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**Corporate Financial Risk Management**

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## Summary and conclusions

In this dissertation we explore economic rationales for corporate risk management. The central issue analyzed in this study is how the firm's decision to engage in risk management (through the use of financial derivatives) interacts with its real and financing/capital structure decisions. We examine why non-financial firms engage in financial risk management (especially their use of financial derivatives) and what forces drive these decisions.

The dissertation consists of two parts. In Part I we provide an extensive review of the theoretical and empirical literature on corporate financial risk management. Part II contains three theoretical essays in which we explore the interaction between risk management, the firm's financing decisions and the product market. In particular, we study how risk management may affect the firm's design of financial securities from a risk sharing perspective (in Chapter 5), and analyze the interaction between risk management, financing decisions and the firm's product market environment (in Chapters 6 and 7). Finally, we discuss and apply the developed insights to a case study on the risk management of the Dutch aircraft corporation Fokker. Below we will summarize the main insights developed in the various chapters and derive implications and suggestions for future research.

In Chapter 2 we present a comprehensive theoretical framework that incorporates existing theories on corporate risk management. As is common in the mainstream finance literature, we first study under which conditions corporate risk management is irrelevant. We then address several market imperfections and examine to what extent risk management affects firm value. We present four important driving forces: taxes, bankruptcy costs, financial contracting costs and managerialism. More specifically, Chapter 2 shows that risk management may increase the value of the firm by reducing expected taxes, expected bankruptcy and financial contracting costs (thereby enhancing investment efficiency), and improving contracting terms with its man-

agers. In addition, we show that risk management may induce firms to take on more debt which can increase firm value through lower taxes or improved incentives. However, we also show that risk management may destroy value. Self-interested managers can use risk management to achieve private objectives. For example, managers may increase their value of the management compensation package or manipulate earnings in order to obtain a better reputation on the labor market. In addition, managers use risk management to prevent the use of costly external financing. Although this generally is value-increasing (since external financing is more costly than internal financing), it may also reduce firm value if it implies that managers can circumvent the monitoring role of financial markets and undertake inefficient investments. We show that all of these different motivations ultimately have direct implications on the way firms should manage their risk.

Chapter 3 reviews the empirical literature on the rationales for corporate risk management. The survey clearly shows that firms that use derivatives are larger, have higher growth opportunities (spend more on R&D), and are more financially constrained (less liquid) than firms that do not. Furthermore, it appears that the use of derivatives by non-financial firms is negatively related to firm size and positively related to the level of debt and the firm's market to book ratio. Moreover, investments of derivatives users seem to be significantly less sensitive to cash flows relative to that of non-users. Hence, the empirical literature finds strong support for the Froot, Scharfstein and Stein (1993) rationale for corporate risk management; risk management prevents underinvestment (due to costly external financing) and enables firms to execute their strategic plan more often. Rationales related to bankruptcy and financial contracting costs also receive strong empirical support. The evidence furthermore suggests that risk management induces firms to increase their debt level. There is, however, little support for taxes as a rationale for hedging. The managerial rationales of corporate risk management have not been tested extensively. The only well-established link that has been found in this respect is between managerial share (and options) holdings and derivatives usage. Other important observations are that derivatives users tend to have higher firm values and that the amount of risk reduction due to risk management is relatively moderate. Particularly interesting are the findings with respect to the substitutability/complementarity of various types of corporate risk management. For example, it appears that alternative forms of risk management are complements rather than substitutes.

In Chapter 4 we evaluate the state-of-the-art theory and the practice of corporate risk management. An important observation is that risk management enables a firm to fine-tune its financing decisions and that managerialism seem important. However, both of these rationales are insufficiently explored. Moreover, we stress that more insight into the costs of financial risk management is needed. The theory provides a valuable framework in terms of the potential individual contributions of several rationales of risk management to firm value. However, at the more detailed level of execution it is not very clear how these various rationales might interact.

We also lack insight with respect to the more specific features of risk management choices. For example, what determines the choice between several risk management instruments or what determines the optimal maturity of financial instruments.

Our confrontation of the theory with recent survey evidence on the corporate use of derivatives implies that firms take a very partial approach to risk management. Firms tend to focus on separate risks in isolation rather than taking a portfolio approach. Benefits of risk management identified in the literature suggest that firms should focus on reducing cash flow volatility (and to some extent volatility in accounting earnings). Although this has been emphasized as the most important objective for risk management, firms still seem to refrain from such an integrated approach of risk management. From this confrontation we further identify some interesting puzzles:

1. Why are risk management decisions remarkably often guided by a view of the market (given the relative efficiency of financial markets);
2. Why and how do accounting guidelines affect corporate risk management?
3. How do the costs and benefits of risk management vary with firm size? In particular, are small firms different in their approach to corporate risk management? What are the major economic benefits of risk management for small firms?
4. How do various forms of risk management (operational and financial hedging, insurance, geographical diversification, etc.) interact? Are they complements or substitutes?
5. How does risk management interact with the design of a firm's securities?
6. Why and how do product market considerations affect risk management decisions?

