THE OPPORTUNITY COST OF ENTREPRENEURIAL LABOUR AND DOMINANT FINANCIAL CONTRACTS*

William Lim
Muhammad Rashid
Md. Maksudur Rahman Sarker

This paper introduces a reduced-form model where agency costs are considered using differing costs of capital and the value of entrepreneurial labor. The entrepreneur faces a choice among three financial contracts: common stock, straight preferred stock and convertible preferred stock. The model first identifies the situation in which convertible preferred stock is dominant. It is assumed that the cost of capital faced by the entrepreneur is lower than the cost of funds to a venture capitalist. This assumption is motivated by the research of Gentry and Hubbard (2001) and Heaton and Lucas (2001). A numerical solution of our model shows that as an entrepreneur's labor value decreases (increases), straight preferred stock (common stock) becomes more dominant, with convertible preferred stock being dominant in the interior. In other words, as an entrepreneur's bargaining power increases (when his or her human capital becomes more valuable), the venture capitalist should have more vested interest (i.e., common stock). Our model thus predicts that a medical doctor entrepreneur would more likely be financed with convertible securities or equity, while a high-school drop-out entrepreneur would more likely be financed by high-yield fixed income securities like junk bonds or usury loans.

Keywords: venture finance, entrepreneurship
JEL Classification: G32

William Lim, Contact Author and Conference Presenter: Associate Professor of Finance, School of Administrative Studies, York University, 4700 Keele Street, Toronto, Canada, M3J 1P3, Phone: (416) 736-2100 Ext. 33822, Fax: (416) 736-5963 , E-mail: limw@yorku.ca; Muhammad Rashid: Professor of Finance, Faculty of Business Administration, University of New Brunswick, P.O. Box 4400, Fredericton, NB, Canada, E3B 5A3, Phone: (506) 458-7350, Fax: (506) 453-3561, E-mail: mrashid@unb.ca; Md. Maksudur Rahman Sarker: Associate Professor of Accounting and Information Systems, Faculty of Business Studies, University of Dhaka, Ramna, Dhaka, Dhaka – 1000, Bangladesh, Phone: (88-02) 966-1900, Fax: (88-02) 861-5583, E-mail: mrsarker@hotmail.com

---

* Preliminary results were presented at the FMA International Meeting, the Australasian Banking and Finance Conference, the Administrative Sciences Association of Canada Conference and the Asian Finance Conference. This version contains new results. Comments from Ted Fee, Randy Hoffman, Michel Robe, Charles Schell, Bill Wilson and participants at the abovementioned conferences are acknowledged. Their comments have been instrumental in helping us obtain the new results. We are also grateful for research assistance from Min Chet Luei, and acknowledge support from the Social Sciences and Humanities Research Council of Canada. The usual disclaimer applies.

I. Introduction and Literature Review

Issues in entrepreneurial finance abound, as can be found in Barry (1994), Wright and Robbie (1997) and Harrison and Mason (1996), amongst others. One empirical stylized fact that emerges is that the dominant financial instruments in venture financing are convertible securities (Norton and Tenenbaum 1992, 1993; Kaplan and Stromberg 2001, 2004). The traditional explanation has been that the use of a convertible security serves to motivate the founder to exert the proper effort and avoid improper risk taking. That is, the use of convertible securities reduces agency costs (Gompers 1997). The agency theory explanation goes as follows: the entrepreneur (E) may place significant weight on increasing private benefits at the expense of the venture capitalist (VC), a moral hazard problem. There is also adverse selection with respect to E's ability. This adverse selection problem is mitigated by a fixed income instrument, which separates the low-ability E from the high-ability E. But the fixed income instrument entails a moral hazard problem of 'bondholder-stockholder conflict of interest' due to limited liability. That is, there is an incentive for E to increase risk to increase E's residual payoff at the expense of VC as shown by Green (1984). Convertible provisions reduce this incentive for E to increase such risk (Green 1984; Jensen and Meckling 1976; Smith and Warner 1979).

