



**TIMBERLAND
INVESTMENT RESOURCES_{LLC}**

Growing value for our clients every day

Virtual Integration: Value-Chain Investing in Timberland and Wood Manufacturing Assets

Chung-Hong Fu, Ph.D., *Managing Director*

Economic Research and Analysis

June 16, 2023



Introduction

Recent excitement about generative artificial intelligence (AI), as featured in chatbots such as ChatGPT, also is causing investors to take interest in companies that make the advanced computer chips, often called GPUs, which are essential for running AI software. Similarly, investors that are making bets on advanced battery technologies that power renewable energy systems and electric vehicles also are placing capital in mining companies and projects that produce the lithium, cobalt and other key materials that are necessary for the manufacturing of such batteries.

This synergistic approach is called “value-chain investing.” In its simplest form, value-chain investing is a form of vertical integration – at least in a virtual form. The goal in such situations is to hedge one’s investments and lower portfolio volatility while remaining focused on sectors that are perceived to have attractive futures.

Now imagine executing such a strategy in the natural resource space. In this paper, we explore the rationale for implementing an investment strategy that pairs timberland assets with wood manufacturing investments. The creation of “virtual integration” between timber and mills offers synergies that can reduce portfolio volatility. We argue that, in turn, this may provide risk-adjusted performance that is better than independent, standalone investments in either forests or forest products manufacturing infrastructure.



Vertical Integration in Forest Products is Not New

The linking of timberland with wood manufacturing is not new; it has been long practiced by a broad spectrum of forest products companies, from lumber producers to paper and packaging manufacturers. This is commonly known as *vertical integration* or *value-chain integration*. While the arrangement has largely fallen out favor in the North American forest products sector, vertical integration does confer real competitive advantages under certain circumstances. This is why the concept continues to be employed today, particularly in other parts of the world like Latin America and Northern Europe. Among the advantages it provides, combining mills with timberland assets can lower the cost-of-capital for the combined entity due to the lower risk profile (i.e., the *beta*¹). Integration can also facilitate the use of leverage, as loans can be made against the forest assets. There are also potential tax efficiencies to be gained as timber revenue is taxed as capital gains rather than as income in some tax jurisdictions, including the United States. Furthermore, tax losses in a forest management division can mitigate the tax gains generated in a linked manufacturing division, and vice versa.

Despite its advantages, many forest product companies in the United States have sold or spun off their timberland holdings since the mid-1980s. These have included, among others, Louisiana-Pacific, International Paper, Georgia-Pacific, and Temple-Inland. Others, such as Rayonier and Weyerhaeuser, have converted to timber REITs.² There are a variety of reasons that vertical integration is less commonly practiced today in the forest products sector than it once was. Among them are the potential conflicts such arrangements can produce. A company with both timberland and mills has a temptation to sacrifice long-term profits generated by its timberland business for the sake of boosting short-term profits within its manufacturing operations. For instance, when lumber markets are

Investing in Wood Products Manufacturing

The discussion of mill investments in this paper refers primarily to the investor putting capital into private equity (“PE”) vehicles that will fund the construction of a new (“greenfield”) mill or the acquisition and modernization of an existing mill with the eventual goal of selling the facility for a return. A strategy of buying stock in a public wood products company could work, but this introduces systematic market risk, and the potential return is lower compared to PE options.

¹ Beta is a quantitative measure of market risk. It tracks the volatility of returns or stock value compared to the overall market.

² REIT is a Real Estate Investment Trust, which is a company that holds real estate (such as timberland) mainly to produce income and can pass that income to shareholders without being taxed.



Southern pine logs being cut into lumber



Stacks of finished lumber at a sawmill

weak, a company can feed its mills its own timber at a lower cost than purchasing timber externally in the open market. Another risk associated with the vertical integration of timberland and manufacturing assets is that it can cause a company to favor one business segment for capital investment (usually manufacturing) over the other. In either case, again, the result can be a boost in short-term corporate performance at the expense of long-term performance, which tends to be sub-optimized because of the factors just described.

