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Bailouts, the incentive to manage risk, and financial crises ☆

Stavros Panageas

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Abstract

A firm's termination leads to bankruptcy costs. This may create an incentive for outside stakeholders or the firm's debtholders to bail out the firm as bankruptcy looms. Because of this implicit guarantee, firm shareholders have an incentive to increase volatility in order to exploit the implicit protection. However, if they increase volatility too much they may induce the guarantee-extending parties to "walk away." I derive the optimal risk management rule in such a framework and show that it allows high volatility choices, while net worth is high. However, risk limits tighten abruptly when the firm's net worth declines below an endogenously determined threshold. Hence, the model reproduces the qualitative features of existing risk management rules, and can account for phenomena such as "flight to quality."

Introduction

In debating the charter for the Bank of England in 1840, Sir Robert Peel (the Prime Minister of Britain at the time) used the following words:

While the charter is well-designed and while we are taking all precautions which legislation can prudently take against the recurrence of a monetary crisis, a crisis may occur despite of our precautions. If it does, and if it be necessary to assume grave responsibility for the purpose of meeting it, I dare say men will be found willing to assume such responsibility.

Sir Robert Peel's words are as relevant today as they were 168 years ago. As the United States is going through one of the worst financial crises of the last decades, it seems important to recall that the current crisis is not unique in its features. During the last few decades, the world has seen several financial crises (Asian crisis, Russian crisis, etc.) that all shared a common theme: Periods of increased risk appetites, as typically evidenced by high leverage ratios, led financial institutions to the brink of bankruptcy. Bailouts and restructuring followed. At the same time, large liquidations of risky positions (sometimes referred to as “flight to quality”) exacerbated the initial negative shocks and led to prolonged periods of depressed asset valuations.

The subprime lending crisis that the United States is experiencing these days provides a reconfirmation of this general pattern: The quest for higher expected returns in the years 2004–2006 led to increased leverage ratios and lending to subprime borrowers. These developments left little margin for error when house values declined and delinquencies increased. Government sponsored bailouts followed once some of the financial institutions were considered “too big to fail.” At the same time, risky markets that attracted several participants between 2004 and 2006 (such as the market for collateralized debt obligations) were abandoned in a quite dramatic fashion in favor of simpler and safer investment forms.

The commonality of the structure of financial crises suggests the possibility of an economic mechanism that can simultaneously explain their recurrent features. Two phenomena seem to be of first-order importance: (a) the pattern of high initial risk taking followed by rapid reversals of risk appetite around the onset of a crisis and (b) the prevalence of bailouts and restructuring during a crisis.

Pre-existing research has suggested that the first phenomenon may have a simple, almost mechanical explanation[1]: It is the very nature of the risk management practices followed by financial institutions that makes them prone to risk appetite reversals. Indeed, existing risk management rules (such as Value at Risk) allow high volatility choices in good times and automatically tighten the risk limits in response to declining market values. This tends to exacerbate the effects of negative shocks. Then why do such risk management rules exist in the first place? This question is important both for positive as well as normative reasons.

The present paper proposes an answer to this question. It develops a model where risk management rules are derived as optimal responses to the adverse risk taking incentives created by bailouts. Additionally, the incentives to undertake a bailout are endogenously determined, making it possible to provide a joint explanation for both the observed risk appetite reversals and the prevalence of bailouts.

Specifically, the baseline version of the model features three agents: the firm's shareholders, its debtholders, and a stakeholder (such as the parent company of the firm, an insurer that guarantees principal repayment to debtholders, junior claimants, the government, etc.).The stakeholder incurs a discrete cost or externality if the firm is terminated, and hence, may be willing to bail out the firm if bankruptcy looms. As one might expect, the presence of such an implicit guarantee makes the shareholders inclined to raise the volatility of the projects that they undertake. However, the stakeholder's guarantee to the shareholders is implicit and the benefit from the firm's continued presence is bounded. Therefore, high volatility choices could make it prohibitively costly for the stakeholder to bail out the firm.

In reality, this tension leads to the adoption of regulations, self-regulations, covenants, laws, etc. that I will refer to as “risk management rules” or commitments. Such rules place limits on the risks that firms can take and hence serve the purpose of reassuring the stakeholder. A new aspect of the model is that rules, regulations, and commitments are allowed to be imperfect, as they are likely to be in reality. The imperfection stems from the fact that future shareholders may choose to renege by paying a cost.[2] The imperfection of commitment implies that the credibility of a risk management rule is not taken as given. Instead, adherence to the rule has to be dynamically consistent.

