

Entrepreneurial Financing



Financial Forecasting

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Lecture 5

ENT 632

Entrepreneurial Financing



- a) Identify Financial Forecasting and Principles of Financial Forecasting.
- b) Explaining Forecasting revenue methods.
- c) Estimating Uncertainty and Forecasting.

Introduction

Financial Forecasting is a critical element of planning for a new venture.

Forecasting is a disciplined way to evaluate how much cash the venture is likely to require and how much it might need if it develops more quickly or slowly than expected.

The principal benefits of a good forecast include:

- **Forecasting** helps entrepreneurs and investors make objective comparisons between pursuing the venture and other opportunities.
- **Forecasting** helps entrepreneurs and investors compare strategic alternatives and select the one with the highest expected value.
- **Forecasting** helps the entrepreneur and investors understand the strengths and weaknesses of the venture.
- A **forecast** provides a benchmark against which to compare actual performance, thereby providing a means to test hypotheses about the venture and to provide early warning of potential problems.

1. Principles of Financial Forecasting

It is useful to begin with an overview of the principles that guide the forecasting process:

Build and support a schedule of assumptions.

- The assumptions may come from fundamental analysis of the opportunity, information about comparable firms, or expert judgment.
- These assumptions guide construction of a financial model of the venture.

Begin with a forecast of revenue.

- It is usually easiest to start with a revenue forecast that is developed in light of the planned scale, scope, and nature of the selling effort.
- Most other aspects of the model are linked to revenue.
- *For example,* the targeted level of sales or rate of sales growth can determine the investment in production capacity and the necessary level of inventory.
- It can be useful to develop an aggregate revenue projection by combining projections for appropriate segments of targeted customer/user groups (e.g., age, region, incomes, propensity to adopt new products) and to separately estimate the numbers and growth rate of each segment.

7.1 Principles of Financial Forecasting (Cont.)

Decide whether to develop the forecast in real or nominal terms.

- **Nominal forecasts** should include an explicit forecast of inflation, whereas real term forecasts are in constant dollars.
- If you expect selling prices and input costs to track the inflation rate, then forecasting in real terms can simplify the model.
- If prices and costs are unrelated to inflation, it can be **better to forecast in nominal terms** and make explicit adjustments for price changes.
- **Interest rates on debt and discount rates used in Discounted cash flow (DCF) valuation are usually quoted in nominal terms.**
- **Discounted cash flow (DCF)** valuation is a type of financial model that determines whether an investment is worthwhile based on future cash flows. A DCF model is based on the idea that a company's value is determined by how well the company can generate cash flows for its investors in the future.

1. Principles of Financial Forecasting(Cont.)

Integrate the financial statements.

- Using formulas to integrate the pro forma balance sheet, income statement, and cash flow statement is essential for testing :
 - (1) Sensitivity to assumptions,
 - (2) Performing scenario analysis, and
 - (3) Simulating the uncertainty of future performance.

Choose an appropriate time span for the forecast.

- The span covered by the forecast depends on the purpose.
- If the forecast is to be used for valuation, the period must be long enough to carry the venture to a point where harvesting opportunities are likely.
- If it is to be used to determine cash needs, it should extend to the point where the venture would be in a position to attract follow-on financing based on its track record.

1. Principles of Financial Forecasting (Cont.)

Choose an appropriate forecasting interval.

- The **appropriate interval** depends on the planning period of the venture.
- For assessing financial needs of an early-stage venture, intervals of one year are too long.
- To arrange financing on a timely basis, the entrepreneur and investors must project cash needs over much shorter intervals.
- If the forecast is to be used for control, the important performance milestones are unlikely to be annual.
- On the other hand, **daily or even weekly forecasts are unlikely to be of much value**.
- Departures from projected results over very short intervals are largely random.
- Generally, **for an early-stage venture an interval of about a month to a quarter provides a sensible balance of timeliness and reliability for use in cash needs assessment.**

Assess the reasonableness of the model.

- Think through the relations among assumptions and line items within and across statements.
- Do they make sense? Are they internally consistent? Try a basic **“what if” analysis** to see if the results are internally consistent and conduct stress tests to make sure the model is robust to extreme outcomes.

