

Risk and Return in Venture Capital Investment

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Investment decisions are often made in strange ways: most investors are concerned to accurately estimate the expected return on an investment. Yet the same investor will be content to classify the risk as low, medium, or high.

In other words, return must be quantified, but risk tends to be measured by hand-waves.

We know that high-risk investments need to produce a high expected return, and low risk investments will be accepted at lower returns. We also know that risk is sometimes measured, after the event, as the variance or scatter of the return over time.

But how many investors try to quantify the risk *before* making the investment? How many can say they expect a return of 18% pa \pm 8% (in which case the queue to invest should start here)? And how many who lost their capital, when they expected a 40% return, estimated the possible down-side risk at -140%?

How to measure risk

Risk is sometimes measured on historical investments by plotting the variance (or standard deviation) of the return over time. In the case of listed securities, this can be also be reflected in a plot of price over time. More volatile (risky) assets show greater fluctuations in price.

Price fluctuations in a listed entity are sometimes a bad reflection of risk, since they are influenced by the liquidity of the securities. The best measure would be one of overall return (capital gain plus dividend) over time.

Of course, in the case of prospective investments, we have no such data. All we have is a business plan

with projections of income, costs, cash flows and returns. Such plans tend to focus on a very few estimates of the return. There are usually three scenarios: optimistic, very optimistic, and hyper-optimistic. In the business plan they are called low, medium, and high. This kind of sensitivity analysis is a crude attempt to estimate risk.

In many business plans, we see only one estimate – usually the hyper-optimistic. For most business planners, the estimation of return and valuation are hard enough. How can one possibly measure risk?

The answer has been around for quite a while. A conference on venture capital in Brisbane in 1984 included a paper on risk measurement using Monte Carlo simulation. In those days you needed to borrow the university's computer for half a day to do it. Now, your office PC can do it while you have coffee.

As with all business planning techniques, it is imperfect, but better than none. In some asset classes, it works quite well. It is based on the same

measure as used historically – a variation in return over time, or the variance of return.

An example

Suppose you were contemplating making an investment in a farm to grow a high-value crop, say, nuts. There are many aspects of this investment you know something about, and a few that are difficult to foresee.

We know what the variation in rainfall and temperature is likely to be, because historical weather records are comprehensive. We might be able to say, for example, that one year in eight will be in the lowest 25% of annual rainfalls, or in drought, so that we could project a very low yield or no yield with that frequency. We also have good market data on prices, so we can input the variance of price over time into the business model. Similar statements might apply, with varying degrees of confidence, to the costs of inputs (fertiliser, pesticide, water, capital, labour).

Armed with this information, we can build a model that shows not just the expected return, but the variation of return. This model allows the inputs, prices, and yields to vary accord-

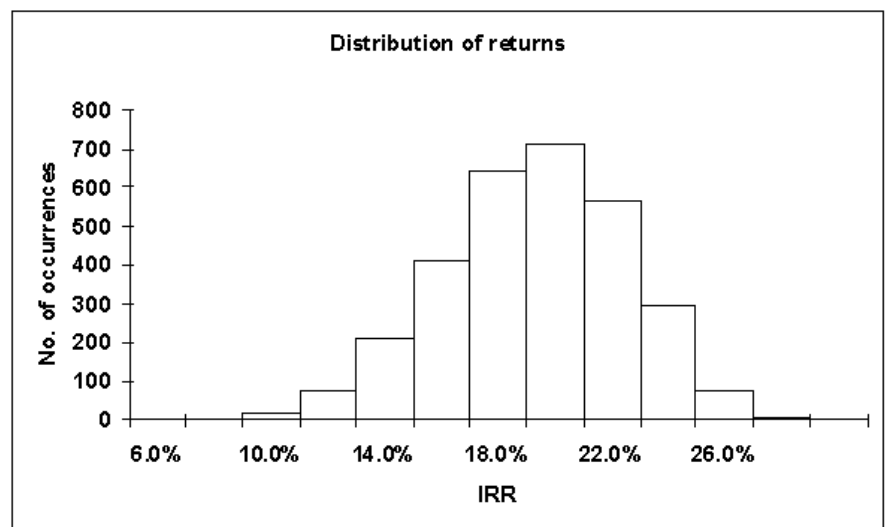


Figure 1- Sample distribution of returns for agribusiness project
The vertical axis represents the frequency of the IRR result out of 3,000 scenarios included in the Monte Carlo simulation that generated the distribution.

