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## TIMBERLAND AS AN INFLATION HEDGE

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Economic Research and Analysis

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## Executive Summary

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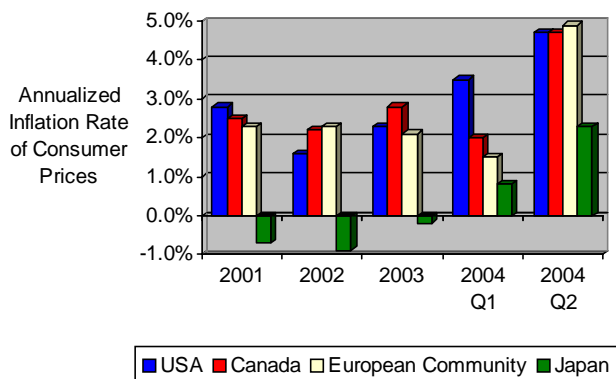
Inflation can be a serious threat to the value of a portfolio. Even in industrialized countries, where effective monetary policy can keep inflation within a moderate window, small differences of a couple percentage points in annual inflation can have a measurable impact on the long-term value of an investment. To insure against an unforeseen erosion of the value of money over time, one may wish to include inflation-protected investments in one's portfolio. A strong candidate to serve that role is timberland. Timberland returns, as measured by the NCREIF Timberland Index, have a seventeen-year history that closely tracks inflation when measured in medium-term (5-year) and long-term (10-year) intervals. This correlation between timberland returns and inflation exceeds that of large-cap blue chip stocks and even standard real estate investments. The key to timberland's inflation hedging ability is the close association between timber prices and overall prices in the economy. That correlation historically has performed better than many other commodities, including energy, precious metals and agricultural goods.

## Introduction

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Timberland has emerged in the last two decades as a viable asset class among institutional investors and high-net-worth individuals. These investors are attracted to timberland's competitive returns relative to its risk. Furthermore, this alternative asset class can provide portfolio diversification, as timberland returns historically have low correlations to other asset classes, such as equities, fixed income, and traditional real estate.

In addition to timberland's risk/return profile and portfolio diversification characteristics, a third benefit that some may overlook is its potential as an effective hedge against inflation. Simply put, returns from timberland investments have the ability to closely track inflation over long-term periods. This feature can prove attractive to a risk-adverse investor. Also, if there are future long-term cash liabilities, an investor may wish to protect his or her coverage of those liabilities from unexpected shifts in price levels.

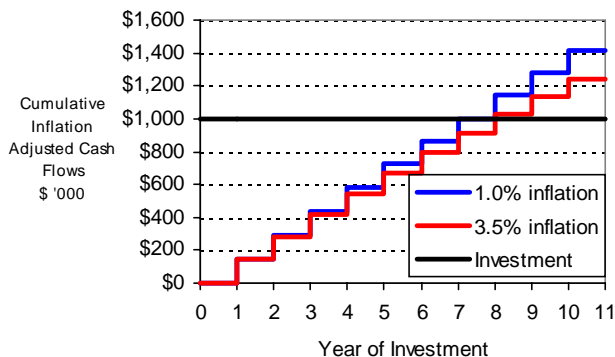


**Figure 1.** Annual inflation rate of consumer prices of the United States, Canada, Western Europe and Japan from 2001 through 2<sup>nd</sup> quarter 2004.

### Value of Inflation Hedging in a Portfolio

Today, most developed, industrialized nations have tamed the inflation beast. Observing inflation in the economies of Japan, Canada, Western Europe and the United States, one will notice that the monetary authorities have been successful in keeping inflation at a moderate level – typically below 5 percent annually (Figure 1). One could make the argument, therefore, that hedging against inflation risk is unnecessary.

