

# Discount rates used for forest valuation – results of the 2015 survey

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## Abstract

Sixteen forest valuers responded to the survey and provided information on 36 New Zealand transactions between mid-2013 and 2015. The average reported implied discount rate (IDR) for the New Zealand transactions was in the range 3.7% to 11% for post-tax cashflows and 4.8% to 13.6% for pre-tax cashflows. There was greater variation in IDR in this survey compared to 2013. Overall averages were 6.9% (post-tax cashflows) and 8.6% (pre-tax cashflows), compared to 7.3% and 8.9% in the 2013 survey.

A feature of the 2015 survey is the lower average IDR for medium/large forests compared to small forests – 6.4% vs 7.1% for post-tax cashflows and 7.8% vs 9.1% for pre-tax cashflows. These IDRs are for current rotation cashflows. IDRs for perpetual rotations are generally lower.

Forest valuers also provided the discount rate they use to estimate the market value of a forest. Valuers apply a discount rate in the range 6% to 10% (average 7%) to post-tax cashflows or a discount rate in the range 7% to 11% (average 8.3%) to pre-tax cashflows. Fourteen of the 16 valuers included in the 2015 survey also participated in the 2013 survey. They are using discount rates for forest valuation that are on average 0.2% lower than in 2013.

## Introduction

Forest valuers were surveyed during the last quarter of 2015 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, 2005, 2007, 2010, 2012, 2014).

## Method

A total of 16 forest valuers were surveyed and asked:

1. What method do you use to determine the market value of a tree crop (or forest)?
2. When using the income (expectation value) approach, what real discount rate do you use to estimate the market value of a tree crop (or forest)?
3. What is the basis for deriving this rate?
4. How do you determine the log prices used?

5. How do you account for the cost of the use of land in valuing a tree crop?
6. Do you include cashflows from only the current crop?
7. When do you assume that cashflows occur?
8. Do you apply a stand-based or estate-based approach?
9. What specific allowance do you make for risk? Do you adjust the discount rate for forest-specific risk?

Valuers were also asked questions about valuation of the carbon trading opportunity:

10. What method do you use to determine the market value of the carbon trading opportunity?
11. What real discount rate do you use to estimate the market value of a tree crop?
12. How do you determine the carbon prices used?
13. What carbon trading strategy is assumed?
14. How do you account for the cost of the use of land in valuing carbon?

Forest valuers were also asked for transaction information:

15. What is your estimate of the discount rate implicit in the transaction price of recent (mid-2013 to 2015) forest sales in New Zealand and Australia?

Finally, valuers were asked about factors relating to replanting and new planting decisions:

16. What real discount rate do you use to evaluate replanting or new planting investments?
17. What is your estimate of the internal rate of return (IRR) on replanting or new planting?

## Responses to survey questions

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

All 16 valuers use the income (expectation value) approach to determine the market value of a forest. Many valuers use a suite of approaches, including the sales comparison and cost approaches. Two valuers blend the income and cost approaches for young stands. Three valuers make some use of the liquidation approach.

## Use of the cost approach

Fifteen of the valuers sometimes use the cost approach for valuing young stands and other limited circumstances, for example:

- When expectation value results in negative or below market value
- When net present value (NPV) is negative and when young stands dominate
- Very young stands and unusual species
- Young crops that are geographically remote from more mature parts of the estate or in a new region without an established forest industry
- Young stands with little detail on growth potential on a site or where the expectation approach gives unrealistic values
- Young stands of alternative species where there is uncertainty in log grade yield/value.

The definition of a young age varied from three to 10 years. One valuer stated that they used the cost approach as a secondary method when the tree crop is primarily pre-merchantable, but it was never used as the primary method, i.e. when it was used it was in conjunction with the income and sales comparison approaches. Another valuer used the cost approach for stands from age one to three years, the income approach from age eight years on, and a blend of the two from ages four to seven years.

