

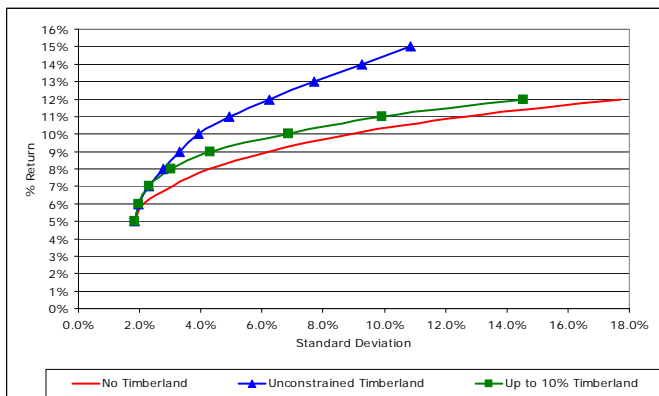


Regional Diversification in Timberland

Investment managers and independent researchers have shown how adding modest amounts of timberland to an investment portfolio can improve portfolio performance. While timberland can provide good returns in its own right, the lack of correlation with other asset classes usually results in the efficient frontier of the portfolio shifting to the left in a risk/return chart, meaning timberland can help provide the same returns at less risk or higher returns for the same risk as a portfolio without timberland.

Most of the published text and charts (some of which we have produced) look at “typical” investment portfolios, and generally use an optimized mix of timberland investment regions or the NCREIF US Timberland Index when adding timber to these typical portfolios. Figure 1 shows the type of efficient frontiers that are generated by such an analysis. The portfolio consists of varying amounts of the S&P 500, Russell 2000, Ibbotson small company stocks, corporate bonds and timberland. No constraints were set on the individual assets.

Figure 1. Typical Portfolio Analysis, 1987-2003



The chart clearly shows that adding timberland—especially with no constraint on the amount that may be allocated to timberland—will improve overall portfolio performance.

But this is a “typical” analysis and many investors do not have “typical” portfolios. Does it make a difference which timberland region is added to the non-typical portfolio?

We always thought it would. We thought, for (an extreme) example, that a portfolio heavily weighted towards small company stocks might get the biggest improvement (higher returns and/or lower volatility) from western timberland investments, while a portfolio weighted heavily towards large cap stocks might receive the biggest improvement from southern timberland—or vice versa.

That was several weeks ago. This newsletter issue was delayed because we have since run a variety (a *very large* variety) of assets and combinations of assets through a portfolio optimizer only to find that our hypothesis was not entirely correct.

While we did not find that different timberland investment regions fit certain portfolios better than others, we did find that returns over different time periods made a difference as to which timberland region contributed the most to the overall portfolio.

We looked at two different time periods. The NCREIF timberland index reports returns for the South and Pacific Northwest since 1987, so we looked at 1987-2003 (Table 1). We also used a market value-weighted mix of SO and PNW timberland. This avoided the impact of NE timberland on our 1987-2003 analysis that would have come from using the US timberland returns. NCREIF has reported returns for the Northeast since 1994, so we also looked at 1994-2003 (Table 2).

For our first set of optimizations, we let the optimizer choose among the S&P 500, Ibbotson small company stocks, the Russell 2000, corporate bonds and NCREIF timberland.

Table 1. Asset Class Characteristics, 1987-2003

	S&P 500	Ibbotson Small Company	Russell 2000	Corporate Bonds	LT Govt Bonds	Treasury Bills	NAREIT Equity	NCREIF Commercial Real Estate	NCREIF SO Timberland	NCREIF PNW Timberland	NCREIF SO/PNW Timberland Mix
Annually Compounded Return	12.04%	10.49%	10.45%	9.07%	9.12%	4.80%	10.95%	6.92%	10.91%	19.71%	15.67%
Standard Deviation	17.96%	18.42%	19.93%	8.88%	11.21%	1.92%	16.56%	5.83%	6.70%	25.12%	13.25%
Correlation Coefficient											
S&P 500	1.0000	0.5370	0.7453	0.1940	0.1848	0.2528	0.2517	0.1423	0.5029	0.2801	0.3732
Ibbotson Small Company		1.0000	0.7995	0.2608	0.1788	-0.0106	0.5421	-0.2912	0.1070	0.2697	0.2647
Russell 2000			1.0000	0.2137	0.1400	-0.1239	0.6871	-0.1986	0.1870	0.3111	0.3087
Corporate Bonds				1.0000	0.9576	0.1392	0.2754	-0.2142	-0.0908	0.1291	0.1034
LT Govt Bonds					1.0000	0.1834	0.2277	-0.1132	-0.0093	0.1135	0.1075
Treasury Bills						1.0000	-0.2601	0.0707	0.2719	0.4009	0.3760
NAREIT Equity							1.0000	-0.2154	-0.0775	0.0828	0.0475
NCREIF Commercial Real Estate								1.0000	-0.0464	-0.3380	-0.3857
NCREIF SO Timberland									1.0000	0.3475	0.5762
NCREIF PNW Timberland										1.0000	0.9473
NCREIF SO/PNW Timberland Mix											1.0000

