An Alternative Approach to Retirement Investing: Framing the Role of Alternative Investments in the Retirement Allocation

By Wade Sias, CFA®, Avi Sharon, PhD, and Sean Klein, PhD

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An Alternative Approach to Retirement Investing

FRAMING THE ROLE OF ALTERNATIVE INVESTMENTS IN THE RETIREMENT ALLOCATION

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There are two unignorable trends in wealth management today. One is the rise of alternative investments and the proliferation of structures to accommodate these types of exposures in individual investor portfolios. The second is the increasing interest in retirement advice, in part because most clients of most advisors today are either in or near retirement—and this requires portfolios to do more and different work, including a change in investment priorities from saving and wealth accumulation to income production and wealth decumulation. In this article, we bring together both topics, alternative investments and retirement allocations, in a holistic analysis.

Alternative investments are not new, but at least historically they were available primarily to institutional allocators. In general, investors in these private-market portfolios sacrificed liquidity in exchange for a substantial return premium versus comparable public assets. Eligible asset owners found this appealing in particular for long-lived, liability-aware portfolios such as those in defined benefit pension plans and endowments—many of which are held to annual return targets north of 7 percent. For these investors, alternatives, typically long-lockup limited partnership interests in portfolios of illiquid private investments, have been a staple for more than two decades. Today, average allocations to private-market alternatives represent 20–40 percent of the total portfolio of these institutional allocators (NACUBO 2022; Public Plans Database 2022).

Individual retirees have similar liability-aware goals, and a similar investment horizon of 20–30 years, yet they have rarely sought exposure to these alternative assets, and certainly not at similar amounts. Today, individual investors have on average only 2–5 percent of their portfolios in alternatives (Baghai et al. 2022).

There are several reasons for the disconnect between the asset allocations of institutions and individuals. As is often the case, some of the divergence is driven by regulatory concerns. Traditional 3(c)(7) private-market alternatives are limited to “qualified purchasers” with at least $5 million in net worth. This is an impediment for most individuals.1 There are further regulatory and other limitations on the inclusion of these types of strategies as options in defined contribution or 401(k) funds and the target-date strategies often used as the qualified default investment alternative.

Liquidity is another factor. The relatively illiquid nature and higher degree of cash-flow uncertainty associated with most alternative investments is another impediment. Historically, this has limited the appeal of private-market alternatives for individual investors. However, during the past several years, a number of retail-oriented alternative investment vehicles have emerged. These new options provide lower thresholds for investor participation and greater liquidity. But critically, from a retirement-income perspective, these vehicles also tend to provide earlier return of capital in the form of attractive cash flows and more consistent income generation.

The question we address in this article is as follows: For investors near or in retirement, is there an optimal framework that effectively balances the liquidity and return characteristics of alternative investments with the varied goals of a retirement allocation, and in a way that advisors can readily deploy?

AN ANALYTICAL FRAMEWORK FOR RETIREMENT INVESTING

Retirement investing is extremely complex. The combination of uncertain future needs, uncertain time horizons, and the complicated and uncertain interaction between spending and returns requires a holistic framework for analysis. The framework we propose seeks to balance the trade-offs among the three key challenges retirees face.

First, and arguably the most critical, is to define and enable a consistent and reliable source of income to support retirees’ spending after their working lives end. Unlike institutional investors, retail investors exhibit a strong preference for portfolio income, and they often seek to anchor their lifestyle to their in-retirement “paycheck” just as they did during their working years (Gongola...
et al. 2021). That is, they tend to rely on spending almost exclusively from cash flows generated by their investments and Social Security. Of course, typically this means they tolerate a meaningful drop in quality of life. Taking the time to ensure the portfolio can generate sufficient and consistent cash flows to support spending—achieving a true “paycheck portfolio”—is job number one.

