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Private real assets: improving portfolio diversification with uncorrelated market exposure

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EXECUTIVE SUMMARY

• In the face of market volatility, lower-for-longer interest rates, and return expectations for equities and bonds that are well below historic averages, institutional investors are considering real assets to help meet investment objectives.

• Private investments in relatively illiquid categories of real assets — farmland, timberland and commercial real estate — have exhibited low or negative correlations to stocks and bonds, diversifying portfolio risk. For the past two decades, real assets have generated higher returns than traditional investments, with significantly lower volatility.

• Portfolio optimization using 28 years of returns demonstrated private real assets’ potential to improve the risk-adjusted returns of traditional stock-bond portfolios, and to diversify risks associated with publicly traded commodities and real estate investment trusts (REITs).

• Results supported combining multiple categories of real assets and constraining overall allocations within practical limits, such as 10% or 20%.

IN SEARCH OF ALTERNATIVES

Since the global financial crisis, interest rates have been anchored at unprecedented lows. At the same time, stock and bond investments have produced positive returns along with bouts of significant volatility. This has left many investors questioning long-held return expectations for these asset classes as well as long-held beliefs on the diversification power of a traditional balanced portfolio. These questions persist in 2020, amid a global pandemic in which stock markets dramatically sold off and government borrowing looks set to reach new record highs.

Against this backdrop, increasing numbers of institutional investors are seeking sources of uncorrelated returns, with many finding real assets playing a role in that pursuit.
This paper focuses on private real assets, which we define as private, direct investment in farmland, timberland and commercial real estate. They belong to a category of alternatives that many institutional investors have not fully explored.

In addition to explaining potential benefits, we provide guidance on the impact of combining real assets with stocks and bonds in portfolios representing different investor risk preferences. We address the impact of real assets’ illiquidity and limited availability — factors that require constraining allocations within practical limits. We also include a case study of one of the world’s largest institutional investors — the TIAA General Account — and their experience of investing in real assets.

HOW REAL ASSETS CAN IMPROVE TRADITIONAL PORTFOLIOS

Results of our analysis support the long-term investment thesis that real assets have potential to improve the performance of traditional portfolios in multiple ways:

- **Diversification:** Real assets are powerful diversifiers, with low or negative correlations to traditional stocks and bonds — and to each other (Figure 1). Private investments rarely move in lockstep with traditional assets or commodities in part because they are relatively illiquid; they are not traded in public markets.*

- **Higher risk-adjusted returns:** For the past 28 years, real assets have provided similar or higher returns than stocks with much lower volatility, resulting in higher risk-adjusted returns, or Sharpe Ratios (Figure 2). Despite higher volatility, real assets provided similar or higher risk-adjusted returns than U.S. and global bonds. Among publicly traded counterparts, REITs and timber product companies had returns higher than or similar to real assets, but with more than double the level of volatility, resulting in lower risk-adjusted returns.

- **Liability-matching characteristics:** Real assets have potential to provide bond-like current income from contractual lease obligations and from revenue from selling commodities. Long-term capital appreciation from rising land values may also help meet future liabilities.

- **Inflation hedging:** Real assets have provided a strong hedge against inflation for two reasons: 1) long-term returns have far outpaced the inflation rate; and 2) many commodities, such as foodstuffs and raw materials, are components of inflation measures, such as the Consumer Price Index (CPI). Driven by global demand trends, rising commodity prices increase the profitability of timberland and farmland, causing land values to rise and providing a long-term hedge against inflation. Since 1992, timberland and farmland returns have averaged 9.6% and 11.4%, respectively — more than double the inflation rate of 2% to 4% during the same time period. Their positive correlations with inflation, 0.38 and 0.20, respectively, were higher than for government bonds or stocks. Similarly, real estate hedges inflation through annual lease escalations, and the rising value of buildings and land in desirable locations.

