RESEARCH NOTE

Constructing a Portfolio for a Five Percent Return Objective

Hurdle rates, forward return expectations, and constrained efficient frontiers under three client liquidity regimes

Summary: The Difficulty of the Target Is Conditional on Its Definition

The difficulty of the target is conditional on its definition. A 5% nominal target is readily achievable today with high-quality fixed income, at roughly one-fifth the volatility of a conventional balanced portfolio. A 5% real target, net of fees, sits at or beyond the edge of what the full investable universe can reasonably support.

THE TWO TARGETS

5% NOMINAL

Achievable

Every client scenario clears it. The open question is how little risk it takes, not whether it is reachable.

5% REAL, 8.2% GROSS

Out of reach

Only the accumulator touches it, at the very tip of its frontier with 35% illiquid. The retiree, capped at 10%, cannot.

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5% nominal hurdle

3.2 % vol

Minimum-risk portfolio that clears

5% real hurdle

8.2 % gross

Incl. 2.2% inflation and 1% fee

Implied inflation (TIPS)

2.2 %

Same at 5/10/30 years

Retiree frontier peak

7.86 %

34 bp short of the hurdle

Data as of	**July 16, 2026**
Basis	**Ten-year, annualized**

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01 Introduction

A client walks in and asks for five percent. It sounds like the most modest request in wealth management, but the question comes apart in your hands as soon as you hold it. Five percent nominal or real? Before fees or after? Earned every year, or annualized across a decade that will contain both halves of a market cycle?

This document follows those forks. It reviews forward-looking return expectations across the major asset classes, translates the client's target into explicit nominal and real hurdle rates, and builds constrained efficient frontiers for three client scenarios that differ only in what their balance sheets can afford to lock away.

The central finding is that the difficulty of the target is conditional on its definition. A 5% nominal target is readily achievable today with high-quality fixed income, at roughly one-fifth the volatility of a conventional balanced portfolio. A 5% real target, net of fees, sits at or beyond the edge of what the full investable universe can reasonably support, and for a client drawing income from the portfolio it is unreachable at any allocation they could sensibly hold.

02 How to View the Five Percent Target

The first move is not to build anything. It is to establish what the number means: nominal or real, over what horizon, and at what tolerance for volatility along the way. Those three answers determine everything that follows, and the distance between them is far larger than the distance between any two allocations considered later in this document.

If the target is nominal	Inflation protection is not an explicit constraint, and the objective becomes narrow and tractable: reach five percent while taking the least risk necessary. Today's rate environment makes that unusually straightforward. Investment grade corporates yield above 5.2%, the ten-year Treasury sits near 4.58%, and the thirty-year is just above 5%. High-quality fixed income can carry the target on its own, with a modest allocation to high-dividend equity available where additional return or income is wanted. The design question is therefore not whether the target is reachable but how little risk it requires.
If the target is real	Inflation erodes the return, so the portfolio must earn its way above the price level rather than above zero. The first task is to price that erosion, and the market provides the estimate directly: the spread between nominal Treasuries and TIPS of matched maturity gives a market-implied inflation expectation for the horizon in question, which is the correct input for a hurdle that has to hold for a decade rather than a quarter. The second task is to accept what the resulting number implies for construction. Bonds and dividend equity alone are unlikely to clear a real target once fees are counted, because their coupons are fixed in nominal terms and carry no linkage to the price level. Capital appreciation has to enter the portfolio, alongside assets whose cash flows are contractually indexed to inflation.

The gap between these two conversations, and what it costs to cross it, is the subject of the rest of this document.

03 Understanding the Client and the Purpose of the Capital

Once the target is defined, the portfolio takes its shape from the client rather than from the market. What is the money for, when will it be needed, and what can the client survive along the way? Five characteristics translate the answers into constraints that the optimizer can actually respect.

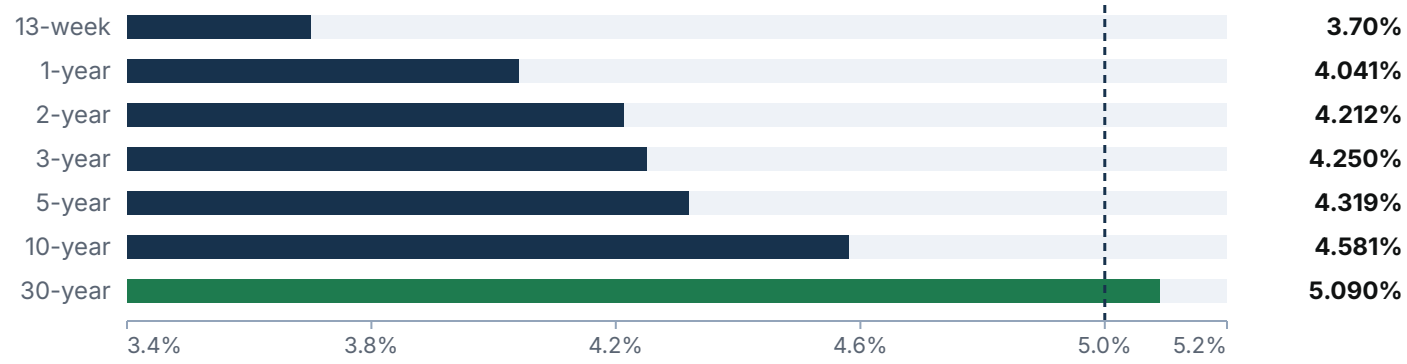
Maturity	The time horizon determines which vehicles are appropriate, and it does so through risk capacity rather than preference. A long horizon of twenty to thirty years supports a tilt toward equities and other growth assets: there is time to recover from a drawdown, and ongoing earnings continue to add fresh capital through the cycle, so capacity for risk rises with time. A short horizon of five to ten years argues for high-quality fixed income, because the binding risk is shortfall rather than volatility. A client who needs the money in seven years may have no opportunity to recover from an equity drawdown in year six.
Liquidity	How much cash the client draws, and when, is the single most underweighted input in most allocations. The drivers are recurring, such as pension or living income, or discrete, such as a tuition obligation or a property purchase. A high recurring need favours dividend-paying equity over pure growth and raises the fixed income allocation; known future obligations are best met by matching asset maturities to the dates on which the cash is required, rather than by holding a general-purpose portfolio and selling into whatever market exists that year.
Risk tolerance	In the general case, risk and return move together and tolerance shapes the allocation directly. In this case the target is fixed, which inverts the problem: the objective is the lowest volatility that still reaches five percent, and tolerance becomes the constraint that determines whether that portfolio is one the client can actually hold through a bad year. A portfolio abandoned in a drawdown returns nothing, whatever the frontier says.
Tax status and account type	Five percent pre-tax and five percent post-tax are different targets, and the difference is larger than most allocation decisions. Whether the assets sit in a taxable account or a sheltered one determines the effective hurdle and dictates asset location, which is the practice of placing tax-inefficient holdings where they are shielded. At high marginal rates the effect can restructure the fixed income core entirely, as the municipal comparison later in this document shows.
Legal and regulatory constraints	The client type determines the rulebook. An individual, a pension fund, an endowment, and an insurer face materially different regimes, and the binding constraints often include concentration limits, restricted holdings arising from employment or prior transactions, and any ESG or ethical exclusions the client imposes. These are constraints on the feasible set rather than preferences within it, and they belong in the optimizer rather than in the conversation afterward.