In fact, it was Wall Street’s recognition of the prevalence of this very “value-trap” scenario within the vertically integrated forest products and paper industries that supported timberland being established as an institutional asset class beginning in the mid-1980s. During this time and for the next decade or more, integrated forest products companies were being urged by analysts to separate and sell off their forests to unlock their hidden balance sheet value³ and to optimize the performance of their manufacturing assets.

³ Timberland held by public companies was not marked to market and was typically undervalued, especially relative to those forest assets held by long-term tax-exempt institutional investors.



Investors Can Synthetically Recreate Vertical Integration

Investors in both timberland and mill assets can avoid being snared in the value trap that was just described by employing a “virtual” integration strategy. This basically entails acquiring timberland and mill assets that may or may not be economically associated and, or mutually reliant upon each other, and managing and operating them separately and as independent and distinct businesses. In such a scenario, the two types of assets are held in wholly separate entities or investment vehicles. In addition, one’s forests and mill assets can be advantageously located in attractive markets, which can be in different locations. This strategic separation allows an investor to avoid the potential conflicts of interest and sub-optimal capital allocation circumstances that vertically integrated forest products companies historically faced and that were described above.



Mature southern pine plantation in Georgia

Timber Price Hedging Between Timberland and Mills

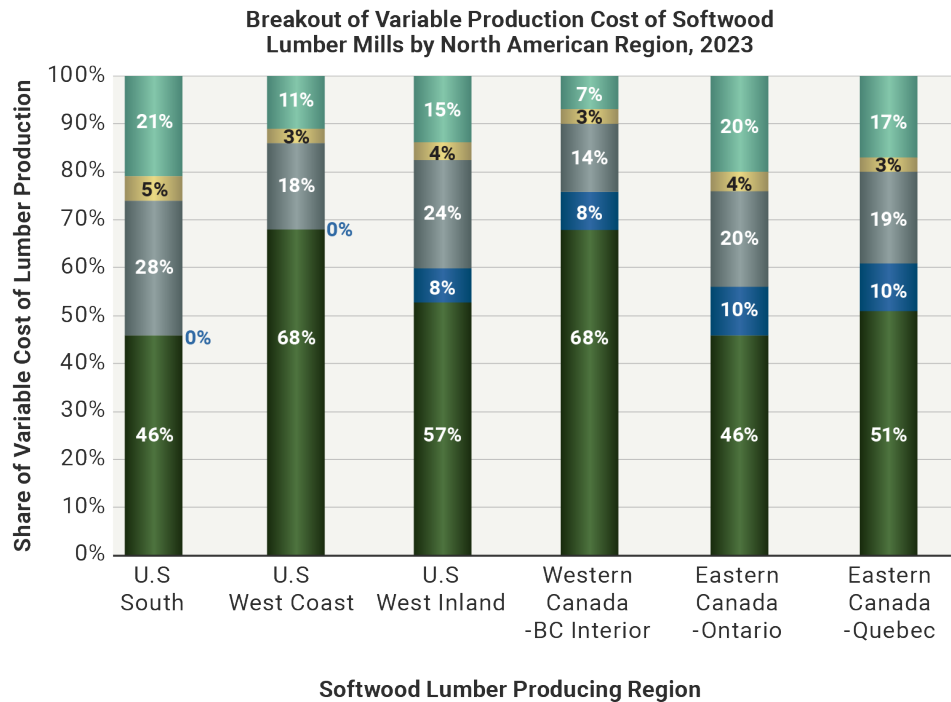
The primary benefit investors receive from integrating timberland and mill assets – at least virtually – is natural hedging. Sawmills, plywood mills, and the other wood product manufacturers profit most when timber prices are low, not high. Timberland assets, in contrast, enjoy higher income when timber prices are high, not low. Thus, in the scenario just described, whichever direction timber prices were to move, timberland holdings could be used as a hedge against the performance of the mill assets or the other way around.



