RISK-BASED NEW VENTURE VALUATION TECHNIQUE

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ACADEMIC ABSTRACT

New ventures that lack a financial history and have a future that is not only unknown, but may be unknowable pose unique problems to the investment community. Since conventional valuation techniques do not work in these cases, entrepreneurs and investors resort to techniques that rely more on art than finance. Although a reduction in information asymmetry usually leads to an agreement between two parties, the methods the entrepreneur or investor use to value a new venture tend to increase this information gap. The author proposes a logical, systematic risk-based new venture valuation technique that reduces information asymmetry during this process.

EXECUTIVE SUMMARY

Before a private equity investment is consummated, the investor and entrepreneur must first agree on the venture's value. Unfortunately, conventional valuation techniques, used for ongoing businesses, do not adequately capture the risk associated with valuing an early stage, pre-revenue company. (Mathonet & Meyer, 2007) Although finance theory states "the value of any investment is the present value of its future cash flows." (Smith & Smith, 2000, p. 234), "valuation of early-stage companies is a black art to those not involved on an ongoing basis with funding early-stage companies." (Berkery, 2008, p. 141)

Even when experts (investors and consultants) were asked to perform a blind valuation on a privately held company using 10 years of revenue history, the valuations varied from $6 million to $17.5 million. As interesting as these results were, the investors had a mean value of $8.85 million, while the consultants arrived at a mean value of $13.17 million, a difference of $4.32 million. (Waldron & Hubbard, 1991) As a footnote, prior to the study, the company in question had actually been sold to a larger publicly traded company for $18.5 million.

If experts cannot agree on the value of the company used by Waldron and Hubbard, imagine the additional difficulty of assigning a value when a company has no financial history and a future that is not only unknown, but in many cases unknowable. (Zeckhauser, 2007) Simply stated, this is the problem facing the private equity investor and the entrepreneur when attempting to agree on the value of a new venture.

The purpose of this paper is to describe a valuation approach to replace the "black art" of valuing early stage companies with a logical, systematic process which results in less information asymmetry.

BACKGROUD

Major sources of new venture equity financing are Angel Investors and Venture Capital. Angel Investors can be defined as individuals who make equity investments in companies absent family connections. (Kelly & Ray, 2003) A Venture Capital fund is a partnership, with a limited life, composed of individuals interested in investing in high growth companies and bound by a series of legal commitments. (Berkery, 2008)

Although both groups share the same investment goal, to achieve significant capital gains (Kelly & Hay, 2003), a majority of Angel Investors chose to invest in seed and early stage companies (Sohl, 2009) while Venture Capitalists tend to avoid investments in these same types of ventures. (Wiltbank, 2006)

The Center for Venture Research reported $12 billion representing 35,000 seed and early stage deals were made by Angel Investors in 2008, with $19.2 billion total investment in 55,480 deals. During the same period Venture Capital invested $7 billion, of a total $28 billion, in 1,555 seed and early stage deals. Venture Capital invested in a total of 3,980 deals in 2008. (Moneytree Reports, 2009)

Although the investment Venture Capital provided to seed and early stage companies represented over 36 percent of the total investment dollars in 2008; these investments correspond to slightly over 4 percent of the total number of deals made to this category of new ventures. Venture Capital tends to make large investments to a small number of companies in this group, while Angel Investors choose to invest smaller amounts but in a much larger number of seed and early stage deals.[1]

Therefore, since this paper specifically addresses the valuation of seed and early stage companies (i.e. new ventures); the term investor will be used generically to include Angel Investors and Venture Capital with the recognition that essentially all seed and early stage companies that receive investments do so from the angel investment community.

When an entrepreneur and investor seek to complete a transaction (investment in a new venture), they often have different amounts of information concerning the transaction. This information asymmetry can result in both parties coming to different conclusions about the value of the investment opportunity. (Kirmani & Rao, 2000) The uncertainty of the future combined with this information gap can result in the investor viewing the opportunity as risky and prone to failure. This situation requires the entrepreneur to change the investor's perception to a more positive view in order to secure the investment. (Phelan, 2005)

INFORMATION ASYMMETRY

A major barrier that can prevent the investor and entrepreneur from agreeing on the value of a new venture is information asymmetry. Asymmetric information occurs when "one party has information the other party lacks and cannot easily acquire." (Smith & Smith, 2000, p. 399).

Akerlof's seminal paper, *"The Market for Lemons: Quality Uncertainty and the Market Mechanism,"* offers insight on how information asymmetry can impact the marketplace for new venture equity investments. In the situation where the equity investment marketplace is populated with opportunities of varying quality and the investor is unable to determine the difference between a new venture with high-future-value (Mattsson, 2005) and a venture with

low-future-value, AND entrepreneurs with high-future-value ventures are unable to "signal" high-future-value to the investor, the investor has no choice but to treat ALL new ventures the same: as having the average of the high and low-future-values. Since this causes the high-future-value ventures to be undervalued, the entrepreneurs with the high-future-value ventures will withdraw from the marketplace resulting in a market failure called "adverse selection." The ultimate outcome of adverse selection is bad deals driving out the good. (Akerlof ,1970)

To overcome adverse selection, entrepreneurs with high-future-value new ventures are motivated to somehow communicate the high-future-value of their new ventures to the investment community to differentiate themselves from the low-future-value new ventures. (Mattsson, 2005) Unfortunately, information asymmetry can also result in entrepreneurs exaggerating the positive and minimizing the negative aspects of their new venture. This situation is referred to as "moral hazard." (Leland & Pyle, 1977)

Leland and Pyle go on to insist since moral hazard prevents the direct transfer of information, the investor should look to the actions of the entrepreneur, such as the entrepreneur's willingness to invest in the new venture as a signal of the "true quality of the project." (Leland & Pyle, 1977)

Although the literature confirms information asymmetry exists between the entrepreneur and investor, reverse asymmetry can also exist between the investor and entrepreneur when the investor is more knowledgeable of the market, competition, investment environment or other business methods. (Mattsson, 2005) At a minimum, the investor will have inside information on the "black art" used to determine the value of the new venture. This form of information asymmetry is also subject to moral hazard. The moral hazard in this case occurs because the investor can increase the probability of achieving a high return on investment (ROI) by insisting on the lowest possible initial valuation.[2]

Therefore, if the investor is interested in a mutually beneficial long term relationship with the entrepreneur, reducing information asymmetry through the direct transfer of information should be a priority of the investor as well as the entrepreneur.

