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Quant or bust:

an obituary for 20th century decision making

(How not to play Russian roulette with shareholders' money)

Corporate decision making is filled with allusions to eyesight: "it is good to be visionary", "you'd better keep your eye on the ball", "don't be blindsided" and "watch out for tunnel vision". When we talk about what a *company* sees, that is unquestionably data.

Yet, when it comes to the incorporation of data into strategic decision making and capital planning, it is typically a case of the blind leading the blind. Even when data is incorporated into strategic decisions, there remains an overwhelming preference for outdated tools, which do not respond to the realities of modern data analysis and the insights that this brings. Discounted cash flow models date from the same era as Polaroid cameras and liquid paper – and unthinking reliance on them has severe and often very expensive implications for investors, employees and all other stakeholders.

The way in which boards and management see their world is reflected in their forecasts. These forecasts are used (together with various models) to assist decision making. Any business decision involves weighing the relative importance of a variety of factors, including the potential payoff, the risk associated with that payoff, and the time horizon. Balancing short term costs against longer term benefits is critical.

Typically, some aspects of an investment decision are quite uncertain – in many cases, this may result in the investment simply not being made. In all cases, the basis for a decision relies on the translation and distillation of raw data and assumptions into beliefs about their business implications. The financial crisis has cast new light on methods that are used to do this, and especially their limitations. This includes whether some 'black swan' events might have been 'grey swans' (black swans that you might have found, if only you knew how to look). In an increasingly data-driven world, where the pace of change is adding to our uncertainty about the future day by day, better approaches to decision making are essential.

DCF models: the Polaroid camera of decision making

The traditional tools for valuing a company are based on ideas that are decades old. The discounted cash flow (DCF) method was developed in the 1930s by Irving Fisher and John Burr Williams and reinforced by the work of Modigliani and Miller in the 1950s (and many others besides). Widespread adoption by investment banks occurred much later in the 1980s and early 1990s. The DCF method is a valid approach to valuing companies, but as with all tools it must be used with skill and care if it is to yield reliable results. The DCF method is powerful because it converts a person's beliefs about the future into a present day valuation. However, it only ever shows one possible future, and the textbooks say that this future should be the one that the user expects to see. This disguises the fact that the future is intrinsically uncertain.

The standard industry practice for acknowledging this uncertainty is to consider a sensitivity analysis, which looks at a range of scenarios – often called 'high', 'central', and 'low' cases. Now here is the problem: How likely is the high case? How likely is the low case? Rarely do we even see people ascribe relative probabilities to a high/medium/low distinction – are the relative likelihoods 5:90:5 or 20:60:20 or 33:33:33? Even this discrete set of scenarios is a simplification. In reality, the future is a continuous spectrum of possibilities, not limited to three cases. The 'low' case is often chosen to be a modest downside scenario, which disguises the fact that catastrophes can and do happen. It is amazing how 'one in a hundred year' events happen much more frequently than once a century.

The forecasts which are inputs to a DCF model must be constructed – by the DCF model user. These forecasts necessarily incorporate that person's inbuilt expectations, biases and knowledge. Creating the forecasts needed for a DCF model has at least a small pinch of voodoo. A forecaster will look at historical performance, industry commentary, other related forecasts, and ultimately write down a figure. This process by which one forecaster, or even a team of forecasters, synthesises information is usually very subjective – from identical information, two forecasters can easily reach quite different conclusions. The problems that emerge are easy to see. Typically, the way a DCF model is used is highly subjective, because modelers don't explicitly account for the range of actual possible futures for the business and the different sources of information supporting them.

Thankfully, some of these issues can be rectified by considering the explicit distribution of possible futures for a company in a statistical sense. Rather than specifying high, medium and low cases, we can specify our beliefs about certain model parameters (eg a growth rate), and the inter-relationship between earnings and other various factors.

This approach has a number of benefits.

Firstly, it actually forces you to write down what you believe – how certain are you about forecasts, for instance? Secondly, whilst more time-consuming, it makes forecasting more robust because you end up with more information about possible outcomes. These additional outputs aid the decision-making process whilst also helping you test the reasonableness of your assumptions.