04 Inflation and Forward Return Expectations Across Asset Classes

With the objective defined and the constraints identified, the remaining input is the opportunity set. What follows is the market as of mid-July 2026: contractual yields where they exist, forward-looking model estimates where they do not, and a market-implied inflation expectation to convert between nominal and real. Contractual yields and modelled expectations are not the same kind of number, and the distinction matters for the conclusions: a Treasury yield is what the instrument will pay if held to maturity, while an equity forecast is the center of a distribution that is wide enough to contain outcomes on both sides of the target.

Fixed income: U.S. Treasury securities

Exhibit 1. U.S. Treasury yield curve



Dashed rule = 5% nominal hurdle

Source: U.S. Department of the Treasury, via Yahoo Finance and CNBC. As of July 14, 2026. Scale 3.4%–5.2%.

Fixed income: municipal securities

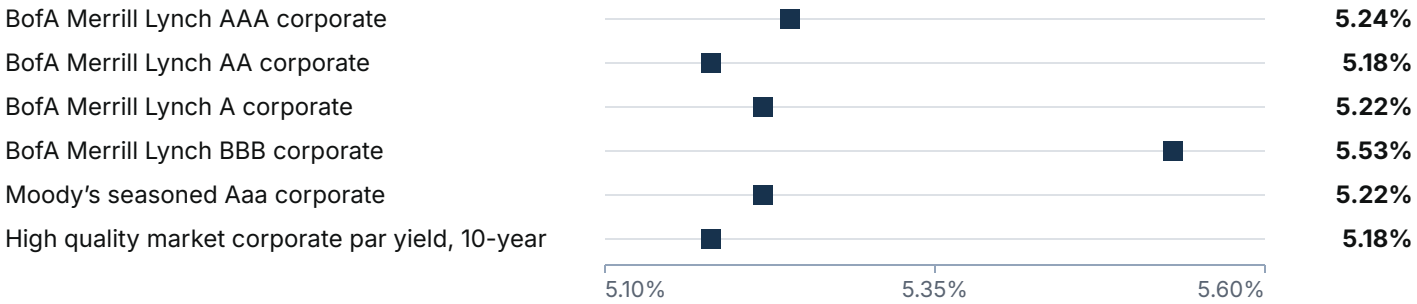
Exhibit 2. Municipal yields by rating and maturity

	10-year	20-year	30-year
AAA	**3.05%**	**3.85%**	**4.25%**
AA	**3.15%**	**4.05%**	**4.45%**
A	**3.35%**	**4.15%**	**4.55%**

Source: FMS Bonds, Inc. Yields shown are tax-exempt at the federal level; see the taxable-equivalent discussion under Limitations. Shading deepens with yield.

Fixed income: investment grade corporate bonds

Exhibit 3. Investment grade corporate bond effective yields

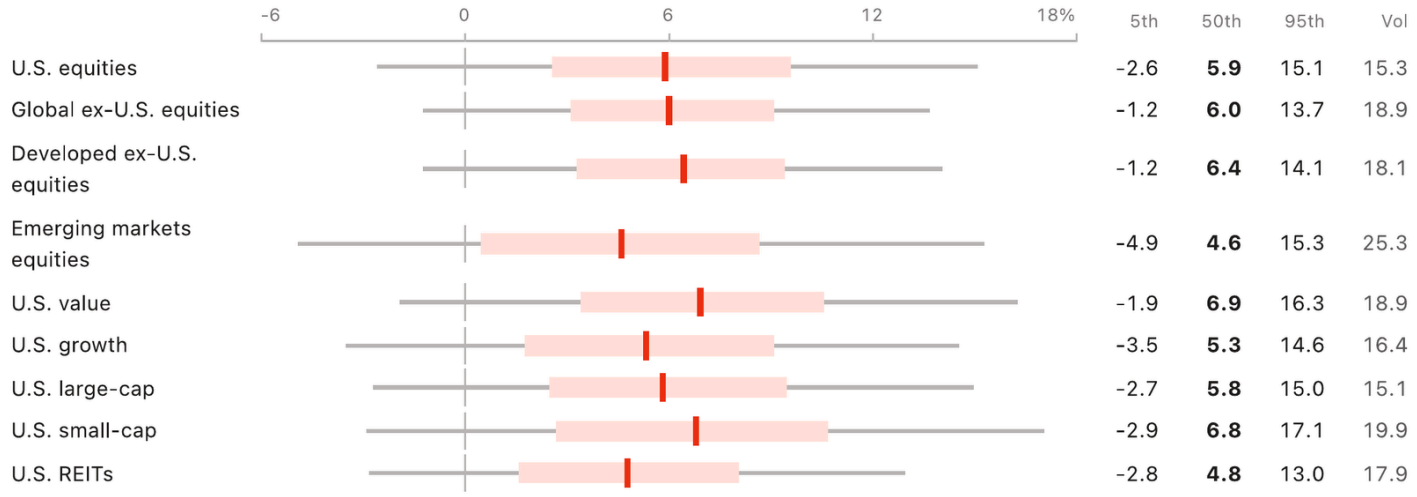


Source: MacroMicro; Federal Reserve Bank of St. Louis (FRED series HQMCB10YRP).

