATE RISK MANAGEMENT

The goal of corporate risk management is to create a reference framework that will allow companies to handle risk and uncertainty. Risks are present in nearly all firms' financial and economic activities. The risk identification, assessment, and management process is part of companies' strategic development; it must be designed and planned at the highest level, namely the board of directors. The risk appetite of the company must also be defined by the board. An integrated risk management approach must evaluate, control, and monitor all risks and their dependencies to which the company is exposed. In general, a pure risk is a combination of the probability or frequency of an event and its consequences, which are usually negative. Risk can be measured by the volatility of results, but higher moments of the distribution are often necessary. Uncertainty is less precise because the probability of an uncertain event is often unknown or subjective, as is its consequence. In this case, we would refer to precautionary rather than preventive activities to protect against uncertainty. Lastly, financial risk management consists in undertaking opportunistic activities related to future risks that may generate positive or negative results.

In this book, corporate risk management is defined as a set of financial and operational activities that maximize the value of a company or a portfolio by reducing the costs associated with risk (Stulz, 1996, 2003). The main risk management activities are diversification and risk hedging using various instruments, including derivatives and structured products, market insurance, self-insurance, and self-protection. The main costs firms seek to minimize are costs of financial distress, risk premium to partners (stakeholders), expected income taxes, and investment financing. Managers' behavior toward risk (risk appetite and risk aversion) and corporate governance also affect the choice of risk management activities.

There are five main risks:

1. Pure risk (often insurable, and not necessarily exogenous in the presence of moral hazard and known in the presence of adverse selection);
2. Market risk (variation in prices of commodities, exchange rates, asset returns);
3. Default risk (probability of default, recovery rate, exposure at default);
4. Operational risk (employee or management errors, fraud, IT system breakdown, derivative mispricing);
5. Liquidity risk: risk of not possessing sufficient funds to meet short-term financial obligations without affecting prices. May degenerate into default risk.

1.4 CONCLUSION

The purpose of this chapter was to present a historical review of risk management. In addition to outlining the important dates, we discuss the objectives of risk management and criticize its application in the years preceding the latest financial crisis. The first conclusion is that risk management must encompass more than simply minimizing the company's risk exposure.

The objective of risk management is to maximize firm or portfolio value via the reduction of costs associated with different risks. The main costs that companies incur are financial distress, income taxes, financing of future investment projects, and premiums payable to stakeholders.

Risk management can also improve the firm's capital structure, which suggests that companies in good financial health should use their information advantage to establish strategies to hedge future prices. Companies also need integrated risk management, which would let them profit from different forms of natural coverage within the company.

Companies can use internal activities and market activities to protect themselves from risks. The most widespread internal activities are prevention of financial risks and accidents (self-protection) and the reduction of financial consequences resulting from bad events (risk retention, self-insurance, liquidity reserves). Market insurance is a form of protection for losses related to pure risks that cannot be covered by the company. Derivatives are financial instruments that protect companies from unanticipated financial losses.

Risk management is part of corporate governance. Its main orientations must be defined by the board of directors and must be monitored by independent and competent directors in the audit committee or the risk committee for companies highly exposed to various risks, such as financial institutions.

Financial institutions face a particular problem. Their risk positions, which are intended to increase their returns, expose their customers (holders of deposits and

insurance contracts) to major losses. This justifies the current regulation of bank and insurance company risks. Recent history shows that international regulation of large financial institutions has failed in several respects: unfortunately, it is the taxpayers who have had to shoulder the cost of the indiscipline of executives of large financial institutions. Regulation can also create perverse and unanticipated effects on financial institutions.

In conclusion, effective regulation of financial institutions apparently remains elusive despite the immense progress seen in the past 25 years.

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