Evaluating Future Forestry’s Growth Potential

Introduction

“In real life, I assure you, there is no such thing as algebra.”

Fran Lebowitz, American author

If not in real life, then how about in a conference? Our organiser, John Stulen might feel nervous at this point, but I sometimes wonder if some attend conferences to escape real life. So I will engage in some algebra.

We can propose a forestry estate, which for plantation growers means a collection of stands. The forthcoming year’s cash flows will include the following:

- **C**: Direct forest establishment and growing costs
- **P**: Costs of production (i.e. harvesting, transport, harvest planning and supervision)
- **R**: Log sales revenues
- **O**: Overhead costs
- **L**: Log sales revenues (if it is rented)
- **A**: Capital expenditure (e.g. new permanent roads, bridges, etc)

The net imminent cash flow will be \( R_0 - P_0 - C_0 - O_0 - L_0 - A_0 \) (where the ‘o ’ subscript means that the revenue is within the forthcoming year). Next year’s net cash flow would use the same formula with ‘1’s as the subscript. Now, however, we want to represent next year’s margin not in terms of what it will be worth next year, but what it is worth to us this year. We’ll add it on to what we have for this year in the process. Our formula has now brought in another variable, \( i \), which we’ll refer to as the discount rate.

\[
P V \text{ Cashflow} = \frac{(R_0 - P_0 - C_0 - O_0 - L_0 - A_0) + (R_1 - P_1 - C_1 - O_1 - L_1 - A_1)}{(1 + i)^1}
\]

We can add on the contribution from year 3, and onwards in like manner, for however long we want to model into the future. In the forestry business in Australasia we might commonly be considering cash flows 60 years hence.

To the foresters in the room, this sort of expression is second nature, and so what is my point? An immediate response is that not everybody in today’s audience is a forester- as the conference title implies, others from the wider finance sector are present. So the message to you other participants is that we do talk in common terms, with the ubiquitous presence of discounted cash flow methodologies. I’ll concede that the illustrated version is very simple with no acknowledgement of gearing, tax, working capital, terminal values or other refinements.

The second message is the pervasiveness of the \( i \) term – the discount rate, and that is what I plan to talk about further.

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A third message is that Fran Lebowitz is inconveniently wrong. In at least some corners of real life there is algebra, but her sound bite is great.

The Discount Rate

So what is the $i$ for forestry investments? From my standpoint, after 20 years in the business of valuing forests, the evidence remains diffuse and at times, contradictory. There are two versions of $i$ that we are most commonly inclined to talk about:

- The Internal Rate or Return (IRR)
- The discount rate

They are both manifestations of the same fundamental measure – a compound interest rate.

- As its name implies, the IRR is internal. Within Australasian forestry circles we mostly confine its application to circumstances where our analysis spans a full rotation, starting with no trees present, and following the investment until we cut them down. This is not a rigid definition, but for want of expression to the contrary, it is the first interpretation of IRR that comes to mind for an Australasian forester.

- In contrast, the “discount rate” is, in most situations, externally derived. In essence the forester and the financial investors say, “Well yes – the IRR is very interesting, but what we need to earn on our investment is $x\%$. Such a discount rate may also be referred to as the “hurdle rate”, or the “cost of capital”.

To remind ourselves of the effect of the different rates, we can examine the value growth trajectory of a forestry investment that involves a single example hectare. Value which is based on the IRR starts with a tree crop value of zero, at age zero. It rises year on year with the additional funds invested in the tree crop (including direct costs, overheads and rent) with compound interest on all invested funds to date. There is a continuous value curve that exactly connects the funds invested in the tree crop and the eventual returns - that is the definition of the IRR.

**Figure 1: Value Trajectories**

In contrast, a discount rate that is other than the IRR produces different values at intermediate stand ages. In the illustrated example the discount rate is **greater** than the IRR, and so the resulting values are **less** at all ages prior to clearfelling.

I am aware that already I’m straying into definitional issues that can become more **complex**, and there is no time for an exhaustive treatment. For the purposes of this presentation I will propose that …

**IRR** – internal – typically relating to the span of the rotation

**Discount rate** – externally derived, and not necessarily coinciding with the span of a rotation
IRR for NZ forestry?

We should observe some historical context about where we used to think that the IRR resided. A series of Zone Studies were produced by MAF from the early 1990s. These presented IRR calculations for a range of species and regimes throughout the country. A common figure was 9.0%.

