How Timberland Can Protect Against Tail Risk:

Thinking Beyond Basic Portfolio Diversification

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Introduction

Timberland has long been recognized for its low correlation with other asset classes. On a scale of 1 for perfect correlation, 0 for no correlation, and -1 for perfectly reversed correlation, timberland returns typically correlate at rates below 0.50 (see Table 1). Under Modern Portfolio Theory espoused by Harry Markowitz (1952), adding low correlation assets like timberland to a portfolio can increase its diversification. This can make a portfolio (a) less volatile without sacrificing total return, or alternatively, (b) increase potential returns without increasing the risk exposure.

Table 1. Timberland returns are represented by the NCREIF Timberland Property Index. Correlations are based on returns for the past three decades through 2022. Sources: Kroll's *2023 SBBI Yearbook*, NCREIF, Standard & Poor's, Cambridge Associates, LBMA, MSCI, Bloomberg.

Statistical Correlation of Annual Returns Between Timberland and Other Asset Classes for the Past 30 Years (1993-2022)

| Asset Class / Benchmark In Descending Order of Correlation	Correlation
Private Equity — Cambridge Assoc. Pvt. Equity Index	0.36
Real Estate — NCREIF National Property Index	0.35
Hedge Funds — Credit Suisse Hedge Fund Index (Since 1994)	0.22
Global Stocks — MSCI World	0.15
Large Cap U.S. Stocks — Standard & Poor's 500	0.09
Long-Term Government Bonds — 20-Yr U.S. Treasury Bonds	0.05
Small Cap U.S. Stocks — Russell 2000	0.00
Interm-Term Government Bonds — 5-Yr U.S. Treasury Bonds	-0.03
Gold — LBMA Gold Price	-0.19
Long-Term Corporate Bonds — Bloomberg U.S. Corp Aa Long	-0.19

However, there are different ways to approach risk. Timberland can offer more diversification value than simply expressed through a correlation number. In this paper, we examine timberland's capacity to buffer a portfolio against extreme negative market or economic events – sometimes euphemistically called "lower tail risk." (See Figure 1.) That buffering ability comes from three attributes:

1. Timberland can act as a cushion to market corrections.

2. Timberland can offer capital preservation amid economic stress.

3. Timberland can provide sustained income across cycles.

A risk-aware investor may wish to take advantage of timberland's three risk-insulating features to better protect his or her portfolio against unforeseen shocks and corrections.

Figure 1. Lower tail risk refers to the outlier probability that a portfolio's return (or any other measured outcome) will fall well below expectations.

Illustrative Example of Probable Outcomes of Portfolio Return from Monte Carlo Simulation
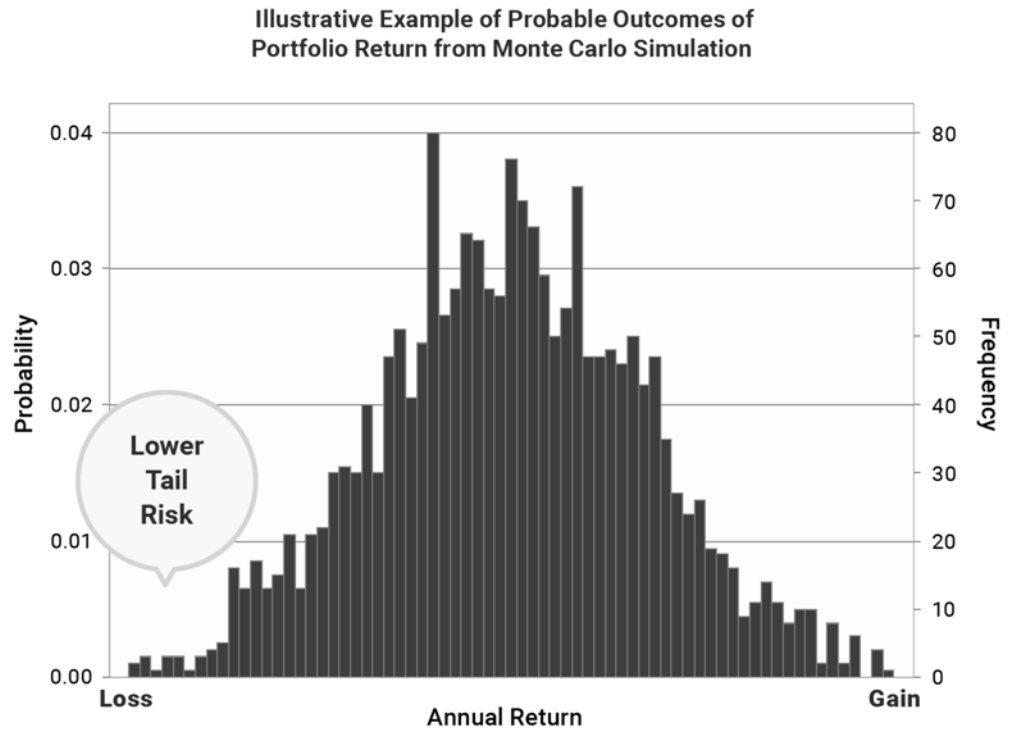
A Cushion to Security Market Corrections