In this paper, we examine the first stage (the angel investing stage) of the venture and derive the dominant financial contract when the bargaining power of E changes. In the extant literature, the explicit value of E's time and skill in financial deal making has been neglected. Instead, an "individual rationality" constraint is simply added to the model analysis. We incorporate an explicit value for the opportunity cost of entrepreneurial labor, and translate this value into "minimum required cash flows" for E and a "maximum allowed rate of return" for VC. Obviously the higher the labor value, the stronger is E's bargaining power. We then show that the dominant security depends on the extent of E's bargaining power. When E's bargaining power is within certain bounds, we are able to demonstrate that the use of convertible securities dominates the use of common or straight preferred stock. The value of entrepreneurial labor provides an upper bound for the return a VC could demand. Thus VC could not simply demand a higher return if E increases risk to increase E's residual payoff as E would walk away if E's share is less than this labor value. Because of the minimal tax advantages of debt in venture financing, the convertible security used is convertible preferred stock. Copeland and Weston (1992) note "preferred stock is frequently issued with a convertible provision", while Kaplan and Stromberg (2001) note "VCs use a variant of convertible preferred stock called 'participating preferred'".

Recently, Schmidt (2003) developed a model where convertible securities were used to endogenously allocate cash-flow rights as a function of the state of the world and E's effort. In this paper, we show with a numerical example how cash flow rights are allocated between E and VC as a function of the state of the world, E and VC's differing costs of capital, and E's labor value. More recently, Bolton and Rosenthal (2002) and Robe, Steiger and Michel (2006, p.18) identified two important questions raised in the financial contracting literature. Basically, they ask if financial contracts (and contracting laws) should change as (1) the opportunity for moral hazard increases and exogenous risks decrease and (2) the returns to human capital or entrepreneurship increase. In this paper, we attempt to relate the type of financial contract with the returns to human capital (reflected in E's labor value). The cash flows and required discount rates (costs of capital) are expected to embody all of Norton and Tenenbaum\s (1992, 1993) factors, and we focus on the bottom line, which is valuation. The rest of the paper is organized as follows: In Section II, the model and associated research questions are presented. Section III provides a detailed numerical illustration. The conclusions are presented in Section IV.

II. The Model and Associated Research Questions

Here we present a reduced form model where agency and other risks are incorporated solely into differing costs of capital for VC and E. Let L^* be the expected present value of entrepreneurial labor which can be obtained by assuming a salary structure of E over the duration of the venture, discounted at the cost of capital of E, k_E. Since the expertise and skill of E will be more (less) in demand in the labor market in the states of nature in which the venture will be a success (failure), E's salary structure is expected to be affected by the probability distribution of future cash flows of the venture. L^* then gives the benchmark of acceptance of a deal by E.

The venture is assumed to consist of one entrepreneurial project. The initial cost of the project is I_0, and the project's stochastic future cash flows, denoted by $\boldsymbol{CF}$, is assumed to be homogeneously known to both VC and E. VC evaluates this venture using its acceptable minimum required discount rate k^*_V (which should incorporate premiums for various types of risks faced by VC). This evaluation provides the expected present value, PV, and the expected net present value, NPV, of the project. Due to a lower cost of capital k_E, the evaluation of the project by E is higher. A lower k_E is assumed as Gentry and Hubbard (2001), Heaton and Lucas (2001) and Timmons (1994, chapter 1) show that entrepreneurs are more risk tolerant. Given any financial deal, there is a specific rate of return to VC, denoted by k_V, which provides a split of $\boldsymbol{CF}$ between VC and E so that VC can recover its financial investment of I_0 and earn exactly k_V per period. Denote this portion of $\boldsymbol{CF}$ to VC by $\boldsymbol{CF}_{\mathbf{V}}$ and the remainder that goes to E by $\boldsymbol{CF}_{\mathbf{E}}$. The minimum required rate of return to VC, denoted by k^*_V, provides a particular split of $\boldsymbol{CF}$ into $\boldsymbol{CF}^*_{\mathbf{V}}$ and $\boldsymbol{CF}^*_{\mathbf{E}}$, and by design VC will not accept cash flows inferior to $\boldsymbol{CF}^*_{\mathbf{V}}$.

