Axiom on Value
A Monthly Note

Valuing a Startup as an Exercise in Quantum Physics

It seems to be clear, therefore, that Born's statistical interpretation of quantum theory is the only possible one. The wave function does not in any way describe a state which could be that of a single system; it relates rather to many systems, to an 'ensemble of systems' in the sense of statistical mechanics. (Albert Einstein, on Quantum Theory, 1936)

The value of a startup and the character of a wave function in quantum theory are similar in that neither is best described by one value but reflect an ensemble of values for which there is a central tendency. Valuing a startup business is not only difficult and complicated but there are many factors that more often than not lead to significant miscalculation. What we know is that there is no valuation model that is designed to address the spectrum of risks, and of course opportunities, that characterize startups as a group.

Axiom works with startups all the time, and the valuation framework most often used is discounted cash flow. The accompanying assumptions typically include a rapid growth phase to reflect the "market opportunity" and a very high cost of capital, to reflect the myriad of undefined risks expected to be encountered, which is then used to discount the expected super growth in free cash flow. The values that result from using this approach may pass the proverbial "smell test" but given the undisclosed trajectories that a startup can take, it is virtually impossible for early stage investors to use the business plan valuation as anything more than a hope and a prayer. On the other hand, early stage investors that are considering investing in the startup generally have a good idea of whether the business model makes sense and also whether the commercial market is large enough to support some level of activity that the startup represents. With this in mind, investors proceed by first giving the business plan valuation a significant haircut and then determine what percentage of the startup they need to own to produce the desired rate of return. The end result is that the entrepreneur gets some financial capital but at a very stiff price.

In order to properly value a startup that will yield higher business values and financial terms from investors that are likely to be less oppressive, entrepreneurs need to recognize two fundamental factors. First, they need to transparently incorporate, but not limited to, the factors noted below.

1. There are a multitude of risks, including not getting to market on time, the product/service does not function as anticipated, operating expenses are greater than expected, and efficiencies of scale do not develop as anticipated (meaning that expense levels are far higher than anticipated and the investment required to sustain commercial viability is greater than expected).

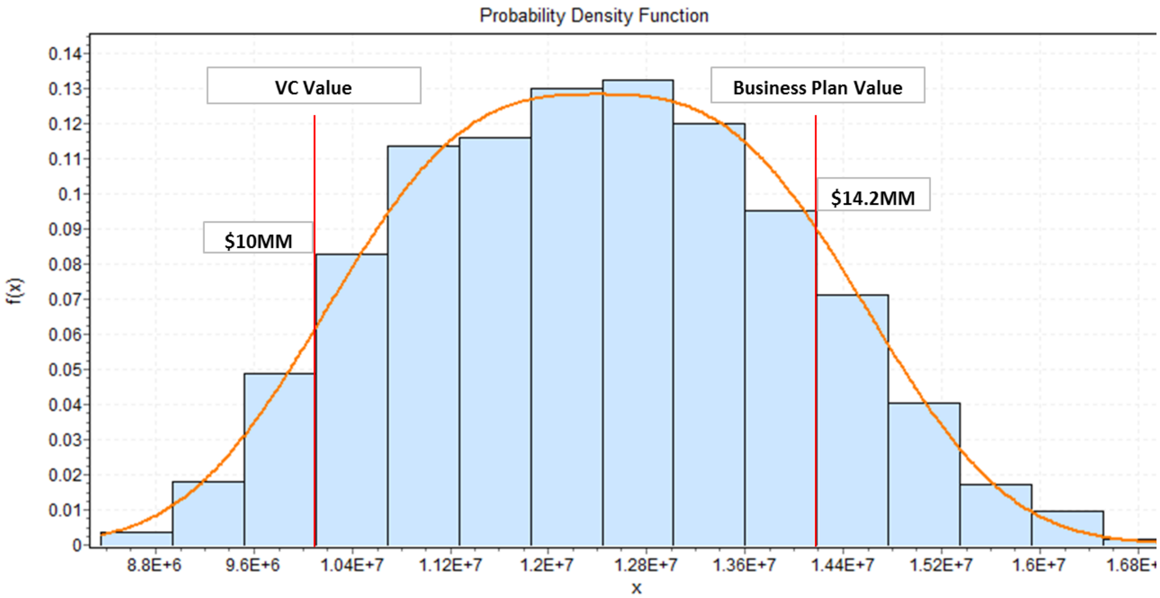
2. Sales may be greater or less than expected and customer segments may not be as receptive as originally thought, while others may be more receptive but in order to take advantage of these developments costly modifications of the product or service are required.