Tail risk for an investor can come from recessions, bear markets, or *black swan* events – which refer to severe but unpredictable disruptions such as the Covid-19 pandemic or the Global Financial Crisis. Timberland assets can be insulated from such market stress because much of the value of a forest is generated through biological growth. Trees are long-term sustainable assets that grow regardless of what happens in the financial markets or the economy. As an added feature, timberland owners can ride out periods of weak timber prices by postponing their harvests until markets improve. Trees not cut continue to grow and add value. Compare that to a real estate investment such as an office building. Any loss of tenant leases during an economic downturn is income foregone permanently; it cannot be recouped later. But in the case of timberland, trees not cut today can be made up in part by more growth and larger harvests later.

Timberland holdings in a portfolio may play a useful role in reducing the effects of *black swan* events that are rare and difficult to predict but can significantly and negatively impact markets.

## Sustained Returns Amid Market Volatility

Sustained returns are one of the key reasons why timberland can serve as a counterbalance to a securities portfolio. Timberland often can produce positive returns during market upturns and corrections. Since timberland's emergence as an asset class in the mid-1980s, the United States experienced four major bear markets in public equities.[1]: (1) the Black Monday Crash of 1987, (2) the Dot-Com Bubble Burst of 2000, (3) the Global Financial Crisis of 2007, and most recently, (4) the U.S. Federal

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[1]   A bear market is defined as a 20% or greater peak-to-trough decline in a major stock market index, such as the Standard & Poor's 500 Index.

Reserve's 2022 tightening of monetary policy to fight inflation. In all four cases, timberland generated positive returns over the course of the bear market, as illustrated in the charts in Figures 2A-2D.