IMPORTANT DIFFERENCES IN THE SIZES OF INVESTABLE MARKETS

Significant differences in the sizes of investable markets across real assets have important implications for investors. The NCREIF indexes used as proxies for U.S. markets represent only a fraction of the total investable markets for farmland and timberland, which are far less institutionalized than commercial real estate. (We relied on U.S. market indexes due to the absence of indexes representing markets for non-U.S. real assets.) Total assets included in the NCREIF indexes represent $11.4 billion for farmland, $23.4 billion for timberland and $683.5 billion for real estate, as of 31 Dec 2019 (Figure 3). In contrast, we estimate the overall size of the U.S. farmland market alone is about $2 trillion, with around $560 billion...
available to institutional investors. The NCREIF Farmland Index represents only the assets owned by institutions — the vast majority of the assets are held by individual farmers in a highly fragmented market with high barriers to entry. Differences in historical returns among real asset categories may partly reflect different levels of market development, contributing to higher returns for the less developed farmland and timberland markets, compared with commercial real estate. Rising institutional interest in farmland and timberland may produce return compression in the future in developed markets but emerging and frontier economies remain largely untapped. In the near term, demand is likely to exceed available investment capacity, posing challenges for investors seeking exposure to farmland and timberland. Predictably, mean-variance optimization specifies extreme allocations to asset classes with more attractive risk/return profiles. We have therefore chosen to constrain allocations to real assets in several exhibits to reflect real-world capacity constraints and liquidity concerns facing institutional investors.

Figure 1: Correlations of real assets, commodities and REITs (1992 – 2019)

**Real assets had low correlations to other asset classes — and to each other**

<table>
<thead>
<tr>
<th>Market Indexes</th>
<th>Stocks</th>
<th>Bonds</th>
<th>Private real assets</th>
<th>Public real estate and commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>Non-U.S.</td>
<td>U.S.</td>
<td>Non-U.S.</td>
</tr>
<tr>
<td>U.S. stocks</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-U.S. stocks</td>
<td>0.77</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. bonds</td>
<td>-0.05</td>
<td>-0.28</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Non-U.S. bonds</td>
<td>0.06</td>
<td>0.04</td>
<td>0.70</td>
<td>1.00</td>
</tr>
</tbody>
</table>
| Private real estate | 0.22 | 0.18 | -0.21 | -0.20 | 1.00
| Private farmland    | 0.01 | 0.18 | -0.31 | -0.23 | 0.39 | 1.00 |
| Private timberland | 0.16 | 0.16 | 0.18 | 0.16 | -0.03 | 0.25 | 1.00 |
| U.S. REITs | 0.53 | 0.50 | 0.19 | 0.11 | 0.15 | -0.03 | -0.02 | 1.00 |
| Agriculture commodities | 0.21 | 0.30 | 0.14 | 0.40 | 0.16 | 0.05 | 0.15 | 0.22 | 1.00 |
| Timber commodities proxy | 0.62 | 0.73 | -0.17 | 0.02 | 0.03 | -0.12 | 0.00 | 0.57 | 0.15 | 1.00 |


Sources: NCREIF, FactSet, Nuveen, LLC.

Figure 2: Performance of real assets, commodities and REITs (1992 – 2019)

**Real assets had higher risk-adjusted returns versus most other asset classes**

<table>
<thead>
<tr>
<th></th>
<th>Stocks (U.S.)</th>
<th>Bonds (U.S.)</th>
<th>Private real assets</th>
<th>Public real estate and commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>Non-U.S.</td>
<td>U.S.</td>
<td>Non-U.S.</td>
</tr>
<tr>
<td>Mean (%)</td>
<td>11.27</td>
<td>7.80</td>
<td>5.73</td>
<td>5.47</td>
</tr>
<tr>
<td>Standard Deviation (%)</td>
<td>16.69</td>
<td>18.97</td>
<td>4.34</td>
<td>5.85</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>0.51</td>
<td>0.27</td>
<td>0.68</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Data are based on rolling one-year total returns, calculated on a quarterly basis for periods ended 31 Mar 1992 through 31 Dec 2019. See Figure 9 for the indexes representing asset classes. Risk-free rate assumed to equal the mean 1-year U.S. Treasury constant maturity rate for the same period.