Though threats today seem mild, there are two counter arguments in favor of hedging against the potential impact of inflation. First, unexpected inflation comes from economic shocks, such as high oil prices. As seen from global events, these risks are real. For example, economists in 1979 forecasted inflation to be 7 percent in the United States. However, the Iranian revolution that year led to a jump in oil prices, which caused the Consumer Price Index (CPI) to rise to 11 percent - 4 percentage points higher than forecasted. In more recent history, we saw the collapse of Asian currencies in the late 90's and an overheated Chinese economy raising global commodity prices in 2004. Until the day we reach a fully integrated global economy, there always will be risks of global market shocks that unexpectedly alter inflation rates.



**Figure 2.** Cumulative real cash flows of a \$1 million investment under two moderate inflation scenarios: 1.0% versus 3.5%. The investment structured to receive an internal rate of return of 8.0% over 10 years through an annual cash yield of 14.9%.

A second reason why inflation is a valid concern to investors is that even small variations in inflation can have significant impact on real returns. In the United States, the Federal Reserve Bank generally targets annual inflation rates within a 1 to 4 percent band. Assume for argument's sake that the Fed is successful. Nevertheless, inflation closer to 1 percent will give a measurably different effect on a portfolio versus inflation closer to 4 percent. To illustrate, let us assume a \$1 million investment with a target nominal return of 8 percent over a 10-year life, as shown in Figure 2. To attain that 8 percent return, the investment pays out \$149,000 annually for 10 years. Should annual inflation be 3.5 percent rather than 1.0 percent, then it will take 8 years instead of 7 to recoup the investment in inflation-adjusted (i.e., real) dollars. Furthermore, the total net real payout, after adjusting for inflation, is \$172,000 less if inflation is 3.5 percent rather than 1.0 percent. The difference is a 12.2 percent shortfall – not an insignificant amount.



Although modern monetary policy has advanced significantly since the mid-20th century, an investor should be aware that inflation is never fully predictable. To protect real returns over time, it may be worth considering investments that move in relatively close association with inflation. One such investment is commercial timberland.

## **The Evidence for Timberland as an Inflation Hedge**

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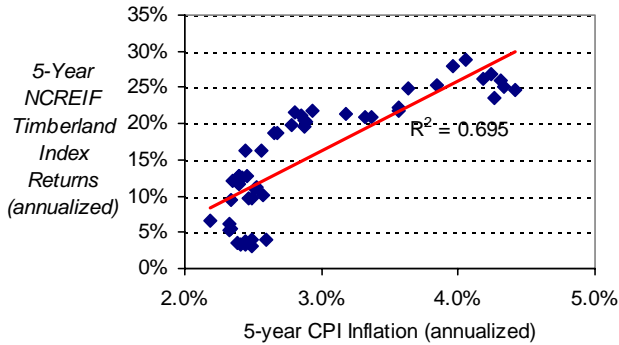
### ***Measures of Inflation and Timberland Returns***

To be convinced that timberland investments can serve as an inflation hedge, one must test against historical records. That test should be done using recognized measures of both inflation and timberland returns. For inflation, the Consumer Price Index (CPI), the Producer Price Index (PPI) and the Gross Domestic Product Deflator (GDP deflator) are three standard measures of overall price levels in the United States. For our analysis, we will select the CPI, as it is the most widely cited gauge for inflation among the three.

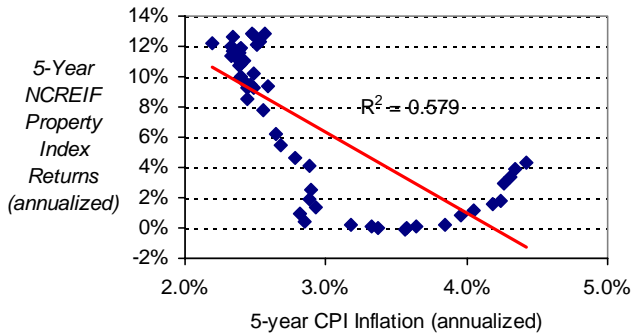
For the measure of timberland performance, the Timberland Index of the National Council of Real Estate Investment Fiduciaries (NCREIF) is the best available for the North American market. As an index, it measures total returns on a quarterly basis for those institutional investors who have contributed their data to NCREIF from 1987 to the present.