Follow-up questions were answered by the 15 valuers who sometimes use the cost approach:

- Do you include indirect costs (e.g. cost of supervision)?
  - Yes – 13
  - Sometimes – 1
  - No – 1
- Do you include overhead costs?
  - Yes – 12
  - Sometimes – 1
  - No – 2
- Do you include the cost of using the land for growing the tree crop?
  - Yes – 11
  - Sometimes – 2
  - No – 2
- Do you include the cost of time?
  - Yes – 11
  - Sometimes – 2
  - No – 2
- Do you use pre-tax or post-tax costs?
  - Pre-tax – 10
  - Post-tax – 5.

One valuer noted that the cost of land 'is a discretionary item that may be reduced or excluded to avoid the value assuming unlikely levels.'

All but one of the valuers who include the cost of time use a lower rate to compound costs than they do to discount cashflows in the income (expectation value) approach. However a wide range of rates is used. Respondents reported using rates of 2% to 7.5% on pre-tax costs and 1% to 6% on post-tax costs.

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

The response from each forest valuer is summarised in Table 1. Four valuers apply the income (expectation) approach using only post-tax cashflows, nine valuers use only pre-tax cashflows, while three valuers use both.

Valuers apply a discount rate in the range 6% to 10% (average 7%) to post-tax cashflows or a discount rate in the range 7% to 11% (average 8.3%) to pre-tax cashflows. Note that if a valuer responded with a range of discount rates, the mid-point rate was used to calculate averages.

One comment was: 'For large estates in production, where we believe there is a keen demand, we are using discount rates generally in the range 7% to 8% applied to a pre-tax cashflow projection. We use higher rates for small and/or immature estates, generally in the range 9% to 11%, depending on risk profile.'

## Has the 'market' discount rate changed since 2013?

In the 2013 survey, the 16 respondents were applying an average discount rate of 7% to post-tax cashflows and an average discount rate of 8.7 % to pre-tax cashflows.

Some 14 of the 16 valuers included in the 2015 survey also participated in the 2013 survey. Figure 1 gives the frequency distribution of the change in discount rate and the average change is a reduction of 0.2%.

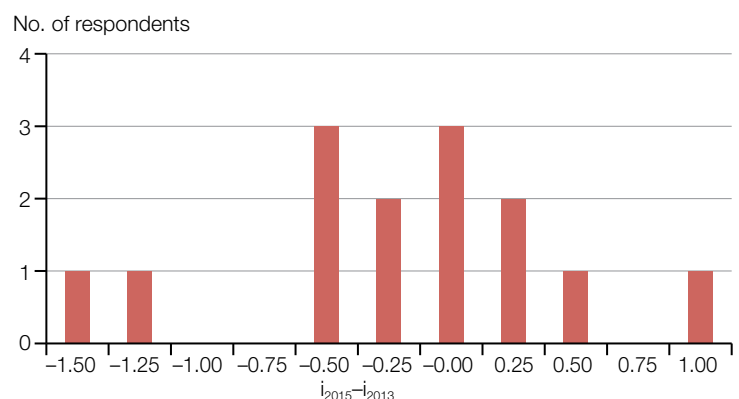


Figure 1: Frequency of change in discount rate from 2013 to 2015 for individual valuers

