

# Discount rates used for forest valuation – results of 2013 survey

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## Abstract

Sixteen forest valuers responded to the survey and provided information on 28 New Zealand and four Australian transactions between mid-2011 and 2013. The average reported implied discount rate (IDR) for the New Zealand transactions was in the range 5.5 to 10.8 per cent for post-tax cashflows and 5.1 to 11.5 per cent for pre-tax cashflows. There was greater variation in IDR in this survey compared to 2011. Overall averages were 7.3 per cent (post-tax cashflows) and 8.9 per cent (pre-tax cashflows), compared to 6.7 and 9.3 per cent in the 2011 survey. Differences between 2011 and 2013 averages are not statistically significant. Forest valuers also provided the discount rate they used to estimate the market value of a forest. Valuers applied a discount rate in the range 5.5 to 9.5 per cent (average 7.0 per cent) to post-tax cashflows or 8.0 to 11 per cent (average 8.7 per cent) to pre-tax cashflows. Nine of the 16 valuers included in the 2013 survey also participated in the 2011 survey. They used discount rates for forest valuation that are on average 0.2 per cent lower than in 2011.

## Introduction

Forest valuers were surveyed during the last quarter of 2013 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).

## 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?

Forest 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 the carbon trading opportunity?

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-2011 to 2013) forest sales in New Zealand and Australia?

Finally, forest 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 tree crop

All 16 forest valuers used the income (expectation value) approach to determine the market value of a forest. Many used a suite of approaches, including the sales comparison and cost approaches.

### Use of the cost approach

All of the forest valuers sometimes used the cost approach for valuing young stands and other limited circumstances:

- Some young crops if net present value (NPV) is less than replacement cost

- When expectation value results in negative or below market value
- Where the whole forest, or the component of it which is the subject of an individual sale, is predominantly (say 70 per cent) at young ages (say less than 10 years for softwoods)
- To benchmark/underpin/compare with an income/expectation approach
- Where no relevant transaction information exists – generally applied with the income approach in a hybrid with pure costs up to five years
- When there is little detail on growth potential on a site or where the income approach gives an unrealistic value
- Young stands of alternative species where there is uncertainty regarding future yields by log grades and log values.

The definition of a young age varied from three to 10 years. One valuer used a cut-off of five years for softwoods and three years for hardwoods.

Follow-up questions were answered by 15 of the forest valuers:

- Do you include indirect costs, e.g. cost of supervision?
  - ☐ Yes – 13
  - ☐ Usually – 1
  - ☐ No – 1
- Do you include overhead costs?
  - ☐ Yes – 13
  - ☐ Usually – 1
  - ☐ No – 1
- Do you include the cost of using the land for growing the tree crop?
  - ☐ Yes – 9
  - ☐ Sometimes – 1
  - ☐ No – 5
- Do you include the cost of time?
  - ☐ Yes – 10
  - ☐ Sometimes – 1
  - ☐ No – 4

Forest valuers who included the cost of time invariably used a lower rate to compound costs than they did to discount cashflows in the income (expectation value) approach. However a wide range of rates was used. Respondents reported using rates of 3.0 to 6.0 per cent on before-tax costs and 2.0 to 7.0 per cent on after-tax costs. One valuer reported using the five-year bank deposit rate adjusted for inflation over the last five years.

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

The response from each forest valuer is summarised in Table 1. Five forest valuers applied the income (expectation) approach using only post-tax cashflows, eight used only pre-tax cashflows, while three used both. Forest valuers applied a discount rate in the range 5.5 to 9.5 per cent (average 7.0 per cent) to post-tax cashflows or 7.0 to 11 per cent (average 8.7 per cent) to pre-tax cashflows. Note that if a forest valuer responded with a range of discount rates, the mid-point discount rate was used to calculate averages.

## Has the 'market' discount rate changed since 2011?

In the 2011 survey, the 11 respondents were applying an average discount rate of 7.1 per cent to post-tax cashflows and of 8.7 per cent to pre-tax cashflows. Nine of the 16 forest valuers included in the 2013 survey also participated in the 2011 survey. Figure 1 gives the frequency distribution of the change in discount rate. The average change is a reduction of 0.2 per cent.

