



Project financing: Deal or no deal[☆]

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ABSTRACT

Most research on project financing focuses mainly on structuring and financing issues. In this paper we propose a model that incorporates the effects of the management efforts on market outcomes in its framework. Thus, we can examine project financing from the perspective of managerial incentives. The model highlights a set of conditions under which corporations prefer off-balance-sheet project financing. The choice is driven by the required amount of investment and the extent of uncertainty. Companies tend to choose project financing when managers' efforts have a significant impact on the magnitude and likelihood of favorable outcomes. Further, the larger the capital amount, the more likely it is that companies will use outside project financing.

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1. Introduction

From the standpoint of a company, project finance is not only a financing decision but also an investment decision. Because of its operational complexity, project financing can be more costly than traditional corporate financing. Lessard (1979) evaluates project financing by adopting an approach similar to that of the adjusted-present-value. The idea behind this method is to understand both the overall benefits and the component values. Such a proposition helps to pinpoint the underlying driving forces of project finance. Following this path, several theoretical models of project finance have been developed, including those by John and John (1991), Finnerty (1996), Nevitt and Fabozzi (2000), and Esty (2003a,b).

The overwhelming contractual arrangements differentiate project financing from traditional corporate financing. The parties involved in structuring of a typical project financing arrangement use the contract as a device designed to meet several different purposes. To explain the economic importance of project financing, most existing studies are based on agency or moral hazard problems, either from the capital assets or the sponsoring firm. For example, the asset-specific agency conflicts addressed in the paper of Habib and Johnsen (1996) can be avoided with project finance. Blanchard, Lopez-de-Silanes, and Shleifer (1994) argue that the short-lived project financing arrangement resolves the inefficient investment with free cash flows. With incomplete information, the joint evaluation of the projects and

existing assets can be problematic. For this reason Shah and Thakor (1987) argue that the primary motivation for project finance is to reduce the information search cost.

Another stream of research interprets project finance as one of the risk management strategies taken by the sponsoring firm. Although the interaction of financing and capital investment has been addressed by Froot, Scharfstein, and Stein (1993), using project finance as a risk hedging tool to prevent sub-optimal investment strategies has been re-examined recently by Parrino, Potoshman, and Weisbach (2002). Chemmanur and John (1996) advocate utilizing project finance for bankruptcy protection of a low-risk project from high-risk projects; Lamont (1997) shares a similar view. Brealey, Cooper, and Habib (1996) also believe that the risk management motivation can lead to an agency conflict between ownership and control. However, these studies focus mainly on the financing dimension.

Our paper attempts to provide justification for project finance from a more integrated and broader perspective than those in the existing studies. In addition to the financing aspect, there are extra concerns in managerial decision that can affect investment values. While managers must understand other issues such as competitive strategy, marketing, ethic, human management, and so on, we build a model that shows the interrelations among these issues. Factors such as market condition, the firm's operational, capital, and ownership structures are at the heart of our study. Incorporating industrial and organizational aspects gives a new impetus to the analysis of project financing. Importantly, we examine how managerial incentives might influence the choice of off-balance-sheet project financing versus internal corporate financing.

To highlight the conditions under which corporations prefer off-balance-sheet project financing, we formulate our model with four key features, each of which presents various operational issues for

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firms. First, the investment project consisting of the sale of product in a quasi-stochastic market characterizes the risk exposures to the parties involved. Second, management's efforts can influence market outcomes, which show the interrelatedness of managerial decision-making. Third, the degree of firms' risk aversion illustrates the conflict between insurance protection and correct incentive. Last, the abundance of risk-neutral lenders who can fund projects with a positive expected value creates a sustainable environment for project financing. With all these features, we are able to describe the real-world project finance situations.

We note that rather than using financial derivatives, the new idea of risk management by transforming the attributes of a firm occurs in our model, but with very different implications when viewed through managerial incentive structures. Shifting the risk of a capital project to outside investors may discourage the appropriate level of effort required to operate the project. The general problem of the conflict between spreading risk and providing appropriate incentives to agents has been widely discussed.¹ In contrast to the majority of such discussions, our model works on cases in which there are many investors and the outside financing market is competitive. This approach recognizes that companies that engage in project financing may anticipate earning economic rents, since the competition to provide funds by outside investors sets limits on the cost of project financing. As a result, the project sponsors are still seriously committed to the project and have a vested interest in seeing the project succeed.