Sources: NCREIF, FactSet, Nuveen, LLC.
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Figure 3: Private real assets represented by NCREIF indexes (billions)

- $11.4 Farmland
- $23.4 Timberland
- $683.5 Real Estate

NCREIF index assets as of 31 Dec 2019.
Source: NCREIF

STRUCTURING A PORTFOLIO OF REAL ASSETS

While the case for real assets is compelling, they raise difficult implementation questions: How should investors structure a portfolio of real assets? How might allocations change for different investor risk and return preferences?

No single optimal allocation fits all risk profiles. Allocations should reflect individual investment objectives, risk tolerance, and liquidity needs. We used mean-variance optimization analysis to show the potential impact of real assets on a range of portfolios representing different risk profiles and constraints. Portfolios shown in this analysis are designed to provide an analytical framework and illustrations and should not be considered investment recommendations. The analysis is based on the following scenarios:

- Adding real assets individually — and as a group — to a portfolio of stocks and bonds
- Comparing real assets with publicly traded commodity stocks and REITs
- Structuring a real asset portfolio for different investment objectives
- Constraining real asset allocations within practical limits in conservative and aggressive portfolios

OBSERVATIONS FROM MEAN-VARIANCE OPTIMIZATION ANALYSIS

Observation 1

Real assets improved the risk-adjusted returns of a portfolio of traditional stocks and bonds

Institutional investors are posing a basic question: How do private real assets impact the risk and return attributes of a portfolio of stocks and bonds? In Figure 4 (next page), efficient frontier charts show the impact of adding farmland, timberland and real estate individually to a stock/bond portfolio. In the table we also show the impact of combining all three categories. In this example, we constrained real assets to 15%, divided evenly at 5% in each.

RESULTS

- Each category of real assets increased returns, with similar or lower levels of risk, resulting in higher Sharpe Ratios.
- Farmland had the greatest impact on returns and received the largest allocation in an unconstrained portfolio at 43%. Real estate at 31% had the second biggest impact on returns, followed by timberland at 24%.
- Diversifying a stock/bond portfolio with a 5% allocation to each of the three real assets increased annual returns by 36 basis points and reduced risk by 70 basis points, producing a higher Sharpe Ratio.

Several factors account for farmland’s record of higher and uncorrelated returns and lower risk, compared with timberland and real estate, which are explored in the section below.

Overall, results support the case for diversifying traditional portfolios with multiple categories of real assets even when constrained within realistic limits. The constraints reflect supply limitations, the relative illiquidity of real assets, their relatively high transaction costs, and the limited history contained in the analysis.
Accounting for farmland’s higher returns and lower volatility

Farmland is the least liquid of the three categories. With relatively few institutional investors, most transactions occur between individual farmers and generally holding periods are for 20 years or more. Population growth, the growth of the middle classes, farm productivity gains and rising demand for alternative fuels have supported steadily rising land values, while barriers to entry and lack of institutional trading have reduced volatility. Data limitations are also likely to be a factor since the 28-year series excludes a period during the early 1980s when U.S. farmland prices declined following the Soviet grain embargo.

Efficient frontier charts show the impact of adding farmland, timberland and real estate individually to a traditional stock-bond portfolio. The portfolio with the highest risk-adjusted return is shown on each efficient frontier.


