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Corporate Financial Risk Management

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Introduction

1.1 Motivation for this study

The management of financial risks has become an important, if not *the most important*, task for today's corporate treasurers. Firms are exposed to all kinds of (financial) risks, and use a variety of ways to mitigate them, from diversification of activities, hedging, to insurance. However, there are remarkable differences between firms both in the emphasis they put on risk management and in the precise way they deal with such risks. Surprisingly, the financial economics literature offers little guidance as to what the economic benefits of corporate risk management are, and therefore as to what the optimal (level of) risk management should be.

This dissertation seeks to bridge this gap. Key questions we address are: Why do firms hedge? What are the distinct economic benefits of corporate risk management? Insights in these fundamental economic rationales improve our understanding and enable us to more optimally guide the risk management decision. To this end, the dissertation includes an extensive overview of the empirical and theoretical literature, some new theoretical contributions, and a case study.

In this section we discuss why (financial) risk management, in particular hedging, has gained in importance. There are several reasons for this. First, we observe an increased volatility in market prices (e.g. exchange rates, interest rates or commodity prices) in the last decades that translates into an increased risk for many firms. Second, the tendency of firms to focus more on their core businesses generally implies less diversified and therefore more risky firms.¹ A (partial) rationale for this emphasis on core business comes from a demand for more transparency and accountability. This in turn has also stimulated financial risk management (especially hedging

¹See Comment and Jarrell (1995) for some evidence on the trend to focus more on one's core business.

and insurance). In particular hedging risks helps mitigate risks that managers cannot control and hence, improving transparency and accountability with respect to management performance.

A third development is that the opportunities to manage risks increase rapidly. Derivatives markets have grown considerably in recent decades. The growth in notional value of outstanding contracts is impressive, as is the speed of financial innovation.² Financial innovation has helped corporations hedge against an increasing number of risks. See for example the introduction of innovations such as weather derivatives, derivatives on telecom bandwidths, and even some types of corporate earnings insurance contracts. The proliferation of derivatives markets has fundamentally changed the way in which firms deal with risk. Traditionally, firms have been using debt and especially equity for the transfer of aggregated risks to financial markets. Financial innovations - derivatives - nowadays enable firms to unbundle these risks and transfer them into much finer parts to the financial market (investors).

A nice illustration of this is United Grain Growers (UGG), a business that trades in grain grown by Western Canadian farmers. Its main risk to earnings is the variability in the volume actually produced. In order to protect itself against this risk the firm traditionally chooses to maintain a high level of equity. Recently, however, UGG announced that it was buying a new insurance policy from an insurance company named Swiss Re, in which the insurance company absorbed the full risk of a drop in grain volume. Part of the firm's risk, originally transferred to the financial market via equity, is now being transferred via an insurance contract. This transaction allowed UGG to reduce its equity.³ UGG claims that the transaction reduces the company cost of capital and therefore creates value. This however, is not automatically true. Obviously, investors in UGG now face lower risks and will therefore reduce their required rate of return. But this risk reduction goes with a price, the price of the insurance contract. If fairly priced, this will mitigate the advantages coming from the investors' lower required return. Accordingly, standard finance theory states that in absence of imperfections such hedging cannot create value. However, as we will highlight in this dissertation, various market imperfections (see also the discussion on the trend of more concentration on the firms' core businesses in the above) may make hedging valuable.

The case of UGG illustrates how new developments in financial markets (here a new type of insurance contract) changed the way firms transfer risk to financial markets. The new type of insurance contract allows UGG to transfer a very specific part of the firm's total risk and

²For example, BIS (2000) estimated the size of the global OTC-derivatives market year's end 1999 at US \$ 88.2 trillion. Remolona (1993) and Finnerty (1989) give an overview of the variety of financial instruments that have emerged over the last decades.

³For a description of this transaction see "Outsourcing Capital", *The Economist*, November 27, 1999, p. 90.

reduces the need for a large equity base. Our understanding of the benefits associated with this new development, however, are still very limited.

1.1.1 Need for economic framework and understanding

The real world importance of risk management stands in sharp contrast to the lack of theories of corporate risk management in the literature. Finance theory gives little guidance to firms as to when to hedge, which risks to hedge, and what types of instruments to use. Even more serious is that finance theory - until recently - could hardly explain the economic benefits of corporate risk management in the first place. Fundamental questions as: Why do firms actually manage financial risks? and What are the real economic benefits for the firm of such risk management? remain largely unanswered. It is only recently that these issues have received more attention in the economic literature. The main purpose of this dissertation is to contribute to our understanding of risk management and help to unravel any distinct economic benefits.