Given any $\boldsymbol{CF}_{\mathbf{E}}$ (equal to $\boldsymbol{CF}$- $\boldsymbol{CF}_{\mathbf{V}}$ by construction), E will calculate the expected present value, PV_E. S/he compares the resulting PV_E with L^* and makes the decision about accepting or rejecting the deal. Suppose E's minimum acceptable share of $\boldsymbol{CF}$, given L^*, is $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{E}}$. In other words, given L^*, $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{E}}$ is the minimum share of the venture's future cash flows which must accrue to E. Let the remainder that accrues to VC be $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{V}}$. The internal rate of return to recover I_0 with $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{V}}$ is k^0_V. Obviously, $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{V}}$ and $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{E}}$ must sum to $\boldsymbol{CF}$. In each deal, both k^*_V and L^* provide cut-off points for decision making: L^* to E and k^*_V to VC. If a deal leads to an allocation of venture cash flows in such a way that VC earns a rate of return less than k^*_V, VC will reject the deal. On the other hand, if a deal results in the expected present value of E's share of cash flows, PV_{E}, being less than L^*, E will reject the deal. This implies that if $k_V > k^0_V$, the deal is not acceptable to E as a higher share of $\boldsymbol{CF}$ goes to VC (that is, $\boldsymbol{CF}_{\mathbf{V}}>\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{V}}$ so $\boldsymbol{CF}_{\mathbf{E}}<\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{E}}$). Therefore, a feasible range requires that $k_V < k^0_V$. On the other hand, if $k_V < k^*_V$, VC will reject the deal. Thus, it must be the case that $k^*_V < k_V$, and the acceptable range of k_V lies from k^*_V to k^0_V. We then use this model to answer the following research questions:

(i) Is it possible for a convertible security to still be the dominant financial security for contracting between VC and E in the absence of explicit agency costs?

(ii) Would the dominant financial security change when E's bargaining power (which is increasing in the value of E's opportunity cost) changes?

In order to find the relationship between the dominant financial security and the opportunity cost of E, L^*, we shall restrict the analysis to the upper bound of the acceptable range for VC which is k^0_V. It is directly related to L^* as follows: Suppose expected future earnings for E increase and thus L^* rises. This means that the share of the cash flows going to E, $\boldsymbol{CF^0}_{\mathbf{E}}$, must be increased or E will reject the deal. As the venture's cash flows ***CF*** are fixed, this means that $\boldsymbol{CF^0}_{\mathbf{V}}$ must decrease. In order to make the present value of the lower $\boldsymbol{CF^0}_{\mathbf{V}}$ equal to I_0, the internal rate of return k^0_V must decrease. The dominant financial security is then determined by comparing the present value of the cash flows $\boldsymbol{CF^0}_{\mathbf{V}}$ of VC (discounted at k^*_V) as L^* changes.

III. A Numerical Illustration of the Model

A. A Simple Numerical Project:

Assume that the entrepreneurship will consist of a single venture that needs the initial outlay of $1,000,000. The probability distribution of operating cash flows and terminal values, along with the duration of the venture, are given in Table 1.

<< Insert Table 1 here>>

The project, though simple, characterizes some common features of entrepreneurial ventures. For example, in a venture, there are usually no cash flows at the "seed" and "start-up" stages and we have permitted this period to be one year. Secondly, in poor states of nature, new ventures produce very little operating cash flows and terminal value, while if the venture is a success, the operating cash flows and terminal value are expected to be significantly higher. We have represented this pattern in Table 1. Thirdly, the life of the project is assumed to be five years, consistent with the average holding period of most venture capitalists (Barry 1994).

One more thing about the venture's future cash flows in Table 1 is that the uncertainty about cash flows persists only until year two, and once the operating cash flows occur, the "bad" or "good" state has been realized and there is no uncertainty thereafter. We assume that both VC and E accept the characterization of the venture's future cash flows as given in Table 1, that is, both have homogeneous projections as the risks of asymmetric information or different perceptions are captured in higher risk premiums of VC. While we shall assume various levels of the required discount rate of VC, k_V, the required discount rate of E is:

$$k_E = R_f + a_E * CV_E \qquad (1)$$

where R_f = the risk free rate of interest,

a_E = value per dollar per period of a unit of the coefficient of variation placed by E (i.e., E's risk aversion parameter), and

CV_E = the coefficient of variation of cash flows belonging to E.

For the higher cost of capital of VC, let k^0_V=40%, and let R_f=10%. We recognize that the total risk premium of 30% to VC is high, but this assumption is consistent with Sahlman (1999). The discounted values of the project as of date two under "bad" and "good" states are then $498,950 and $4,490,550 respectively. The expected discounted value as of date two is $2,494,741 with standard deviation of $1,995,793. As of date zero, the expected present value, *PV*, using k_V = 40%, is $1,272,827. Given the initial cost of the project of $1,000,000, the expected net present value, *NPV*, is $272,827. While the discounted values of the project as of date two under "bad" and "good" scenarios are the same as above, due to E's lower degree of risk aversion, the current value of the project is higher. Suppose k_E is 20%, then *PV* to E is $1,732,459. Given the coefficient of variation of the project of 0.8 and the initial value of k_E of 20%, equation (1) implies a_E = 0.125. This is the value we shall use subsequently.