<table>
<thead>
<tr>
<th>Allocation representing highest risk-adjusted return, based on Sharpe Ratio</th>
<th>100% Traditional portfolio</th>
<th>Adding only farmland</th>
<th>Adding only timberland</th>
<th>Adding only commercial real estate</th>
<th>Adding three categories of real assets, fixed at 5% each (15% combined)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks</td>
<td>15%</td>
<td>6%</td>
<td>24%</td>
<td>7%</td>
<td>5% each</td>
</tr>
<tr>
<td>Bonds</td>
<td>85%</td>
<td>94%</td>
<td>76%</td>
<td>93%</td>
<td>10%</td>
</tr>
<tr>
<td>Farmland</td>
<td>43%</td>
<td>51%</td>
<td>55%</td>
<td>55%</td>
<td>75%</td>
</tr>
<tr>
<td>Timberland</td>
<td>51%</td>
<td>49%</td>
<td>45%</td>
<td>45%</td>
<td>25%</td>
</tr>
</tbody>
</table>

| Average annual total returns (%) | 6.55 | 8.53 | 7.35 | 6.87 | 6.83 |
| Standard deviation (%) | 4.31 | 3.23 | 4.52 | 3.49 | 3.57 |
| Sharpe Ratio | 0.87 | 1.78 | 1.01 | 1.17 | 1.13 |

Data are based on rolling one-year total returns, calculated on a quarterly basis for periods ended 31 Mar 1992 through 31 Dec 2019. Asset classes represent the following indexes: stocks – Russell 3000 Index and MSCI ACWI ex USA Index; bonds – Bloomberg Barclays U.S. Aggregate Index and Bloomberg Barclays Global Aggregate Index; privately held U.S. commercial real estate – NCREIF Real Estate Index; privately held U.S. farmland – NCREIF Farmland Index; privately held U.S. timberland – NCREIF Timberland Index. Mean-variance optimization based on historical returns is intended for illustration purposes only and should not be considered investment recommendations.

Sources: NCREIF, FactSet, Nuveen, LLC.
Observation 2

Private real assets provided higher returns with lower volatility than publicly traded commodities and real estate stocks.

We compared private real assets with publicly traded commodity stocks and commercial REITs to assess diversification benefits against the illiquidity of private assets. Since many institutional investors already have exposure to REITs and commodities, such as metals or oil and gas, we also compared the impact of combining private real assets with public stocks. This analysis used fixed allocations and constrained alternatives to 15% of the portfolio, consistent with realistic limits.

Figure 5 compares three portfolios consisting of a fixed 85% in stocks and bonds in a 60/40 ratio, and 15% in alternative assets. Portfolio 1 adds three categories of private real assets, divided evenly at 5% each. Portfolio 2 adds three categories of publicly traded commodities and REITs, divided evenly at 5% each. Portfolio 3 combines private and public assets, split evenly at 2.5% each.

RESULTS

• Private real assets increased portfolio returns and reduced volatility, resulting in a higher Sharpe Ratio, versus publicly traded commodity stocks and REITs. This can be seen by comparing the performance of Portfolio 1 and Portfolio 2 in Figure 5.

• Private real assets helped to diversify the volatility risk of publicly traded commodities and REITs. This can be seen by comparing the performance of Portfolio 2 and Portfolio 3 in Figure 5. The combination of private and public assets in Portfolio 3 increased returns by 23 basis points and reduced volatility by 74 basis points, resulting in a higher Sharpe Ratio, compared to Portfolio 2.

Figure 5: Comparing real assets vs. public commodities and REITs (1992 – 2019)
Observation 3

Farmland dominated a portfolio consisting only of private real assets

The next analysis shows how different asset categories work together in a portfolio consisting only of private real assets. We examined how the structure can change based on different investment objectives. An efficient frontier using farmland, timberland and real estate allowed comparison of three portfolios producing the highest efficiency, lowest risk and highest return (Figure 6).

RESULTS

• The most risk-efficient portfolio was dominated by farmland at 63%, but also included 20% timberland and 17% real estate, benefitting from low correlations among the categories.
• The lowest-risk portfolio reduced farmland exposure to 40% and increased timberland and real estate to 26% and 34%, respectively, reflecting relatively low or negative correlations between categories.
• The highest-return portfolio consisted of 100% farmland, reflecting higher returns and lower volatility compared to timberland and real estate.
• Overall, the most efficient real asset portfolio generated much higher risk-adjusted returns than the most efficient combination of traditional stocks and bonds. The real asset portfolio produced an additional 395 basis points of return and only increased standard deviation by 133 basis points.

