



Natural Resources and Infrastructure Investments

Justin Ourso, CFA
Portfolio Manager

Sandra LaBaugh, CFA
Portfolio Manager

Real assets: The impact of rising interest rates on farmland and timberland investment

Executive Summary

- Investors fear the new credit tightening cycle will negatively impact the investment performance of real assets in the United States.
- Concerns are that rising interest rates will push up discount rates, causing a decline in farmland and timberland values and total returns.
- However, historical data show that rising-rate environments were not highly correlated with farmland and timberland performance. Further, each sub-asset class has characteristics that tended to reduce the potential impact of rising interest rates.
- Prices for farm and timber commodities are more important drivers of asset values and longer-term investment performance compared to interest rates.
- The expected slow pace of rate hikes by the U.S. Federal Reserve, the limited impact of the federal funds rate on longer-term U.S. Treasury yields, and stable economic growth in the U.S. should support real asset returns in the near term; global economic and demographic trends support long-term fundamentals.

Will higher rates hurt farmland and timberland returns?

The Federal Reserve's policy shift to credit tightening with rising interest rates is prompting concern about the potential impact on real asset performance. Investors fear that rising rates will increase the discount rate for real assets, potentially causing a decline in property values and total returns for farmland and timberland assets in particular. Their fear is rooted in the principle that a rising discount rate reduces the net present value of future income, forcing a reduction in property value as competing investments become relatively more attractive.

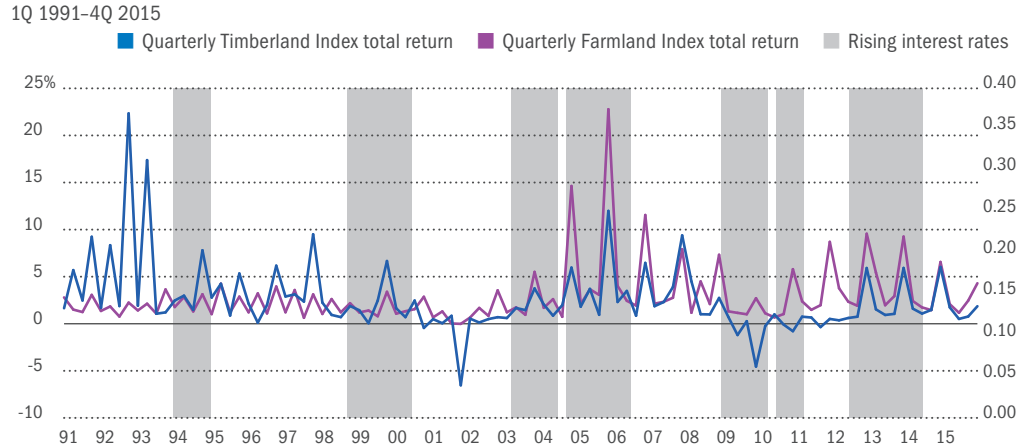
For a variety of reasons covered in this paper, the unique characteristics of real assets historically have helped to buffer farmland and timberland from short-term fluctuations in interest rates and commodity prices. In particular, farmland and timberland tend to be relatively illiquid and infrequently traded due to the nature of their markets. Their land values tend to depend more on longer-term trends in global demand for food and forest products.



Return correlations between timberland and farmland and 10-year Treasury rates are very low.

Indeed, the record generally shows that performance for both sub-asset classes has not suffered during past periods of rising interest rates. Two widely used measures of performance—the NCREIF Farmland and Timberland Indexes—show generally positive and relatively consistent returns over the past 20-plus years, despite multiple periods of rising interest rates (Exhibit 1).

Exhibit 1: NCREIF timberland and farmland quarterly total returns and periods of rising rates



It is not possible to invest in an index. Performance for indices does not reflect investment fees or transactions costs. Sources: Moody's Analytics, NCREIF as of fourth quarter 2015, TIAA-CREF.

More importantly, return correlations between timberland and farmland and 10-year U.S. Treasury¹ rates are very low, at 0.11 and -0.09, respectively (Exhibit 2). In fact, timberland and farmland show little correlation with most major asset class—stocks, bonds and commodities. The correlation between timberland and farmland is also low, at 0.21, making them complementary. Both also show a generally positive relationship with inflation, with even stronger links during periods of more rapidly rising prices, making the two asset classes powerful hedges against inflation.