Cumulative Total Return of S&P 500 and Timberland Over the Course of U.S. Bear Markets
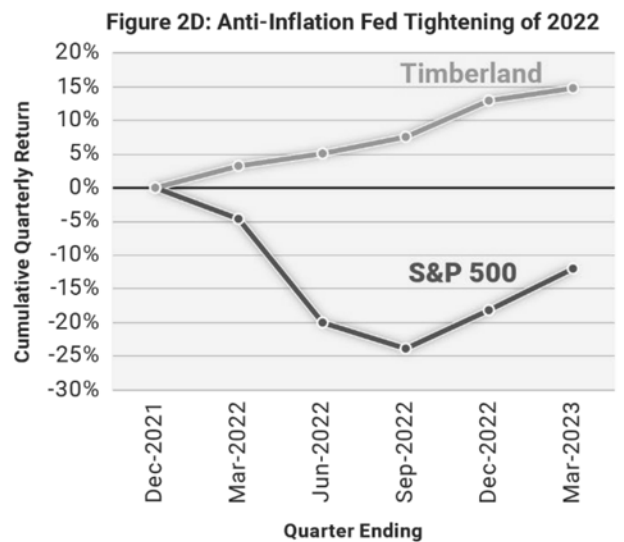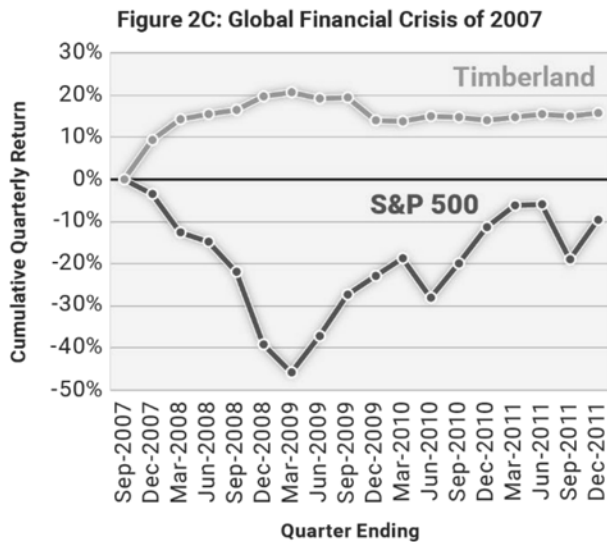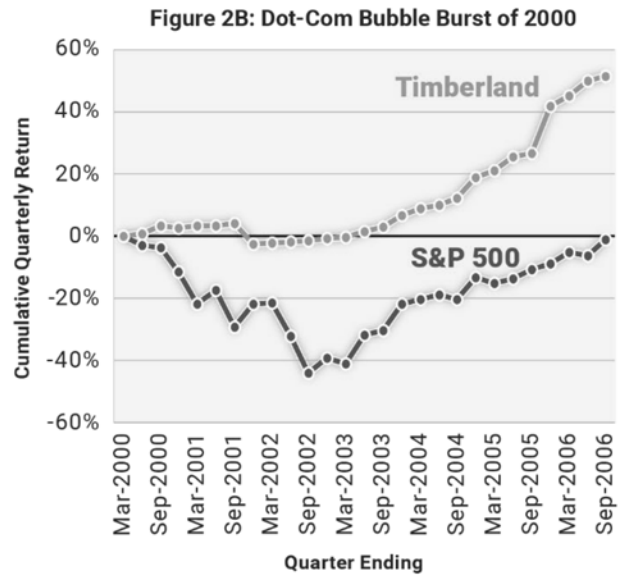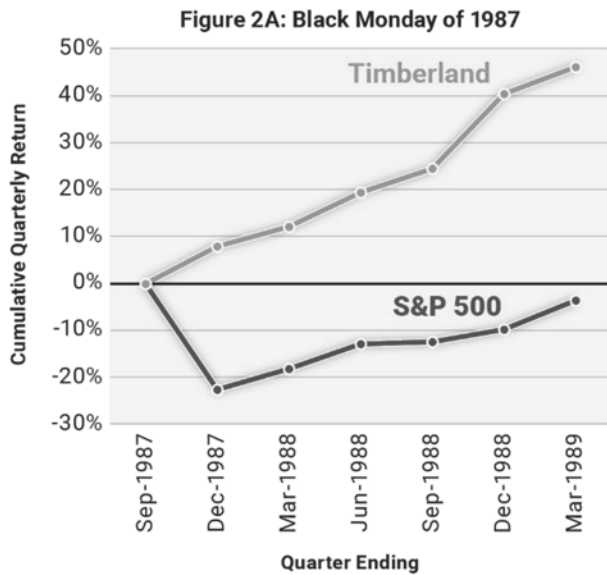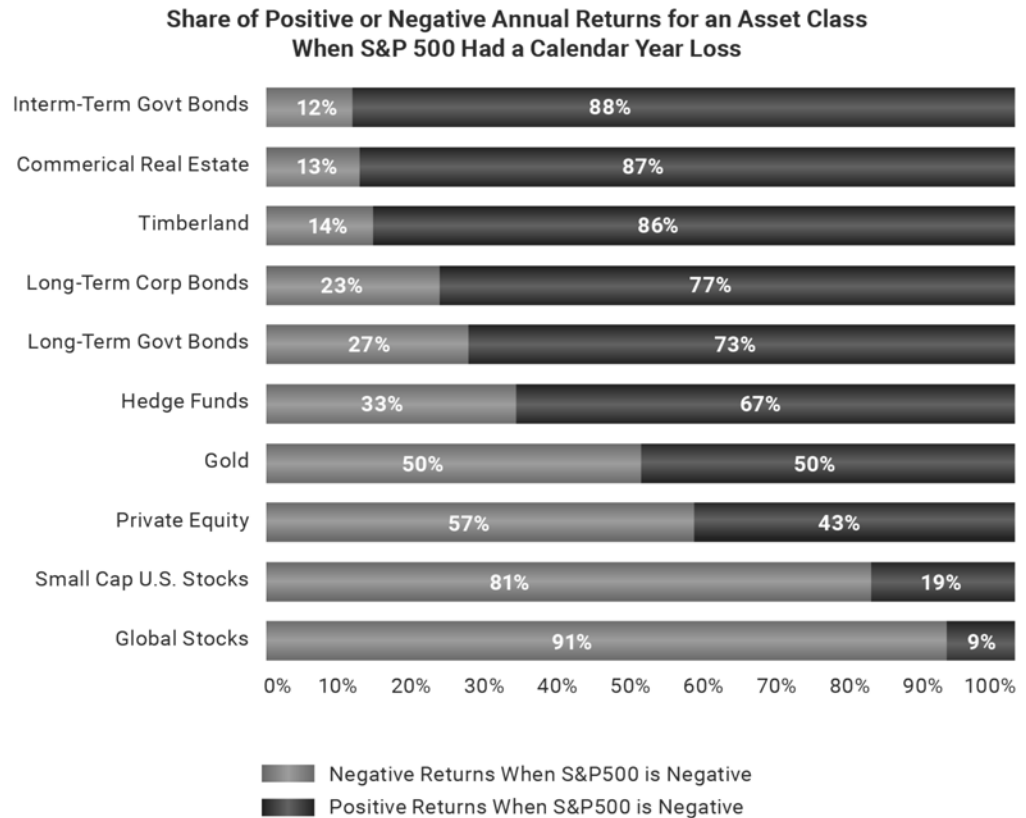