Second is longevity—the imperative to ensure that the financial asset portfolio, so easily eroded by spending, inflation, and potentially uncouoperative markets, doesn’t expire before they do. The long and uncertain horizon in retirement investing means that the desired balance between income today, traditionally found with bond-like assets, versus greater wealth in the future, i.e., through their equity allocation, is unknown (Klein et al. 2023). Generating and preserving greater wealth over time is an obvious way to solve for shortfall risk during a long lifetime. If only that were so easy. Absent that, longevity insurance in the form of annuities ought to be an appealing option for many, but in practice adoption has been quite limited. Even the deferral of Social Security beyond the start of one’s retirement—a way to achieve a higher, inflation-adjusted payout in a government-backed annuity—is a surprisingly rare choice by clients, due in part to behavioral and precautionary preferences (Goda et al. 2015; Moore and Sapra 2019; Fulford and Sapra 2019; Bronshtein et al. 2020). Instead, driven largely by the fear of running out of money, retirees generally tend to under-spend relative to their pre-retirement budget (Martel and Sharon 2020).

Finally, and unsurprisingly, risk is a key concern. Risk has many measures, but drawdowns are particularly damaging for retirees because of the well-known and devastating interaction of spending and sequence-of-returns risk. Retiree spending amplifies drawdowns, and this amplification increases non-linearly with the timing, the size, and the duration of the drawdown. This can lead to the realization of permanent losses.

These three goals—generating reliable portfolio income, achieving future wealth to support a lifetime of spending, and mitigating the risk of market drawdowns—are particularly difficult to balance in a single portfolio. We now look at how an allocation to alternatives can help advisors optimize across all three dimensions.

SEVERAL COMMON RETIREMENT ASSUMPTIONS

Retirement portfolios differ meaningfully across households (Browne et al. 2022). However, there are common features upon which we can begin our analysis. First, in terms of spending rate, a real annual withdrawal rate of 4 percent of initial assets (Bengen 1994) is a reasonable base case. Secondly, in terms of starting asset allocation, most target-date strategies approach retirement age with an allocation near 40 percent in stocks and 60 percent in bonds. These common default positions, with this typical asset exposure and level of risk, suggest a reasonable use case for a generalized retiree portfolio.

With this generic example in mind, we begin applying our framework across several different asset allocations (see appendixes A and B for details about our capital market assumptions and simulation process, respectively). We consider two blended portfolios: our base case allocation with 40–percent equities and 60–percent bonds (40/60), and a more aggressive allocation with 60–percent equities and 40–percent bonds (60/40). Relative to a 100–percent fixed income allocation, the inclusion of equities sacrifices a meaningful amount of coupon and dividend income, i.e., 20–30 percent less a year, such that the portfolio’s income falls below the initial 4–percent withdrawal rate. Figure 1 shows the average annual income of each portfolio before taxes during the first 10 years of retirement.

These common default positions, with this typical asset exposure and level of risk, suggest a reasonable use case for a generalized retiree portfolio.

Of course, lower income today from equities may be compensated by future capital appreciation. Figure 2 shows the wealth outcomes, net of inflation-adjusted spending, after 10 years. Although a higher allocation to equities reduces current portfolio income, it
FEATURE | AN ALTERNATIVE APPROACH TO RETIREMENT INVESTING

HIGHER EQUITY ALLOCATIONS TEND TO DRIVE HIGHER WEALTH

Average wealth net of inflation-adjusted spending—10 years, per $1 million

<table>
<thead>
<tr>
<th>Allocation</th>
<th>Average Wealth ($1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Fixed Income</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>40/60</td>
<td>$1,102,211</td>
</tr>
<tr>
<td>60/40</td>
<td>$1,144,422</td>
</tr>
</tbody>
</table>

Source: PIMCO as of March 31, 2023. Wealth information is shown after a period of 10 years with spending, distribution, and simulation assumptions as shown in appendix B.

EXPLORING POTENTIAL DRAWDOWNS AND SEQUENCE RISK

5th percentile of wealth versus $1-million initial allocation

<table>
<thead>
<tr>
<th>Allocation</th>
<th>5th Percentile Wealth Shortfall</th>
<th>Worst Drawdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Fixed Income</td>
<td>$365,148</td>
<td>$1,022,099</td>
</tr>
<tr>
<td>40/60</td>
<td>$347,915</td>
<td>$1,102,211</td>
</tr>
<tr>
<td>60/40</td>
<td>$466,017</td>
<td>$1,144,422</td>
</tr>
</tbody>
</table>

Source: PIMCO as of March 31, 2023. Wealth information is shown after a period of 10 years with spending and simulation assumptions shown in appendix B. Worst drawdown is defined as the conditional value-at-risk at the 95-percent level of confidence and is measured net of nominal spending during the total 10-year horizon, i.e., drawdowns can last multiple years.

