

Discount rates used for forest valuation

Results of 2005 survey

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Introduction

Forest valuers were surveyed during August/September 2005 about the discount rate used for forest valuation. The survey is an update of similar surveys carried out every two years since 1997 (Manley 1998, 1999, 2001, 2003).

Method

A total of 22 forest valuers, mostly from consulting firms, were surveyed and asked:

1. What method do you use to determine the market value of a forest?
2. When using the DCF (Discounted Cashflow) approach, what discount rate do you use to estimate the market value of a forest?
3. What is the basis for using this rate?
4. How do you determine the log prices used?
5. What specific allowances do you make for risk?
6. How do you account for the cost of land in valuing a tree crop?

The first four questions were identical to those asked in previous surveys. The last two questions were suggested by participants at the NZIF Forest Valuation Workshops held over the last year.

Forest valuers were also asked for transaction information:

- their estimates of the discount rate implied by the transaction price of recent forest sales.
- price (\$/ha) and key factors (such as age, species, location, site productivity, silviculture, terrain) for sales of forests with a narrow age-class.

The latter request was an attempt to provide practitioners with indicative \$/ha values, particularly for young stands, to allow benchmarking with forest values estimated using DCF analysis.

Responses to survey questions

1. Method used to determine the market value of a forest

All 22 valuers primarily use the DCF approach to determine the market value of a forest. Thirteen of the valuers also sometimes use the cost compounding approach for valuing young stands – generally stands less than 5-10 years old which are not part of a larger estate.

2. Discount rate used to estimate the market value of a forest

The response from each forest valuer is summarised in Table 1. Compared to previous surveys, a higher percentage of valuers are using post-tax cashflows, the convention

adopted in the NZIF Forest Valuation Standards. A total of 17 valuers (77%) use post-tax cashflows, although three of these valuers also use pre-tax cashflows in some circumstances.

Valuers apply a discount rate in the range 6.5 to 9.5 % (average 8.35 %) to post-tax cashflows or a discount rate in the range 8 to 10 % (average 9.1 %) to pre-tax cashflows¹.

One valuer uses a discount rate of 8% for the valuation of small forests but uses 9% for the valuation of large forests because there are fewer potential purchasers.

Has the "market" discount rate changed since 2003?

In the 2003 survey, respondents were applying an average discount rate of 8.3 % to post-tax cashflows and an average discount rate of 10.2 % to pre-tax cashflows. The 2005 survey result for the discount rate being applied to post-tax cashflows is almost identical. The reduction in the average rate being applied to pre-tax cashflows is largely a reflection of new respondents using a lower rate on average than respondents who also participated in the 2003 survey.

The survey included 12 of the 17 forest valuers who had responded to the 2003 survey. Their responses to the 2005 survey were compared with their responses to the 2003 survey. Four of these valuers use the same discount rate, three use a lower discount rate, while five use a higher discount rate. The average discount rate used by this subset of 12 valuers was virtually unchanged.

3. How is the discount rate selected?

Fourteen valuers select discount rate based on market evidence. This evidence includes analysis of the discount rate implied by recent transactions (i.e. the IDR or implied discount rate). Three of these valuers also use CAPM (Capital Asset Pricing Model) or WACC (Weighted Average Cost of Capital), the opportunity cost of capital.

Four valuers primarily use an estimate or calculation of the required rate of return:

- Required rate of return by investors in this asset class.
- Required rate of return on alternative investments.
- CAPM.
- WACC.

Four valuers select discount rate primarily on the basis of current industry practice using information from other valuers, from the recent NZIF Forest Valuation Workshops or from previous rounds of this survey.

4. How are log prices determined?

A range of approaches are used including:

¹ If a valuer responded with a range of discount rates, the midpoint discount rate was used for analysis.

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Table 1 - Discount rate used to estimate the market value of a forest.