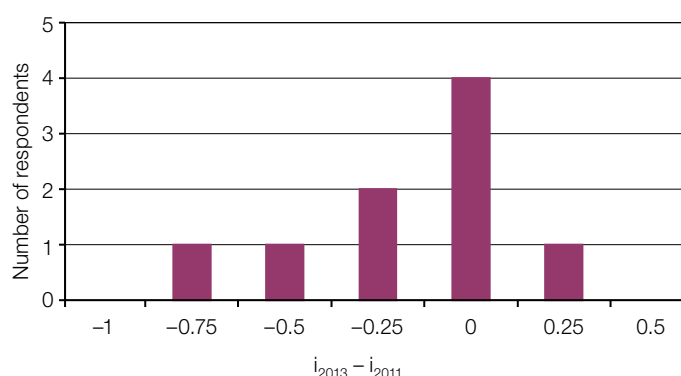


Figure 1: Frequency of change in discount rate from 2011 to 2013 for individual forest valuers

## 3. How is the discount rate selected?

Forest valuers selected discount rate based on a range of information sources:

- Eight used the results of this survey or their own survey, while another two used opinions from other forest valuers
- Seven used IDRs, while another two used unspecified 'market evidence'
- Four used capital asset pricing model (CAPM)/weighted average cost of capital (WACC)
- Three used consistency as the basis for deriving discount rate
- One used both the IRR of forestry and the rate of return of competing land uses, with a premium of two per cent on the latter.

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          | 7                                           |                                                 | IDR                        | 12Q immature forest<br>Current to 12Q over 3 years for mature             | Notional rental based on market rental                        |
| 2          | 7                                           | 9–10                                            | Expert opinion/consistency | Current to trend (12Q) over 5 years                                       | CFL rental                                                    |
| 3          |                                             | 8.5 (NZ)<br>8 (Australia)                       | IDR & WACC/CAPM            | Current to trend over 5 years                                             | Actual or notional rental                                     |
| 4          |                                             | 9                                               | CAPM/Survey                | 18Q > 2 years from harvest<br>Current < 2 years from harvest              | Actual rental or 4–6% of LMV or 9% of LEV                     |
| 5          |                                             | 7.5–9 large estates<br>9–11 small estates       | IDR/comparable risk        | Current to trend over 5–8 years                                           | Market rental                                                 |
| 6          |                                             | 7–9                                             | Consistency                | 12Q                                                                       | 7–9% of LEV (min of 0)                                        |
| 7          | 6.5–8                                       |                                                 | IDR/Survey                 | 6Q immature forest<br>4Q mature forest                                    | 4.5–5% of LMV                                                 |
| 8          |                                             | 7–8                                             | Consistency                | 12Q adjusted by CPI                                                       | 6% of LMV                                                     |
| 9          |                                             | 8–9 (NZ)<br>7.5–8.5 (Australia)                 | IDR/WACC/Survey            | Econometric model                                                         | Market rental or LMV* discount rate                           |
| 10         | 7                                           | 9                                               | Market evidence/survey     | 12Q                                                                       | Market rental                                                 |
| 11         | 5.5–9.5                                     |                                                 | IDR/survey                 | 12Q immature forest<br>4Q within 3 years of harvest<br>Current for mature | 4% of LMV                                                     |
| 12         | 6                                           |                                                 | Other valuers/IRR          | 12Q immature forest<br>4Q within 3 years of harvest                       | % LMV                                                         |
| 13         |                                             | 7.5 (low risk forest near port)<br>8.0 (others) | Market evidence            | 1Q lag behind current                                                     | No rental                                                     |
| 14         | 6–7                                         | 8–9.5                                           | IDR/survey/trends          | Current trending to long-term average                                     | Actual rental or notional rental based on CFLs or 3–5% of LMV |
| 15         |                                             | 10.5 (eucalypts)                                | Survey                     | Current                                                                   | 8% LMV                                                        |
| 16         | 7.3–7.5 large estates                       |                                                 | Survey/WACC/CAPM           | Initial prices 4Q to 12Q<br>returning to trend over 10 years              | Actual or notional rental                                     |

#### 4. How are log prices determined?

Most forest valuers differentiated forests in production from immature forests. For immature forests 12Q averages were often used. For production forests the current price was typically used at least as a starting point. Seven forest valuers had prices trending to 12Q averages or long-term forecasts over a period of five to 10 years. One comment: 'Currently we are taking a more forward view, given log export market developments (China) over the past 3 years.'