Exhibit 2: Correlations between asset classes

| Asset class/Index | Annual Return correlations (1991–2015) | |
|---------------------------|--|---------------|
| | U.S. Timberland | U.S. Farmland |
| S&P 500 | 0.17 | -0.02 |
| Russell 3000 | 0.18 | -0.01 |
| MSCI EAFE | 0.09 | 0.17 |
| 10-year U.S. Treasuries | 0.11 | -0.09 |
| Long-Term Corporate Bonds | -0.02 | -0.19 |
| Corporate Real Estate | -0.04 | 0.43 |
| Inflation | 0.28 | 0.10 |
| Commodities | -0.08 | 0.12 |
| U.S. Farmland | 0.21 | 1.00 |

S&P 500: Total return; Russell 3000: Total return; MSCI EAFE: Net return; Long-Term bonds: Ibbotson U.S. Long Term Corporate Bond Index; Corporate Real Estate: NCREIF NPI; Inflation: Consumer Price Index (Seasonally adjusted: all items); Commodities: Continuous Commodity Futures Price Index; U.S. Timberland: NCREIF Timberland indexes total return; U.S. Farmland: NCREIF Farmland index total return.

Sources: Bloomberg, NYBOT via Bloomberg, NCREIF, TIAA.

Farmland’s and timberland’s historical record of low correlations and inflation hedging—combined with attractive risk-adjusted returns—explain the interest of long-term investors in using farmland and timberland to diversify portfolios.

The link between interest rates, discount rates and investment performance

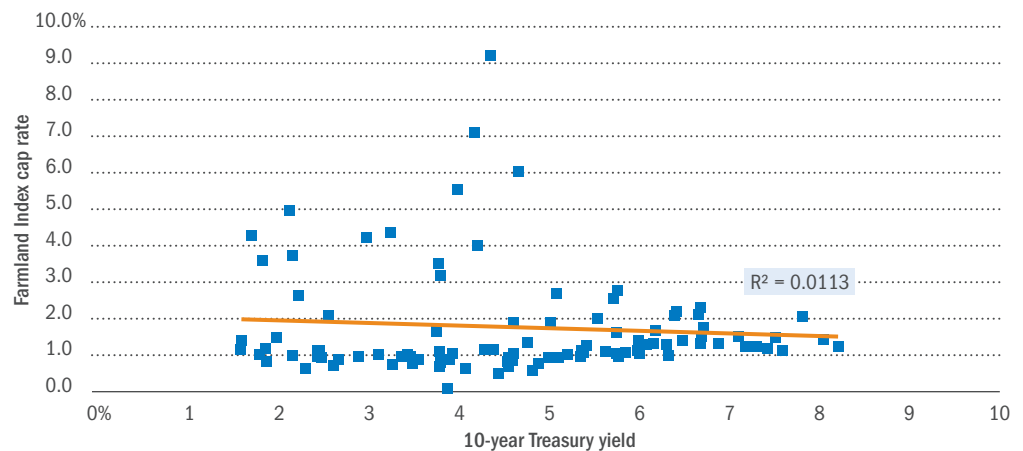
Investors are concerned that rising interest rates will push up the discount rates used to determine valuations for timberland and farmland assets. They understand that, in general, a property’s value reflects its future operating income discounted to the present. The discount rate used in valuation is often called the *capitalization rate* or *cap rate*, and in simplest terms, is defined as current income divided by property value.

$$\text{Cap rate} = \text{Net operating income (NOI)} \div \text{Property value}$$

Based on this standard formula, rising interest rates increase yields on competing investments, causing return expectations and discount rates for real assets to adjust upward. All else equal, when the Fed raises interest rates, discount rates would go up and property values would fall. However, the relationship between interest rates and discount rates is more complex—influenced by a variety of economic factors, including the relative risk of a particular property, its unique sequence of cash flows, and even proximity to end markets in the case of timber. Typically, all else is *not equal*.

Historically discount rates have not moved in lockstep with interest rates. To demonstrate this, we calculated correlations between the income portion of NCREIF total returns—a proxy for the discount rate—and 10-year Treasury rates. Farmland’s discount rate showed a slightly negative relationship, with a correlation of -0.11 (Exhibit 3), although the accompanying R-squared of 0.01 indicates that there is very little connection between the performance pattern of the two rates.²

