Hancock Timber
RESEARCH *Note*

Publication Reference N-03-8

Exchange-Rate Risk for Timberland Investments in New Zealand

June 2003

This note examines the exchange-rate risk associated with the annual cash flows from equity investments in New Zealand radiata pine plantations. We take the perspective of an investor interested in $US returns, both because many of our investors are $US – denominated, and because the $US currency market is far more liquid than is the $NZ market.

Introduction and Summary

Currency risk arises in ownership of radiata pine plantations in New Zealand from three principle sources: the first is the revenue stream, apparently, but not actually, denominated in a combination of $US and $NZ. The second is the cost stream, which is in fact denominated in a combination of $US and $NZ. The third, for leveraged investments, is external debt, where we have a choice of currencies. Consider each of these in turn.

First, New Zealand timberland revenues derive from the sale of logs into export and domestic markets. It turns out that both are, in effect, $US markets. Export prices in Pacific Rim log trade are typically denominated in $US. The evidence is strong that New Zealand radiata export logs are part of this US – dollarized market. Even though receipts might be in $NZ, New Zealand radiata export log prices change in direct response to the $US/$NZ exchange rate. The domestic market responds to these US – dollarized export prices. There are no restrictions on the export of logs from New Zealand. As a consequence, "export parity" pricing is observed. That is, domestic log prices tend to equal export prices once differences in quality and marketing specifications are taken into account. Hence, New Zealand timberland revenues are denominated in $US. In the case of export prices, the relationship is explicit, and in the case of domestic prices, the relationship is implicit as a result of the structure of the domestic log market.

Second, since revenues are denominated in $US, investor exposure to the $NZ is limited to those costs that are denominated in $NZ. Some of these costs – gasoline, diesel fuel, site preparation chemicals, and equipment for logging, hauling and site preparation – are $US based, so the exposure to the $NZ is less than a cursory examination of the *pro forma* income statements would suggest. Analysis by forestry experts in New Zealand indicates that about 85 percent of annual operating costs for a typical radiata pine estate are $NZ based. This cost stream gives rise to some exposure to the $NZ.

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Third, we have the choice of currencies for external debt. Because there are, in effect, no $NZ revenues, it would be unwise to borrow in $NZ. This conclusion is reinforced currently by the large spread between the cost of $US- and $NZ-denominated debt, in the range of 100 to 200 bps at the time of this writing.

These facts make it possible to measure the sensitivity of the investment performance of New Zealand timberland properties to exchange-rate fluctuations. We found, for example, that a 1 percent decline in the $US reduced before-debt operating $US cashflows for a large New Zealand property with relatively stable future harvest levels by 1.2 percent, and lowered distributable cash by 2.4 percent. Of course, such results vary from property to property and from year to year.

The remainder of this note first discusses the revenue stream, then deals with the choice of currency for external debt, and finally develops the estimates of exchange-rate sensitivities. An appendix lays out the use of external debt as a natural currency exchange-rate hedge.

New Zealand Timberland Revenues Generated in $US, Most Costs Denominated in $NZ

Conventional derived-demand theory tells us that timber prices are derived from the demand for logs in various end-use markets. This theory teaches that timber prices respond to the prices of final products. For our purposes, two of these "final product" markets are important – the market for log exports and the market for logs used by domestic processors. Let us consider each case separately.

For log exports, New Zealand competes with the US PNW, British Columbia, Chile and Russia for market share. In all cases, logs are sold in the common currency of $US. Hence, when considering currency exposure, the key question related to log exports is the degree to which New Zealand radiata prices respond to the general level of prices in Pacific Rim trade.

To examine this issue, we regressed the rates of change in New Zealand radiata pine A-grade sawlog export prices (in $NZ) on rates of change in Douglas-fir sawlog export prices from the US PNW (in $US) and the $US/$NZ exchange rate. To accept the hypothesis that New Zealand export prices respond to $US prices, we would expect changes in radiata export prices to be strongly correlated with changes in $US-denominated Douglas-fir prices. In addition, if radiata prices were expressed in $NZ, then we would expect the exchange-rate coefficient to be 1.0.

The following regression provides the results for 23 years of data (1978 through 2001) for A-grade logs:

$$P_{Rad} = -0.0133 + \underset{(0.240)}{0.763}\, P_{DF} + \underset{(0.3250)}{0.976}\, EX \qquad R^2 = 0.402$$

where P_{Rad} = Price of radiata pine logs, (log-difference transformation), P_{DF} = Price of Douglas-fir export logs (log-difference transformation), EX = $NZ/$US exchange rate (log-difference transformation), and numbers in parentheses are the standard error of the estimates.