To weigh the evidence in context, two major asset classes are used for comparison: equities and real estate. A commonly accepted measure of overall returns from U.S. large-cap equities is the Standard & Poor's 500 Index (S&P 500). For real estate investments, we use the NCREIF Property Index (NPI). The NPI reports the returns of commercial real estate properties held by tax-exempt institutional investors who are members of NCREIF; it includes retail, apartments, industrial, and office properties.

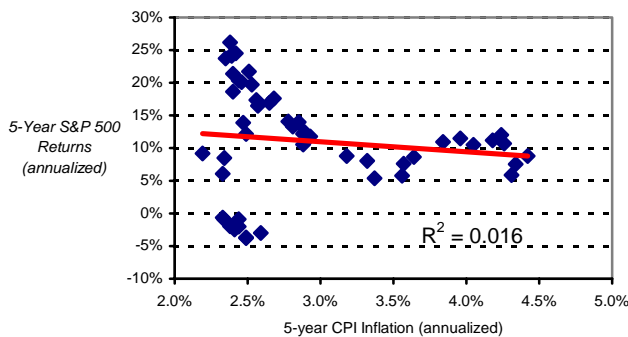
The missing major asset class – fixed income – is not used in the comparison against timberland because most bonds are, by nature, poor hedges against inflation. Fixed income instruments, by definition, provide a fixed schedule of coupon and principal payments. (Exceptions are some tracking and indexed bonds, such as Treasury Inflation-Protected Securities (TIPS).) With their fixed nominal cash streams, bonds in general offer no protection against inflation risk.



**Figure 3.** Plotting the return of the NCREIF Timberland Index over a given 5-year period against the CPI inflation over that same period. The periods fall within 1987 Q1 to 2004 Q2 and the values are annualized.



**Figure 4.** Plotting the return of the NCREIF Property Index over a given 5-year period against the CPI inflation over that same period. The periods fall within 1987 Q1 to 2004 Q2 and the values are annualized.



**Figure 5.** Plotting the return of the S&P 500 over a given 5-year period against the CPI inflation over that same period. The periods fall within 1987 Q1 to 2004 Q2 and the values are annualized.

### Tracking Inflation over the Medium-Term

As an asset class, timberland is normally viewed as a longer term investment. On the inflation side, short-term spikes in prices over a quarter or two are typically not of concern to most investors. Rather, it is the unexpected persistent inflation year over year that will erode the value of a portfolio.

Consequently, we test the NCREIF Timberland Index performance against inflation over a more realistic investment horizon of five years. This study simulates how an investor's portfolio may have performed if he or she invested in timberland sometime within 1987 and 1999, and liquidated it at the end of 5 years. How would the investor's returns compare against inflation during that period? **Figure 3** suggests that the investor would have done quite well. In periods of high inflation, timberland returns were higher than average. The relationship is measured at a strong 87 percent correlation with a statistical level of significance beyond 0.01 percent.

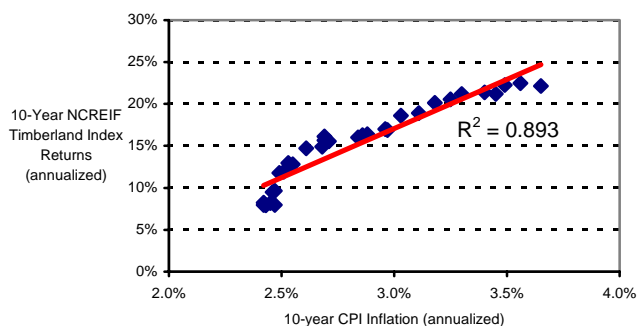
By comparison, commercial real estate in that same period had the opposite effect with inflation. As seen in **Figure 4**, periods of high inflation tend to correspond with lower returns from real estate. At least from 1987 through 2004, real estate as an inflation hedge is not as effective as popular conception would lead us to believe.

With equities, the evidence is inconclusive. **Figure 5** shows inflation with little correlation with equities.

