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Corporate financing decisions under ambiguity: Pecking order and liquidity policy implications

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ABSTRACT

This paper addresses the following unresolved questions from the perspective of ambiguity theory: Why do some firms issue equity instead of debt? Why did most firms retain their cash holdings instead of distributing them as dividends in recent times? How do firms change their financing policies during a period of severe financial constraints and ambiguity, or when facing the threat of an unpredictable financial crisis? We analyze how the values of the firm's equity and debt are affected by ambiguity. We also show that cash holdings are retained longer if the investors' ambiguity aversion bias is sufficiently large, while cash holdings become less attractive when the combined impact of ambiguity and ambiguity aversion is relatively low.

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1. Introduction

Over the last three decades, there have been many developments in decision theory that improved our understanding of uncertainty. In line with Knight (1921), uncertainty can be divided into two well-defined distinct parts, risk and ambiguity. "Risk" is used to refer to any sort of uncertainty that can be defined through the existence of a probabilistic model based on one single probability assessment, which is known to the decision maker (DM). "Ambiguity" is used to refer to situations in which the DM appears to be not fully confident that his/her beliefs apply. Practically, risk is mostly used when uncertainty is calculable, i.e. both outcomes and a subjective probability distribution over outcomes can be specified. Ambiguity applies to situations where uncertainty is incalculable, i.e. where there is no clear perception of the possible outcomes or of an estimate of a single plausible probability distribution. At least since Ellsberg (1961), experimental studies in ambiguous settings have repeatedly shown that DMs usually prefer to deal with known, rather than unknown probabilities, thereby revealing a form of ambiguity aversion (see, i.e. Mousavi & Gigerenzer, 2014 for a discussion of risk and uncertainty).

Although the recent literature on ambiguity has provided a unified and elegant framework to address (and often solve) some financial

puzzles (e.g. the equity premium puzzle and the interest rate puzzle, see Epstein & Schneider, 2010), there are still ill-understood phenomena in corporate finance, whose explanation, in our view, might benefit from the ambiguity theory perspective.

Recent studies document a secular increase in the cash holdings of some firms (Bates, Kahle, & Stulz, 2009; Denis & Sibikov, 2010; Faulkender & Wang, 2006; Holberg, Phillips, & Prabhala, 2014). In 2010 the Federal Reserve reported that cash holdings of U.S. corporations experienced the largest-ever increase in records going back to 1952. Cash increased very fast after 2008, growing at an annual rate of 11% until 2014. US non-financial companies held \$1.82 trillion of cash at the end of 2014, including technology, pharmaceutical and industrial giants, such as Apple Inc., Pfizer Inc., and General Motors Co. "The rising corporate cash balances could represent a longer-term behavioral shift in the wake of the deepest financial crisis in decades" (The Wall Street Journal, June 10, 2010). One reason could be that firms facing deep uncertainty about future transactions and vague economic perspectives may find it beneficial to pile up significant amounts of cash as a cushion. And yet, both anecdotal¹ and large sample evidence points to an incentive for managers to avoid visible accumulation of cash holdings. Moreover, one would expect that the precautionary demand for cash should decrease when firms can hedge more effectively as more types of

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¹ An often cited anecdotal example is Kirk Kerkorian's attack on Chrysler in the past century, showing that large cash holdings drew the action of shareholders who could threaten managers' position.

derivatives are available, e.g. as a consequence of improvements in information and financial technology since the early 1980s. Thus, the observed increase in cash holdings represents an anomaly that challenges existing theories.

Various empirical studies are inconclusive about the hierarchy or “pecking order” among different sources of funds (see Leary & Roberts, 2010, and references there). Some have documented a significant heterogeneity in corporate decisions attributed to a divergence in beliefs about the firm’s value between managers and the market (see also Lins, Servaes, & Tufano, 2010, about investor preferences and cross-country differences in corporate financial decisions). Behavioral explanations of corporate decisions have recently come to consider “managers’ personal traits” (Hackbarth, 2008, 2009), which may include their attitude towards ambiguity. But whether the choice between equity or debt finance is affected by managers’ personality traits and their perception biases is still controversial (see, for example, Breuer, Rieger, & Soyprak, 2014b). Some evidence indicates that executives often believe that their common equity is undervalued by the market, but in other cases, and especially following bad periods in the stock market, CFOs tend to focus on downside risk in their analysis and think their stock is overvalued (see, i.e., Ben-David, Graham, & Harvey, 2013), leading to the insight that these contrasting findings could be “reconciled by means of a behavioural perspective to corporate finance” (Hackbarth, 2008).

