

ENTREPRENEURIAL FINANCE: *Strategy, Valuation, and Deal Structure*

Chapter 13. Value Creation and Contract Design

Questions and Problems

1. Consider a venture to develop a new video game system for babies. The system is designed to be installed in child-safety car seats. If everything goes according to the entrepreneur's plan, the venture can achieve sales of \$10 million in four years. At that point, based on market information for similar companies, the venture could be offered to the public at a multiple of 6 times annual sales. To complete development of the venture, the entrepreneur anticipates needing \$1 million in capital immediately, \$1.5 million in year 1, \$2 million in year 2, and \$3 million in year 3. Capital that is raised in advance of when it is needed can be invested to earn an annual return of 5 percent.
 - a. Suppose the investor uses hurdle rates of 75 percent for current investment, 60 percent for year-1 investment, 45 percent for year-2 investment, and 30 percent for year-3 investment. How much capital does the entrepreneur need if all of the investment is provided now? How much of the equity would the investor require for making such an investment?
 - b. Now, suppose the investor would make annual contributions of the needed amounts of capital (in four stages). How much of the equity would the investor require at each stage? Assuming that the venture is successful and that its projections are on target, how much of the equity would the investor ultimately require?
 - c. Finally, suppose the venture survives but is significantly less successful than the entrepreneur projects it to be. At the time of the year-1 investment, the revenue projection is reduced to \$9 million, at the time of the year-2 investment, it is reduced to \$7.5 million, and at the time of the year-3 investment, it is reduced to \$6 million. All other assumptions are unchanged. What fraction of the equity would the investor ultimately require?
2. Suppose that for the venture described in problem 1, the projected sales level in year 4 is of a success scenario. It is equally likely that the venture will have sales of \$2 million at that point. Suppose the investor makes the entire cash commitment at time zero. The entrepreneur plans to contribute \$400,000 of human capital, from his total wealth of \$1.5 million, and will invest the balance in the market. The expected market return is 11 percent per year. The market standard deviation is 20 percent per year. The correlation between the venture and the market is .25. Suppose the investor and the entrepreneur both receive equity claims.
 - a. Assume the market for outside investment capital is highly competitive. How much would the investor require in exchange for the investment? What is the NPV of the investor's interest? What is the NPV of the entrepreneur's interest in the venture?
 - b. Now, assume that there is only one suitable investor for the venture and that there are dozens of other people who could develop the concept just as effectively as the entrepreneur. How much equity would the entrepreneur require? What is the NPV of the entrepreneur's interest? What is the NPV of the investor's interest?
 - c. Finally, suppose the investor provides the capital at time zero in exchange for a certain payment at year 4, with an annual return of 10 percent. How much is the payment the investor will require? What is the NPV of the investor's financial claim? What is the NPV of the entrepreneur's financial claim?
3. Continue with the same venture as in the previous problems. Try to design a contract for second-stage investment by the investor at year 2. Initially, the investor would contribute enough for the first 2 years. Later, the investor would contribute enough for the last 2 years.

Suppose that at the time of the second-stage investment, the investor will know that the probability of the success scenario is either 0.8 or 0.2. Assume that if no second-stage investment is made, the venture is terminated with no liquidation value.