Thirdly, whilst it is possible to use 'expected outcomes' for valuation, this is completely useless for risk management. Knowing that a company won't breach its debt covenants in the 'base case' scenario isn't very helpful if further analysis shows the company has a 30% chance of doing so within three years. The traditional DCF usage fosters 'base case' thinking – this conceals and obfuscates risk.

Fourthly, there is a huge amount of objective data around which can be used to replace or augment pre-existing subjective beliefs. Suppose you work for a mining company and have been drilling holes in a tenement. How do you know whether you should drill another hole given what you already know about the tenement? Suppose you work for a toll road investment consortium and are trying to determine the capital structure for a new toll road, but you know that toll road forecasting has a chequered history in Australia – what do you do? Suppose you are trying to buy an agricultural property out of receivership with debt finance – how much debt should you be willing to take on given that the property previously fell into receivership because of an extended drought? Suppose you are a media company scheduling next season's programming – what do you offer for broadcast rights? These are all questions for which there is an objective, reliable and trustworthy answer, if only the right data sources are used, and the right type of statistical analysis applied.

> "If we have data, let's look at data. If all we have are opinions, let's go with mine." Jim Barksdale, former CEO, Netscape

Even for highly predictable volume-driven businesses where no single decision by itself significantly affects the profitability of the business, this approach leads to superior outcomes, because it leads to a more precise understanding of the nature and 'cost' of risks in the business, thus allowing for better capital planning. The approach we recommend is one which moves business decision making from a place of 'decision making with forecasts' to 'decision making under quantified uncertainty'.

The future is uncertain – and you can't change that

As Nobel Prize winning physicist Niels Bohr said, *"Prediction is very difficult, especially about the future".* The future is intrinsically uncertain. No matter how hard you plan or analyse, there will always be a significant degree of uncertainty which cannot be removed. The role of a business is to manage this uncertainty on behalf of shareholders – this is how returns are generated. If there was no uncertainty, all returns would be limited to the risk free rate.

Businesses deal with uncertainty in different ways. Some companies are paralysed by it. When confronted with uncertain data and the inability to forecast the future with precision, a company (read: board and management) can prevaricate and put its corporate head in the sand. This creates a tendency to consistently defer to the status quo, even when this may clearly not be a viable strategy in the long run. Businesses derive their value as the result of an amalgamation of decisions with uncertain future consequences. If you don't make decisions which have uncertainty, you don't have a business – you have a cash box buried in a vault surrounded by an enormous army.

We have had direct experience with companies that baulk at the idea of explicitly acknowledging uncertainty in some contexts. As an example, we worked for a company in an industry where the quality of data is widely acknowledged to be poor. We accounted for the poor data quality in our analysis and recommendations. Such an approach did not sit well with our client – they saw that the role of the board was to make decisions based only on data that was certain. The client wanted us to replace our analysis which accounted for uncertainty

with one which worked off a single, certain 'base case'. In another example, we saw management exclude completely valid data from the decision-making process because it did not conform to their world view. Pretending that uncertainty doesn't exist doesn't remove the problem – it just means that you are making a decision whilst being willfully blind.

Navigating uncertainty has very real implications in significant transactions, such as recommending an acquisition or commencing a major expansion. Ultimately, a valuation model is a decision support tool. 'Fair value' is an abstraction. In the context of a takeover, the question for the board is not what is the fair value of the target' but 'should we commit shareholders' money to buy the target'. The concept of fair value can itself mask critical aspects of the outcome of a decision. In businesses with highly asymmetric outcomes, you can expect to make money on average whilst having a 95% chance that you will lose money – think about tech startups, which have a high failure rate. Valuation is merely a tool assisting in that process. To be truly effective in a world of uncertainty, the process of valuation must incorporate uncertainties into the decision – not just apply a 'haircut' to the result (particularly as this haircut always seems to come in multiples of ten percent).

