Defined Duration® Investing

How Matching Assets to Liabilities Across Time Can Improve Financial Plans and Investor Behavior

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ABSTRACT

Most portfolios get built from the asset side. You pick a risk tolerance, optimize for expected return and hope the plan works out. This paper flips that around. We put a time horizon on assets that don't come with one by measuring how long it would take to recover from a severe loss at the asset's expected real return. We call that its Defined Duration. Once every asset has a duration, an advisor can match assets to a client's liabilities across every time horizon, the same way pensions and banks run asset-liability management. We think this helps investors understand why they own what they own, trade less and stick with their plans when markets get ugly. This revision adds a formal methodology, current estimates as of October 2026, a historical check using post-war data and a fully worked case study.

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1. Introduction and Literature Review

This research builds on earlier work on asset class duration and asset-liability matching. Our aim is to turn those ideas into something a financial advisor can actually use with clients.

Leibowitz (1986) popularized the idea of equity duration, treating stocks like bonds and measuring their sensitivity to interest rates. That approach never held up well in practice. A 2005 review in *Investment & Pensions Europe* questioned whether equity duration was a workable concept at all, and Asness (2022) showed that the rate sensitivity of equity factors like value is far less reliable than people assume. Our own work landed in the same place. Interest rate sensitivity just isn't stable enough to build a financial plan around.

So we use a different definition. Bernstein (1999) described the duration of stocks as the point where an investor becomes indifferent to a decline once future returns are accounted for. We build on that. Instead of measuring sensitivity to rates, we measure the size of a severe loss and how long it takes to recover from it in real terms. That recovery period is the investor's point of indifference. It borrows from Kahneman and Tversky (1979), since loss aversion is exactly what pushes investors out of assets before their time horizon is up.

Once each asset has a duration we can apply asset-liability matching (ALM) inside a financial plan, similar to Horan and Johnson (2014) and Wilcox, Horvitz and diBartolomeo (2006). As Horan and Johnson note, ALM differs from mean-variance optimization because it matches specific assets to specific liabilities across time.

What makes this approach different is where it starts. Instead of optimizing around the returns a client wants, it starts with the liabilities the client needs to meet. It's a planning first approach that gives a sensible time horizon to assets that don't have a maturity date.

2. The Investor's Intertemporal Problem

Benjamin Graham wrote that "the investor's chief problem, and even his worst enemy, is likely to be himself" (Graham, 1973). That's true, but we'd add that time is a big part of the problem. French (2022) defines risk as "uncertainty about lifetime consumption." Our spending needs change over time and we can't predict them with much precision. So asset-liability management is really a timing problem. We're trying to have the right amount of money available at the right points in life, and when assets and liabilities fall out of sync, behavioral biases creep in and put the plan at risk.

No One Ever Panic Sold a 3-Month T-Bill[1]

Someone who buys a 3-month T-bill yielding 5% knows everything they need to know to stay calm about it. They know the time horizon. They know the income. They know the credit risk.

The odds of panic selling an asset come down to how certain you are about it. A T-bill buyer who needs 4% income over the next three months has matched an asset to a liability. There's nothing to panic about because they know exactly how long the money is tied up and what it will be worth at the end.

Most assets don't offer that kind of precision. But we think a reasonable estimate of duration can give investors something close to that clarity across every asset class, and clarity leads to better behavior and more durable plans.

3. The Arithmetic of Asset-Liability Matching

Investors too often treat long-term assets like short-term investments. That drives up taxes, fees and behavioral mistakes. Matching each asset to the right time horizon cuts those frictions down.

Sharpe (1991) showed that before costs, the average actively managed dollar must earn the same return as the average passively managed dollar, because together they are the market. After costs, active has to lose. We think the same logic applies across time. In a perfectly efficient world, investors would hold every asset for its full life. A 10-year Treasury buyer would hold for 10 years and a 1-year T-bill buyer would hold for one year. Investors don't do this, partly because their liabilities are unpredictable and partly because many assets, like stocks, have no maturity date at all.

