

PART I

Financial Modeling Structure and Design

*Structure and Mechanics of Developing
Financial Models for Corporate Finance
and Project Finance Analysis*

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CHAPTER 1

Financial Modeling and Valuation Nightmares

Problems That Financial Models Cannot Solve

An inevitable step in just about any financial analysis these days is making some kind of explicit or implicit projection of cash flow and/or earnings and/or financial ratios that measure profitability, credit quality, or other key performance indicators. Since valuation of debt or equity is all about making forecasts, you could go to a fortune-teller or read the astrology section of your newspaper to make a prediction about the future. These days, however, forecasts used in valuation are more often founded on fancy financial models built using elaborate spreadsheets. After the East Asian crisis of 1997, the bursting of the dot-com bubble in 2000, the global financial crisis of 2008, the European debt crisis in 2010, and innumerable other less famous valuation disasters or missed investment opportunities where debt and equity valuation failures had relied on sophisticated financial models, it could be argued that going to astrologers and fortune-tellers would have been a better strategy.

Notwithstanding serious questions about the general efficacy of making financial projections and the dangerous ways in which people make forecasts, the fact is that financial models are becoming more and more complex and they are also being used more than ever before in all types of investment analysis. Seemingly sophisticated financial models using elaborate programming functions can appear impressive and even artistic. But these beautiful models are also often almost impossible to use in assessing risk and value. Given the prominence of modeling in financial analysis, the first part of this book describes how to build flexible, accurate, structured, and transparent financial models that can be used to assess various different valuation problems.

When studying many valuation mistakes made in the past decades, it becomes clear very quickly that the most important pitfall in modeling is the

development of economic assumptions for prices, volumes, capital expenditures, and operating expenses that are put into the models. The problems did not happen because of making a spreadsheet that did not follow some bureaucratic best practice defined by some IT staff. If you take a step back and think about all sorts of past financial failures ranging from the global financial crisis to bankruptcies of small business enterprises to industry-specific failures such as solar panel manufacturers, there are a few patterns of mistakes that are repeated and that seem obvious after the fact. Before delving into sophisticated mathematical equations, spreadsheet techniques, and model structure issues that deal with methods to resolve difficult project and corporate finance modeling challenges, you should think about why the outcomes of financial analysis using financial models sometimes fail so miserably. You can then leave these ideas somewhere in the back of your brain while you create the ornate models that follow all of the rules about flexibility, accuracy, structuring, and transparency.

Some recurring valuation mistakes related to financial modeling that continue to be made despite more and more sophistication in financial analysis include the following nine errors:

1. Making assumptions in financial models that business entities earning a rate of return substantially higher than their cost of capital and growing quickly can continue this financial performance for a long time even when they do not have some kind of sustained competitive advantage.

Earning a higher return than the cost of capital and growing quickly seems to put a company in the famous powerhouse square shown on management consultant PowerPoint slides, which is supposedly the best place to be for valuation. But when returns and growth are high, valuations are also high. More important, other companies from all over the world will attempt to enter the industry no matter how unique managers of the company claim to be. New capital expenditures from other companies entering the market then lead to industrywide overcapacity, followed by reduced prices and sudden dramatic declines in returns. If demand growth is slower than expected, which happens more often than not, the overcapacity and depressed prices can last for many years and the company suddenly finds itself in the worst box on those management consulting slides. Examples of high growth and returns leading to industry expansion followed by surplus capacity and price crashes include the famous telecom industry meltdown in the late 1990s, in which more than 50 percent of loans defaulted; the merchant electric power crash of 2000–2001 in the United Kingdom, where virtually every electricity plant without a fixed price contract defaulted on its debt; the real estate industry during many periods, most notably before the U.S. crash of 2008; very high returns earned by solar

manufacturing companies, followed by massive new entry and dramatic price declines after Chinese manufacturers entered the industry; high returns earned by bulk cargo vessels before 2008, followed by overcapacity and depressed prices that have continued long after commodity prices and other industries recovered; and depressed occupancy rates and room rates for hotels in Iquitos, Peru, following a period of overbuilding that was initiated when the region received UNESCO heritage site status.

2. Entering projected prices in financial models that remain above the long-run cost of production even when capacity is increasing in an industry.

You can define a bubble as a situation in which prices are above long-run marginal cost and/or asset values are not consistent with levels that provide investors with a reasonable return on their investment. Assuming that prices can be sustained above marginal cost is an error that has happened before the U.S. real estate crash, when people believed they could profit by buying and selling (or flipping) a product. It occurred during the famous tulip bubble in Holland in the seventeenth century, and it may be happening in U.S. natural gas prices above the marginal cost of producing shale gas. The assumption that prices could remain above marginal cost was behind the valuation mistakes just discussed in comparing returns to the cost of capital, ranging from the telecom industry crash to overproduction of container ships.

3. Using information in financial models that relies on so-called independent experts, whether these people or institutions are credit rating agencies, large and reputable corporations, consulting companies that create very fancy models, experts speaking on CNBC or Bloomberg, famous finance professors, or former politicians.

Many valuation nightmares have demonstrated after the fact that it is more important to put your feet on the ground by visiting countries, meeting with real consumers, trying out products and services, and having a thorough independent understanding of the business idea than to trust on so-called experts when developing financial projections. Reliance on entities like rating agencies not only was a cause of the global financial crisis of 2008, but has also occurred with traffic studies made for project financings such as the Eurotunnel; toll roads and toll bridges all over the world; theme parks; and the Iridium disaster, in which Motorola promoted its satellite phones; and countless other cases. The famous Panama Canal catastrophe in which French investors lost so much money in the nineteenth century resulted from trusting the opinion of a famous engineer who had visited Panama only once. Relying on the reputations of companies that were thought to be the most innovative in their industry—such as Enron, WorldCom, and Lehman Brothers—without thinking through the fundamental competitive advantages and product quality has turned out to be very dangerous.