Acknowledging uncertainty can be hard and confronting, particularly when you start to use the language of outcomes. Take corporate leverage as an example. Directors and management will often approve a target debt level or leverage ratio. However, this is itself an abstraction. The reason that people really care about debt levels is that excessive debt can lead to insolvency. So what if, instead of just comparing leverage ratios, you instead consider the probability of insolvency within five years as a function of leverage? This concept intrinsically involves a statistical estimation, but is immensely more useful. It also helps guide the conversation away from 'a debt/capital ratio of 50% is fine under the expected scenario' to 'under a debt/capital ratio of 50% the probability of insolvency is uncomfortably high'. And it focuses the board's decision on the issue of 'how high is too high?'

> "To be truly effective in a world of uncertainty, the process of valuation must incorporate uncertainties into the decision".

The appropriate gearing level for a company is a very real issue, and one that can only be properly be understood in the context of probabilities of default – which assume an uncertain future. If only the analysts for investors in the various toll roads around Australia had looked at this issue in the right way, they might have made different decisions. The Sydney Cross-City Tunnel, the Sydney Lane Cove Tunnel, the Brisbane CLEM7 tunnel and the Brisbane Airport Link all became insolvent because of excessive debt levels, which were based on overly optimistic traffic forecasts. A comprehensive statistical analysis would have revealed the high likelihood of insolvency given the actual capital structures used and the challenges in accurately forecasting toll road patronage.

The issue for the toll roads stems from the fact that high leverage was imposed before knowledge of actual patronage – something that is learned very quickly once the toll road is open. A preferable approach to capital structure determination which acknowledged patronage uncertainty in a statistical fashion could have substantially reduced the risk of insolvency. Instead of maximising leverage before construction (when the traffic outcomes are very uncertain), this approach would see a low initial level of debt through construction, with the debt load taken on progressively as the actual traffic outcomes become known. In this way, the leverage ratio is directly matched to the patronage risk. This is a much better approach than taking massive bets on toll road patronage – as many equity investors found out because the attempt to maximise their returns actually resulted in the complete loss of their investment.

A similar story has occurred time and time again globally for leveraged wind farms, which have become insolvent within a few years of inception despite wind outcomes that were entirely predictable with the right analysis. If you leverage to the hilt based on average wind forecasts, you should not be surprised if you go bust in a perfectly

predictable period of lower than average wind.

Bringing big data – or rather "big analysis" – into the boardroom

The toolbox for making objective decisions under uncertainty has been around for a long time. The ability to update your forecast objectively as new information becomes available was formalised more than 200 years ago with the development of 'Bayesian' statistics. This deals with uncertain data, parameters and hypotheses and updates the view of the world as new information arrives. It was used by Alan Turing to break World War II encryption, in the 1950s to demonstrate that smoking probably caused lung cancer, and by Nate Silver to correctlypredict the outcome of the US Presidential election in 49 of 50 US states.

We've used this extensively in our own business – more or less everywhere. We've developed a new approach to valuation of resources companies that is dramatically better than existing models, we've valued one of the largest and most unpredictable irrigated farms in the Southern Hemisphere, and we helped one of Australia's largest utility companies implement a capital structure which withstood the financial impact of the Brisbane floods which hit just six months after its formation. And we predicted the Labor Party's outcome at the 2013 Australian Federal Election to within one seat some four months before the election, despite much less polling data being available compared to the USA.

Anyone who isn't using statistical approaches to dealing with situations with significant uncertainty is playing a financial version of Russian roulette. Single-scenario and point-forecast models are fine so long as the average occurs reliably (no bullet in the chamber), but represent a dangerous over-simplification of real life (one bullet every six shots). A better approach is available, and it unequivocally delivers a much better understanding of risk, and much better outcomes.

The corporate buzzword of the 21st Century is undoubtedly 'big data' – the generation and collection of ever-larger quantities of data from which insights might be drawn. More important, however, is the 'big analysis' that is required to distil meaning from data sets, whether they are large or small. In our own experience, we have been able to add as much value to decision making by understanding the true implications of limited sets of data, where information is sparse, as we have where data is extensive.

'Big data' is about analysing unstructured data to make inferences about cause and effect among various data, and has been driven by the ability collect, store and analyse information, thanks to the exponentially growing increases in computer power and storage capacity.