ing to historical data, then gives us not one but a range of estimates for the return on investment.

Our example of growing nuts in Queensland results in the graph (Figure 1) of the likely distribution of return on investment. Interestingly, even the mean (or expected value) of the return is different from that which is calculated without considering the variability of key factors such as yield and price. That suggests conventional analysis may not even accurately estimate the expected value of the return, let alone its variability.

We can then make statements such as: "There is a 47 per cent probability of making an average return over 5 years of 19 per cent" or, in some other example, "There is a 23 per cent probability of making a loss every 6 years"

This is a more informed basis for decision-making than the traditional business plan, or its analysis by venture fund managers. It is less dogmatic, placing more responsibility on the investor to apply his/ her preferences in deciding whether to invest. The investor can question the assumptions, such as the variation in market price, and the planner can incorporate them to see what effect it has on the risk and return.

It represents a much more rigorous approach than has been the norm in the process of evaluating and negotiating venture capital investments for the last 20 years.

Applications

The example given above is obviously favourable to this approach: in agribusiness, you have a lot of data on inputs and outputs, and a good understanding of how these businesses work. So, is the technique of use in other industries?

The answer is yes. The authors have applied the technique to businesses as diverse as aquaculture, agribusiness, waste disposal, and property development. Of course, some types of business are less well-suited than others to this approach. For example, a software development enterprise

suffers from great uncertainty in costs, prices, and market take-up.

Nevertheless, the authors believe the questions that are required by this approach should be asked. If the answers are vague, the approach may not yield useful information. On the other hand, this very vagueness tells the investor something he needs to know.

From what we have seen, decision making within the venture capital industry in Australia remains a black art. Investment managers ruthlessly cull the many proposals they receive, in their attempt to get down to their 2 or 3% of investments as quickly as possible. Our experience, from the other side of the table, is that they often don't do it well.

There is little doubt that a more rigorous approach to estimating risk, as well as expected return, of VC investments might enhance the performance of our venture capital industry.

Once the method has been applied, the prospective investor has a ready-made list of questions:

- On what data were the assumptions about price based?
- How sensitive is the return to labour costs?
- Is the variation in material costs a major determinant of yield? If not, does its large variance matter?

We can only imagine how the process might be transformed if both investors and potential investees were to adopt the same approach.

For difficult cases, the authors are developing more sophisticated statistical methods to take account of conditional probabilities – where the value of one variable depends on the value of another.

Portfolio risk and return

One of the values of the approach outlined above is for fund managers. Apart from measuring variation in a variable we can also, given the data, take into account the covariance of inputs. That is, we can measure whether two inputs are truly independent of

each other, or whether they are actually highly dependent. In this latter case, they must be combined intelligently, or the model will overestimate the risk.

The same kind of analysis can be used to compose a portfolio of investments where the risk of the individual assets is largely unrelated. This means that if one asset has a bad year, the others will not necessarily do so, protecting the investor on the downside. Fund managers try to do this with listed entities, but their capacity to do so is limited by their minority interests.

We believe the approach could be used to build a fund to invest in areas – such as agribusiness – where the expected returns may be lower than for high-tech businesses, but where there is little correlation between investee project returns. We think portfolio returns above that of listed equities is possible from less glamorous industries, though not by the margin that venture capital funds have aimed for in the past.

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