Figures 2A-2D. Sources: Standard & Poor's 500, NCREIF

Timberland's natural independence to market volatility is exceptional among the broad cross section of asset classes. As shown in Figure 3, timberland provided a positive return 86% of the time when the S&P 500 experienced a negative return for the year. That track record beats out other commonly known stock market hedges such as hedge funds (67% positive rate) and gold (50% positive rate).

Figure 3. Performance based on period when applicable benchmark is available from inception through 2022, but no earlier than 1926. Associated benchmark to listed asset class is the same as shown in Table 1.

Share of Positive or Negative Annual Returns for an Asset Class When S&P 500 Had a Calendar Year Loss

Asset Class	Negative Returns When S&P500 is Negative	Positive Returns When S&P500 is Negative
Interm-Term Govt Bonds	12%	88%
Commerical Real Estate	13%	87%
Timberland	14%	86%
Long-Term Corp Bonds	23%	77%
Long-Term Govt Bonds	27%	73%
Hedge Funds	33%	67%
Gold	50%	50%
Private Equity	57%	43%
Small Cap U.S. Stocks	81%	19%
Global Stocks	91%	9%

Timberland's comparatively defensive performance extends across the greater investable universe. During periods of market disruption, several asset classes can turn negative together, which can weaken portfolio diversification and return performance. It can be seen visually in Table 2, which shows positive or negative returns of 11 different asset classes since the inception of the Timberland Property Index benchmark in 1987. Positive returns are shown in blue and negative returns are shown in red, along with the numerical loss.

Calendar Year Total Return

YEAR	STOCKS			BONDS			ALTERNATIVES				Timberland
	S&P 500	Russell 2000	MSCI World Index	Long-Term Corp. Bonds	Long-Term Govt Bonds	Interm-Term Govt Bonds	Hedge Funds (since 1994)	Gold	Real Estate	Private Equity	
1987		-8.8%		-0.3%	-2.7%						
1988								-15.7%			
1989								-2.2%			
1990	-3.1%	-19.5%	-17.0%					-2.5%			
1991								-9.6%	-5.6%		
1992			-5.2%					-5.8%	-4.3%		
1993											
1994		-1.8%		-5.8%	-7.8%	-5.1%	-4.4%	-2.1%			
1995											
1996					-0.9%			-4.4%			
1997								-21.7%			
1998		-2.5%					-0.4%	-0.6%			
1999				-7.5%	-9.0%	-1.8%					
2000	-9.1%	-3.0%	-13.2%					-6.3%			
2001	-11.9%		-16.8%							-11.6%	-5.2%
2002	-22.1%	-20.5%	-19.9%							-7.7%	
2003											
2004											
2005											
2006											
2007		-1.6%									
2008	-37.0%	-33.8%	-40.7%				-19.1%		-6.5%	-22.6%	
2009					-14.9%	-2.4%			-16.8%		-4.7%
2010											-0.1%
2011		-4.2%	-5.5%				-2.5%				
2012											
2013				-7.1%	-12.2%	-2.0%		-27.8%			
2014								-0.2%			
2015		-4.4%	-0.9%	-1.0%	-0.7%		-0.7%	-11.4%			
2016											
2017											
2018	-4.4%	-11.0%	-8.7%	-4.7%	-0.6%		-3.2%	-1.1%			
2019											
2020											
2021				-2.7%	-5.4%	-3.4%		-3.8%			
2022	-18.1%	-20.4%	-18.1%	-26.2%	-26.1%	-9.4%		-0.4%		-5.5%	