The results imply that about three – quarters of a proportional change in the overall price level in the Pacific Rim (as measured by Douglas-fir prices) is directly translated into New Zealand radiata price levels. The coefficient is statistically different from zero ($p < 0.005$) and is not statistically different from 1.0. Furthermore, as indicated by the coefficient on the exchange rate, changes in the exchange rate are fully translated into changes in $NZ price levels. These results indicate that, although New Zealand radiata export-log prices may sometimes be reported in $NZ, they trade at the $US equivalent.

The domestic New Zealand market is small, and as a consequence, much of the wood products manufactured in New Zealand are exported – the US, Australia and Japan are the three largest markets. Since log exports are not restricted, domestic processors should face the export price, a condition called "export-parity pricing." Of course, minor differences in prices might persist as a result of different specifications or marketing arrangements for export logs.

To test the hypothesis of export-parity pricing, we regressed the price of domestic logs on the price of export logs and the exchange rate. The data we have are for pruned logs only, and are denominated in $NZ. For export-parity pricing to hold, we would expect the coefficient for the export log price to be 1.0, and the coefficient for the exchange rate to be zero (since all prices are expressed in $NZ). The data are quarterly, so we included a couple of periods in the regression to account for the fact that adjustments in export prices might take a couple of quarters to be reflected in the domestic market. Again the equation was estimated in log-difference form. The results for the period 1992:3-1999:4 are:

$$P_{DOM} = -0.00048 + \underset{(0.101)}{0.443}\, P_{EXPORT} + \underset{(0.100)}{0.459}\, P_{EXPORT\,-1} + \underset{(0.097)}{0.0595}\, EX \qquad R^2 = 0.626$$

where P_{DOM} = Price of pruned radiata pine logs sold into the domestic market (log-difference transformation), P_{EXPORT} = Price of pruned radiata pine logs sold into the export market (log-difference transformation), EX = $NZ/$US exchange rate (log-difference transformation), and numbers in parentheses refer to standard error of the estimates.

The coefficients on the export-price variables sum to 0.902, indicating that, within two quarters, 90 percent of any proportional change in export prices is translated into the domestic market (the four-quarter sum is 0.995). This result is consistent with the export-parity assumption. Note that the coefficient on the exchange-rate variable does not differ statistically from zero, as we would expect given that both price series are expressed in $NZ.

Operating costs are all paid in $NZ. However, some operating costs – gasoline, diesel fuel, site preparation chemicals, and equipment for logging, hauling and site preparation – are denominated in $US. Forestry experts in New Zealand suggest that about 15 percent of annual operating costs for a typical New Zealand timberland property are $US based.

The conclusion that New Zealand timberland revenues are, in effect, denominated in $US, and most operating costs are denominated in $NZ, paves the way for examining two important issues related to exchange rates: the choice of currency for external debt, and the sensitivity of investor returns to changes in the exchange rate.

Choice of Currency for External Debt

Conventional wisdom in corporate finance suggests matching the currencies of debt to the currencies of net pre-debt revenues. Doing so provides a “natural hedge” against changes in the currency exchange rates (that is, a movement in the exchange rate changes, by the same amount, debt payments and the revenues available to support those debt payments). The appendix to this note explains this idea in detail.

In the case of New Zealand timberland, we have demonstrated in the analysis above that the revenue streams are largely, if not solely, denominated in $US. The cost stream is denominated primarily in $NZ. As a result, the standard corporate-finance prescription indicates that the external debt should be denominated in $US. To put this another way, adding $NZ-denominated debt would only *increase* the sensitivity of cash flows, profits, or IRR to changes in the $US/$NZ exchange rate.

Finally, if $US interest rates were higher than $NZ interest rates, there might be some merit in borrowing in $NZ. That is, the lower borrowing cost might offset the increase in exchange-rate risk. However, at the time of writing, $NZ interest rates are 100 to 200 bps higher than $US interest rates. The significant difference in interest rates reinforces our conclusion that, from the perspective of an investor interested in $US returns, the external debt for New Zealand timberland should be denominated in $US.

Exchange-Rate Risk

It appears that the revenues from New Zealand timberland are generated in $US, and most (but not all) of the operating costs are in $NZ. Furthermore, interest payments on external debt are likely to be in $US. Given this structure of the revenue and cost streams, what is the exchange-rate risk?

To examine the exchange-rate risk, it is useful to define profits for an investment in New Zealand timberland, in $US, as:

$$DC = R - C_{US} - EX(C_{NZ}) - I_{US}D_{US}$$

$$OCF = R - C_{US} - EX(C_{NZ})$$

where DC = distributable cash, in $US, OCF = operating cash flow prior to external debt payments, in $US, EX = $US/$NZ exchange rate, R = gross revenues, in $US, C_{US} = portion of operating costs denominated in $US, C_{NZ} = portion of operating costs denominated in $NZ, I_{US} = interest rate on $US debt, and D_{US} = amount of $US debt.

