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by William A. Sahlman,

Harvard Business School

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INTRODUCTION

During much of the 1960s and 1970s, academic discussions of corporate capital structure routinely began with the assumption that a firm's financing decisions had no material effect on its intrinsic economic value. Setting aside tax consequences and the possibility of a costly bankruptcy, the value of the firm was assumed to depend solely on the level and risk of a firm's operating cash flows. And operating profitability in turn was assumed to depend entirely on corporate investment decisions that are made prior to, and completely independently of, financing choices.¹ In the last ten years or so, however, finance scholarship has progressively reversed this assumption while entertaining the possibility that the way a transaction is financed can influence operating outcomes in predictable, systematic ways² And the results of this new thinking—especially the contribution of the “agency cost” literature to our understanding of the current wave of financial restructurings – have been interesting.³

Further support for this relatively new direction in finance may also come from an area of study beyond the usual academic focus on public corporations: namely, the venture capital markets. For, the interaction of entrepreneur and venture capitalist has resulted in the evolution of a unique set of financial contracts. And in no other kind of transaction does the implied link between value and financial structure appear so strong and direct as in the typical venture capital deal. As I hope to show in this article, an effective financial design may well be the difference between a flourishing and a failed (if not a still-born) enterprise.

1. The original formulation of the capital structure “irrelevance” argument was by Franco Modigliani and Merton Miller, “The Cost of Capital, Corporation Finance and the Theory of Investment,” *American Economic Review* 53 (June 1958).

2. The first major theoretical departure from the capital structure “irrelevance” argument came with the formulation of the “agency cost theory” by Michael C. Jensen and William Meckling, “Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure,” *Journal of Financial Economics*, 3 (October 1976).

3. I am thinking, especially, of Michael Jensen's article, “Agency Cost of Free Cash Flow, Corporate Finance and Takeovers,” *American Economic Review* (May 1986). For an extended elaboration of Jensen's arguments, see also Vol. 1 No. 1 of this journal.

FIRST PRINCIPLES

As is true of all financial transactions, structuring a venture capital deal involves the allocation of economic value. Value, in turn, is determined by the interaction of three major ingredients: cash, risk, and time.

My colleague Bill Fruhan argues that all financial transactions can be classified into three categories: those that create value, those that destroy value, and those that transfer value between two or more parties.⁴ This taxonomy can be readily transferred to venture capital because almost all venture capital deals either create, destroy, or transfer value. For example, a sound deal that provides appropriate incentives for an entrepreneur is likely to result in significantly higher value to be shared by entrepreneur and venture capitalist alike. The same deal, while increasing total value, may also have opposite effects on the value of two different claims on total value (for example, debt and equity), thus providing an example of a value transfer. Finally, a promising deal that is not well-designed can result in a failed venture, the extreme case of value destruction.

A Simple Example

Before turning to the case of venture capital, let's begin by considering a very simple project with the following characteristics:

Investment Required at Time 0.....	\$1000
Annual Cash Flow.....	\$500
Total Number of Cash Payments.....	\$5
Terminal Value (end of year 5).....	\$1000

The resulting cash flows are put in Table 1. Suppose also that the payment of these cash flows is guaranteed by the government and that the current appropriate (risk-free) discount rate is 10%.

In this case, the present value of the future cash flows is \$2,516, and the net present value of the project is \$1,516. If you owned the rights to this investment project, you would be indifferent between selling the rights to another person (with the same information) for \$1,516 or keeping the project for yourself. Any offer above that value would induce you to sell. In this simple deal, the cash flows are known with certainty by both the buyer and the seller. Moreover, each agrees, or is likely to agree, on the appropriate discount rate to apply to convert future cash flows to the present. And, finally, the expected cash flows are not affected by any action by the buyer or the seller. Given these conditions, it is easy to describe the terms on which a deal such as this one will trade.

Dealmaking in the Real World

If the world consisted principally of investment projects like this one, then the study of deals would not be very important, or very interesting. In the real world, however, the following conditions are far more likely to apply:

- the future cash flows are unknown (both in amount and timing);
- the appropriate discount rate is unknown;
- any two parties analyzing the same deal will disagree about the future cash flows, the appropriate discount rate to apply, or both;
- the sources of potential disagreement are many, and range from simple disagreement based on

TABLE 1

Period	0	1	2	3	4	5
Investment	(1,000)					
Cash Inflow		500	500	500	500	500
Terminal Value						1,000
Net Cash Flow	(1000)	500	500	500	500	1,500

4. William E. Fruhan, Jr., *Financial Strategy: Studies in the Creation, Transfer, and Destruction of Shareholder Value* (Homewood, IL: Richard D. Irwin, Inc. 1979).

common knowledge to the fact that the parties may be governed by different rules (for example, tax treatment) to the possibility that one party knows more than the other;

- there will be conflicts of interest: one or more of the dealmakers may be in a position to influence the outcome of the project so as to benefit at the expense of the other participants; and
- the terms that govern the allocation of the cash flows will themselves affect the nature (amount, timing, and risk) of the cash flow stream.

Now, take the same basic expected cash inflows and outflows from the example above, but introduce uncertainty. That is, the annual cash flow is expected to be \$500 per year, but the actual number will only be known over time. In this case, it may be appropriate to apply a higher discount rate than before (especially if the new risk includes a systematic, or market-related, component).

Suppose the appropriate discount rate were 20% instead of 10%. In this case, the present value of the cash flows would be \$1,897 (instead of \$2,516) and thus the net present value would be \$897 (instead of \$1,516). If someone offered you \$1,000 today for the right to exercise the option to invest in this project, then you would gladly sign it over. If you were to offer to sell for \$800, then any investor would gladly buy.