Table 1: Individual responses to survey questions

Respondent	Discount rate applied to post-tax cashflows	Discount rate applied to pre-tax cashflows	Basis for discount rate	Log prices based on	Cost of land based on
1	6–7		IDR	12Q immature forest Current for immediate harvest	Notional rental based on market rentals
2	7	8–8.5 9–10 (poor data)	Market evidence/ other valuers	12Q	CFL rental
3		7.5–8.5	IDR & WACC/CAPM	Current to trend over 5 years	Actual or notional rental based on market rentals/CFLs or 4–5% of LMV
4		8.5–9	Survey, consistency, other valuers	6Q for immature/ semi-mature forest Current for mature forests	Actual or notional rental based on market rentals/CFLs
5		7–8 (large estates) 9–11 (small estates)	IDR (comparable area, maturity & risk)	Current to forecast over 5 to 7 years	Notional market rental based on CFL/other evidence/land valuer
6		8–8.5	Consistency	12Q	8–8.5% of LEV (min of o)
7	6.5–8.5		IDR/survey	6Q or 12Q immature forest 4Q mature forest	4.5–5% of LMV
8		7–8	Bank term deposit rate trends	12Q adjusted by CPI	5–6% of LMV
9		7.5 (NZ) 7 (Australia)	IDR/ADR	Econometric model	Land valuer/CFL rentals/forestry right rentals/grazing rentals Commonly 4–6% of LMV
10	7.3	8.9	Survey	12Q	Land valuer or 1.5% of capital value of land
11	6–10		IDR	Current to 12Q over 3 years	4% of LMV
12	7		Survey/returns from competing land uses	12Q immature forest 4Q mature forest	5% of LMV
13		7.5 (mature forest) 8 (young/limited measurement)	Market evidence	12Q	Actual rental
14		8.5	Survey/other valuers	12Q indexed by PPI	Use nominal value of \$1500/ha or 6% LMV
15		9.5	Client request	20Q	5% LMV
16	6	7.5	Investor input	Initial prices 4Q returning to trend	Notional rental based on market rentals

### 3. How is the discount rate selected?

Valuers select the discount rate based on a range of information sources:

- Five valuers use the results of this survey while another two use opinions from other valuers
- Six valuers use IDRs while another two use unspecified 'market evidence'

- One valuer uses the capital asset pricing model (CAPM)/weighted average cost of capital (WACC) method
- Two valuers use consistency as the basis for deriving discount rate.

### 4. How are log prices determined?

Most valuers differentiate forests in production from immature forests. For immature forests, 12Q or

6Q averages are often used. For production forests, the current price is commonly used at least as a starting point. Typically valuers have prices trending to 12Q/6Q averages or long-term forecasts over a period of three to seven years. Two valuers make forecasts of future price trends:

- 'For export prices we employ a proprietary econometric model to predict future prices up to 10 years into the future. This is combined with published sources for exchange rate forecasts. For New Zealand domestic prices we undertake a supply/demand analysis to forecast the future trend. This will be refined into an econometric modelling approach also.'
- 'We take a forward-looking approach using forecasts of exchange rate, inflation, shipping costs over the next five to seven years.'

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

On leasehold land, the actual rental is commonly being used as the cost of land, whereas for freehold land a notional land rental is being applied. This notional land rental is being estimated using a range of sources including:

- Forest land rentals including Crown Forestry Licence rentals
- Market rentals for pastoral land
- Land valuers.

Many valuers use mechanistic approaches to estimate the notional market rental when the land is freehold. For example, eight valuers estimate land rental as a percentage (usually 4% to 6%) of land market value (LMV).

### 6. Do you include cashflows from only the current crop?

When estimating the market value of a tree crop, 10 valuers include cashflows from the current crop only. However the other six valuers undertake a multiple-rotation valuation as part of establishing a market value, in conjunction with a single-rotation valuation that is accounting standard-compliant:

- 'For financial reporting and insurance we consider only the current crop cashflow but we use future cashflows for sale and purchase due diligence.'
- 'We check the contribution of 2R+ for materiality. We include them where they are material, i.e. when we can't refute the null hypothesis that they may be statistically indistinguishable from zero.'
- 'Most client valuations (e.g. annual revaluations) need to be IAS-compliant. We thus recognise cash flow from only the existing crop. If there is a requirement to replant, we say that the value of future rotations goes to the land so the tree crop value is still the value of just the existing tree crop.'

We include multiple rotations where we are valuing a tree crop investment opportunity on freehold land where multiple rotations are possible.'

