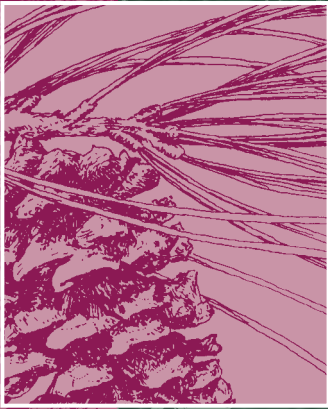


Timberland *as a*  
Portfolio Diversifier

Research Notes *2003*



## Timberland as a Portfolio Diversifier

**T***his research note evaluates the historical performance of U.S. timberland investments during the period 1960-2002 relative to the performance of other assets such as stocks, bonds, and commercial real estate. Our research is divided into two sections: a comparison of the level and volatility of past returns for the various asset classes, and an examination of the capacity of timberland to diversify a portfolio of stocks, bonds, and commercial real estate.*

*A companion research note entitled **Historical Returns for Timberland** details the measurement of historical timberland returns, and presents estimates of the past performance of forest assets in various regions.*

## Returns for Timberland, Commercial Real Estate and Financial Assets

To compare the historical level and volatility of returns for U.S. timberland investments with other assets, we obtained historical rates of return since 1960 for S&P 500 stocks, small company stocks, long-term corporate bonds, and U.S. Treasury bills from Ibbotson Associates. Past rates of inflation (measured by the CPI-U) were obtained from the same source. Returns for international equities were calculated from Morgan Stanley's Europe, Australia and Far East (EAFE) Stock Market Index. Rates of return for private equity investments in commercial real estate were obtained by combining returns for the Prudential Property Investment Separate Account (PRISA) from 1969 through 1977 with returns from the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index since 1978.

Returns for a timberland portfolio with 40 percent of its value in the U.S. Pacific Northwest, 50 percent in the South, and 10 percent in the Northeast (the portfolio is rebalanced each year) serve as the benchmark for timberland performance. The returns prior to 1987 for the Pacific Northwest and South, and prior to 1994 for the Northeast, were obtained from the John Hancock Timber Index. Returns after those years are from the NCREIF Timberland Property Index.

The following table compares the mean and standard deviation of the annual rates of return for each alternative asset class during the periods 1960-2002, 1973-2002 (30 years), 1983-2002 (20 years) and 1993-2002 (10 years). The data for 1960-2002 (or 1969-2002 if earlier returns are not available) are presented in graphical form.

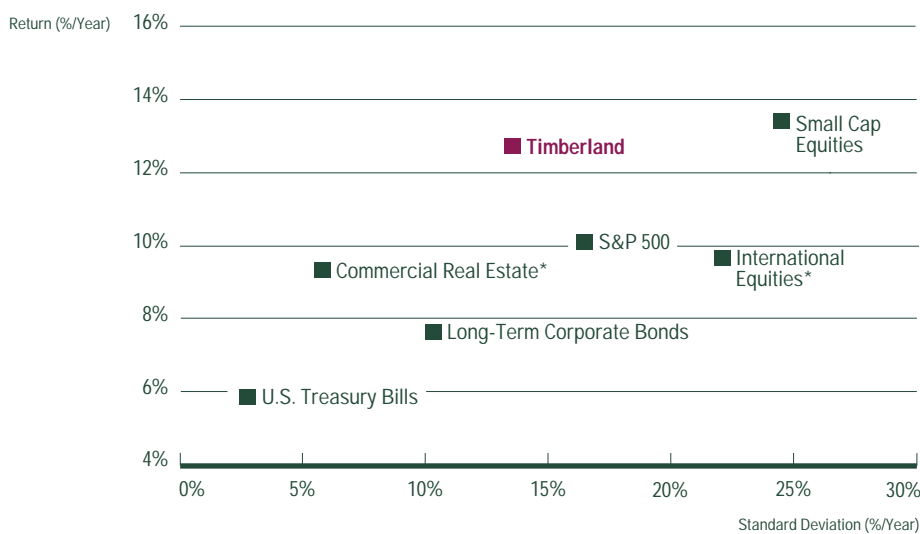
**Table 1**  
**Level and Volatility of Annual Returns (before fees)**  
**for Timberland and Other Assets**

