Timberland's Contribution to an Efficient Portfolio

Portfolio Diversification and Timberland's Contribution to an Efficient Portfolio

Overview

In an effort to maximize portfolio expected return at an acceptable level of risk, investors seek optimal diversification amongst investment asset classes. Asset class allocation within a portfolio is generally the largest determinant of portfolio performance, both from a performance and risk standpoint.

A cornerstone of Modern Portfolio Theory ("MPT"), introduced by Harry Markowitz and others, is the concept of seeking portfolios that lie along an efficient frontier. The efficient frontier is formed by a set of portfolios which exhibit the maximum expected return for a given level of risk. Investors would be expected to choose a portfolio that lies along this efficient frontier based on their risk tolerance. There are an almost endless variety of portfolios that an investor could form with risky assets, but we would expect investors to choose portfolios that lie along the efficient frontier, as any alternative portfolio is by definition inefficient.

Diversified portfolios will generally exhibit less risk for a given level of return because specific risk can be reduced and low or negative covariance provides a risk offset. This paper explores the role of timberland in a well-diversified efficient portfolio.

Timberland exhibits several unique attributes that support inclusion in institutional investment portfolios. Benefits of owning timberland can include ongoing operational cash flows and attractive real risk-adjusted returns. In addition to these fundamental investment characteristics, timberland offers benefits unique to this particular asset class that can help a portfolio retain and even grow value during times of market volatility. The first of these is biological growth; the timber inventory on a tract of timberland continues to grow irrespective of market conditions. The second benefit is the

About Campbell Global

Campbell Global brings more than three decades of experience and leadership to sustainable timberland and natural resource investment management. As a full-service firm, we acquire and manage timberland for investors, while seeking to provide the highest quality service and expert management. Known for expertise and integrity, we seek to deliver superior investment performance by focusing on unique acquisition opportunities, client objectives, and disciplined management.

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ability to warehouse inventory in place, or "store on the stump." This represents the owner's option to reduce or forgo harvesting, which allows the unharvested trees to grow until market conditions are ideal for harvesting.

Building the Efficient Portfolio

There are a few basic building blocks required to construct a portfolio that lies along the efficient frontier. We require an estimate of each asset's expected return, expected standard deviation, and expected covariance with all other assets included in the investment universe. In our analysis, we included asset classes that are typically found in an institutional portfolio, as well as timberland.

We informed our return, standard deviation, and covariance expectations based on data provided by Callan Associates in their 2014 Capital Market Projections publication. Timberland expected return, standard deviation, and covariance of returns with asset classes included in the analysis was provided by Campbell Global's research department. We utilized optimization software to determine portfolio weights to maximize expected return, given various levels of risk. To examine the impact of including timberland in a given portfolio, the analysis is performed both with and without timberland.

Efficient frontier analysis is quite sensitive to the parameters that are used. The results of the analysis can yield an efficient frontier that is mathematically sound, but unlikely to be implemented by a typical institutional investor. To address this we constructed efficient portfolios under two different portfolio weight constraint scenarios. The first scenario constrains portfolio weights to a maximum of 75%, so no single asset class completely dominates the portfolio. In the second scenario we applied portfolio weight constraints that more closely align with institutional portfolio's asset allocations.