B. The Value of Entrepreneurial Labor

Es usually have a lot of work experience in their areas of expertise. The levels of their salaries are expected to be contingent on the "bad" or "good" state of nature because demand for their services will be weaker if the "bad" state occurs and will be stronger if the "good" scenario materializes. Reflecting these considerations, we assume the following salary structure for E:

<<Insert Table 2 here>>

In the "bad" scenario, E's salary declines to $80,000 and stays at that level for the next four years while in the "good" scenario, his/her salary rises by 5.3% for one year and rises by 8% thereafter. The coefficient of variation of E's salary structure is 0.16. With a_E = 0.125 and R_f = 10%, the annual personal discount rate, using equation (1) above, is approximately 12%. The expected present value of E's labor, L^*, is then $363,809.

C. Choice of Financial Contract

In this section, we consider various instruments by which VC can provide funds to E. We assume that in each case, the total amount of the initial cost of $1,000,000 is provided by VC.

(i) Common Stock Financing

With k^0_V = 40%, the expected present value, *PV*, of the venture is $1,272,827, and the expected net present value, *NPV*, given the initial cost of $1,000,000, is $272,827. Given these figures, VC will demand 78.57 percent ownership of the venture, leaving 21.43 percent for E. The cash flows (***CF***) of the venture are also split by these percentages. These split cash flows are rounded to the nearest integer and given in Table 3. At k^0_V = 40%, PV_E = $363,809 = L^* by design. In calculating PV_E, k_E = 20% is used and this discount rate is obtained by using equation (1). The minimum required rate of return to VC may not be higher than 40%. Otherwise E will be out of the deal because PV_E will then be lower than $363,809 or L^*. Suppose k^*_V is 35%. Then, the allocation of the project's cash flows to VC and E is given in case B of Table 3. In this situation, the expected present value of $\boldsymbol{CF_E}$ rises to $467,734, but the expected present value of $\boldsymbol{CF_V}$ is still $1,000,000. Obviously, if a higher k_V is set while k^*_V is 35%, the PV_E, using k^*_V as the discount rate, will be lower than \$467,734 but greater than \$363,809. We allocated cash flow rights and calculated DV_2, PV_E and $\boldsymbol{PV_V}$ for several k_V for $35\% < k_V < 40\%$. For example, if k_V = 37.5%, E's ownership ratio is 24.22 percent and its PV_E becomes \$415,790 (using k_E = 20%). VC's share becomes 75.78 percent and VC's PV_V becomes \$1,041,102 (using k^*_V = 35%).

<<Insert Table 3 here>>

(ii) Straight Preferred Stock Financing

With a finite venture, only a term preferred stock can be negotiated. After determining preferred dividends, the sharing of the terminal value has to be decided upon. Given any k_V, it is clear that if a higher share of the terminal value goes to VC, the annual preferred dividends to earn the given k_V will be somewhat lower. That is, given the value of E's opportunity costs, there is a trade-off between annual preferred dividends and share of terminal value belonging to VC. We have to fix one of the two and we do that by assuming that in each state of nature, 75.78 percent of the terminal value is allocated to VC. This sharing is consistent with k_V = 37.5% under common stock financing. To find the annual preferred dividend X, it may be noted that *X* cannot be covered from operating cash flows in the "bad" scenario; therefore, all cash flows will belong to VC. It means that VC will receive \$100,000 in each year starting at year two in the "bad" scenario. In addition, s/he receives 75.78 percent of the terminal value in each state of nature. E's share of the cash flow is the remainder of the $\boldsymbol{CF}$. The annual preferred dividend *X*, k^0_V and k_E are obtained from equation (1), the following equation (2) and the present value of *X* in the good state and the terminal shares for E (with a_E = 0.125, R_f = 10%):

$$1000 = [1/(1+k_V)^2] * [0.5\{100*3.4869 + 0.7513*0.7578*200\} + 0.5\{X*3.4869 + 0.7513*0.7578*1800\}] \qquad (2)$$

