



Debt, hedging and human capital[☆]

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ABSTRACT

This paper provides a theory of debt and hedging based on human capital. We distinguish human capital from physical capital in two ways: (1) human capital is inalienable and can exercise a one-sided option to leave the firm and (2) human capital is not perfectly replaceable. We show that a firm may reach the first best solution while issuing debt or equity to outsiders provided that either the insiders receive a senior claim or that the firm hedges. We then show that given asymmetric information concerning costs the only viable solution has the firm issuing debt to outsiders and hedging.

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1. Introduction

The risk management policies of financial firms have important implications for financial stability, but existing theories were primarily developed for firms specializing in physical assets. While tangible assets are important to the creation of value by some financial firms, the most important source of valuation creation at most financial firms are their intangible assets, in particular their human capital.² In this paper we extend the literature on capital structure and risk management by analyzing the role of hedging in a world where human capital is of first order importance. While our analysis of the results focuses on financial firms, the model itself applies to any firm where human capital is the primary determinant of firm value.

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¹ Steve Smith, a friend and coauthor passed away before this draft had been finished.

² Qian (2003) finds that trading and financial firms rank highest in his measures of human capital intensity.

Human capital has different contracting implications from physical capital, in particular the inalienable nature of human capital as Hart and Moore (1994) emphasize in their development of a theory of debt.³ One critical difference pointed out by Myers (1999) is that for firms that rely on human capital, “the assets go out to the parking lot every night” and need not return unlike physical assets. An important part of workers incentive to return each day is the firm’s promise to compensate its workers for their production, a promise whose credibility can be weakened by the taking of unhedged risks and that can be destroyed by the realization of sufficiently large losses.

Viewing the risk management policies of financial firms through the prism of human capital has at least two important implications for bank supervisors and financial stability. An immediate implication of inalienable human capital is that, to the extent the stock market value of a financial firm embeds the human capital of the organization; the market capitalization is not a good measure of the firm’s ability to absorb losses. Once a firm’s losses cross some

³ Myers (1999) and Zingales (2000, p. 1624) propose a theory that is based on the firm as a nexus of contracts between those parties that control assets and those that hold outside claims to the firm. This theory raises questions about theories of hedging and capital structure that focus exclusively on the value of residual claimants. In particular, as Zingales has emphasized, attention needs to be paid to the role of human capital and the types of contracting needed to insure that first best outcomes where feasible. See also Naqvi (2007) for a model in which the inalienable nature of human capital provides managers with some negotiating power in bankruptcy.

threshold and its ability to provide appropriate compensation is in doubt, the firm's human capital has an incentive to provide their talents to another firm. Nevertheless, our model suggests that prudential supervisors are wise to monitor the market capital of a financial firm, especially its relationship to the economic (or fair) value of its net assets. A firm's incentive to carefully manage its risks in a variety of ways including hedging increases with its human capital.

The remainder of the paper is as follows. Section 2 provides more intuition about the model and its relationship to the existing literature. Section 3 describes the model setup and assumptions. In Section 4 we look at the hedge/no hedge decision with symmetric information, while in Section 5 we model the problem as one of asymmetric information between managers and outside claimants. Section 6 contains some brief concluding remarks and some empirical implications one might draw from the model.

2. Model overview and relationship to existing theories

The model developed here is driven by four key assumptions: (1) management owns the rights to a positive net present value project that requires outside financing, (2) this project is most valuable if the existing managers remain with the firm, (3) human capital is inalienable, the firm's managers cannot be forced to work, and (4) the managers have valuable outside opportunities.

We analyze two cases. In the symmetric information case we contrast three alternative financing strategies. We first show that there is an overhang problem with simply issuing outside debt or equity that is analogous to the debt overhang problem with firm's investment in physical assets. In contrast, to the physical asset case, however, issuing equity does not solve the problem in our model. In some states the firm's insiders share of the profits will not exceed the value of their outside opportunities because the requirement that dividends also be paid to outside investors reduces the payments to the firm's managers. Thus, whether the firm issues debt or equity, its managers may opt for their outside option in some states, even when it is socially optimal to stay with the firm, because the firm's profits are insufficient to satisfy outside claimants and still pay the managers their reservation income.