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

Most forest valuers are using the general approach adopted in the 2012 revision of Standard B12 Forest Valuation Method, i.e. in the valuation of the tree crop 'in all cases the opportunity cost of land should be included using market rental.' 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.

Some forest valuers used mechanistic approaches to estimate the notional market rental when the land was freehold. For example, eight estimated land rental as a percentage (usually 3.0 to 6.0 per cent) of land market value (LMV). One who prefers using market rentals commented that they were not universally accepted by clients. Consequently, use is sometimes made of the land-in/land-out method that results in land cost being land market value times the discount rate.

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

When estimating the market value of a tree crop, most forest valuers only included cashflows from the current crop. However as well as a single-rotation valuation that is accounting standard-compliant, some forest valuers also undertook a multiple-rotation valuation as part of establishing a market value. This occurs when there is a requirement to replant either by law or as part of the acquisition process. A number of forest valuers will also do this routinely in the case of multiple-rotation cutting rights in order to value the entire owner's interest and ensure that future implications are understood and explained to the client.

Other purposes under which a multiple-rotation valuation model is developed are for a:

- Client acquisition model
- Long-term investment valuation
- Feasibility analysis
- Land expectation value (LEV) calculation.

One response was:

*It depends on the assignment; the definition of your term "tree crop" varies. If the investor needs to comply with IFRS or regional standards set forth by New Zealand or Australia, we consider the tree crop to be the current crop only (i.e., trees in the ground on the effective valuation date). If we are appraising perpetual or multi-rotation forestry rights, and the investor defines the tree crop as current and future tree crops, then we include cash flows for the current and successive rotations.*

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

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

- Start of a period                  Six forest valuers
- Middle of a period                Five forest valuers

- End of a period                    Three forest valuers
- Real-time                           One forest valuer
- Start for costs/middle          One forest valuer for revenues.

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

Five forest valuers followed a stand-based approach while another five adopted an estate-based approach. Six used both approaches depending on the nature (size, age-class distribution) of the forest being valued.

## 9. Treatment of risk?

Eleven forest valuers primarily included risk in the cashflows by adjusting areas, yields, costs or prices. One of these allowed for risk by including the cost of insurance in cashflows. A comment made was: 'In principle allowance for risk should lie where it falls but this can make valuations extremely complex and incomprehensible.' Four forest valuers used discount rate as the principle means of adjusting for risk. One of these increased the discount rate by one per cent when documentation or data is lacking, while another adjusted beta in the CAPM.

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

Ten of the forest valuers had 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 was the predominant method used. One valuer assumed that carbon value was attached to land and calculated it as the difference between pre-1990 and post-1989 land values.

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

Discount rates used varied:

- Six forest valuers used the same discount rate for valuing the carbon trading opportunity as for valuing the tree crop
- Two used a discount rate for carbon that was 4.0 to 5.0 per cent lower. One used the real borrowing rate and the other considered that 'revenue streams from carbon trading are analogous to a loan requiring repayment at harvest. We adopt a range. Typically we will use a rate that is marginally higher than the risk-free rate (3.25%) as well as a rate that approximates the debt finance rate (5.25%).'
- Two used a higher discount rate for carbon. One added a premium of two per cent to the tree crop discount rate. The other used a discount rate of 15 to 20 per cent in order to 'reconcile expectation value with difference in land values.'