In the preceding paragraph, I assumed that buyers and sellers could agree on the expected cash flows and on the discount rate. Obviously, Pandora's box could be opened further, and the introduction of differences and disagreements between dealmakers will reveal many other grounds on which to trade.

If, for example, the parties to the deal disagree about the magnitude or the nature of the risk inherent in the cash flow, then they will apply different discount rates in their analysis. This sort of disagreement may render impossible an agreement on an appropriate price. Or, it may expand the set of possible deal terms. For example, if the potential seller used a discount rate of 20% and the buyer thought 10% to be the correct figure, then there would be a wide range of prices (in this case, between \$897 and \$1,516) at which the seller would gladly sell and the buyer willingly buy the right to make the investment. Or, if the buyer thought the cash flows would rise at an annual rate of 5%, then even if the buyer and seller used the same discount rate (of 20%), they would both be willing to accept a price between \$897 (the seller's minimum) and \$1,026 (the buyer's maximum).

Allocating Cash Flow

Now the fun starts. Suppose this generic deal is now called a start-up venture, and the two parties negotiating are identified as the entrepreneur and the venture capitalist. The venture capitalist uses a discount rate of 40% for projects like the one under consideration. The question is, what proportion of the equity will the venture capitalist demand in order to justify investing the \$1,000 capital required to get the project off the ground?

To answer this question, you must determine what proportion of each future cash flow figure would provide a 40% annual rate of return to the venture capitalist, given an initial investment of \$1,000. One way to attack this problem is to calculate the present value of the gross future cash flows, using the venture capitalist's 40% required return. In so doing we find that the present value is equal to \$1,204.

This is the total "value pie" to be split between entrepreneur and venture capitalist. If the venture capitalist only needs to invest \$1,000 to receive all of these cash flows, then he would increase his net present value by \$204. If the venture capitalist owned only 83% ($\$1,000/\$1,204$) of the deal, however, then the present value of his share of the future cash flows would be \$1,000, exactly equal to the cost of the investment. Therefore, the venture capitalist would willingly pay \$1,000 to buy 83% of the equity in this hypothetical venture because the anticipated return would be 40% per year. The entrepreneur would be left with the remaining 17% of the equity, corresponding to \$204 divided by \$1,204.

Allocating Risks

The analytics described above are straightforward, and are based on some simplifying assumptions. Suppose, however, that the venture capitalist and the entrepreneur are in the process of negotiating a deal and that the forecasts are those included in the company's business plan. The venture capitalist, having seen hundreds of unfulfilled "conservative" projections in the past, is skeptical about the numbers. Partly, his skepticism is already reflected in the high discount rate applied to the estimates, a discount rate that is higher than the true expected return on the venture capital portfolio. Other than buying simple common equity, and thus implicitly agreeing to a proportional risk-reward sharing scheme, how else could the venture capitalist structure a deal with the

TABLE 2

Common Stock (Proportional Sharing)	Venture Capitalist		Entrepreneur		Total	
Share of Total Stock		83%		17%		100%
Annual Cash Rec'd: Bad Scenario	\$373	83%	\$77	17%	\$450	100%
Annual Cash Rec'd: Good Scenario	\$456	83%	94	17%	550	100%
Expected Annual Cash Received	\$415	83%	85	17%	500	100%
PV of Cash Received (incl. TV)	\$1,000	83%	204	17%	1,204	100%
Net PV (incl. investment)	\$0		204		204	
Std. Dev'n of PV (and of NPV)	\$85	83%	18	17%	102	100%
Preferred Stock						
	Venture Capitalist		Entrepreneur		Total	
Share of Total Stock		83%		17%		100%
Annual cash Rec'd: Bad Scenario	\$415	93%	\$35	7%	\$450	100%
Annual Cash Rec'd: Good Scenario	\$415	73%	135	27%	550	100%
Expected Annual Cash Received	\$415	83%	85	17%	500	100%
PV of Cash Received (incl. TV)	\$1,000	83%	204	17%	1,204	100%
Net PV (incl. investment)	\$0		204		204	
Std. Dev'n of PV (and of NPV)	\$0	0%	102	100%	102	100%

entrepreneur to assuage his skepticism?

One possibility would be to invest in the form of preferred (or, more commonly, convertible preferred) stock.⁵ In this alternative, the venture capitalist would have a prior claim on the earnings of the company, and may also have a prior claim on the liquidation value of the company. Suppose, for example, that the venture capitalist asks for a preferred stock that entitles him to receive up to \$415 in the form of dividends from the company each year before the entrepreneur receives anything. (Note that \$415 is equal to 83% of the expected cash flow of \$500.) Also assume that the two parties split the \$1,000 return of capital in the final year according to the original 83%/17% rule. What has changed?

In this new situation, a great deal has changed; there has been a major shift in risk from the venture capitalist to the entrepreneur. This shift in risk occurs even though the expected return to each party remains the same. To explore this risk-shifting process, suppose there were really two different, but equally likely scenarios for future cash flows. In the first, the actual cash flows turn out to be \$450 per year. In the other, the cash flows are \$550 per year. The terminal value is the same under either scenario.

Obviously, under both the proportional sharing rule and the new preferred stock arrangement, the expected total annual cash flow is \$500, the expected total present value is \$1,204, and the expected total net present value is \$204. The standard deviation of the total expected present value is \$102.

Under the straight equity deal, the venture capitalist and entrepreneur share proportionately (83%/17%) both the risk and the reward. That is, the venture capitalist has an expected present value of \$1,000, and expected net present value of \$0, and a standard deviation of expected present value of \$85; the entrepreneur has an expected present value of \$204, an expected net present value of \$204, and a standard deviation of expected present value of \$18. Note that the total risk in the project, as measured by the standard deviation, is split according to the 83%/17% rule.