Asset Class	1960-2002		1973-2002		1983-2002		1993-2002	
	Return	Std Dev	Return	Std Dev	Return	Std Dev	Return	Std Dev
Timberland	12.57%	13.23%	14.54%	14.79%	12.30%	11.50%	9.97%	7.48%
Commercial Real Estate*	9.29%	5.42%	9.53%	5.70%	7.73%	5.59%	9.25%	4.08%
S&P 500	10.10%	16.55%	10.66%	17.99%	12.71%	16.48%	9.33%	19.68%
Small Capital Equities	13.47%	24.42%	14.20%	22.37%	11.57%	18.26%	11.58%	15.79%
International Equities*	9.92%	21.97%	9.35%	22.24%	10.52%	23.66%	4.30%	17.44%
Long-Term Corporate Bonds	7.65%	10.62%	9.28%	11.52%	10.92%	9.52%	8.75%	9.92%
US Treasury Bills	5.83%	2.65%	6.58%	2.73%	5.65%	2.01%	4.37%	1.25%
CPI	4.33%	3.06%	4.96%	3.30%	3.15%	1.19%	2.49%	0.63%

Please refer to Note on page 9.

\*Data for commercial real estate and international equities are from 1969-2002.

**Figure 1**  
**Risk and Return of Alternative Investments (before fees)**  
**1960-2002**



Please refer to Note on page 9.

\*Data for commercial real estate and international equities are from 1969-2002.

A fundamental observation emerges from these results: there has been a direct relationship between the magnitude and volatility of returns for different investments. Rates of return for assets such as small company stocks and international equities have been the highest but also the most volatile; returns for U.S. Treasury bills have been relatively low but stable. This direct relationship between the magnitude and volatility of asset returns is known as the “capital market line.”

Our series of historical returns for timberland—calculated from the John Hancock Timber Index and the NCREIF Timberland Property Index—suggests that timberland investments lie above the capital market line. In other words, the level of timberland returns has been relatively high given their volatility.

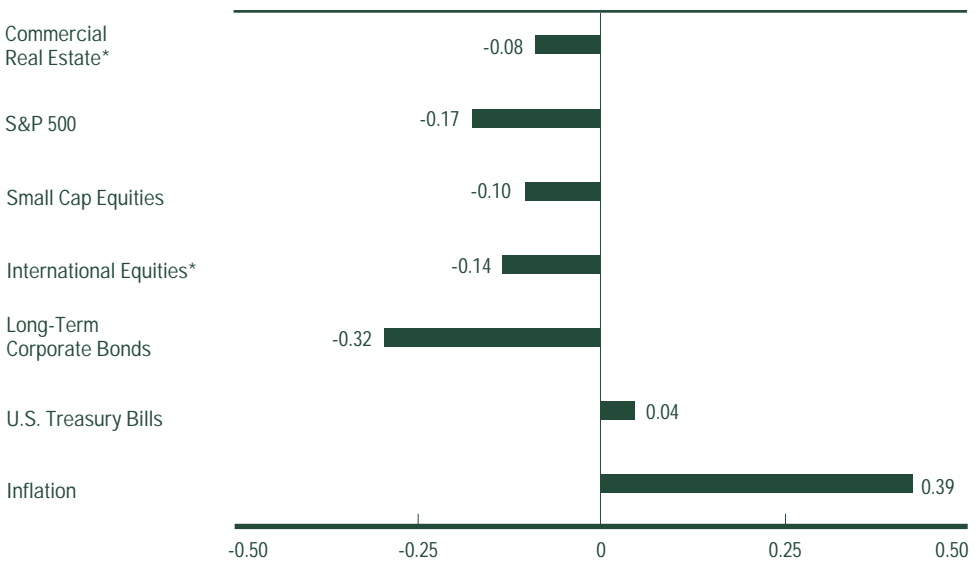
## Role of Timberland in Risk-Efficient Portfolios

Asset allocation decisions should not be based solely on comparisons of the level and volatility of historical rates of return. In our view, classes of assets tend to be priced to generate the return that compensates investors fairly for bearing the amount of risk associated with the asset class. Rather than identify superior-performing classes of assets, an investor should select the combination of different asset classes that, given the investor’s risk tolerance, generates the optimum expected rate of return.

The role of timberland investments in such “risk-efficient” portfolios can be assessed by examining the correlation among rates of return for various classes of assets. In general terms, the most risk-efficient portfolios are formed by mixing assets with negative, or weakly positive, correlations. The following

chart illustrates the correlation between annual returns for timberland and other investments during the period 1960-2002 (or 1969-2002 if earlier returns are not available). The complete matrix of correlation coefficients calculated from annual returns during the periods (1960-2002, 1973-2002, 1983-2002 and 1993-2002) is presented in the Appendix.