This hedging between timberland and mills can exist because the largest cost in running a wood products facility, such as a lumber mill, is the wood it consumes and processes into a finished product. The bar chart in Figure 1 shows that roughly half to two-thirds of the cost of manufacturing lumber in North America is derived from buying logs to supply a mill with wood.

Figure 1. Source: Hamir Patel and Gabriel Nicholson of CIBC Capital Markets. "Lumber Stats Have Yet to Show Easing of Offshore Imports." (May 10, 2023)

- Other
- Energy
- Labor
- Duties
- Wood

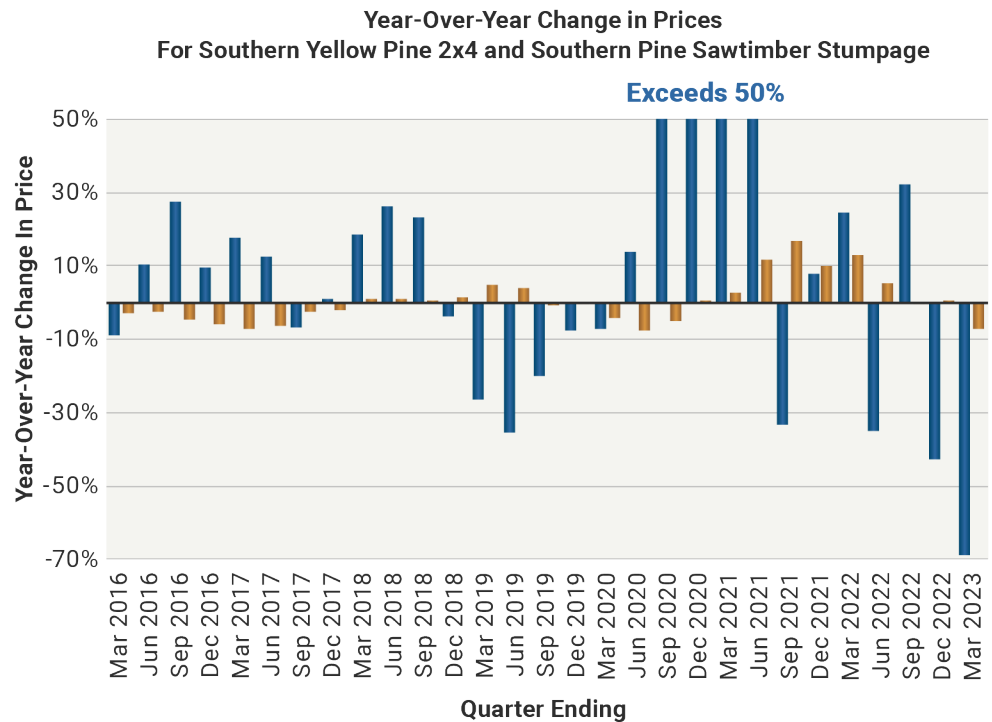


Hedging can be effective because lumber markets do not necessarily track timber markets. Figure 2 shows the annual price changes of lumber and timber in the U.S. South, which is the geographic region of North America that produces the largest volumes of both timber and lumber. It is important to note that lumber prices are often more volatile than those of timber. If timber and lumber move at different rates or in different directions, periods of strong lumber markets can produce outsized profits for mills. Yet, periods of weak lumber markets will not necessarily depress timber prices, which are an important driver of timberland investment performance.



Figure 2. Sources: Random Lengths (lumber prices) and Timber Mart-South (timber prices).