4. Trusting financial model results where increasing returns are projected by management, but not recognizing that the projected returns come about only because the company is taking on increased risks.

Companies with declining returns or lower margins than their peers often desperately try to increase or maintain equity returns. But these companies (or individuals) can generally meet their return objectives only by incurring increased risks and then trying to hide those risks using the latest business jargon and/or creative accounting. When taking on new ventures or deploying capital that involves taking greater risk, it is tempting for management to directly or indirectly cover up the risks through not fully disclosing things or worse, by using very sophisticated and confusing financial terms along with financial models that are impossible to understand. Examples of valuation errors caused by presenting confusing information include Constellation Energy in 2006–2008, Enron's impossible to understand financial statements, and innumerable financial institutions that made risky loans or engaged in risky trading behavior to boost their returns before the financial crisis of 2008.

5. Ignoring shifts in the cost structure and demand changes that can quickly render existing assets obsolete when developing risk analysis using financial models.

Sudden shifts in demand and/or price is a particular problem in modeling oligopolistic industries where seemingly stable returns and cash flows can suddenly change on the whim of competitor actions and/or changes in consumer taste and/or global events. Think about the sequence of Hewlett-Packard (HP), Nokia, Research in Motion (RIM, now BlackBerry), and Apple. A few years ago Nokia was all the rage with investors and the company was assumed to have unique products that would yield a sustainable competitive advantage and strong returns over an indefinite period. Then Nokia lost its luster and Research in Motion was the poster child for investors. A couple of years later RIM lost its popularity and Apple became the most valuable company in the world as it somehow made people even more addicted to their cell phones. In the case of automobile companies and airlines, sudden changes in industry demand could not be absorbed by companies with cost structures that contained high proportions of fixed cost from labor contracts, such as General Motors and United Airlines. Commodity industries may be very volatile and not offer extraordinary returns, but at least you can apply basic economic principles when thinking about prices, volumes, industry capacity, and market demand. Oligopolistic industries can be more challenging to evaluate in financial models because seemingly stable cash flows are subject to sudden changes that can occur that result in returns falling to levels below those of companies in competitive industries.

6. Putting faith in fancy, complicated, and innovative new financial paradigms when creating financial models.

At the turn of the twenty-first century the so-called new economy was supposed to replace traditional financial analysis that relied on cash flow and rate of return relative to cost of capital. New economy principles could explain why dot-com companies did not need cash flow or profit to generate value; real option models were used to justify new electricity peaking power plants that did not make economic sense using traditional discounted cash flow analysis; collateralized debt obligations supposedly could somehow reduce risk by putting together a bunch of shady loans that had been granted to people who could not repay them. When such new models cannot be explained in simple terms and when the seemingly sophisticated financial models cannot explain why one can somehow earn high returns without having a sustained competitive advantage, they almost always turn out to be rubbish. It is much better to study fixed and variable costs together when evaluating different possibilities of demand growth.

7. Having confidence in contracts that may be well drafted by sophisticated lawyers but that do not make economic sense, and incorporating those contracts into financial models.

Financial contracts that have turned out to be unsustainable included subprime loans issued before the financial crisis of 2008; electricity purchase contracts called power purchase agreements in Senegal, India, Indonesia, the United States, the Philippines, and many other places; construction contracts for large, complex projects such as the Eurotunnel and Euro Disney that chronically underestimated the actual cost; oil projects where ownership structures resulted in extreme economic profit for private investors; and financial subsidies from governments in Spain and the Czech Republic that led to very high returns for project developers. In each of these cases, financial projections made by analysts assumed contracts that would remain in place even though the contracts allocated risks in crazy ways and led to prices and returns that were far away from returns that could be realized on other projects with comparable risk. When contracts lead to returns that seem too good to be true, they probably are.

8. Inputting symmetrical upside case and downside assumptions into models when developing risk analysis without adequately considering differences in upward limits and downward exposures that create skewed returns.

Not properly accounting for deviations between upside and downside variation led to the California crisis in electricity prices in 2000–2001; it also leads to underestimating exposure to risk of nationalization when oil prices are low, and to retiring large plants when prices are low and have much more potential movement to the upside than to the downside.

9. Ignoring long-term trends in historic data and not understanding the value of long-term historic returns when evaluating financial projections.

In making financial forecasts you should carefully study the past and test your projections in light of any historic data that you can get your hands on. If results of your model do not make sense in the context of history, then something is probably wrong with the assumptions in your model. Similarly, investments for which you have good quality historic data are better than investments that rely on some kind of business plan or consulting study, all else being equal. Valuation mistakes that arise from not looking at history are illustrated by the stock price of General Electric in 2007–2009. In 2007 GE's stock price reached a high of \$42 while in March 2009 the stock price fell to a level of \$5. The valuation mistake in this case did not concern making a bad investment that went down, but rather failing to capitalize on an investment opportunity. To justify a stock price of \$5 you would have had to make a series of pretty unrealistic assumptions about GE's rate of return in light of a long series of historic data. The return would have to reach levels far below those ever experienced in history and it would have to stay at those low levels for a very long time. With hindsight, it is clear that not accounting for historical data when investing in GE and realizing upside was a big mistake.

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