

ENTREPRENEURIAL FINANCE: *Venture Capital, Deal Structure & Valuation*

Chapter 5. New Venture Strategy and Real Options

Questions and Problems

1. Which of the following decisions are “strategic?” Explain your reasoning.
 - a. An owner of a nursery decides to buy an option on a parcel of land that is contiguous to his nursery.
 - b. The nursery owner exercises the option and buys the land.
 - c. The nursery owner decides to carry palm trees.
 - d. The nursery owner expands his staff by 10 employees.
 - e. The nursery owner builds a greenhouse on the plot of land he purchased.

2. From the perspective of the entrepreneur explain, in general terms:
 - a. The strategic considerations that would tend to favor small-scale over large scale entry;
 - b. The strategic considerations that would tend to favor rapid growth;
 - c. The strategic considerations that would tend to favor vertical integration into both manufacturing and distribution;
 - d. The strategic considerations that would tend to favor outside equity financing instead of debt.

In each case, be sure to focus on the value of the entrepreneur’s interest in the venture rather than on the entire venture, taking into consideration the interdependencies among product-market, organizational, and financial strategic choices. Support your reasoning with some specific examples.

3. Draw a payoff diagram similar to Figure 5.2a for a one-month call option on Google with an exercise price of \$520. What is the value of the option at expiration if Google’s share price is \$547? What is the profit if the option premium is \$9.50?
4. What happens to the value of a call option (an increase or a decrease) for each of the following? Explain why.
 - a. An increase in the exercise price
 - b. An increase in the value of the underlying asset
 - c. An Increase in the time to expiration
 - d. An increase in the volatility of the underlying asset
5. Draw a payoff diagram similar to Figure 5.2b for a three-month put option on Starbucks with an exercise price of \$20. What is the value of the option if the Starbucks share price is \$22 on the day the option expires? What about if the share price is \$16.50. What is the profit if the option premium is \$1.50?
6. What happens to the value of a put option (an increase or a decrease) for each of the following? Explain why.
 - a. An increase in the exercise price
 - b. An increase in the value of the underlying asset

- c. An Increase in the time to expiration
 - d. An increase in the volatility of the underlying asset
7. What is an abandonment option? In what ways might an entrepreneur benefit by agreeing to give an outside investor the option to abandon a venture?
 8. A building supply store is considering expanding its capacity to meet a growing demand for its products. The alternatives are to build a new store at a site nearby, expand the existing store, or do nothing. There is a 60% chance the economy will be stable, and a 20% chance of either an economic upturn or downturn. The following NPV estimates based on economic conditions have been provided:

| | Market upturn (millions) | Stable market (millions) | Market downturn (millions) |
|------------------|-----------------------------|-----------------------------|-------------------------------|
| Build new store | \$1.9 | \$0.3 | -\$0.5 |
| Expand old store | \$1.5 | \$0.5 | -\$0.3 |
| Do nothing | \$0.5 | \$0.0 | -\$0.1 |

- a. Set up a decision-tree for this problem
 - b. What should the company do?
9. You can acquire an existing business for \$2 million. You are uncertain about future demand. There is a 40% chance of high demand, in which case the present value of the business will be \$3 million. There is a 25% chance of moderate demand, and the associated present value is \$1.5 million. Finally, there is a 35% chance of low demand, in which case the present value is \$1 million. Draw a decision tree for this problem. What is the expected net present value of the business? Should you invest? Explain.
 10. Suppose that if you buy the business described in Question 9, you can expand the business by investing another \$500,000 after you learn the true future demand state. This would make the present value of the business \$4 million in the high-demand state, \$2.5 million in the moderate demand state, and \$1.0 million in the low demand state. Draw a decision tree to reflect the option to expand. Evaluate the alternatives. What is the net present value of the business if you consider the option to expand? How valuable is the option to expand?
 11. Consider Question 9 again, and suppose that the market value of the business assets would have a present value of \$1.8 million if the business were to be liquidated after the true demand state is known. Draw a decision tree to reflect the abandonment option. Evaluate the alternatives. What is the net present value of the business if you consider the abandonment option? How valuable is the option to abandon?
 12. Finally, reevaluate the investment opportunity in Question 9, incorporating both the expansion opportunity from Question 10 and the abandonment option from Question 11. Draw the decision tree incorporating both options. Are the values of the expansion and abandonment options additive? Why or why not?
 13. Suppose that by committing to invest \$3 million today, you can acquire a project that has a 30% chance of success at the end of the first year. If it is not successful at that point, the probability of success in the second year is 40%, and if it is not successful at the end of the second year, the

probability of success at the end of the third year is 20%. In the event of success at any point, the project will generate cash flows worth \$4 million. If the project is unsuccessful, it is worth zero. Find the cumulative probability of success and determine the expected net present value of the project.