Sources: Ibbotson Associates, NCREIF, NAREIT, Frank Russell

Table 2. Asset Class Characteristics, 1994-2003

	S&P 500	Ibbotson Small Company	Russell 2000	Corporate Bonds	LT Govt Bonds	Treasury Bills	NAREIT Equity	NCREIF Commercial Real Estate	NCREIF US Timberland	NCREIF SO Timberland	NCREIF PNW Timberland	NCREIF NE Timberland	NCREIF SO/PNW Timberland Mix
Annually Compounded Return	11.06%	10.12%	9.47%	7.97%	8.01%	4.18%	12.05%	10.06%	8.76%	9.26%	6.22%	13.17%	8.15%
Standard Deviation	21.46%	16.49%	19.70%	10.43%	13.32%	1.65%	17.44%	3.33%	7.14%	8.49%	7.81%	13.21%	7.22%
Correlation Coefficient													
S&P 500	1.0000	0.5156	0.7704	0.0368	0.0526	0.2982	0.0916	0.4502	0.7106	0.6231	0.5536	0.5311	0.6681
Ibbotson Small Company		1.0000	0.6196	0.0020	-0.0778	0.4080	0.1973	-0.1045	0.3263	0.2126	0.4529	-0.0222	0.3311
Russell 2000			1.0000	-0.0632	-0.1217	-0.0472	0.5086	0.0608	0.4161	0.2992	0.5660	0.1503	0.4326
Corporate Bonds				1.0000	0.9568	0.1205	0.1099	-0.0159	-0.2036	-0.1158	-0.1577	-0.5150	-0.1208
LT Govt Bonds					1.0000	0.2653	0.0654	0.1283	-0.0645	-0.0203	-0.0086	-0.3729	0.0000
Treasury Bills						1.0000	-0.0902	0.4700	0.3677	0.2987	0.3224	0.2410	0.3306
NAREIT Equity							1.0000	-0.2243	-0.0493	-0.0239	0.2884	-0.4614	0.0859
NCREIF Commercial Real Estate								1.0000	0.2927	0.2395	0.0121	0.7089	0.1760
NCREIF US Timberland									1.0000	0.9342	0.8120	0.5618	0.9795
NCREIF SO Timberland										1.0000	0.6262	0.4059	0.9566
NCREIF PNW Timberland											1.0000	0.2774	0.8243
NCREIF NE Timberland												1.0000	0.3947
NCREIF SO/PNW Timberland Mix													1.0000

Sources: Ibbotson Associates, NCREIF, NAREIT, Frank Russell

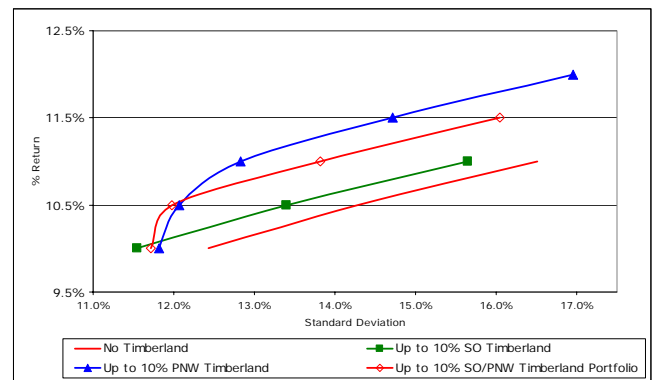
We started with five portfolios:

1. Unconstrained
2. Minimum 50% S&P 500
3. Minimum 50% Ibbotson small company
4. Minimum 50% Russell 2000
5. Minimum 50% corporate bonds

For all five portfolios, we tried four timberland allocation scenarios: no timberland, up to 10% SO timberland, up to 10% PNW timberland, and up to 10% SO/PNW timberland mix.

To our surprise and disappointment¹, there were no significant differences in the allocations among the portfolios. For example, Figure 2 shows the efficient frontiers for the Minimum 50% Russell 2000 portfolio and the frontiers here are typical for the five portfolios. In all cases, portfolios *with* timberland had lower volatility than portfolios without.

