Scenario-Based Valuation

Background

“Scenario-Based Valuation” is a method of valuing businesses that is consistent with the finance you know (i.e., DCF) but allows you to capture the “high risk nature” of private equity and venture capital. You will get a chance to use this in The Knot, for example. There is nothing new in this technique that you have not already seen in finance. Calculating the value of the cash-flows in the financial market by determining the expected cash-flows and discounting a rate consistent with the risk (systematic) of the cash-flows. The idea here is to focus on expected cash-flows in a way that helps you use your extensive business intuition or judgment. Each time you are doing an analysis, remember the twin goals: (1) Find the value, and (2) Figure out what you are betting on.

This short note is aimed at helping you implement this approach. If you get stuck with an “Excel problem” while working on a case, feel free to ask for a suggestion. And I have listed this in “steps” but of course the process is iterative. You might not get all or the right “key variables” on the first pass.

Step 0 DCF

There is nothing different in principle about valuing a start-up business.

\[ V_0 = \sum_{t=1}^{\infty} \frac{E[\tilde{c}_t]}{(1 + E[R])^t} \]

When you implement in an equity valuation, you typically model (say) 10 years
of cash flows and then think about a perpetuity (boring, normal,...) growth thereafter.

\[ V_0 = \sum_{t=1}^{T} \frac{E[\tilde{c}_t]}{(1 + E[\tilde{r}])^t} + \frac{E[\tilde{c}_{T+1}]/(r - g)}{(1 + E[\tilde{r}])^T} \]

Usually, we use a spreadsheet with about \( T = 10 \) years of modeled cash flows. The long horizon growth rate is \( g \approx 2\% \) – this is for the phase of the company when things are "normal". The discount rate, comes from a financial model of risk (say the CAPM) and is a number (currently) along the lines of 10\% (a beta of about 1).

In a VCPE setting there are a few things to consider:

1. Is the "risk" higher? We can chat about this in class. But the evidence is that the portfolio risk (beta, discount rate) is not all that different than in regular equity valuation. The cash flows have more variance and that matters. But not in the discount rate. (The steps 1 and following are aimed at how to think about the cash flows).

2. What if the VC wants to exit (sell) in five years? This is an important component of the VC investment cycle, but it does not really change how we think about valuation. Ask: "what will the company be worth in five years?" To answer that you still need to model the cash flows in years 6 to whenever. The VC has to sell to someone or in the market.

3. What do VC’s say they are doing? We will talk about this in class as well. It is complicated. VC’s use a variety of "rules of thumb" (akin to multiples) to do valuation. They are also interested in doing valuations "quickly" since they need to filter out the duds so they can focus on the companies with potential. It is also complicated since VC’s are "negotiating." If you want to "buy low," you want to tell the founder a lower number than perhaps the true value. Lastly, it is complicated by the fact that VC’s should "buy low" since they will be offering their "consulting services" as they monitor and mentor the business.

There is a lot to consider. My suggestion for you to get rolling is to focus on a DCF valuation model. Once you have one working, then you can think about a more careful modeling of the cash flows. See steps 1 to 5 below.
Step 1  What are the relevant state variables?

What information about the future is important to the business value – these are key “state variables” (I will call these $x$.) Determining the important state variables requires your business judgment. Some of the variables may be apparent from the description of the business. Others may require some sensitivity analysis to see what drives value.

Here are a few suggestions:

- Identify information that makes calculating the conditional value on knowing the key variable, $V(x)$, straightforward. In our movie case, suppose you know the first weekend box office revenue. The information in $x$ does not eliminate risk in your esitmation. However, the remaining risk is easy to account for as “typical” business risk with a beta.
- Focus on items that are “debatable.” The goal is to conduct your analysis so that you can apply your business judgment. Try to specify things in terms of what you can quantify. (I find the marketing “chain” analysis helpful here. For a customer to buy from you, they need the item, they need to know about it, they need to choose you over a competitor,... . Marketing uses that to ask where to spend advertising dollars, for example. Here you can ask which one of those items in the chain is most uncertain, important...)
- Focus on information that will be resolved in a short horizon. You need to make assumptions about the state variables $x$. If you look too far into the future, your business judgment is less valuable (e.g., infinite horizon growth rates will never be known).
- Identify the “real options” or key decision points. There are often many and it is OK to simplify. When might you make the decision to shut down, ramp up, etc. What might that decision depend on? E.g., Customer base, prototype works, FDA approval

Step 2  Make Some Distribution Assumptions

Once you have identified key variables, you need to identify possible values or possible realizations. This is not an easy step. However, it is unavoidable. You cannot write down expected cash flows without implicitly making assumptions
about the state variables. By making explicit assumptions, you will highlight key assumptions. Again, this provides you with a target for your business judgment.

There are (at least) three sources of information available to you: the business plan, available external data, and business judgment. A good first start is to “reverse engineer” a scenario. In the Knot, for example, what has to happen for the cash flow projections shown in the case to be correct.

Step 3 - Calculate the “conditional” Value

Given a set of outcomes \(x\), what is the value, \(V(x)\). This is a relatively straightforward thing to do once you have a spreadsheet. (The Facebook case had this for you; key in an assumption about growth and out pops a value.)

In each conditional value, keep in mind that your future decisions might depend on \(x\). For example, if you have no customers and costs are really high, you will shut down the business. You will not have a perpetuity growth on a negative cash flow. Right?

Step 4 - Calculate Unconditional Value

We know (have a model for) \(V(x)\) and a set of assumptions about how \(x\) is distributed. Now just calculate \(E[V(x)]\). You can either doing this by looking at a few scenarios and probability weighting the sum. Alternatively, you can use a Monte Carlo simulation to simulate many possible \(x\), \(V(x)\) and take the average.

Step 5 - Analyze the model

None of valuation is simply “mechanical.” You need to impose your business judgment on things. The nice part of a coherent valuation model is you can shift your focus from specific to overall in an attempt to get to a reasonable valuation.

- In your model, how frequently does the business survive? If all your scenarios lead to success, you are likely too optimistic. Similarly, if all lead to disaster, you might be too pessimistic. (Both of those are “in general”)
- In your scenarios that are wildly successful, does that look “possible” or are you making an assumption that is unrealistic.
- How sensitive is your valuation to your distribution assumptions? Remember, VC and PE situations are high risk. You will find that your valuations
are very sensitive to your assumptions.

- One of the goals is to figure out "what you are betting on." This way you can use your experience and business judgment to aid in your decision.