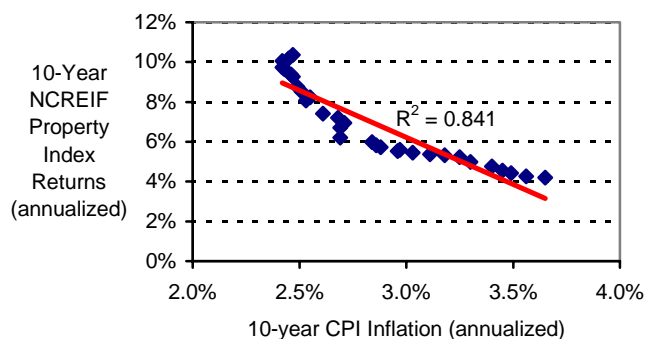
### Tracking Inflation over the Long-Term

While the evidence suggests timberland can be an effective hedge against inflation over a 5-year interval, timberland is more commonly viewed as a long-term investment. Horizons for timberland holdings in a balanced, diversified portfolio often reach ten years or more. As a final test, therefore, ten-year returns from timberland are compared against inflation over that same period. The results are shown below in **Figure 6**.

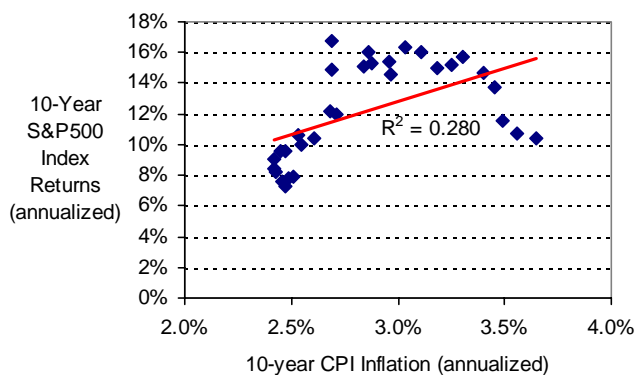
The correlation between the NCREIF Timberland Index returns and the CPI inflation reaches 98% when measured over ten years. In addition, the statistical test for significance exceeds the 0.01 percent level. However, some words of caution are needed. Keep in mind that as we move from a five-year interval to a ten-year interval, there is a correspondingly smaller and smaller span of history to observe. The quarterly returns



**Figure 6.** Plotting the return of the NCREIF Timberland Index over a given 10-year period against the CPI inflation over that same period. The periods fall within 1987 Q1 to 2004 Q2 and the values are annualized



**Figure 7.** Plotting the return of the NCREIF Property Index over a given 10-year period against the CPI inflation over that same period. The periods fall within the 1987 Q1 to 2004 Q2 and the values are annualized.



**Figure 8.** Plotting the return of the Standard & Poor's 500 Index over a given 10-year period against the CPI inflation over that same period. The periods fall within the 1987 Q1 to 2004 Q2 and the values are annualized.

span seventeen years, but the 10-year returns span a history of seven years (with starting points in 1987-1994 and ending points in 1997-2004). Therefore, with fewer observations and a shorter history, a measure of prudence is suggested in interpreting the results. Nevertheless, the results do support the argument that timberland could be an effective hedge against inflation.

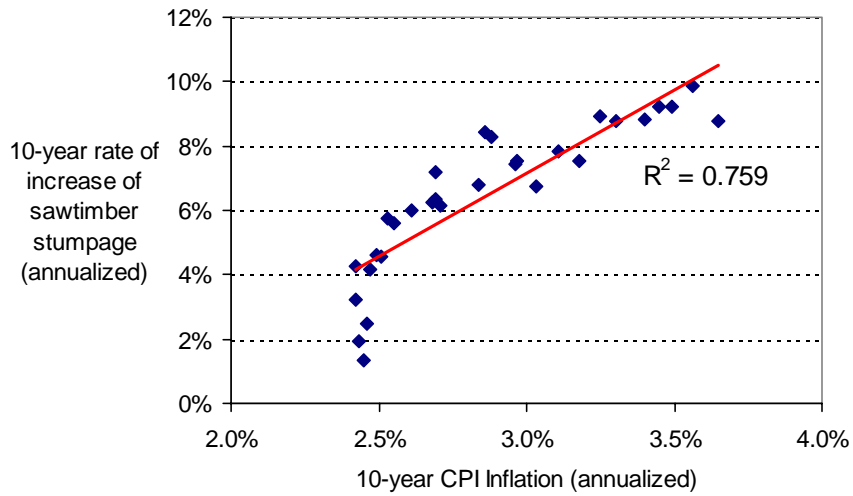
For comparison, the same chart is made for commercial real estate (**Figure 7**) and the S&P 500 (**Figure 8**). Notice that the relationship between real estate and inflation continues to be negative; that is, periods of higher inflation rates correspond with lower returns from real estate. On the other hand, large-cap equities exhibit some positive relationship with inflation over a 10-year horizon.