Figure 6: Structuring a portfolio of farmland, timberland and private real estate

Farmland dominated returns, with timberland and real estate enhancing diversification

![Figure 6: Structuring a portfolio of farmland, timberland and private real estate](image)

<table>
<thead>
<tr>
<th>Portfolios on the efficient frontier</th>
<th>Minimum-risk portfolio</th>
<th>Highest Sharpe Ratio portfolio</th>
<th>Maximum-return portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocations</td>
<td>35% Farmland, 39% Timberland, 26% Private commercial real estate</td>
<td>20% Farmland, 63% Timberland, 17% Private commercial real estate</td>
<td>100% Farmland</td>
</tr>
<tr>
<td>Average annual total returns (%)</td>
<td>9.90</td>
<td>10.50</td>
<td>11.36</td>
</tr>
<tr>
<td>Standard deviation (%)</td>
<td>5.44</td>
<td>5.67</td>
<td>6.78</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>1.31</td>
<td>1.36</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Data are based on rolling one-year total returns, calculated on a quarterly basis for periods ended 31 Mar 1992 through 31 Dec 2019. Asset classes represent the following indexes: privately held U.S. commercial real estate – NCREIF Real Estate Index; privately held U.S. farmland – NCREIF Farmland Index; privately held U.S. timberland – NCREIF Timberland Index.

Mean-variance optimization based on historical returns is intended for illustration purposes only and should not be considered investment recommendations.

Source: NCREIF, Nuveen, LLC.
Observation 4
Constraining real assets within practical limits still improved performance

How much real assets exposure is reasonable for institutional investors? Real assets are expected to continue their recent steady growth, with current portfolio allocations generally estimated at 5% to 10%, and endowments ranging up to about 15%. Overall, real assets represent more than $10 trillion out of $27 trillion of global institutional assets under management in 2019, or nearly a third. Additionally, institutions are increasing their exposure to alternatives in efforts to increase current income and risk-adjusted returns, dampen volatility, and meet specific needs, such as inflation protection.

As noted earlier, mean-variance optimization outputs may suggest extreme allocations to individual asset classes based on returns for the time period used as inputs. For most institutions, allocations exceeding 25% to individual real assets categories would be unrealistic. Most portfolios would lack sufficient liquidity to meet near-term spending obligations, and investors would have difficulty accessing enough farmland and timberland. Moreover, questions about the limitations and relatively short history of index data would argue against such large holdings in real assets.

There is no single optimal allocation to real assets, which will differ based on the investor’s specific risk profile. The next analysis considers two model portfolios representing a conservative allocation of 20% stock and 80% bonds and an aggressive allocation of 80% stock and 20% bonds. We limit the combined real asset allocation to 10% (3.3% per category) in the conservative portfolio and 20% (6.6% per category) in the aggressive portfolio.

RESULTS

- Despite the allocation limits, real assets reduced volatility compared to only stock-bond portfolios — resulting in higher risk-adjusted returns (Figure 7).
- Overall, results show that, based on historical performance, investors could improve portfolio risk-adjusted returns with allocations that were fractions of the unconstrained allocations, but realistic for institutional investors.