Respondent	Discount rate applied to post-tax cashflows	Discount rate applied to pre-tax cashflows	Basis for discount rate	Log prices based on
1	8 - 8.5		Market implied	Current + return to average
2	9 - 9.5		Market implied	Current
3	8.5		Others/Survey/Seminar	Current/Average
4	7.5 - 8.5		Market implied & WACC	4Q
5	9		Market implied	7Q + 5 * Current
6	8 - 9		Market implied	Current + return to average
7	9		Market implied/Others	12Q
8	7.4		WACC	Current + return to average
9	8 - 10		CAPM	Current + return to average
10	8.5		Others/Survey/Seminar	12Q
11	9 - 10		Market implied/Others	Current
12	8		Required rate of return	Current + return to average
13	8		Market implied/WACC/Survey	12Q to 20Q
14	8 - 9		Market implied	Current/12Q
15	8	10	Market implied & WACC/CAPM	Current + return to average
16	8	10	Market implied	Current + return to average
17	6.5	8	Required rate of return	Current
18		9	Market implied	Current + return to average
19		9 - 11	Market implied	12Q
20		8 - 9	Market implied	Current
21		9	Others/Survey	20Q
22		8	Others/Seminar	12Q

- Current (or most recently reported) prices – 4 valuers.
- Average prices for the last 4, 12 or 20 quarters – 7 valuers.
- Current prices for mature stands but 12 quarter average or “long term average prices” (1996-98 Agri-Fax prices) for young stands – 2 valuers.
- A weighted average of prices from the previous 7 quarters and current prices – 1 valuer.
- Current prices for the short-term with long-term prices (i.e. after 5 years) predicted using average 12Q/20Q prices or from an analysis of trends – 8 valuers.

Prices used come from a number of sources including MAF, Agri-Fax, other log price surveys or from the valuer's own information.

Are discount rates and price assumptions correlated?

Given the current trend in log prices, average log prices will generally increase as the historical period over which

log prices are averaged increases. Consequently it might be expected that valuers who average over longer periods (e.g. last 20 quarters) would use higher discount rates than valuers who use current prices.

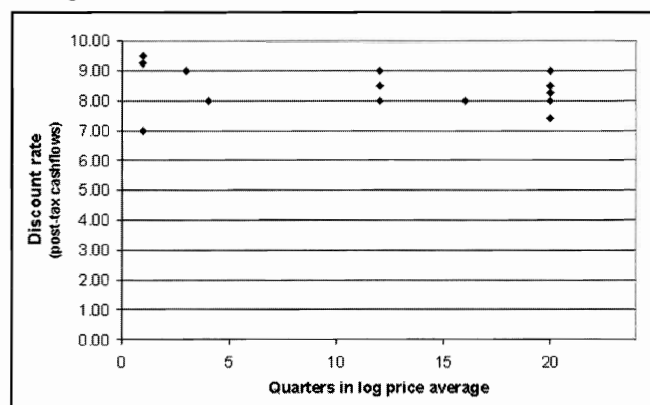
Fig. 1 shows discount rate (applied to post-tax cashflows) graphed against the number of quarters over which log prices are averaged. For this graph, valuers who use an unspecified “analysis of trends” approach were assigned an averaging period of 20 quarters. It is apparent that there is no relationship between discount rate and the period over which log prices are averaged.

5. What specific allowances are being made for risk?

Seven respondents stated that they adjust yields. Examples include:

- Sometimes take 5-10% off volume if consider it over-predicted.
- Adjust area as well as yields where necessary.
- If there is no fire insurance, assume a higher attrition

Fig. 1: The discount rate applied to post-tax cashflows by forest valuers plotted against the period over which log prices are averaged.



rate for mortality.

- Adjust pruned log quality.

Five respondents have made adjustments to cashflows.

For example:

- Include fire protection and surveillance costs.
- Increase roading and harvesting costs if a difficult situation.

Ten respondents adjust the discount rate. Comments include:

- Adjust the discount rate for unreliable yield information.
- Use a higher discount rate if poor stand data.
- Increase discount rate by 0.5% if lack information.
- Increase discount rate by 0.5% if suspicious about pruned log quality (no tending history or validation study).
- Increase discount rate by 0.5 to 1% if have uncertainty over land tenure and access.
- Sometimes increase discount rate by 1-2% for unquantifiable factors.
- Increase discount rate for price volatility.