NEW VENTURE VALUATION PROBLEMS

Although the rigorous analytical valuation techniques found in standard finance textbooks do not work with early stage ventures. (Berkery, 2008), "the present value of a new venture can be found by discounting future cash flows using a cost of capital that is appropriate for the risk." (Smith & Smith, 2000, p.271) These apparently contradictory conditions can co-exist because it is how the future cash flow is forecast and how risk is translated into the cost of capital (discount rate) that matters. (Berkery, 2008)

Most, if not all investors, reject discounted cash flow (DCF) calculations as the sole basis for valuation because their experience is long-term cash flow projections tend to grossly overstate the value of the new venture. (Berkery, 2008) Another serious deficiency of DCF calculations is how the discount or hurdle rate is assigned. In an effort to offset the optimistic cash flow forecasts, investors tend to assign high discount rates to use with the DCF calculation. (Smith & Smith, 2000) In addition, a single discount rate infers the risk or uncertainty is constant over time. (Leslie & Michaels, 1997)

Since DCF calculations present a problem, a market based valuation technique may offer a better solution. The "method of comparables" argues that certain financial ratios of a public firm can be used to establish the market value of a private firm. (Beaty, Riff & Thompson, 1999) The use of Price-to-Earning ratio (P/E) or Price-to-Sales ratio (P/S) is commonly used to estimate the value of a new venture. Unfortunately, both have deficiencies. In the case of P/E ratio, many early stage companies have no earnings. The P/S ratio, however, does not take into consideration differences between the comparable company and new venture in gross margin, size of the market or growth rates. (Berkery, 2008) Although the "method of comparables" comes closest to a true market value, the accuracy of the calculation is totally dependent on the similarity of the comparable to the new venture which is rarely possible.

The Special Case of the Venture Capital Method

The most accepted valuation method in the private equity market is the Venture Capital method. It also happens to be the simplest approach. (Smith & Smith, 2000)
There are only four steps to this method:

1. Project the company's net income for some terminal year. Scherlis and Sahlman suggest five years with the net income based on the company meeting its performance objectives.
2. Use a price-to-earning ratio from comparable companies to calculate the company's terminal value based on the net income arrived in step 1.
3. Convert the company's terminal value to the present value by applying a high discount rate (35% to 80%).
4. Using this present value as the denominator and the invested capital as the numerator, calculate percent ownership. (Scherlis & Sahlman, 1987)

Although this method is straightforward, it also has high subjectivity and major sources of information asymmetry toward the entrepreneur. It is clear the purpose of this approach is to insure the investor's investment objectives are achieved.

Although the wide use of the Venture Capital method is likely due to its simplicity, the author would also suggest that the investor enjoys the "advantage" the technique provides to determine the present value of the new venture while using their own ROI as the primary consideration. (see footnote 2).

"A new venture lacking investment has no value" appears to be the main defense for this approach. If using the Venture Capital Method results in investors developing sufficient confidence and experience to make investments, then the method is useful. The author, however, maintains that a similar result can be achieved by using a valuation technique that also reduces the information asymmetry between the entrepreneur and investor.

THE REAL OPTIONS DILEMMA

The primary concept of real options, as in financial options, is that uncertainty of a future outcome can be reduced over time. In other words, real options recognizes the consequence of learning on a new venture's value. Although financial options are well understood within the financial community, extracting these same principles from real options theory and applying them in practice have been problematic. (Leslie & Michaels, 1997)

Real options also provide the ability for an investor to make three choices at specific intervals: (1) invest further in the project, (2) modify the project or (3) abandon the project. Unlike DCF which assumes the risk or uncertainty (discount rate) of the expected cash flows is constant, real options factors in the changing uncertainty of the expected cash flows. (Copeland & Antikarov, 2003) How to easily integrate real options thinking into new venture valuations however remains a dilemma.

This paper suggests that by applying the risk-based valuation technique, the entrepreneur and investor can overcome information asymmetry, the problems with DCF and method of comparables as well as integrate real options thinking into the new venture valuation process. In order to present this risk-based valuation technique, the author will first introduce a taxonomy of commercialization risk and a review of financial modeling.

COMMERCIALIZATION RISK

Commercialization risk is a generic phrase that typically encompasses all risks associated with bringing a business concept to market. All new venture commercialization risks will have a large subjective component and therefore rely, in most part, on the knowledge and perception of the individual. In most cases, the information asymmetry between the entrepreneur and investor results in the investor and entrepreneur perceiving the commercialization risks differently. A goal all entrepreneurs must have when dealing with investors is to minimize this information gap so that the perceived commercialization risk is similar to both parties. The business plan is the main vehicle the entrepreneur can use to reduce information asymmetry.
For the purposes of this discussion, all commercialization risks are assumed to fall within the following three categories: (1) development risk, (2) customer acceptance risk and (3) marketing and sales risk. These three risk categories also follow the normal flow of the commercialization process.

Development risk deals with content and technology and consists of all activities required to answer the question: “Can this product or service be built or delivered?” The development risk is low when the targeted features and benefits of the product/service are known and measurable. All development activities prior to “beta” or pilot testing are included in this risk category.

Customer acceptance risk consists of activities required to answer the question: “Are we building the right thing?” The customer acceptance risk is low when a specific market segment has been defined where the unmet or underserved needs match up with the specific features and benefits of the product/service being developed. All activities associated with the successful completion of “beta” or pilot testing fall into this category.