☐ Positive Return   ■ Negative Return

Table 2. Timberland returns are represented by the NCREIF Timberland Property Index. Benchmarks representing the other asset classes are the same as those featured in Table 1. Sources: Kroll's 2023 SBBI Yearbook, NCREIF, Standard & Poor's, Cambridge Associates, LBMA, MSCI, Bloomberg

Notice from the table that downturns in one financial market often coincide with downturns in other markets. This "collateral damage" across asset classes accentuates the lower tail risk in a portfolio. As some would say, "When it rains, it pours." The most recent example of this is the bear market of 2022 when the U.S. Federal Reserve aggressively raised short-term interest rates to combat high inflation. In response, eight out of the 11 featured asset classes experienced full-year declines in total return. We saw similar broad-based, multi-asset losses in 2018 and 2008. Timberland, in comparison, is an outlier. Negative annual returns only occurred three times in the past 36 years. This asymmetry in performance between timberland and other asset classes means an allocation to timberland in a portfolio could act as a countercyclical buffer against broad market losses and economic shocks.

Capital Preservation

Quick View of
Value-at-Risk (VaR) Measure

To help gauge downside risk, value-at-risk gives the probability that a specified level of loss will occur over a defined time frame. For example, a one-quarter 95% VaR of $10 million means there is a 5% probability (1-95%) that the portfolio will fall in value by at least $10 million over the course of one quarter.

VaR is conventionally reported by establishing the probability and calculating the loss factor. For this paper, it is more useful to flip convention where we hold the loss amount and calculate the probability.

There are three methods to calculate VaR: (1) parametric; (2) stochastic simulation (e.g., Monte Carlo) modeling; and (3) historical. For our analysis, we use the historical method due to its simplicity and effectiveness for smaller data sets.

One reason timberland can be resilient in periods of volatility is because it is able to hold its value even in periods of declining markets and a weak economy. One way to measure this is through the value-at-risk (VaR) metric. For the investor, value-at-risk assesses the risk of loss in an asset or portfolio over time. (See call out box for more details.) We calculated timberland value-at-risk by asking what is the historic rate at which timberland witnessed an annual loss of 5% or greater in any given year. That record is compared against other asset classes in Table 3 below.

Notice that over its 36-year history, NCEIF's Timberland Property Index only experienced a single year where it saw a reduction of 5% or more. Only two other featured asset classes from the table had a value-at-risk record equivalent to timberland—intermediate-term U.S. government bonds (5-yr U.S. Treasuries) and hedge funds. Interestingly, some asset classes that traditionally were considered useful for capital preservation displayed a worse VaR value than timberland. These include real estate with a 6.7% probability of a 5% annual loss and gold with a 22% rate.

There are several potential reasons why timberland features strong asset value protection. Two have been mentioned earlier in the paper: (a) biological growth and (b) the ability to easily substitute between harvest (for income) and growth (for appreciation). A third factor is that forestry is one of many potential economic uses for rural land. Other rural land uses include solar farms, carbon offsets, cropland, outdoor recreation, horse farms, country estates, the development of wetlands mitigation banking credits, and the conservation of scenic

and wildlife values – just to name a few. Among the wide spectrum of rural land uses, timberland is the lowest-value land use. Most other types of rural land carry a higher economic value.

Due to the steady demographic migration into the rural areas and expanding economic development, timberland often transitions to higher-and-better uses (HBU) and rarely the other way. Furthermore, the growing value placed on sustainability and addressing climate change is raising the forestry value of rural land. Together, this explains why timberland prices typically go up and rarely go down.