■ SYP 2x4 Lumber
 ■ Southern Pine Sawtimber



Idea of Synthetic Integration is Picking the Best Market for Each Investment

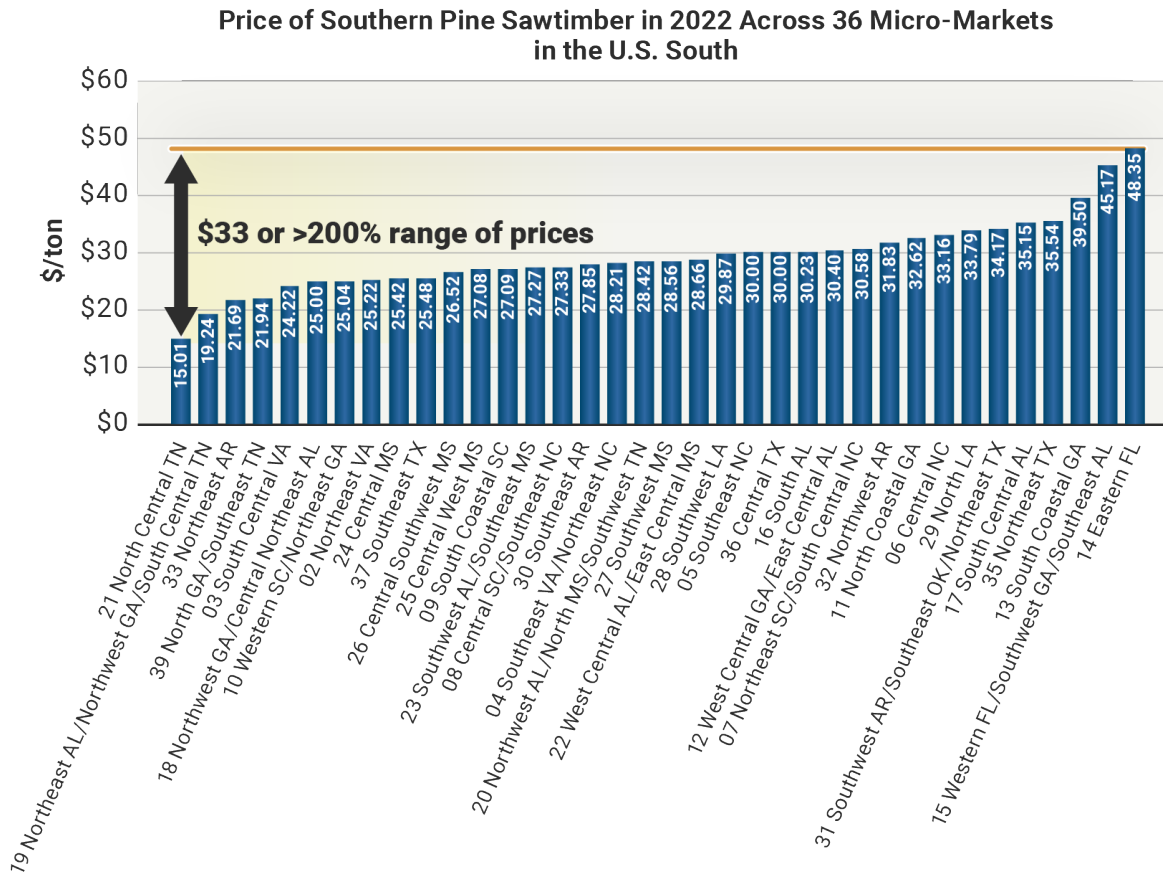
When integrated wood product companies hold timberland along with mills, they can benefit from this natural hedging effect. However, investors can take the integration strategy further by ensuring that their timberland and mills asset are not linked from a management standpoint. Consider the contrast. Mill owners prefer to buy logs in low-cost wood markets where they face little competition for timber from other mills. Timberland owners, in comparison, prefer to sell their timber in high-priced wood markets where numerous mills will compete for their wood and thus pay higher prices. Virtual (or synthetic) integration gives investors the best of both worlds. The goal is to pick the optimal markets for each type of investment – for timberland and for wood manufacturing. This helps avoid some of the pitfalls of the vertically integrated forest products company business model.