A thorough understanding of the economic benefits of corporate risk management is important for several reasons. First, without such a thorough understanding it is almost impossible to provide guidelines for corporate risk management. The lack of guidance is apparent when one opens textbooks in (international) finance. The primary focus in these books is to describe financial derivatives and their potential uses in a firm's risk management. Textbooks typically don't answer questions such as: To what types of risk should a firm direct its risk management?, and What is the best instrument to hedge an exposure? It is not suggested that the authors of these textbooks should be blamed, these omissions point at an important shortcoming in the corporate finance theory; the lack of a fundamental framework that explains why and under which conditions risk management is beneficial.

A second reason for the importance of understanding the economic rationale(s) for corporate risk management is the potential for misuse of derivatives in particular. More specifically, the increased opportunities for firms to engage in risk management have gone hand in hand with many debacles, with substantial losses for firms like Showa Shell, Metallgesellschaft AG, Allied Lyons, Procter and Gamble and Yakult. Many of these losses were directly related to the corporate use of financial derivatives and therefore raised a widespread concern about this practice in both board rooms and the public opinion.⁴ What is needed is an effective control mechanism for corporate treasuries. For this a thorough understanding of managerial incentives and the real economic benefits of risk management is important.⁵

⁴In a recent comparative study on the use of derivatives by US and German firms by Bodnar and Gebhardt (1998), 16.5% of US firms and 11.1% of German firms cited concern over public perceptions of derivatives usage as the reason for not using derivatives in risk management.

⁵Boot and Ligterink (1997) sketch a framework for effective internal control of a treasury along these lines.

A third reason for a thorough understanding of the economic benefits of risk management lies in the ongoing debate on how firms should disclose information on derivative positions in their annual reports. It appears that the accounting disclosure rules of derivatives positions have an (surprisingly) important influence on how firms actually do manage their risks.⁶ If so, a distinct improvement could be made if disclosure guidelines could be fine-tuned to show that they are consistent with the true economic benefits of risk management. For that purpose, insights into the economic benefits as well as the managerial incentives for risk management are of crucial importance.

1.2 Approach and background

Although recently, there has been some progress in developing rationales for corporate risk management, we are still far away from a fundamental framework. The primary objective of this dissertation therefore is to develop a better understanding of why particularly non-financial corporations are involved in risk management.⁷

Firms engage in risk management through (see e.g. Mason, 1995; Duffhues, 2000):

1. *hedging* - taking an opposite position in the risk, either on the spot market or in the derivatives market;
2. *diversification* - combining less than perfectly correlated risks;
3. *insurance* - set of contracts that limit risk in exchange for a premium.

Most of the literature on corporate risk management focuses on hedging (and in particular on the use of derivatives). As already pointed out in Duffhues (2000), this seems shortsighted.

⁶In 1982, when the FASB accounting guidelines with respect to translating foreign currencies changed from FAS 8 into FAS 52, empirical studies found an important shift in the way corporations managed foreign exchange risk. Under FAS 8, firms often hedged their accounting exposure. After FAS 52 was introduced, firms less often hedged their accounting exposure (see Shalchi and Hosseini, 1990). Also in more recent studies, e.g. the survey by Bodnar and Gebhardt (1998), managers often indicate that accounting guidelines affect the firm's choice of risk management (instruments).

⁷Although financial institutions share many of the rationales developed in this dissertation to engage in risk management, we choose to focus on non-financial corporations. For financial institutions the management of financial risks is part of their core business and risk processing a key financial intermediation function. This is somewhat different for non-financial corporations. Moreover, financial institutions also use derivatives for trading purposes. As a result, derivatives transactions are hard to disentangle accordingly. That is also the reason why most empirical studies on risk management focus on non-financial institutions. For a discussion about risk management for financial institutions see Saunders (1997) or Smithson (1998).

For example, operating decisions that reduce a firm's exposure should also qualify as hedging decisions. Such operating decisions, however, generally do not fit in the definition of hedging. Using a currency option to reduce exposure is furthermore generally seen as hedging. But in a pure sense an option has all the characteristics of an insurance contract.⁸ Apart from that, the distinction between insurance and hedging has become more vague as insurance companies accept risks previously sold to the financial market. For example, Honeywell Inc., a US multinational, sold a portfolio of risks (insurable and currency risk) in one contract to an insurance company in 1997.⁹

Theories of corporate risk management - as we will show in this dissertation - offer explanations why firms may want to engage in risk management in its broadest sense.¹⁰ They generally do not explain which of the alternatives to use. The emphasis on hedging (and more specifically the use of derivatives) in the corporate finance literature in our opinion follows from the (increased) liquidity of financial derivatives markets and the increased opportunities that derivatives offer firms to engage in such risk management over the last decade. Although most of our results hold for the broadest definition of corporate risk management, we will follow the literature and will emphasize hedging (with derivatives). Where necessary, however, we will also pay considerable attention to alternative forms of risk management. Interesting questions then emerge. Are alternative forms of corporate risk management complements or substitutes? What are the costs of one alternative versus the other?¹¹

