The mean-variance portfolio optimization methodology introduced by Harry Markowitz (1952) has been extensively used by investment managers to assess performance of diverse asset classes. We have utilized efficient frontiers and risk-return plots to compare timberland performance to other assets for over 20 years. However, the theory of optimal asset allocation has advanced considerably and new methods have been developed to address some of the deficiencies of the mean-variance approach.

Chart 1 contains the p-values of normality tests for several asset classes. In two of the tests, timberland in the U.S. Pacific Northwest (TL PNW) and U.S. commercial real estate (U.S. Real Estate), the p-values are practically zero, indicating that the null hypothesis of normally distributed returns can be safely rejected.

A further shortcoming of the mean-variance theory and the use of the covariance matrix as a realistic risk measure is covariance matrix symmetry. This means a large positive return is valued equally as heavily as an extreme negative return—an approach unlikely to be embraced by many investors.

An alternative risk measure that does not suffer from the shortcomings of the mean-variance approach is provided by the conditional value at risk (CVaR). CVaR (Embrechts et al., 1997), sometimes called expected shortfall or the probability of loss.
expected tail loss, is an asymmetrical measure of risk that was originally introduced to address the shortcomings of the value at risk (VaR), a risk measure used by financial institutions to calculate required capital reserves. An intuitive illustration of both down-side risk measures, VaR and CVaR, is provided in Chart 2 on page 1.

Chart 2 displays a hypothetical asset return distribution with $\alpha$, the probability of suffering losses, shaded in green. VaR then represents the $\alpha$ quantile of the return distribution, while CVaR represents the conditional expected loss given that a loss has occurred. In other words, VaR answers the question; “how bad can things get?”, whereas CVaR answers the question; “if things get bad, how much is the portfolio expected to lose?” (Hull 2009)

To assess how timberland allocations perform under CVaR, we constructed a hypothetical portfolio from the asset classes listed in Chart 1 on page 1. We constrained the allocation of assets within the portfolio to mimic industry trends (See Cover Notes, page 6)

We solved the resultant portfolio optimization problem for several values of target returns to obtain the corresponding optimal asset allocations. The results are displayed in Chart 3. Chart 4 shows results for the corresponding mean-variance capital allocation problem.

Each bar in Chart 3 and 4 indicates the portfolio composition for a given target return value along the bottom horizontal axes.

Although the differences in the solutions are not drastic, several characteristics do stand out. Namely, when using CVaR, the optimum portfolio allocated the maximum allowable amount of capital to timberland in the U.S. South and Pacific Northwest. This was not the case when using VaR. For both risk measures, the allocations to U.S. and non-U.S. equities are at the lowest possible levels given the constraints. Relative to allocations obtained in the mean-variance problem, the use of mean-CVaR leads to a larger allocation of U.S. government bonds and a much lower allocation of U.S. commercial real estate.

The differences in the solutions can, in part, be attributed to the shapes of the distributions of asset returns. Recall that U.S. commercial real estate and U.S. Pacific Northwest timberland returns failed the normality test. Chart 5 and Chart 6 on page 6 contain the histograms and empirical densities of the two return series and provides visual clues into the normality test results. The returns to real estate have clearly been negatively skewed; hence the asymmetrical mean-CVaR produces lower allocations to this asset class.

The returns to timberland in the Pacific Northwest have been positively skewed and allocations to the asset class are at the maximum permitted level under both risk measures.

Historically we have relied on the mean-variance methodology to test the inclusion of timberland in institutional investors portfolios.

Portfolio optimization using the mean-CVaR methodology confirms our earlier conclusions: Timberland has performed well and provides strong diversification benefits in a mixed asset portfolio.
Prices for softwood sawtimber in the U.S. were mixed first quarter. Log oversupply at ports destined for China met with slower demand in China, causing a drop in softwood log export prices in the Pacific Northwest and New Zealand. In the U.S. South, first quarter’s regular seasonal bump in prices was realized, with sawtimber prices rising $5 per ton. Yet, prices for sawtimber in the U.S. South continue to be well below historical levels.

First quarter prices for Random Length’s 2x4 Westside southern pine rose 8 percent over fourth quarter prices – a welcome first quarter ritual to manufactures south-wide. Delivered log prices in the South have yet to see much pass through in price increases.

Export markets drove log and lumber pricing in the Pacific Northwest again first quarter. After a near-term record setting 2011, first quarter showed a continued slowdown, slipping 7 percent from the first three months of 2011. Beginning in the fourth quarter last year, Chinese demand slowed as inventories in that country filled. Although Douglas-fir remains the most common species exported from the Pacific Northwest to all destinations, hemlock volumes have risen with China the main destination.
Figure 4. Softwood Pulpwood Stumpage Prices
Pulp prices were flat first quarter after a consecutive quarterly rise in the Pacific Northwest and a consecutive quarterly fall in the U.S. South. Production of paper board in the South during the first two months of the year was up – and dryer than normal weather across most of the South made timber supply plentiful.

Figure 5. Market Pulp and U.S. Pulp Log Prices
Weaker market pulp pricing was experienced globally in the first quarter as Chinese demand slowed to reduce inventories while the economies in Europe suffered and buying softened. First quarter NBSK averaged $870/t, down from recent highs of $1,023/t in the second quarter of 2011.