**Figure 7: Limiting real assets exposure to 10% and 20% of traditional portfolios (1992 – 2019)**

<table>
<thead>
<tr>
<th>Portfolios</th>
<th>Conservative portfolio (20% stock/80% bond)</th>
<th>Conservative portfolio + 10% real assets</th>
<th>Aggressive portfolio (80% stock/20% bond)</th>
<th>Aggressive portfolio + 20% real assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocations</td>
<td></td>
<td>3.3% each</td>
<td>20% each</td>
<td>6.6% each</td>
</tr>
<tr>
<td>Average annual total returns (%)</td>
<td>6.75</td>
<td>7.01</td>
<td>10.16</td>
<td>10.09</td>
</tr>
<tr>
<td>Standard deviation (%)</td>
<td>4.58</td>
<td>4.15</td>
<td>13.34</td>
<td>10.94</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>0.87</td>
<td>1.02</td>
<td>0.55</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Data are based on rolling one-year total returns, calculated on a quarterly basis for periods ended 31 Mar 1992 through 31 Dec 2019. Asset classes represent the following indexes: stocks – Russell 3000 Index and MSCI ACWI ex USA Index; bonds – Bloomberg Barclays U.S. Aggregate Index and Bloomberg Barclays Global Aggregate Index; privately held U.S. commercial real estate – NCREIF Real Estate Index; privately held U.S. farmland – NCREIF Farmland Index; privately held U.S. timberland – NCREIF Timberland Index. Sources: NCREIF, FactSet, Nuveen, LLC.
INVESTMENT IMPLICATIONS — AND CONCLUSIONS

This analysis shows private real assets offer institutions compelling potential to enhance risk-adjusted returns. As long-term investments, their benefits provide some compensation for their relative illiquidity. They can combine bond-like income from asset leases and equity-like returns from long-term appreciation in land values. These features can support asset-liability matching, with potential for improved long-term portfolio returns to meet future obligations, and lower volatility of returns to meet current liabilities.

Our analysis provides directional guidance for incorporating private real assets in institutional portfolios:

Adding private exposure to any single category — farmland, timberland or commercial real estate — increased portfolio returns and reduced risk, resulting in higher Sharpe Ratios.

Private real assets offered superior risk-adjusted returns compared with publicly traded commodity stocks and REITs. In combination, private real assets helped to diversify the volatility of publicly traded commodities and REITs, resulting in higher portfolio risk-adjusted returns.

Unconstrained, farmland tended to dominate timberland and commercial real estate, based on historical returns reflecting farmland’s limited availability and less-developed institutional markets. The resulting large allocations suggested by mean-variance optimization require practical constraints to address availability, prudent diversification, and liquidity needs.

Overall, results support the case for diversifying traditional portfolios with multiple categories of real assets within realistic limits. A combined allocation of only 10%, evenly divided among the three categories, significantly improved portfolio risk-adjusted returns.

These results should be considered broadly illustrative — not specific investment recommendations. As noted previously, data limitations — relatively short time series, self-reporting, and a “smoothing” effect from periodic appraisals — are likely to understate actual volatility of private real assets returns. Traditional mean-variance optimization has well-known drawbacks that are not tied to a specific asset class, including the assumption that returns are normally distributed and reliance on historical returns that cannot predict future results. While these limitations are important to acknowledge, they do not undermine the potential for real assets benefits to persist in the future. First, long-term capital appreciation depends on inexorable global trends — population growth and urbanization — that drive steadily rising demand and diminishing supplies of food, wood products and high-quality commercial real estate. Second, real assets’ low correlations and capacity to diversify risk are primarily a function of their being private, relatively illiquid, and not subject to public markets and speculative trading.

CHALLENGES OF INVESTING IN PRIVATE REAL ASSETS

High barriers to entry make it difficult for most institutional investors to undertake direct investments in private real assets, particularly farmland and timberland. Gaining access and managing complex risks require proven capabilities to address three major hurdles:

• Lack of transparency. Sophisticated due diligence capabilities are essential to analyze the potential profitability and cash-flow profile of assets in diverse regions around the globe.

• Capital requirements. Deep financial reserves are necessary to achieve scale economies, provide geographic diversification, and invest in technology and infrastructure.

• Operational risks. Investing in farmland and timberland involves a range of operational risks that include weather, pest damage, marketing perishable crops and complying with local regulations. Expertise in local markets and access to a network of local operators can allow investors to transfer operational risk and gain steady income through leasing contracts. Commercial real estate requires investment scale for diversification and large staffs to acquire and oversee holdings.