Solving these simultaneous equations finds that k^0_V, the k_V at which PV_E = \$363,809, is 39.8%. E's discount rate in this case rises to 21.8% due to a higher level of risk borne. Assume that k^*_V, the minimum required rate of return to VC, is 34.8%. Then, from $\boldsymbol{CF_E}$, PV_E is \$455,300, while PV_V of $\boldsymbol{CF_V}$ is \$1,000,000. The calculations of cash flows to VC and E for k^*_V = 34.8% and k^0_V = 39.8% are provided in Table 4. The choice of k^*_V takes into account the fact that the risk of VC under preferred stock financing is slightly lower than the risk under common stock financing. We allocated cash flow rights and calculated DV_2, PV_E and PV_V for several k_V for $34.8\% < k_V < 39.8\%$. For example, at k_V=37.5%, the annual preferred dividends, *X*, is \$658,000 and resulting PV_V at k_V=34.8%, is \$1,041,501 (*NPV* = \$41,501) and PV_E = \$406,266 (at k_E = 20%).

<<Insert Table 4 here>>

(iii) Convertible Preferred Stock Financing

For this instrument, there are three components of the deal which need to be decided upon. One is the periodic preferred dividends, *X*, the second is the conversion ratio, to be denoted by δ, and the third is the sharing of the terminal value if conversion does not take place. With respect to the sharing of the terminal value in the non-conversion state, we continue to assume the 75.78 percentage. The conversion ratio, δ, is the fractional claim on the operating cash flows and terminal value of the venture in the "good" state of nature (the conversion state). Given a k_V, if X is set at a high level, the required δ will be lower, and vice versa. Now one of these components must be fixed and we let X = \$75,000. Then, as before, δ, k^0_V and k_E are obtained from equation (1), the following equation (3) and the present value of X and the terminal share in the "bad" state plus (1-δ) of the cash flows in the "good" state for E ($a_E = 0.125$ and $R_f = 10\%$).

$$1000(1+k_V)^2=(75*3.4869+0.7513*0.7578*200)*0.5+\delta*(900*3.4869+0.7513*1800)*0.5$$

which implies that: $$\delta = [1000(1+k_V)^2 - 188.09]/2245.275 \quad (3)$$

Solving these simultaneous equations finds that the δ that makes the PV_E = \$363,809 is 79.56 percent which corresponds to k^0_V=40% (approximately). For comparison, we choose k^*_V =35%. Table 5 below provides a split of the cash flows and the resulting valuations. Compared to Table 4, we see that k_E declines slightly because VC share of cash flows rises only when the venture has upside potential and this reduces risk to E. We allocated cash flow rights and calculated DV_2, PV_E and PV_V for several k_V for 35% < k_V < 40%. For example, at k_V = 37.5%, δ = 75.84 percent, PV_V (at k^*_V = 35%) is \$1,037,458, and PV_E = \$419,780 (at k_E approximately 20%).

<<Insert Table 5 here>>

D. Answers to our Research Questions

We now have the following two results to our research questions:

(i) *Result (1):* There exists a k_V lying in the acceptable range from k^*_V to k^0_V where the convertible preferred stock is the dominant financial security for contracting between VC and E. To obtain this result, we follow Schmidt (2003) and examine Total Social Surplus (TSS) to determine the dominant financial security. We define TSS = $PV_E + PV_V$. The following table 6 shows the existence of a k_V where the convertible preferred stock has the highest TSS.

<<Insert Table 6 here>>

Having shown the possibility of convertible securities being dominant, we now approach the issue of when such securities are dominant. In order to find the relationship between the dominant financial security and the opportunity cost of E, L^*, we shall restrict the analysis to the upper bound of the acceptable range for VC which is k^0_V as discussed previously. When L^* increases, k^0_V and the cash flows $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{V}}$ of VC fall, and vice versa. The dominant financial security is then determined by comparing the present value of the cash flows $\boldsymbol{CF}^{\mathbf{0}}_{\mathbf{V}}$ of VC (discounted at k^*_V) for each of the three securities, denoted PV_V. For the sake of continuity in using TSS as the basis of comparison, we shall add PV_E or L^* to PV_V (= TSS) in our analysis.

(ii) *Result (2):* Figure 1 shows that as E's opportunity cost L^* increases (decreases), common stock (straight preferred stock) becomes more dominant as it has the steepest (flattest) slope, with the concave convertible preferred stock dominant in the interior region (L^* from 29,000 to 433,000 approximately). That is, as E's bargaining power increases (due to human capital increasing), VC should take more vested interest (that is, common stock).

