Forest Research Group

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The Biggest Timberland Investment Risk

When most investors talk about risk, they are referring to the volatility of the returns. This is shown by the fact that investors often refer to the capital market line (an example is shown in Figure 1) when discussing risk and return.

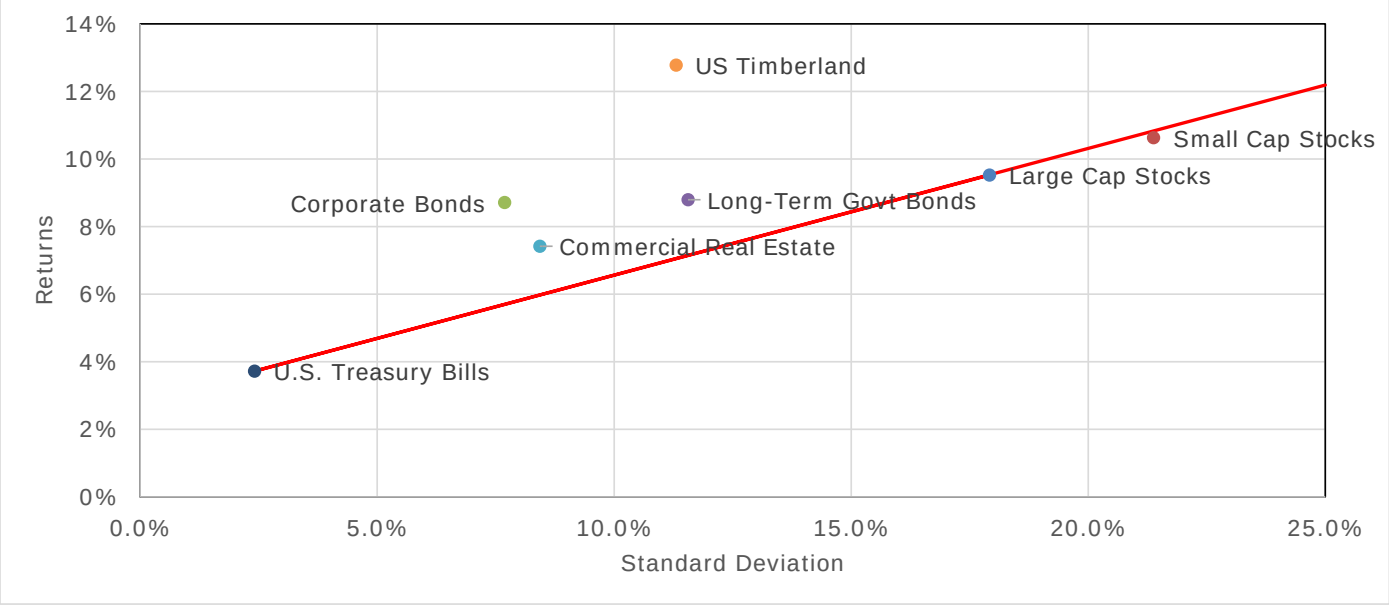
The capital market line compares the returns and standard deviations of those returns for the assets being compared. The x-axis, which is labeled "standard deviation" here, is often labeled "risk" in such charts. So the "risk" being measured is the standard deviation of the returns, which, in turn, is an indication of the volatility of those returns.

Figure 1 shows that timberland had higher returns than long-term government bonds over the analysis period, but with a similar level of volatility. So timberland provided higher returns than bonds at about the same level of risk. Timberland returns also outperformed commercial real estate, but real estate showed much lower "risk". Further analysis would be needed to determine which asset produced the best results for any given portfolio of which they were a part.

But, when investors ask about the "risk" involved in timberland investment, they are asking about more than volatility. They are usually asking about the risk of physical damage to standing trees. The standard deviation of returns does not directly measure these other "risks".

But, physical loss is not the greatest risk for a timberland investment.

Figure 1. Capital Market Line for Selected Assets, 1987-2012



Sources: Morningstar, NCREIF

The Biggest Risk

The biggest risk in timberland investing is paying too much for the property.

