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Liquidity management and corporate demand for hedging and insurance

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ABSTRACT

We analyze the demand for hedging and insurance by a firm facing cash-flow risks. We study how the firm's liquidity management policy interacts with two types of risk: a Brownian risk that can be hedged through a financial derivative, and a Poisson risk that can be insured by an insurance contract. We find that the patterns of insurance and hedging decisions are pole apart: cash-poor firms should hedge but not insure, whereas the opposite is true for cash-rich firms. We also find non-monotonic effects of profitability. This may explain the mixed findings of empirical studies on corporate demand for hedging and insurance.

1. Introduction

Corporate risk management has been the subject of a large academic literature in the last 30 years. This literature aims at filling the gap between the irrelevance results derived from the benchmark of perfect capital markets (Modigliani and Miller, 1958) and the practical importance of risk management decisions in modern corporations.

Several directions have been explored for explaining how and why firms should hedge their risks,[1] among which: managerial risk aversion (Stulz, 1984), tax optimization (Smith and Stulz, 1985), cost of financial distress (Smith and Stulz, 1985), cost of external financing (Stulz, 1990; Froot et al., 1993; Scharfstein and Stein, 1993). A few papers have applied these ideas to model corporate demand for insurance.[2]

The specific testable implications derived from each of these models are different, but some of them are robust. In particular, there is now a consensus among financial economists that profitability and

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[1] For a critical assessment of these ideas, see Smith and Stulz (1985).
[2] See for example Mayers and Smith (1982, 1987, 1990), or Caillaud et al. (2000).

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liquidity should be important determinants of firms' hedging and insurance policies. All of the above theories predict indeed that less liquid and less profitable firms should manage their risks more actively. However, this is only partially confirmed by the data. Indeed, the empirical literature (see for example Tufano (1996)[3] and Geczy et al. (1997)[4]) finds that liquidity is indeed an important determinant of hedging (more liquid firms hedge less), but there is no clear evidence on the impact of liquidity on insurance decisions. Also, profitability does not seem to have a clear and robust impact on hedging and insurance decisions.

The main objective of this paper is to show that when liquidity management and risk management decisions are endogenized simultaneously, the theoretical impact of profitability is non-monotonic: the firms that gain the most from actively managing their risks are not the less profitable nor the most profitable. Moreover, when insurance decisions are explicitly modeled, we find that the optimal patterns of hedging and insurance decisions by firms are exactly opposite: cash-poor firms should hedge but not insure, whereas the opposite is true for cash-rich firms. Thus the relation between liquidity and optimal risk management decisions of firms may be more complex than initially thought. This may explain the mixed findings of empirical studies on corporate demand for hedging and insurance, who typically use linear specifications.

The paper uses a continuous time stationary framework à la Merton (1974) or Leland (1998)[5], with the important difference that we focus on liquidity risk rather than solvency risk. Namely, we consider a model similar to Radner and Shepp (1996) and Jeanblanc and Shiryaev (1995) where a firm operates a profitable technology but is confronted with unpredictable[6] liquidity shocks. Cash management is used to reduce the cost of two financial frictions that work in opposite directions: on the one hand issuing new securities is costly and on the other hand, free cash-flows can be wasted by managers. We show that the optimal liquidity management policy of the firm is to accumulate cash balances up to some target level x^* and distribute all further gains as dividends. As we explain below, x^* can be viewed as a measure of the cost of financial frictions.

We first construct a simple model that allows to integrate liquidity management and risk management decisions (Section 2). We then use this model to characterize these optimal decisions (Section 3). Section 4 provides some robustness checks. Section 5 estimates the gains from hedging and insuring. Section 6 concludes by deriving testable implications on the impact of profitability and risk on corporate hedging. Mathematical proofs are in Appendix.

2. Integrating liquidity management and risk management

One of our objectives is to contrast the behavior of a firm with respect to two types of risk:

- Risks like currency risk that continuously impact the earnings of the firm and can be hedged through market instruments like futures contracts.

- Risks like industrial accidents that have a small probability of occurrence but a large cost if they occur, and can only be covered through an insurance contract.[7]

[3] Tufano (1996) studies risk management behavior in the US gold mining industry. He finds that managerial compensation (in the form of share ownership or stock options holdings) is a major determinant of the use of derivatives: when managers own shares, firms hedge more, but when managers own options, firms hedge less. He also finds that more liquid firms hedge less.

[4] Geczy et al. (1997) study a sample of 372 US firms, composed of the Fortune 500 largest firms that have at least one source of foreign exchange exposure. They use a logit model to explore the determinants of the use of currency derivatives. They find evidence that higher quick ratios, indicating more internally available funds, are associated with a lower probability of using currency derivative instruments.

[5] Similar frameworks have been used to analyze the impact of solvency regulations and regulatory audits on banks' portfolio decisions: see e.g. Merton (1978), Bhattacharya et al. (2002) or Dangl and Lehar (2001).

[6] Specifically, in our model instantaneous cash flows contain a Brownian and/or Poisson component. Equivalently, cumulated cash flows X_t follow a mixed Poisson-diffusion process. By contrast, in Merton (1978) and Leland (1998) the profitability of the firm is uncertain but cash flows are predictable. That is, in their model the cash flow process X_t satisfies $dX_t = \mu_t dt$ (no diffusion term nor jump) but μ_t itself follows a diffusion.

[7] In the real world, the situation is more blurred: there are market instruments that cover Poisson risks and vice versa some insurance contracts can cover Brownian risks. Moreover, most risks have both a continuous and a jump components. Our distinction is only made for expository purposes.