The marketing and sales risk deals with positioning the product or service into close enough proximity to the target market so that a purchase decision is made. All activities associated with implementing the marketing and sales strategy fall within this category. This risk usually affords the highest risk in any new venture’s commercialization effort and can require the most expenditure. The marketplace is littered with products/services that had low development and customer acceptance risks yet failed in the market. The marketing and sales risk is considered low once positive operating cash flow is sustained.

Table 1: Commercialization Risks			
Type of Risk	Nature of Risk	How is Risk Resolved	Possible Milestones
Development	Can the product or service be built or delivered?	Features and Benefits are measurable	Feasibility Study Market Survey Prototype Pilot Manufacturing Patent
Customer Acceptance	Are you building the right thing?	Target market's unmet needs match with features and benefits of product or service	Focus Groups Beta and/or pilot testing is complete Regulatory approval
Marketing & Sales	Is the product or service available for purchase to meet sales goals?	Sales targets are met resulting in positive operating cash flow	Sales channel in place Promotional programs Strategic sales partners Specific sales goals met

These three risk categories have two characteristics. First, they are cumulative. The overall commercialization risk will be the sum of the individual category risks. A low risk in one category does not offset a high risk in the other two. For example, if the development risk is low (prototype is complete), but the customer acceptance risk remains high (have not found a specific market segment with unmet or underserved needs that match the features and benefits of the prototype), the overall commercialization risk remains high. Therefore, to achieve low commercialization risk, the perceived risk in all three categories must be low.

The second characteristic of the three categories of commercialization risk is they are serial. From an investor's perspective, the customer acceptance risk cannot be reduced until the development risk is minimized and the marketing and sales risk cannot be reduced until the customer acceptance risk is minimized.

This concept supports the natural flow of the commercialization process. For example, the customer acceptance risk can only be minimized once the specific market segment with needs that match the product/service features and benefits has been identified. This cannot happen until the development risk is minimized, and the product/service's features and benefits are finally known. The same can be said for the marketing and sales risk: Until the market segment has been identified, a low risk marketing strategy cannot be developed.

FINANCIAL MODELING

Financial modeling is critical to successfully determining the value of a new venture. As mentioned in the background, the cash flow of a new venture must be the basis for any valuation. How the cash flow is derived is the problem. For the model to have credibility with investors, it must use market based revenue and cost assumptions and contain granular details. (Mathonet & Meyer, 2007) For valuation purposes, the model must also result in a month-to-month financial statement that covers 60 months (income statement, balance sheet and statement of cash flows).

This model will combine managerial and financial accounting principles. Market based assumptions are used to determine the revenue and cost basis for the pro forma financial statements. In the United States, it is important that all financial statements conform to

General Accepted Accounting Principles (GAAP). This conveys the founders have an understanding of financial accounting principles which is important when dealing with investors.

The market and sales assumptions are used to drive the model's revenue engine, while the business model assumptions will determine the subsequent costs required to generate the revenue.

The Operating Cash Flow (OCF) is used to determine the enterprise's value as opposed to Free Cash Flow because the OCF indicates how well the new venture's business model is succeeding. Free Cash Flow can be impacted by other activities not directly related to the business model.[3]

RELATIONSHIP BETWEEN COMMERCIALIZATION RISK & FINANCIAL MODELING

As a part of the new venture planning process, a business plan must be developed that describes the compelling nature of the investment opportunity. To successfully accomplish this task, the narrative of the business plan must convince the investor the development risks and customer acceptance risks are sufficiently reduced to merit evaluating the financial aspects of the new venture. In other words, the revenue stream has credibility only after the investor is convinced the product/service can be developed and the target customer will respond favorably when the product/service is delivered.

The output of the financial model (pro forma financial statements) is the mathematical representation of the marketing and sales strategy. In other words, the marketing and sales risk can be visualized through the projected financial performance as represented by the financial model.

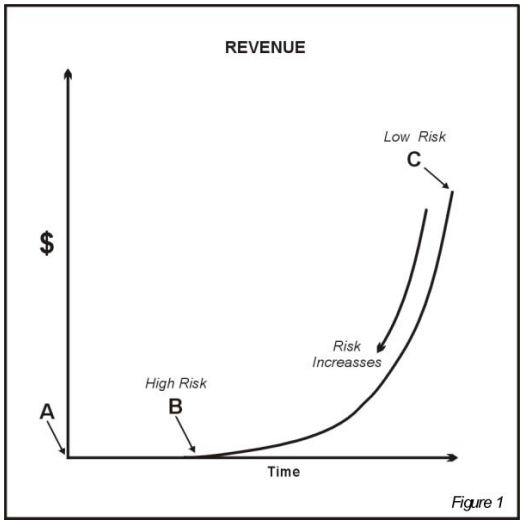

Figure 1

The revenue curve (one aspect of the pro forma statements) in Figure 1 helps explain this concept. In this graph, "point A" represents today, "point B" is when revenue begins, and "point C" is the last dollar of revenue recognized in the 60-month pro forma statements.

The first dollar of revenue (point B) has high risk because the marketing and sales strategy is unproven. Even if the company has market data indicating the marketing and sales strategy should generate the revenue suggested at “point B,” from the viewpoint of “point A,” this revenue still has significant risk since no sales have yet resulted from the new venture’s marketing and sales strategy.

On the other hand, if the company performs as planned and achieves the projected revenue stream (follows the curve B to C), that last dollar of revenue (point C) is certain to be achieved because the marketing and sales strategy is proven. Therefore, the marketing and sales risk increases from “point C” to “point B.” Understanding this concept of marketing and sales risk as viewed through the pro forma financial statements is paramount when placing a value on a pre-revenue company.

RISK-BASED VALUATION TECHNIQUE

The risk-based valuation technique consists of: (1) establishing a future value for the new venture using DCF, (2) validating this future value using comparable companies, (3) applying real options principles to assign a current value to the new venture and (4) adjusting the financial model to attain a balanced investment.