Choosing the right markets in which to hold timberland and mill assets can make a big difference in the long-term performance of a virtual integration strategy. There are numerous small micro-markets across the wood producing regions of the United States. To illustrate this point, Forest2Market, a prominent and well-regarded timber price reporting service for the forest sector, identifies at least 36 sub-markets or micro markets for southern pine sawtimber in the U.S. South alone. In 2022 for example, Forest2Market reported pine sawtimber prices ranging as low as \$15.01 a ton in north central Tennessee to as high as \$48 in eastern Florida, with other parts of the South falling somewhere in-between (Figure 3). This \$33 per ton span equates to more than



a 200-percent pricing differential. Imagine an investor building a portfolio that includes high-quality timberland properties in the top quartile of southern micro-markets and private equity investments in wood processing facilities located in the bottom quartile micro markets. The effect this dispersal of quality assets could have on the investor’s overall performance could be significant.

Figure 3. Source: Forest2Market



While the conceptual framework for employing virtual integration as just described is compelling, it also is important to understand that a variety of criteria go into the selection of a timberland or mill investment, and timber pricing is one of many key considerations. The broad diversity of timber prices across micro-markets simply highlights the necessity of selecting timber investments independently from mill investments.



Natural Hedging Creates a Portfolio Diversification Effect

Portfolio diversification is one of the best tools available to investors for lowering the collective risk of a portfolio while also earning a competitive return. The complementary nature of timberland and wood-based manufacturing assets provides strong potential for enhancing a portfolio's diversification profile.

To test the natural hedging potential of a combined timberland and mill strategy, we compared historical timberland returns along with the estimated returns of sawmill holdings. Our focus was the U.S. South. Among the different timberland investment regions in the U.S., the South offers attractive sub-markets with plentiful, low-cost timber resources, which also have the potential to attract sawmills and other wood manufacturing facilities. In contrast, the other leading timber producing region of the U.S., the Pacific Northwest, is characterized by tight timber availability and high timber prices, which limit that region's attractiveness for siting new mill investments.

In our analysis, the NCREIF Timberland Property Index represented timberland returns in the U.S. South.⁴ Private equity investments in wood-based manufacturing, however, are uncommon, and public data either does not exist or is inaccessible. To overcome this challenge, we used average sawmill production costs in the U.S. South as tracked by Forest Economic Advisors, an economic research consultancy that focuses on the forest products sector. We then estimated hypothetical gross returns from sawmill assets in the South when the data was combined with (a) spot market prices for lumber, (b) sawtimber pricing for the region, and (c) typical EV/EBITDA valuation ratios for publicly traded lumber companies. (A more detailed explanation of the process is provided in the appendix at the end of this paper.)



Interior of a newly-built southern pine sawmill in Mississippi

Based on this analysis, 30-year annual returns for three different investment strategies are shown in Figure 4: (1) a timberland-only portfolio; (2) a sawmill-only portfolio; (3) a 70:30 weighted portfolio comprised of both timberland and sawmill holdings. The identifying return markers on the vertical axis were removed from the graph to focus attention on the relative variability of the three different strategies analyzed. We made two observations upon completing our analysis and producing the chart. First, the performance of the mills (orange line) was significantly more volatile, with higher peaks and valleys, as compared to the performance of the timberland holdings (blue line). The second observation was that timberland returns sometimes move in different directions from those of mill returns. Good examples include the period during the recession of 2001-2002 (the "Dotcom Crash") and the Housing Bubble of 2005-2007, when

⁴ NCREIF is the National Council of Real Estate Investment Fiduciaries, a non-profit research organization that tracks institutional investments in real estate, farmland and timberland.



returns for timberland in the U.S. South increased while sawmills in the region mostly faced losses due to falling lumber prices. Our analysis demonstrates that the benefit of creating a portfolio that combines timberland assets with mill investments (grey line) is that year-to-year volatility is much lower than when a mill-only investment strategy is being pursued. However, while assuming higher risk, it is also important to note that a mill-only investment approach generates premium returns when compared with those of a timberland-only strategy.