Under the new preferred stock deal, however, the venture capitalist has managed to shift all of the risk to the entrepreneur. That is, given the narrow range of possible cash flow outcomes, the venture capitalist will always receive his \$415 per annum cash flow. The entrepreneur, however, will no longer receive 17% of the cash flows regardless of the actual cash flow; instead, he will receive \$35 per

5. Convertible preferred is the convention, we use straight preferred for purposes of simplicity in exposition

BY INCREASING THE ENTREPRENEUR'S RISK, THE VENTURE CAPITALIST IS TRYING TO "SMOKE OUT" THE ENTREPRENEUR, AND GET THE ENTREPRENEUR TO SIGNAL WHETHER SHE REALLY DOES BELIEVE THE FORECASTS IN THE BUSINESS PLAN.

year in the bad scenario (7% of the expected value) and \$135 in the favorable scenario (27%). The standard deviation of the venture capitalist's return is now zero, while the standard deviation of the entrepreneur's present value is \$102.

The reader should ignore the fact that the example is contrived and slightly silly. No investor would demand a 40% return for a riskless project. Also, the lower and upper bound of possible annual cash flows are purely arbitrary and meant only to simplify the example to show how risk is shifted from one party to the other. In the real world, the lower bound would almost always be significantly lower than the expected value of the venture capitalist's share, thus forcing the venture capitalist to bear enough risk to justify use of a 40% return requirement. And if the lower bound were below the expected value of the venture capitalist's share, then the expected present value would be lower than in the previous scenarios unless the entrepreneur were required to meet the shortfall in preferred stock dividends out of his own pocket, or the venture capitalist were entitled to receive a bonus payment during the favorable scenario.

Why would the venture capitalist suggest using preferred stock rather than straight equity? The obvious reason would be to try to improve his reward-to-risk ratio. But simply transferring risk to the entrepreneur by gaining liquidation preferences is probably not the primary motive for structuring venture capital deals this way. Two other possibilities come to mind: (1) by increasing the entrepreneur's risk, the venture capitalist is trying to "smoke out" the entrepreneur, and get the entrepreneur to signal whether she really does believe the forecasts in the business plan; and (2) the venture capitalist is trying to provide the strongest possible incentives for the entrepreneur to do at least as well as projected. If the business exceeds plan, then the entrepreneur will share disproportionately in the benefits of doing so. Given the entrepreneur's strong incentives to beat the plan, structuring the deal this way may actually increase the probability that a more favorable outcome will occur.

Summing Up

Let's stop here for a moment and briefly and review our progress to this point.

The process of financial contracting in venture capital focuses on a few very simple questions:

- how is cash allocated?
- how is risk allocated?
- what are the incentives for both parties in the deal?

In the examples above, we looked at two simple versions of common arrangements for sharing risk and reward. In the first example, a proportional sharing scheme was employed. In the second, a non-proportional scheme was introduced in which the venture capitalist demanded a fixed dollar return, regardless of the actual outcomes.

There are of course a myriad of possible variations on this theme. It is possible to combine proportional sharing schemes with fixed hurdles. Or, the timing of the hurdles can be altered. There are also many other mechanisms for affecting the allocation of value and the implicit incentives in a given deal. What is important to note, at this point, is that investors can infer information about the abilities and convictions of entrepreneurs by offering different deal terms and gauging the response. The ability to signal intentions credibly may enable some entrepreneurs to obtain funding that would not have been available were there no means for communicating true abilities or convictions.

Staged Capital Commitment

Suppose you present an investment proposal to a venture capitalist that calls for an expenditure of \$20 million to build a semiconductor fabrication facility. The \$20 million will be required over a three-year period. How will the venture capitalist respond to your offer to sell him 75 percent ownership of the venture for \$20 million?

After picking himself up off the floor, the venture capitalist will begin a process of trying to educate you about the real world. And, if he has not been too offended by your proposal, he will make a counter-proposal. The terms of the counter-offer will likely call for staged infusions of capital over time. In the first round, for example, the venture capitalist might offer to invest \$ 1 million for the purpose of assembling the managerial team, writing a business plan, completing engineering specifications, conducting market research, and testing the feasibility of the process.

The \$1 million capital would be expected to last about nine months. At that point, the venture would be expected to raise additional capital for the purpose of building a prototype manufacturing plant. That process might require \$4 million in capital. Finally, there would be plans for a third round of fi-

TABLE 3

Round of Financing	Amount Invested This Round	% Rec'd This Round	Cumulative		Implied Valuation (Post Money)
			VC's Share	Founder's Share	
First Round	\$1,000,000	50.0%	50.0%	50.0%	\$2,000,000
Second Round	\$4,000,000	33.3%	66.7% ⁶	33.3%	\$12,000,000
Third Round	\$15,000,000	25.0%	75.0%	25.0%	\$60,000,000

ancing for the purpose of building a full-scale manufacturing facility and beginning to market. The investment required at that point might be \$15 million.

With respect to valuation at each stage of the process, it is entirely possible that the entrepreneur will end up owning the 25% share that he demanded in the initial negotiation. But the process by which that ownership is attained will be very different. One plausible scenario is described in Table 3.

In this plan, the company raises the total of \$20 million over three rounds. At each point new capital is infused into the company, the valuation increases. In the first round, for example, the venture capitalist demands 50% of the company for only \$1 million. In the last round, however, the venture capitalist is content to receive only 25% of the company in return for \$15 million, thus implying a post-money valuation of \$60 million.⁶

Why does the venture capitalist demand that capital be staged over time rather than committed up-front? Why would any self-respecting entrepreneur accept such a process? Remember that the venture is scheduled to run out of capital periodically; if it cannot raise capital at the second or third rounds, then it goes out of business and the entrepreneur is out of a job.