Within a handful of years, Gerard Horgan produced a very readable report within a Greenplan prospectus suggesting a rate of 7.0%.

At Indufor we find ourselves calculating the IRRs for a variety of New Zealand forests, at various times and for various purposes. We are uncomfortable with calculations that produce a single result. These give little appreciation of the precision level of the results, or their sensitivity to key inputs. To adequately represent these effects it is better to turn to Monte Carlo analysis, of which an example is shown in Figure 2.

Figure 2: Example Monte Carlo Analysis

Prior to the log price improvement from the 4Q2009, our calculations would have shown rates in the range of 4.5-5.5%. Within the particular example tested, there is a pronounced sensitivity to prevailing price levels. If we leave all other inputs unchanged and input the MAF domestic log price trends across the period December 2007 to December 2011, we get the IRR trend illustrated in Figure 3.

Figure 3: IRR Response to Log Prices
IRR for International forestry?

How do the New Zealand rates compare with international evidence? One most useful basis for comparison is the sequence of studies produced over the years by Dennis Neilson, Geoff Manners, Bob Flynn et al under DANA and then RISI publishing banners. Their "Tree Farm and Managed Forest Industry" reports of 1997, 2003 and 2007 each examine approximately 100 case studies around the world. A frequency distribution of IRRs from the studies is shown in Figure 4. The particular ones that are illustrated correspond to a subset of the data in which the assessed country risk is similar to that of New Zealand.

Figure 4: IRR Frequency Distribution (Neilson, Manners, Flynn et al)

From Figure 4 we see a broad range of IRRs, and a decline in the average IRR from one study to the next.

What rate do investors require?

There are three potential sources we might turn to:

- Declared rates
- Transaction evidence
- Built-up rates – WACC/CAPM

To emphasize a previous point, there is no mention of the IRR. There is general assent that because an IRR is internal, it offers no effective acknowledgement of the investor’s opportunity cost of capital.

This paper does not offer the scope for an exhaustive review of discount rates, but two recent publications are worth noting. The latest survey of discount rates used by New Zealand forest valuers has just been published in the NZ Journal of Forestry. The author is Professor Bruce Manley, Convenor of the Forest Valuation Working Party of the New Zealand Institute of Forestry. The graph is of my own derivation, employing Manley’s points. Four categories of survey responses are illustrated:

- The tax classification identifies whether the rates are for application to pre- or post-tax cash flows.
- “Applied” discount rates are those that the survey respondents apply when they are valuing forests. In contrast, the implied rates are those that they perceive have been demonstrated in recent transactions.

In producing “market” valuations, valuers try to reflect transaction evidence as faithfully as they can. Given this target, the Applied Discount Rates (ADRs) are in principle an attempt to extrapolate the Implied Discount Rates (IDRs).
In reviewing Figure 5, no clear trend from the last four surveys is apparent. Further, there is little sense of any narrowing of the consensus range.

**IWC Survey**

The International Woodland Company places its investors’ funds across a portfolio of timberland investments, including funds managed by some of the well-recognised Timber Investment Management Organisations. Through its investigative processes, it sees a large number of valuation reports from a variety of valuers. These relate to properties in a range of locations. In its February newsletter, IWC has reported on a comparison of its findings. Figure 6 reproduces one of the graphs in IWC’s newsletter - the full document should be read for a complete explanation.

The level of the rates seems intuitively sensible. The market for timberland is best established in the US, and with a higher frequency of transactions, there are lower perceptions of risk than elsewhere. In contrast, forests in “Emerging Economies” are likely to be less well understood, and their potential liquidity is uncertain. New Zealand has been grouped with Australia as “Oceania” within the graph. A median rate of approximately 8.0% is demonstrated.
WACC/CAPM approach

Once again we must gently refute Fran Lebowitz’s truism, for the WACC and embedded CAPM do provide us with opportunities for more forays into algebra.

\[
W_{\text{ACC}} = \frac{k_e (1-t_c)E}{(1-t_c(1-\gamma)V} + \frac{k_d (1-t_c)D}{V}
\]

Where:

\[
k_e = r_f + \beta_L \times (R_m + \tau_m - r_f)
\]