2. Forecasting revenue

- **Revenue forecasting** is important because revenue is a key driver of value and for determining how much to invest in the inputs that are essential for responding to demand as it develops.
- To develop the revenue forecast, we begin by specifying the assumptions that drive revenue and revenue growth—**assumptions** about such things as market size, market share, and price.
- **Clear, explicit, and well-supported assumptions make the forecast** more than just an exercise and make it **credible to investors**.
- **For valuation and to anticipate financing requirements**, we need to link product-market performance to financing needs. The revenue forecast is the customary link.
- This is because financing supports the start-up investments that are necessary before revenue generation can begin.
- **Once the venture is producing and selling a viable product, sales growth is the primary driver of financing needs**.
- For any given forecast of future revenue, we can work back to estimate the free cash flows from operations that are expected to be available, or the additional financing needed to support the growth.

2. Forecasting revenue (cont.)

Forecasting the revenue of an established Business

- **A reliable revenue forecast for an established business can sometimes be based on prior experience.**
- *For example*, we might project that revenue will grow at the average rate of the previous five years.
- A more sophisticated approach could take into consideration the trend in the rate of revenue growth (as opposed to the average), or the forecast could be tied to changes in underlying economic and demographic factors.
- **One simple approach to forecasting revenue is to extrapolate the average historical nominal growth rate.**
- **A possible way to improve the revenue forecast may be to make it in real (inflation-adjusted) rather than nominal terms.**
- Another way to improve forecast accuracy can be to weight historical data so that the more recent experience receives greater weight.
- **Weighting is based on the idea that the future will probably be more like the recent past **than** the more distant past.**
- With enough historical data and appropriate software, one could determine the weights that yield the (statistically) best estimates of sales in later years.
- **Exponential smoothing is a weighting scheme that is easy to apply and can work well when historical data are limited.** The simplest form of the exponential smoothing model is

$$\text{Forecast}_{T+1} = \alpha \times \text{Actual}_T + (1 - \alpha) \times \text{Forecast}_T \quad (1)$$

where α is a weighting factor between zero and one. For example, suppose that the revenue forecast for period T was

100 and the actual was 110. **If α is set to 0.2, the forecast for $T + 1$ is**

$$0.2 \times 110 + 0.8 \times 100 = 102$$

whereas, if α is set to 0.8, the $T + 1$ forecast is

$$0.8 \times 110 + 0.2 \times 100 = 108$$

- Although the equation does not refer to periods before T , they are reflected in the forecast implicitly.
- Because the period T forecast is estimated in the same way as the $T + 1$ forecast, actual results of earlier periods are implicit in the $T + 1$ forecast, through the previous forecast.
- The term “**exponential smoothing**” signifies that when Eq. (1) is used, the weights applied to earlier results decrease exponentially.
- The relative importance of each year’s data to the forecast is determined by the weight factor, α . A high value of α is used if recent results are believed to be an important predictor of future results.
- A lower value increases the weight on older results.
- If α is high, the forecast adjusts quickly to new results.
- In the extreme, if α is equal to 1.0, then the next period’s forecast is equal to this period’s actual result. If α is low, the forecast adjusts gradually.
- The approaches to revenue forecasting that we have discussed, including exponential smoothing, are examples of “**naïve forecasting**” methods.

- They extrapolate existing trends without considering underlying economic forces that drive demand and revenue.
- More elaborate naïve models are available to deal with factors like **seasonality** or with a growth rate that is expected to decline systematically over time.
- In some cases, it may be more reliable to forecast growth rate percentages instead of revenue levels.
- Beyond that, we could consider underlying economic forces that affect the level of sales or the growth rate.
- These forces might be macroeconomic variables, such as the growth rate of GDP, or demographic factors, such as the population growth rate or the average age of the population.
- Finally, they could be industry-specific factors, such as the revenue growth rate for the industry, emergence of new competitors, or product innovations.
- We caution, however, that it is not helpful to identify relationships between revenue and other factors that are themselves difficult to forecast.

Forecasting Revenue of a New Venture

- Developing a revenue forecast for a venture with no track record is more difficult, and the result is likely to be less certain.
- How can we forecast revenue for a product that does not yet exist, where the full scope of applications and customers is not yet known, and where actions and reactions of competitors are yet to be seen? Rather than allowing these concerns to overwhelm us, it is important to search for simplicity.
- We consider two approaches:
 - (1) **Yardsticks**, and
 - (1) **Fundamental analysis.**

Yardsticks.