<<Insert Figure 1 here>>

IV. Conclusion.

In this paper, we considered the opportunity cost of labor income facing an entrepreneur. It is argued that in a financial deal, E's labor value must represent a cut-off point to E in negotiation with VC. The paper then suggested a range of acceptable deals to both VC and E. It considered three financial contracts: common stock, straight preferred stock and convertible preferred stock, and derived the benchmarked cash flows to VC and E for these three securities. This analysis derived the conditions of dominance. It was found that the convertible preferred stock could have an edge over common stock and straight preferred stock in providing greater total social surplus. This result is consistent with the literature on agency costs.

One novelty in our model is that, unlike Robe (1999), we did not use the traditional principal-agent framework. Instead, we included an agency risk premium for VC as suggested by Reid and Smith (2004). This resulted in a higher cost of capital for VC, contrary to Kerins, Smith and Smith (2003). This higher cost of capital for VC could also account for the default risk premium, Knightian risk premium (Walden, 2004) and different degrees of risk aversion of VC and E amongst other factors enumerated by Sahlman (1990). It is also consistent with Gentry and Hubbard (2001) and Heaton and Lucas (2001). Using a higher cost of capital for VC, we then calibrated our model and found numerical answers to our research questions. First, we found that as E's opportunity cost L^* increases (decreases), common stock (straight preferred stock) becomes more dominant, with the convertible preferred stock dominant in the interior region. That is, as E's bargaining power increases (due to E's human capital becoming more valuable), VC should take more vested interest (i.e., common stock). This result is not inconsistent with Hart and Moore (1994) if, as they suggest, common stock is thought to be a bond with a very long maturity. If E has little bargaining power (L^*<29,000), the dominant financial security is straight preferred stock, which is consistent with Admati and Pfleiderer's (1994) result.

Our results are also consistent with Robe, Steiger and Michel's (2006) finding that bankruptcy laws become tougher as the returns to human capital decrease. We find that financial contracts should change as the returns to human capital change. The optimal contract changes from debt to equity as the returns to E's human capital increase as the higher opportunity costs induce E to expend the necessary effort. VC is then able to share more of the risk with an equity contract. Es with higher human capital would also need to upkeep their reputations. Brandt and Hosios (1996) and Weidenmier (2005) find that reputational concerns provide a key disciplining device which mitigates moral hazard problems. Future research could focus empirically on whether expected future incomes of Es affect the use of convertible securities. Our model predicts that a medical doctor entrepreneur would more likely be financed with convertible securities or equity, while a high-school drop-out entrepreneur would more likely be financed by high-yield fixed income securities like junk bonds or usury loans.

References

Admati, A.R. and P. Pfleiderer (1994). “Robust Financial Contracting and the Role of the Venture Capitalist,” *Journal of Finance*, XLIX, 371-402.

Barry, C.B. (1994). “New Directions in Research on Venture Capital Finance,” *Financial Management*, 23, 3-15.

Bolton, P. and H. Rosenthal (2002). “Political Intervention in Debt Contracts,” *Journal of Political Economy*, 110 (5), 1103-1134.

Brandt, L. and A.J. Hosios (1996). “Credit, Incentives and Reputation: A Hedonic Analysis of Contractual Wage Profiles,” *Journal of Political Economy*, 104 (6), 1172-1226.

Copeland, T.E. and J.F. Weston (1992). *Financial Theory and Corporate Policy.* Third Edition. Reading, Mass.: Addison-Wesley Publishing Company.

Gentry, W.M. and R.G. Hubbard (2001). “Entrepreneurship and Household Saving,” NBER Working Paper No. 7894, Cambridge, Mass.: National Bureau of Economic Research.

Gompers, P. (1997). “Ownership and Control in Entrepreneurial Firms: An Examination of Convertible Securities in Venture Capital Investments,” Working Paper, Harvard Business School, Boston, Mass., USA.

Green, R.C. (1984). “Investment Incentives, Debt, and Warrants,” *Journal of Financial Economics*, 13, 115-136.

Harrison, R.T. and C.M. Mason (1996). *Informal Venture Capital: Evaluating the Impact of Business Introduction Services*. London, England: Prentice Hall/Woodhead-Faulkner.

Hart, O., and J. Moore (1994). “A Theory of Debt Based on the Inalienability of Human Capital,” *Quarterly Journal of Economics*, 109, 841-879.