The interactions between spending and balances, any view of risk must look at wealth effects rather than just asset returns. With this in mind, we review the drawdowns of each portfolio as well as the severity of more adverse outcomes of the simulation that typically stem from more turbulent markets and/or inflationary paths. Figure 3 shows the risk of the portfolios through their returns (drawdowns) and total wealth, inclusive of spending behavior (shortfalls).

In exchange for the lower median balance shown in figure 2, we see that the fixed income-only portfolio has meaningfully lower drawdown risk than either the 40/60 or 60/40 allocations. Similarly, while the median wealth outcome for 60/40 is meaningfully higher, the worst wealth outcomes also are meaningfully lower. With this lens, the 40/60 allocation looks appealing, even though it fails to produce income sufficient for the retiree’s 4-percent spending target. The adverse wealth outcomes of a 40/60 allocation are in line with what we see for a 100-percent fixed income portfolio, despite higher levels of volatility. This is explained by a combination of higher expected returns over time (relative to the 100-percent fixed income portfolio) and appealing diversification benefits from a negative long-run stock–bond correlation.

However, if we expand the investment universe to include alternative investments, rather than simply shifting the equity allocation higher or lower, we may be able to achieve better scores across all three of our retirement metrics.

A RETIREMENT ALTERNATIVE

During the past decade, the alternative investment landscape has evolved materially. There now are many ways for accredited individual investors to access alternative investments across a wide spectrum of risk and liquidity. Although individual funds within each classification can differ materially, we characterize common alternative investment vehicles and some common differences among them, as shown in table 1.

The interval fund is the newest vehicle that stands out as a structure that can be appealing for a wide range of retirees. Interval funds are more widely accessible on investment platforms and are more regulated, with both greater transparency and filing provisions from the Securities and Exchange Commission (SEC). Their periodic and explicit liquidity terms can greatly simplify liquidity management and cash-flow expectations relative to other structures such as vintage funds. Interval funds provide liquidity terms to investors that are known in advance. Even a modest liquidity provision, such as 5 percent per quarter, means that 20 percent of assets could be withdrawn over a typical year.
INTERVAL FUNDS PIQUE INTEREST

Versus comparable mutual funds and ETFs in the same Morningstar category, interval funds have provided:

### HIGHER REALIZED RETURNS:

+4.51%
3-year average excess returns

### HIGHER DISTRIBUTION YIELDS:

+3.27%
Average excess trailing 12-month distribution yield

### GREATER CONSISTENCY:

87% of intervals outperform their comparable category median 3-year return

This is well beyond a typical 4–6 percent spending rate of an early retiree even before accounting for any intermediate income produced by these assets. As we will see, this income can be substantial.

Although the vehicle has gained renewed relevance only in the past decade (the structure’s origin dates to 1986), limiting both the number of funds and the evaluation horizon, early performance of these assets has been quite strong. Interval funds historically have delivered enhanced returns and income potential net of fees versus their mutual fund and exchange-traded fund (ETF) peers. In figure 4, we show the performance of interval funds during 2019–2022 against their Morningstar category peers.

We see that 87 percent of interval funds outperformed their like-category mutual fund and exchange-traded fund (ETF) peers. This outperformance was substantial: The average interval fund produced net-of-fee annualized three-year returns more than 4 percent higher than its peers. The interval fund cohort also reported higher 12-month trailing distribution yields (and resulting retirement cash flows) versus its peers by a similar margin (3.5 percentage points). Although the data is limited to the past three years, it was a volatile period. The outperformance shown in figure 4 includes the COVID–19 pandemic and the historically high levels of inflation and rapidly rising rates of 2021–2022.
ENHANCING RETIREMENT PORTFOLIOS

In figure 5, we illustrate an efficient frontier of potential portfolios that incorporates allocations to income-oriented private credit strategies. For simplicity, we source this allocation equally from our starting retiree portfolio of 40-percent equities and 60-percent bonds. In terms of portfolio volatility, allocations up to around 20 percent to private credit maintain a similar volatility profile to a more conservative 40/60 portfolio, at levels of estimated returns that can even exceed the more aggressive 60/40 option.