- An approach that is sometimes useful is to identify reasonable “yardstick” companies for which **public** (and possibly nonpublic) data are available.
- A **yardstick** is a firm that is comparable to the venture on some dimensions that are important to the forecast. Actual comparability may not need to be very close.
- Depending on the kind of information we wish to forecast, it is **not** even necessary that a yardstick firm be producing the same product.
- **Comparability** can be based on factors such as the expected market, distribution channels, adoption rates, usage rates, repurchase rates, uniqueness of the product, or technology.
- **Data availability is one advantage of the yardstick approach.**
- Many small companies go public every year.
- In the process, they often supply a great deal of information about the period before the company was public.
- Companies that go public are ideal candidates for assessing revenue growth potential.
- However, revenue estimates based on public companies are by nature optimistic for a new venture.
- **Public firms** are success stories and have already survived for longer than the typical new venture.
- Moreover, issuing shares publicly suggests that the firms have grown rapidly enough that outside equity financing has become important for growth.

Yardsticks. (cont.)

- By studying the experiences of yardstick companies, the entrepreneur can obtain information on the various stages of new venture growth and their changing financing needs.
- Sometimes the IPO prospectus contains enough historical data to measure revenue growth over a number of years.
- In some cases, there is enough historical information to infer the length of the development period before the company was able to market a product successfully and to infer the costs involved in the process.
- Financial information from yardsticks has value beyond forecasting.
- The prospectus also contains information on how those companies met their financing needs before going public.
- Each company can serve as a case study, providing insight into the financing choices the entrepreneur faces.
- In addition, the companies' financial statements can aid in formulating the assumptions the entrepreneur needs for projecting the financial statements of the new venture.
- IPO prospectuses are available from various sources, including the issuing company and the underwriter.
- The SEC maintains an electronic database of prospectuses and other corporate submissions on its EDGAR website.
- How can we use the sales information from yardsticks to generate a revenue forecast? The techniques are fundamentally the same as for an established business using its own historical revenue.
- For an existing business, its own historical experience is simply one yardstick that is likely to be particularly good.
- For a new venture, this convenient sales record is not available, but the task is the same—to use historical sales experience (in this case, of other firms) to generate a forecast.

Fundamental analysis.

- Fundamental analysis is an alternative to reliance on yardsticks.
- Approaches to fundamental analysis can vary.
- For a venture such as a coffee shop that is similar to others already in operation, the fundamental approach might be mainly empirical, such as observing the traffic at other coffee shops, analyzing their product offerings and pricing, and talking to customers.
- Total revenue is a function of days and hours of operation, customers per hour, and average transaction size—all factors driven by product mix, advertising, competition, and location.
- For example, suppose you have researched two different coffee shops—one in a neighborhood that is active from early morning until late in the evening, including weekends, and one in a location such that it primarily serves employees of nearby businesses that are open standard hours. Your estimates of revenue are as follow:

Comparable Type	Days per year	Hours per day	Customers per hour	Revenue per customer	Annual revenue
Business/Entertainment Center	360	18	40	\$6.50	\$1,684,800
Business Only	300	12	45	\$8.00	\$1,296,000

- As the evidence indicates, revenue is sensitive to location.
- While the business and entertainment location generates significantly more revenue, it is also likely to incur higher rent and entails longer hours of operation, resulting in higher expenses.
- By comparing different locations and constructing a complete financial model for each, the entrepreneur can refine the location decision.

Demand and Supply Considerations (cont.)

- **Revenue estimates** for a venture can be generated from either the demand side or the supply side.
- The **demand-side approach** assesses consumer willingness and ability to buy the product, assuming that the venture has adequate capacity to supply all that is demanded.
- The approach begins with an estimate of the venture's market share that depends on such demand-related factors as number of competitors, pricing, location, and intensity of marketing efforts.
- For **unique products**, initial **market share is easy to estimate—100%**—but the size of the market is difficult to **judge**, and the rate of market share erosion due to competitive entry depends on defensibility of the entrepreneur's position.
- For a **more traditional venture**, the potential market size may be easy to estimate (published estimates may exist), but market share is more uncertain, and the reactions of competitors may be important.

Demand and Supply Considerations (cont.)

- In contrast, the **supply-side approach** seeks to determine how fast the venture can grow given managerial, financial, and other resource constraints.
- Possible supply-side constraints include limits on access to raw materials, financing, and technology; there also may be constraints on the ability to hire and train employees.
- In other words, **even if demand increases rapidly, the venture's growth rate may be limited on the supply side.**
- Supply shortages are common in product markets where new models are regularly introduced.
- When Samsung introduced its Galaxy S6 Edge, for example, it was unable to keep up with demand partly because of the technical challenges of producing the phone's curved screen.
- In 2013, Tesla was unable to keep up with demand for its recently introduced Model S because of a shortage of batteries.
- Commenting on the shortage, CEO Elon Musk stated, **"We really are production-constrained, not demand-constrained,"** and indicated that the supply shortage was likely to continue into 2014.