Exhibit 3: NCREIF Farmland Index cap rate vs. 10-year Treasury yields

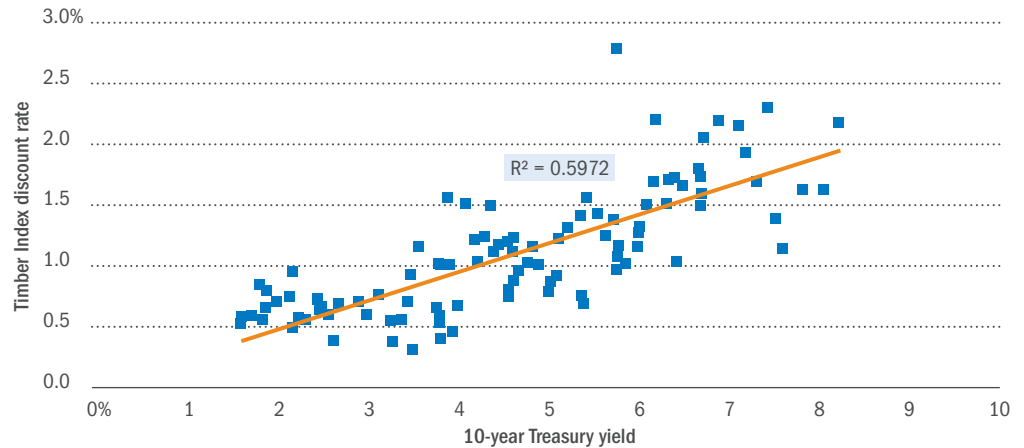


Quarterly returns for NCREIF Farmland Index income and 10-year Treasuries 1Q1991 through 4Q2015.
Sources: NCREIF, Bloomberg.

Timberland’s income returns and discount rates can vary independently of changes in interest rates.

Timberland’s proxy for the discount rate—the NCREIF cash yield or EBITDDA return—shows a much stronger correlation to 10-year Treasury rates, at 0.77 (Exhibit 4).³ An R-squared of 0.59 suggests the performance pattern of the two rates is also more closely linked than for farmland. In this case, however, the relationship is less meaningful due to the nature of timberland cash flows and the asset class’ changing risk profile.

Exhibit 4: NCREIF Timber Index discount rate vs. 10-year Treasury yields



Quarterly returns for NCREIF Timberland Index cash yield (EBITDDA) and 10-year Treasuries 1Q1991 through 4Q2015.
Source: NCREIF; Bloomberg.

NCREIF income is less valid as a proxy for the timber discount rate because income can vary based on the underlying age class of timberland properties in the index. Also, NCREIF timber cash yields are a snapshot based on a single quarter’s return, whereas in practice timberland is typically valued by discounting up to 50 years’ worth of cash flows. Moreover, timberland owners may choose to accelerate or delay timber harvesting based on market conditions—for example, leaving trees on the stump when prices are low. As a result, timberland’s annual income returns and specific property discount rates can vary independently of changes in interest rates.

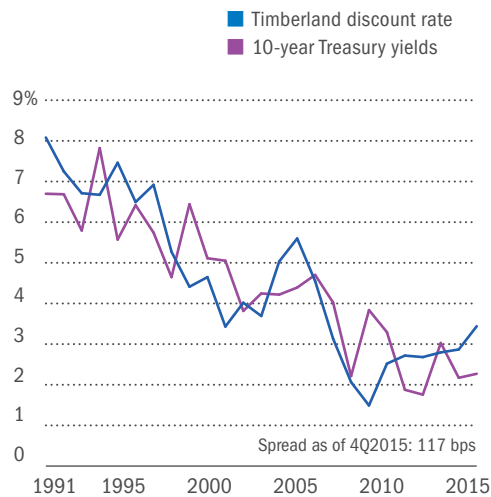
Even more fundamentally, correlation does not imply causation. Timberland as an asset class has evolved since the late 1980s and has seen a steady increase in new investment and a decrease in perceived risk. Greater acceptance has driven down its discount rate and risk premium, a trend that coincided with a general decline in nominal interest rates over the past three decades. Hence, the high correlation is less likely the result of interest rates driving discount rates and land values.

Spreads between discount rates and interest rates vary over time

Even where there is evidence of a relationship, this does not imply that rates move in tandem. If they did, the spread between the discount rate and prevailing interest rates would remain fairly constant. In fact, the relationship fluctuates over time.

