

# Hancock Timber RESEARCH *Note*

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## Levering Timberland Investments: Consequences for Equity Returns

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**Using debt to finance a timberland investment changes the character of the equity returns in certain predictable ways. This note lays out the most important of these effects, including the effect on mean returns, volatility of returns, diversification capacity and capital asset pricing.**

Because interest payments can provide a substantial income tax shield, we examine returns in both tax-exempt and taxable situations. Other issues surrounding timberland leverage, including foreclosure risk, cash flow constraints and the efficiency of markets for timberland debt, are identified but left for future analysis.

Throughout this discussion, we denote the unlevered return on a timberland investment (this could be a property or a portfolio) as  $r_u$ , and the cost of debt as  $r_d$  (assumed to be fixed rate with no amortization of principal). The ratio of debt to equity in the investment is  $\delta$ , so the percentage debt is  $\delta/(1+\delta)$ . To make this clear, suppose the total value of the investment is \$200 million, financed with \$50 million of debt and \$150 million of equity. Then  $\delta = 0.33$  and debt as a percentage of total capitalization is 25 percent.

### Mean Returns

For a tax-exempt investor, the return for levered timberland equity is:

$$r_l = r_u + \delta (r_u - r_d).$$

Leverage increases the equity return as long as the unlevered return is higher than the cost of debt. The magnitude of the increase can be substantial. At this writing, rates on most timberland mortgages are in the range of 8.0 percent in nominal terms. Assuming a 3.0 percent expected rate of inflation, real debt costs are approximately 5.0 percent per year. With 50 percent debt ( $\delta = 1.0$ ), leverage would increase a real expected return of 8.0 percent on unlevered equity to 11.0 percent on levered equity.<sup>1</sup>

<sup>1</sup> Note that for illustrative purposes, our formulation makes at least two important simplifying assumptions. First, it does not consider any up-front costs of obtaining debt financing. Origination fees for bank loans, for example, may range from 50-150 basis points of the loan amount. Second, it assumes that the capital structure of the investment stays constant. In many cases, however, the percentage debt will decline over time as the value of the timberland property increases through a combination of timber inventory growth and price appreciation. Both of these factors will reduce the actual levered return.

The effective pre-tax levered return on timberland equity for a taxable investor is:

$$r_l = r_u + \delta [r_u - (1 - t) r_d],$$

where  $t$  = the investor's marginal tax rate.

The deduction of interest payments from income and capital gains lowers the cost of debt for a taxable investor to  $(1 - t) r_d$ . This reduction in debt costs increases effective pre-tax equity returns by the amount  $\delta t r_d$ . Assuming a marginal tax rate of 30 percent, the tax shield increases real equity returns for the situation described above from 11.0 to 12.5 percent. Note, however, that timber depletion, which effectively lowers the tax rate for timberland investments, decreases the magnitude of the tax shield afforded by leverage. Thus, the tax consequences of leverage will vary among investments as well as investors.

### Volatility of Returns

The standard deviation  $\sigma$  of the levered equity return in both tax-exempt and taxable situations is:

$$\sigma(r_l) = (1 + \delta) \sigma(r_u)$$

This assumes that debt and tax rates are fixed so their standard deviations are identically 0.

Leverage always increases the volatility of returns for timberland equity. Again, the increase can be substantial. Returns for a timberland investment financed equally with debt and equity will be twice as volatile as returns from an equivalent unlevered investment. Interestingly, the effect depends on the debt percentage but not on the debt rate.

### Diversification and Asset Pricing

Leverage will not affect the correlation coefficients between returns for the levered asset and other investments. However, it will affect the CAPM  $\beta$  of the asset in a straightforward way:

$$\beta_l = (1 + \delta) \beta_u$$

Again, this assumes that both debt and tax rates are fixed.

Note that leverage increases the capacity of a negative- $\beta$  asset to diversify a portfolio of positive- $\beta$  assets. (The CAPM  $\beta$  of a portfolio is simply the value-weighted average of the individual asset  $\beta$ 's.)

## Other Issues Surrounding Leverage

While these are the primary consequences of leverage for timberland equity returns, other issues can also influence the performance of a levered investment. We identify some of these issues here, but leave a fuller discussion to the future.

### *Cash Flow Constraints*

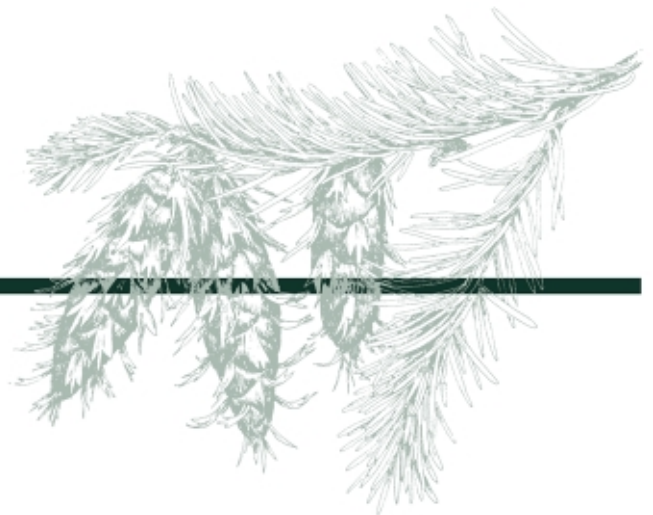
Most forms of leverage require a relatively steady flow of cash to service the debt. This limits flexibility to time timber sales in response to timber market conditions. In fact, if debt levels are high and timber markets are exceptionally weak, harvests may actually need to be accelerated to generate cash requirements. Further study is needed to quantify the cost of this cash flow constraint.

### *Foreclosure Risk*

Leverage creates the possibility that the value of timberland equity can fall to zero. If the levered asset can not generate the cash required to service the debt, foreclosure may result. Ordinarily the risk of foreclosure is measured by such factors as loan-to-value and interest-coverage ratios. Simulations we have done for a typical southern pine forest suggest that the risk of foreclosure is negligible as long as the debt is kept to modest levels. Since timber properties typically carry a very large inventory of merchantable inventory relative to annual harvests, at any point in time expected cash flows can be augmented by the simple expedient of cutting more trees. Obviously this moves the harvest schedule away from the planned, optimal harvest schedule, but the reduction in the weighted-average cost of capital associated with increased leverage may more-than-offset the reduction in present value. This issue warrants further study.

### *Efficiency of Markets for Timberland Debt*

If debt is priced fairly, then leverage should not affect the risk-adjusted return to timberland equity for a tax-exempt investor. In other words, the increase in return afforded by leverage would be associated with a commensurate increase in risk. Further analysis of markets for various forms of debt is needed to determine debt costs and assess the fairness of its pricing.



## Research Publications from the Hancock Timber Resource Group

Title	Date Published	Reference #
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	

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