Scenario 1: Portfolio Weights Limited to 75%

We first constructed an efficient frontier of portfolios whose asset class weights could rise to a maximum of 75%. This series of portfolios provides a theoretical illustration of how timberland can enhance portfolio outcomes. It is unlikely that an investor would allocate 75% of their portfolio to a single risky asset class, but when the efficient frontier contains such portfolios, the benefits of adding timberland are clearly highlighted.
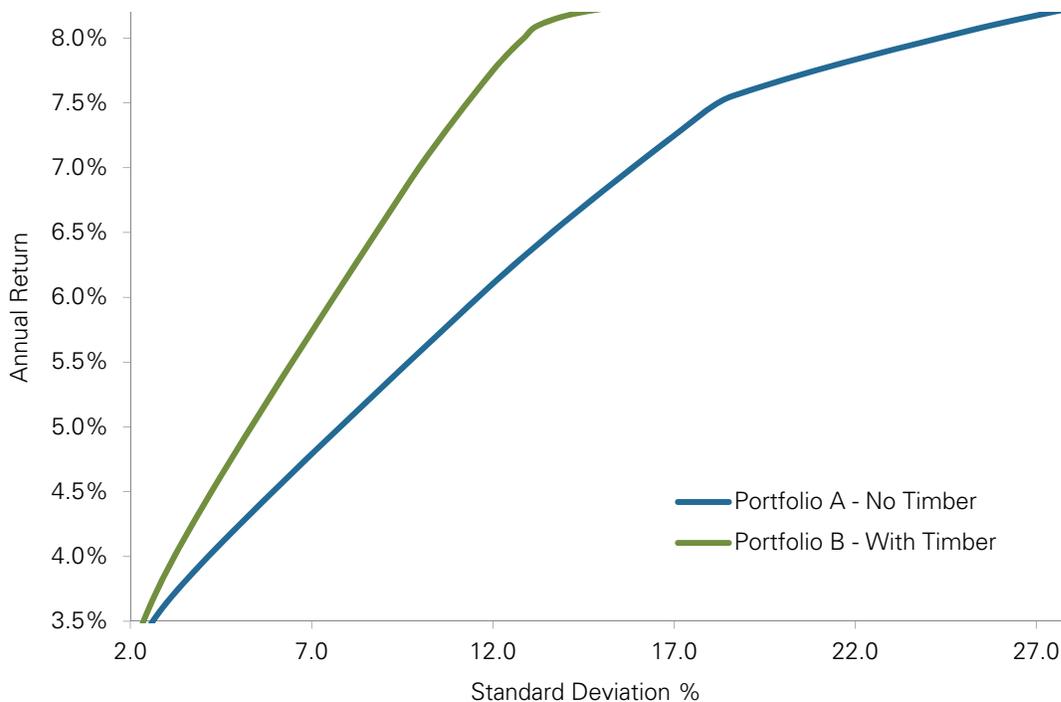
Table 1 | Portfolio Weights Limited to 75%

Asset Class	Expected Return (Nominal)	Standard Deviation	Max Asset Allocation
Equity - US Large Cap	7.50%	18.30%	75%
Equity - US Small Cap	7.90%	23.00%	75%
Equity - Developed Ex-US	7.50%	20.20%	75%
Equity - Emerging Ex-US	7.90%	28.00%	75%
FI - US Corporate	3.00%	3.80%	75%
FI - US Treasury	2.80%	2.30%	75%
FI - US T-Bills	2.00%	0.90%	75%
FI - US TIPS	3.00%	5.30%	75%
FI - Non-US	2.80%	9.40%	75%
Private Real Estate	6.20%	16.50%	75%
Private Equity	8.50%	33.10%	75%
Absolute Return (Hedge Funds)	5.10%	8.90%	75%
Commodities	3.10%	18.30%	75%
Private Timberland	8.18%	15.00%	75%

The analysis produced an efficient frontier with expected returns ranging from 3.25 percent to 8.35 percent. The benefit of diversifying a portfolio with private timberlands becomes evident quickly as Portfolio B (with timber) achieved higher total returns than Portfolio A (no timber) at any level of risk. For example, at a 7% standard deviation, the return of Portfolio B is nearly 100 bps higher than Portfolio A and the gap continues to widen as risk increases. For the given target returns examined, the risk (standard deviation) is 10 to 985 basis points lower for Portfolio B than Portfolio A.

Graph 1 | Portfolio Weights Limited to 75%

Portfolio Efficient Frontier for Multi-Asset "Traditional" Portfolio
Maximum Allocation to Any Asset is 75%

Portfolio A - No Timber
Portfolio B - With Timber

Y-axis: Annual Return
X-axis: Standard Deviation %

Scenario 2: Analyzing a Realistic Institutional Portfolio

As a demonstration of what may be more realistic for institutional investors, our second analysis sets the portfolio weight constraints at levels that are more consistent with observed real-world portfolios.   As in the previous analysis, one efficient frontier curve includes timberland and one does not.

Table 2 | Analyzing a Realistic Institutional Portfolio

Asset Class	Expected Return (Nominal)	Standard Deviation	Max Asset Allocation
Equity - US Large Cap	7.50%	18.30%	100%
Equity - US Small Cap	7.90%	23.00%	30%
Equity - Developed Ex-US	7.50%	20.20%	50%
Equity - Emerging Ex-US	7.90%	28.00%	30%
FI - US Corporate	3.00%	3.80%	100%
FI - US Treasury	2.80%	2.30%	100%
FI - US T-Bills	2.00%	0.90%	100%
FI - US TIPS	3.00%	5.30%	100%
FI - Non-US	2.80%	9.40%	50%
Private Real Estate	6.20%	16.50%	30%

Private Equity	8.50%	33.10%	30%
Absolute Return (Hedge Funds)	5.10%	8.90%	30%
Commodities	3.10%	18.30%	30%
Private Timberland	8.18%	15.00%	30%

In the second scenario, the analysis yielded expected returns ranging from 3.00 percent to 8.00 percent, solving each for the lowest portfolio standard deviation consistent with the target return. Returns in excess of 8.00 percent were not solvable due to the individual asset allocation limitations.