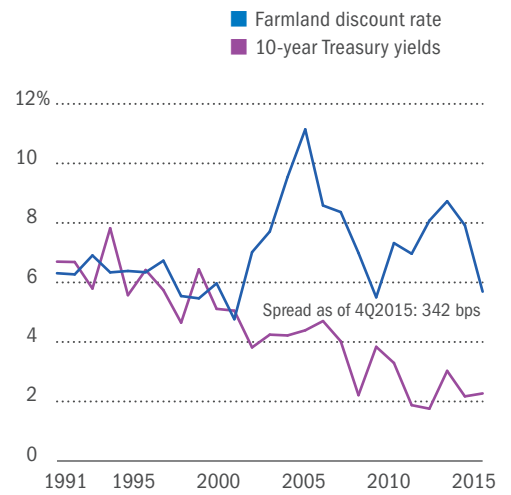
For example, the spread for timberland has ranged from a positive 189 basis points to a negative 235 basis points over the 25-year period, 1991–2015 (Exhibit 5). The spread can vary because the discount rate takes into account a complex set of economic factors. As a result, interest rates could move up or down—widening or narrowing the spread—without necessarily increasing the discount rate and causing a drop in land values.

Exhibit 5: Annualized NCREIF Timber Index discount rate vs. 10-year Treasury yields: 1991–2015



Discount rate: NCREIF Timber Index cash (EBITDDA) return; 10-year Treasury yields at year-end.
Sources: NCREIF, Bloomberg.

Exhibit 6: Annualized NCREIF Farmland Index cap rate vs. 10-year Treasury yields: 1991–2015



Cap rate: NCREIF Farmland Index income return.
Sources: NCREIF, Bloomberg.

Farmland’s discount rate shows even greater variability, soaring since 2001 despite steadily declining interest rates (Exhibit 6). The spread over 10-year Treasuries peaked at 675 basis points in 2005, declined to 166 in 2009, and peaked again in 2012 before falling to 342 basis points, as of December 31, 2015.

An important characteristic helps to explain why real asset discount rates are independent of interest rates. Investors in farmland and timberland have a very long-term orientation—indeed, some forest properties and permanent farm crops like nut trees have life cycles spanning decades. These investors tend to focus on the long end of the yield curve and look beyond the current rate cycle when making investment decisions. In contrast, Fed rate hikes impact the very short end of the yield curve. With strong global demand for Treasuries putting downward pressure on longer-term yields, rising short-term rates are likely to have little influence on real asset discount rates.

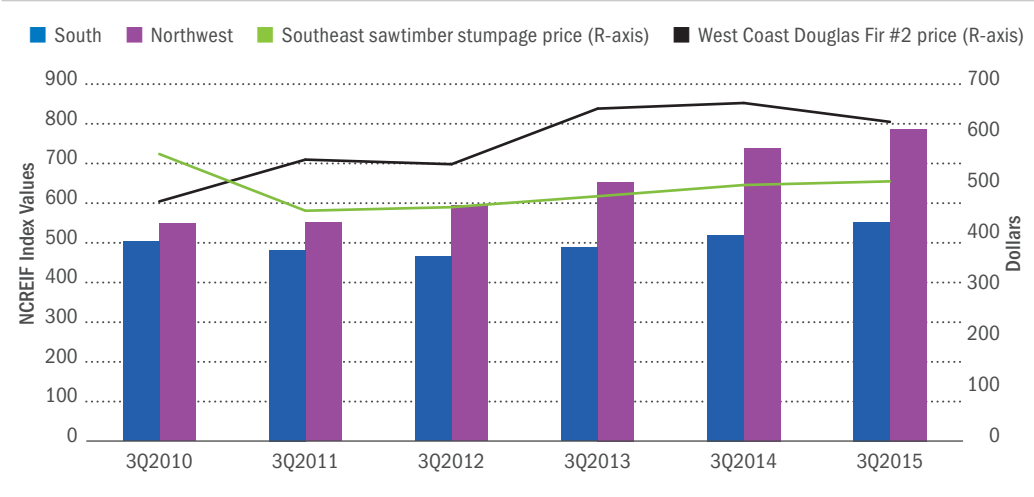
Timberland operating income was found to be a significant determinant of timberland value.⁴

Returns are influenced by long-term commodity price trends

If interest rate changes have little impact on discount rates, what does drive real asset performance? A range of factors can influence returns, but most important is the level of commodity prices and their impact on the income component of total returns. An analysis of timberland assets by Greenwood Resources (a timberland asset management affiliate of TIAA-CREF) tested the significance of operating income and interest rates on timberland value.⁴ Operating income was found to be a positive and significant determinant of timberland value, while interest rates were not found to be significant. Because timber commodity prices drive operating income, they also strongly influence timber property values—interest rates do not.

This relationship is evident in land values tracking generally rising prices for wood commonly used in construction, U.S. Southeast pine sawtimber and Pacific Northwest Douglas fir (Exhibit 7).