Figure 2. Allocation in a 50% Minimum Russell 2000 Portfolio, 1987-2003

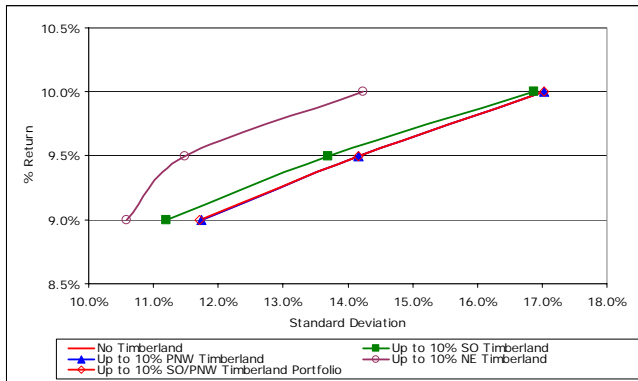


In almost all cases, when the (historical) portfolio returns were 10% or less, SO timberland provided the lowest volatility as measured by the standard deviation. When the portfolio returns were 12% or more, PNW timberland provided the lowest volatility. When the portfolio returns were between 10% and 12%, the SO/PNW timberland mix provided the lowest volatility.

¹ Surprise and disappointment because the results did not support our hypothesis.

Figure 3 shows the same portfolio using returns from 1994-2003. Using return data from the last ten years, NE timberland lowers the standard deviation more than any of the other investment regions. PNW timberland received very small allocations in most of the portfolios.

Figure 3. Allocation in a 50% Minimum Russell 2000 Portfolio, 1994-2003



In a final attempt to find support for our hypothesis, we tried using finite allocations instead of allocation ranges. A number of public employee pension funds publish their asset allocations on their web sites and most of them provide specific target allocations, not ranges. The portfolio optimizer was not needed in this analysis, because the asset allocations were finite points. The tables below show the portfolio without timberland, then the portfolio when 5% was allocated to timberland. The allocation of other assets remained proportional. In other words, if the S&P 500 received an allocation of 50% when there was no timberland in the portfolio, it received an allocation of 48% when timberland was added.

Table 3 shows four (of many) portfolio allocations using asset characteristics from 1987 to 2003. The boxes in the return and standard deviation columns indicate the highest returns and lowest standard deviations. In all cases, timberland from any region or group of regions lowered volatility. In all four examples, adding PNW timberland to the portfolio provided the highest returns, but reduced the standard deviation by only 7-29 basis points. SO timberland did little for the portfolio returns, but it lowered the standard deviation (our measure of volatility) by 40-54 basis points.

Table 3. Results, 1987-2003

	Return	Chg fm No Timberland	Std. Dev.	Chg fm No Timberland
40% S&P 500, 10% Russell 2000, 30% Corporate Bonds, 10% Treasury Bills, 10% NAREIT Equity				
No Timberland	10.16%		10.49%	
5% NCREIF SO Timberland	10.20%	0.04%	10.09%	-0.40%
5% NCREIF PNW Timberland	10.64%	0.48%	10.42%	-0.07%
5% NCREIF SO/PNW Timberland Mix	10.43%	0.28%	10.22%	-0.27%
40% S&P 500, 20% Russell 2000, 30% Corporate Bonds, 10% NAREIT Equity				
No Timberland	10.72%		12.23%	
5% NCREIF SO Timberland	10.73%	0.01%	11.73%	-0.50%
5% NCREIF PNW Timberland	11.17%	0.45%	12.06%	-0.17%
5% NCREIF SO/PNW Timberland Mix	10.97%	0.25%	11.86%	-0.36%
75% S&P 500, 25% Corporate Bonds				
No Timberland	11.30%		14.07%	
5% NCREIF SO Timberland	11.28%	-0.02%	13.53%	-0.54%
5% NCREIF PNW Timberland	11.72%	0.42%	13.78%	-0.29%
5% NCREIF SO/PNW Timberland Mix	11.52%	0.22%	13.63%	-0.44%
75% S&P 500, 10% Corporate Bonds, 5% Treasury Bills, 10% NCREIF Commercial Real Estate				
No Timberland	10.87%		13.78%	
5% NCREIF SO Timberland	10.87%	0.00%	13.26%	-0.52%
5% NCREIF PNW Timberland	11.31%	0.44%	13.49%	-0.29%
5% NCREIF SO/PNW Timberland Mix	11.11%	0.24%	13.35%	-0.44%

At first glance, Table 3 suggests, based on historical returns, that you should invest in PNW timberland to produce higher overall returns or SO timberland to produce lower overall volatility. However, the results in Table 3 are based on the returns from 1987 to 2003 (from Table 1). Table 4 shows the results of the analysis using asset characteristics from 1994 to 2003 and suggests a different conclusion.