Table 2: Estimates of the discount rate implicit in the transaction price of forests or interests in forests sold during mid-2011 to 2013. Forests are described by location and size class (small < 1,000 ha, medium 1,000 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                     | 9.5                               |                     | 11.5                             |                     |
| 2      | Small  | Waikato     | 1                     | 6.5                               |                     | 8.2                              |                     |
| 3      | Small  | Waikato     | 1                     | 6.7                               |                     | 8.7                              |                     |
| 4      | Small  | CNI         | 1                     | 7.0                               |                     |                                  |                     |
| 5      | Small  | CNI         | 1                     | 7.0                               |                     |                                  |                     |
| 6      | Small  | East Coast  | 1                     | 7.0                               |                     |                                  |                     |
| 7      | Small  | East Coast  | 1                     | 7.1                               |                     | 8.4                              |                     |
| 8      | Small  | East Coast  | 1                     |                                   |                     | 9.0                              |                     |
| 9      | Small  | East Coast  | 2                     | 7.0                               |                     | 8.8 (8.8–8.9)                    |                     |
| 10     | Small  | Hawke's Bay | 1                     | 8.0                               |                     | 9.6                              |                     |
| 11     | Small  | Wairarapa   | 2                     | 6.0 (5.0–7.0)                     |                     | 7.2                              |                     |
| 12     | Small  | Wairarapa   | 2                     | 6.9 (6.8–7.0)                     |                     | 9.0                              |                     |
| 13     | Small  | Marlborough | 1                     | 7.3                               |                     | 9.7                              |                     |
| 14     | Small  | Nelson      | 1                     |                                   |                     | 5.1                              |                     |
| 15     | Small  | Nelson      | 1                     |                                   |                     | 9.0                              |                     |
| 16     | Medium | Northland   | 1                     | 7.8                               |                     | 10.1                             |                     |
| 17     | Medium | East Coast  | 3                     |                                   |                     | 7.9 (7.5–8.6)                    | 6.1 (5.3–5.9)       |
| 18     | Medium | East Coast  | 1                     | 7.3                               |                     |                                  |                     |
| 19     | Medium | Wairarapa   | 2                     | 7.0 (6.8–7.2)                     |                     | 8.6 (8.3–8.8)                    |                     |
| 20     | Medium | Marlborough | 2                     | 6.5                               |                     | 9.3 (8.8–9.7)                    |                     |
| 21     | Medium | Marlborough | 3                     |                                   |                     | 7.7 (6.3–8.8)                    | 7.1                 |
| 22     | Medium | Marlborough | 1                     | 5.5                               |                     | 8.0                              |                     |
| 23     | Medium | Canterbury  | 3                     | 10.8                              |                     | 10.7 (8.5–13.2)                  | 8.7 (7.4–10.0)      |
| 24     | Medium | Otago       | 1                     | 9.5                               |                     | 11.5                             |                     |
| 25     | Large  | Northland   | 1                     |                                   |                     | 9                                |                     |
| 26     | Large  | CNI         | 2                     |                                   |                     | 7.8 (7.7–7.8)                    | 7.8 (7.8–7.8)       |
| 27     | Large  | New Zealand | 3                     | 6.1                               |                     | 8.1 (7.6–8.5)                    | 8.2 (8.1–8.3)       |
| 28     | Large  | New Zealand | 1                     |                                   |                     | 10                               | 9.5                 |
|        |        |             |                       |                                   |                     |                                  |                     |
| 1      | Large  | Australia   | 4                     | 5.8                               |                     | 8.0 (6.5–9.4)                    | 8.0 (7.4–8.5)       |
| 2      | Large  | Australia   | 3                     |                                   | 6.2                 | 8.1 (7.8–8.3)                    | 7.6 (7.4–8.0)       |
| 3      | Large  | Australia   | 2                     |                                   |                     | 11.9 (10.5–13.3)                 | 10.3 (9.8–10.8)     |
| 4      | Large  | Australia   | 1                     |                                   |                     | 9.5                              | 8.6                 |

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

Most forest valuers used current prices for carbon. Four also projected carbon prices and forecasted potential market development, for example, 'we run various scenarios including spot price, \$25 cap and other scenarios.'

## 13. What carbon trading strategy is assumed?

Different trading strategies were assumed from selling only safe units to selling all units. One valuer who assumed that only safe units would be sold noted that 'my strategy has been shown to be too conservative by a number of forest owners who sold above the safe level and then squared up with cheap ERUs.'

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

Only two forest valuers partitioned land rental between the tree crop and carbon trading opportunity.