The impact on yield potential, as shown in figure 6, is perhaps the starkest. Including interval funds leads to an increase in estimated portfolio income of 30–45 percent over both the 40/60 and 60/40 portfolios. The increase in income is enough to exceed the 4-percent initial withdrawal rate.

Retirees inclined to spend in line with their portfolio income—as most are—would enjoy a significantly higher standard of living in retirement with a modest allocation to these types of assets.

Unlike the trade-off between equities and fixed income only, the introduction of alternative assets leads to higher

Consistent Income at Determined Intervals

Average annual income per $1 million

AN APPEALING ALTERNATIVE: HIGHER WEALTH AND LOWER RISK

Average wealth net of inflation-adjusted spending—10 years, per $1 million

Source: PIMCO as of March 31, 2023. Hypothetical example for illustrative purposes only. Allocations to flexible credit are sourced equally from equity and fixed income, i.e., half from each, not pro rata. To mitigate the effect of initial conditions, return and volatility information is shown after a period of 10 years. Simulation assumptions are detailed in appendix B.
Lisa is a 65-year-old retiree with $2 million. She currently has invested 60 percent in U.S. equities and 40 percent in fixed income. Her life expectancy is around 85 to 86 years, but she and her advisor wish to plan out to age 95 given her good health. Her financial advisor proposes a few modifications and suggests up to 20 percent in alternative credit strategies with an ability to access private markets, sourced equally from equities and fixed income.*

Lisa’s financial advisor presents the solution in the figure below, highlighting three key areas of the new proposed plan.

Walking through the results, the financial advisor shows Lisa that she can comfortably hit her 4-percent spending goal of $80,000 with an additional income buffer of $8,000 from her portfolio. Lisa can take extra comfort in the new proposal because it improves the odds of her wealth lasting to age 95. This is in part due to a substantial reduction in the risk of large losses. Her advisor explains that whereas she may need to stomach a 30-percent drawdown in the 60/40 (or $600,000 on $2 million), the new solution reduces drawdown risk by 10 percent or the equivalent of around $200,000 in loss tolerance.

Long-term outcomes also are appealing. Her expected wealth under each proposal grows by a comparable amount during her 30-year horizon, though the left tail is meaningfully trimmed with the addition of alternatives. Lisa is quite happy with these results.

On top of this, because the improved outcome provides some peace of mind, Lisa is comfortable delaying receipt of Social Security benefits, which given her average level of retirement benefits, potentially can increase her annual (inflation-indexed) income by an additional $7,000 relative to claiming at her full retirement age.**

* Although not modeled in these results, a shorter-dated bond ladder can be an appealing option here. A ladder solidifies near-term cash flows to help offset the practically small but emotionally significant reduction in liquidity from an allocation to alternatives.

** Average monthly benefit in 2023 for a retiree is $1,833. Deferring to age 70 increases monthly benefits by 32 percent relative to the full retirement age for those born in or after 1960 (Social Security Administration 2023).

### A CASE STUDY—STANDING THE TEST OF TIME

<table>
<thead>
<tr>
<th>30/50/20</th>
<th>60/40</th>
</tr>
</thead>
<tbody>
<tr>
<td>4% spending target</td>
<td>$88,201</td>
</tr>
<tr>
<td>$2,783,702</td>
<td>$2,781,501</td>
</tr>
</tbody>
</table>