To begin to understand the reasons underlying this seemingly peculiar process, it is important to think about how the venture under consideration will evolve over time. In particular, what new information will the venture capitalist and the entrepreneur have at each point that the company goes back to raise capital?

Consider the point at which the company needs to raise \$4 million. At this point, the venture capitalist

and entrepreneur will know how the company has performed relative to its initial business plan. What is the management team like? How do they work together? Does the new business plan make sense? Has the company developed complete engineering specs? How has the perceived opportunity changed? Does the market research reveal adequate demand? What new competition exists? How have valuations in the capital market changed since the previous financing round? These are the types of questions that can be answered at the end of the first nine months of operation. If all goes well, the major risks outstanding at the time of the first round of financing – the “people risk” due to the lack of a complete management team, the technical risk from the lack of produce specification, and the market risk due to the lack of market research – will have been greatly reduced. If so, the venture capitalist will be willing to buy shares at a much higher price, thus in effect accepting a lower expected rate of return.

If the company continues to proceed as hoped while approaching the third round of financing, there should be a similar reduction in perceived risk to the investor. Whereas, at the second round, consulting engineers could evaluate the product specifications for the venture capitalist, now there will be an actual product. Market research and initial marketing should by now have produced verifiable interest in the product, if not a backlog of orders. At this stage, then, the venture capitalist is evaluating an investment in a real product, within a known competitive context, on the eve of full-scale production and marketing. The increase in valuation at the third round reflects the further reduction in risk of investing at this point.

6. Note that, although the venture capitalist purchases a third of the company in this round, he only increases his cumulative share by a sixth (to 66.7%) When a company issues new shares of stock to raise capital, the resulting dilution is essentially charged proportionately to each existing shareholder. Thus, the ven-

ture capitalist's share increases only by that portion of the new equity he does not already hold. To compute the cumulative shares:
 Second Round: $50.0\% + (33.3\% \times (1 - 50.0\%)) = 66.7\%$
 Third Round: $66.7\% + (25.0\% \times (1 - 66.7\%)) = 75.0\%$

BY STAGING THE COMMITMENT OF CAPITAL THE VENTURE CAPITALIST
GAINS THE OPTIONS TO ABANDON AND TO REVALUE THE PROJECT AS
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OPTIONS...

Suppose, however, that all does not go according to plan. At the time the \$4 million is required, the company has not done well, and there are new competitors not previously anticipated. At this point, the venture capitalist can either abandon ship and allow the company to fail, or can strike a new price with the entrepreneur that reflects the less sanguine outlook. For example, the venture capitalist might demand as much as 50% of the company for his \$4 million, implying a total valuation of only \$8 million.

The point here is simple: by staging the commitment of capital the venture capitalist gains the options to abandon and to revalue the project as new information arrives. These are extremely valuable options, as will be demonstrated later.

But does this process make sense from the standpoint of the entrepreneur? Go back to the original proposal. Remember that the entrepreneur asked for \$20 million in return for 75% of the shares. It seems likely that, even if the venture capitalist had been willing to consider the offer, he would have demanded a much higher share of the company than 75%, given the enormous risk as of the first round. This would likely have created a situation in which neither side would have found it sensible to proceed. The entrepreneur would have had too little incentive to risk his career, and the venture capitalist would have been worried about this loss of motivation. (As a general rule, if there does not appear to be enough room to provide sufficient incentives to management, then the deal probably won't get done.)

The Value of the Option to Abandon

Why do the venture capitalist and the entrepreneur seem to end up better off under the alternative of staged capital commitment? To explore this issue, it will make sense to return to our simple example at the beginning. For a \$1,000 initial investment, the projected cash flows were \$500 per year for each of five years, followed by a \$1,000 return of capital at the end of the fifth year. Suppose that instead of a simple \$1,000 investment up-front, the investment can be made in two stages of \$500 each. Suppose also that there is great uncertainty about the future annual cash flows to be received. There is a 50% chance they will be \$50 per year and a 50% chance they will turn out to be \$950 per year; and the expected value thus remains \$500 per year.

We will now explore two different sets of rules governing this investment project. In the first, the ven-

ture capitalist has no choice but to invest the second \$500 in the second year; that is, even if the actual annual cash flows turn out to be \$50, the \$500 will be spent. Under the second set of rules, the venture capitalist has the right, or option, to decide whether or not to invest the second \$500. He can make this decision at the end of the first year, just after he has learned what the actual annual cash flows will be. If he decides not to invest (that is, to abandon the project) then he forfeits the right to receive any of the annual cash flows, and receives a reduced share, \$750, of the terminal payment of \$1,000. The different possible sets of cash flows are provided in Table 4.

What is the present value of the investment project under the different sets of rules? Evaluating the first is easy; the expected present value of the cash inflows and outflows is \$846 and the expected net present value is \$346. Note that the latter figure is higher than the \$204 determined in the previous section because the venture capitalist is now allowed to defer investing \$500 for one year.

Under the second set of rules, the venture capitalist must evaluate whether or not it makes sense to invest in the second year, after the actual cash flows are revealed. If the cash flows turn out to be \$950 per year, then the venture capitalist would be crazy not to spend the \$500 necessary to receive the annual cash flows. (An investment that required investing \$500 to receive \$950 immediately, not to mention \$950 for four years and an additional \$250 of terminal value, has an infinite internal rate of return.)

If, however, the cash flows turn out to be only \$50 per year, then the venture capitalist has a tougher analysis. If he invests \$500, he will receive \$50 immediately and \$50 a year for 4 years, as well as an additional \$250 in terminal value. If he chooses not to invest, he will forfeit the \$50 payment stream and the additional terminal value.

Given a discount rate of 40%, it turns out that he is much better off deciding not to invest. The net present value of the incremental investment from that point forward is – \$292. By not investing, the venture capitalist raises the net present value of the project as a whole, as of year 1, from – \$97 to \$195, thus “creating” \$292 in value.