**Relative Returns in Timberland and Synthetic Sawmill Investments
In the U.S. South for the Past 35 Years (1988-2022)**

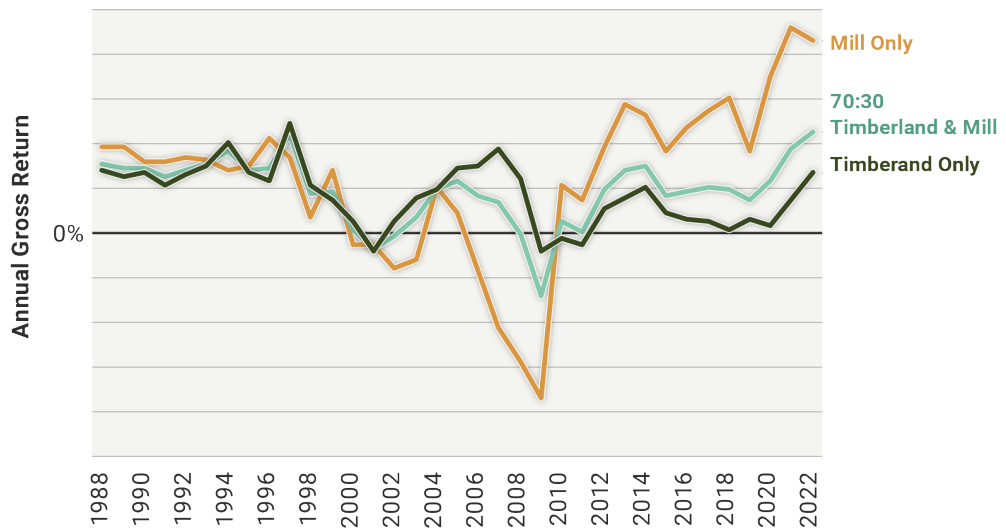


Figure 4. Timberland returns from NCREIF Timberland Property Index (South). Synthetic sawmills returns based on variable cost of production of U.S. South sawmills from Forest Economic Advisors; lumber prices from Random Lengths; timber prices from Timber Mart-South; and EV/EBITDA ratios of public solid wood manufacturers from CIBC Capital Markets. Returns are gross before any taxes, management fees and debt.

The risk and return benefits of pairing timberland with mill investments are quantified in Table 1 and Figure 5. If we take standard deviation of annual returns as a measure of risk, timberland assets offer less than half the risk exposure (7.0%) of private equity investments in sawmills (18.1%). However, a 50:50 weighted portfolio consisting of both strategies can cut risk levels by 45% as compared to a sawmill-only investment strategy. For this reason, the Sharpe Ratio⁵ (a basic measure of risk-adjusted performance) is almost comparable to that of a timberland-only strategy. An even higher Sharpe Ratio is generated when a 70:30 strategy is employed, which suggests that a portfolio does not need a significant component of mill investments for it to generate significant synergies with timberland. When plotted on a risk-to-return chart in Figure 5, the 50:50 and 70:30 timberland-to-mill portfolios both offer better risk-to-return tradeoffs than either a timberland-only or a mill-only investment strategy.

⁵ Sharpe Ratio is the premium return above the risk-free rate divided by the standard deviation, which is a measure of investment risk. The higher the Sharpe Ratio, the better the risk-factored performance. In this analysis, the risk-free rate is assumed to be 2.91%, which was the average return of 90-day U.S. Treasury Bills over the 35-year period.