These techniques have obvious application to questions such as, "What are the characteristics of a customer most likely to churn their mobile phone contract?" or "What items should a supermarket stock to get customers to spend more in their basket?" The nature of these questions means that big data has often been driven by a bottom-up approach, where ideas percolate up from the operational level of a business to the top. As it percolates it is mixed with management's experience and judgment so decisions with higher strategic importance have less regard to the data alone. Quantitative analysis is still mostly relegated to stocking shelves and bundling goods, a long way away from the boardroom.

While companies are enthusiastic about 'big data', many of them have not even embraced 'small data' – making the best use of the information already available at board level. As discussed above, forecasting and decision making is riddled with subjectivity, and nowhere is this truer than in the boardroom. Yet, the advances that statistics, computers and quantitative data analysis have brought are truly powerful. Should these not be employed and considered by directors, who sit at the heart of all decision making in a company? Our experience is that there are substantial, concrete and demonstrable benefits to be had in applying these techniques to assist the decision-making process undertaken by boards. The opportunity to bring robust and objective analysis to the place in a company most dominated by experience and judgment is a powerful one. With the proven benefits of analytics, the question is not whether more advanced methods will get incorporated into board and management decision making, but when and how.

Most companies will ultimately encounter a seismic change in their industry – usually a severe event (or perhaps a near miss) that gives them to the opportunity to reshape their future to embrace methods which might have mitigated the disaster. Corporate dinosaurs will claim that what happened was entirely outside of their control or propose 'management renewal' which does not address the flaws in the decision-making processes. In contrast, the companies that will thrive will be those that embrace the uncertainty inherent in every aspect of their businesses. They will create boardroom cultures which love big analysis (and small data!), and have abandoned base case assumptions and the status quo.

Of course, none of this will make directors or management obsolete – decisions will still need to be made by people. But with the evidence of the destruction of incredible amounts of global value due to poor decisions made, despite the availability of data which could have altered those decisions, the time has come to say "enough is enough – there is a better way of doing things".

Silicon Valley has shown just how much value can be created by thinking differently, not just in technology but in other mainstream industries such as car manufacturing and solar energy. The same is true for financial and strategic decision making. In short, the future is quant, but more importantly your future is quant. The game is already afoot, and those that move early will be richly rewarded. P

Julian King, Andrew Paddon and Nigel Lake

Latest issue from Pottinger Perspectives:

We've all heard of the concept of the bucket list – the things that you really want to do before you die. But have you ever thought of making a bucket list for your company? The cold hard truth is that very nearly all organisations will meet with the corporate undertakers in the end. As an example, the world's first company, the Dutch East India company, was founded in 1602. At its peak, it employed nearly a million Europeans. Once richer and more powerful than most nations, it eventually died an ignominious death, appointing receivers in 1800. And at the other extreme, the large majority of small businesses and start-ups fail, the majority of them before their tenth birthday.

http://www.pottinger.com/bucket-list-20.html

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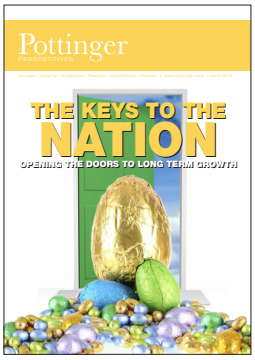

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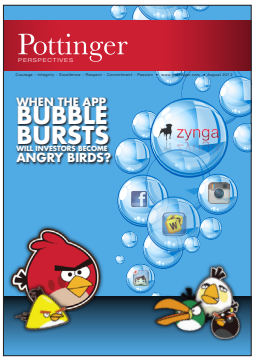

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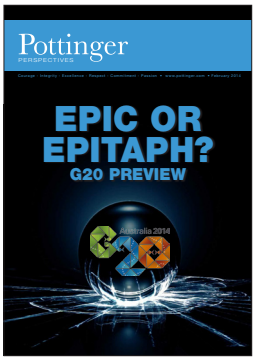

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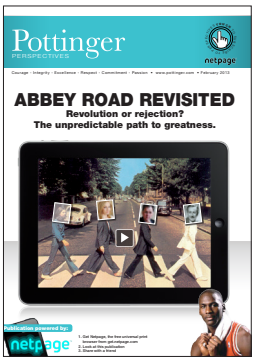

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