We populated these equations with performance projections for a large New Zealand timberland property. Of course, performance will vary from property to property and from year to year.

$$DC = \$57.4mm - \$4.4mm - 0.46(\$NZ62.8mm) - \$12.0mm = \$12.1mm$$

$$OCF = \$57.4mm - \$4.4mm - 0.46(\$NZ62.8mm) = \$24.1mm$$

We can use these equations to simulate the impact of a change in the exchange rate on annual profits. Suppose that the $NZ strengthens by 10 percent so the $US value of the $NZ-based costs increases from $28.9 to $31.8. Distributable cash falls to $9.2 mm (24 percent), and operating cash flow falls to $21.2mm (12 percent).

Four points are evident from this analysis. First, the sensitivity of the operating cash flows is greater than one, so a 1 percent change in exchange rate gives rise to a slightly larger change in OCF. Second, distributable cash is more sensitive to changes in the exchange rate, with a 1 percent change in the exchange rate giving rise to a 2.4 percent change in distributable cash. Third, to borrow in $NZ would make matters worse, increasing the sensitivity of both distributable cash and capacity to service debt to the exchange rates.

Appendix

Using External Debt to Provide a Natural Currency Hedge

This Appendix explains the idea of matching the currency of debt with the currency of revenues as a means of creating a natural currency exchange-rate hedge. As before, we take the perspective of a \$US investor.

Define distributable cash for a timberland property, in \$US as:

$$DC = R_{US} + EXR_{NZ} - C_{US} - EX(C_{NZ}) - I_{US}D_{US} - EX(I_{NZ})D_{NZ} \quad (A1)$$

Where DC = distributable cash, in \$US, EX = \$US/\$NZ exchange rate, R_{US}, R_{NZ} = revenues, in \$US and \$NZ, C_{US}, C_{NZ} = operating costs, in \$US and \$NZ, I_{US}, I_{NZ} = interest rates on \$US and \$NZ debt, and D_{US}, D_{NZ} = amount of debt in \$US and \$NZ.

For \$US-denominated investors to be perfectly hedged against changes in exchange rates means that distributable cash does not change if the exchange rate changes. To express this condition mathematically, we want to solve for the amount of \$NZ debt that makes the derivative of DC with respect to EX zero, or

$$d\,DC/d\,EX = 0 \quad (A2)$$

Doing the math gives us

$$D_{NZ} = (R_{NZ} - C_{NZ})/ I_{NZ} \quad (A3)$$

Based on the analysis in the body of this note, $R_{NZ} = 0$, so the only way to hedge the currency exposure is to go long (that is, to lend) in \$NZ. This would be the objective of a currency hedge for those investors who wanted to protect themselves against movements in the exchange rate.

As a test of the strength of the conclusion that all the external debt should be borrowed in \$US, imagine that the revenues from domestic log sales are actually denominated in \$NZ, and that 85 percent of the domestic costs are \$NZ denominated with the remainder being \$US denominated. Then, the financial model for the large New Zealand property described in the body of the note gives the following values for these variables:

$$R_{NZ} = \$NZ\ 57.9\ mm$$
$$C_{NZ} = \$NZ\ 62.8\ mm$$
$$I_{NZ} = 7.85\%$$

With these values, Equation A3 still gives us a negative value for D_{NZ} (that is, we would want to go long in \$NZ). The problem is that there is simply not adequate projected \$NZ revenue to offset the \$NZ operating costs, let alone additional \$NZ debt.

Research Publications from the Hancock Timber Resource Group

Title	Date Published	Reference #
Exchange-Rate Risk for Timberland Investments in New Zealand	6/03	N-03-8
The Benefits of Timberland in a Real Estate Portfolio, Revisited	6/03	N-03-7
Disposition Discipline and its Contribution to the Performance of Timberland Investments	2/02	N-02-6
Review of Southern Pine Sawtimber Prices on HTRG Properties in Alabama and Mississippi	8/01	R-01-3
Stochastic Simulation in Timberland Investment Analysis	7/01	R-01-2
The NCREIF Timberland Index	7/01	
Timberland as a Portfolio Diversifier	7/01	
Historical Returns for Timberland	7/01	
Relating Cash Flow and Total Return: Do Properties With Lower Near-Term Cash Flow Produce Higher Total Returns?	1/01	N-01-2
Investing in Forests as Part of the Response to Climate Change	9/00	B-00-2
Taking Advantage of the Wholesale Discount for Large Timberland Transactions	2/00	R-00-1
Levering Timberland Investments: Consequences for Equity Returns	2/00	N-00-1
Dueling Views of Timberland in P&I: What's the Real Story?	2/00	B-00-1
Hancock Timberland Investor	Quarterly	