6. How is the cost of land accounted for in valuing a tree crop?

Most valuers are using actual rentals when valuing the tree crop on leasehold land or CFLs (Crown Forest Licences). However there are many variations being applied in the valuation of the crop on freehold land depending on whether land rental is calculated as:

- Discount rate multiplied by LEV (Land Expectation Value).
- Discount rate multiplied by LMV (Land Market Value).
- An estimate of land rental, often calculated as LMV multiplied by a rate that is lower than the discount rate.

Some of the specific approaches being used for determining a notional land charge for a crop on freehold land are:

- LEV when replanting is intended, LMV when not replanting.
- LEV when replanting is intended, land rental of 5% *

LMV when not replanting.

- LEV (7 valuers).
- LMV (4 valuers).
- Maximum of LEV or LMV.
- LMV or estimated rental if this is too high
- 6% * LMV.
- Half discount rate * LMV
- Estimated rental (2 valuers).
- Estimated rental when replanting is intended, LMV when not replanting.
- Estimated rental (based on CFL rentals) for small forests. LMV for estates.

The range of approaches being used reinforces the need for the NZIF Forest Valuation Working Party to provide greater guidance to practitioners on this subject.

Cost compounding approach

The 13 respondents who sometimes use the cost compounding approach for valuing young stands have varying assumptions about the costs included and the compound rate used. All respondents include direct costs, all but one include overhead costs, and all but four include a land cost. Most valuers include costs on a pre-tax basis although some use post-tax costs; i.e. they net out the benefit of any tax deduction that the owner has received.

The average compound rate used is 4.9% (range 3.5 to 8%). Nine of the thirteen valuers use a compound rate in the range 4 to 5%.

Discount rate implied by recent transactions

Information provided by valuers on estimates of the implied discount rates in recent transactions is summarised in Table 2. Information was also provided on a back-to-back deal in the Manawatu in which two small forests were exchanged based on valuations done using a discount rate of 9% applied to post-tax cashflows.

There is some variation in the implied discount rates that different forest valuers have estimated for the same transaction. The valuers providing these estimates clearly had different assumptions about some key inputs. Most of the IDRs reported in Table 2 were calculated using current prices for the short-term with long-term prices predicted to increase (to average 12Q/20Q prices or a long-term trendline). However even within this general approach there can be material differences in log price estimates.

This illustrates the requirement for consistency stated in the Guidance Notes on Discount Rate in the NZIF Forest Valuation Standard: "If a discount rate is derived using transaction evidence it should be derived using the same set of assumptions (taxation, borrowing, log prices, log price increases) as will be used in valuation of the target forest."

Transaction information - young stands

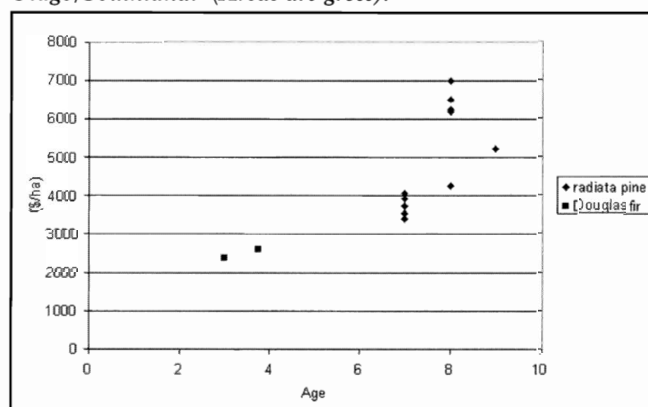
Figs. 2 and 3 show the transaction information that was obtained on a \$/ha basis for young stands. Fig. 2 has data from 13 transactions (11 for radiata pine and 2 for Douglas fir) in Otago/Southland during the last 2 years.