Investors also hold assets for the wrong time horizons for behavioral reasons. Stocks are long-term instruments, but people trade them like short-term ones, and in aggregate that activity can only lower returns. It isn't always irrational though. Some activity is unavoidable when you're trying to meet uncertain liabilities.

Here is our temporal version of Sharpe's Arithmetic:

> ***The average investor who holds an asset for its full duration will earn a higher return after taxes and costs than the average investor who trades that asset trying to make it earn more than it was designed to earn.***

The average holder of a 3-month T-bill can't trade it into earning more than its yield. In aggregate, everyone who trades that T-bill earns its yield before costs, no matter how cleverly some of them time it. The same is true of every asset. The hard part is figuring out the right holding period for assets that don't come with one. Investors who get that right also get a behavioral benefit, since they're less exposed to fear-based selling and FOMO-based buying.[2]

4. Defined Duration and the Point of Indifference

In a 1977 *Fortune* article Warren Buffett argued that "stocks, in economic substance, are really very similar to bonds." His point was that corporate America's return on equity kept coming back to about 12% year after year, so owning stocks was a lot like owning a perpetual bond with a sticky coupon (Buffett, 1977).

We take that analogy a step further. If stocks are long bonds with no maturity date, we should be able to estimate a duration for them. Not duration in the textbook sense of interest rate sensitivity, but a practical version. How long does an investor need to hold an asset before they can be reasonably confident they'll be made whole after a bad outcome?

That's the point of indifference. Loss aversion tells us investors care most about one question. If I take a big hit tomorrow, how long until I'm back to even in real terms? Inside that window a loss is a real risk to the plan. Beyond it, short-term losses shouldn't matter much at all.

5. Methodology

The Defined Duration of an asset is the number of years it would take to recover from a stress scenario loss, compounding at the asset's expected real return:

$$\text{Defined Duration} = \ln[\, 1 \div (1 - L) \,] \div \ln(\, 1 + r \,)$$

L is the stress loss and r is the expected real return

The logic is simple. A bigger potential loss or a lower expected return means a longer duration. We estimate the two inputs a little differently depending on the asset.

- **Equities.** We assume a 50% stress loss, which is close to the worst post-war real drawdown for US stocks (see Table 2). The expected real return is the cyclically adjusted earnings yield, or 1 divided by CAPE. Higher valuations mean lower expected returns and longer durations.
- **Bonds.** We assume a 200 basis point rise in rates, which produces a loss of roughly twice the bond's modified duration. The bond recovers that loss at its real yield. We use the TIPS yield of similar maturity, or the nominal yield minus 5-year breakeven inflation where there's no TIPS benchmark.
- **Blends.** A portfolio's Defined Duration is the weighted average of its parts. A 60/40 mix of global stocks and 5-year Treasuries comes out to about 0.6 × 20.5 + 0.4 × 3.9 = 13.9 years.
- **Assets without cash flows.** Gold, commodities and most alternatives don't produce cash flows, so there's no yield or earnings stream to recover a loss with. We don't give them a forward Defined Duration. We treat them as portfolio insurance that sits outside the core buckets and use history to show how long their slumps have lasted.