## 15. Discount rate implied by recent transactions

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

- The range of IDRs (applied to post-tax cashflows) in the 2013 survey is 5.5 to 10.8 per cent with an average of 7.3 per cent. In the 2011 survey the range was 4.4 to 8.4 per cent with an average of 6.7 per cent
- The range of IDRs (applied to pre-tax cashflows) in the 2013 survey is 5.1 to 11.5 per cent with an average of 8.9 per cent. In the 2011 survey the range was 7.8 to 10.6 per cent with an average of 9.3 per cent.

Also included in Table 2 is information on four recent Australian transactions. These forests are all predominantly radiata pine. The last two transactions were in receivership at the time of sale. IDRs are higher for these two sales, and those for the other two transactions are at the lower end of IDRs reported for large New Zealand forests. This aligns with the use of slightly lower discount rates for Australian plantations reported by two forest valuers (see Table 1).

Table 2 has estimates (for some medium and large transactions) of IDR applied to cashflows for perpetual rotations as well as the current rotation. In many cases 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.

## Replanting and new planting

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

Six forest valuers provided a response on the replanting discount rate, while eight gave the discount rate they used to evaluate new planting investments. All but one used the same discount rate as for forest valuation. The other valuer used the organisation's cost of capital for future investment analysis.

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

There were nine responses to this question. Estimates for radiata pine were:

- 7.0 to 8.0 per cent with market rental in CNI – 6.0 per cent on freehold land
- 4.5 to 6.5 per cent New Zealand
- 2.0 per cent West Coast to 6.0 to 7.0 per cent Northland, CNI – New Zealand range less than 80 kilometres from port and ground-based
- 4.0 to 6.0 per cent New Zealand
- 5.0 to 7.0 per cent Wairarapa and 7.0 to 9.0 per cent Hawke's Bay
- 3.0 to 4.0 per cent Marlborough
- 8.0 per cent best of CNI, 5.0 to 7.0 per cent rest of CNI, 0 to 5.0 per cent East Coast, 4.0 to 7.0 per cent Northland, 2.0 to 6.0 per cent SNI, 3.0 to 6.0 per cent Nelson/Marlborough, 2.0 to 5.0 per cent Otago/Southland
- 7.0 per cent inland Taranaki
- 5.0 to 7.0 per cent CNI/Northland, 4.0 to 6.0 per cent NSW/Victoria.

The IRRs are generally higher than those reported in 2011, no doubt reflecting the increase in log prices since then. However the estimates of IRR collected in this survey, generally pre-tax, indicate that there is still a disconnect between the discount rates used for forest valuation in New Zealand and the IRR of new planting or replanting projects. The estimated IRR is typically lower than the discount rate used for forest valuation.

## Discussion

### Number of respondents

The number of respondents to the survey has increased from 11 in 2011 to 16 in 2013. This is a result of actively seeking out individuals and organisations, both in this country and offshore, who value New Zealand and Australian plantations on a routine basis. Transaction data was provided by 11 of the forest valuers.



## Future rotations

There is a trend to looking at cashflows associated with future rotations, particularly in the valuation of larger forests. Comments from two respondents:

*Increasingly we would include an examination of the cashflows from future rotations, wherever the ownership of the forest is not confined to the current crop. If we "examine" the next rotation, this does not mean that it is the sole basis for value derivation.*

*When valuing entire real property interest, we model all cash flows expected by the typical investor, including those associated with current and future rotations. Under IFRS, we then must allocate total value between land and current crop. Here, the current crop value includes cash flows only from existing trees. The residual "contributory" land value (total value less current crop) reflects the added contributory value of future rotations, plus income from potential conversion to other uses.*

## Trends in implied discount rate

Figures 2 and 3 show the IDRs (applied to post-tax cashflows and pre-tax cashflows respectively) of transactions reported in all nine surveys to date. Note that the IDRs for each transaction have been averaged in the cases where there was more than one respondent. The overall conclusion would be that the general level of discount rates in the 2013 survey is similar to that reported in the 2011 survey. Certainly the average discount rates in the 2013 survey are not statistically different from 2011 averages – around 7.0 per cent for post-tax cashflows and 9.0 per cent for pre-tax cashflows.