Within this framework, I analyze the optimal choice of a risk management rule and show that it has a particularly simple form: undertake projects with high risk levels when net worth (defined as assets minus liabilities) is sufficiently high and switch to projects with low risk levels when net worth falls below an endogenously determined threshold.

The intuition for this result is simple. An optimal risk management rule should induce the stakeholder to bail out the firm in order to avoid the deadweight cost of bankruptcy. Simultaneously, it should provide future shareholders with high continuation values in order to reduce the temptation to renege. The optimal risk management rule achieves both of these objectives. By tightening the risk limits when net worth is low, it becomes possible to allow projects with high volatilities when the firm's assets safely exceed its liabilities. By postponing the high volatilities for the times when net worth is high, the anticipated growth rate of shareholder value is maximized. This “backloading” effect is common in many dynamic contracting contexts.[3]

This paper belongs to the continuous time literature that analyzes capital structure via contingent claim methods. This literature was initiated by the seminal Merton (1974) paper. Duffie (2001) presents a textbook treatment.[4] This literature takes the cash flow and control rights of debt and equity claims as given and uses the risk neutral pricing approach of Cox and Ross (1976) in a continuous time framework to price claims on a firm (including implicit guarantees) by option valuation techniques. The present paper contributes to this literature by explicitly modeling the incentives of the shareholders to take risk and the incentives of the stakeholder to undertake a bailout.

Leland (1998) also models endogenous volatility choice. The present paper supports the results in Leland (1998), in that it shows analytically the optimality of simple Markovian “bang-bang” type volatility policies. However, the two papers have a different focus and consider different frictions and choices, so that the optimal volatility process takes a different form. Specifically, in Leland (1998) shareholders have an incentive to *increase* rather than *decrease* volatility as net worth declines and termination looms. The reason is that in Leland (1998) there are no bailouts or debt renegotiations, so that the terminal nature of bankruptcy removes the incentives to mitigate risk that are present in this paper. Therefore, in Leland (1998) the only incentives to mitigate risk result from the callability of debt. For parsimony, and in order to illuminate the new insights of the present paper, I abstract from taxes, callability, and the endogenous choice of capital structure, so that the only reason to mitigate risk is the participation constraint of the stakeholder.

The model is also related to a literature in financial economics that studies how commonly observed risk management practices can lead to variations in institutional risk taking. See, e.g., Grossman and Zhou (1996), Basak (1995), Pavlova and Rigobon (2008), Basak and Shapiro (2001), and Gromb and Vayanos (2002). The contribution of this paper is to understand *why* the prevailing risk management rules dictate risk limits that tighten as firms’ net worth declines. In the context of optimal option exercise with idiosyncratic risk, Miao and Wang (2007) show that the precautionary motive introduces concavity into the agent's objective, and hence, an incentive to mitigate volatility. In the present paper, the value of the guarantee is always a convex function of assets, and were it not for the stakeholder's participation constraint, the firm would always set volatility to its highest possible level. Motivated mostly by the Asian crisis, a literature in international economics considers the effects of bailouts for understanding crises in developing economies by taking a general equilibrium perspective.[5] However, this literature does not consider the risk-shifting incentives of shareholders and the bailout-extension incentives of the stakeholders jointly. This paper also relates to the voluminous literature on debt, allocation of control and cash flow rights, default, and reorganization, that I will not attempt to summarize here.[6] The main difference between this paper and prior literature is that (a) for the most part, the present paper studies the incentives to inject “new money” into a company, as opposed to splitting the existing cash flows, and (b) the present paper focuses on the risk taking[7] and risk management incentives of bailouts, in an intertemporal framework with potentially imperfect commitment.[8] Methodologically, the paper uses continuous time methods to analyze an intertemporal incentive problem. Continuous time methods allow a close and explicit characterization of the solution to dynamic incentive problems. However, the present paper differs with the dynamic contracting literature,[9] since the goal is not to study the optimal design of debt and equity or the dynamic evolution of a firm's capital structure. Instead, this paper takes the capital structure as given, and focuses exclusively on the incentives to take risk and the incentives to undertake bailouts within a dynamic framework.