Table 4. Results, 1994-2003

	Return	Chg fm No Timberland	Standard Deviation	Chg fm No Timberland
40% S&P 500, 10% Russell 2000, 30% Corporate Bonds, 10% Treasury Bills, 10% NAREIT Equity				
No Timberland	9.39%		11.22%	
5% NCREIF US Timberland	9.35%	-0.03%	10.86%	-0.36%
5% NCREIF SO Timberland	9.38%	-0.01%	10.88%	-0.34%
5% NCREIF PNW Timberland	9.23%	-0.16%	10.87%	-0.35%
5% NCREIF NE Timberland	9.57%	0.19%	10.83%	-0.40%
5% NCREIF SO/PNW Timberland Mix	9.32%	-0.06%	10.87%	-0.35%
40% S&P 500, 20% Russell 2000, 30% Corporate Bonds, 10% NAREIT Equity				
No Timberland	9.92%		12.86%	
5% NCREIF US Timberland	9.86%	-0.06%	12.42%	-0.44%
5% NCREIF SO Timberland	9.88%	-0.03%	12.43%	-0.44%
5% NCREIF PNW Timberland	9.73%	-0.18%	12.44%	-0.43%
5% NCREIF NE Timberland	10.08%	0.16%	12.38%	-0.49%
5% NCREIF SO/PNW Timberland Mix	9.83%	-0.09%	12.42%	-0.44%
75% S&P 500, 25% Corporate Bonds				
No Timberland	10.29%		16.40%	
5% NCREIF US Timberland	10.21%	-0.08%	15.82%	-0.58%
5% NCREIF SO Timberland	10.24%	-0.05%	15.83%	-0.56%
5% NCREIF PNW Timberland	10.09%	-0.20%	15.78%	-0.61%
5% NCREIF NE Timberland	10.43%	0.14%	15.88%	-0.52%
5% NCREIF SO/PNW Timberland Mix	10.18%	-0.11%	15.81%	-0.59%
75% S&P 500, 10% Corporate Bonds, 5% Treasury Bills, 10% NCREIF Commercial Real Estate				
No Timberland	10.31%		16.34%	
5% NCREIF US Timberland	10.23%	-0.08%	15.77%	-0.57%
5% NCREIF SO Timberland	10.26%	-0.05%	15.79%	-0.55%
5% NCREIF PNW Timberland	10.10%	-0.20%	15.74%	-0.60%
5% NCREIF NE Timberland	10.45%	0.14%	15.87%	-0.47%
5% NCREIF SO/PNW Timberland Mix	10.20%	-0.11%	15.76%	-0.58%

Unlike in Table 3 (1987-2003), only the addition of NE timberland to the portfolio provides higher returns than the timber-less portfolio. However, the reduction in returns from the other timberland regions is offset by reductions in volatility. For every basis point drop in returns, the standard deviation falls by from as few as 2.2 to as many as 54 basis points. In two cases, PNW timberland lowers the standard deviation more than the NE timberland does.

Summary

This analysis shows that there is no clear indication that investing in one timberland investment region will provide better overall performance for a particular portfolio than investing in another timberland region. Our original hypothesis that, for example, a bond-heavy portfolio should invest in PNW timberland does not appear to be correct.

However, our analysis shows that over different periods of time, one timberland investment region may be better than others for all portfolios. “Better” is a term that must be defined by the portfolio manager, because the analysis may provide two “answers”. For example, for the period 1987-2003, PNW timberland provided higher returns, while SO timberland provided lower volatility.

But the Northeast provided better overall portfolio performance for the period 1994-2003. Does that mean the Northeast is the best region for timberland investment? It may have been the “best region” over the past 10 years, but what will returns and standard deviations and correlation coefficients be over the next ten? Will timberland behave like it did in the period 1987-2003, or more like it did from 1994 to 2003?

A simple solution is to diversify the timberland investment across regions. Different regions have provided better return characteristics than others at times over the past 15 years. Diversification will allow the investor to benefit from regional differences without needing to guess where to buy and sell in the short-run

Based on historical returns, timberland from any region would have a positive impact on overall portfolio returns. In our analysis, in those times and regions where timberland reduced returns (up to 20 basis points) it lowered volatility (up to 60 basis points).

Next Issue

Correlation coefficients are an important component of portfolio optimization. Table 1 and Table 2 show that these coefficients change over different time periods. In our next issue, we will examine this important input and look at ways it can be used and abused.

Forest Research Group

You may have noticed a new company name and newsletter title at the top of this page.

The company name reflects what we do. Our focus is on forest economics research, particularly research related to timberland investment. Copies of these Forest Research Notes will be posted on our web site.

The newsletter title changed because we found an established older newsletter with much the same name.

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Jack Lutz, PhD
Forest Economist
Forest Research Group
66 Old Stagecoach Road
Alton, Maine 04468
(207) 827-1019
jlutz@forestresearchgroup.com
www.forestresearchgroup.com