Second, and most importantly, entrepreneurs need to understand that the factors noted above, along with others, will likely combine in unexpected ways that will lead to sales and expense trajectories that the entrepreneur has not anticipated but will nevertheless be expected to cope with. Each of these outcomes is associated with a different business value which means that a startup is really not characterized by one value- the business plan value- but rather a distribution of values which reflect the market place the business will develop in.

The question then becomes how do these factors combine? Is there a logic that may provide guidance? For startups, more so then for established firms, there are many more known unknowns and this along with the plethora of unknown unknowns makes placing a final and precise value on a startup almost an exercise in futility. However, all hope is not lost once we are willing accept the view that we do not know what trajectory the startup will take and certainly we generally know almost nothing about when the startup will become commercially viable. If we consider the various factors that govern a startup and assume they will randomly combine over a future time period, then we can study what the valuation implications of these combinations are. If we randomly combined the factors described in 1 and 2 above, for example, what would this tell us?

First and foremost it would generate a distribution of firm values and the associated probabilities of achieving these values. ***The strength of this analysis is not in simply understanding the valuation implications if specific things go awry but rather what happens if some things go right and others do not since inevitably this will be the case. In the end, we do not really know how future values of various valuation drivers might combine in ways that may be detrimental to the startup or enhance its prospects. What we do know is that there are series of events that could occur and we want to know how these in combination will impact the prospects of the startup and its value***.

The Exhibit below is constructed based on 27,000 valuations which are produced by randomly combining the multitude of paths that numerous variables that drive valuation can take. The startup is an Axiom client selling its unique products and related services to an energy-related business client base.



The founder was in the midst of his first capital raise and was receiving feedback that the value he placed on the firm was too high. Given this feedback and accompanying term sheets that were hard to fully come to grips with, he turned to Axiom for help to better understand what the value of the firm really is and how to use what he learned to negotiate terms that are more consistent with the firm's central tendency value.

There are two vertical lines indicating the value assigned by the entrepreneur in the business plan and the value implied by a VC investor group's term sheet. Based on Axiom's analysis, the central tendency of the firm's value distribution is in the neighborhood of $12 million.

So what is the value of this startup? The answer is the value is likely to be between $10.5 and $13.6 million since this range covers a significant portion of the value distribution. The eventual transaction value is based on a multitude of factors but two that are critical are: level of investor competition and liquidity in the market for startups.

*Note: For this and other articles in the **Axiom on Value** series, see the Axiom Blog at:*
http://axiomvaluation.com/blog/

About Axiom Valuation Solutions

Axiom Valuation provides a comprehensive range of expert valuation services for private businesses, illiquid securities, fixed income portfolios, intangible and tangible assets, and other hard-to-value assets. We value thinly traded public companies and divisions of public companies for a variety of purposes.

We offer a unique alternative investment return authentication service (AIRAS) for institutional investors in hedge funds and private equity funds. Since 2001, Axiom Valuation has conducted valuation assignments for clients throughout North America, Europe, and Asia. Axiom serves it clients from its headquarters in Wakefield, MA and its branch offices in Arizona, Germany, and California. In the increasingly complex world of valuation, we provide ANSWERS YOU CAN TRUST, and UNDERSTANDING BEYOND THE NUMBERS. [Learn more.](#)

Contact Wakefield, MA Headquarters:

Co-Founder and Chairman	Stan Feldman	(781) 486-0100 Ext 204

Axiom Valuation Solutions Arizona Managing Director Vlad Hulpach (408) 703-1364	Axiom Valuation Solutions Europe Managing Director Thomas Klepsch +49 (0) 5731 1539897	Axiom Valuation Solutions California Managing Director Charles Sena (949) 296-7646