After determining the optimal decision, conditional on the arrival of new information, the venture capitalist can then evaluate the entire project looking forward. Because he can cut off the investment process if the cash flows turn out to be low, the ven-

FINANCIAL ECONOMISTS HAVE DEVISED PROMISING TECHNIQUES FOR
VALUING SUCH OPERATING OPTIONS BY USING AN OFFSHOOT OF
OPTION PRICING THEORY CALLED "CONTINGENT CLAIMS ANALYSIS."

TABLE 4

	0	1	2	3	4	5	PV @ 40%
RULE I: VC MUST INVEST IN BOTH YEARS							
Good Scenario		\$950	\$950	\$950	\$950	\$ 950	\$1,933
Bad Scenario		50	50	50	50	50	\$ 102
Expected Ann's Cash		500	500	500	500	500	\$1,018
Terminal Value						1,000	\$ 186
Expected Cash In.		500	500	500	500	1,500	\$1,204
Investment	(\$500)	(500)					(\$ 857)
Expected Net Cash	(\$500)	\$0	\$500	\$500	\$500	\$1,500	\$ 346
RULE II: VC HAS OPTION TO ABANDON IN YEAR ONE							
Good Scenario							
Annual Cash Flow		\$950	\$950	\$950	\$950	\$ 950	\$1,933
Terminal Value						\$1,000	\$ 186
Investment	(\$500)	(500)					(\$ 857)
Net Cash Flow	(\$500)	\$450	\$950	\$950	\$950	\$1,950	\$1,262
Bad Scenario							
Annual Cash Flow		\$ 0				\$ 0	
Terminal Value						\$ 750	\$ 139
Investment	(\$500)						\$ 500
Net Cash Flow	(\$500)	\$ 0	\$ 0	\$ 0	\$ 0	\$ 750	(\$ 361)
Expected (or Average) Value of Scenarios							
Expected Net Cash	(\$500)	\$225	\$475	\$475	\$475	\$1,225	\$ 451

EXPECTED VALUE OF OPTION TO ABANDON (RULE I – RULE II): \$104

ture capitalist has an expected present value of \$951 and an expected net present value of \$451.

The new expected net present value of \$451 can be compared to the \$346 determined when the venture capitalist had no choice. Somehow, an extra \$104 of value has been created simply by changing the rules a little bit. This difference is the value of the option to abandon. To gain this option, the venture capitalist would be willing to invest up to an additional \$104 at the outset for a given level of ownership.

In this regard, the process of estimating the value of the option to abandon is usually far more complex than that described above. This is so because

the number of possible scenarios is effectively infinite, as is the number of points in time at which the value of continuing the project must be evaluated. Despite the obvious complexity of the real world, financial economists have devised promising techniques for valuing such operating options by using an offshoot of option pricing theory called "contingent claims analysis."⁷

This analysis reveals, among other things, that the value of the option to abandon is higher under the following conditions:

- the greater the uncertainty about the future value of the venture;

7. See Volume 5 Number 1 of the *Midland Corporate Finance Journal*, which is devoted almost entirely to the applications of contingent claims analysis in capital budgeting.

THE ENTREPRENEUR FACES A CONFLICT OF MOTIVES IN RAISING
CAPITAL...SOME HAVE DESCRIBED THIS PROBLEM CONFRONTING THE
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- the greater the amount of time before the actual decision to abandon must be made; and
- the higher the ratio of the value of the abandoned project (the liquidation value) to the value of the project if pursued (present value of additional free cash flow less additional investment).

It is important to note that the traditional process of calculating expected net present values does not give the same answer as the process described above, in which each decision is evaluated at each point in time and the decision tree folded back to the present assuming optimal decisions are made at each intermediate point in time. In our example, to be sure, the difference in approaches does not change the basic fact that the project looks good. But it is very easy to imagine situations in which the value of the option to abandon might be sufficiently high to change the net present value from negative to positive. Such might be the case when there is great uncertainty and the investor has the option to stage the capital investment over time. But, this is exactly the case in most venture capital investments; and this is why one almost always sees staged capital commitment in these investments.

Application to Dealmaking

From the above analysis, it seems clear that a driving force behind staged capital commitment is the preservation of the option to abandon. This option has great value to the venture capitalist. And, indeed, the option is exercised relatively frequently in the real world.

But let's return once more to the view of the entrepreneur. Because the option to abandon is valuable to the venture capitalist doesn't necessarily mean, after all, that it adds value for the entrepreneur. Wouldn't the entrepreneur almost always be better off if the venture capitalist committed all the required capital up-front?

While generalizations are dangerous, staged capital commitment probably makes as much sense for the entrepreneur as for the venture capitalist. The reason, as I suggested earlier, is that the entrepreneur has a chance to minimize the dilution he suffers by bringing in outside capital. Because there is more value initially (precisely because of the option to abandon), the share of value awarded to the venture

capitalist is lower, holding all other things constant.

In addition, staged capital commitment not only provides the venture capitalist with the option to abandon, but also gives the entrepreneur the option to raise capital at a higher valuation. The entrepreneur is betting that there will be positive results on which to base higher and higher valuations as the company grows, thus necessitating less dilution at each stage that new capital is required. And the willingness of the entrepreneur to bet on himself, as we have seen, sends a positive signal to the venture capitalist.

The entrepreneur, then, faces a conflict of motives in raising capital. On the one hand, he is tempted to raise only the minimum necessary amount of capital to avoid selling too much stock in early rounds at low prices, thus suffering great dilution. At the same time, however, he is also tempted to raise excessive amounts of capital early to preserve the option to continue operations through tough times. Some have described this problem confronting the entrepreneur as “the horse race between fear and greed” –that is, between the fear of running out of capital and the desire to retain maximum possible ownership (and I will return to this later).