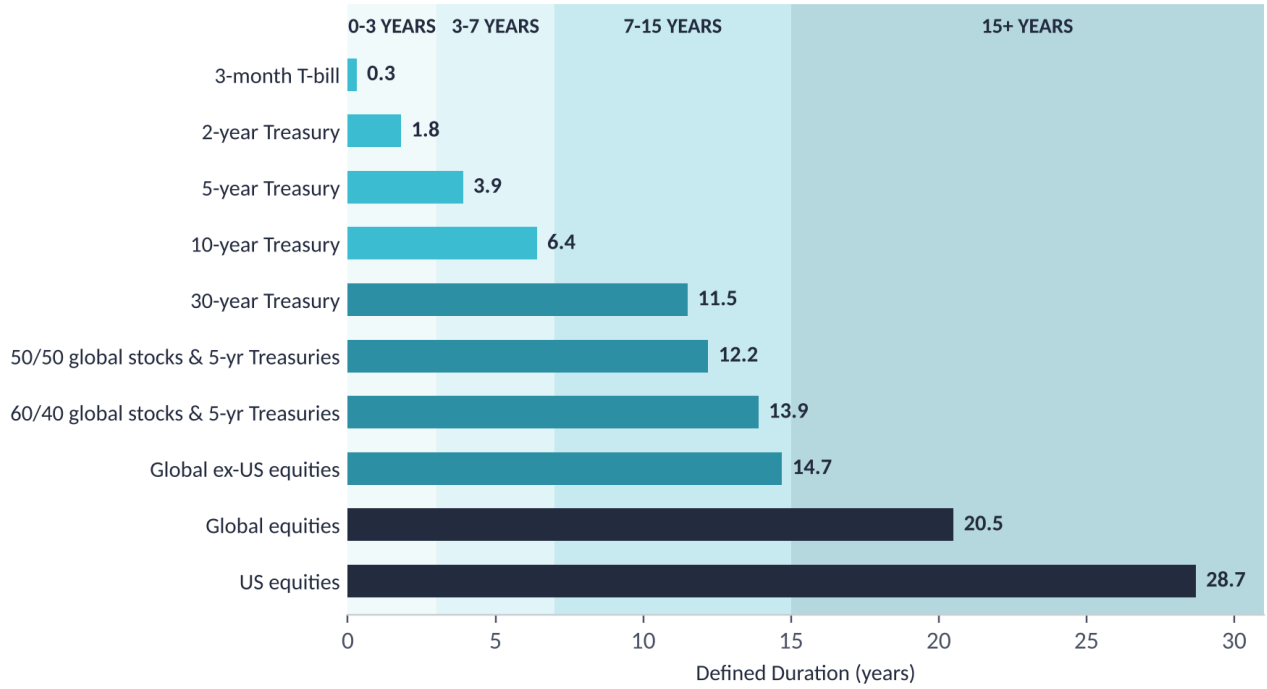
Table 1 and Figure 1 show our estimates as of late October 2026. These numbers move with markets. When stocks get more expensive their duration gets longer, and when bond yields rise bond durations get shorter. That's a feature, not a bug. It tells the investor the asset's time horizon has changed.

Table 1. Current Defined Duration estimates

Asset	Stress loss	Expected real return	Defined Duration (years)	Bucket
3-month T-bill	0.5%	1.5%	0.3	0-3
2-year Treasury	3.8%	2.2%	1.8	0-3
5-year Treasury	8.8%	2.4%	3.9	3-7
10-year Treasury	15.6%	2.7%	6.4	3-7
30-year Treasury	29.6%	3.1%	11.5	7-15
50/50 global stocks and 5-year Treasuries	Blend	Blend	12.2	7-15
60/40 global stocks and 5-year Treasuries	Blend	Blend	13.9	7-15
Global ex-US equities (CAPE 20.8)	50%	4.8%	14.7	7-15
Global equities (CAPE 29.1)	50%	3.4%	20.5	15+
US equities (CAPE 40.9)	50%	2.4%	28.7	15+

Sources: Treasury and TIPS yields and breakeven inflation from the Federal Reserve Bank of St. Louis (FRED series DTB3, DGS2, DGS5, DGS10, DGS30, DFII5, DFII10, DFII30 and T5YIE), October 28, 2026. US CAPE from multpl.com, October 29, 2026. Global and global ex-US CAPE from Siblis Research, September 30, 2026. Calculations by Discipline Funds.

Figure 1. Defined Duration by asset, October 2026



Source: Table 1.

6. What History Says

Forward estimates are only useful if they square reasonably well with what has actually happened. Table 2 runs the same math on US data from 1946 through 2025, all after inflation. It shows each asset's worst real drawdown, its real annual return, the duration our formula implies from those two numbers, and the longest stretch it actually spent below a prior real peak.