The structure of the paper is as follows. Section 2 presents the setup of the basic model. In order to expedite the presentation of the main result, Section 3 restricts attention to Markovian policies and derives the optimal volatility policy in that class assuming the presence of full commitment. Section 4 presents several realistic extensions of the baseline model and a discussion of its real-world implications. Section 5 introduces the notion of imperfect/costly commitment and shows that Markovian commitments are optimal even after allowing for general (potentially history-dependent) commitment policies. Assuming imperfect/costly commitment, Section 6 establishes that the qualitative features of the optimal risk management rule are the same, irrespective of whether the rule is determined by the shareholders or by the stakeholder through regulation. Section 7 concludes. All proofs are relegated to the Appendix.

Section snippets

Model

The baseline model makes a number of simplifying assumptions for expositional reasons. Several of the simplifying assumptions are relaxed in subsequent sections.…

The set of feasible payoffs

The first step towards solving Problem 1 is to characterize the set of payoff functions $P(W)$ that can be attained by $\sigma(W) \in \mathscr{M}$, while also satisfying (11). This is the purpose of the next lemma.

Lemma3

Let the payoff function P be defined as in (5), *and assume that it satisfies constraint* (11). *Then the following results hold for any* $\sigma(W) \in \mathscr{M}$:

1. *In the domain* (L, ∞), P *satisfies the ordinary differential equation* $\frac{\sigma^2(W)}{2} W^2 P_{WW} + r P_W W - (r+\lambda)P = 0$.…
2. P *is within the bounds* $0 \le P(W) \le B$ *for all* $W \in [L, \infty)$. *At* $+\infty$ *the function* P …

…

…

Absence of a stakeholder and debt forgiveness

It seems reasonable to ask if the model's predictions carry through even in cases where no stakeholder is present. To answer this question, this subsection presents a simple and stylized variant of the previous model, whereby optimal principal writedowns can produce effects that are similar to bailouts.[21]…

Imperfect and costly commitment

So far, the paper has only considered Markovian policies. A voluminous literature restricts attention to Markovian policies on a priori informational grounds.[24]…

Allocation of bargaining power

In several realistic situations, risk management rules are imposed by the stakeholder via regulation. Assuming costly commitment, this section shows that the distinction between regulation and self-regulation affects the rents of the two parties, but not the qualitative features of the optimal rule.

To be precise, suppose that the shareholders of the firm have some outside option when $W_\tau = L$. Such an outside option could be the result of legal difficulties in enforcing absolute priority, or more…

Conclusion

This paper presented a model, whereby a firm is bailed out so as to avoid costs associated with bankruptcy. The optimal actions for the stakeholder, the firm, and the lenders were derived endogenously. Even though the presence of an implicit guarantee increases the shareholders' incentives to take risk, it also makes it more and more costly for the stakeholder to continue providing the implicit protection.[30]…

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adverse effects to the banking sector during sovereign defaults (Panageas, 2010; Acharya and Rajan, 2013), and (iii) the cost of bank bailouts to the government (Gorton and Huang, 2004; Diamond and Rajan, 2005). Only recently, studies on two-way feedback effects between the risk of default in the banking and public sectors have emerged (Reinhart and Rogoff, 2011; Alter and Schüler, 2012; Acharya et al., 2014; Gennaioli et al., 2014)....

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Transmission channels of systemic risk and contagion in the European financial network

2015, Journal of Banking and Finance

> *Citation Excerpt :*
>
> ...Global financial market participants were directly impacted by its default and numerous repercussions were felt throughout the world, resulting from a plethora of cross-border and cross-entity interdependencies (De Haas et al., 2012; Acharya et al., 2014). The shock was rapidly spread in Europe, where by the end of September, euro area governments rescued the Belgian-French bank Dexia, demonstrating vividly that these interdependencies generate amplified responses to shocks and increase the speed of contagion in the financial system (Panageas, 2010; Acharya et al., 2011; Aiyar, 2012; Acharya et al., 2015 inter alia). Thus, in the aftershock era, the effects of both interconnectedness and contagion manifested themselves and systemic risk emerged as one of the most challenging aspects (Elliott et al., 2014; Acemoglu et al., 2015)....

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2014, Journal of Comparative Economics

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2011, Journal of Corporate Finance

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> ...Also, and similar to Purnanandam (2008), Almeida et al. 2011-this issue cannot look at genuine time-effects as their model is again restricted to a fixed two-period investment horizon. Finally, in Panageas (2010) “conflicting motives” gained fresh attention from the adjacent issue of financial crises and regulation in the banking industry. If outside stakeholders have an incentive to bail out firms as bankruptcy looms, bank shareholders face a risk-shifting incentive in order to exploit the implicit protection; however, they will balance that temptation against the stakeholders' threat to withdraw their guarantee if shareholders increase risk too much....

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