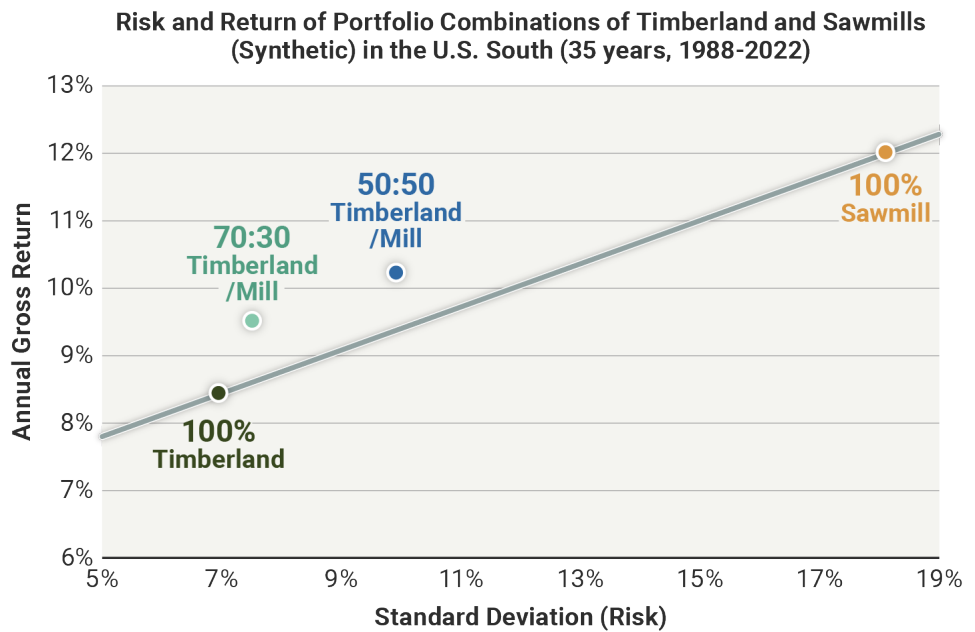


Table 1. Portfolio Combinations of the NCREIF Timberland Property Index and Synthetic Private Equity Sawmills Investments for the U.S. South (35 years, 1988-2022)

Portfolio	100% Timberland (South)	100% Sawmill (South)	50:50 Timberland & Sawmill	70:30 Timberland & Sawmill
Average Annual Return	8.4%	12.0%	10.2%	9.5%
Standard Deviation (Measure of Risk)	7.0%	18.1%	9.9%	7.5%
Sharpe Ratio*	0.79	0.50	0.74	0.87

* A measure of investment performance above the risk-free rate after factoring in risk. The higher the Sharpe Ratio, the better. Risk free rate is assumed to be 2.91%, which was the average return of 90-day U.S. Treasury Bills over the 35-year period.

Figure 5. A rule of thumb is to have risk-to-return combination that stay above the line, which indicates that the gain in return is more than the tradeoff of higher risk as delineated by the link between the two anchor points: 100% timberland and 100% sawmill portfolios. Returns are gross before any taxes, management fees and debt.





Summary and Conclusion

To summarize, there is a natural hedging effect that occurs between timberland and primary wood manufacturing. This is because timber prices impact timberland returns in ways that do not correspond with how they impact the performance of mills. A portfolio that combines timberland assets with mill investments therefore can offer a better risk-adjusted performance outlook than one that is comprised of either timberland or manufacturing assets alone. A heavy investment in the manufacturing side of such a strategy is not required; in fact, valuable gains in the form of lower risk exposure can be made with just a 70:30 allocation ratio between forest and manufacturing assets.

There is an additional benefit to combining timberland and mill assets when a virtual integration strategy is being utilized. Investors have an advantage over vertically integrated wood product companies because their placement of capital in timberland assets can be made independent of the choices they make about investing in manufacturing assets. This can provide an investor with the hedging and diversification benefits they seek without confining them to making the type of sub-optimal capital allocations that historically characterized the approach of many integrated forest products companies. To put it simply, investors are in a better position to select the best timberland investments to go along with the best mill investments, regardless of whether they are in the same market footprints or far away from each other.

For questions and additional information, contact:

Chung-Hong Fu
Managing Director of Economic Research and Analysis
Timberland Investment Resources, LLC
1330 Beacon St., Suite 311
Brookline, MA 02446
Phone: (617) 264-4767
E-mail: fu@tirllc.com

Disclaimer

This paper is provided for the education of its readers. The opinions and forecasts made are for informative purposes only and are not intended to represent the performance of an investment made through Timberland Investment Resources, LLC. No assurances are made, explicit or implied, that one's own investments in timberland or with Timberland Investment Resources, LLC specifically, will perform like what has been described in the paper.