Finally, there is an additional and powerful reason why the deal should be structured in stages. There is no more powerful motivator than the knowledge that the enterprise is scheduled to run out of cash in the relatively near future. In the parlance of entrepreneurial finance, the rate at which a company consumes cash is called the “burn rate.” Given any level of initial cash and a burn rate, it is possible to calculate the “fume date” – the date on which the company will have exhausted its cash and will be operating solely on fumes. The existence of periodic “fume dates” focuses the energies of management on creating value from limited resources; and this process can accrue to the benefit of both entrepreneur and venture capitalist.

To summarize, then, a common technique used in financing new ventures is to infuse capital over time, retaining the option to abandon the venture at any point that the net present value looking forward is negative. This technique appeals to venture capitalist and entrepreneur alike. The venture capitalist preserves available option and also creates the strongest possible incentives for management to create value

8. The reader should also keep in mind the tension that exists in such situations between the entrepreneur and the venture capitalist. For the venture capitalist, a single venture is but one of many. For the entrepreneur, the venture is

all they have. Abstract discussions of the option to abandon should be tempered with knowledge that people's careers and egos are at stake.

FLEXIBILITY IN FUTURE PRICING CAN MAKE THE DIFFERENCE BETWEEN A VENTURE SUCCEEDING AND FAILING WHEN PERFORMANCE IS NOT AS FAVORABLE AS EXPECTED

and meet goals. The entrepreneur minimizes dilution and also benefits to the extent that his energies are appropriately focused on value creation.

But while the above example tends to suggest that the preservation of such financing options is an unequivocal boon, the reader should also always keep in mind the fact that the real world is more complicated and that providing such options to the venture capitalist may create its own problems. For example, having a periodic “fume date” will work in many situations as a motivating factor. In others, though, it may create incentives to aim for short-term success rather than long-term value creation. This may or may not be in the best interests of both parties. Also, the future cash flows will never be known with any degree of certainty. Because of the great uncertainty remaining at any stage of development, some ventures will be abandoned even though they actually have excellent prospects; and some will be funded when they should not be.

It is worth noting in passing, however, that many successful companies have gone through periods when they came very close to their “fume date.” Many have also had to change their business plans dramatically as new information was revealed. These realities often make the staged capital commitment process not only valuable to entrepreneur and venture capitalist alike, but also a very trying experience for anyone involved.

The Option to Re-Value a Project

In the preceding section, the focus was on achieving some understanding of the option to abandon a given project. There are also steps short of abandonment that warrant consideration. The process of staged capital commitment involves periodically evaluating whether to continue funding and investment and, if so, on what terms. The right to revalue a given project has value when compared to an alternative situation in which the future financing terms are decided irrevocably at the start of the venture.

Suppose a venture starts with a 50/50 split in equity ownership between the entrepreneur and the venture capitalist. One year after the venture starts, the company needs more capital. The question is: At what price will the new capital come in? If the original deal awarded the venture capitalist the right to invest in future rounds at a price to be negotiated later, the answer will depend on the progress the company has made since its last funding as well as

the state of the economy and capital markets at the time. If the prospects are good, then the value will be relatively high; if not, value will be low. In the former case, the entrepreneur will suffer minor dilution; in the event of poor performance, the dilution factor will be much larger.

Now, suppose that instead of flexible pricing on the second round of financing, the venture capitalist was granted a fixed price option at the beginning to buy one million shares at a price of \$10.00 per share at any point within two years. If the justifiable per share price at the end of two years is above \$10.00, then the venture capitalist will exercise the option. If the price is below \$10.00, the venture capitalist will walk away from the option, thereby truncating the lower side of the return distribution.

But if the company really needs the \$10 million, and the justifiable price is below \$10.00 per share, then the money will not necessarily be forthcoming. Moreover, another outside investor might find the existence of the call option (actually warrants in this case) problematic in terms of investing because of the potential for future dilution if the company does succeed in increasing value above \$10.00 per share. If the money cannot be raised, then the venture will suffer and may even fail.

Flexibility in future pricing can make the difference between a venture succeeding and failing when performance is not as favorable as expected. The reader might argue that no venture capitalist will walk away from a venture with value simply because of some inflexible deal provisions. But the situation described above has occurred many times and a complex game of “chicken” develops between the entrepreneurial team and the venture capitalists, in which each tries to obtain the best deal. The result of such a game can be very detrimental to the economic vitality of the enterprise. Moreover, it should also be remembered that the venture capital fund has many companies in its portfolio, and the venture capitalist may well decide to walk away from one investment that is not performing up to expectations even if doing so seems not to make sense.

The Option to Increase Capital Committed

Another option to be considered is the right to increase funding to a company, particularly if the company is doing well. Consider a start-up venture in the specialty retailing area. The company’s business plan calls for having 20 stores in the Northeast by the

THE RIGHT TO INCREASE CAPITAL INVESTED AT SOME INTERMEDIATE POINT IS VERY VALUABLE. ONE UNRESOLVED ISSUE, HOWEVER, IS WHO SHOULD “OWN” THE RIGHT TO INVEST MORE MONEY. TO WHOM DOES THE BENEFIT OF SUPERIOR PERFORMANCE BELONG?

end of two years. Suppose after the first year, the company has 6 stores, each of which is performing well above expectations. It might make sense for the entrepreneur and venture capitalist to accelerate the rate at which new stores are introduced. To do so will entail raising additional capital. The venture capitalist will welcome the opportunity to invest more heavily in such a successful venture, and would like to lock in the right to do so. The entrepreneur, however, would want to ensure that the price at which additional capital is raised reflects the superior past performance and prospects of the company.