Demand and Supply Considerations (cont.)

- Combining the supply- and demand-side approaches, a venture's expected rate of growth is whichever is lower.
- **Slow-growth scenarios** normally are constrained by the limits of market demand, whereas **rapid-growth scenarios** normally are constrained by the organization's ability to manage growth.
- One advantage of the yardstick approach is that it uses the actual experiences of other firms and therefore implicitly considers both supply- and demand-side factors.
- **Whether a forecast is based on yardsticks, fundamental analysis, or a combination of the two, it is important that projections be realistic and credible.**
- Fundamental analysis is subject to the greatest potential for wild speculation.
- Consider the sales forecast of a proposed fast-food chain, the Bunny Hutch: "Assume each person in an area with a population of 10 million eats one bunny burger one night per week, at \$1.00 per bunny burger. That's \$10 million per week."
- Projections made by individuals with established reputations and industry experience or by objective third parties are more likely to be realistic and credible than estimates made by an entrepreneur who is enamored of the idea in the first place.
- **The best substitute for relying on independent expert projections is to base the analysis on solid reasoning and well-supported and well-documented assumptions.**

3. Estimating Uncertainty

- For a new or early-stage venture, efforts to forecast revenue and other results may seem to be of little value.
- After all, the probability that actual performance will turn out to be much like the forecast is quite low. Nonetheless, **forecasting is probably more important for a business with an uncertain future than for one that has experienced steady growth.**
- For a venture with an uncertain future, the forecast of expected performance is simply an anchor for estimating uncertainty.
- **For many purposes, the forecast of uncertainty is far more important.**
- For example, the financial needs of a venture depend heavily on uncertainty.
- Failure to allow for possibilities such as development delays, lower-than-expected profitability, or higher-than-expected demand can result in critical financing errors.

7.3 Estimating Uncertainty (Cont.)

Assessing Risk Using Historical Data

- The approaches discussed previously for revenue forecasting can also be used to estimate uncertainty.
- One simple approach **for an established company** is to generate a baseline historical trend for a key variable, such as sales or the sales growth rate, and then estimate uncertainty as the historical standard deviation of differences between actual and expected values.
- **For a venture without a track record, uncertainty is greater and more difficult to estimate.**
- One approach is to base the estimate on the experiences of other companies that are similar in important respects.
- **For a new venture, we could use the dispersion of revenue across yardstick companies and over time for those companies to estimate the standard deviation.**
- Another is to envision alternative realistic scenarios for the venture and develop projections consistent with each. An estimate of uncertainty can be developed by applying probabilities to the different scenarios.

Sensitivity Analysis

- In sensitivity analysis, we vary the assumptions of the model one at a time or a few at a time and observe the impact on the forecast.
- Used effectively, sensitivity analysis can clarify which parameters are most important in the forecast.
- Once we identify the critical input parameters, we need to develop reasonable descriptions of their uncertainty.
- History—from the firm's experience or the experiences of comparable firms—can provide guidance, but always with the caveat that the past may not be predictive of the future.
- Another shortcoming of sensitivity analysis is that varying individual model inputs over predetermined ranges ignores possible interdependencies among variables.
- Finally, the forecaster's choice of maximum and minimum values for a given input may be subjective and result in a biased forecast.

Developing Alternative Scenarios

- Some of the limitations of sensitivity analysis can be overcome by considering specific scenarios.
- **Scenarios allow several assumptions to be evaluated simultaneously and can incorporate correlations among variables.**
- Prospectuses of public companies and other public data sometimes can help you make a reasonable forecast of a success scenario.
- The success scenario may be the one that is most important for estimating how much financing the venture will need. For other purposes, it is important to develop a more comprehensive forecast of uncertainty.
- Value, for example, depends on expected performance and uncertainty, not just on performance in a success scenario.
- How can scenarios be developed that reasonably represent the uncertainty of a new venture? For simple businesses like retail shops and restaurants, the realistic range of performance may be narrow.
- For those, it may be possible to rely on information from public sources, some of which we describe shortly.
- But how can scenarios be developed for a business with tremendous potential and great uncertainty?
- Consider, for example, the difficulties of forecasting the value of a speculative, but promising and potentially important, new medical treatment for cancer.
- The answer depends partly on expected future revenues and the uncertainty of those revenues.