- 'In estimating forest estate (land plus trees) market value we use the investment lifecycle and commonly predict out 60–80 years followed by a terminal value. In estimating IFRS compliant fair value we use the current rotation only for the tree crop. The fair value of land and improvements plus the fair value of the tree crop must however equal the market value. Reconciliation is performed through the discount rate. We apply the market discount rate to multiple rotation cashflows. The rate applied to the current rotation tree crop varies and is derived by equating the current rotation tree crop fair value plus land fair value to the forest estate market value.'
- 'We value the current crop only for IFRS allocation to "biological assets". However if we are estimating the value of forestry rights that include multiple rotations we do model the current and future rotations, particularly where the highest and best use of the land is to replant rather than convert to a non-forest use. But note that this is a true leasehold interest and, technically speaking, the value of future rotations reflects contributory land value.'
- 'We include future rotations where forests are purchased on the assumption of being replanted in perpetuity.'

### 7. When do you assume that cashflows occur?

A number of different conventions are assumed for the timing of cashflows:

- |                                       |           |
|---------------------------------------|-----------|
| • Start of a period                   | 4 valuers |
| • Middle of a period                  | 8 valuers |
| • End of a period                     | 2 valuer  |
| • Start for costs/middle for revenues | 1 valuer  |
| • Start or time of operations         | 1 valuer. |

### 8. Do you apply a stand-based or estate-based approach?

Five valuers follow a stand-based approach while four valuers adopt an estate-based approach. Seven valuers use both approaches depending on the nature (size, age-class distribution) of the forest being valued and also the purpose of valuation. For example, one valuer uses an estate-based valuation for sale and purchase due diligence but stand-based for financial reporting and insurance purposes.

### 9. Treatment of risk?

Eleven valuers primarily include risk in the cashflows by adjusting areas, yields, costs or prices. One of these valuers allows for risk by including the cost of insurance in cashflows.

Two valuers use discount rate as the principal means of adjusting for risk. A further eight valuers use the discount rate as a secondary means to adjust for risk, e.g. 'where there is insufficient confidence in what the cashflow adjustments should be and we believe it would reflect the approach that the market would take.'

Three valuers make no adjustment for risk.

One valuer said that they:

'Try to build risk into the woodflow/cashflow projections as far as possible:

- Care with total recoverable volume (TRV) estimation
- Cautious approach to breakdown by log types (e.g. pulpwood >20%, pruned content <30%)
- Careful harvesting strategy, reflecting pragmatic limits on ramp up and ramp down
- Application of an allocation model to recognise market absorption limits.'

## 10. Method used to determine the market value of the carbon trading opportunity

Eight of the valuers have valued the carbon trading opportunity (i.e. the value of the opportunity to receive NZUs and the liability to surrender NZUs as carbon stocks increase or decrease) associated with a tree crop on post-1989 forest land.

The income (expectation value) approach is the predominant method used. One valuer assumes that carbon value is attached to land and calculates it as the difference between pre-1990 and post-1989 land values.

One valuer noted that: 'In recent years, when C prices were low, we have often said "No C value", as any hypothetical value is outweighed by the risks.'

## 11. Discount rate used to estimate the market value of the carbon trading opportunity

Discount rates used vary:

- Five valuers use the same discount rate for valuing the carbon trading opportunity as for valuing the tree crop.
- Two valuers use a discount rate for carbon that is higher. One uses a discount rate of 10% to 15% based on the IDR from pre-1990 and post-1989 land differentials. The other adds a premium of 1% to 2% to the tree crop discount rate.
- One valuer uses a lower discount rate for carbon:
  - 'Due to the reversal of cash flows compared to a normal investment, a high discount rate leads to high values – we commonly use the government bond rate as the alternative return on the money received for the sale of units upfront.'

Seven of the eight valuers use pre-tax cashflows.

## 12. How do you determine the carbon prices used?

Most valuers use current prices for carbon.

## 13. What carbon trading strategy is assumed?

Different trading strategies are assumed from selling only safe units to selling all units. One valuer responded that: 'For permanent forests we assume 100% of carbon units are sold but only 75% is sold for single rotation forests.'

## 14. How is the cost of land accounted for in valuing the carbon trading opportunity?

Only one valuer partitions land rental between the tree crop and carbon trading opportunity. Other valuers said that:

- 'The cost of land should be partitioned, but the carbon contribution in recent valuations has been sufficiently small that we have not applied a separate rental to the carbon trading activity.'
- 'Post-1989 carbon is considered an 'add-on option' to the tree crop value and so the tree crop carries the full land rental cost.'