Table 2. Post-war real drawdowns and recovery times

Asset (1946-2025)	Worst real drawdown	Real annual return	Implied Defined Duration	Longest stretch under water (years)
3-month T-bills	-27.2%	0.2%	131	39
10-year Treasury	-47.5%	1.1%	58	40
Baa corporate bonds	-30.1%	2.9%	13	16
60/40 S&P 500 and 10-year Treasury	-35.2%	5.2%	8.5	12
S&P 500	-48.0%	7.3%	9.2	13
US small caps (bottom decile)	-80.6%	7.5%	23	13
US home prices	-34.6%	1.2%	37	23
Gold	-77.1%	2.5%	61	30

Source: Damodaran (2026), annual year-end returns, 1928-2025 dataset updated January 2026, deflated by CPI. The 60/40 portfolio is rebalanced annually. Calculations by Discipline Funds. Annual data understate intra-year declines.

A few things jump out.

Cash is only safe in nominal terms. Post-war T-bills lost 27% of their purchasing power at the worst point and spent 39 years below their prior real peak, most of it during the inflationary decades after World War II. Ten-year Treasuries were even worse. This is exactly why cash and short bonds belong at the front of the plan. They're great at delivering a known number of dollars soon. They're a poor way to fund real spending decades from now.

Stocks have been more reliable over long periods than their volatility suggests. The S&P 500's worst real drawdown was 48% and its longest stretch under water was 13 years. That's painful, but it's finite. Our forward estimates in Table 1 are longer than the historical numbers because today's valuations imply lower returns than the 7.3% real return stocks actually delivered. We'd rather plan on the conservative number.

Assets without cash flows can stay down for a very long time. Gold spent three decades below its prior real peak. That doesn't make it useless. It does mean it shouldn't be counted on to fund a specific liability, which is why we treat it as insurance.

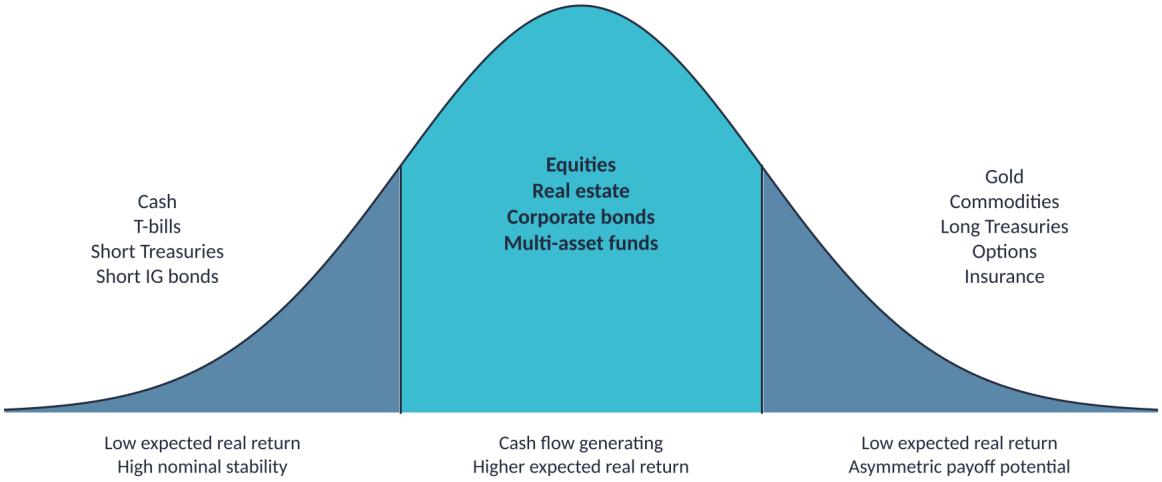
Table 2 also shows the limits of any single measure. Annual data hides intra-year declines, so true peak-to-trough losses were bigger. And the post-war period was one of the best stretches for US stocks on record. We use forward estimates for planning and history as a sanity check.

7. The Asset Class Paradox

Good financial planning is about maximizing certainty around future cash flows. The problem is that the assets with the most short-term certainty tend to have the worst long-term real returns, and the assets with the best long-term real returns can produce big losses in the short run. Defined Duration resolves that paradox by putting each asset in the time horizon where its strengths matter and its weaknesses don't.