A mythical software company that requires a $1 million investment is used as an example. This company is pre-revenue and has plans to complete a working prototype followed by beta testing. The software product is unique and will be introduced in a new market not yet served by several major software manufacturers. After successful sales, the company plans to private label the software to one of these major software manufacturers while retaining the manufacturing rights. Using private labeling as a means to grow a company is often referred to as an Original Equipment Manufacturing (OEM) strategy. The pro forma cash flow statement indicates the amount of investment needed to complete the prototype is $400,000, to complete the beta test is $200,000 and to cover expenses until the first OEM client is signed is an additional $400,000.

Any attempt to assign a value to a new venture will always have subjective components. Much of the proposed technique is no different. What is attempted, however, is to provide as much objectivity as possible in assigning the company’s pre-revenue value.

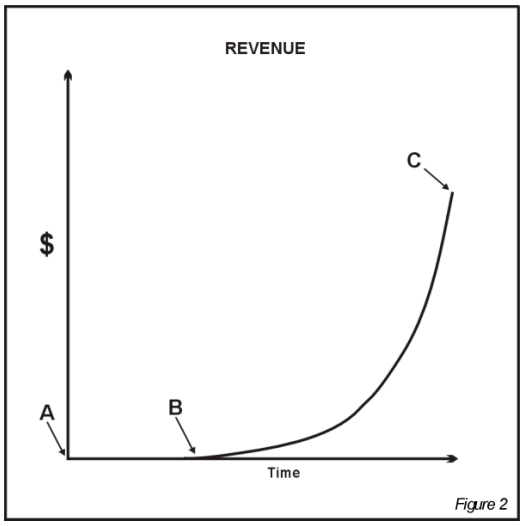

Figure 2

A company's pre-revenue value can be determined using this technique only if the Operating Cash Flow (OCF) is derived from pro forma financial statements and a business plan having the following characteristics (Refer to Figure 2):

1. The business plan's narrative minimizes the perceived development and customer acceptance risk to the point where the investor can agree the revenue stream is likely to begin at point B.
2. The investor acknowledges that the pro forma income statement underestimates revenue and overestimates costs. Therefore, the investor acknowledges that the resulting revenue curve (line B to C) is likely to occur and contains upside potential.

Establishing Future Value using DCF

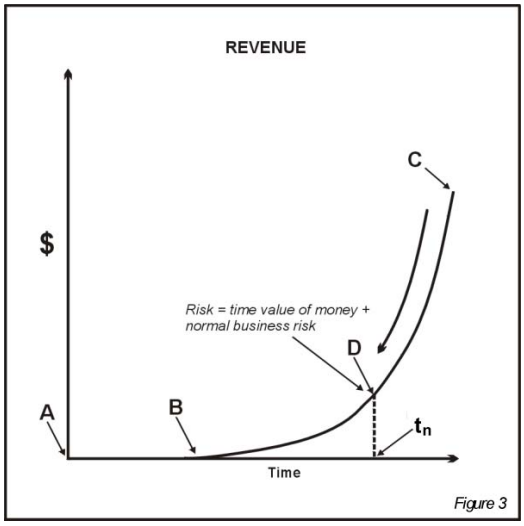

Figure 3

As mentioned previously, the revenue line (B to C) in Figure 3 can represent the risk associated with the marketing and sales strategy. The revenue at point B has high risk (unproven marketing and sales strategy) and the revenue at point C has very low risk (proven marketing and sales strategy). Therefore, the marketing and sales risk increases from point C when following the revenue line back in time to point B.

To begin the valuation process, a point between point B and point C must be established when the "marketing and sales strategy has first been proven." At this point D, all commercialization risks (as previously defined) have been eliminated from the enterprise. In fact, the risk of investing in this company at point D would merely consist of the time value of money plus normal business risk. Any investment in this enterprise at point D will have no more or less risk than investing in any other ongoing business. In other words, an investor will not assign a commercial risk premium on this enterprise when investing at point D.

At that point on this revenue line (point D) the risk will approach a normal risk. Therefore, at this time in the future, point t_n, an investor would require only a normal return on an investment.

This critical point in the company's future, normal business risk (t_n), will coincide with the point in time when the fundamental business model is viewed as working. The financial

metric that directly measures the performance of the business model is the OCF. As a rule of thumb, twelve consecutive months[4] of positive OCF is used as a good indicator that the fundamental business model is performing as intended. At t_n, the development risk has also been eliminated since the product is fully developed and the customer acceptance risk along with the marketing and sales risk are both minimized due to the enterprise's success in achieving sustained positive cash flow.[5]

Once t_n has been established for this company, point D is assigned the normal risk of 20 percent. This risk represents a combination of the time value of money and the normal risk associated with an ongoing business and is a reflection of the economic environment. In this Case, risk can be viewed as "what an investor expects as an acceptable return on a normal investment."[6]

Using risk as the discount rate, the future value at time t_n is calculated using a discount rate of 20 percent. The equation used to describe the value at t_n is the sum of two components: (1) the explicit value component and (2) the continuing value component. The explicit component consists of the forecast of the future cash flow for the sixty months in the financial model. Projections beginning at month sixty-one are implicit forecasts based on an assumption of the monthly growth rate going forward. (Smith & Smith 2000) The implicit value component of the equation recognizes the new venture is ongoing and will generate cash flow beyond that expressed in the financial model.

$$Value@t_n = \sum_{t=t_n}^{t} \frac{C_t}{(1+r_t)^t} + \frac{CV_T}{(1+r_T)^T} \quad (1)$$

Equation (1) describes the value at the time of normal business risk in terms of the explicit and continuing value components, where C_t is the cash flow for each month, t; CV_T is the continuing value as of the last month of the explicit value period, month T; r_t is the discount rate for month t cash flows; and r_T is the monthly growth rate beginning after month T. (Smith & Smith, p. 274)

For this example, assume this calculation results in a value of $20 million. As a result, the financial model indicates the future value of this company, at time t_n, is likely to be $20 million.