Exhibit 7: U.S. land values and associated timber prices

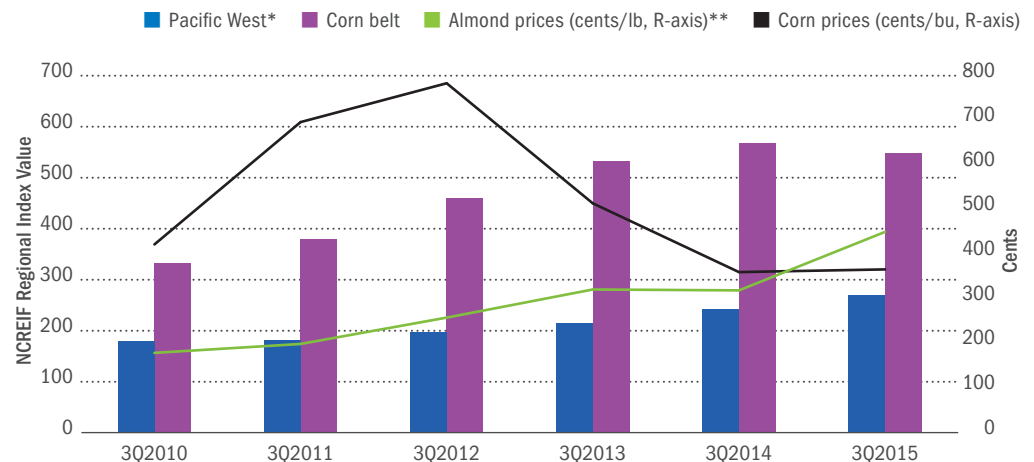


Southeast Average Pine Sawtimber stumpage prices normally quoted in \$US/ton; converted to \$/20 tons to match chart scale. West Coast Douglas Fir #2 is quoted in \$US/thousand cubic feet (MCF). NCREIF Index Value represents indexed measure of appreciation component of total return.

Sources: Timber Mart-South; RISI, Inc.; NCREIF; TIAA-CREF Analysis.

Data on farmland fundamentals showed a similar connection between commodity price trends and land values, although the two major farm categories—annual row crops and permanent crops—show divergent results (Exhibit 8).

Exhibit 8: Regional U.S. land values and associated crop prices



* Pacific West reflects value of permanent crops.

** 2015 almond prices as forecasted by TIAA-CREF.

NCREIF Regional Index Value represents indexed measure of appreciation component of total return.

Sources: USDA NASS, NCREIF, TIAA-CREF Analysis.

As booming global demand for row crops, such as corn and soybeans, subsided and supply surged with weather-induced bumper harvests, prices fell between 2012 and 2014, causing weakness in the value of Corn Belt farmland in 2015. Permanent crops, such as nuts and grapes, have enjoyed strong consumer demand, while drought has limited supplies, supporting higher prices and land values. Almonds and land in the Pacific West where they are grown provide a prime example of steadily rising commodity prices driving up land values.

Land values tend to be less volatile than commodity prices

While timber and crop prices drive income returns, land values remain somewhat insulated from commodity price volatility. Property values tend to respond to longer-term commodity price trends, rather than short-term fluctuations (Exhibits 7 and 8). This characteristic helps to explain the relative stability of farmland and timberland total returns, which include income and land appreciation.

Timber prices were significantly hurt by decreased demand and excess inventories caused by the U.S. housing market's slow recovery from the Great Financial Crisis. Douglas Fir and Southern Pine timber prices have improved, but remain below their pre-crisis levels. Nonetheless, the land value index for the U.S. South region, which is tied to lumber, has been steadily climbing since 2012. Northwest values have also moved steadily higher despite a drop in timber prices in 2015. Going forward, an improved job market, early signs of personal income growth, and rising confidence in the U.S. housing market suggest stronger demand over the longer term.

Low turnover and illiquidity help to insulate real assets from the impact of rising interest rates.

Large commodity price moves in a given year do not necessarily drive similar changes in timberland values because investors can defer harvests and wait for better prices. Furthermore, only a small portion of the timber is harvested in any given year, limiting the impact of one year's pricing environment on full-cycle income and returns.

In U.S. farmland, a precipitous decline in corn prices since 2012 has not been equally reflected in Corn Belt land values. Two factors help to sustain farm operating income and limit potential deterioration in land values. Non-storable row crops must be sold even when prices are unfavorable, and crop insurance limits weather-related losses. Still, a multiyear decline in prices caused by favorable weather conditions and yields has narrowed margins in the U.S. Corn Belt to break-even or unprofitable levels, indicating that farmland values could weaken in 2016.