Another financing strategy under symmetric information has the firm issue either outside equity or junior debt to finance the firm and issue senior claim to cash flows held by the managers of the firm that at least equals the value of their outside option. We show that such an arrangement yields the first best solution. The firm could also issue outside debt or equity and hedge by transferring sufficient income from high profit states to low profit states so that the firm can honor its outside obligations and still pay insiders an amount at least equal to their outside obligation. This also yields the first best allocation.

In the asymmetric information case there is a second determinant of the firm's where managers know the cost of production but where outside investors only know the variable's distribution. The price at which outsiders will purchase a claim is based on their knowledge of the cost parameter. Outsiders' estimate of the cost parameter will almost surely differ from the managers' observation of the realized value. If outsiders underprice their claims, the managers will gladly accept the transfer. Even if outsiders overprice the claims, managers will nevertheless issue the claims if the project's expected profits exceed the wealth transfer to outside claimants.

However, if the firm has the option of issuing debt and making that debt riskless by hedging, it can eliminate the difference between outside investors' and the managers' valuation of the debt. Thus, this financing option dominates the other alternatives.

Thus our results show that there is both an optimal capital structure and an optimal risk management strategy without resorting to taxes. Even with symmetric information, capital structure decisions influence firm value in the presence of inalienable human capital. The addition of any information asymmetry is sufficient to make it optimal for the firm to issue outside debt and uses hedges to make that debt riskless.

Our paper is related to a number of papers in the extant literature. Indeed, the last twenty years has brought forth a number of rationales for why firms should manage risk using off balance sheet contracts. The first involves managerial risk aversion, the convexity of the tax schedule or the existence of costly financial distress discussed by *Stulz (1984)* and *Smith and Stulz (1985)*. One could view our model as extending *Smith and Stulz (1985)* by formally modeling financial distress costs in the form of the departure of valuable human capital rather than assuming the existence of such costs.

Other non-exclusive rationales fall into three categories: (a) alleviating the underinvestment problem first posed by *Myers (1977)*, (b) dealing with asymmetric information problems between insiders and outsiders (the *Myers and Majluf, 1984* "problem") and (c) agency cost problems discussed in *Jensen and Meckling (1976)*.⁴

One paper that appears closely related to ours is *Bessembinder's (1991)* underinvestment model. *Bessembinder* argues that by hedging the firm can alleviate the debt overhang problem by shifting some of the distribution from default to non-default states. Thus, some projects in *Myers (1977)* setup that would not have been taken on absent hedging may now have a positive NPV to the firm's owners if the firm can commit to hedging in the futures market.

Although our paper is like *Bessembinder's* in that it considers the use of hedging to overcome a debt overhang problem, the focus of our paper is different and that leads to a difference in one of the models' key assumptions. *Bessembinder's* focus is whether and to what extent the firm's investment will fall short of its optimum value due to the debt overhang problem. Given this focus, the natural assumption is that uncertainty about the value of the hedgeable price is resolved after the investment has been made. In contrast, our focus is on the decision of managers and other insiders as to whether they will stay with the firm or exercise their outside option *ex post*. As this option may be exercised at any time, the natural assumption in our model is that insiders decide whether to exercise their outside option after the hedgeable price is observed.

The difference in assumptions has important implications for the results. The firm could eliminate the debt overhang problem in *Bessembinder's* model by issuing equity whereas in our model an equity issue by itself does not solve the overhang problem. Moreover all of the equity issuance alternatives are dominated by the combination of debt and hedging with asymmetric information.

Another paper that has some similarities is *Almazan et al. (2004)* which focuses on the implications of information release for the terms under which the firm contracts with its employees. The key difference in our papers is the assumption about the information set of key insiders. *Almazan et al. (2004)* assume that the key insiders (which they label the quick learners) understand some technology that is important to the firm but do not have information about the condition of the firm. The release of information changes the terms on which these employees will contract with the firm in an asymmetric way with bad information raising the cost of contracting more than good information would reduce the costs. In contrast, we assume the key insiders in our model have access to all available information.

⁴ *Stulz (1996)* reviews these theories and argues that many firms risk management involves "taking a view" on market prices. Also see *Triki (2005)* for a review of the empirical literature on risk management and hedging.

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