Validating Future Value using Comparable Companies

The next step in the process is to validate the company's estimated future value. Because t_n is a point in time when the company has normal business risk, comparable companies (Comps) can be found. Prior to this point in time, locating Comps for the new venture requires finding companies that have similar commercialization risks which is exceedingly difficult, if not impossible. Once the company achieves t_n however, finding comparable companies to validate the projected value is possible.

First, locate several public companies that operate in the same or similar markets and use a similar business model. The more characteristics the Comps have in common with the new venture the better. The recent financial performance of these comparable companies will be used to generate specific financial ratios that can then be used to estimate the new venture's value at t_n.

Price to earnings (P/E ratio) is a common and readily available ratio that can be used to describe the financial performance of a company with respect to the underlying value of the company. The numerator of this ratio, price per share, is the market value of the company divided by the number of outstanding shares. The denominator, earnings per share, is the net income divided by the number of diluted shares. Diluted shares include common shares, options and/or other potential future liabilities which reflect the overall capital structure of the company and can result in a lower P/E ratio. This ratio is useful when the companies being compared have similar capital structures.[7]

The P/E ratio is now multiplied by the new venture's projected annualized Net Income at t_n. The result is the value the market suggests the company would have at t_n based on the current value of similar companies. It is critical to use several Comps to estimate the range of values the market is likely to assign the new venture.[8]

In the case of the software new venture example, any value higher than $20 million using the Comps' P/E ratio will validate the financial model, while a value less than $20 million will indicate the financial model's revenue and cost assumptions must be modified because the model over values the company at t_n.[9]

Using this example, if the pro forma revenue curve were achieved, not only does the financial model indicate the future value of the company would be $20 million at time t_n (by discounting the OCF at 20%), but the market also suggests that same value (by using Comps). Therefore, it is reasonable to expect a person to exchange a $1 million investment at t_n for only five percent of the new venture's equity.

Applying Real Option Principles

The proposed technique incorporates several real options' concepts. According to the modified Black-Scholes equation for real options, six factors affect value: (1) present value of expected cash flows, (2) present value of fixed costs, (3) the options time to expire, (4) uncertainly of the future cash flows, (5) risk-free rate of interest and (6) value lost over duration of option. (Copeland & Antikarov, 2003) In the proposed technique, only the first four factors are used. Fortunately, these four factors have the most impact on the overall value of the real option. (Leslie & Michaels, 1997)

Establishing a market validated value for the new venture at t_n provides a reference point for determining the current value of the new venture. At "point A," the value of the company is much lower than $20 million because the risk at "point A" is significantly higher than the normal risk (20%) at t_n. This inverse relationship between risk and value is critical when applying real options.

To account for the change from a high risk at point A to a normal risk at t_n, a series of risk-reducing events must occur between these two points in time. The business plan must describe these critical milestones to justify this systematic reduction in risk. These critical milestones are termed value changing events because, when completed, the risk is reduced and the value of the company is subsequently increased. (Berkery, 2008) A well constructed business plan should contain a GANTT chart showing all of the critical commercialization activities which can then be used to identify the major value-changing events and when they are scheduled to occur.

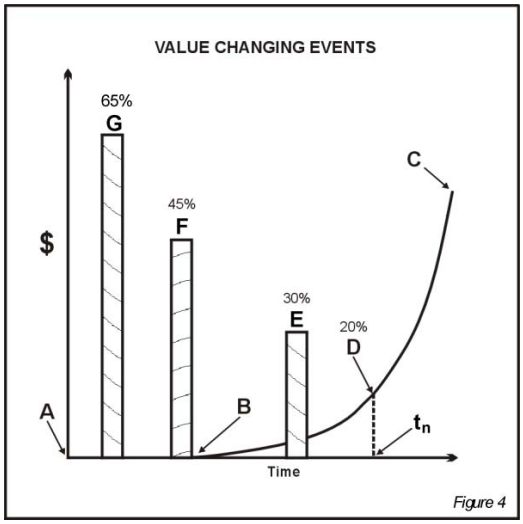

Figure 4

In the software new venture example (see Figure 4), three such value changing events have been identified prior to "point D": (E) first OEM contract is signed, (F) beta test is completed, and (G) prototype is completed. Each of these value changing events represents a risk-reducing activity associated with the three categories of commercialization risk. The time each event is planned to be completed is documented in the business plan.

- Development Risk (Event G) – Prototype completed. Converting an idea or concept to a physical "thing" will reduce the development risk.
- Customer Acceptance Risk (Event F) – Beta test completed. A successful Beta test will provide feedback on the customer's perception of the product and lead to changes in the product design to insure high customer acceptance.
- Marketing & Sales Risk (Event E) – First OEM contract signed. This event signifies the successful implementation of the marketing and sales strategy which will reduce the risk in this area.

This example indicates that at least one value changing event should occur within each of the three commercialization risk categories. Each of these events represents a reduction in the commercialization risk and therefore an opportunity for the company's value to increase after each objective is achieved.

Once the value changing events have been established and placed on the timeline, the entrepreneur performs a simple comparative analysis to assess the reduction in risk from one value changing event to another. Similar to the Venture Capital method, where a high discount rate is used to convert the terminal value to the present value, going back in time from point D (time of normal risk, t_n), the risk at each value changing event will increase to account for the increasing commercialization risk.

This process is purely subjective and will depend on the specific circumstances and nature of the commercialization activity. For example, the assignment of development risk to a value changing event will be influenced by the skill set within the organization. A prototype that is outsourced to experts who regularly produce such items will have a lower risk than an in-house organization who is building a prototype for the first time.