In contrast, unfavorable weather in California has limited production of U.S. permanent crops, such as almonds, pistachios and wine grapes. However, strong demand has kept prices high, supporting grower profitability and continued property value appreciation.

Low turnover of farmland and timberland contributes to stable property values

The muted effect of commodity price changes on property values reflects other unique characteristics of farmland and timberland, including: low turnover, illiquidity and lack of pricing transparency.

In the United States only about 1% of farmland changes hands yearly, while timberland's annual turnover rate is also low. Farm and timber assets also generally enjoy a stable group of owners who invest for the long term. Timber ownership is dominated by financial institutions—Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs)—concentrated in relatively few companies. Conversely, farm assets are owned primarily by individual farmers and strategic investors who buy and hold, with less than 1% of assets owned by financial institutions.

Lack of pricing transparency is another factor. Transaction prices for farmland and timberland often remain private and NCREIF index returns themselves are derived from surveys conducted only periodically. In contrast, public stock and commodity markets trade in high volume on a daily basis with significant price transparency.

Low property turnover in combination with other characteristics related to illiquidity, such as long asset duration, help to insulate real assets from the impact of rising interest rates.

Outlook for timberland and farmland assets

While rising interest rates are likely to have little impact on real asset performance, investors should consider economic and demographic trends that will drive long-term results.

In this credit tightening cycle, the Fed is raising interest rates in response to stronger U.S. economic and job growth, which should support lumber demand and timber prices. In the near term, U.S. and overseas timber demand is likely to be constrained and prices unlikely to recover fully, due in part to weakness in China. Longer term, a significant wood deficit in China and a continuing U.S. housing recovery are expected to support overall demand and production of wood products.

In general, timberland investments can benefit from an increasing asset base as tree growth and productivity gains from technology and improved management increase yields. In particular, emerging markets—where capital and technology are often scarce—offer opportunities for faster economic growth, new markets and bigger gains from efficiency improvements.

U.S. farmland markets, meanwhile, remain competitive, particularly permanent crops, as investors search for higher returns. Land values are softening in the primary U.S. grain and oilseeds regions, but this may offer more compelling buying opportunities in the future. Similar to timber, overseas farmland markets offer attractive long-term return potential. Higher return opportunities can come from underlying economic growth in emerging markets and the ability to improve farm productivity by upgrading infrastructure and modernizing management.

Demographic trends support long-term demand fundamentals as growing populations and a burgeoning middle class in emerging markets increase consumption of wood products and meat-based protein. In addition, rising global demand for alternative energy is expected to boost demand for wood pellets, biomass alternatives and energy-rich crops such as corn and sugarcane. Despite rising demand, the supply of timberland and farmland will be constrained by development, industrialization and scarce water sources—factors supporting higher property values over the long term.

Conclusion

- History shows little correlation between rising interest rates and performance of real assets.
- Farm and timber commodity prices, rather than interest rates, have greater influence on discount rates and land values.
- Unique characteristics of timberland and farmland—particularly illiquidity and low turnover—have tended to insulate property values from commodity price volatility, supporting a record of stable operating income and rising land values.

¹ The yield on the 10-year U.S. Treasury is a widely used proxy for the general level of interest rates and has a 0.83 correlation with the federal funds rate for the quarterly periods, 1991 through 4Q2015. Timberland investors may use 10-year TIPS yields as a proxy for real (inflation-adjusted) interest rates. However, we have used 10-year Treasuries throughout the paper owing to their greater number of observations and the fact that the two rates have a correlation of 0.93 for all quarterly periods 1Q1997–4Q2015.

² Note: correlation shows *what the relationship is* between the two factors while R-squared (r^2) show *how strong that relationship is* or how well behavior of one factor explains the other.

³ NCREIF's timberland cash yield is a simplified proxy for the discount rate. There are other methods of computing rates, but all have limitations given the illiquid nature and opaque pricing of timberland properties. Another widely used method is to survey buyers and sellers on timberland market factors. Results from Sewall Surveys, one example, had a correlation of 0.57 with NCREIF's yields, showing the two methods loosely corroborate each other, but do have differences.

⁴ See Mary Ellen Aronow, Clark S. Binkley, and Courtland L. Washburn, "Explaining Timberland Values in the United States," Greenwood Resources Research Note 2004-2; December 2004.

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