Equity: forward-looking return forecasts

Three points about the tables below are worth stating before reading them. Every forward estimate shown sits below the market's own long-run history, a pattern explained in the section that follows. The percentile ranges matter as much as the medians, since a median of 5.9% with a fifth percentile of minus 2.6% is a very different object from a contractual 5.2%. And the Vanguard thirty-year distribution is tighter than the ten-year one at the same median, which is the horizon effect made visible.

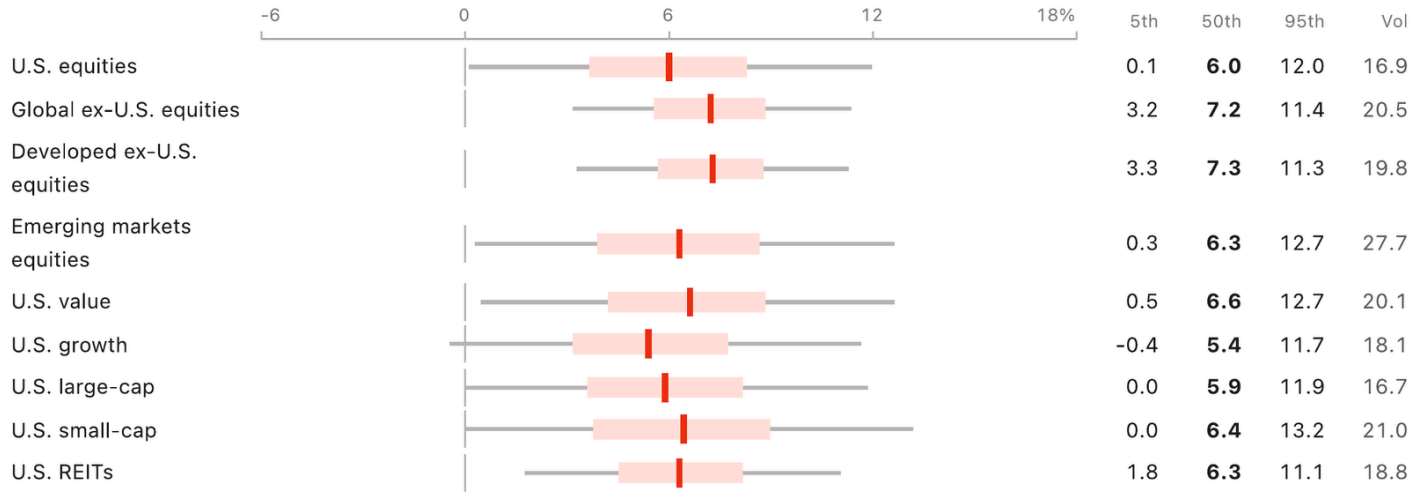
Exhibit 4. Vanguard Capital Markets Model, ten-year forecasts (percentile distribution)



	5th	50th	95th	Vol
U.S. equities	-2.6	**5.9**	15.1	15.3
Global ex-U.S. equities	-1.2	**6.0**	13.7	18.9
Developed ex-U.S. equities	-1.2	**6.4**	14.1	18.1
Emerging markets equities	-4.9	**4.6**	15.3	25.3
U.S. value	-1.9	**6.9**	16.3	18.9
U.S. growth	-3.5	**5.3**	14.6	16.4
U.S. large-cap	-2.7	**5.8**	15.0	15.1
U.S. small-cap	-2.9	**6.8**	17.1	19.9
U.S. REITs	-2.8	**4.8**	13.0	17.9

Source: Vanguard Capital Markets Model, projections as of April 22, 2026. Annualized nominal returns, ten-year horizon. Non-U.S. returns unhedged. Light band is 25th–75th, red line the median, grey line zero.

Exhibit 5. Vanguard Capital Markets Model, thirty-year forecasts (same scale)



	5th	50th	95th	Vol
U.S. equities	0.1	**6.0**	12.0	16.9
Global ex-U.S. equities	3.2	**7.2**	11.4	20.5
Developed ex-U.S. equities	3.3	**7.3**	11.3	19.8
Emerging markets equities	0.3	**6.3**	12.7	27.7
U.S. value	0.5	**6.6**	12.7	20.1
U.S. growth	-0.4	**5.4**	11.7	18.1
U.S. large-cap	0.0	**5.9**	11.9	16.7
U.S. small-cap	0.0	**6.4**	13.2	21.0
U.S. REITs	1.8	**6.3**	11.1	18.8

Source: Vanguard Capital Markets Model, projections as of April 22, 2026. Annualized nominal returns, thirty-year horizon. Same axis as Exhibit 4: the distribution narrows markedly while medians barely move.

Exhibit 6. Goldman Sachs ten-year forward return expectations (downside, baseline, upside)