## 15. Discount rate implied by recent transactions

Information provided by eight valuers on estimates of the implied discount rates in 36 recent New Zealand transactions is collated in Table 2. In summary:

- The range of IDRs (applied to post-tax current rotation cashflows) in the 2015 survey is 3.7% to 11% with an average of 6.9%. In the 2013 survey the range was 5.5% to 10.8% with an average of 7.3%.
- The range of IDRs (applied to pre-tax current rotation cashflows) in the 2015 survey is 4.8% to 13.6% with an average of 8.6%. In the 2013 survey the range was 5.1% to 11.5% with an average of 8.9%.

The increase in the range of IDRs reflects the difference between transactions rather than the difference between valuers. Different valuers provided similar IDRs for most of the transactions for which multiple responses were received. In contrast, some valuers reported transactions with a wide range of IDRs. For example, one valuer reported IDRs between 4.8% and 13.6% (applied to pre-tax cashflows) while another reported from 4.6% to 9.8%.

The lower IDR for perpetual rotations compared to current rotations for all but one of the reported forests indicates that the IRR on replanting is generally lower than the IDR for the current rotation. How to deal with the contribution of the second and subsequent rotations is an issue currently being considered by the NZIF Forest Valuation Working Party.



Table 2: Estimates of the discount rate implicit in the transaction price of forests or interests in forests sold during mid-2013 to 2015. Forests are described by location and size class (small <1000 ha; medium 1000 to 10,000 ha; large >10,000 ha). Where there are multiple respondents for a transaction the average is reported together with the range

Forest	Size	Location	Number of respondents	IDR applied to post-tax cashflows		IDR applied to pre-tax cashflows	
				Current rotation	Perpetual rotations	Current rotation	Perpetual rotations
1	Small	Northland	1	7			
2	Small	Northland	1			9	
3	Small	Northland	1	3.7		4.8	
4	Small	Northland	1	8.8		10.2	
5	Small	Northland	1	7.1		9.3	
6	Small	Northland	1	8.6		10.2	
7	Small	CNI	2	8 (6.5–9.5)		11.4	
8	small	CNI	1			8.5	
9	Small	Hawke's Bay	1			8.5	
10	Small	SNI	1	7			
11	Small	SNI	1				8.7
12	Small	SNI	1	6.5			
13	Small	SNI	1	6		8	
14	Small	SNI	1	6.8		8.9	
15	Small	SNI	1				8.7
16	Small	SNI	1				8.7
17	Small	SNI	1	3.9		5.9	
18	Small	SNI	1	11		13.6	
19	Small	SNI	1	5.3		7.6	
20	Small	SNI	1	7.8		10	
21	Small	Nelson/Marlborough	1	7.7		9.4	
22	Small	Nelson/Marlborough	1	10.5		12	
23	Small	Otago/Southland	1	5.8		7.3	
24	Small	Otago/Southland	1			9.6	
25	Medium	CNI	2			8.6 (8.0–9.3)	
26	Medium	CNI	2	3.9		5.1 (4.8–5.5)	
27	Medium	East Coast	3	6.6 (6.3–7.0)			
28	Medium	SNI	3	5.8 (5.2–6.5)		7.4 (6.4–8.2)	6.1
29	Medium	SNI	1			8.6	7.3
30	Medium	SNI	1	5.3		6.6	
31	Medium	SNI	4	6.7		8.3 (8.2–8.5)	7.3 (7.1–7.5)
32	Medium	Nelson/Marlborough	2			10.0 (9.8–10.3)	8.7 (8.2–9.3)
33	Medium	Nelson/Marlborough	1	10		11.0	
34	Large	North Island	1			7.9 (7.7–8.2)	7.3 (6.8–7.8)
35	Large	CNI	2			7.0	
36	Large	Nelson/Marlborough	3			4.9 (4.6–5.3)	5.6 (5.4–5.9)

## Replanting and new planting

### 16. What discount rate do you use to evaluate replanting or new planting investments?

Nine valuers responded to this question. All use the same (or a similar) discount rate as for forest valuation. One valuer also uses the organisation's required earning rate on investment/cost of capital.