In this example, the right to increase capital invested at some intermediate point is very valuable. One unresolved issue, however, is who should “own” the right to invest more money. To whom does the benefit of superior performance belong?

One way in which venture capitalists gain the right to invest more, while still allowing the entrepreneur to benefit from success, is by asking for rights of first refusal on all subsequent financings. By doing so, they buy the option to invest later, but only on whatever terms are deemed appropriate by the capital market.

In sum, there are a variety of financing options—options to abandon, to re-value, and to increase capital committed—built into the financing contracts fashioned by the professional venture capital community. Over the life of any venture capital portfolio, there are likely to be some losers, some winners, and some intermediate performers. Successful funds generate high rates of return by cutting their losses early, not investing great amounts in early rounds, and letting their winners run by investing larger amounts of money in multiple rounds of financing. Phrased differently, they frequently exercise their options to abandon and their options to participate in later rounds of financing. You will also discover that some of the most successful companies in their portfolios had a distress round of financing in which the ability to re-value the investment was the difference between continued financing and bankruptcy. Prominent examples are Federal Express and MCI Communications.

ANTICIPATING THE CONSEQUENCES OF FINANCING DECISIONS

Managers and capital suppliers are making extraordinarily complex decisions in environments characterized by great uncertainty. More important, they

must live with the consequences of those decisions. One way to approach the task of decision-making is to ask three questions before making a decision:

- What can go wrong?
- What can go right?
- What decisions can be made today and in the future that will maximize the reward-to-risk ratio?

These simple questions are designed to force the decision-maker to confront uncertainty directly and to manage the uncertainty.

One of the most critical issues in venture capital financing, as we have seen, is the decision whether to raise capital in excess of expected requirements. A risk common to virtually every venture ever started is that all will not go as planned and that the introduction of a product or the sales response will fail to meet expectations. It is also often the case that the company will have to change the focus of its efforts dramatically as it gathers more information about the opportunity.

To raise capital in excess of anticipated needs is equivalent to buying an option to change strategy as required, or to keep the company on sound financial footing until results do match expectations. Of course, in gaining that option, the venture capitalist is denied valuable options to revalue or to abandon. One compromise is not to raise excess capital, but nevertheless to retain the option to call on the investors for additional capital if needed, in return for which the current equity round would have to be sold at a lower price.

Maximizing the reward-to-risk ratio also requires examining the other side of the spectrum—what can go right—and ensuring that in the event of the venture’s success, the value created can be fruitfully harvested. One means of harvest is for the venture to be acquired after a period of years. The question is: what decisions can management make that will increase the likelihood that such a rewarding end to the venture will take place? In this regard, management must carefully avoid introducing any form of “poison pill” into its capital structure that will preclude a buyout offer.

To illustrate, some start-up companies raise capital from a major participant in the industry. Although doing so may provide necessary capital and some expertise or marketing, it may also mean that no other large competitor of the original funder will even consider an offer later on. A start-up can thus lose the option to market the company to the highest bidder in the industry. In this situation, as when any

option is being given up, this route should be pursued only if there are sufficient offsetting benefits.

Venture capitalists often ensure that they will profit in the event of success by gaining the right to force the company to go public, or the right to sell stock jointly with the company's public offering. By structuring an investment in the form of preferred stock, a venture capitalist can also profit from a success that is too modest to permit a public offering—that is, by recovering capital through the redemption of preferred stock and the payout of accumulated dividends. Such a structure also permits the venture capitalist to receive some payout in the form of dividends in the event of a “sideways” scenario.

The process of anticipating good or bad news and making decisions that maximize the chance that the good will outweigh the bad is a critical element of good decision-making. Moreover, it is not all that difficult to decide what events, good or bad, are likely to occur in any venture over time. These events will occur with respect to:

- the people (e.g., death, motivation);
- the individual company (e.g., production or marketing issues);
- the industry in question (e.g., competition, substitutes);
- the sociological environment (social rules/legal system); and,
- the state of the economy and capital markets (e.g., boom, recession, lower or higher stock prices).

Sensible deals will preserve options to react to and receive maximum benefit from good news, and will also protect the company from going under when bad news arises. Sensible deals will also provide strong incentives to all parties to skew the outcome towards the good news side of the ledger.

An Example of a Bad Deal

Anyone familiar with start-up companies recognizes that a common problem is that the company consumes more cash than was projected when it raised capital. Frequently, the primary cause is a shortfall in revenues which may occur for many different reasons. And because running out of cash is not an uncommon occurrence, any deal terms that govern the relationship between the company and the suppliers of capital must reflect the likelihood that the company will require more capital.

Unfortunately, deals are very often designed that make it extremely difficult to raise capital when

the company needs to. For example, in one case, the original capital suppliers to a start-up demanded the option to acquire up to 51% of the common stock that would be outstanding at any time in the following three years. The option could be exercised at a fixed price equal to the price paid in the first round of financing. The same group also got the right of first refusal on all subsequent financings, for a period lasting 60 days.

There were several problems that arose as time passed. First, the company's progress was disappointing when compared against the business plan projections. The result was that the company needed a significant infusion of capital long before anticipated. The logical supplier of the new capital was the group owning the option. But, there was a problem: the financing group had very little incentive to exercise their option early. Doing so would sacrifice the value of being able to wait to learn more about the company. And that value was considerable because of the length of time left on the option and the high risk involved in the venture.

On the other hand, potential new capital suppliers were confronted with the problem that they might be diluted immediately after they invested because the original financing group could then acquire up to 51% of the then outstanding shares at a fixed price. Moreover, because the group had a 60 day right of first refusal, the new potential investors also faced the possibility that the investment of time and energy required to evaluate the deal might go for naught if the original investors exercised their right of first refusal. This was entirely possible because the very fact that the new investors were interested would signal that the company's prospects were attractive to a third party. A final problem was that the original financing group did not really have sufficient resources to exercise their options when the money was needed.