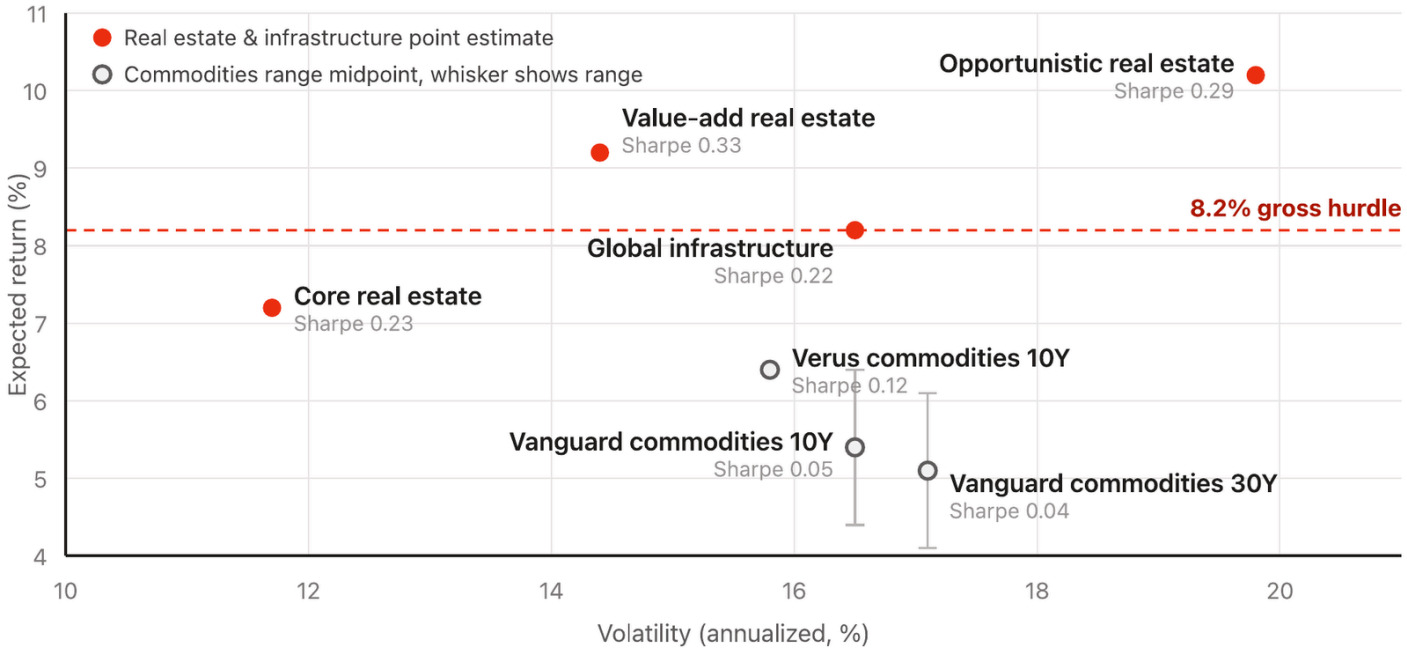


	Downside	Baseline	Upside
Emerging markets	7.6	**10.9**	12.5
Asia Pacific ex-Japan	7.7	**10.3**	11.6
Japan	3.0	**8.2**	10.8
Europe	4.1	**7.1**	10.1
United States	2.7	**6.5**	10.3
World	3.6	**7.1**	10.5

Source: Goldman Sachs, 10-Year Forward Return Expectations, November 2025. Stated in local currency, so not directly comparable to the unhedged Vanguard figures in Exhibit 4. Navy marker is the baseline.

Real assets

Exhibit 7. Real assets: expected return and volatility



Source: Verus 2026 Capital Market Assumptions; Vanguard Capital Markets Model. Sharpe ratios computed against 3.7% cash. Commodity forecasts are ranges: the marker is the midpoint, the whisker the bounds.

Private credit and private equity

Exhibit 8. Private credit and private equity assumptions

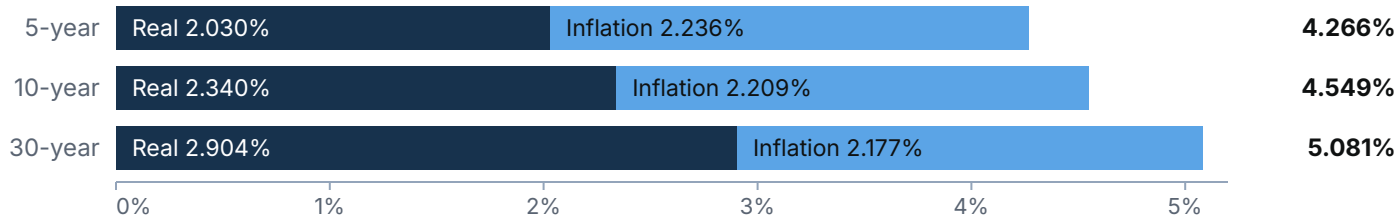
Asset class	Index proxy	Geometric	Arithmetic	Std dev	Sharpe
Private credit, broad	Morningstar LSTA	7.7%	8.5%	13.3%	0.29
Direct lending, unlevered	Morningstar LSTA	6.3%	6.7%	8.7%	0.29
Direct lending, levered	Morningstar LSTA	7.4%	8.1%	12.3%	0.29
Credit opportunities	Morningstar LSTA	8.4%	9.6%	16.0%	0.29
Junior capital / mezzanine	Morningstar LSTA	7.8%	8.7%	14.0%	0.29
Distressed credit	Morningstar LSTA	8.6%	12.2%	29.1%	0.16
Private equity	CA Private Equity	8.0%	10.9%	26.0%	0.16
Private equity, direct	CA Private Equity	9.0%	11.9%	26.0%	0.20
Private equity, fund of funds	CA Private Equity	7.0%	10.0%	26.0%	0.12

Source: Verus 2026 Capital Market Assumptions. Sharpe ratios computed on geometric returns against 3.7% cash.

Implied inflation from TIPS breakevens

The breakeven is the spread between a nominal Treasury and a TIPS of matched maturity, and it represents the inflation rate at which an investor would be indifferent between the two. It is a market price rather than a forecast, which is precisely what a decade-long hurdle rate requires.

Exhibit 9. Nominal Treasury = TIPS real yield + implied inflation



Source: U.S. Department of the Treasury. As of July 15, 2026. The near-identical readings across all three maturities (2.18%–2.24%) indicate a stable term structure of inflation expectations rather than a near-term distortion.

Findings from the asset class return data

For a five percent nominal target, today's rate environment does most of the work. The thirty-year Treasury yields just over 5% and investment grade corporates sit above 5.2%, so the target is essentially lockable with high-quality fixed income alone. That is a regime change rather than a market call: in 2021 the same conversation would have required significant equity risk to reach the same number.