Value-at-Risk Probabilities for a 5% Annual Loss for Various Asset Classes Based on Historic Performance

Asset Class	Starting Year Performance History is Tracked	Number of Times When Annual Loss Exceeds 5%	Probability of a 5% or Greater Loss in a Calendar Year
Interm-Term Government Bonds	1926	2	2.1%
Timberland	**1987**	**1**	**2.8%**
Hedge Funds	1994	1	3.4%
Long-Term Corporate Bonds	1926	6	6.2%
Real Estate	1978	3	6.7%
Private Equity	1987	4	11.1%
Long-Term Government Bonds	1926	11	11.3%
Large Cap Stocks, S&P500	1926	20	20.6%
Global Stocks, MSCI World	1970	11	20.8%
Gold	1969	12	22.2%
Small Cap Stocks, Russell 2000	1926	23	23.7%

Table 3. Timberland returns are represented by the NCREIF Timberland Property Index. Benchmarks representing these asset classes are the same as those featured in Table 1. Sources: Kroll's 2023 SBBI Yearbook, NCREIF, Standard & Poor's, Cambridge Associates, LBMA, MSCI, Bloomberg

Sustained Income

Beyond its ability to hold value, timberland can also generate sustained income. This attribute can allow a diversified portfolio of timberland holdings to ride through severe economic cycles. Income from timberland investments, as measured by NCREIF's Timberland Property Index, has consistently generated income above 2% (see Figure 4) – with 2009 during the bottom of the Global Financial Crisis as the one exception.

Income generation held even during black swan events like the collapse of the U.S. housing bubble in mid-2000s. New home construction fell from over 2 million starts in 2005 to one-fourth that level by 2009. Despite the significant loss of residential construction, timberland's level of income generation remained steady. A similar outcome occurred during the 2020 coronavirus outbreak, where large parts of the United States and global economy were under lockdown and the economy contracted, yet timberland income saw no significant change.

Figure 4. Drawn from NCREIF's Timberland Property Index. Income return is defined as EBITDDA return (earnings before income, taxes, depreciation, depletion and amortization). Total return adds appreciation return (i.e., capital gains) to EBITDDA return. Both total return and EBITDDA return are calculated without debt but before manager fees.

Total Return and Income Return from Timberland

There are various reasons for the resiliency of cash yield from forestry assets. Biological growth certainly plays one part. Another key reason is that demand for wood products does not vary much year to year. The need for wood products is surprisingly steady across economic cycles, whether it is to remodel a house, use as bathroom tissue, or getting on-line purchases shipped in corrugated boxes. For that reason, many U.S. timber markets have shown remarkably stable performance over time. This can be observed comparing the markets of lumber and timber as shown in Table 4. The volatility of the price of logs (known as sawtimber) in the Pacific Northwest is less than half (21%) that compared to the Spruce-Pine-Fir ("SPF") lumber (47%), which is made from the logs. In the South, Southern Yellow Pine ("SYP") lumber markets prices are eight times more volatile than timber prices used for its manufacture.

Table 4. Coefficient of Variation measures volatility by dividing standard deviation by the mean (i.e., straight average). Values are based on annual prices following the Global Financial Crisis (2010-2022). The higher the percentage, the greater the perceived volatility. SYP is Southern yellow pine. SPF is spruce-pine-fir. Source of timber and lumber prices: Forest Economic Advisors.

Volatility of Lumber and Timber Prices
Coefficient of Variation of Annual Prices

U.S. South		U.S. Pacific Northwest	
40%	**5%**	**47%**	**21%**
SYP 2x4, 2&Btr	Southern Pine	SPF 2x4, 2&Btr	Douglas Fir
Lumber Prices	**Sawtimber Prices**	**Lumber Prices**	**Sawtimber Prices**

Summary and Conclusions

Investing is never predictable. The unexpected can quickly upend a methodically built portfolio. We have seen this in modern history with the Arab oil embargo in the mid-1970s, as well as the implosion of internet and technology stocks in 2000. More recently, we faced the coronavirus pandemic that grounded large parts of the global economy, which was soon followed by a surge of inflation that precipitated a rapid rise in interest rates in many developed economies. All this uncertainty has made some investors seek to "weatherproof" their portfolio. One approach is to pile into ultra-safe, conservative investments such as AAA-rated government bonds. But the likely downside is the sacrifice of significant long-term returns. A second approach is to strategically add exposure in assets that are less impacted by economic and market shocks.

Timberland's unique attributes position it to effectively accomplish the second approach. Over the course of more than three decades as an asset class, timberland has demonstrated its ability to be (a) largely independent of broad corrections of financial markets; (b) capable of maintaining its value amid recessions and downturns; and (c) effective in generating cash yield through economic cycles.

For questions and additional information, contact:

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