Our main objective is to advance a behavioural perspective for studying equity holders and debt holders’ decisions. We integrate ambiguity into a contingent claim model to analyse what happens when DMs are rational in all respects, except for how they perceive the firm’s future. The behavioural biases impact on firm’s financing decisions and, in particular, on the values of corporate securities. Our paper sets out to answer the following unresolved questions: Why do certain firms issue equity instead of debt? Why did most firms retain their cash holdings instead of distributing them as dividends in recent times? How do firms change their financing policies during a period of severe financial constraints and ambiguity, or when facing the threat of a financial crisis in the foreseeable future? Our paper tries to provide answers within the framework of a dynamic model which incorporates ambiguity and the investor’s attitude towards it. Our goal is not to challenge existing works addressing such issues; rather we try to reveal some missing ingredients of corporate policies. We model the corporate decisions as real options and apply the mathematics of mixed singular control/optimal stopping methods in stochastic settings under ambiguity. In particular, we analyze how the values of the firm’s equity and debt are affected by ambiguity (Propositions 1 and 2) and relate our results to the pecking order puzzle (Proposition 3); moreover, we show how ambiguity affects cash holdings and optimal dividend policies (Propositions 4 and 5). We find that the presence of a standard pecking order or its reverse may depend on the relative ambiguity aversion biases of the managers and the investors: if managers have a stronger ambiguity aversion bias than the market, then a reversal of the standard pecking order preferences can be obtained. Finally, we find that cash holdings are retained longer if the impact of the ambiguity aversion bias is sufficiently large, which is consistent with the observed change in cash holdings in periods of turbulence and vague uncertainty. Cash holdings become less attractive with relatively small ambiguity aversion biases, in which case the DM prefers to receive dividends instead.

2. Literature and theory

2.1. Behavioural corporate finance and ambiguity theory

Corporate finance theory has recently started considering common personality traits of managers, behavioural biases, investors’ sentiment in modeling the complex decision-making processes in corporations. For example, excessive optimism and overconfidence have been described as frequently observed managers’ behaviours, since the survey evidence by Graham and Harvey (2001). DMs who tend to be overconfident

about their abilities overestimate those abilities. Those who are overconfident about their knowledge (i.e., overconfidence in the sense of “miscalibration”, see Hackbarth, 2009) tend to establish excessively narrow confidence intervals. Alternative examples of biases are due to “mental accounting” (Thaler, 1980), where DMs set reference points for the accounts that determine gains and losses (leading eventually to “disposition effects”, Shefrin & Statman, 1985), and often assign different weights to events with negative or positive realizations. Thus, there may be “mistakes” that managers make because of cognitive imperfections and emotional influences, which add up to other behavioural errors by investors, too. As a result, “judgements may be based on feelings rather than underlying fundamentals” (Shefrin, 2009). These errors can create a wedge between fundamental values and market prices and may determine important implications for the practice of corporate finance.

Such distortions seem to be further amplified when financial markets are abnormally uncertain. In times of economic turbulence, like the recent recession and the financial catastrophe that erupted in August 2007, new forms of uncertainty become truly relevant in financial strategies. In particular, ignorance and ambiguity attitudes may influence the valuation processes by the managers and the investors.² In an ambiguity world, people are very insecure about what they know. Consequently, small slivers of information can cause prices to leap and plummet, with decisions far from a standard probabilistic rule. In some cases, unrealistic pessimism characterizes the DM’s behaviour, involving overestimating the probabilities of unfavorable events and underestimating the probabilities of favourable events. Charness and Gneezy (2010) demonstrated experimentally that people are willing to pay a price to avoid ambiguity, and this affects their financial decisions. As recent psychometric tests and experimental evidence confirm, “there is a clear evidence that an average ambiguity aversion is the typical qualitative finding” (Trautman & Van De Kuilen, 2013). A recurrent issue concerns the omission of incalculable risk and the impact of investors’ sentiment and ambiguity on managers’ “cognitive assessment” (Kahneman & Tversky, 1979) of option values and investment/financing opportunities. Under uncertainty, DMs are not sure about the likelihood of the states of nature and their valuation of option payoffs “are subject to vagueness, behavioural biases and partial ignorance” (Driouchi, Trigeorgis and Gao, 2015).

Some papers have recently embedded ambiguity and ambiguity attitudes into economic decisions that can be described as an option exercise or optimal stopping problems. Miao and Wang (2011) employ the recursive multiple-priors utility model developed by Epstein and Wang (1994) to incorporate ambiguity in the study of real investment and exit problems. They show that ambiguity may accelerate or delay option exercise, depending on the relative degrees of ambiguity about continuation and termination payoffs. Nishimura and Ozaki (2007) apply the continuous time multiple-priors utility model developed by Chen and Epstein (2002) and show that irreversible investment decisions are delayed because of ambiguity. Agliardi, Agliardi and Spanjers (2015) study the effect of ambiguity on the conversion option embedded in defaultable bonds. Asano and Shibata (2014) employ the multiple-priors utility model in the context of natural capital investment and environmental policies, while Gao and Driouchi (2013) apply this methodology to rail transit investment. These contributions employ multiple-priors models involving real options, but do not deal with corporate finance problems. In all these real option valuation models, ambiguity deforms the objective probability distribution by changing the drift of the relevant stochastic processes, leaving however the standard deviation constant.

In our paper ambiguity is taken into account following a different approach. Our ambiguity-based analysis goes beyond the maximin or “worst case” criterion of the multi-prior utility model and uses “capacities” (Gilboa, Postlewaite, & Schmeidler, 2008), representing DMs beliefs in the stochastic processes of the underlying assets. The approach of dynamically consistent Choquet random walks (Kast & Lapied, 2010,

² Various papers linked ambiguity and financial crises (see, i.e., Routledge & Zin, 2009, Boyarchenko, 2010 and Driouchi, Trigeorgis, and So, 2015).

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