Equities can beat five percent, but as a distribution rather than as a contract. Vanguard's model puts the U.S. equity median at 5.9% over ten years, barely better than a coin flip against the hurdle, and its fifth percentile is negative at minus 2.6% annualized. Real estate and private markets offer higher expected returns, with core real estate near 7% and private credit in the high sixes to mid sevens, but they carry illiquidity and, in the private sleeve, volatility that appraisal-based pricing understates.

The honest framing for the client is therefore a choice rather than a recommendation: lock the five percent, or pursue upside beyond it, with the right mix determined by liquidity needs and by how much uncertainty the client can live with. Even in the lockable version, diversification remains appropriate. A single-asset portfolio that hits the number is still a concentrated portfolio.

The conversation changes completely if the client means five percent real. TIPS breakevens put expected inflation at roughly 2.2% at both the ten and the thirty year horizons, which makes a 5% real target about 7.2% nominal. Add a 1% advisory fee and the portfolio needs approximately 8.2% gross. Public markets alone cannot reach that hurdle. Vanguard's U.S. equity median is 5.9% and a fully invested 60/40 sits near 6%, leaving a gap of more than 200 basis points that comes entirely from fees and inflation stacked on top of each other rather than from any view about markets.

5% real	+ Inflation 2.2%	+ advisory fee 1%	60/40 portfolio
5.00%	**7.20%**	**8.20%**	**≈ 6.0%**

Closing that gap means going beyond public markets, but the assets that do so are not interchangeable, and treating them as a single bucket is the most common error in this conversation. Infrastructure is the workhorse, with roughly 8.2% expected return and inflation escalators written into the underlying contracts, so it addresses the return gap and the inflation risk simultaneously. Core real estate performs some of both jobs. Private equity and private credit close the gap on pure return, with Verus placing them between 7 and 9%, but they are not inflation hedges. Their premium is compensation for illiquidity and leverage, and their reported volatility is smoothed by appraisal-based pricing in a way that flatters the path without reducing the risk.

As the private sleeve grows, therefore, the binding constraint shifts from market risk to liquidity design. The allocation has to fit inside the client's liquidity budget, meaning known cash needs plus a stress buffer, and a deliberate cash reserve should be held against capital calls and the denominator effect in a drawdown year. The 5% real portfolio is buildable, but only for a client whose balance sheet can afford to lock capital away. For many clients the honest recommendation is to renegotiate the target instead.

05 Why the Next Decade Will Not Look Like the Last One

The S&P 500's long-run annualized return is roughly 8 to 9% in nominal terms, about 6% after inflation. But that average blends regimes. Bull markets deliver well above it and bear markets far below, and the real challenge of long-horizon investing has never been earning a good year. It is sustaining a target return across both halves of the cycle.

This matters now because recent returns have been borrowed, in part, from future ones. Equity returns decompose into two components that behave very differently. The fundamental component, dividends plus earnings growth, runs at roughly 6 to 7% today. The speculative component is the change in what investors are willing to pay per dollar of those earnings. Most of the past few years' outperformance came from the second component, and valuation multiples now sit in their highest decile since 1988.

Multiple expansion is not repeatable indefinitely, and over long horizons its contribution reverts toward zero. That single mechanism, rather than any general pessimism, is why forward-looking models across institutions cluster below the historical average: Vanguard, Goldman Sachs, and JPMorgan all place U.S. equity medians near 6%.

A lower expected-return world changes the job. A 5% real target can no longer rely on market beta alone. It requires deliberately harvesting additional return sources, and it requires managing the path, because a fixed target makes drawdowns expensive and diversification is what keeps a bad cycle from becoming a permanent loss.

Inflation compounds the challenge from the other side. Current readings sit above the central bank target, and with present economic and geopolitical disruption they may remain elevated for some time. The 2.2% breakeven used throughout this document is not a contradiction of that observation; it is a different quantity. The breakeven is what the market charges today to bear inflation risk over the next decade, which is the correct input for a decade-long hurdle, whereas a spot reading describes the last twelve months. The distinction is worth naming because it determines the direction of the error: if the market is underpricing inflation, the true hurdle sits above 8.2% and every conclusion in this document becomes stronger rather than weaker. For a real-return objective, inflation is not background noise. It is a headwind to be priced, which is why the portfolio must include assets whose cash flows carry inflation linkage rather than assets that merely tend to do well when prices rise.

06 Case Study: Ten-Year Allocation Using the Efficient Frontier

The client's request defines the problem: reach a five percent return target while taking the least risk necessary. The efficient frontier is that problem stated formally. For every level of target return it identifies the asset allocation with the minimum achievable volatility, and building it requires three inputs, namely expected returns, standard deviations, and the correlations between asset classes.

All three inputs come from a single source, the Verus 2026 Capital Market Assumptions, and that choice is deliberate. Returns, volatilities, and correlations are estimated jointly within one framework, on the same horizon, with the same cash assumption and the same treatment of private-market smoothing. Mixing sources would combine assumptions that were never designed to coexist, and the internal consistency of the covariance structure matters more to the output than the appeal of any individual number. The Vanguard and Goldman Sachs figures presented earlier are therefore used as cross-checks on the conclusions, not as inputs to the optimization.

Exhibit 10. Correlation assumptions applied in the optimization

	Cash	Tsy	TIPS	Core IG	US LC	US SC	Intl	EM	Pvt cr	Comdty	Core RE	REITs	Infra	Pvt eq
Cash	1.0													
Tsy	0.2	1.0												
TIPS	0.0	0.8	1.0											
Core IG	0.2	0.9	0.8	1.0										
US LC	−0.0	0.2	0.5	0.4	1.0									
US SC	−0.1	0.1	0.4	0.3	0.9	1.0								
Intl LC	−0.0	0.2	0.5	0.4	0.8	0.8	1.0							
EM equities	0.0	0.2	0.4	0.4	0.7	0.6	0.8	1.0						
Private credit	−0.0	−0.1	0.3	0.2	0.6	0.7	0.6	0.6	1.0					
Commodities	−0.1	−0.2	0.2	−0.0	0.4	0.4	0.4	0.5	0.5	1.0				
Core real estate	−0.4	0.0	0.3	0.1	0.3	0.4	0.3	0.3	0.1	0.2	1.0			
REITs	−0.1	0.3	0.6	0.5	0.8	0.8	0.7	0.6	0.6	0.4	0.3	1.0		
Infrastructure	0.0	0.3	0.5	0.4	0.8	0.7	0.8	0.7	0.7	0.5	0.2	0.8	1.0	
Private equity	−0.0	−0.1	0.1	0.1	0.7	0.6	0.5	0.5	0.3	0.3	0.5	0.5	0.5	1.0

Source: Verus 2026 Capital Market Assumptions, ten-year horizon. Matrix transcribed from the published table, verified against the source, and repaired to the nearest positive semi-definite matrix (largest cell adjustment 0.019). Shading: blue intensity for positive correlation, grey for negative.