This dissertation contributes to the existing literature in four ways. Our first contribution is that we develop a framework that comprehensively integrates the existing theoretical work in corporate finance and also review the existing empirical work. Part I identifies the state-of-the-art corporate risk management theories and identifies the major remaining puzzles in the literature on corporate risk management. A second contribution is that we develop insights into the potential interaction of risk management and the design of a firm's securities. Both are important in the (re)allocation of risk. However, to date, this interaction has not yet been explored. A third contribution is that we show that product market competition is an important driving force behind risk management when there is imperfect competition. Finally, the fourth contribution is that we explore the relevance (and importance) of corporate risk management theories in a case study on Fokker.

⁸Mason (1995) considers options as insurance rather than hedging.

⁹For a description of this transaction, see "Honeywell Inc. and Integrated Risk Management", Harvard Business School case 9-200-036.

¹⁰Corporate risk management in this dissertation does not only encompass the aforementioned three forms of risk management but also incorporates increasing risk (speculation).

¹¹For an interesting discussion on the more philosophical question how risk management fits in the financial management of corporations see Duffhues (2000).

This dissertation primarily builds on theories developed in (corporate) finance, and to a lesser extent, on those developed in the industrial organization literature. Both have a strong micro-economic foundation and have benefited from developments in non-cooperative game theory and information economics.¹²

In the sixties and early seventies, the main approach in finance was the neoclassical analysis. In that approach, the firm was considered as a black box that maximizes some objective function. Markets were considered frictionless and the institutional setting was considered unimportant. In such a setting, Modigliani and Miller (1958) derived their famous irrelevance propositions; financing decisions are irrelevant if investors in a firm can undo or copy the firm's financing decisions on their own account.

Two other important pillars of modern finance were developed in this period. First, the concept of efficient markets.¹³ Loosely stated, the concept of efficient markets means that financial markets do not leave money on the table. This directly implies that firms cannot systematically outperform the market by speculating on financial market prices: financial price changes are highly unpredictable.¹⁴

The second important concept that was developed in this period relates to the pricing of risk.¹⁵ The main insight is that only risks that cannot be diversified away in financial markets are priced in financial markets. Applied to corporate risk management, it implies that reducing diversifiable risk in itself has no direct impact on the firm's cost of capital. Hence, for a firm to reduce diversifiable risk is not beneficial *per se*. But even with respect to non-diversifiable risks it is not clear why reducing this risk is beneficial for a corporation. Non-diversifiable risks are priced in financial markets. Reducing non-diversifiable risk reduces the firm's cost of capital, but has associated costs. Generally, since financial markets are rather efficient, you pay for what you get, and again we should conclude that corporate risk management does not matter.¹⁶

In order to reveal the benefits of corporate risk management, it is important to open the black box common in the neoclassical approach. Information economics in combination with non-

¹²For a general introduction, see Rasmussen (1989).

¹³Foundations have been developed in Fama (1970, 1991). See also Jacobsen (1999) for a clear and non-technical introduction of this field.

¹⁴There is enough evidence that supports this claim. Even professionals such as banks and institutional investors cannot gain systematically while speculating on financial prices. Some recent studies in the field of market micro structure (e.g., Lyons, 1998) indicate that even a foreign exchange dealer hardly makes any profit from speculating but mainly from intermediation.

¹⁵A pioneering article on the Modern Portfolio theory is Markowitz (1952). Later contributions (e.g. Sharpe, 1964) more explicitly focuses on the pricing of risk.

¹⁶Or more precisely, the net present value of an investment in financial markets is generally equal to zero.

cooperative game theory has become the standard tool to analyze and understand decisions within a firm and between insiders and outsiders.

Although the bulk of contemporary corporate finance theory builds on game theory and information economics, we do not restrict ourselves in this dissertation to these approaches. More specifically we also apply general equilibrium analysis of incomplete asset markets to see whether there is a role for corporate risk management. We build on a strand in the literature that rationalizes financial innovations especially due to improved risk sharing.¹⁷ We use this approach to gain more insight into the role of risk management and its interaction with the design of securities.¹⁸

Finally, we build upon a strand in the literature that studies the interaction between financing decisions and product market strategies.¹⁹ Using simple industrial organization models (often with imperfect competition) we study if there is strategic interaction between risk management strategies of firms in the same industry.