Heaton, J. and R. Lucas, Jr. (2001). “Capital Structure, Hurdle Rates and Portfolio Choice - Interactions in an Entrepreneurial Firm,” Working Paper, University of Chicago.

Jensen, M.C. and W.H. Meckling (1976). “Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure,” *Journal of Financial Economics*, 3, 305-360.

Kaplan, S. and P. Stromberg (2001). “Venture Capitalists as Principals: Contracting, Screening and Monitoring,” *American Economic Review*, 91 (2), 426-430.

Kaplan, S. and P. Stromberg (2004). “Characteristics, Contracts, and Actions: Evidence from Venture Capital Analyses,” *Journal of Finance*, 59 (5), 2177-2210.

Kerins, F., J.K. Smith, and R. Smith (2003). “Opportunity Cost of Capital for Venture Capital Investors and Entrepreneurs,” *Journal of Financial and Quantitative Analysis*, forthcoming.

Norton, E. and B.H. Tenenbaum (1992). “Factors Affecting the Structure of U.S. Venture Capital Deals,” *Journal of Small Business Management*, 30, 20-29.

Norton, E. and B.H. Tenenbaum (1993). “The Effects of Venture Capitalists’ Characteristics on the Structure of the Venture Capital Deal,” *Journal of Small Business Management*, 31, 32-41.

Reid, G.C., and J.A. Smith (2004). “How do Venture Capitalists Handle Risk in High-Technology Ventures? – some preliminary results,” Working Paper, Centre for Research into Industry, Enterprise, Finance and the Firm (CRIEFF), University of St. Andrews, Fife, Scotland.

Robe, M.A. (1999). “Optimal vs. Traditional Securities under Moral Hazard,” *Journal of Financial and Quantitative Analysis*, 34 (2), 161-89.

Robe, M.A., E.-M. Steiger and P.-A. Michel (2006). “Penalties and Optimality in Financial Contracts: Taking Stock,” Working Paper, Kogod School of Business, American University.

Sahlman, W.A. (1990). "The Structure and Governance of Venture-Capital Organizations," *Journal of Financial Economics*, 27, 473-521.
Sahlman, W.A. (1999). "Aspects of Financial Contracting in Venture Capital," in *The Entrepreneurial Venture*. Eds. W.A. Sahlman and H.H. Stevenson. Boston, Mass.: Harvard Business School Publications.
Schmidt, K.M. (2003). "Convertible Securities and Venture Capital Finance," *Journal of Finance*, LVIII (3), 1139-1166.
Smith, C.W. and J.B. Warner (1979). "On Financial Contracting: An Analysis of Bond Covenants," *Journal of Financial Economics*, 7, 117-161.
Timmons, J.A. (1994). *New Venture Creation*. Fourth Edition. Chicago, Ill.: Irwin.
Walden, J. (2004). "Real Investments Under Knightian Uncertainty," Working Paper, Yale University International Center for Finance, New Haven, Conn., USA.
Weidenmier, M.D. (2005). "Gunboats, Reputation and Sovereign Repayment: Lessons from the Southern Confederacy," *Journal of International Economics*, 66 (2), 407-422.
Wright, M. and K. Robbie (1997). *Venture Capital*, First Edition (The International Library of Management). Aldershot, England: Dartmouth Publishing Company Limited.

Table 1

Venture's Future Cash Flows
(Dollar figures are in thousands)

State of Nature	Probability	Annual Operating Cash Flow 1	2	3	4	5	Terminal Value In Year 5
Bad	0.5	0	100	100	100	100	200
Good	0.5	0	900	900	900	900	1800

Table 2

Entrepreneur's Salary Structure

State of Nature	Probability	Annual Salaries (in thousands of dollars) 1	2	3	4	5
Bad	0.5	100	80	80	80	80
Good	0.5	100	105.3	113.7	122.8	132.6

Table 3

Benchmarked Cash Flows of VC and E Under Common Stock Financing
(Dollar figures are in thousands)