Addressing these challenges

Institutional investors seeking the potential benefits of this alternative asset class should identify asset managers with specialized expertise, strategic partners, global scale and a track record of investment success.
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Case study: Putting real assets to work supporting insurance products

Insight from TIAA General Account

Improving the risk/return profile of a conservative fixed-income portfolio

California vineyards, U.S. Pacific Northwest timberland and New York City commercial real estate might not come to mind as potential holdings of a conservative insurance portfolio. But private real asset investments like these represent a small but growing portion of the TIAA General Account, supplementing investments largely in high-quality bonds.

Why would relatively illiquid alternative investments make sense for a statutory portfolio with about two-thirds of its assets in low-risk, fixed-income investments supporting contractually guaranteed payments? The answer lies in the powerful diversification and inflation hedging potential of private real assets that can help to reduce overall portfolio risk. Direct investments in real assets represent $17.9 billion, or about 7%, of the $271 billion General Account (Figure 8).

Real assets provide three potential benefits to the General Account: current income, long-term capital appreciation, and low correlations with traditional investments.

- **Income generation:** While most traditional fixed-income investments recently have offered low yields, real assets have generated relatively attractive and stable levels of current income. Expected annual income returns range from about 3% to 6%, depending on asset category. Mainly, this income comes from leases — acreage leased to farmers, commercial real estate rented to tenants, timber sales and infrastructure leased to municipalities or agencies.

- **Capital appreciation:** Expectations of the increasing value of land and natural resources over time act as a hedge against inflation — protecting the General Account’s future purchasing power. Projected annual total returns range from 7% to 10%, depending on asset category.

- **Low correlations:** Real assets tend not to move in lockstep with traditional investments. Their correlations to stocks and bonds are low and sometimes negative, providing diversification that is especially desirable when correlations between traditional assets converge during periods of market volatility.

Advantages of private real assets over publicly traded commodity stocks

- In seeking to diversify the General Account, TIAA chose direct investments in real assets over publicly traded commodity stocks for important reasons. Real assets tend to be much less volatile because they are not subject to market speculation, such as options trading. At times when the commodity price cycle is unfavorable, we have flexibility to leave real assets in the ground to await better prices. Unlike bonds that mature or may be called, we can hold real assets indefinitely, selling appreciated property as needed to help meet the General Account’s long-term liabilities.

Managing risks inherent in real assets

TIAA has developed solutions to address illiquidity and other risks inherent in holding real assets. The General Account holds appropriate amounts of liquid assets and other liquidity sources. Real assets investments can be structured in ways that reduce exposure to operational risks, such as growing, harvesting and selling crops or timber. In many cases, Nuveen can avoid these risks by leasing farmland or creating wood supply agreements with local mills.

Diversification across global regions and asset types helps to address other risks. Agricultural investments, for example, are spread across four continents — Australia, North and South America, and Europe — reducing exposure to drought, pest damage, commodity pricing and other market-specific risks. In real estate, the size and scope of the U.S. market provide ample geographical diversification across regions and metropolitan areas, along with property-type diversification. Nuveen Real Estate has offices across the globe providing opportunities to diversify in the U.S., Europe and Asia. Across its range of real asset management capabilities, Nuveen has embedded responsible investment practices, adding a further layer of risk management for environmental, social and governance concerns. With real assets investment experience dating to 1934 in real estate, 1998 in timber, and 2007 in agriculture, Nuveen has a first-mover advantage in establishing scale and developing expertise ahead of most other asset managers.

Real asset exposure in the TIAA General Account already provides important contributions to risk-adjusted returns. In continuing efforts to diversify the portfolio and hedge inflation, TIAA expects to maintain healthy allocations to farmland, infrastructure, real estate and timberland. Investments in real assets offer the potential to combine steady current income and long-term capital appreciation, making them a good fit with the General Account’s current and long-term liabilities.
Figure 8: Allocations to real assets in the TIAA General Account (as of 31 Mar 2020)

General Account total assets under management: $271 billion
Private real assets investments in the General Account: $17.9 billion

Allocations among real assets in the TIAA General Account

- Commercial real estate: 51%
- Agriculture: 20%
- Infrastructure: 7%
- Timber: 22%
- Impact investments*: 7%