We have identified three key factors that you must get right when buying a timberland property. If you overestimate any of these key factors, the cash flows you actually generate from the timberland will be less—maybe *much* less than what you assumed in your acquisition model.

Those three factors are:

- Inventory
- Growth Rate
- Timber Price Forecasts

To illustrate some of the issues, we set up a simple acquisition model for a hypothetical property. It is 2,600 acres of fully-regulated southern pine where 100 acres of 25-year-old pine is available for harvest each year and 100 acres are site prepped and planted each year.

We assumed an annual harvest of 120 tons per acre with a product distribution (and pricing) as shown in Table 1. These are the "actual" numbers used in our examples.

Table 1. Key Assumptions

	Volumes (tons/acre)	Price ($/ton)
Pine Sawtimber	40	$25
Pine Chip N Saw	40	$15
Pine Pulpwood	40	$8

Using these volumes and prices and using a 6 percent discount rate, the present value of the property is about $2.6 mm or $1,000/acre. (That price is a bit lower than we might find on the market now, but if we want to earn 6% and timber prices stay at their current levels—and if the rest of the assumptions in our the model are correct—that is all we can afford to pay.)

Inventory

If you overestimate the volume of standing timber on a property, your investment model will indicate a purchase price that is too high.

The risk of a faulty inventory is (or should be) fairly low. Forest inventories are based on a statistical sampling of the forest and field procedures for inventories are well established. The risk of poor execution by foresters on the ground in a forest inventory is low. Experienced foresters can fly over a property and come up with very close estimates of what is on the ground. In addition, the standing inventory is a physical thing—there is no need to assume anything about it.

The risk comes in designing a particular inventory project for a particular property. The more complex a forest is, the more complex the inventory project becomes. A large, naturally regenerated forest in the US Northeast will contain multiple stands of various sizes and several forest types (e.g., hardwood or spruce-fir), and each will contain multiple species with trees of different sizes (and often ages). It takes a little bit of analysis to determine how many sample points/plots should be taken in each stand. Inventories of southern pine plantations are a little less complex because there are fewer species involved (if we ignore the hardwood bottomlands).

It is critical to gather the correct information. It is vital to have the field foresters using the correct specifications for the products to be measured. For example, assuming the local sawmills will take trees (or logs) down to a small-end diameter of, say 4 inches, will overstate the sawtimber inventory if the local market specification is actually 6 inches. In short, if you gather the wrong information, your inventory isn't helpful.

A lesser risk comes from new technologies such as satellites and Lidar. A lot of research has gone into using these technologies over the past couple of decades, but widespread replacement of inventory foresters on the ground has not occurred. One of the challenges with these technologies is that they can often measure *volume* with acceptable accuracy, but estimating the *grade* of standing trees has been more difficult.

So what happens if we get the inventory wrong?

With a southern pine property we might be more likely to miss the product allocation rather than the total volume. So let's assume we get that product allocation wrong. Suppose instead of the "actual" distribution shown in Table 1, we've assumed that half of the volume was sawtimber, a quarter was Chip N Saw and the last quarter was pulpwood. Now our acquisition model tells us the present value of the property is just over $3.0 mm or $1,173/acre.

So we pay the $3.0 mm for the property and expect to get a 6% return. But paying $3.0 mm for a $2.6 mm property drops the IRR to 4.8 percent.

The risk of a faulty inventory can be limited by making sure the correct product specifications are used in the design. If we are careful, there is little *uncertainty* and no *volatility* about the standing timber on a property.

Growth Rate

Closely related to assumptions about the timber inventory are assumptions about growth rates. We can be very certain about how trees have grown on our forest in the past. The risk here comes from assumptions about future growth rates. In collecting data about the inventory, foresters will also be measuring tree growth. That will provide good data on how trees have grown in the past.

The risk here is that the future will be different than the past. But we cannot be *certain* about future rainfall or insect infestations or fires.