### Timber Prices and Inflation

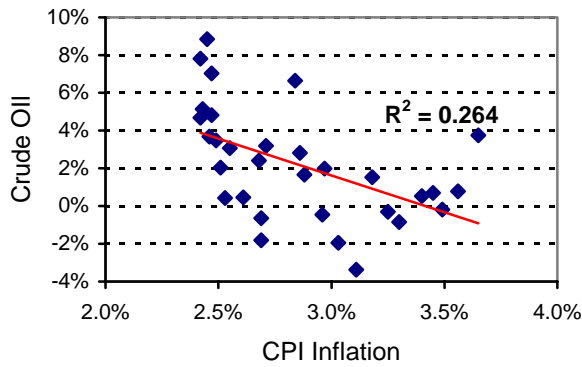
Why would timberland investments track inflation? The value of commercial forestland is derived mainly from the revenue generated from the sale of timber harvests. Hence, much of the investment return of a timberland investment comes from the price of logs. A rising market for timber would boost timberland returns. Conversely, a declining market for timber would hurt timberland returns; not only would the cash amount generated from a harvest decrease, but the property value would decline as well.

It stands to reason that if timberland returns have historically tracked inflation, it is because, ipso facto, timber prices track inflation. To test that hypothesis, the 10-year rise in timber prices is plotted against the CPI in that same period (**Figure 9**). The timber price selected is the average sawtimber stumpage price of southern yellow pine in the U.S. South. Sawtimber is the highest valued log product and southern pine is the largest commodity timber market in North America. To compare apples to apples, the chart covers the same period of 1987-2004 as in the NCREIF Timberland Index.

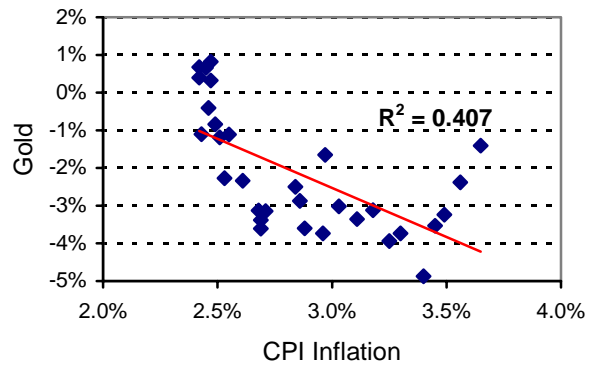
With a correlation factor of 87%, the relationship is strong. To put timber into perspective, the following four charts in figures 10a-10d plot gold, coffee, sugar and crude oil against inflation. Notice that unlike timber, there is very little, if any, relationship between the other commodities' price and inflation over a 10-year period.



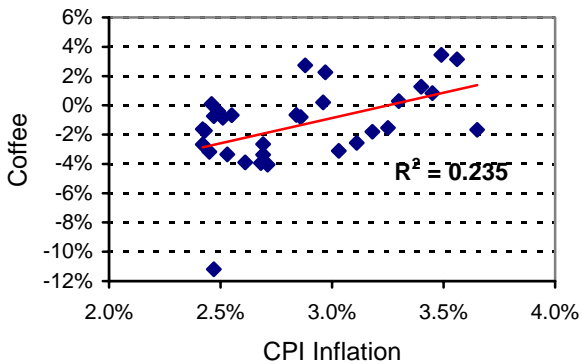
**Figure 9.** Plotting the rise of South-wide pine sawlog prices over a given 10-year period against the CPI inflation over that same period. The periods fall within the 1987 Q1 to 2004 Q2 window and the values are annualized. Log price source: Timber Mart-South.



