

## Chapter 10

# Valuing a Start-up

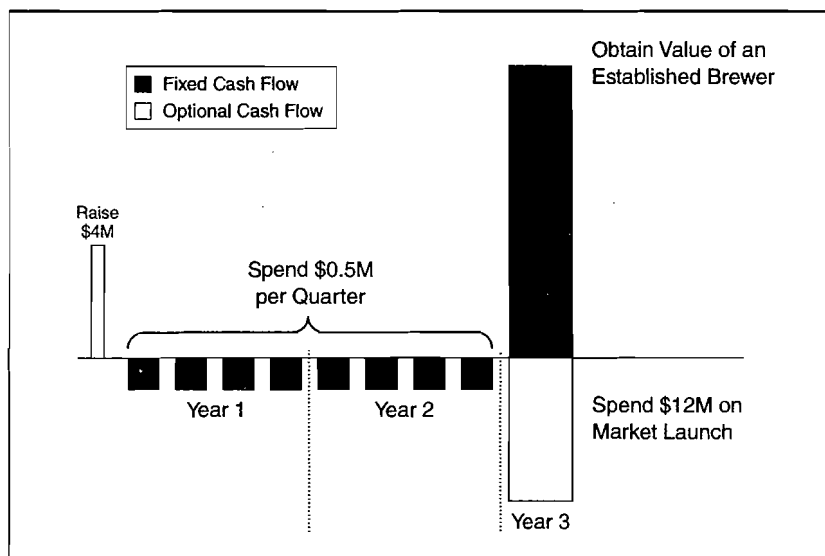
Portlandia Ale was two guys and a dream. The company was started by two brewers who wanted to develop their own products. The company needed \$4 million to begin product development and manufacturing and another \$12 million in two years for the market launch. The entrepreneurs were very optimistic about their business opportunity, despite considerable uncertainty about the value of the market opportunity they were chasing. In other words, Portlandia Ale was a typical start-up. How much was it worth?

Figure 10.1 shows Portlandia's simple start-up plan. The company needed \$4 million to get started and an additional \$12 million to launch the product. Prospective investors were worried about the marketplace. Once distribution and sales began, Portlandia would earn the same margins as other microbrewers and would be expected to be able to sustain its future growth from profits. The microbrewery segment of the beer market was becoming increasingly crowded, however, and sales migrated across products. Portlandia knew that it would need to continue to develop new products as an established microbrewery, but that the value of a first product introduction was uncertain.

The brewers had tried to value the company using a discounted cash flow analysis, but the result had been a negative value. As they searched for financing, the brewers had shown prospective investors a business plan with a single very optimistic forecast for future sales that everyone knew did not accurately reflect the risks of the start-up. Portlandia's value came largely from its growth option: Today's \$4 million investment creates the opportunity to make the \$12 million investment in two years to become an established microbrewer.

**Figure 10.1** Portlandia Ale's Business Plan

Portlandia's business plan calls for the microbrewer to raise \$4M in initial funding and \$12M in follow-on funding 2 years later. The follow-on investment will be made only if the market value of an established brewer exceeds the required investment.

***Parallels to Other Applications***

Many growth opportunities derive their value from future contingent investment decisions and are nearly impossible to value with discounted cash flow and other conventional tools. This case study shows how the value of a start-up is derived from growth options. Although the firm in this case is private, the results obtained by the real options approach are aligned with financial market valuations of established firms in the industry.

Many projects and investment opportunities are similar to a start-up venture, and this simple model of a growth option covers a wide range of applications, including corporate R&D, "intrapreneurial" ventures, and platform projects. The real options approach shows that using realistic inputs, investments that embed growth options will have higher expected returns, conditional on survival, than the underlying asset. This helps to explain differences in performance across firms in the same industry.

## The Questions

What is the value of Portlandia Ale that correctly reflects its growth option? What company-specific and financial market information is used in this valuation?

## The Application Frame

If all goes well, in two years Portlandia will have a viable business with a complete product line moving through its distributor. The company will have arrived as an established microbrewer with a business model similar to that of other microbrewers. Discounted cash flow, or use of comparables such as P/E ratios, can be used to value the firm as an established microbrewer because the value is largely based on cash flow.

Before establishing itself, Portlandia has a growth option. The option's exercise is triggered by the value of the firm as an established microbrewer, which is calculated as follows:

- Forecast Portlandia's sales level in two years, as an established business. The brewers expected that this would be \$6 million per year.
- Calculate the average of the current market value-to-sales ratio for established publicly traded microbrewers whose current sales are in the same range. (Make sure not to select firms with valuable growth options, but rather ones that are representative of the business model of the industry for established firms.) The average market value-to-sales ratio of three of these firms as of March 1997 was 3.66.
- The current value of Portlandia's market opportunity, the value of being an established firm, is \$22 million ( $\$6 \text{ million} \times 3.66$ ). This is the initial value of the underlying asset in the growth option.