A likely rational for such a comparative risk analysis with respect to the software new venture example in Figure 4 follows:

- Point D (at t_n) has already "earned" a risk of 20 percent. Signing a large OEM account at event E does not guarantee that the revenue at point D will be achieved, but it does significantly increase the likelihood. Therefore, event E is assigned the risk of 30 percent. (The 20 percent assigned to point D plus an additional 10 percent of risk.)
- Event F signifies the successful completion of the beta test. This does not directly lead to signing a large OEM account, but it does indicate a high degree of customer or market acceptance and therefore a corresponding reduction in risk from event G. Therefore, a risk of 45 percent is assigned to point F (15 points added to 30 percent).
- The prototype is completed at event G. Although this event does not insure the beta test will be successful, it does indicate a significant reduction in the development risk. A risk of 65 percent is assigned to event G (20 points added to 45 percent).

Once completed, this analysis describes a high risk (65%) business opportunity diminishing to a normal investment risk (20%) provided the three value-changing events are achieved as shown in Figure 4. An investment risk of 65 percent can be restated as once the prototype is completed, there is only a 35 percent chance the revenue at point D will be achieved.

Replacing the t_n in equation (1) with the month each milestone is completed, the new venture's value at the completion of events E, F, and G can be calculated. In this example, assume the new venture's value at the completion of each event is: E - $10 million, F - $6 million and G - $2 million as shown in Figure 5.

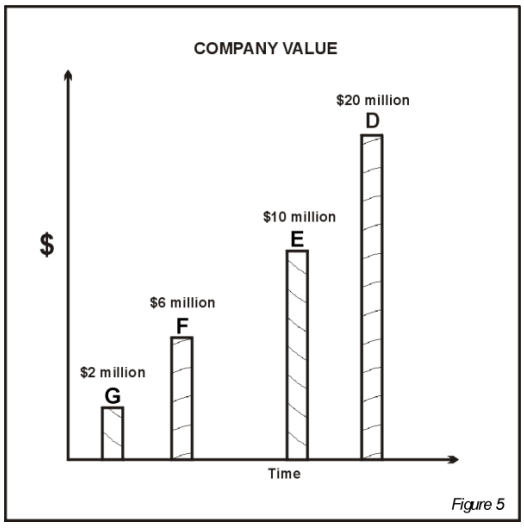

Figure 5

Therefore, with a market justified value of $20 million at t_n and taking into consideration the uncertainty of the OCF (a real option principle) at three value changing events, this software company will likely have a value of $2 million once the prototype has been completed.

From the entrepreneur's viewpoint, this valuation is disappointing since the required $1 million investment at the beginning of the project would translate into giving up 50 percent of

the new venture's equity. From the investor's perspective, investing $1 million at the beginning of the project would expose the entire investment to a 65% risk which may be too high. An additional real option principle, inserting a time period when the opportunity will expire, can now be applied to address these concerns.

Table 2: Impact of Staged Investment

Point	Value Changing Event	Discount Rate	Valuation	Required Investment	Retained Equity
D	Normal Risk	20%	$20 million	0	72.7%
E	OEM Contract	30%	$10 million	$ 400,000	72.7%
F	Beta Test	45%	$6 million	$ 200,000	76.7%
G	Prototype	65%	$2 million	$ 400,000	80.0%

According to Table 2, if the entrepreneur only requests and receives enough funding to complete each value changing event (based on the cash flow needs of the company), the total equity given up over the life of the project is reduced from 50 percent to approximately 27 percent.

From the investor's perspective, this approach only exposes $400,000 to the highest risk and each subsequent investment, if made, will have a corresponding lower risk. In addition, once each value changing event is completed, the investor is able to assess whether further investment is warranted and under what conditions. Therefore, the true benefit of incorporating real options when valuing a new venture is it takes into consideration the value of learning and inserts flexibility. In this case, the investor and the entrepreneur will know more about the future of this business opportunity once each value changing event is achieved. By staging the investment to correspond to cash flow needs and the completion of critical value changing events, the founders are able to conserve equity and the investor is able to minimize the investment's overall risk.

The four factors from the modified Black-Scholes equation used in this technique are:

1. The value of the company using DCF.
2. Exercise price expressed as staged investments
3. The options time to expire expressed as the time to complete the value changing events.
4. Uncertainty of future cash flow expressed as the risk (discount rate) assigned to each value changing event.

Balancing the Investment

A balanced investment is one where specific investment goals of the founders and the investors are satisfied. In general, from the founders' perspective, the primary goals are to receive the requested funding while conserving their equity position. From the investors' perspective, the primary goals are to make the smallest overall investment while achieving a target Return on Investment (ROI) at the earliest possible liquidity event.

The founders' goals can be achieved by balancing the initial investment versus the initial valuation. In this instance, exchanging 20 percent equity for the initial investment shown in Table 2 is probably a good balance for most entrepreneurs. If, however, the initial investment

is too high or the initial valuation is too low, the investment can be out of balance for the founders.

Most private investors in the United States are seeking an ROI of ten to one[10]. At the point of liquidity, they expect to return $10 for every $1 invested. Although they will settle for less, they will not make that initial investment unless they have confidence a 10:1 ROI is achievable. With this perspective, a balanced investment for the investor requires the earliest liquidity event to have a value ten times the initial investment. The example used in this discussion shows the first opportunity to implement an exit strategy (initial public offering, acquisition, etc.) is at t_n which has a value of $20 million. In this case, the initial valuation and exit valuation are indeed in balance.

Unfortunately, when this technique is first applied to any investment opportunity, the investment is rarely in balance. Attempting to bring the investment into balance requires: (1) revisiting the market data and adjusting the marketing and sales strategy and/or business model, (2) adjust the revenue and cost assumptions in the financial model to accommodate any change in marketing and sales strategy and/or business model, (3) generate the new OCF and (4) calculate a new valuation. As a part of calculating a new valuation, the timing of the value changing events and their corresponding risk/discount rates must be revisited.

This iterative process will be repeated several times until the three critical investment parameters come into balance: (1) initial investment required, (2) initial valuation and (3) the valuation at normal risk, t_n or the investment remains out of balance.