These puzzles deserve to be explored in more detail. Chapters 5, 6 and 7 of this dissertation, attempt to fill some of these gaps.

Chapter 5 analyzes the interaction between corporate risk management and security design. Both the design of a firm's securities and risk management (especially the use of derivatives) enable a firm to transfer risk. For example, a firm issuing shares sells part of its risk to the financial market. Alternatively, through a forward contract a firm can transfer risk to the financial market. How do these different forms of risk sharing interact? We explore this issue in a theoretical model where transaction costs and short-sale constraints make financial markets incomplete. In such a market the design of financial securities issued by firms is important in order to share risk and to increase the proceeds from issuing these securities. We introduce risk management into this framework and show how it increases firms' opportunities to improve on their security design. In particular, we show that risk management enables firms to design securities that have

lower marketing costs. That is, risk management enables firms to design securities that attract a larger investment base. An implication of our model is that firms issue more debt.

In Chapters 6 and 7 we study the interaction between risk management, financing and product markets. In Chapter 6, we analyze the interaction between two competitors' hedging strategies when they face costly external financing and operate strategically in a market with imperfect competition. We find that costly external financing makes firms compete less aggressively on the product market. Risk management may affect the firm's expected profits both through its effect on the expected costs of external financing as well as through its effect on the product market equilibrium. That is risk management may affect the likelihood that firms end up in equilibria where they face external financing costs (and thus compete less aggressively on the product market) or are unconstrained and compete more aggressively. As a result, there is strategic interaction between competitors' hedging strategies. The equilibrium hedging strategies depend on the extent to which firms are financially constrained or have deep pockets and the types of financing costs these firms face.

In a numerical example, we find that when firms need limited amounts of external financing, there is an equilibrium where both firms do not hedge. When both firms have limited amounts of internal wealth and they both face convex financing costs, then hedging by both firms is the equilibrium strategy. In the latter cases, where hedging is the equilibrium strategy, not hedging would have produced higher expected profits. However, a coordination problem prevents firms from achieving such higher profits. This result therefore is merely the outcome of a prisoners' dilemma. We think this to be a fruitful area for future research. In our analysis we focus on symmetric cases only. An interesting extension is then to analyze what happens when one firm has deep pockets while the other does not. Moreover, it would be interesting to endogenize the costs of external financing.

Chapter 7 examines product market competition in a more dynamic framework. In this chapter, we analyze the optimal risk management decision for a firm when building market share is important. An important consequence of costly external financing is that it makes firms more short-term oriented and therefore less aggressive in the short run. This, however, negatively affects a firm's opportunity to build market share. We show how risk management potentially mitigates this problem. An implication of our model is that risk management can be expected to be more prevalent for financially constrained firms in industries where building market share is important (e.g. because large investments need to be made). In addition, we suggest that risk management might be used to prevent the negative consequences of (potential) predatory strategies by competitors. Both chapters suggest that there are additional benefits and costs to risk management when taking product markets into consideration. We therefore think that considering the interaction with product markets is a valuable contribution to the literature which would further increase our understanding of corporate risk management.

In Chapters 5 through 7 we look at risk management from two perspectives. In the first of these chapters we focus on the interaction between financial contracting (security design) and risk management taking the real decisions as given. In contrast, in Chapters 6 and 7 we focus on the interaction between the firm's real decisions and risk management. Also in these chapters financing plays an important role (especially internal versus external financing). It would be interesting to integrate these two perspectives in future work.

In Chapter 8 we apply the main insights developed in this dissertation to a case study on the risk management decisions of Fokker during the period 1987 to 1996 (the year of its default). During this period, Fokker faced an important dollar-exposure and engaged both in full hedging as well as non-hedging strategies. We apply the insights developed in this dissertation to analyze whether Fokker's risk management choices can be supported by theoretical contributions. We argue that based on these theories both Fokker's decision to hedge as well as its decision to stop hedging can be rationalized. Their initial hedging strategy offers some support for the importance of arguments related to financial distress but also for product market considerations in corporate risk management. With its hedging strategy, the firm tried to buy time to restructure in order to be able to compete in the product market. Due to both internal and external causes, however, Fokker appeared to be unable to reduce its operating costs during the time period that the company "bought" with its hedging strategy. After some time Fokker's hedging strategy lost its effectiveness. The firm was very close to bankruptcy and its prospects were troublesome. It therefore should not come as a surprise that the firm switched to a non-hedging strategy. This increased the value of its option to restructure. Why Fokker remained unhedged after the takeover by DASA is an open question that remains to be answered. With the merger, the direct threat of bankruptcy disappeared and with it the firm's main motivation to remain unhedged. In the case of Fokker, we then expect the economic benefits of hedging to exceed those of not hedging. Therefore, the insights developed in this dissertation cannot explain why Fokker remained unhedged after their merger with DASA.

Although current theories provide us with a framework to understand the major economic benefits of corporate risk management, this framework is still far from complete. There are quite a number of puzzles indicated earlier that merit further attention. Further work in this area therefore is important, especially given the profound role of corporate risk management in today's financial markets.