Figure 6. U.S. Timberland Values in Private Property Markets
Timber land values reported by NCREIF were flat to slightly up first quarter. In the U.S. South, timberland values at $1,477 per acre are slightly higher than yearend values and a reversal of the downward trend in timberland values reported by NCREIF since the first quarter 2009.
Figure 7. U.S. Timberland Valuation Multiples in Private Property Markets
Timberland valuation multiples – or price-to-earnings ratios – reduced the spread between U.S. Southeast and Pacific Northwest in the first quarter of 2012. Notably, income in the Southeast increased significantly during the first quarter of the year driving the regional valuation multiple downward. The Pacific Northwest saw a small decline in income during the same period, while land values remained flat in both regions.

Figure 8. Hancock Securitized Timberland Index
The Hancock Securitized Timberland Index increased by 2.5 percent during the first quarter of 2012. Deltic was the main driver behind the increase as its value rose by 10 percent. Rayonier increased by one percent over the first quarter. Potlatch lost two percent of market value during the first quarter. Plum Creek fared the worst in the first quarter and lost five percent of its value.

Figure 9. U.S. South Timberland Values in Public Equity and Private Property Markets
The gap between values of private and public timberland values continued to narrow in the first quarter of 2012. Privately held timberland, as measured by the NCREIF Timberland Index remained essentially flat during the quarter, while public timberland increased by eight percent from the start of the year.
Timberland Portfolio Allocation and the Mean-Conditional Value at Risk (Continued from page 2)


Source: HTRG Research


Source: HTRG Research

Cover Notes:
The relevant asset allocation constraints used in this optimization are:

- Farmland ≤ 0.05, Real Estate ≤ 0.1, U.S. South Timberland ≤ 0.05, U.S. West Timberland ≤ 0.05, U.S. Bonds ≥ 0.1, Non-U.S. stocks ≥ 0.05, S&P 500 ≥ 0.2

These limits on asset classes were established from investment manager surveys published by Pensions and Investments. By design, the portfolio constraints are strictly descriptive, meant to reflect observed allocation trends, rather than prescriptive.

Citations:

Crain Communications. Pensions & Investments, Chicago, Ill.


NOTES:

Figure 1. The composite price for southern sawtimber is based on quarterly average Timber Mart-South published prices for pine sawtimber and chip-n-saw stumpage. Pacific Northwest prices are derived from quarterly average Log Lines published prices for whitewoods and Douglas-fir with internal analysis of logging costs for stumpage calculations. New Zealand export prices are based on New Zealand Ministry of Forestry quarterly average published prices for radiata unpruned A. J. and K sort export logs with internal analysis of logging costs for stumpage calculations. Northeast sawtimber prices are calculated from internal analysis.

Figure 2. Quarterly southern pine (Westside), kiln dried, 2x4 #2 lumber price published by Random Lengths. Timber Mart-South published southern pine sawlog and chip-n-saw log prices converted to lumber scale using RISI historical lumber recovery rates as published in their North American Lumber Forecast.

Figure 3. Quarterly Douglas-fir, green 2x4 lumber (Portland rate) and Hem-Fir (coast), kiln dried, 2x4 lumber prices published by Random Lengths. Douglas-fir and whitewood sawlog prices derived from Log Lines published prices for #2 and #3 sawlogs in various regions in the Pacific Northwest converted to lumber scale using RISI historical lumber recovery rates as published in their North American Lumber Forecast.

Figure 4. Pulpwood composite prices are derived from quarterly average Timber Mart-South published prices for southern pine pulpwood stumpage. Log Lines published whitewood and Douglas-fir pulp log prices with internal analysis of logging costs for the Pacific Northwest, and HTRG analysis of spruce/fir pulpwood in the Northeast.

Figure 5. Quarterly NB/UK pulp prices reported from Hawkins Wright. Southern pine pulp log prices published by Timber Mart-South. Pacific Northwest Douglas-fir pulp log prices published by Log Lines. Pulp log prices expressed in multiples of 10 to accommodate market pulp pricing scale.

Figure 6. Regional NCREIF timberland market value per acre is derived by dividing the total regional market value at quarter end by the number of acres reported in that region.

Figure 7. EBITDDA multiples are calculated using NCREIF timberland value per acre at quarter end divided by trailing four-quarter average NCREIF net income per acre.

Figure 8. The Hancock Securitized Timberland Index (HSTI) uses a base-weighted aggregate methodology (similar to that used to construct the S&P 500) to calculate a market capitalization-weighted value for seven publicly traded timber-intensive forest products companies. Base weights were adjusted for the emergence of new companies or at the beginning of each year. Dividends are not reinvested. The companies included in the HSTI have no investment relationship with Hancock Timber Resource Group.

Figure 9. Public equity values are derived from our Timberland Enterprise Value Per Southern Equivalent Acre (TEV/SEA) calculation for seven timber-intensive publicly traded companies as compared to southern timberland values per acre calculated from the NCREIF database. TEV is a quarterly estimate based on total enterprise value (total market equity + book value debt) less estimated value of processing facilities, other non-timber assets and non-enterprise working capital. SEA uses regional NCREIF $/acre values to translate a company’s timberland holdings in various regions to the area of southern timberland that would have an equivalent market value. Rayoner was added to the index as of Q1 2004 when they changed their status to a REIT. Potlatch recently changed its status to a REIT in Q4 2008. Weyerhauser was added to the index at Q1 2011 after obtaining REIT status.

References to expected investment performance in this newsletter are based on historical information and are based on managements projections. Potential for profit as well as for loss exists.