Correlations do more work in this problem than the return forecasts do, because portfolio variance is driven by the cross terms rather than by the individual variances. The matrix above therefore determines how much diversification is available, and with it what the frontier can achieve at any given level of return. Three features of it shape the results that follow. Core real estate carries the only materially negative correlation to cash, at minus 0.4, which is why it earns a place even in the lowest-risk portfolios. Private credit sits between 0.6 and 0.7 against public equities, so its diversification benefit is real but considerably smaller than the illiquidity premium alone would suggest. And Treasuries, TIPS, and core investment grade cluster between 0.8 and 0.9, which means the fixed income sleeve behaves as a single position rather than as three, and that the diversification available inside it is limited.

Exhibit 11. Ten-year return and risk assumptions

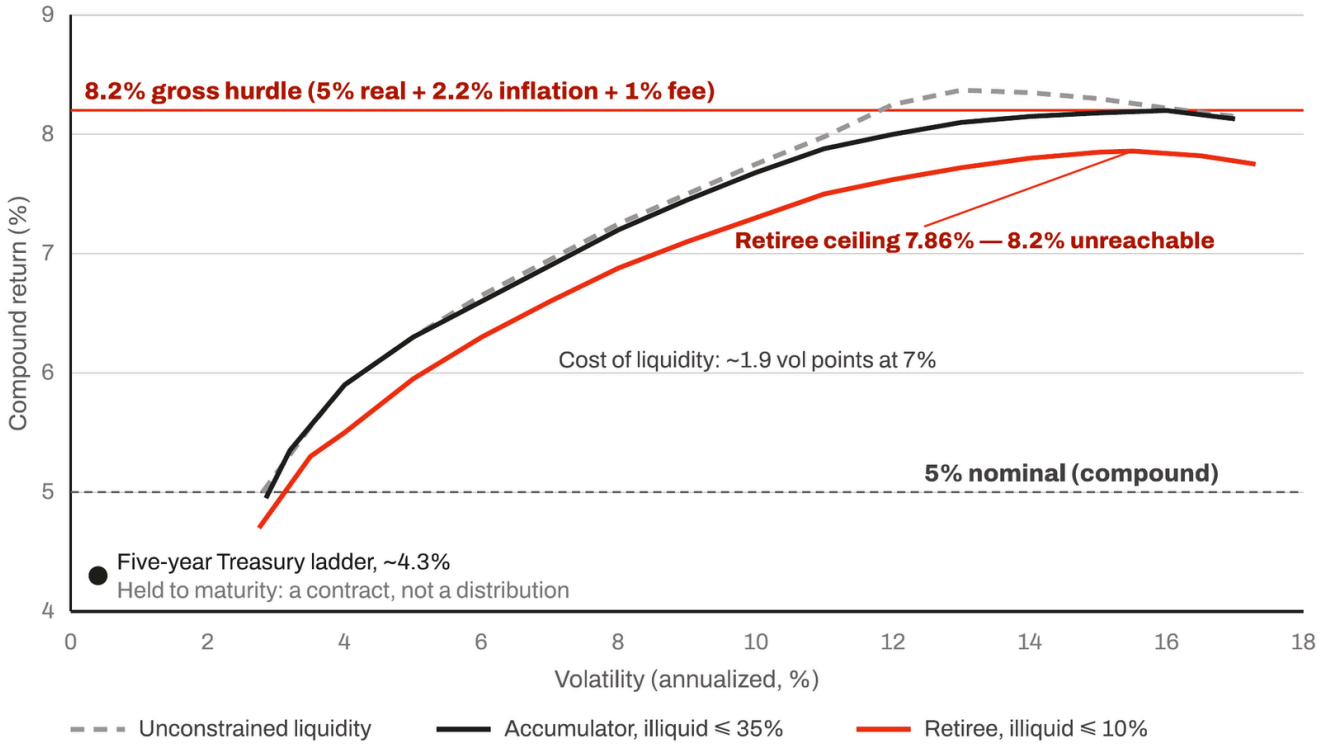
Asset class	Index proxy	Geometric %	Arithmetic %	Std dev %	Sharpe	Liquidity
Cash	30-day T-bills	3.7	3.7	1.1	–	Liquid
Treasuries	Bloomberg Treasury 7–10Y	4.2	4.4	7.1	0.10	Liquid
TIPS	Bloomberg U.S. TIPS 5–10	4.5	4.7	5.5	0.18	Liquid
Core IG	Bloomberg U.S. Aggregate	4.7	4.8	4.9	0.22	Liquid
US large-cap	S&P 500	5.4	6.5	15.5	0.18	Liquid
US small-cap	Russell 2000	6.4	8.4	21.2	0.22	Liquid
Intl large-cap	MSCI EAFE	6.8	8.2	17.4	0.26	Liquid
EM equities	MSCI EM	6.7	9.3	24.2	0.23	Liquid
Private credit	Morningstar LSTA leveraged loans	7.7	8.5	13.3	0.36	**Illiquid**
Commodities	Bloomberg Commodity	6.4	7.7	15.8	0.25	Liquid
Core real estate	NCREIF Property	7.2	7.9	11.7	0.36	**Illiquid**
REITs	FTSE Nareit Equity REITs	7.2	8.8	18.0	0.28	Liquid
Infrastructure	S&P Global Infrastructure	8.2	9.5	16.5	0.35	Liquid
Private equity	CA Private Equity	8.0	10.9	26.0	0.28	**Illiquid**

Source: Verus 2026 Capital Market Assumptions. Arithmetic returns feed the optimizer; geometric returns are shown for compounding. Sharpe ratios computed against 3.7% cash.