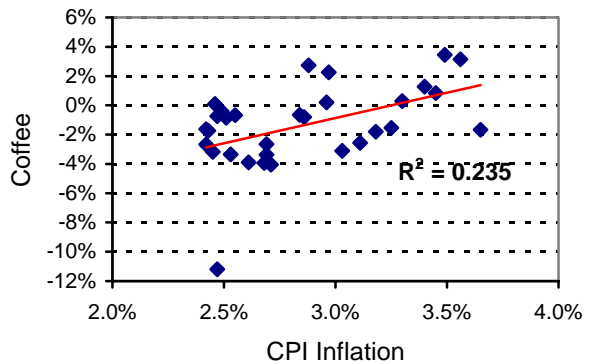
Source: U.S. Department of Energy – Cushing OK WTI Spot



Source: Kitco Inc.



Source: International Coffee Organization – Composite Indicator Price



Source: New York Board of Trade – Sugar No. 11 contract for 50 long tons

**Figures 10a – 10d.** Plotting the rise in spot price of select commodities over a given 10-year period against the CPI inflation over that same period. The periods fall within the 1987 Q1 to 2004 Q2 window and the values are annualized.



**Assessing the Evidence**

As we have seen from the evidence, timberland as an asset class shows a remarkable correlation to inflation over the last seventeen years that NCREIF has tracked timberland investment returns. With a correlation at a statistically significant 98 percent, timberland has strong inflation hedging potential over the long-term (i.e., 10-years). During periods of above average inflation, timberland investments have produced a correspondingly higher rate of return. This inflation hedging characteristic of timberland compares well against the major asset classes of equities and real estate. As seen in **Table 1** below, only timberland has a positive correlation with inflation that is statistically meaningful; equities and traditional real estate cannot make that claim.

The reason for the inflation hedging ability of timberland is the link between timber prices and the overall price level of the economy. More than many other commodities, timberland moves in tandem with the overall price level of the economy over the long-term. This association is explored in the next section.

**Table 1.** Summary of statistical values testing the relationship of CPI inflation against the 5-year and 10-year returns of (a) timberland, (b) real estate, and (c) large-cap stocks, as represented by the NCREIF Timberland Index, NCREIF Property Index, and the Standard & Poors' 500, respectively.

Investment Category	Statistical Correlation of Total Returns	Linear Regression R <sup>2</sup> of Annualized Returns	Statistical Significance p-Value
5-year returns			
<i>Timberland</i>	87.4%	69.5%	>0.01%
<i>Real Estate</i>	-75.7%	57.9%	>0.01%
<i>Large-cap stocks</i>	-21.6%	1.6%	12.82%
10-year returns			
<i>Timberland</i>	97.9%	89.3%	>0.01%
<i>Real Estate</i>	-89.6%	84.1%	>0.01%
<i>Large-cap stocks</i>	48.6%	28.0%	0.55%

**Explanation of terms:**

*Correlation:* The larger the value, the greater the correlation. 0% is no correlation. -100% is perfect negative correlation. 100% is perfect positive correlation.

*R2:* How much inflation would explain the investment returns if a linear regression was performed.

*p-value:* Effectively, the lower the p-value, the greater the level of statistical significance. In general practice, a p-value of 5% or lower suggests statistical significance.