Given the risk aversion assumption, firms will always see project finance as a way to reduce risk if outside investors are available. However, the compatibility between the work incentive and pay scheme has profound implications for contract designs when market power is present. As we noted above, an abundance of outside financing does not interfere with the incentives of the firm providing a low level of effort. Nevertheless, when outside investors create greater bargaining power by forming a syndicate in negotiation, they have a stronger influence on designing contracts that attempt to induce high effort. Casual observation suggests that outside investors can at least detect the minimum work effort. Thus, the ultimate contract design will be dictated by the difference in expected profits between high and low efforts, and the difference in costs between the two efforts. A smaller difference in costs between the two effort levels encourages a higher level in an optimal contract. Similarly, a larger difference in profits also promotes a greater effort.

Our model demonstrates that firms will use traditional corporate financing when managerial effort has a significant impact on both the magnitude and the probability of favorable outcomes. It also shows that the funding requirement or the scale of the project is directly related to the decision of choosing project finance, and that market size has ambiguous effects depending on the size of the capital investment.

The paper is organized as follows. Section 2 introduces the basic model framework and presents an analysis of different financing forms. Section 3 discusses the comparative static results and the testable predictions from the model. Section 4 concludes.

2. The model

We consider a company that owns the franchise rights for an investment project. There is large and long-term market risk inherently involved in this project. Its revenue depends on the output, q , and the inverse demand curve, $P = a - bq$, for the firm's product.

$$R(q) = Pq = (a - bq)q + R_0. \tag{1}$$

The total cost is given by:

$$C(q, e) = c_1q^2 + c_2q - c_3eq + K + e, \tag{2}$$

where R_0 is the minimum revenue that is independent of the output, $e \in (e_L, e_H)$ corresponds to low or high effort, and $K > 0$ represents the required initial capital investment.²

To ensure that the firm's cost is always an increasing function of its output, we impose the condition, $c_2 > c_3e_H$. The parameter c_3 reflects the reduction in marginal and average costs from each unit of effort.

The cash flow from the project, W , is primarily determined by the difference between the revenue and cost through production, which is subject to market risk u in a simple multiplicative fashion. That is,

$$W = u[R(q) - c(q, e)], \tag{3}$$

where $u \in [u_1, u_2]$ is a two-state random variable with $u_2 > u_1$. By assuming multiplicative uncertainty on the cash flows, the company output level will be chosen independently of the state of the world.

We further assume that the probability of state occurrence is influenced by the level of effort undertaken by the management of the new business entity. For low effort,

$$\text{Prob}(u = u_1|e_L) = \alpha \tag{4}$$

and high effort,

$$\text{Prob}(u = u_1|e_H) = \psi\alpha, \tag{5}$$

where $0 < \psi \leq 1$. ψ indicates the impact of high effort on the likelihood of favorable outcomes. The smaller the ψ , the higher the impact.

In our analysis, "effort" reflects general managerial competence and attentiveness. It is understandable to categorize effort into two groups: one that can be clearly specified and the other that cannot be specified. Since the first part of effort can be specified and monitored through contracts, it is the minimum effort that has to be provided by managers. High effort includes this low level effort and the part that cannot be contracted.

We assume that the company's utility function exhibits Arrow-Pratt constant relative risk aversion, which is denoted by R .

$$U(W) = W^{1-R}. \tag{6}$$

Being risk averse, $0 < R < 1$, the company maximizes the expected utility of the cash flow, W from the investment project.

In this analysis the company considers two forms of financing and compensations. The first option is self-financing, or corporate-funded by the company. The cash flow varies depending on the market outcome. The other alternative is to use project financing with outside investors. The company then gets a fixed reward that is independent of market outcome. This reward will be determined by the low effort situation, as outside investors cannot contract for a high level of effort and they cannot tell whether good performance is a result of high effort or pure luck.

¹ There have been considerable thoughts on the incentive schemes to reward managers within a firm and on whether to provide managerial rewards tied to firm profits or to provide fixed salaries. Managers in general will have more limited opportunities to capture economic rents that company owners may potentially earn.

² R_0 reflects the fact that as long as there is a basic need of the services to provide steady cash inflows, the market will not be completely stochastic. We are grateful to a referee for pointing it out. Interestingly, it does not affect the optimal output decision. Our findings on the effects of various variables remain the same as those when it is zero. From now on, we assume $R_0 = 0$.

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