- \(k_e\) = cost of equity
- \(k_d\) = cost of debt
- \(E\) = market value of equity
- \(D\) = market value of debt
- \(t_c\) = corporate tax rate.
- \(\gamma\) = proportion of tax collected from the company which gives rise to the tax credit associated with an imputed or franked
- \(\beta_L\) = the levered or geared beta
- \(r_f\) = risk free rate
- \(\tau_m\) = “value” of imputation tax credits
- \(R_m\) = expected return on the market portfolio

The formulaic nature of the WACC could at first impression be reassuring. It suggests the promise that given some hard inputs, we can get some precise, authoritative outputs. There are, however, complications. Several of the inputs to the calculation defy exact estimation. One particular example is the beta factor which represents the correlation between the individual asset’s investment performance and that of the market as a whole. Recommended practice is to base the beta factor on the performance of listed forestry stocks, ideally those confined to owning forests alone and not complicated by associated processing activity.

Despite the recommendation, the international and local populations of pure-play forestry stocks have been diminishing. This has led to beta’s based on only a limited sample, and corresponding sensitivity to stocks showing aberrant behaviour.

Experts in the CAPM have also become increasingly inclined to recommend the inclusion of additional adjustors to the formulae, acknowledging the effects of a firm’s size and liquidity characteristics. The upshot is that the spread of WACC/CAPM-based results may not offer precision better than ±100 basis points.

The WACC/CAPM combination definitely warrants attention for the principled structured approach that it brings to the analysis. We have not yet been able to confidently assert that it gives us hard, precise results.

So where does the IRR sit relative to discount rates?

If we can’t tie down the IDR, or WACC/CAPM figures with confidence, do we nevertheless have a sense of where they fall relative to the IRR. As it happens, we do – our overriding sense is that the IRRs are less than the discount rates. This is not only in New Zealand, but most international locations where we are conducting forest valuations.
**The IRR / Discount rate discrepancy: Analysis at the level of a single example hectare**

**IRR higher than the discount rate**

**Figure 7: Discounting at the IRR and a Lower Rate**

Tree growing super-profitability will, in an informed, rational and frictionless market find its way into the land value. As the land value goes up, its actual or notional rent would go up, and the internal rate of return would decline. For this type of discrepancy, land value is potentially the great leveller.

**IRR less than the discount rate**

Once again land value can provide some levelling, but only up to a point. If there is enough disparity between the discount rate and the IRR, there is not enough value in the land to absorb the necessary reduction. The land price would have to be negative to allow the tree growing venture to achieve the hurdle rate.

**And so what is the message?**

At the single example hectare level the implications of the analysis are quite straightforward:

If you are buying a stand part way though the rotation, and can get it at a price consistent with your hurdle rate, then so far so good. If you have been perspicacious enough and fortunate enough to have estimated the future cash flows correctly, then by the time you see your trees harvested, you will have earned your hurdle rate.

Should you invest in the next rotation? Given your demonstrated perspicacity, we’ll assume that you have the numbers to estimate the IRR correctly. The decision rules of DCF analysis are then simple – if the IRR is less than the hurdle rate, don’t engage. Find something else to do with the land and your money.

**The discount rate and the estate model**

Here things can get interesting. Some years ago I was involved in an exercise for an Australian State Treasury – that is in itself significant because you would expect that this was a milieu in which all participants were financially literate (numerate?). We were dealing with the value of the State’s plantation resources. Only at the eleventh hour did the penny drop for them that incorporating a next rotation of forest in the valuation reduced the value. It was understandably a disconcerting finding, because it questioned the whole commercial attractiveness of what they had to sell.

**First, what might have led them to expect otherwise?**

Let us say that we have a “normal forest”. This is a technical forestry term that implies that there is an equal area of equally productive tree crop in each age-class of the forest. Moreover every age class in the intended rotation is represented. We might cut each age class as it reaches maturity and then replant it, maintaining the rotation. If the costs and prices all maintain their relativity, rising equally with inflation, then it is most convenient to express the
projected cash-flows in real terms. They will be the same, of the same net amount, and demonstrating the same composition, from one year to the next. The effect is illustrated in Figure 8.

Figure 8: Projected Real Cash-flows for Example Normal Forest

We can derive the Net Present Value for this cash-flow projection, using the formula introduced earlier. It might start at the first year, and extend indefinitely into the future. In this particular case we get an NPV of $14.3 million at a discount rate of 8.0%.

What if we advance the start point of our NPV calculation along the cash flow projections, and start at year 2? We find that the value remains steady, as we would expect it should – it is the same set of cash-flows extending indefinitely.