		Annual Operating Cash Flows					Share of	
Type of Cash Flow	**State of Nature**	**1**	**2**	**3**	**4**	**5**	**Terminal Value**	**Discounted Values And Std. Dev.**
Case A:	Bad	0	79	79	79	79	158	$DV_2 = 1971$
$k^0_V = 40\%$								$\sigma_2 = 1577$
$\boldsymbol{CF}_\mathrm{V}$	Good	0	711	711	711	711	1422	$PV_V = 1082.2$ [a]
Case A:	Bad	0	21	21	21	21	42	$DV_2 = 524$
$k^0_V = 40\%$								$\sigma_2 = 419$
$\boldsymbol{CF}_\mathrm{E}$	Good	0	189	189	189	189	378	$PV_E = 363.8$
Case B:	Bad	0	73	73	73	73	146	$DV_2 = 1821$
$k^*_V = 35\%$								$\sigma_2 = 1457$
$\boldsymbol{CF}_\mathrm{V}$	Good	0	657	657	657	657	1314	$PV_V = 1000$ [b]
Case B:	Bad	0	27	27	27	27	54	$DV_2 = 674$
$k^*_V = 35\%$								$\sigma_2 = 539$
$\boldsymbol{CF}_\mathrm{E}$	Good	0	243	243	243	243	486	$PV_\mathrm{E} = 467.8$

[a, b] For the calculation of this PV_V, a discount rate of 35% is used

Table 4

Benchmarked Cash Flows of VC and E Under Straight Preferred Stock (Figures are in thousands)

		Annual Operating Cash Flows					Share of	
Type of Cash Flow	**State of Nature**	**1**	**2**	**3**	**4**	**5**	**Terminal Value**	**Discounted Values And Std. Dev.**
Case A:	Bad	0	100	100	100	100	152	$DV_2 = 1957$
$k^0_V = 39.8\%$								$\sigma_2 = 1494$
$\boldsymbol{CF_V}$	Good	0	695	695	695	695	1364	$PV_V = 1077$ [a]
Case A:	Bad	0	0	0	0	0	48	$DV_2 = 538$
$k^0_V = 39.8\%$								$\sigma_2 = 502$
$\boldsymbol{CF_E}$	Good	0	205	205	205	205	436	$PV_E = 363.8$
								$(k_E = 21.8\%)$
Case B:	Bad	0	100	100	100	100	152	$DV_2 = 1819$
$k^*_V = 34.8\%$								$\sigma_2 = 1356$
$\boldsymbol{CF_V}$	Good	0	616	616	616	616	1364	$PV_V = 1000$ [b]
Case B:	Bad	0	0	0	0	0	48	$DV_2 = 675$
$k^*_V = 34.8\%$								$\sigma_2 = 639$
$\boldsymbol{CF_E}$	Good	0	284	284	284	284	436	$PV_E = 456$
								$(k_E = 21.8\%)$

[a, b] For the calculation of this PV_V, a discount rate of 34.8% is used.

Table 5

Benchmarked Cash Flows of VC and E Under Convertible Preferred Stock (Figures are in thousands)

Type of Cash Flow	State of Nature	Annual Operating Cash Flows 1	2	3	4	5	Share of Terminal Value	Discounted Values And Std. Dev.
Case A: k^0_V =40% CF_V	Bad	0	75	75	75	75	152	DV_2 = 1974
								σ_2 = 1598
	Good	0	716	716	716	716	1432	PV_V = 1083.7 [a]
Case A: k^0_V =40% CF_E	Bad	0	25	25	25	25	48	DV_2 = 521
								σ_2 = 397
	Good	0	184	184	184	184	368	PV_E = 363.8 (k_E=19.6%)
Case B: k^*_V =35% CF_V	Bad	0	75	75	75	75	152	DV_2 = 1824
								σ_2 = 1448
	Good	0	656	656	656	656	1312	PV_V = 1000 [b]
Case B: k^*_V =35% CF_E	Bad	0	25	25	25	25	48	DV_2 = 670
								σ_2 = 547
	Good	0	244	244	244	244	488	PV_E = 466.5 (k_E=20%)

[a, b] For the calculation of this $PV_{V,}$ a discount rate of 35% is used.

Table 6

Choice of a Financial Instrument at Interior Values of k_V

Instrument	TSS ($ '000)	PV_V ($ '000)	PV_E ($ '000)
Common Stock at k_v=37.5 %	1456.892	1041.102 (k^*_V=35 %)	415.79 (k^0_V=20 %)
Straight Pref. at k_v=37.5 %	1447.77	1041.5 (k^*_V=34.8 %)	406.27 (k^0_V=21.8 %)
Convert. Pref. at k_v=37.5 %	1457.238	1037.458 (k^*_V=35 %)	419.78 (k^0_V=20 %)

Figure 1