The average stock price volatility of three established microbrewers is estimated to be 40%. It is expected that the microbrewer's value will fluctuate in value with financial market revisions of the market-to-sales ratio or from revisions in Portlandia's sales forecast that arise from industrywide factors, such as a change in alcoholic beverage taxes or increased bottling costs from recycling restrictions.<sup>1</sup>

The real options analysis recognizes the uncertainty about the value of an established microbrewer, and it also recognizes that the

second investment opportunity limits some of the downside risk because it is contingent on a strong value of the market opportunity. The option to invest in two years is analogous to a European call option on the value of an established microbrewery. The Black-Scholes equation can be used to get a first-cut valuation.

## The Results

For comparison, we first calculate the value of Portlandia Ale using the discounted cash flow method. The analysis assumes that Portlandia will follow a fixed strategy of expanding into a full-fledged microbrewer regardless of market conditions in two years. This results in a  $-\$0.23$  million valuation. A risk-adjusted discount rate for the microbrewer of 21% is used.<sup>2</sup>

A simple real options analysis includes the contingent nature of the launch decision in two years. Portlandia and its investors will commit \$12 million required for launch only if the value of Portlandia as an established brewery at that time exceeds \$12 million. Although the forecast in the discounted cash flow analysis was for a \$22 million valuation, this is only a forecast. The actual realization may be substantially higher or lower.

The Black-Scholes equation is used to value the growth option (see Figure 8.7). The input parameters are  $A = \$14.46$  million (the present value of \$22 million),  $X = \$12$  million,  $\sigma = 40\%$  per year,  $r = 5\%$ , and  $T = 2$ . The result is \$4.96 million, the value of the option to invest \$12 million in two years' time. Hence, the value of the firm is \$1.13 million after accounting for the present value of the \$4 million required during the next two years ( $\$1.13\text{M} = \$4.96 - \text{PV}(\$4)$ ).

Portlandia's management and investors have even more flexibility in their investment decisions. During the first two years, they can decide at the beginning of each quarter whether to invest another \$0.5 million to keep the project (with all the subsequent investment options) alive or to abandon it. The value of the firm, including this American-style option, can be obtained with the binomial option valuation model. Under these assumptions, the value of Portlandia increases to \$1.74 million.

The contribution of the growth option to Portlandia's value can be seen by comparing the value of the company obtained from the real options approach and the value obtained from the discounted cash flow analysis. The difference, \$1.36 million, arises from uncertainty about the value of the market opportunity and from Portlandia's contingent

### *P/E Ratios—Valuation Using Comparables*

P/E ratios are the valuation tool favored by financial analysts on Wall Street. The P/E ratio, defined as stock price to earnings per share, is a quick summary of how much investors are willing to pay per dollar of current earnings. For a quick analysis, analysts use P/E ratios from companies comparable to the one they want to value. (Value equals earnings times the comparable company P/E ratio. Either forecasted or current earnings are used.)

The long-term stock market average P/E ratio is 13, but individual company P/E ratios vary significantly, even in the same industry. Stock prices embed growth options, and firms differ by their portfolio of growth options and their ability to execute to realize the value of these options. Also, the amount of debt issued by the firm affects its P/E ratio. Earnings are net of interest expense, so a firm with substantial debt obligations will have lower earnings and a higher P/E ratio, all else being equal.

Both P/E ratios and dynamic tracking are objective financial market information, not subjective estimates. It is hard to argue with a price determined by a set of investors who are willing to pay real dollars. However, the use of P/E ratio for valuation is based on a static selection of the comparable firms, whereas dynamic tracking defines a comparable firm as one with the same sensitivity to the same underlying asset—a much more precise basis of comparison.

Start-ups often have no earnings or earnings so small as to make a P/E ratio-based valuation appear arbitrary. Consequently, it is customary to value them using a price-to-sales ratio.

decision in two years. Not only does the real options analysis produce a more attractive valuation, it also better communicates the risks.

The real options results can also be used to calculate the minimum growth rate that Portlandia must realize if the second investment is to be made. At the end of two years, Portlandia will invest only if its value as an established brewer is greater than or equal to \$12 million. (\$12 million is the critical value.) Examination of the binomial tree shows that if the value of the established market was \$12 million or higher,

Portlandia's investors would realize a 66% return over the two-year period.

This very simple analysis has captured the essence of the contingent decisions in start-up opportunities and has established the value of a private firm from financial market values. No detailed forecasts of cash flows were used in the valuation, although pro forma forecasts will have other uses in assessing the business opportunity.

*This case study valued a growth option with a single, market-priced source of uncertainty. The next case study incorporates private risk, which is present in most real options applications.*