It helps to picture asset allocation as a bell curve (Figure 2). The middle holds the cash flow generating assets with higher expected real returns, like stocks, real estate, corporate bonds and multi-asset funds. The tails hold smaller amounts of assets that offer either extreme nominal stability or the potential for big payoffs in specific environments.

Figure 2. The Defined Duration bell curve



Cash sits in the left tail. It offers nominal certainty and, as Table 2 shows, very little real certainty. Insurance sits in the right tail. The premiums are a steady negative cash flow, but the payoff can be large in exactly the scenario it's designed for. Gold, commodities, long Treasuries and options behave in a similar way. They tend to deliver low or unstable real returns most of the time, with the potential for big gains in specific environments like deflation for long Treasuries or inflation for commodities.

A Defined Duration plan can hold many of these instruments, a lot like an All Weather style strategy, but with the client's own timeline as the foundation. The curve should be shaped to the person. A retiree may need fatter tails for short-term certainty and insurance. A young saver can usually get away with thinner tails.

Banks and pension funds have used ALM to manage their balance sheets for decades. We think it works just as well at the retail level, and it helps settle a long running conflict between planners and investment managers. Managers often charge high fees chasing market-beating returns while planners are trying to keep clients disciplined and on track. When a manager takes risks that don't fit the client's timeline, the client inherits uncertainty they never signed up for. Matching strategies to time horizons takes most of that

conflict off the table.

8. Four Ways to Change a Portfolio's Duration

From a planning perspective there are four main levers for changing a portfolio's average duration:

- **Diversification.** Blending assets with different durations gives you a weighted average. Adding bonds to a stock portfolio shortens its duration. Adding stocks to a bond portfolio lengthens it.
- **Rebalancing.** Selling long duration assets after they've run up and buying shorter ones shortens the portfolio. Doing the reverse after a selloff lengthens it.
- **Income.** Near-term cash flows like coupons, dividends, Social Security or a pension cover near-term spending, which means less of the portfolio has to sit in short duration assets.
- **Insurance.** An asymmetric payoff in a specific bad scenario provides money during a stretch when long duration assets may be under water, which effectively shortens the plan's duration.

9. Diversification as a Temporal Tool

We usually think of diversification as a return tool. From a planning perspective, diversifying across time horizons matters just as much. Multi-asset funds blend durations into something in between, which makes them useful for the middle of a plan.

Here's a hypothetical. Assume T-bills return 3%, a 10-year Treasury yields 4% and stocks return 8% over the next decade. A mix of 60% T-bills and 40% global stocks would be expected to return 5% a year, with a Defined Duration of about 8.4 years using Table 1 ($0.6 \times 0.3 + 0.4 \times 20.5$). A 10-year Treasury has a duration of about 6.4 years and an expected return of 4%. The blend adds about two years of duration and a full point of expected return.

That trade isn't always on the table though. As of late October 2026, 3-month T-bills yield about 4.0%, the 10-year Treasury yields about 5.05% and US stocks trade at a CAPE above 40. Under those conditions the bond looks better than the blend. The method doesn't tell you what to buy. It tells you what you're trading off.

10. Bundled vs. Unbundled Portfolios

Take a simple example. Mr. and Mrs. Smith are a moderately conservative couple, age 55, planning to retire at 65 with a 4% withdrawal rate. If we assume bonds return 4% and stocks return 8% over the long run, a 50/50 portfolio should earn about 6%, comfortably above what they need to withdraw.

They could just buy a single 50/50 fund. Using Table 1, that fund has a Defined Duration of roughly 12 years, which lines up reasonably well with their average need. But it bundles everything into one pool with one moderately long duration. When markets fall, every dollar they spend comes out of that pool, and they end up selling stocks, bonds and cash together when all they really needed was the cash.

2022 is a good example. Stocks and 10-year Treasuries both fell about 18% that year while inflation ran 6.5% (Damodaran, 2026). A 60/40 investor drawing income had nowhere to hide inside the fund. Even in

normal years a bundled fund feels riskier than it is. Stocks drive more than 90% of a 60/40 portfolio's volatility (Dravid, 2018), so a "balanced" fund often feels a lot like a stock fund.