Source: PIMCO as of March 31, 2023. Wealth information is shown after a period of 10 years with spending and simulation assumptions as in appendix B. Income is shown averaged during the initial 10 years with spending and simulation assumptions as in the appendix. Adverse scenarios above correspond to the bottom 25th percentile of the distribution of wealth (75-percent confidence level) each year over 30 years.
This additional income and wealth come at the cost of liquidity. In general, a key trade-off for any investor in alternatives is a sacrifice in daily liquidity. However, asset liquidity is not binary and the amount of time that funds are illiquid can range from quarters to months and even decades. The effective liquidity of an investment is more subtle still. Although distributions are at the discretion of managers and differ from the explicit liquidity terms of a fund, any cash distribution has the effect of partially converting an otherwise illiquid investment into an accessible liquid cash flow for investors. For example, in an investment with a 10-percent annual distribution, an investor can effectively access 10 percent of the balance as those distributions are paid. This is on top of any intermediate liquidity provided by the fund. In the case of a fund offering 5-percent quarterly liquidity, the distributions and liquidity provision would combine to provide just less than 30 percent of the initial investment amount available to spend over the course of the year. This amount of effective liquidity substantially exceeds any reasonable amount of early retiree spending, even completely discounting all the liquidity available from any other assets and the historically common occurrence of liquidity availability in excess of the absolute minimum provided by the funds. Effective liquidity increases with strategies that distribute more frequently and more consistently, and higher effective liquidity allows for greater flexibility to rebalance allocations or meet unexpected needs.

CONCLUSION
The past decade has seen a substantial increase in the variety of investments available to retail investors. Alternative investments are now far more available with higher effective liquidity than in the past. Once the right structures and investments are incorporated, they can be used to improve many of the key outcomes retirees and their financial advisors seek. In exchange for a modest reduction in liquidity, cash-flow-producing interval funds tend to increase retirement income while potentially boosting future wealth and managing sequence risk.

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APPENDIX A: CAPITAL MARKET ASSUMPTIONS
Figure A1 highlights our five-year capital market assumptions and risk assumptions across a range of private assets alongside equities and core bonds.

Consistent with the literature, we expect more-flexible strategies with the ability to invest in private assets to provide an additional 1–4 percent of annualized returns (Baz et al. 2019). Private credit and private real estate notably may provide equity-like return potential, but they exhibit volatility profiles below that of equities and thus a much more attractive risk-adjusted return. Other assets have similar profiles, such as hedge fund and private equity strategies, but a key differentiator for retirees is that private credit and private real estate also provide more attractive and relatively consistent income streams that, as discussed, are an important feature for retirement portfolios.

For the purposes of our framework, both flexible credit and real estate strategies may offer benefits to the traditional stock–bond retirement portfolios analyzed above. For simplicity and given our emphasis on maximizing portfolio income in retirement, we consider a single allocation example incorporating an investment into flexible credit strategies.

APPENDIX B: SIMULATION MODEL
Real interest rates are modeled using an Ornstein–Uhlenbeck (OU) process (Uhlenbeck and Ornstein 1930), and nominal interest rates are modeled using

* For all indexes and models, five-year return estimates (arithmetic) are based on the product of risk factor exposures and projected risk factor premia, which rely on fair value models and qualitative inputs from senior PIMCO investment professionals. Private volatilities are unsmoothed to account for bias otherwise common in volatility estimates of unpriced assets.

** We employ a block bootstrap methodology to calculate volatilities. See Disclaimer for details.

Source: PIMCO as of March 31, 2023. For all indexes and models, five-year return estimates (arithmetic) are based on the product of risk factor exposures and projected risk factor premia, which rely on fair value models and qualitative inputs from senior PIMCO investment professionals. Private volatilities are unsmoothed to account for bias otherwise common in volatility estimates of unpriced assets.

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a variation of the Cox–Ingersoll–Ross (CIR) model (Cox et al. 1985). The choice of an OU process for real rates allows for the realization of negative rate levels, whereas a CIR structure ensures positive levels for nominal interest rates and spreads. The dynamics for yields and spreads are governed by the following differential equation:

\[ dx_t = \theta(\mu - x_t)dt + \sigma_i x_t dz_t \]  

(A1)

where \( dz_t \) is a multivariate Wiener process with covariance matrix \( \Sigma \); \( \mu \) is the long-term equilibrium factor level; \( \sigma \) is the shock volatility; and \( \theta \) is a mean-reversion parameter for each tenor. For real rates, \( i = 0 \), and for nominal rates and spreads, \( i = 0.5 \). All simulation paths are conditioned on the current level, \( x_0 \).