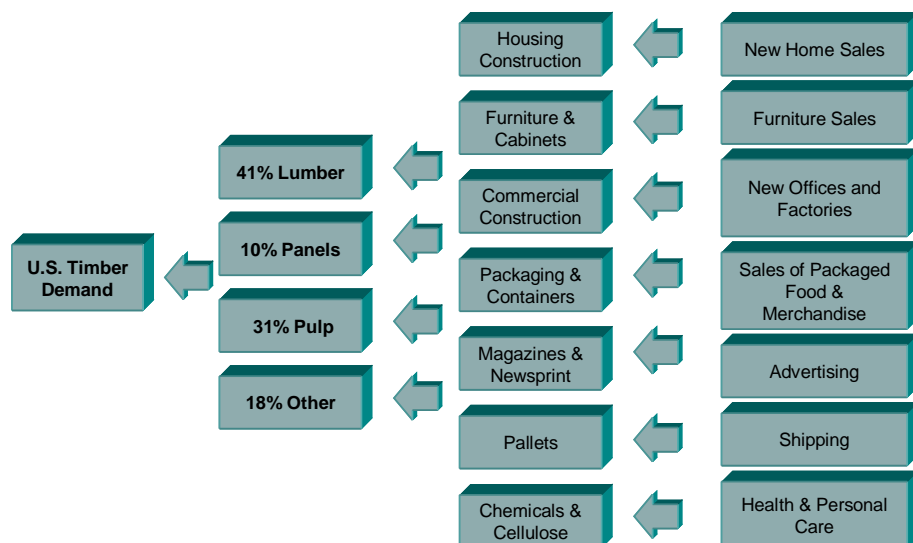
## Behind the Inflation Hedging Ability of Timberland

### *Demand for Timber is Broad Based*

Timber prices, like the prices of many commodities, are closely tied to demand. The demand for logs, however, is not the final determinant of timber prices. Rather, it is “derived” demand for wood-based end-products. In other words, the ultimate consumption of wood is derived from the end-products that have wood and wood fiber.

To apply this concept, an investor may consider investing in a primary industry if she believes a related secondary industry is expected to perform well. If she invests in Michelin, the investor is indirectly betting on the performance of the automotive industry because Michelin tires are sold into the automobile market. If she invests in Boeing, the investor is betting on the health of the airline industry because airline companies purchase planes from Boeing. But if she invests in timberland, the investor essentially is betting on home construction, newspapers, magazines, home improvement stores, furniture dealers, office supplies, and manufacturing.

In other words, timberland can be a good inflation hedge because the demand for timber is derived from a broad section of the economy. As seen in **Figure 11**, if inflation (by definition) is the rise in the overall price level of the economy, then wood-based products are well represented by a large swath of those overall prices in the economy.



**Figure 11.** Demand for timber is derived from a wide number of sectors in the economy



A common misconception is that demand for timber comes essentially from residential home construction. On the contrary, wood products permeate through many levels of the economy. For example, constructing a high-rise office would require concrete moulds at the foundation, yet these moulds require the use of plywood. Disposable diapers are made of a highly absorbent form of cellulose, which also is a wood-based product. Processed foods, from orange juice to cereal to frozen pizza, use paper-based packaging. The list goes on and on.

### ***A Inelastic Supply of Timber Creates Price Pressures***

Demand is only one-half of the equation. The other half is supply. If supply responds quickly to increased demand, then any price spikes will be temporary. On the other hand, if supply responds slowly or not at all, then price pressures will persist. The latter is the case with timberland. When one needs twenty or more years to grow timber, it is difficult to respond quickly when the market is strong. In the northern latitudes, such as the Pacific Northwest and the Northeast, the cycle between planting and final harvest can reach over half a century. With such long production cycles, higher timber prices caused by inflation will have a tendency to persist.

Nevertheless, the timber market eventually will respond to higher prices. That ability to respond, however, is somewhat constrained. Economic theory tells us that in a competitive market, producers will enter or expand production as long as there are profits to be gained in doing so. The end result is that supply expands until the price falls to the lowest long-run average cost of production.

What makes timberland different is that the ability to expand supply is limited without first incurring higher costs. Wood production is a “residual” economic use. Most all other economic uses for land – with the possible exception of pastureland – are of higher value than growing trees. Effectively, agriculture, recreation, residential, and manufacturing all out-compete timberland. In fact, the total timberland base is being eroded worldwide due to “higher and better use” (or HBU) opportunities.