We add uncertainty when we introduce new species or a new generation of genetically-improved seedlings or new silvicultural techniques. These may have been thoroughly researched on test plats, but often not across thousands of acres and through all conditions a stand is likely to experience, such as extended drought or cold.

Faulty growth assumptions would show up as higher harvest volumes in our model than we would actually get from the property. We might, for example, think we were going to harvest 150 tons per acre rather than the 120 tons per acre we show in Table 1.

While there may be less certainty about growth rates than inventory, the band of uncertainty is fairly narrow.

Timber Price Forecasts

The greatest level of uncertainty is found in timber price forecasts. If you use or build a discounted cash flow model to analyze potential timberland investments, you will have to make some assumptions about future timber prices. This involves considerable more uncertainty than estimating standing timber or growth rates.

For an example of how a faulty timber price forecast can impact our returns, let's say our acquisition model assumes 5 percent real price appreciation over the next ten years for sawtimber and Chip N Saw. This pushes the sawtimber price from Table 1 to $40.72 per ton in 2024[1] and the Chip N Saw price rises to $20.15 per ton. This gives us a purchase price of just over $3.8 mm or $1,646/acre.

But let's assume prices stayed flat as in our base case. We'd pay the $3.3 mm for a $2.6 mm property and our IRR would be 3.4 percent.

Future timber prices depend on a wide variety of factors that are difficult to measure because they have not happened yet:

[1] 5 percent annual real price appreciation may sound aggressive, but that 2024 sawtimber price is just pennies over the long-term average for sawtimber.

- Will your forest grow the size and quality of trees that are in your investment model?
- Will the mills you assume will buy your timber still be operating in 5 or 10 years?
- Will log exports increase or decrease over the life of the investment?
  - If exports *increase* you might expect timber prices in your region to rise as domestic mills compete for logs with the exporters.
  - If exports *decrease*, there will be more timber available to local mills and you might expect timber prices to decline.
- Will changing technologies in wood-consuming mills change the demand for your timber?
  - Will mills pay more for smaller logs?

Summary

When investors talk about risk, they are usually thinking about volatility. But physical assets like timberland face other risks.

The greatest risk in timberland investing is paying too much for a property and this is driven largely by uncertainty around future timber volumes and values. Faulty inventories are a factor in bad purchases, but careful attention to inventory design should prevent that problem. There is less certainty about growth rates, because new generations of seedlings and silvicultural techniques and changes in weather can change harvest volumes in ways we did not anticipate. There is even less certainty around timber prices in the future.

Incorrect assumptions in the acquisition model will produce a purchase price that is too high.

Up-Coming Events

Forest Economics: Gateway to Sustainability

St Louis, MO USA
March 17-18, 2014

The 2014 annual meeting of The International Society of Forest Resource Economics (formerly Southern Forest Economics Workers) will be in St Louis. I will be presenting *Stumpage Price Distributions and Their Effect on Expected Timberland Returns*, using southern pine prices as an example. For more information, visit the web site at:
http://sofew.cfr.msstate.edu/meeting2.asp?id=36

Forestry and the Global Environment: Challenges of Managing and Conserving Forests in the 21st Century

New Haven, CT USA
March 23-28, 2014

Yale University's Global Institute of Sustainable Forestry will again be offering a one-week session and I will be helping Lloyd Irland lead a discussion on the economics of and markets for timber, wood-based energy, carbon and ecosystem services as one segment of the session. For more information, visit the web site at:
http://environment.yale.edu/gisf/mid-career-courses/executive-education-in-forestry-program

IFA Plantation Productivity Symposium: Proving R&D Pays

Mt Gambier, South Australia, Australia
12-14 May, 2014

My presentation will look at the need to invest in improving productivity of timberlands to improve or maintain asset values and returns. Preliminary information is available from Institute of Foresters of Australia (IFA) at:
http://forestry.org.au/events/plantation-productivity-symposium-proving-r-d-pays

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