Equation A1 is estimated for two-year, 10-year, and 30-year tenors for municipals, nominal rates, and real rates. Future yield curves are fitted from these simulated tenors using a Nelson–Siegel model. Simulated inflation is endogenous to the realized path for nominal and real interest rates, and is modeled based on breakeven inflation. Formally, realized inflation, \( \pi_t \), is determined by the following dynamics:

\[ \pi_t = BE_t + \sigma_{\pi t} dz_{\pi t} \]  

(A2)

\[ BE_t = y_{\pi t} - y_{\pi t} + \mu_{\pi t} \]  

(A3)

where \( \sigma_{\pi t} \) is inflation volatility; \( y_{\pi t} \) and \( y_{\pi t} \) are the one-year nominal and real rates at time \( t \), respectively; and \( \mu_{\pi t} \) is a shift parameter allowing for an inflation risk and liquidity premium. Finally, equities are modeled as returns in excess of the risk-free rate and realized inflation, based on the following equation:

\[ r_t = r^f_t + \mu_{ERP} + \epsilon_t \]  

where \( r^f_t \) is the risk-free rate (three-month Treasury yield) at time \( t \); \( \mu_{ERP} \) is the equity risk premium; \( \epsilon_t \) is the equity volatility; and \( \epsilon_t \) is a standard normal shock. The parameters in the simulation are intended to represent reasonable values over a very long, e.g., 40-year, horizon and are disclosed in table B1.

Core bond and fixed income assets are modeled as a combination of U.S. Treasuries and investment-grade credit corporate bonds with a long-run mean return of 4.5 percent and volatility of 6.7 percent. The private credit interval fund is generated via a levered exposure to high yield credit spread with very small exposures to equity and idiosyncratic risk. Idiosyncratic risk has an information ratio of 0.15, and we assume a liquidity premium of 150 basis points per year. Altogether, the long-run simulated return is 7.4 percent with a volatility of 14.5 percent.

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**SIMULATION PARAMETERS**

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<th>Variable</th>
<th>Tenor</th>
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<th>( \mu )</th>
<th>( \sigma )</th>
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<td>Nominal Rates</td>
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<td>2.7%</td>
<td>1.00%</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>0.1</td>
<td>3.0%</td>
<td>0.90%</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>0.1</td>
<td>3.1%</td>
<td>0.80%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.1</td>
<td>0.7%</td>
<td>1.00%</td>
</tr>
<tr>
<td>Real Rates</td>
<td>10</td>
<td>0.1</td>
<td>1.0%</td>
<td>0.75%</td>
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<td></td>
<td>30</td>
<td>0.1</td>
<td>1.1%</td>
<td>0.60%</td>
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<td>Credit Spreads</td>
<td>IG</td>
<td>0.3</td>
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<td></td>
<td>HY</td>
<td>0.2</td>
<td>0.95</td>
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<tr>
<td>Inflation</td>
<td>-</td>
<td>-</td>
<td>0.0%</td>
<td>0.50%</td>
</tr>
<tr>
<td>Equity</td>
<td>-</td>
<td>-</td>
<td>3.0%</td>
<td>16.00%</td>
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<tr>
<td>Liquidity Premium</td>
<td>-</td>
<td>-</td>
<td>1.5%</td>
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**WEALTH AND INCOME PERCENTILES**

**(A) WEALTH AT YEAR 10, PER $1 MILLION**

<table>
<thead>
<tr>
<th>Wealth</th>
<th>100% Fixed Income (FI)</th>
<th>40% Equity / 60% FI</th>
<th>60% Equity / 40% FI</th>
<th>30% Equity / 50% FI / 20% Private Credit</th>
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<tbody>
<tr>
<td>5</td>
<td>$434,931</td>
<td>$653,020</td>
<td>$534,086</td>
<td>$673,951</td>
</tr>
<tr>
<td>25</td>
<td>$827,029</td>
<td>$867,983</td>
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<td>50</td>
<td>$988,813</td>
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<td>75</td>
<td>$1,177,873</td>
<td>$1,294,387</td>
<td>$1,396,795</td>
<td>$1,354,109</td>
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<tr>
<td>95</td>
<td>$1,530,179</td>
<td>$1,681,288</td>
<td>$1,970,099</td>
<td>$1,766,954</td>
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<tr>
<td>Mean</td>
<td>$1,022,099</td>
<td>$1,102,211</td>
<td>$1,144,422</td>
<td>$1,154,333</td>
</tr>
</tbody>
</table>