This example demonstrates precisely where the thought process described above is critical in designing deals. Neither management nor the investors should have signed this deal. Doing so was essentially a bet that everything would transpire exactly as outlined in the business plan, an outcome that probably has only a 10 percent chance of happening. The financial structure almost drove this company into bankruptcy and only very intense negotiations to modify the deal saved the company.

Having stated boldly that this deal should never have been signed, we now ask if a different deal

WILL RESPECT TO THE RIGHT TO INVEST MORE MONEY LATER, THIS GOAL COULD HAVE BEEN ACCOMPLISHED BY GAINING PROPORTIONAL RIGHTS OF FIRST REFUSAL, WHICH WOULD ALLOW THE INVESTOR TO PARTICIPATE IN LATER ROUNDS OF FINANCING IN PROPORTION TO THE EQUITY ALREADY HELD.

could have been structured to accomplish the same basic objectives. First, the investors were clearly interested in preserving three options: (1) the right to control the company (the “51%” option); (2) the right to invest more money at a fixed price for an extended period of time; and (3) the right to maintain their ownership position in the event a subsequent financing round was about to take place at an unfairly low valuation. Management was interested in raising enough capital to get the company off the ground. At the same time, however, it wanted to minimize the dilution from selling shares at a low valuation relative to that possible on future rounds if the company did well.

If both parties had anticipated the future by asking questions detailed at the beginning of this section, the deal they struck could have been quite different while still satisfying the implicit objectives of each party. To illustrate, both the investors and the management would probably have been far better off to raise additional capital in the first place. The company was already far behind the plan when this deal was made, and there was not sufficient new (positive) information on which to base a new capital infusion. The investors and management had raised too little capital for the company to get to the point where a new, better informed decision about whether or not to proceed could be made.

Second, the investor group could have structured a deal in which they simply paid a lower initial price per share for the company, rather than acquiring the right to invest more money at a fixed price later. The investors purchased a package consisting of some common stock and some rights. On the surface, it would appear that they paid a relatively high price per share of stock. But when a portion of the original investment capital is attributed appropriately to these “ancillary” rights, then the actual economic price paid for the common stock turns out to be far lower. If the investor group had structured a simpler deal in which they paid the lower price, they would have been confronted with far less trouble later.

With respect to the right to invest more money later, this goal could have been accomplished by gaining proportional rights of first refusal, which would allow the investor to participate in later rounds of financing in proportion to the equity already held. Such rights, however, should not be structured so as to discourage another outside group from investing the time and resources required to decide whether or not to invest.

Also, the deal could have been structured with a “ratchet,” enabling the original investors to be protected against subsequent financing rounds at lower prices. With a ratchet in place, the shares owned by the original investor would be retroactively adjusted so that the effective price per share paid would be no higher than the price paid by the subsequent round.

Finally, with respect to the control issue, the investor group was deluded into believing that 51% was a magical figure, and the only way to retain control in the situation. In reality, control vests in the hands of those who have capital when capital is needed. Control can also be attained by having a majority representation on the board of directors, or through employment contracts with rigid performance specifications. The particular mechanisms by which this investor group sought to retain control—the rolling 51% option—almost brought the company to its knees.

CONCLUSION

We began this note on venture capital by introducing a relatively simple example of a deal, one in which the entrepreneur sought capital from a venture capitalist. We saw that the terms negotiated affected the split of cash and the split of risk, and hence the split of value between the supplier and the user of capital. We then pointed out that alternative structures would affect the incentives of the entrepreneur such that the total amount of value at stake was affected by the terms negotiated.

We then took the relatively simple single-investment type deal and expanded the terms to include the more realistic possibility that the investment would be made in several distinct stages over time. In so doing, we discovered that certain options provided venture capitalists, both explicit and implicit, are valuable to venture capitalist and entrepreneur alike, and thus improve the terms on which the entrepreneur is able to raise capital. Staging capital infusions into ventures, for example, enables the venture capitalist to retain the option to abandon a project if that makes sense. We also observed that the entrepreneur enters into such contracts willingly, though there are obvious possible scenarios in which having structured the deal that way will not have been in the best interests of the entrepreneur.

Similarly, both parties can gain from providing the other party the option to re-value a project, or

from the venture capitalist's option to increase capital committed if the project proves unexpectedly successful. Building such options into venture capital contracts also helps overcome initial differences of opinion between venture capitalist and entrepreneur as to, say, the probability of different outcomes. Such options also provide a signaling mechanism, if you will, by which entrepreneurs can credibly communicate to investors their confidence in the project and in their own abilities.

These options not only add to the total project value as of a first financing round, but also provide a structure for avoiding a financing impasse should things not work out as planned. The terms of financing must allow the company to obtain the capital necessary for survival in (temporary) bad-news scenar-

ios, as well as providing for the exploitation of good-news scenarios. If the deal is structured such that it is almost impossible to raise additional capital (for example, there is an implicit "poison pill" built into the contract), then the financial structure of the deal will reduce instead of adding to the value of the project.

The message that seems to emerge most clearly, then, from this look at venture capital is this: The total value of an investment opportunity may depend critically on the financing terms governing the deal. By restructuring terms, the size of the total economic "pie" can be dramatically changed-for better or worse. The extent to which these insights into venture capital markets have a bearing on the financial practices of public corporations remains an open question, but one that surely merits further attention.

■ WILLIAM SAHLMAN

is Associate Professor of Business Administration at the Harvard Business School, where he teaches a course in Entrepreneurial Finance. Dr. Sahlman's primary research interests are financial contracting and risk capital, with major emphasis on venture capital, initial public offerings, and leveraged buyouts.

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