Two columns in the table above carry more weight than the return forecasts themselves. The gap between the arithmetic and geometric figures is the volatility drag, and it widens sharply with risk: about 1.1 points for U.S. large-cap equities, but 2.9 points for private equity, which is how a 10.9% arithmetic forecast compounds at 8.0%. Optimizing on arithmetic inputs and reporting compound results is therefore not a technicality but the difference between a frontier that can be compared to the client's hurdle and one that cannot. The liquidity column defines the constraint that separates the three client scenarios: only private credit, core real estate, and private equity are marked illiquid, and the cap on their combined weight is what distinguishes the accumulator from the retiree.

Using these inputs, portfolios are solved with a standard numerical optimizer, SLSQP, with the full constraint specification set out in Appendix A. The frontier is then traced under each client scenario.

Exhibit 12. Constrained efficient frontiers under three liquidity regimes



Optimized on arithmetic inputs and plotted in compound terms. Long-only, per-asset cap 25%, raised to 40% for cash, Treasuries, and core fixed income. As of July 16, 2026.

The ten-year frontier is generated under three client scenarios, each defined by a liquidity constraint and each tested against two hurdle rates.

Unconstrained liquidity	A theoretical baseline with no liquidity requirement, shown as a reference rather than a recommendation. It illustrates what the optimizer would do if no client existed, and its distance from the other two curves is a direct measure of what the client's own circumstances cost them.
Accumulator, illiquid ≤ 35%	A client still in the accumulation phase, with ongoing income and no withdrawals. The balance sheet can afford to lock capital through multi-year commitments, so a larger illiquid sleeve is acceptable in exchange for higher expected return.
Retiree, illiquid ≤ 10%	A client drawing regular income from the portfolio. The constraint is derived from the balance sheet rather than from preference: known withdrawal needs plus a stress buffer determine what must stay liquid, and the illiquidity budget is whatever remains.

The two hurdle rates are 5% nominal, the client's stated target, and 8.2% gross, which is what a 5% real target becomes after adding 2.2% expected inflation and a 1% advisory fee. The liquidity percentages are illustrative. In practice each budget would be set from the individual client's cash-flow schedule and stress tolerance, which is precisely the conversation this framework is designed to support.

07 Findings from the Efficient Frontier Analysis

At the 5% nominal hurdle, all three liquidity scenarios clear the target easily and cheaply. The minimum-risk five percent portfolio carries roughly 3.2% volatility, dominated by cash, core investment grade bonds, and a modest sleeve of real assets. In today's rate environment five percent nominal is not a difficult target, and the interesting question is how little risk it requires rather than whether it can be reached at all.

A five-year Treasury ladder held to maturity is worth examining alongside the optimized portfolio, because it isolates what the frontier is actually selling. The ladder delivers a contract rather than a distribution: no mark-to-market path, no sequence risk, and a known cash flow on a known date. What it does not deliver is five percent. The five-year yield is 4.319%, which leaves the ladder roughly 70 basis points short of the target, and those basis points cannot be conjured. They have to be bought in one of two currencies. Duration buys them, by extending to the thirty-year at 5.09% and accepting three decades of price volatility along the way. Credit buys them, by moving into investment grade corporates at 5.2% and accepting spread and default risk. The optimized 3.2% volatility portfolio is simply the efficient combination of those two purchases. Certainty has a price in this market, and at the five-year point that price is about 70 basis points.

At the 8.2% gross hurdle the picture inverts. The unconstrained frontier reaches it at about 11.6% volatility. The accumulator, capped at 35% illiquid, touches the hurdle only at the very tip of its frontier, near 16% volatility, with no margin to spare. The retiree, capped at 10% illiquid, cannot reach it at all: that frontier peaks at 7.86% compound, thirty-four basis points short. For that client the honest conversation is not about allocation but about the target itself.

> **THIRTY-FOUR BASIS POINTS UNDERSTATES THE PROBLEM**
>
> To come within thirty-four basis points, the optimizer had to hold 22.2% emerging market equities, 25% REITs, 25% infrastructure, 10% private equity, and 17.8% commodities, with no fixed income at all, running at 15.7% volatility. That is a portfolio appropriate to a client with no near-term liabilities, and it is being proposed for a client drawing income every quarter. Set the shortfall aside entirely and no advisor would recommend it. The real distance between this client and a 5% real target is therefore not thirty-four basis points but the whole space between that portfolio and one they could actually hold.

Exhibit 13. Six portfolios along the frontier (weights, %)

	Reaching 5% nominal: three routes			Capacity limit: ceiling portfolios		Reaching 8.2%
	Least-cost 5% (retiree, full menu)	Least-cost 5% (stocks & bonds only)	Max Sharpe (retiree)	Retiree ceiling	Traditional-only ceiling	8.2% gross (accumulator)
FIXED INCOME						
Cash	**40.0**	**35.4**	**40.0**	–	–	–
Core investment grade	**37.9**	**40.0**	**33.5**	–	**23.5**	–
PUBLIC EQUITIES						
U.S. large-cap	–	–	–	–	1.5	–
U.S. small-cap	–	5.3	–	–	**25.0**	–
Intl large-cap	–	**15.2**	–	–	**25.0**	–
EM equities	–	4.0	–	**22.2**	**25.0**	12.3
REAL ASSETS & PRIVATES						
Private credit	–	–	–	–	–	9.7
Commodities	7.7	–	8.2	**17.8**	–	2.7
Core real estate	9.8	–	10.0	–	–	–
REITs	–	–	–	**25.0**	–	**25.0**
Infrastructure	4.4	–	8.4	**25.0**	–	**25.0**
Private equity	–	–	–	10.0	–	**25.0**
Compound return %	**5.05**	**5.15**	**5.24**	**7.86**	**6.60**	**8.20**
Volatility %	3.2	5.5	3.6	**15.7**	**14.9**	**16.1**
Sharpe (arithmetic)	0.44	0.29	**0.45**	0.34	0.27	0.36
Illiquid share %	10	0	10	10	0	35



Weights in percent. Shading tracks weight; solid green marks the portfolio that clears the 8.2% gross hurdle and light orange the 7.86% near miss. Source: Verus 2026 Capital Market Assumptions; author's optimization. Long-only, per-asset cap 25% (40% for cash, Treasuries, core fixed income). As of July 16, 2026.