- a. Try to select equity stakes of the investor so that the investor will invest if success is likely, but not if failure is likely, and such that the investor's overall decision has a NPV of zero. To do this, you need to compare the investors NPV from investing or not investing in both the success and failure scenarios. Also, you need to value the investor's claim with rational exercise of the stage-two option.
 - b. What is the value of the entrepreneur's financial claim on the venture?
4. Now, suppose a third investor, who has no other investment in the venture, provides the second-stage investment in the previous problem.
- a. Determine the amount of equity the second-stage investor would require to achieve a NPV of zero for investing if success is likely.
 - b. Determine the amount of equity the first-stage investor would require to achieve a NPV of zero, assuming the probability of second-stage investment is 0.5.
 - c. What is the value of the entrepreneur's residual position?
5. SIM Continue with the same problem and assumptions, except use simulation to evaluate the venture instead of discrete scenarios. Suppose expected sales potential in year 4 is \$6 million and is normally distributed with a standard deviation of \$5.657 million. Assume that market value at the end of year 4 is 6 times potential sales revenue, as long as potential sales revenue is positive, and zero otherwise.
- a. Suppose the investor provides all outside capital at time zero. How much equity would the investor need to achieve a NPV of zero?
 - b. What would be the resulting value of the entrepreneur's claim?
6. SIM Suppose, in problem 5, that a second-stage investment can be made at year 2. The investment decision depends on a forecast of year-4 sales, which is made at year 2. Assume that the expected forecast in year 2 is that sales potential will be \$6 million and that the forecast has a standard deviation of \$4 million. Assume, further, that the actual sales level in year 4 is drawn from a normal distribution with expected value equal to the forecast and a standard deviation of \$4 million.
- a. Suppose a new well-diversified investor who requires a zero NPV makes the investment. What fraction of the equity would the investor need to justify investing whenever the simulated forecast of sales is at least \$4 million? \$6 million?
 - b. Suppose the first-stage investor also requires a zero NPV. How much equity would the first-stage investor need at time zero if the second-stage investor invests whenever the forecast of sales is \$4 million? \$6 million?
 - c. In both cases, how much equity does the entrepreneur retain? What is the NPV of the entrepreneur's interest?
 - d. How would you recommend that the entrepreneur try to determine the optimal amount of equity to offer the second-stage investor?
7. Conditional on success, a venture is expected to have a harvest value of \$40 million. Otherwise the venture will be valueless. Some members of an angel investor group are considering making the investment (and will still be well-diversified, even after investing). The angels seek a return consistent with the CAPM, plus compensation for their human capital investment at a rate of \$120,000 per year. If they invest, they would plan to stage the investment. The investors anticipate a constant burn rate of \$100,000 per month over the entire life of the venture. The investors expect to provide the monthly cash needs. The parties

agree about risk, expected return, timing, and investment requirements. Stage durations and probabilities of the possible outcomes are as follows:

Outcomes	Probability	Time to Complete	Harvest
Success in Stage 4	30%		
Failure in Stage 4	15%	1.00 year	\$40,000,000
Failure in Stage 3	15%	1.00 year	\$0
Failure in Stager 2	15%	0.75 years	\$0
Failure in Stage 1	25%	0.25 years	\$0

The annual risk-free rate is 5 percent, the market rate is 11 percent, and the annualized standard deviation of market returns is 20 percent. The venture's correlation with the market is .20.

- Compute the expected harvest cash flow and standard deviation of cash flows as of the time of each anticipated financing round. Also compute the present value of the commitment, assuming the venture is not staged. (This problem can be completed most easily by downloading and modifying the tables from the chapter).
- Use the present value of the expected investment required if the venture is successful to determine the value of the venture to the angel investors. What is the fraction of equity the investors would require for committing up-front to provide all of the financing? Be sure to allocate enough equity to the investors to compensate for the human capital they are committing. Assuming that the entrepreneur has \$4.0 million of other wealth to invest in the market, what is the value of the entrepreneur's interest?
- Determine the expected value of the venture at the time of each expected investment round. (Be clear and consistent about how you are dealing with the investor's return on human capital).
- Determine the minimum fraction of equity the angel investors would require for investing at each stage and determine their cumulative ownership percentage, assuming that ownership percentages are not diluted by subsequent investments. (The percentage must provide for a return on the investor's human capital at each stage). How do the results compare with the results without staging?
- Compute the entrepreneur's residual expected cash flow and standard deviation of cash flows. How does the entrepreneur's ownership interest compare with the interest if the investment is not staged?
- Find the value of the entrepreneur's ownership interest in the venture when the financing is staged. How does the value compare with the value without staging?
- Suppose, at the time of the Round 1 financing, the entrepreneur sells the investor enough additional shares so that, if the venture is successful, the investor's fraction of equity is the same as without staging (the same percentage as in part (b)). Assume the investor pays for the additional equity based on the Stage 1 valuation and that the entrepreneur invests the payment in the market. Compute the value of the entrepreneur's portfolio. How does the expected cash flow and risk of the entrepreneur's ownership claim compare with your answers in part (e)? How does the value compare with the value when the investor receives only the minimum shares necessary at each round (in part (f))?