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Table 2 - Estimates of the discount rate implicit in the transaction price of sales in 2003-2005 of forests or interests in forests. Forests are described by location and size class (Small <1000 ha; Medium 1000 to 10,000 ha; Large >10,000 ha).

Forest	Number of respondents	Implied discount rate (applied to post-tax cashflows)	Implied discount rate (applied to pre-tax cashflows)
1. Small forest - Northland	1	9	
2. Small forest - Northland	2	8 - 10	
3. Small forest - Coromandel	1	9.8	
4. Small forest - CNI	1	9	
5. Small forest - East Coast	1	7.6	
6. Small forest - East Coast	1	6.9	
7. Small forest - East Coast	5	8 - 9	10.2 - 13.5
8. Small forest - Marlborough	1	8.8	
9. Medium forest - CNI	1	9.5	
10. Medium forest - CNI	1	8.3	10
11. Large forest - CNI	4	8.4 - 10	11.6 - 12.4
12. Large forest - CNI	1	7.7	10
13. Large forest - CNI	2	10	10.8
14. Large forest - East Coast	1	8.7	
15. Large forest - New Zealand	2	9	11.8
16. Large forest - New Zealand	1	6.9	8.3
17. Large forest - New Zealand	2	5.6 - 6.8	7.6
Secondary market - forest investments	1	8.4	

Fig. 2: Price paid for land plus trees in 13 transactions in Otago/Southland. (Areas are gross).



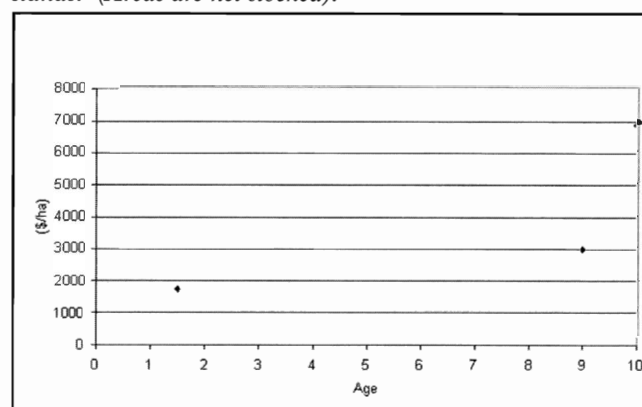
The value indicates what was paid on a per hectare basis (gross area rather than net stocked area) for land plus trees. Fig. 3 has data for tree crop only (net stocked area) from three transactions (1 each from Northland, East Coast and Hawkes Bay).

The data presented in Figs. 2 and 3 are presented primarily to illustrate the amount, or lack, of available data. The limited number of transactions reported for young stands outside Otago/Southland could indicate that:

- there were few transactions; or
- transactions of young stands have more to do with investment in land than the tree crop and consequently do not come to the attention of forest valuers.

At the Forest Valuation Workshops it was suggested that the NZIF should consider the development of a transaction database. This survey was a first attempt to gauge the amount of information available for such a database.

Fig. 3: Price paid for the tree crop in 3 transactions of young stands. (Areas are net stocked).



Discussion

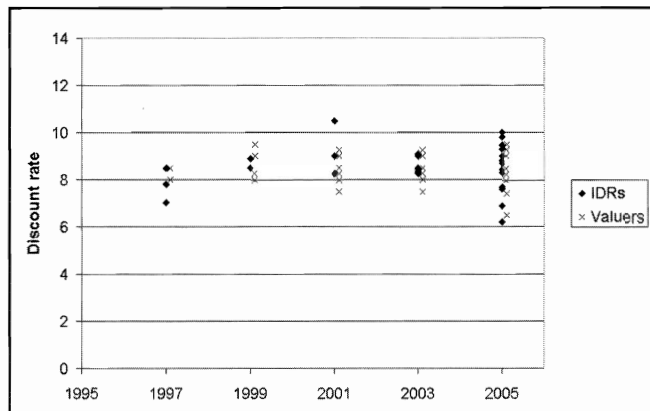
Trends in discount rates since 1997

Figs. 4 and 5 show the IDRs (applied to post-tax cashflows and pre-tax cashflows respectively) of transactions reported in all five surveys to date². Also shown are the discount rates used by forest valuers to estimate the market value of a forest. These figures suggest that:

- IDRs have remained at the same general level since 1997. Although IDRs (post-tax cashflows) reported in 1997 are low relative to those reported in 1999, 2001 and 2003 they were limited in number and fall within the range of IDRs reported in 2005.
- More transactions have been reported in recent years. This indicates an increase in activity but is partially caused by a "wider net" being cast in more recent surveys.

² IDRs for each transaction have been averaged in the cases where there were more than one respondent.

Fig. 4: IDRs (applied to post-tax cashflows) for transactions reported in each of the five discount rate surveys. Also shown are the discount rates used by forest valuers.



- The IDRs reported in 2005 cover a wide range. Extension of the range at the lower end is largely caused by two transactions of “Large forest – New Zealand” which have relatively low IDRs. One respondent made the comment “Until 2004 buyers were building in higher risk profiles because of log price uncertainty – discount rates on pre-tax cashflows up to 10-11%. With the interest from the new infrastructure funds we are now seeing buyers using discount rates of 6.5 to 9.5%.”
- Valuers are using discount rates that generally fall within the range of IDRs. Although some forest valuers select discount rate primarily using information from other valuers, these rates are in line with the discount rates implicit in market transactions.

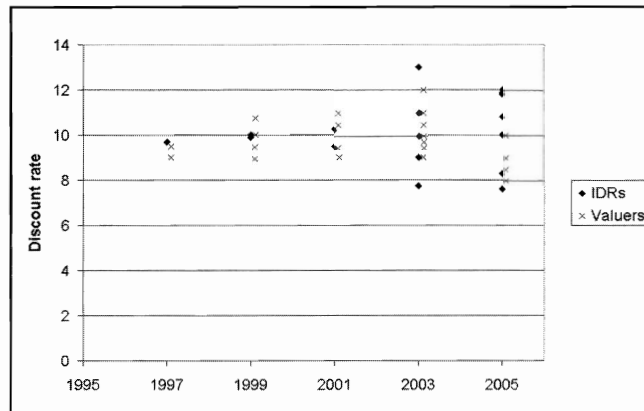
Purpose matters

The survey focuses on the discount rates that are being used to determine the market value of a forest. It is not uncommon for forest owners to use different discount rates for different purposes. For example, different rates might be used for decisions about forest sale and purchase, silviculture and replanting. Despite recent publicity, the majority of plantations in New Zealand are being replanted following harvest. In some situations this clearly indicates that the owner has a required rate of return on the replanting investment that is lower than the IDRs reported in this survey for transactions.

Preference for post-tax cashflows

The NZIF Forest Valuation Standards (NZIF 1999) are based on the convention that “all values derived from discounted cashflow analysis should be calculated from post-tax cashflows”. This position was taken because “It is evident that there is no single and universal adjustment between the discount rates in the case of plantation forests in New Zealand. The relationship is affected by the impact of the cost-of-bush because of such factors as the maturity of the forest at the time of purchase and the assumed level of inflation. Accordingly, it is preferable to model the effects of tax explicitly in order to produce after-tax NPVs.”

Fig. 5: IDRs (applied to pre-tax cashflows) for transactions reported in each of the five discount rate surveys. Also shown are the discount rates used by forest valuers.



Manley (2002) shows how the difference between the discount rates to be applied to pre-tax cashflows versus post-tax cashflows increases with stand age because of the cost-of-bush effect. Greater realisation of this is one reason why an increasing proportion of forest valuers are using post-tax cashflows. For example, one respondent commented that a recent transaction of a mature forest with a compressed age-class distribution had highlighted the cost-of-bush effect on discount rate margin. As a consequence the valuer has now adopted the NZIF convention and discounts post-tax cashflows.

References

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