Graph 2 | Analyzing a Realistic Institutional Portfolio
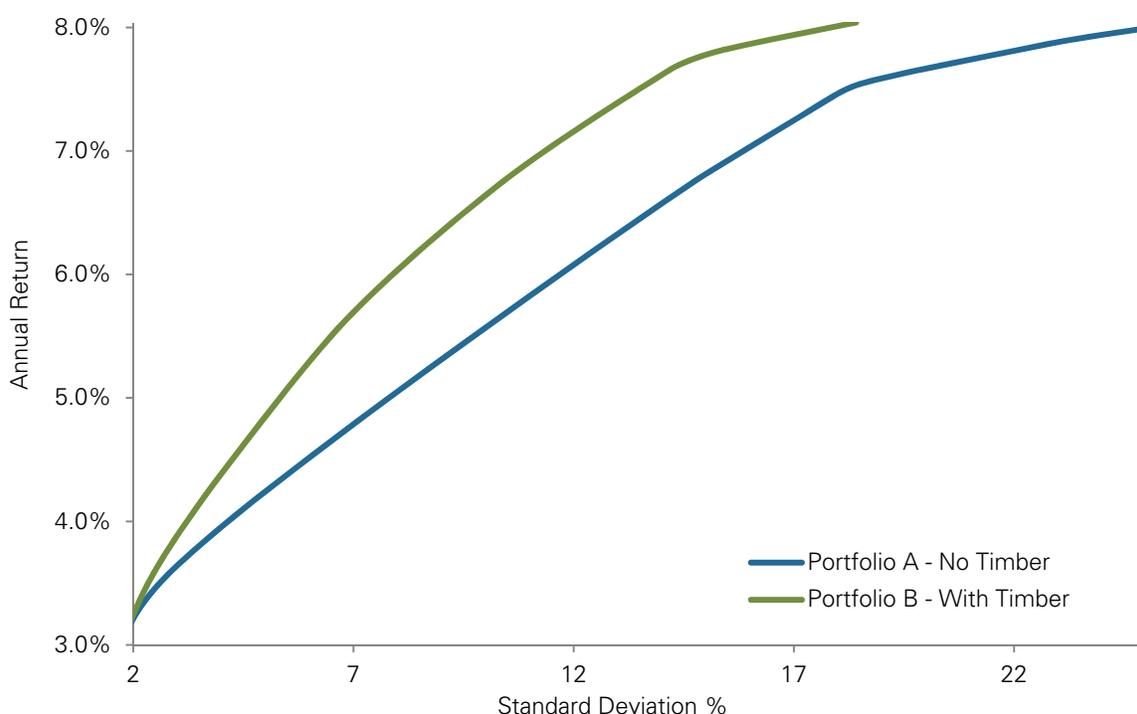
Once again, Portfolio B (with timber) achieved a higher total return than Portfolio A (no timber). For example, at a standard deviation of 8.5%, the return of Portfolio B is once again nearly 100 bps higher than Portfolio A. For any given target return studied, the risk (standard deviation) is between a minimum of 2 and a maximum of 760 basis points lower for Portfolio B. Once again it is evident that the portfolio with timber outperforms the portfolio without.

Conclusion

Our exploration of two different portfolio weight scenarios suggests that timberland can enhance return for a given level of risk along the full spectrum of an efficient frontier. This result is consistent with timberland's attractive risk-adjusted return track-record and its low correlation with other asset classes. In addition to its ability to enhance the efficient frontier of possible portfolios, timberland also has many attractive characteristics that enhance portfolio outcomes including biological growth which is uncorrelated with drivers of systematic risk and the option to store vs. harvest inventory during adverse market conditions.

About the Author

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Mr. Hoyt is a Senior Associate, Finance and Strategy for Campbell Global. His responsibilities include financial structure optimization, tax strategy, portfolio cash flow projections and modelling, performance calculation, research, and special projects.

Prior to joining Campbell Global, Mr. Hoyt worked in public accounting with Deloitte & Touche LLP, performing financial statement audits of both publicly traded and private companies. Mr. Hoyt is a Certified Public Accountant and a Chartered Financial Analyst.

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