With timberland relegated to the bottom of the totem pole of economic uses, the only way to expand timber production is to (a) import more, or (b) try to grow more



wood on the same amount of land. Neither are zero cost options. Importing more incurs shipping costs and requires drawing timber from high cost sources. Growing more wood per acre requires intensive management; however, higher timber prices are needed to draw in the additional investments needed to increase productivity.

### ***Long-Term Tracking, Short-Term Noise***

To pull it all together, timberland investments respond to inflation because timber prices – the basis of return for the asset class - respond to inflation. Price pressures at the consumer level eventually feed back into timber markets. However, supply is inelastic. In other words, forest landowners find it difficult in the medium and long-term to rev up harvests without incurring higher costs. Finally, the global availability of timberland is limited; in order to grow more timber requires more land or more intensive management, both of which require higher timber prices to draw in the investment.

This structure – a slow response to price pressures, plus an inelastic supply – works in favor of timberland's long-term tracking with inflation. In the short-term, however, there is a lot of noise from extraneous factors that cloud the link between timberland and inflation. These factors include the seasonal weather patterns affecting harvest levels, and the adjustment in inventories held by mills. Changes in currency exchange rates could boost or restrict imports. Landowners could delay or advance timber harvests to take advantage of market changes. Last, but not least, it takes time for prices in end-use markets to feed back into timber markets.

## **Applying the Inflation Hedging Feature of Timberland**

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To the investor, risk is a four letter word. But risk comes in many forms, including default risk, liquidity risk, call risk, reinvestment risk, and foreign exchange risk - to name a few. Unexpected changes in the inflation rate are another such risk. It is a hazard borne over the life of the investment. The risk comes from the uncertainty of how many real dollars an investor will receive at the end of her investment. Because of that uncertainty, investors demand a premium – in the form of a higher expected return – for having to bear that burden.

Hence, the less correlated (or negatively correlated) an investment is to inflation, the greater the inflation risk premium. Similarly, investments that positively track



movements in the inflation rate would have low premiums. If timberland investments track inflation well, then it should, by argument, have a lower risk premium. All other things being equal, timberland will be the preferred investment over other asset classes that are more exposed to inflation.

How much of a reduced risk premium timberland commands will depend on the investor's "appetite" for inflation risk. Risk adverse investors highly value insurance against unexpected inflation. Therefore, they would allocate more of their portfolio to inflation protected investments with timberland being among them. Investors who put a priority on conservation of capital are also good candidates. Finally, excellent candidates for inflation hedging include investors with certain liabilities on the horizon that are exposed to inflation, such as future college tuition or pension obligations that are adjusted for inflation.

## Summary

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Inflation can be a serious threat to the value of a portfolio. Even in industrialized countries, where effective monetary policy can keep inflation within a moderate window, small differences in inflation of 100 or 200 basis points can have a measurable impact over the long-run on a portfolio's value. As an inflation hedge, timberland returns, as measured by the NCREIF Timberland Index, have a seventeen-year history that closely tracks that of inflation. However, that performance is relative to the investment horizon; timberland has been more effective as an inflation hedge over the long-term (e.g., 10 years) rather than the medium-term (e.g., 5 years). The inflation protection ability of timberland is derived in part from the fact that wood products permeate many sectors and markets. When prices of final goods and services inflate, they eventually feed back into timber prices. For the investor who values the inflation protection characteristics of timberland, running an asset allocation model may suggest adding timberland to the portfolio.



## Disclaimer

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This paper is provided for the education of its readers. The charts and statistics shown are for illustrative purposes only and are not intended to represent the performance of an investment made through Timberland Investment Resources, LLC past, existing or future. 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.

The performance of the indices reported in this paper – including the NCREIF Timberland Index, the NCREIF Property Index, and the Standard & Poor's 500 Index - are before any transaction costs, management fees or incentive fees. Actual investor returns may be lower.

## For Additional Information

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Further information and full details of the calculations and models used in producing the figures and tables are available upon request.

For questions and additional information, contact:

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