Developing Alternative Scenarios (Cont.)

- Defining a **success scenario** for the venture's revenue forecast is not difficult. Public information is sufficient to accurately forecast the number of potential candidates for treatment.
- Using the techniques discussed earlier, we can forecast market share and sales volumes.
- Data on prevailing prices for proprietary treatments for other life-threatening ailments can be used to forecast revenues.
- However, it is hard to imagine a project that is subject to more uncertainty.
- How likely is it that the development efforts will succeed, and the patent holder can sell the product for a price unconstrained by government intervention? Moreover, how many competing research projects are under way, and how likely are they to succeed? What effect would innovation by a competitor have on market share and selling price?
- **One way to come to terms with the uncertainty is to define a small number of realistic scenarios in addition to the success scenario, such as the following:**
 - Development efforts are successful and the product faces weak competition from other successful efforts.
 - Successful development efforts are offset by strong competing products.
 - Development efforts are not successful and the project is abandoned.
- The entrepreneur's challenge is to construct alternative scenarios with realistic assumptions about their effects on product price and quantity and realistic assessments of their relative probabilities.
- Defining a small number of realistic scenarios helps focus the research and reveals the kinds of information that will be most useful.

Incorporating Uncertainty With Simulation

- **Simulation** is the final technique we consider for incorporating uncertainty into a revenue forecast.
- We first identify the assumptions behind the forecast.
- Then we assign a probability distribution to each key assumption and estimate correlations among the variables.
- These assumptions can be developed using historical data, evidence drawn from other companies, and/or fundamental evaluation of the market and potential demand for the product.
- We already have seen that IPO prospectuses can contain much useful information.
- Reports from Wall Street equity analysts often include descriptions of target customers and estimates of market size, selling prices, and time to market.
- Agencies like the Food and Drug Administration (FDA) provide voluminous data on drug and device approvals, clinical trial timetables and results, and similar information.
- All such sources can be used to approximate probability distributions for key variables and to establish relationships and estimate correlations among variables.