**Figure 2**  
**Historical Correlations With Timberland Returns**  
 1960-2002



\* Data for commercial real estate and international equities are from 1969-2002.

Rates of return for timberland investments have been correlated directly with inflation, providing a partial inflation hedge.

Timberland returns have been correlated inversely with returns for common stocks, corporate bonds and commercial real estate equity. This indicates that much of the volatility of timberland returns is “diversifiable.” It also suggests that the addition of timberland to a portfolio of conventional financial assets will reduce the portfolio’s volatility.

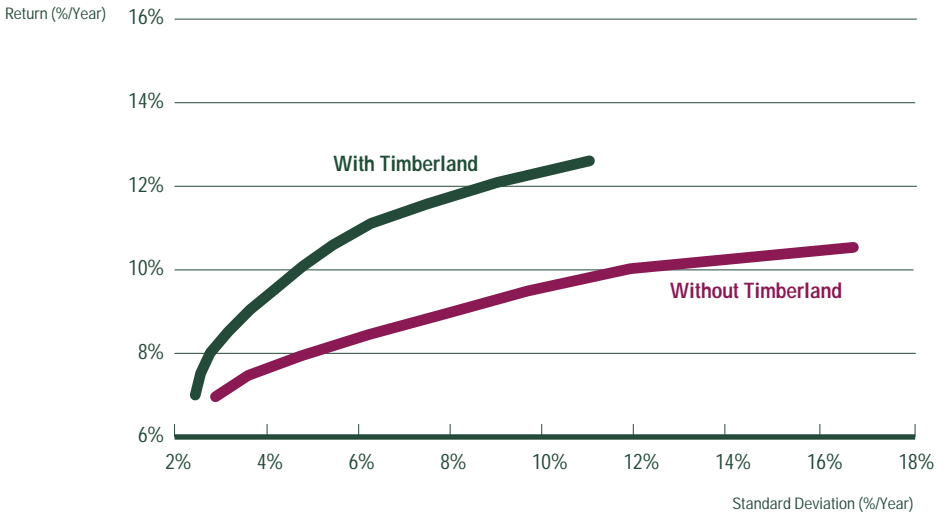
We calculated two risk-efficient frontiers of diversified portfolios: one with timberland and the other without timberland. Allocations of portfolio value to small company stocks, international equities and commercial real estate were limited to 10 percent, 10 percent, and 20 percent, respectively. Expectations of return levels, volatilities and correlations were generally based on historical values during the period 1960-2002. Expectations for international equities and commercial real estate were based on values during the period 1969-2002. Following Firstenberg, Ross and Zisler (“Real Estate: The Whole Story” Journal of Portfolio Management, Spring 1988), the expected standard deviation of commercial real estate was increased to 11.28 percent. The percentage allocations at target return levels ranging from 8-11 percent are presented below. Plots of the two risk-efficient frontiers follow.

**Table 2**  
**Risk-Efficient Portfolios With and Without Timberland**

	8.0		9.0		10.0		11.0		Return (%/year)
	2.8	4.7	3.7	7.8	4.8	11.8	6.3	13.1	Standard Deviation (%/year)
Timberland	14.1	0.0	23.9	0.0	33.7	0.0	46.1	0.0	Allocations of Portfolio Value (%)
Commercial Real Estate	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.1	
S&P 500	0.0	2.6	0.0	17.7	0.0	49.5	4.2	62.7	
Small Cap Equities	2.9	10.0	5.6	10.0	8.3	10.0	10.0	10.0	
International Equities	1.9	5.5	2.5	9.2	3.2	10.0	3.1	8.2	
Long-Term Corp. Bonds	12.7	20.8	18.5	31.7	24.3	10.5	16.6	0.0	
U.S. Treasury Bills	48.4	41.1	29.5	11.3	10.5	0.0	0.0	0.0	

- With Timberland
- Without Timberland

**Figure 3**  
**Risk-Efficient Frontiers**



These results confirm that the addition of timberland to a portfolio of stocks, bonds and commercial real estate can substantially reduce its volatility. Consider a target return level of 10 percent. Without timberland, the risk-efficient portfolio has a standard deviation of 11.8 percent. With timberland, the standard deviation decreases to 4.8 percent.

## Conclusions

Our analysis of the relationship between returns for timberland and other assets suggests the following:

- Timberland returns appear to lie above the capital market line. That is, the level of timberland returns has been relatively high given their volatility.
- Returns for timberland have been related directly to the rate of inflation. This suggests that timberland investments have been an effective vehicle for the preservation of capital during inflationary periods.
- Timberland returns have been inversely correlated with, or independent of, returns for other investments. Thus, timberland has little systematic risk, and has the potential to reduce the volatility of a portfolio of stocks, bonds and commercial real estate.