14. In contrast to Question 13, suppose that if you spend \$1 million today on the research project, there is a 30% chance of success at year-end and a 70% chance of no success. At that point, you can decide to invest another \$1 million to continue the project. If you do invest, the probability of success at the end of the second year is 40% and the probability of no success is 60%. Finally, if you invest another 1 million on the project (if you still have not achieved success), the probability of success falls to 20% and the probability of failure rises to 80%. Conditional on success at any stage, the project is expected to generate cash flows worth \$4 million.
 - a. Draw a decision tree to reflect the structure of decisions the entrepreneur must consider.
 - b. Evaluate the decision tree. Is the project worth pursuing? If so, which is the best course of action for the decision maker?
15. Compare the values in Questions 13 and 14. How valuable is the staging option? Explain how staging is related to abandonment options. Would you expect a series of abandonment options to be additive? Explain.
16. Redo the real options analysis of the retail facility model in the chapter assuming that the probability of high demand is 40% and the probability of low demand is 30%. All other assumptions are unchanged.
 - a. Calculate or examine how this change affects the values of the accept-reject decision and the various alternatives involving the real options to wait, expand, and abandon.
 - b. What are the approximate values of the various options?
 - c. Based on the analysis, what is the best strategy to pursue? Assume that the option to abandon the small facility can be acquired costlessly, but that the option to abandon the large facility would cost \$17,000 (the incremental values computed in the chapter).
 - d. Why do you think increases in the probabilities of the high and low demand conditions change the values in the way that they do?
 - e. What can you say about how the values of real options depend on risk levels?
17. As the retail facility entrepreneur in the chapter, suppose you believe the outside investor should be willing to accept a lower fraction of equity in the case that the option to wait before investing is exercised. Specifically, because the investor will know the true state of nature, you believe the investor should be willing to accept 1.0% of the equity for each \$20,000 he invests (just like with the expansion option, but for the investor's entire investment). All other assumptions are unchanged.
 - a. Re-evaluate the waiting option.
 - b. How, if at all, does this affect the conclusions about the best strategy for you to follow?
18. Having accumulated 7000 points at a casino night fund-raiser for your school, you are in the lead. The closest contender has accumulated only 4000 points. At the end of the evening there will be an auction, where the grand prize is a two-day yacht trip with Warren Buffet. The other prizes are all of trivial value. The master of ceremonies announces that there is time for one more bet, and you are at the roulette table, as is the runner-up. Assume that you both would like to win the trip.
 - a. Suppose you hold on to 5000 points and bet 2000 on black. What should your rival do?

- b. Suppose your rival goes first and bets everything on red. What should you do?
 - c. Suppose your rival offers to split the prize evenly with you if you both agree not to bet. What should you do? How does your answer depend on whether you would bet first, your opponent would bet first, or you both would have to bet at the same time?
 - d. All things considered, would you rather be the first mover, the second mover, or both bet at the same time?
19. SPF Enterprises is considering entering a new pharmaceutical market currently dominated by Jolax, Inc. which has a monopoly position. Assume SPF is the first mover. If SPF does not enter, Jolax can continue to charge a high price, with a NPV of \$5 million. If SPF does enter, Jolax has two strategies: (a) continue to charge the high price, which means SPF would gain market share; (b) drastically lower its price, depriving SPF of any significant market share, but also reducing profitability for both firms. For strategy (a), the NPVs of Jolax and SPF would be \$3 million and \$2 million respectively. If Jolax drops its price, the respective NPVs are \$0 and negative \$1 million.
- a. How would you advise SPF to proceed?
 - b. Can you think of a third strategy for Jolax?
20. Reconsider Question 19 assuming that Jolax has significant idle production capacity. If SPF enters the market, and Jolax drops its price, it can use the excess capacity to retain a larger market share (and more profits). In this case the NPVs to Jolax and SPF would be \$4 million and negative \$3 million respectively. Now how would you advise SPF?
21. Consider the Ethan's Bar game-tree analysis in the chapter.
- a. Suppose Ethan is uncertain of how Naomi will react to his decisions. Ethan believes that, conditional on Ethan's decisions, there is a 70% probability that Naomi will make the right choice, based on the assumptions in Figure 4.6, and a 30% that Erin will make the wrong choice. How does this affect the expected values of Kelly's strategies to enter with a large bar, a small bar, or wait? How, if at all, does this affect Ethan's optimal strategy? (Ignore the possible effects of this risk change on the conditional present values shown in Figure 4.6).
 - b. Suppose Ethan believes Naomi will ignore Ethan's initial decision. Rather, there is a 70% chance that Naomi will enter no matter what Ethan does. What is the best strategic course of action for Ethan to follow? Comment on how game trees and decision trees differ from each other. (Ignore the possible effects of this risk change on the conditional present values shown in Figure 4.6).