### 17. What is your estimate of the internal rate of return on new planting?

There were 11 responses to this question:

- 6.5% to 8.5% CNI and East Coast with market rental (6% to 8% on freehold land)
- 5% to 6%
- 4% to 8%
- 7% CNI/Northland/Hawke's Bay, 5% to 6% SNI, 2% West Coast, 3% to 5% rest of South Island
- 5% to 7% CNI replanted land
- 5% to 7% Wairarapa, 7% to 9% Hawke's Bay
- 4% to 6% Marlborough
- 7.7% BOP
- 7% radiata pine and 9% redwood in King Country/Taranaki/Northland
- 5%
- 6% to 8% CNI/Nelson, 5.5% to 7.5% Northland/Hawke's Bay/SNI, 2% to 6% East Coast, 5% to 7% Canterbury/Otago/Southland.

The last valuer also reported the IRR for Australia:

- 6% to 8% Green Triangle
- 4% to 6% NSW & WA
- 2% to 5% QLD.

## Discussion

### Trends in IDR

Figures 2 and 3 show the current rotation IDRs (applied to post-tax cashflows and pre-tax cashflows respectively) of transactions reported in all 10 surveys to date. Note that IDRs for each transaction have been averaged in the cases where there was more than one respondent. While the range and variance of discount rates has increased there is a trend of decreasing discount rates, particularly for medium and large forests from 2013 to 2015.

The average discount rate being applied is:

- 6.9% for post-tax cashflows in 2015 compared to 7.3% in 2013
  - 6.4% for medium/large forests in 2015 vs 7.6% in 2013
  - 7.1% for small forests in 2015 vs 7.2% in 2013

- 8.6% for pre-tax cashflows in 2015 compared to 8.9% in 2013
  - 7.8% for medium/large forests in 2015 vs 9% in 2013
  - 9.1% for small forests in 2015 vs 8.7% in 2013.

The difference between the 2015 discount rates for large/medium and small forests is not significant and neither is the trend from 2013 to 2015. However the reduction in the discount rate for pre-tax cashflows from 9% in 2013 to 7.8% in 2015 for medium/large forests is close to being statistically significant with a p-value of 0.07. (Significance of the 5% level requires the p-value to be less than 0.05.)

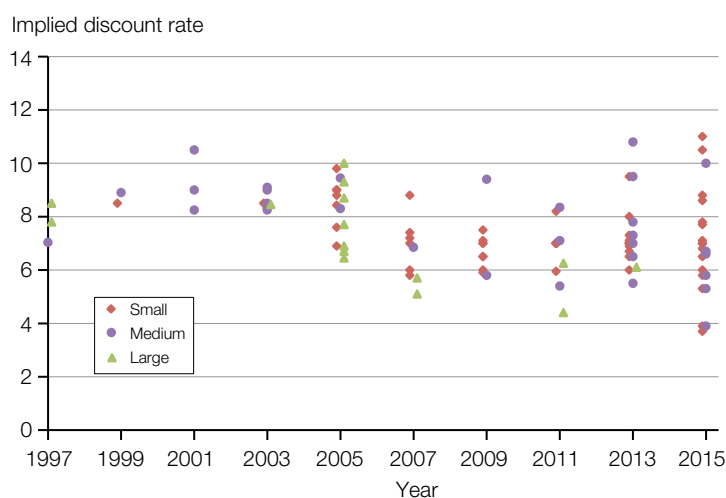


Figure 2: IDRs (applied to post-tax current rotation cashflows) for transactions reported in each of the discount rate surveys. Forests are identified by size class (small <1000 ha; medium 1000 to 10,000 ha; large >10,000 ha)