Results of using the Technique:

If the investment remains out of balance, the entrepreneur has performed an exercise that has revealed why the opportunity will not appeal to the investment community. This is a good result. Now, the entrepreneur can invest her time and energy in another project.

For those investments that are in balance, the founders can be confident that their opportunity may appeal to the investment community. A balanced investment does not guarantee an investment will be made. Even a balanced investment can have other characteristics that justify rejection by the investor.

A balanced investment suggests that based on a set of conservative market assumptions, the founders developed a financial model that indicates a valuation at t_n that has been confirmed by the market through comparables. In addition, the financial model also indicates, based on value changing events with increasing discount rates, an initial value for the new venture. The valuation results of this technique, however, are only as good as the assumptions in the financial and valuation model.

Although the resulting valuation is not definitive, it does represent the result of a logical, systematic process. Any discussions questioning the results of this exercise will center on subjects the founders are well versed. Investors may disagree with:

1. The value changing events
2. The discount rates used
3. Where the time of normal business risk occurs
4. Market or cost assumptions, etc.

From the founder's perspective, these are the exact topics that need to be discussed. If the investor is more informed on any of these subjects, their inputs can easily be applied to the model to see the impact on the valuation. These kinds of discussions provide a platform to reduce information asymmetry by direct information transfer thereby minimizing moral hazards and eliminate adverse selection.

Venture Capital Method vs. Risk-Based Valuation Technique

Although the Venture Capital Method and Risk-Based Valuation Technique have several steps in common, there are differences that significantly impact the quality of the results. Although both methods establish a "terminal value" using the "method of comparables" and use DCF to arrive at the present value, in many ways the Venture Capital Method is more subjective.

The Venture Capital Method does not rely on a market driven financial model to determine net income. The discount rate seems to be purely based on the investor's desired return on investment and not on any subjective analysis of the changing commercialization risk. In addition, this method tends to reinforce information asymmetry to the benefit of the investor.

In contrast, the Risk-Based Valuation Technique attempts to use financial modeling to tie market based assumptions to the cash flow to the valuation. The technique also incorporates real options thinking to reduce investment risk through staged investments. Using this methodology also encourages the founders and investors to reduce information asymmetry which should result in a valuation both parties can more easily agree.

BENEFITS OF RISK-BASED VALUATION TECHNIQUE

In most cases, the intrinsic difficulty of determining a new venture's value results in the founders failing to even make the attempt. They may spend an exorbitant amount of time developing a detailed financial model that describes every aspect of their proposed business opportunity. However, by not attempting to address the valuation problem, the entrepreneur forces the interested investor to unilaterally determine if the investment is balanced from their perspective. This places the founders at a tremendous disadvantage in the pending negotiations. The investment may be rejected because the investor fails to see a balanced investment, when in fact, adjustments could have been made to the marketing and sales strategy and/or business model to achieve a balanced investment for both parties.

Entrepreneurs who invest the time and energy in implementing this technique will have a better understanding of their business opportunity. This technique forces them to integrate marketing research data throughout the financial model that eventually migrates into the valuation of their company. In fact, there are two approaches when applying this technique: (1) Use reasonable and achievable market assumptions to determine if the investment is balanced or (2) Create a balanced investment and determine if the market assumptions necessary to achieve the balanced investment are reasonable and achievable. Either approach will ultimately have similar outcomes.

For business opportunities that survive this process and appear to be balanced investments, this technique provides a logical, systematic approach to assigning a value to a pre-revenue new venture. When confronted with an interested investor who disagrees with the resulting value, the subsequent discussion will center on parameters the entrepreneur is thoroughly

knowledgeable. For example, the investor may challenge the discount rates, the value changing events or other assumptions driving the financial model. The entrepreneur should be perfectly positioned to justify their use. In the case where the potential investor is more of an expert than the entrepreneur, the investor's suggestions can simply be inputted into the financial and valuation models and the results are then evaluated.

Both parties benefit from such a discussion and interchange where the inherent information asymmetry between the founders and investors can be minimized. This approach requires both parties to share information until either a balanced investment is achieved or the business opportunity is rejected.

Investors who insist that entrepreneurs use this technique can essentially eliminate moral hazard from their information asymmetry with the entrepreneur. The rigorous requirements imposed on the entrepreneur will minimize the ability to exaggerate or otherwise over estimate the financial performance of the new venture. The benefits to the entrepreneur cited above, will also inure the additional benefit of improving the "quality" of the deals presented to the investor.

At the end of the day, the true value of a new venture is whatever the entrepreneur and investor agree it is. This risk-based valuation technique simply provides a more objective foundation to base that negotiation.

CONCLUSION

Information asymmetry is an unavoidable part of the entrepreneur-investor relationship. In addition, the unique characteristics of valuing a new venture only magnifies this information gap. Existing early-stage valuation methods and techniques either foster or in part require the information asymmetry to be either maintained or increased.

The proposed technique builds on the widely used Venture Capital Method by using value changing events to add real options thinking to the process and market-based financial modeling to validate the "terminal value." Linking the "terminal value" to the point when the business model is proven (twelve consecutive months of positive cash flow) adds more objectivity to the method.

This paper also introduced a taxonomy that allows a logical, systematic look at the components of commercialization risk and a method of assigning individual risk during the commercialization process.

Introducing the concept of "balanced investment" into the valuation process encourages the entrepreneur and investor to reduce information asymmetry.
An area for further study that would make the technique more robust and less subjective would be how to quantitatively assign risk to the value changing events.

History of Technique

The author began developing this technique in 1998 while working for a non-profit technology incubator. Initial efforts were concerned with simply providing the nascent entrepreneur with a logical defense for a valuation based on a rudimentary financial model.

Beginning in 2005, the author was invited by the Center for Entrepreneurship and Innovation at the University of Florida to join the teaching staff in the Thomas S. Johnson's Entrepreneurship Master's Program. The capstone course of the program, New Venture Creation, has used this valuation technique as a key component of the business planning process. The instructor provides a multitab Excel spreadsheet template that each student uses to produce a custom financial model for their business plan. In addition, they use a second Excel spreadsheet template for performing the valuation. Each spreadsheet is linked so that any changes to the financial model assumptions flow through to the valuation model.