These results tempt one to conclude that timberland has generated excess or above-market returns. We tend not to believe that this is the case.

Investors are probably attributing other sources of risk to forests. Because timberland investments are relatively illiquid, investors may be requiring an illiquidity premium. Or perhaps investors are requiring a premium to accept some of the diversifiable risk of timberland; that is, the portion of the volatility of timberland returns that can be eliminated through inclusion of forests in a well-diversified portfolio. In either case, timberland investments should be particularly attractive to investors who are able to accept the relative illiquidity of timberland and who possess well-diversified portfolios.

## Notes and Disclosures

Historic timberland performance figures calculated from the John Hancock Timber Index are based on a model containing certain assumptions, including but not limited to assumptions about timber growth rates, harvest levels, prices, production costs and property liquidity. As such, they are hypothetical rather than based on actual reported performance. Historic timberland performance figures should not be construed as guarantees of future returns. Potential for profit as well as for loss exists. The impact of future economic, market and weather factors may adversely affect timberland performance. Some timberland investments managed by HTRG had results materially different from those portrayed here for the asset class as a whole.

## Appendix

The following table shows a matrix of correlation coefficients calculated from annual returns during the periods 1960-2002, 1973-2002, 1983-2002 and 1993-2002.

**Table 3**  
**Correlation Coefficients of Timberland**  
**and Alternative Asset Returns**

	Timberland	Commercial Real Estate	S&P 500	Small Cap Equities	Int'l Equities	Long-Term Corporate Bonds	U.S. Treasury Bills	Inflation	Years
Timberland	1.00	-0.08	-0.17	-0.10	-0.14	-0.32	0.04	0.39	1960-2002
	1.00	-0.08	-0.18	-0.15	-0.10	-0.37	-0.13	0.32	1973-2002
	1.00	-0.39	0.27	0.13	-0.02	-0.18	-0.08	0.30	1983-2002
	1.00	-0.15	0.63	0.39	0.76	-0.14	0.19	0.16	1993-2002
Commercial Real Estate		1.00	0.03	0.03	0.11	-0.27	0.54	0.47	1970-2002
		1.00	0.07	0.05	0.16	-0.29	0.53	0.47	1973-2002
		1.00	0.16	-0.20	0.22	-0.08	0.34	-0.13	1983-2002
		1.00	0.40	-0.20	-0.07	-0.11	0.62	-0.29	1993-2002
S&P 500			1.00	0.66	0.55	0.32	0.07	-0.19	1960-2002
			1.00	0.67	0.58	0.37	0.11	-0.21	1973-2002
			1.00	0.58	0.55	0.29	0.38	-0.09	1983-2002
			1.00	0.55	0.65	0.06	0.62	-0.20	1993-2002
Small Cap Equities				1.00	0.34	0.06	0.00	-0.04	1960-2002
				1.00	0.38	0.19	0.07	0.02	1973-2002
				1.00	0.28	0.16	0.00	-0.27	1983-2002
				1.00	0.35	0.01	0.34	-0.11	1993-2002
International Equities					1.00	0.13	-0.12	-0.21	1970-2002
					1.00	0.14	0.01	-0.14	1973-2002
					1.00	0.22	0.24	-0.18	1983-2002
					1.00	-0.25	0.09	0.05	1993-2002
Long-Term Corporate Bonds						1.00	0.06	-0.32	1960-2002
						1.00	-0.04	-0.47	1973-2002
						1.00	0.21	-0.11	1983-2002
						1.00	0.01	-0.18	1993-2002
U.S. Treasury Bills							1.00	0.68	1960-2002
							1.00	0.61	1973-2002
							1.00	0.55	1983-2002
							1.00	0.07	1993-2002
Inflation								1.00	1960-2002
								1.00	1973-2002
								1.00	1983-2002
								1.00	1993-2002

Note: Data for commercial real estate and international equities extend back to 1969 only

Please direct questions or comments to:

**Clark S. Binkley, Ph.D.**

Managing Director and Chief Investment Officer  
 cbinkley@hnr.com

**Courtland L. Washburn, Ph.D.**

Director of Economic Research & Investment Strategy  
 cwashburn@hnr.com

**Mary Ellen Aronow**

Forest Economist  
 maronow@hnr.com

**Hancock Timber Resource Group**

99 High Street, 26th Floor  
 Boston, Massachusetts 02110  
 (617) 747-1600

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