1.3 Outline of this dissertation

We start this dissertation in **Chapter 2** with the development of a comprehensive theoretical framework that incorporates existing theories of corporate risk management. Starting in a neo-classical world with complete and frictionless financial markets, we first show that the firm's risk management decisions (as well as the firm's other financing decisions) are irrelevant. This is similar to the propositions of Modigliani and Miller (1958). Analogous to the development of capital structure theory, the logical next step is to analyze if and how the introduction/existence of specific market imperfections affect the (optimal) risk management decision. We identify four driving forces behind corporate risk management: taxes, bankruptcy costs, financial contracting costs and managerialism. This opens a wide field of possible motivations for corporate hedging, but also for corporate speculation. Risk management appears to be strongly related to both a firm's capital structure and the design of management compensation contracts.

Most of the theoretical research discussed in Chapter 2 has received at least some empirical support. **Chapter 3** surveys recent empirical studies on the rationalization of corporate risk management. In particular there is especially strong evidence in favor of theories rationalizing corporate risk management based on its beneficial effect on bankruptcy and financial contracting costs, which relates risk management strongly with the firm's other financing decisions. Risk

¹⁷Allen and Gale (1994) provide a very good overview of this field.

¹⁸Security design is an important new field in corporate finance. The objective in this literature is to derive (optimal) financial instruments from first principles rather than take these instruments as given.

¹⁹Maksimovic (1995) offers a good introduction in developments in this field.

management reduces the (future) funding costs associated with a certain financial structure and in addition allows the firm to take more debt in its financial structure.

Following the extensive surveys of both theoretical as well as recent empirical work in Chapters 2 and 3, **Chapter 4** evaluates the state-of-the-art theories in corporate risk management. We confront our earlier findings with the practice of corporate risk management in order to draw some important conclusions and to develop a research agenda. The Chapters 2 through 4 present the state-of-the-art, but also identify the main gaps and shortcomings in the literature. In the second part of this dissertation (Chapters 5-8) we seek to fill in some of the voids. We thereby focus on the interaction between risk management and financial contracting.

In **Chapter 5**, we study the interaction between corporate risk management and the firm's basic securities in a framework where transaction costs of developing financial securities and short sale constraints make financial markets incomplete (Allen and Gale, 1988; Madan and Soubra, 1991). In such a world firms have an incentive to develop securities that facilitate risk sharing in the economy. We introduce and rationalize corporate risk management in this framework. Risk management enables the firm to issue more generic securities. Since these securities are valued higher by a larger group of investors they can be sold with lower marketing costs. Risk management in this framework therefore increases the firm's net proceeds from securities. Moreover, we show that corporate risk management and security design decisions have a different function in the optimal allocation of risk; corporate risk management supports security design. Corporate risk management may therefore be especially helpful in fine-tuning the firm's initial security design decisions. Chapter 5 increases our understanding of the role of risk management and securities in the allocation of risk and helps to understand why firms like UGG (see Section 1.1) tend to partition and unbundle risks.

Chapters 6 and 7 focus on a second important gap in the literature. An important motivation for corporate risk management that has been neglected in our opinion is the interaction between risk management and product markets, especially if there is imperfect competition. We show that there is interaction between corporate hedging, product markets and financial contracting. Taking this interaction into consideration further improves our understanding in why firms manage their risks the way they do.

In **Chapter 6** we consider a world with imperfect competition in product markets. We consider two firms that compete in a duopoly. Both firms are exposed to a risk factor. When these firms face financial constraints we find that there is strategic interaction with respect to the firms' hedging decisions. We explore such interaction and derive equilibrium hedging strategies. This chapter also rationalizes why firms are concerned about their competitors' hedging decisions and try to take this into account in determining their own.

In **Chapter 7** we consider a more dynamic model in which firms have an incentive to increase their market share. Firms compete in two rounds in an imperfect product market. One firm is

exposed to a risk factor while the other is not. If the exposed firm also requires external financing and financial contracting is prone to an agency problem, then corporate risk management may benefit the firm. The model enables us to draw conclusions on the relation between the firm's product market strategies (e.g. building market share, engage in predation, etc.), its financing decisions and risk management. This is important since corporate treasurers often refer to the impact of a hedging strategy on the firm's product market strategies. Our model rationalizes such behavior.

To illustrate product market (but also other) considerations in corporate risk management, we finally present a case study on Fokker's risk management in **Chapter 8**. The Dutch aircraft producer filed for bankruptcy in 1996. An important external cause of its bankruptcy was the development in the US dollar. Before 1996 there were several moments that the firm was close to bankruptcy and therefore, the firm was financially constrained for much of the time. Particularly interesting in this case is that there was a major shift in the firm's risk management strategy (from full hedging to not hedging most of its exposure) at a certain moment in time. What was the (initial) primary objective for the firm's risk management strategy? How does this relate to the rationalizations provided in this dissertation? What tentative conclusions can be drawn about the relative importance of these theories? The case study sheds light on these issues.