**(B) AVERAGE INCOME OVER 10 YEARS, PER $1 MILLION**

<table>
<thead>
<tr>
<th>Income</th>
<th>100% Fixed Income (FI)</th>
<th>40% Equity / 60% FI</th>
<th>60% Equity / 40% FI</th>
<th>30% Equity / 50% FI / 20% Private Credit</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>$28,959</td>
<td>$23,651</td>
<td>$19,290</td>
<td>$32,514</td>
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<td>25</td>
<td>$35,530</td>
<td>$29,085</td>
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<td>$38,560</td>
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<td>75</td>
<td>$47,709</td>
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<td>$59,071</td>
<td>$48,138</td>
<td>$45,024</td>
<td>$58,394</td>
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<tr>
<td>Mean</td>
<td>$42,235</td>
<td>$34,584</td>
<td>$30,554</td>
<td>$44,101</td>
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(A) and (B) Source: PIMCO

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ENDNOTES
1. Roughly 98 percent of households in the United States have less than $5 million of assets and net worth. (Federal Reserve Board 2019).
2. Of course, retirees could fund their spending by selling shares of their fixed income or equity holdings. This would reduce the importance of income. In practice, though, it is far more common for retirees’ spending to be positively correlated with their portfolio income.
3. This is significantly higher than most estimates of the liquidity premium (Baz et al. 2019), in part because interval funds tend also to be higher risk than other investments in their respective categories.
4. This is just under 30 percent (29.25) because the yield would accrue to lower balances over time as the investor withdraws their funds.
5. Precautionary motives that lay behind uncertain future spending needs appear to support a variety of otherwise unusual retiree behaviors (Klein 2020a, b)
6. These estimates are unsmoothed and are thus even larger than what participants would see and feel from their account statements. Although this is the appropriate economic measure of risk, it understates behavioral benefits that may be present in smoothed volatilities (Baz et al. 2022).

REFERENCES
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Appendix / Footnotes
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MODELS
Corporate and Municipal Ladder Models: Are based on a proprietary database of investable securities with a current PMIGC buy rating and excluding securities rated below investment grade and does not represent the portfolio characteristics or performance of an actual account. Security selection criteria for each model portfolio is primarily driven by the specified maturity band (e.g., 1–3 year, 1–5 year, etc.), the average minimum quality allowable for each model (A- for Munis, BBB- for Corporates) and the impute of many indicated state preferences. Security weights are optimized to maximize yield while subject to the guidelines just specified and issuer concentration considerations. The information is intended to illustrate what a Corporate and Municipal Ladder portfolio might look like. An actual account’s holdings would vary and would therefore vary from the model. The model portfolio does not represent actual trading and does not reflect the impact that economic and market factors might have on management of the portfolio. No guarantee is being made that the structure or actual account holdings of any portfolio will be the same or that similar returns will be achieved. Model results may vary with each report and over time.
Private Corporate Credit Model: Model risk factor exposures are estimated based on a public equivalent benchmark and alpha estimates derived from historical data on private funds in the Preqin Private Equity Universe. The public market equivalent is duration hedged high yield. We then add adjustments for illiquidity premia and idiosyncratic risk based on the historical distribution of alpha (relative to the PME benchmark) in the Preqin category. Median and 25th percentile models reflect alpha estimates from the median and 25th percentile of the historical alpha distribution, respectively.
Private Core Real Estate Model: Model risk factor exposures are estimated through a regression on the CREIF (DOCE Core Real Estate Index. We unsmooth returns to remove the bias from accounting based reporting.
Private Equity Model: Model risk factor exposures are estimated based on a public equivalent benchmark and alpha estimates derived from historical data on private funds in the Preqin Private Equity Universe (ex-VC). The public market equivalent is a custom index of publicly traded US firms matched to the size, EBITDA multiple, and revenue multiple observed on PE deals in the Preqin database. We also add additional filters for value (top half of Book-to-Market), top half of Earnings Yield, leverage and equity return volatility (filtered to approximately match HY CDS issuers), and eliminate outliers. We then add adjustments for illiquidity premia and idiosyncratic risk based on the historical distribution of alpha (relative to the PME benchmark) in the Preqin category. Median and top quartile models reflect alpha estimates from the median and 75th percentile of the historical alpha distribution, respectively. Unless otherwise specified, models reflect the median of the historical alpha distribution.
PORTFOLIO ANALYSIS
The portfolio analysis is based on indices and models. No representation is being made that the structure of the average portfolio or any account will remain the same or that similar returns will be achieved. The analysis may not be attainable and should not be construed as the only possibilities that exist. Real results will vary and are subject to change with market conditions. There is no guarantee that results will be achieved. No fees or expenses were included in the estimated results and distribution. The scenarios assume a set of assumptions that may, individually or collectively, not develop over time. The sample analysis reflected in this information is based upon data at the time of analysis. Forecasts, estimates, and certain information contained herein are based upon proprietary research and should not be considered as investment advice or a recommendation of any particular security, strategy or investment product.
PIMCO routinely reviews, modifies, and adds risk factors to its proprietary models. Due to the dynamic nature of factors affecting markets, there is no guarantee that simulations will capture all relevant risk factors or that the implementation of any resulting solutions will protect against all. All investments contain risk and may lose value. Simulated risk analysis contains inherent limitations and is generally prepared with the benefit of hindsight. Realized losses may be larger than predicted by a given model due to additional factors that cannot be
accurately forecasted or incorporated into a model based on historical or assumed data.