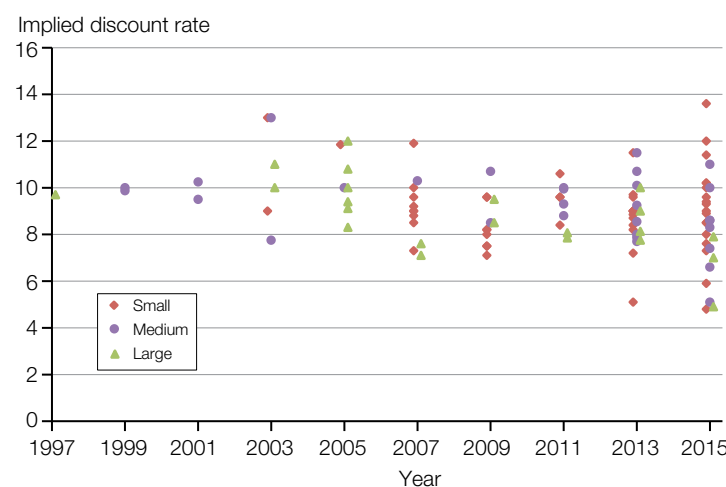


Figure 3: IDRs (applied to pre-tax current rotation cashflows) for transactions reported in each of the discount rate surveys. Forests are identified by size class (small <1000 ha; medium 1000 to 10,000 ha; large >10,000 ha)

## Comparison to Sewall survey

US forest valuation company James W. Sewall Company regularly carries out its own survey of discount rates. In the Sewall Investor Survey undertaken in June/July 2015 there were 20 responses from active investors to the question 'What is the "base" discount rate (real, pre-tax, before TIMO fees and expenses) required for successful bids on generic timberland investments in the US now?' Mean and median responses were 5.25% and 5.50%, respectively.

Respondents were subsequently asked to 'Provide the discount rate premium over the US base rate' for a range of international forest investments. For New Zealand pine, the premium was 1.32% (mean) and 1.50% (median). When asked about this risk premium, Bret Vicary of Sewall noted:

1. New Zealand log prices are highly exposed to demand from China and other destinations. The 2015 Chinese downturn exemplifies the risk.
2. The lack of domestic economy for logs means marketing options are relatively thin.
3. Single species means lack of diversity, and thus risk, both market and biological.
4. Lack of optionality for other uses of the property that create alternative timber and non-timber values – highest and best use (HBU) values, conservation easement sales, recreation asset sales, conversion to non-forest uses.
5. Foreign exchange risk around local New Zealand prices for labour and other non-petroleum-based expenses.

The discount rates in the Sewall survey are applicable to perpetual rotations (i.e. multiple) rather than just the current rotation. IDRs for perpetual rotations were reported for six medium/large forests in the 2015 NZIF discount rate survey. The average IDR for these transactions is 7%, which closely aligns with the results of the Sewall survey. Dr Vicary (pers. comm.) noted that:

"Certainly the active investors view New Zealand and Australia very favourably. The better estates are world-class with highly predictable yields, excellent infrastructure and great operating conditions. The zeal to diversify portfolios has driven offshore discount rates downward as managers are increasingly under pressure by their clients to land deals outside the US, especially safe geographies like New Zealand."

## IDR vs IRR

Table 2 has estimates (for some medium and large transactions) of IDR applied to cashflows for perpetual rotations as well as current rotation. In all cases bar one the perpetual rotation IDR is less than the current

rotation IDR. This indicates that the IRR on replanting is less than the IDR associated with current rotation cashflows.

The IRRs reported in question 17 are on average higher than those reported in 2013. This, in conjunction with the reductions in IDRs, means that there will be fewer cases/less impact of the second and subsequent rotations having a negative value.

## Detailed analysis of transactions to come

Manley (2016) used the transactions reported in the 2013 survey to develop a relationship between \$/ha for each transaction and average age, species mix, volume, proportion of pruned area, harvesting costs and distance to port. Transaction data collected in the 2015 survey will be used to supplement the 2013 data and the analysis repeated.

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