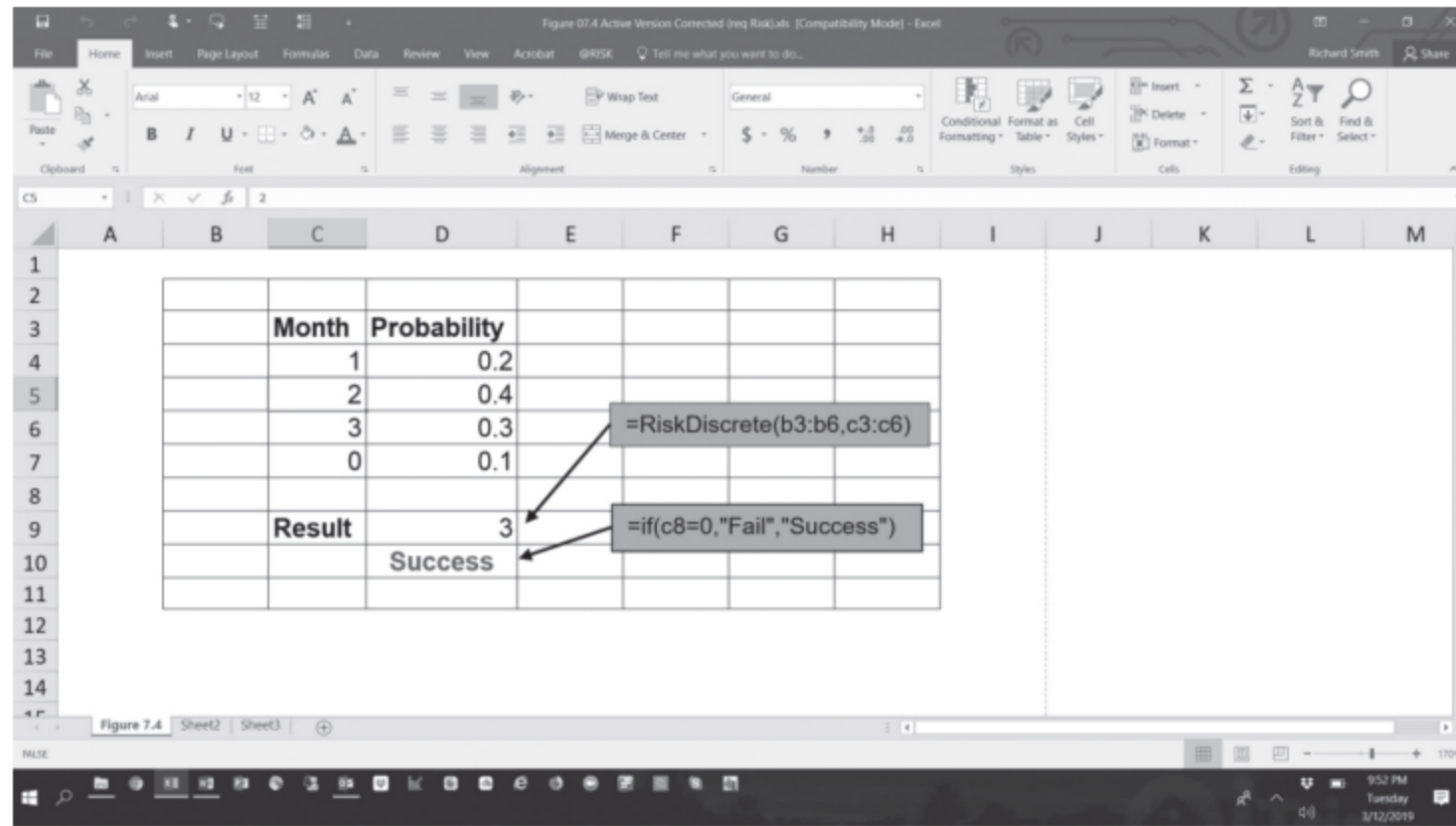


FIGURE 7.4

Discrete probability approach to simulating development timing

The figure shows the simulation structure and a randomly generated outcome.

7.7 Summary

- Selling a product or service is at the core of any company's business model. Although estimating sales is especially challenging for a new venture, financial forecasting disciplines the way an entrepreneur thinks about the venture. Not only can forecasting be used to develop and test hypotheses about the opportunity and help determine cash needs and the timing of those needs, it can also affect the value of the venture. A forecast can be an important fund-raising tool if it convinces prospective investors of the merits of the project and provides some specific performance benchmarks.
- The starting point for any financial forecast is an estimate of revenue. The venture's strategy for getting customers to purchase its goods or services is of critical importance for any business plan. If the forecast is for an existing business, we can use historical data as the basis for projections. Numerous statistical techniques are available to improve forecast accuracy using historical data. Tradeoffs of selection criteria include data availability, model complexity, and uncertainty.

7.7 Summary (Cont.)

- For a new venture, yardsticks and fundamental analysis can help overcome the lack of an historical track record.
- Yardsticks are comparable firms—either public or private—that have a product and strategy reasonably close to that of the venture.
- Data on yardsticks can come from IPO prospectuses, 10-K filings and annual reports, and other public sources.
- Even if good yardsticks are available, it is useful to develop a sales forecast based on fundamental analysis.
- With fundamental analysis, the entrepreneur collects data on customer demographics, macroeconomic factors, substitute products, and so on and then uses the data to develop a set of assumptions for forecasting revenue.
- The forecast model is most useful if it reflects a solid understanding of the product and industry and if the forecast links expectations for performance in the product market to implications for financial performance.
- The assumptions are most useful if they are defensible and backed by research and objective data.

7.7 Summary

- Any financial forecast must reflect the uncertainty implicit in the key assumptions. Uncertainty can be analyzed using sensitivity analysis, scenarios, and simulation. With sensitivity analysis, we vary key assumptions over some reasonable range to see how revenue or some other financial metric is impacted. Sensitivity analysis is limited, as we can vary only one or two variables at a time and correlations between variables are not recognized. Scenario analysis involves developing several stories about how the venture might progress and then matching assumptions to each story. Using scenarios overcomes the limitations of sensitivity analysis, but we are still limited by the number of scenarios that can reasonably be evaluated and the need to assign probabilities to each outcome. With simulation, an infinite number of possible paths can be generated and analyzed. This method allows for the most realistic assessment of the venture's future, but reliable results are dependent on the validity of the assumptions.
- The new venture revenue forecast forms the basis for forecasting the rest of the financial statements, with an ultimate goal of estimating the venture's cash flows and valuing the opportunity.



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