Integrating the risk-based valuation technique into the business plan process allows the student to clearly understand the relationship between market forces, financial performance, cash flow needs and company valuation as they attempt to achieve a balanced investment. This process results in an enhanced learning experience.

Special Note

Although this technique can be used with a wide variety of business opportunities, new ventures that require extremely large initial capital expenditures and/or have extremely long development cycles are not ideal candidates. These types of investments do not follow the normal pattern of achieving t_n. New ventures that plan to reach t_n in less than three years are best suited for this technique, since the financial model's cash flow only extends to 60 months.

ENDNOTES

1. Due to the 2008 financial meltdown, these numbers may be considered an anomaly. But even in 2005, $21 billion in private investment was made to 35,700 seed and early stage companies. Of that total, Venture Capital represented 23% of the dollars and 3% of the deals. (Sohl, 2006, Moneytree Reports, 2006)
2. Since the future price (terminal value) of the new venture is set by the marketplace, the investor only has control of the purchase price (initial value) to maximize ROI. Investors adhere to the maxim: Money is made on the buy, not the sell. The Waldron and Hubbard study where the expert investors' calculated a mean value of $8.85 million when the actual market value was $18.5 million may be an example of this moral hazard in practice.
3. Choosing operating cash flow over free cash flow is made on a case by case basis. There may be instances where free cash flow is a better indicator the business model is working (i.e. a business that requires a continuous inflow of capital expenditures).
4. Twelve months is only a guideline. The number of months of positive OCF to establish the business model may be less or greater depending on the situation. Whatever number is used must, however, be realistic to the investor.
5. If the company is introducing new products or introducing new distribution channels at or after point D, new marketing and sales risk would be introduced and the required twelve months of positive OCF would need to be extended until these new risks are minimized.
6. Normal risk is always relative to the investment environment at the time. In this case, the assumption is the public markets are providing an average 15% return to the average investor and an additional 5% is added to make up for the illiquid aspect of a private investment. A higher or lower normal risk can also be used as the investment

environment changes. For example, in a time of high inflation, a 20% normal risk would necessarily need to be higher.

7. If the companies being compared do not have similar capital structures and the P/E ratio does not appear to be a good metric, another ratio that factors in value can be used. For example Value to Net Earnings which would simply remove the number and type of shares from the equation all together.
8. An alternative approach is to calculate the P/E ratio for the new venture at t_n and compare this result to the P/E ratios of the Comps.
9. The revenue and cost assumptions driving the financial model must be adjusted so that the resulting OCF generates a value at t_n that is less than or equal to the value suggested by the Comps' P/E ratio. If the new set of assumptions do not seem reasonable, then the business opportunity may not be feasible in this market. For the remainder of this discussion, assume the Comps do, in fact, justify the $20 million valuation at t_n.
10. A 10:1 return on investment is somewhat arbitrary. As stated by Berkery: "Equity is expensive, and the investor wants 5, 10, or 20 times the capital back." (Berkery, 2008, p. 79)

REFERENCES

Akerlof, G.A. 1970. The Market for Lemons: Quality Uncertainty and the Market Mechanism, *Quarterly Journal of Economics*. 84(3): 488-500.

Berkery, D. (2008). *Raising Venture Capital for the Serious Entrepreneur*. New York: McGraw-Hill.

Copeland, T. & Antikarov, V. 2003, *Real Options: A Practitioners Guide*. Thompson Corporation, New York.

Kelly, P. & Hay, M. H. 2003. Business Angel Contracts: The Influence of Context. *Venture Capital*, 5(4), 287-312.

Kirmani, A. & Rao, A. R. 2000. No pain, no gain: A critical review of the literature in signaling unobservable product quality. *Journal of Marketing*, 64(2): 66-79.

Leland, H. & Pyle, D. 1977. Information Asymmetries, Financial Structure and Financial Intermediation. *Journal of Finance*, 32: 371-387.

Leslie, K. J. & Michaels, M. P. 1997, The real power of real options. *The McKinsey Quarterly*, Number 3, pp. 4-23.

Mathonet, P.Y. & Meyer, T. (2007). *J Curve Exposure: Managing a Portfolio of Venture Capital and Private Equity Funds*. West Sussex, England: John Wiley & Sons, Ltd.

Mattsson, J. (2005). Information Asymmetry, Market Signaling and High-tech Start-up Financing. Working paper. Helsinki University of Technology, Finland.

Moneytree Reports (2006, 2009). PricewaterhouseCooper and National Venture Capital Association. Retrieved from https://www.pwcmoneytree.com.

Phelan, S.E (2005). Entrepreneurship as expectations management, *New England Journal of Entrepreneurship*, 8(1), 49-58.

Smith, J. & Smith, R. (2000). *Entrepreneurial Finance*. New York: John Wiley & Sons.

Sohl, J. (2009). The Angel Investor Market in 2008. University of New Hampshire, Center for Venture Research. Retrieved from http://wsbe.unh.edu/files/2008_Analysis_Report_Final.pdf

Sohl, J. (2006). "The Angel Investor Market in 2005." University of New Hampshire, Center for Venture Research. Retrieved from http://wsbe.unh.edu/files/Full_Year_2005_Angel_Market_Analysis_-_March_2006.pdf

Waldron, D. & Hubbard, C. (1991). Valuation methods and estimates in relationship to investing versus consulting. *Entrepreneurship: Theory and Practice*, 16 (1): 43-52.
Wiltbank, R.E, (2005). Investment Practices and Outcomes of Informal Venture Investors. Venture Capital. *International Journal of Entrepreneurial Finance*, volume 7, issue 4.
Zeckhauser, R. (2007). Investing in the Unknown and Unknowable. Working Paper Series. Harvard University, John F. Kennedy School of Government.