So how can including the next rotation be value destructive? As we progressively bring the next rotation in, the value is staying the same. Further, too, as long as there is an unbroken sequence of positive margins, then whatever the discount rate is, there is going to be a positive NPV from the next rotation. The financial analysts might again protest in frustration, “Where is there value destruction?”

An inkling that there is a problem comes if we expand or contract the resource. In the base case we have had 30 age classes, each of 100 ha. If we were to propose spending the next 10 years planting an additional 40 ha per year, what does it do to the current value? Running the model indicates that it becomes 13.751 million.

Conversely, if we harvest 100 ha in each of the next 10 years, and only replant 60, the value becomes 14.814 million. The prospect of expanding the forest reduces the NPV. The prospect of downsizing it increases the value. It appears the next rotation is value destructive because if we could avoid some or all of it, the forest would be worth more.

What is going on?
The explanation lies in the requirement for proper matching of the costs and returns. The following Figures partition the cash flows properly between the rotations. To have next rotations we have to start re-investing funds imminently and these, by definition, earn just the IRR.
As long as its IRR is less than the applied discount rate, then the next rotation will undermine the forest value, if a perpetual model is used as the basis for the analysis.

So where has this got us to?

An investor might have thought that by buying a forest at a discount rate of, say, 8% applied within a perpetual valuation model, that they would thereafter earn 8% on their investment. I would suggest that the explanation is rather too glib. Viewed in aggregate you may indeed be getting an average return of 8%, but if you look at the different stages in the investment the returns are very different.

At a purchase price of $14.3 million, you are making allowance for the fact that the next rotations can only earn 4.96%. If you were find a way to avoid the next rotation, and yet had acquired the current rotation for $14.3 million, then you could earn 9.5% on your investment.

The Future Chief Financial Officer

One way of rationalising the situation would be to propose that underpaying for the current rotation provides the necessary subsidisation for the next? My own misgiving is that I struggle a little with the sustainability of such an arrangement.

You could put yourself in the shoes of the CFO of the forest investment company some 20 years hence. Addressed on an incremental investment basis, what he or she has in front of them is an on-going stream of cash reinvestments in a business that is not earning its hurdle rate. Those originally responsible for buying the forest might well defend their actions saying, “Well, we purchased the current rotation cheaply in order to underwrite succeeding rotations.”

CFO: “And this effective subsidy is where, now….?”
20 years would be a bit late for buyer remorse.

Consequences
We continue to think about how to best address this current rotation/next rotations earnings rate capability when forest valuations are conducted on a perpetual cash flow basis.

- There is an issue for disclosure (and disclosure itself is a matter on which the financial reporting standards have been placing increasing emphasis)
- There is an issue for investor comprehension
- There is an issue for rationalisation (and among other matters there may be a credible argument for split discount rates)
- There is a spur to improve the profitability of forestry (if one wants to attract finance into it)

What about carbon?
Indeed – what about carbon? One response would be to say that growing trees for timber has to stand on its own two feet as an investment. A justification for this argument lies in the fact that more than half of the current national estate is pre-1990 forest and will therefore be denied the opportunities to exploit carbon trading.

It can nevertheless be noted that the numbers for carbon growing and trading look intriguing. If the price was to have remained at $20/NZU, then the contribution to NPV that carbon trading could offer was impressive.

Perhaps, since the title of my paper relates to future forestry’s growth potential, we don’t have to be concerned about the estate that is there now, and just consider what might drive expansion?

Conclusion
If growth is dependent on rewarding investors with sufficient return on capital, then the signals are uncertain. If plantation forestry in New Zealand has to have carbon to justify its expansion, then I am not satisfied that this is a good message. It raises the question of whether we should even be reinvesting in perpetuating a large proportion of the tree crop that we have.

What would make timber growing work? The single most effective variable would be higher log prices. If there was evidence that prices can at least be held in real terms, rather than demonstrating a decline, then this could have twin, synergistic effects:

- Enable a higher IRR
- Give investors the confidence to accept a lower hurdle rate.

I’m presuming that most here would like to see future growth in the extent of New Zealand’s planted forests. I believe that it would be good for national prosperity, and should indeed benefit the world’s population. It would certainly help in retaining New Zealand’s soil mantle. The most influential thing that we can do if we want to expand the estate is to assiduously pursue, and secure higher log prices.