The allocations tell the same story from the inside. Low-hurdle portfolios rest on fixed income, roughly 40% cash and 35 to 40% core investment grade, supplemented by commodities and core real estate. As the hurdle rises the composition rotates: private equity and private credit enter in size, real assets scale up, and traditional fixed income falls away entirely in the 8.2% portfolio. Fixed income does survive in the traditional-only ceiling portfolio, but that portfolio tops out at 6.60%, well short of the real-return requirement.

I In the current rate environment a five percent nominal target is achievable through multiple routes, and a fixed income core with a real-asset sleeve is the recommended construction, delivering the target at the lowest volatility available on the frontier.

II Once inflation and fees are counted, private investments shift from optional to structural for a 5% real objective. But the requirement runs through the client's balance sheet rather than through their risk appetite. The illiquid allocation must fit inside a liquidity budget derived from known cash needs plus a stress buffer, and for clients whose budget cannot stretch that far, the recommendation is to renegotiate the target rather than to force the allocation.

08 Limitations

Three simplifications deserve note, and each points toward the layer of analysis that would resolve it.

First, the optimization compresses each asset class into a single expected return, discarding the full distribution around it. Vanguard's own projections put the fifth to ninety-fifth percentile range for U.S. equities at roughly minus 2.6% to plus 15.1% annualized. In a strong decade a traditional portfolio may well clear even the real hurdle, and in a weak one nothing here clears five percent nominal. Pricing that uncertainty is the role of a simulation layer reporting probability of success rather than point estimates, which is the natural next step on top of this frontier.

Second, the analysis is tax-blind, and tax is not a rounding error at this level of wealth. The client's marginal rate and account structure determine the effective hurdle and can materially reshape the fixed income core. At a 37% marginal rate the 3.05% AAA municipal yield shown earlier is a 4.84% taxable equivalent, potentially displacing corporate credit from the portfolio entirely. Tax optimization sits downstream of this document's scope, as flagged under tax status in the discussion of client characteristics above, but it is capable of moving the answer more than several of the allocation decisions above.

Third, the frontier is a single-period snapshot, while a ten to thirty year engagement is a path. Rebalancing policy, glide paths, and the discipline required to resist the well-documented temptation to add risk when a goal falls behind all belong to a dynamic layer that recent research has developed and that this framework is built to support.

Appendix A: Optimization Specification

Problem. For each target return t, the portfolio minimizes variance $w'\Sigma w$ subject to four constraints: full investment, $\sum w_i = 1$; the expected arithmetic return pinned at the target, $w'\mu = t$; the illiquid allocation, comprising private credit, core real estate, and private equity, capped at the client's liquidity budget, being 35% for the accumulator, 10% for the retiree, and unconstrained for the theoretical baseline; and long-only positions with per-asset caps of 25%, raised to 40% for cash, Treasuries, and core fixed income. The frontier is traced by re-solving across arithmetic targets from 4.3% to 9.6% in 20 basis point steps. The traditional-only comparison restricts the investable set to cash, Treasuries, TIPS, core investment grade, and public equities under the same mechanics.

Solver. The problem is solved numerically with SLSQP, a sequential quadratic programming method (Kraft, 1988) as implemented in SciPy. Closed-form Markowitz solutions exist only when short selling is unrestricted and position limits are absent; the inequality constraints present here, namely the liquidity budget and the per-asset caps, make numerical solution necessary. Because the method is a local optimizer, each problem is solved from three fixed random starting points and the lowest-variance solution is retained, which also makes every figure in this document exactly reproducible.

Inputs and hygiene. Expected returns enter in arithmetic terms, following the Verus methodology note that arithmetic forecasts are the correct optimization inputs. Results are converted to compound terms at the portfolio level, $g \approx \mu - \frac{\sigma^2}{2}$, for comparison against the client's hurdles, which are compounding concepts. The correlation matrix was transcribed from the published Verus table, verified against the source, and repaired to the nearest positive semi-definite matrix; the largest resulting cell adjustment was 0.019, consistent with rounding in the published figures. Input consistency was verified with the identity arithmetic minus geometric $\approx \frac{\sigma^2}{2}$ across all fourteen asset classes.

Limitations of the machinery. Three caveats apply to any allocation shown. Reported private-market volatilities, though de-smoothed by the data provider, may still understate true risk, particularly for core real estate. The covariance matrix describes a single correlation regime, so assets that earn their allocation in stress regimes, such as Treasuries in growth shocks and TIPS in inflation shocks, are structurally underweighted by the optimizer and re-enter by judgment. And cash's low measured volatility reflects monthly stability rather than certainty about its ten-year return path, which is why maturity-matched ladders substitute for cash in practice. Allocations shown are illustrative model output, not client recommendations.

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Research, modelling, and analysis are the author's own. Allocations shown are illustrative model output, not recommendations for any particular client.

DISCLOSURES

This report was prepared by Sonny Xi for informational purposes only and does not constitute investment advice or a recommendation to buy or sell any security. Estimates are based on the author's model as of July 16, 2026, and may change without notice.

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- Meta Platforms, Inc. (META): equity research report, October 2026
- CME Group Inc. (CME): equity research report, October 2026
- Amazon.com, Inc. (AMZN): equity research report, October 2026
- The Ensign Group (ENSG): sell recommendation
- H2 2026 Macro Outlook
- VAR macro forecasting model
- Constructing a Portfolio for a Five Percent Return Objective (this report)

ANALYST CERTIFICATION

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