TIAA General Account
- Total assets: $271 billion
- Net Capital and Surplus: $44.1 billion

Source: TIAA
* Private equity and debt real asset investments pursuing impact investment objectives.
Appendix

Data analysis methodology

Real assets categories
We selected three categories of real assets — farmland, timberland and commercial real estate — based on their history of superior risk-adjusted returns, compared to public investments. They offer low or negative correlations with traditional assets in part because they are relatively illiquid, infrequently traded, or insulated from commodity speculation, such as options trading. These real assets categories also have at least 25 years of index performance data as a reasonable foundation for analysis. More nascent categories, such as infrastructure, were excluded due to shorter track records.

Methodology
The analysis used traditional mean-variance portfolio optimization (MVO), based on historical performance, standard deviation, and correlations of returns by asset class. Returns and standard deviation data represent six indexes: three representing private real assets and three representing publicly traded commodities and REITs (see Figure 9 for the list of indexes). Mean-variance optimization is a technique for determining the set of asset allocations providing the maximum return for a given level of risk. This set of portfolio allocations forms a curve known as the “efficient frontier.” Our analysis is based on rolling one-year total returns, calculated on a quarterly basis. This approach maximizes the number of observations and avoids skewing caused by the seasonality of property appraisal data. Separately, we identified portfolios producing the highest risk-adjusted returns by comparing Sharpe Ratios. The latter reflect 1-year total return, minus 1-year Treasury bill rate, divided by the standard deviation of returns.

Data limitations
Data limitations require tempering conclusions. We relied exclusively on data representing U.S. markets due to the absence of non-U.S. indexes. Indexes for private farmland, timberland and commercial real estate developed by the National Council of Real Estate Investment Fiduciaries (NCREIF) are the best available market proxies, but do not represent the total size of the investable markets. Nonetheless, we believe the results of our analysis are broadly applicable to non-U.S. real assets markets, excluding currency effects. NCREIF data for private real assets are based on periodic independent external appraisals and internal updates — not sales transactions. This methodology tends to smooth the volatility of returns. Finally, mean-variance optimization results may be highly sensitive to changes in input assumptions. As a result, our optimization results should be considered broadly illustrative and directional, rather than predictive or precise.

Time period dependency
The time period for our analysis, 1992 to 2019, or 28 years, represents the longest track record common to all the asset classes. This period includes events with significant impact on financial markets and capital flows. The 1990s experienced the longest U.S. expansion (10 years) in the past 150 years, while the 2009-2019 recession was the longest in the past 50 years. Changing economic conditions affected the performance of traditional and real assets alike. However, unlike traditional asset classes, real asset classes were relatively undiscovered by investors in the 1990s and early-2000s, and market inefficiencies allowed for higher returns in these early years. Additionally, there is evidence that the low and negative correlations between traditional and real assets observed in the 1990s and early-2000s are diminishing. To test the impact of time period dependency, we performed the same analysis for the most recent decade, 2010-2019. MVO modeling confirmed our results from the 28-year period that real assets improved risk-adjusted returns when added to traditional stock-bond portfolios.

Figure 9
The analysis used six indexes: three representing private real assets and three representing publicly traded commodities and REITs

<table>
<thead>
<tr>
<th>Sub-asset class</th>
<th>Private (direct exposure)</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Estate</td>
<td>NCREIF Property Index</td>
<td>FTSE Nareit U.S. Real Estate Index</td>
</tr>
<tr>
<td>Farmland</td>
<td>NCREIF Farmland Index</td>
<td>S&amp;P GSCI Agriculture Index</td>
</tr>
<tr>
<td>Timber</td>
<td>NCREIF Timberland Index</td>
<td>Proxy index based on a combination of S&amp;P Global Timber and Forestry Index (2004 – 2017) and returns for companies representing 4% or more of the index between 1992 and 2003</td>
</tr>
</tbody>
</table>
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