Financing constraints and the use of performance-sensitive debt

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Abstract

Performance-sensitive debt (PSD) is a popular financial instrument in the corporate private debt market. In a real-options setting, this paper aims to clarify how PSD impacts on investment policy, capital structure, and agency cost of financing constraints when the firm faces the upper limit of debt issuance. We show that the constrained leverage hardly depends on the performance sensitivity. In particular, our conclusions predict that PSD can decrease the severity of financing constraints relative to the fixed-coupon debt case and the loss of firm value arising from investment and financing distortions due to the presence of financing constraints. The higher the performance sensitivity, the less likely that the firm is financially constrained. These findings provide a novel investment-based explanation for issuance of PSD.

1. Introduction

Since the mid-1990s, a new type of debt contract, performance-sensitive debt (PSD), has been quite popular in the private debt market, particularly in corporate bank loans. For instance, Asquith, Beatty, and Weber (2005) report that more than 70% of the sample of commercial loans includes performance-sensitivity provisions, and in the sample of Manso, Strulovici, and Tchistyi (2010), 40% of loans have performance-sensitivity provisions. The key feature of a PSD contract is that the coupon paid rises if the firm's financial performance deteriorates and falls if it improves.

At first glance, PSD obligations seem puzzling because the issuing firm has to pay its debt holders more when less cash is available. Therefore, several theories have been proposed in the literature to explain why firms write such contracts from the perspective of various market frictions. Koziol and Lawrenz (2010) demonstrate that PSD has the potential to mitigate the asset substitution problem of Jensen and Mecking (1976). Manso et al. (2010) show that PSD can be used as a screening device for a firm's credit quality in a setting with asymmetric information. More recent work by Sarkar and Zhang (2015a) demonstrates that firms may issue PSD in order to mitigate or even completely eliminate (when designed optimally) the well-known agency problem of underinvestment (Myers, 1977).
To the best of our knowledge, no papers in the theoretical literature explicitly analyze the link between financing constraints in lending relationships and the use of PSD contracts. Firms commonly face credit and bank loan for reasons that stem from the view articulated by Jensen and Meckling (1976): investors are reluctant to lend beyond a certain amount because issuing debt encourages risk shifting from equity holders to debt holders. We focus on whether PSD can be used to mitigate inefficiencies arising from financing constraints relative to traditional fixed-coupon debt, and thus, we try to provide a new explanation for the use of PSD contracts. This is the issue that we address in this paper.

To help fill this gap, we consider a firm with no assets in place but a perpetual option to invest in a project at any time by incurring an irreversible investment cost at that instant. The investment cost is covered by issuing equity and PSD, albeit subject to an exogenously given credit constraint that prohibits the firm’s debt-to-asset ratio from exceeding a pre-specified threshold. We restrict our attention to the use of PSD to finance investment costs in the presence of financing constraints and aim to answer the following questions regarding corporate finance: First, how do PSD contracts, as a financing instrument, affect the constrained firm’s investment and financing decisions? Second, how do they impact on the agency costs of financing constraints? Finally, under what market situations the firm with PSD financing is less likely to be financially constrained?

It turns out that the magnitude of investment and financing distortion arising from the presence of financing constraints is substantially lower under PSD financing than under fixed-coupon debt financing, implying a decrease in the loss of firm value. This result predicts the empirical phenomenon reported by Begley (2012) that constrained firms can receive relatively larger loans under performance-sensitivity provisions than in the fixed-coupon case; hence, they are less likely to be financially constrained with PSD. Consequently, our theoretical results provide an additional explanation for why PSD may be superior to traditional fixed-coupon debt in certain cases. Furthermore, we show that firms with PSD financing are less likely to be financially constrained with higher performance sensitivity, earnings volatility and bankruptcy costs, as well as with lower earnings growth and tax rates.

While traditional fixed-coupon debt has been analyzed extensively in the literature, only a few recent academic contributions specifically address PSD contracts. In research related to our work, Bhanot and Mello (2006) develop structural pricing models for rating-based PSD contracts. Mjøs, Myklebust, and Persson (2013) focus on the pricing of PSD contracts with finite maturity. More recently, Myklebust (2012) examines the role of PSD in financing expansions of levered firm with existing assets-in-place and existing fixed-coupon debt. Furthermore, Sarkar and Zhang (2015b) discuss interactions between the investment and financing strategies of a start-up firm with loan-commitment-type PSD financing. However, these strategies are derived independently of financing frictions.

This paper also ties into a strand of the literature that analyzes the role of debt financing capacity constraints on firm decision making. Belhaj and Djembissi (2009), Wong (2010), and Shibata and Nishihara (2012) investigate the interactions between the investment and financing decisions of a firm that uses fixed-coupon debt financing in the presence of debt issuance constraints. Further, Shibata and Nishihara (2015a) introduce a firm with two classes of debt (bank debt and market debt) to consider how financial frictions affect investment, financing, and debt structure strategies. Following this line of research, Shibata and Nishihara (2015b) consider endogenous investment quantity and investment and financing decisions in the presence of financial frictions in combination with debt renegotiation during periods of financial distress. This paper differs from the existing studies: while they focused on the role of financing constraints, we pay close attention to inefficiencies arising from financing constraints, and thus provide an investment-based explanation for the popularity of PSD.

The remainder of this paper is organized as follows. In Section 2, the model of the firm is described. Section 3 presents the solution to our model. The numerical results and comparative statics are presented in Section 4, whereas the conclusions are provided in Section 5. The proofs of the propositions are relegated to the Appendix.

2. Model

In this section, we proceed in three steps. First, we set up the model and describe a PSD contract. Second, we provide the value functions after PSD is in place. Finally, we formulate the investment and financing decisions problem for the constrained, levered (PSD-equity financed) firm.

2.1. Setup

Consider an owner-managed firm with a perpetual right to invest in a single project at any time by paying a fixed, irreversible investment cost \( I \). Once the project is under way, it generates a random stream of earnings before interest and taxes (EBIT), \( X = (X_t)_{t \geq 0} \), which is governed by the following geometric Brownian motion process:

\[
dX_t = \mu X_t dt + \sigma X_t dZ_t, \quad X_0 \text{ given},
\]

where \( \sigma > 0 \) is the volatility, \( \mu > 0 \) is the drift, and \( Z_t \) is a standard Brownian motion. The values of \( \mu \) and \( \sigma \) are positive, and the parameters are given. The process \( X_t \) is a non-negative Itô process, and the generator of \( X_t \) is

\[
A(f) = \frac{1}{2} \sigma^2 X^2 \partial^2 f + \mu X \partial f,
\]

where \( f(X) \) is a smooth function of \( X \). The value function \( V(X) \) is a solution to the Hamilton-Jacobi-Bellman (HJB) equation:

\[
\min \left\{ \frac{1}{2} \sigma^2 X^2 \partial^2 V + \mu X \partial V + \frac{1}{2} (V - \pi - \beta) \right\} = 0,
\]

where \( \pi \) is the profit function, \( \beta \) is the discount rate, and \( \partial V / \partial X \) is the derivative of \( V \) with respect to \( X \). The value function \( V(X) \) is the solution to the boundary value problem:

\[
\frac{1}{2} \sigma^2 X^2 \partial^2 V + \mu X \partial V = 0, \quad X > 0, \quad \partial V / \partial X = 0, \quad X = 0.
\]

Since the seminal paper of McDonald and Siegel (1986), the methodology of real options has become the standard approach featuring a firm’s irreversible investment flexibilities.
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