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Journal of Banking & Finance 29 (2005) 1405–1428
Journal of BANKING & FINANCE
www.elsevier.com/locate/econbase

Real options, agency conflicts, and optimal capital structure

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Received 24 June 2003; accepted 7 May 2004
Available online 4 August 2004

Abstract

We examine the impact of a stockholder–bondholder conflict over the timing of the exercise of an investment option on firm value and corporate financial policy. We find that an equity-maximizing firm exercises the option too early relative to a value-maximizing strategy, and we show how this problem can be characterized as one of overinvestment in risky investment projects. Equityholders' incentive to overinvest significantly decreases firm value and optimal leverage, and significantly increases the credit spread of risky debt. Numerical solutions illustrate how the agency cost of overinvestment and its effect on corporate financial policy vary with firm and project characteristics.

JEL classification: G13; G31; G32; G33
Keywords: Capital structure; Stockholder–bondholder conflicts; Overinvestment; Real options

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0378-4266/$ - see front matter
doi:10.1016/j.jbankfin.2004.05.036

1. Introduction

Starting with the seminal work of Jensen and Meckling (1976) and Myers (1977), a large literature in corporate finance has focused on the impact of stockholder–bondholder conflicts on corporate financing and investment decisions. The basic message from this work is that managers acting on behalf of equityholders have incentives to underinvest and overinvest, and that the agency costs arising from these incentives influence the cost of debt financing and therefore the firm's optimal mix of debt and equity. However, theoretical work in this area has largely been qualitative, focusing only on directional effects. [2] In this paper, we seek to extend this literature by examining the magnitude of these relationships. In a real options model of the firm's investment decision, we address two questions. First, how big are the agency costs of debt? And second, how do these costs quantitatively affect optimal leverage?

Several recent papers attempt to answer these questions. Mauer and Ott (2000), Moyen (2002) and Titman and Tsyplakov (2002) develop contingent-claims models that focus on assessing the magnitude and importance of the agency cost of underinvestment. [3] The basic setup in these models is that the firm has debt in place and finances new investment with equity. As in Myers (1977), equityholders tend to underinvest because they pay the full cost of making the investment but share the benefits with debtholders. Depending on model parameters, these authors generally find that the agency cost of underinvestment is quantitatively important (ranging from 2–9% of firm value for base-case parameters) and is an important determinant of optimal leverage.

In this paper we focus on assessing the magnitude and importance of the agency cost of overinvestment. Unlike the case of underinvestment, there have been few attempts to measure the agency cost of overinvestment. Leland's (1998) analysis is perhaps the only work other than ours that specifically addresses this important issue. [4] He develops a contingent-claims model where the firm may increase the risk of assets-in-place after debt is issued. Analogous to the risk-shifting problem of Jensen and Meckling (1976), he finds that equityholders have an incentive to overinvest in risky assets to transfer wealth from bondholders to themselves. However, in sharp contrast with the results of our analysis (discussed below), he finds that the agency cost of overinvest is small (about 1% of firm value for base-case parameters) and has a negligible affect on optimal leverage.

A fundamental difference between Leland's model and our model is his assumption that firm asset value is exogenous and therefore independent of financial structure. Implicitly, an increase in asset risk is accomplished by replacing the firm's current set of assets with new ones having exactly the same value but higher risk.

[2] For example, see Barnea et al. (1980), Gavish and Kalay (1983), Green and Talmor (1986), Kim and Maksimovic (1990), John and John (1993), and Mao (2003).

[3] This is a short list of some of the recent work in this area. Other papers that examine some of these issues include Brennan and Schwartz (1984), Mello and Parsons (1992), and Parrino and Weisbach (1999).

[4] A paper by Ericsson (2000) has virtually the same model as Leland (1998), and so we focus our discussion on Leland's model and results.