**VOLATILITY (ESTIMATED)**

We employ a block bootstrap methodology to calculate volatilities. We start by computing historical factor returns that underlie each asset class proxy from January 1997 through the present date. We then draw a set of 12 monthly returns within the dataset to produce an annual return number. This process is repeated 25,000 times to have a return series with 25,000 annualized returns. The standard deviation of these annual returns is used to model the volatility for each factor. We then use the same return series for each factor to compute covariance between factors. Finally, volatility of each asset class proxy is calculated as the sum of variances and covariance of factors that underlie that particular proxy. For each asset class, index, or strategy proxy, we will look at either a point in time estimate or historical average of factor exposures in order to determine the total volatility. Please contact your PIMCO representative for more details on how specific proxy factor exposures are estimated.

The analysis included here is not based on any particular financial situation, or need, and is not intended to be, and should not be construed as a forecast, research, investment advice or a recommendation for any specific PIMCO or other strategy, product or service. Investors should consult their investment professional prior to making an investment decision.

The analysis contained in this paper is based on hypothetical modeling. **HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM.**

**ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS.**

Return assumptions are for illustrative purposes only and are not a prediction or a projection of return. Return assumptions are an estimate of what investments may earn on average over the long term. Actual returns may be higher or lower than those shown and may vary substantially over shorter time periods.

Past performance is not a guarantee or a reliable indicator of future results.

All investments contain risk and may lose value. Investing in the bond market is subject to risks, including market, interest rate, issuer, credit, inflation risk, and liquidity risk. The value of most bonds and bond strategies are impacted by changes in interest rates. Bonds and bond strategies with longer durations tend to be more sensitive and volatile than those with shorter durations; bond prices generally fall as interest rates rise, and low interest rate environments increase this risk. Reductions in bond counterparty capacity may contribute to decreased market liquidity and increased price volatility. Bond investments may be worth more or less than the original cost when redeemed.

Inflation-Linked Securities (ILBs) are bonds that are indexed to inflation. ILBs decline in value when real interest rates rise. The primary advantage of ILBs is the potential for the recovery of some inflation exposure if the bond component of the index performs well. ILBs can provide management of inflation risk, and as such, may also be subject to liquidity risk due to restrictions on transfer, and lack of a secondary trading market. ILBs are typically designed as a hedge against inflation and may not be suitable for all investors. 

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Private credit involves an investment in non-publicly traded securities which are subject to liquidity risk. Portfolios that invest in private credit may be leveraged and may engage in speculative investment practices that increase the risk of investment loss. Investments in Private Credit may also be subject to real estate-related risks, which include new regulatory or legislative developments, the attractiveness and location of properties, the financial condition of tenants, potential liability under environmental and other laws, as well as natural disasters and other factors beyond a manager’s control. Management risk is the risk that the investment techniques and risk analyses applied by PIMCO will not produce the desired results, and that certain policies or developments may affect the investment techniques available to PIMCO in connection with managing a strategy.

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