## Detailed analysis of transactions to come

Forest valuers also provided information about each transaction including average age, volume, harvesting costs and distance to port. This will be used to develop a relationship between dollars per hectare for each transaction and key explanatory variables following the general approach of Manley and Bell (1992). This analysis will be reported in a subsequent issue of the Journal.

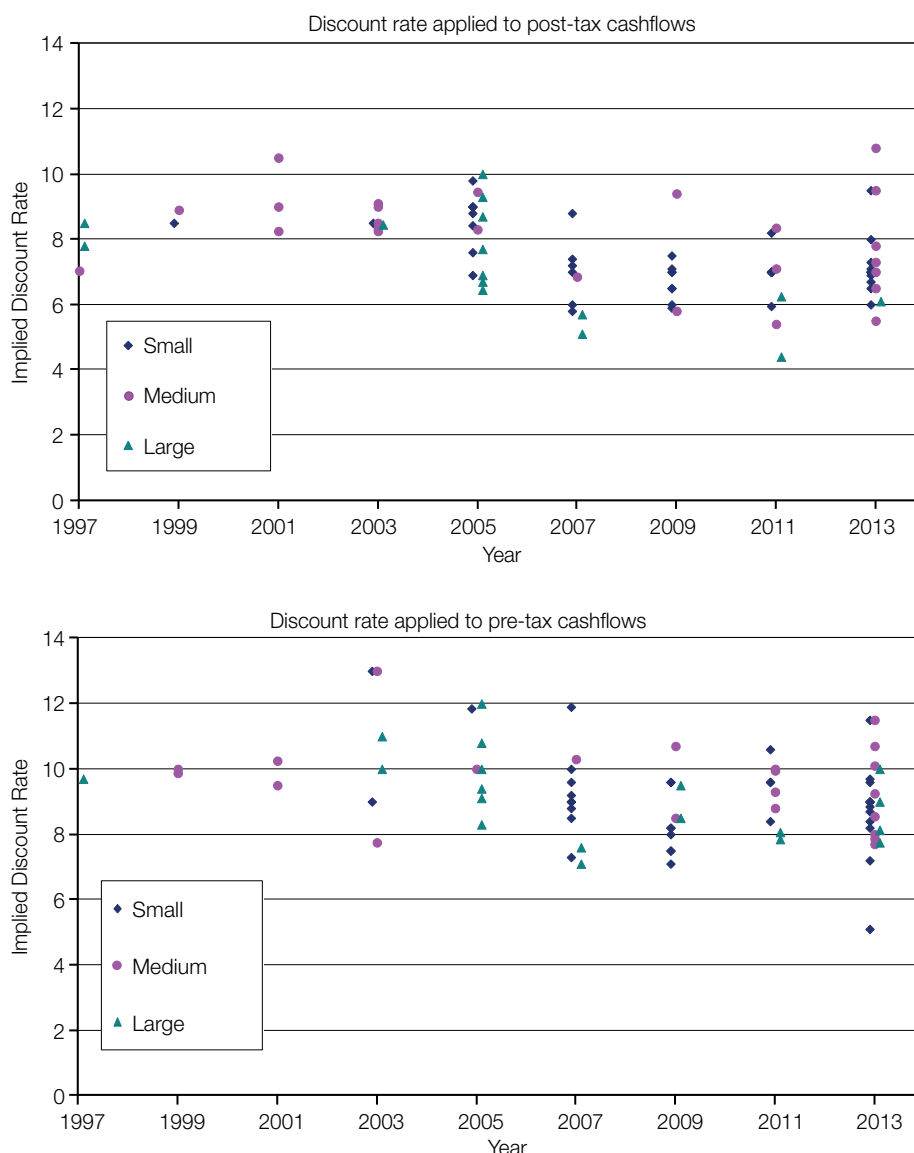


Figure 2: IDRs (applied to post-tax cashflows) for transactions reported in each of the discount rate surveys. Forests are identified by size class (small < 1,000 ha, medium 1,000 to 10,000 ha, large > 10,000 ha)

Figure 3: IDRs (applied to pre-tax cashflows) for transactions reported in each of the discount rate surveys. Forests are identified by size class (small < 1,000 ha, medium 1,000 to 10,000 ha, large > 10,000 ha)

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