The alternative is to unbundle. Keep the same broad diversification, but split it into a handful of low cost pieces with durations you can see and match to specific liabilities. That gives the investor something closer to a bond ladder, except we're laddering durations across every asset class.

Kitces (2014) showed that bucket strategies and total return rebalancing produce similar results once the buckets are refilled systematically, and noted that the real value of buckets may be psychological. We agree and would go a step further. When each piece of a portfolio has a tangible duration tied to a real liability, the investor can see that the next several years of spending are safe even when stocks are down 30%. That visibility is what keeps people from doing something dumb at the worst possible time.

There's good evidence that behavior matters here. Morningstar's 2026 *Mind the Gap* study found that the average fund investor earned 1.2 percentage points a year less than their funds over the 10 years ended 2025 because of poorly timed buying and selling. The gap for allocation funds was smaller, about 0.7 points (Morningstar, 2026). Simpler portfolios seem to help people behave better. We think tying every piece of a portfolio to a specific time horizon can push that further.

11. Practical Implications for Financial Advisors

Traditional asset allocation starts with return optimization. Defined Duration starts with the plan. The advisor quantifies the client's liabilities across time, prices them, and then matches assets to them. That process does a few things:

- It gives every holding a clear time horizon and a clear job.
- It gives clients more certainty about why they own what they own.
- It improves after-tax, after-fee returns by cutting unnecessary activity.
- It improves behavior by making near-term safety visible.
- It lines up the advisor's long-term goals with the client's, which helps retention.

In practice we use four core buckets: 0-3 years, 3-7 years, 7-15 years and 15+ years, with alternatives as an optional fifth bucket for portfolio insurance. We price each bucket's liabilities using real Treasury yields, fund the near-term buckets to those values and let the surplus flow to the longest bucket. Each bucket should usually hold at least 10% of the portfolio so no part of the timeline is left exposed to sequence risk.

12. Limitations

- **The inputs are estimates.** CAPE-based returns and a 50% stress loss are reasonable, but neither is precise. Different assumptions give different durations.
- **A stress loss is one scenario.** Real losses unfold over time and the path matters, especially for someone who's withdrawing.
- **Durations change.** Rising valuations lengthen equity durations and falling yields lengthen bond durations, so the buckets need periodic review.

- **History is one path.** The post-war US was an unusually good period for American stocks.
- **Assets without cash flows don't fit the formula.** For gold, commodities and most alternatives we only have their historical record.

None of this breaks the framework. It just means Defined Duration is a planning tool, not a guarantee.

13. Conclusion

Time in the market matters more than timing the market. But every investor has to time the market in one sense, because they have bills that come due at specific points in their lives. Defined Duration puts a time horizon on every asset, including the ones that don't come with one. That lets advisors build portfolios from the liabilities out instead of from expected returns in, and it gives investors a portfolio they can understand and stick with. We think that's where a lot of the real value in financial advice comes from.

If you'd like to learn more about Discipline Funds and Defined Duration investing, please contact the authors at cullenroche@disciplinefunds.com and ericafries@disciplinefunds.com.

Appendix: A Case Study in Defined Duration Investing

Mr. and Mrs. Drewl are both 60 and working full time. They plan to retire at 63. Mr. Drewl was recently diagnosed with a degenerative neurological condition, which creates real uncertainty around his life expectancy and future care costs. Mrs. Drewl is healthy and is planning for a life expectancy of 90. Their goals are to maintain their standard of living, maximize certainty and hopefully leave something for their two children, ages 20 and 25.

The Drewls at a glance	
Portfolio	$900,000 IRA, 50/50 stocks and bonds across 30 individual stocks, 5 domestic equity mutual funds and 5 bond mutual funds and closed-end funds, mostly high cost[3]
Cash	$100,000 in a bank account earning nothing
Saving until retirement	$10,000 a year
Retirement spending	$75,000 a year
Retirement income	$50,000 a year from Social Security and a pension
Housing	Downsizing at retirement, $100,000 for a down payment and moving costs in year 4

The Drewls have a long horizon. Mrs. Drewl could easily live another 30 years. But their risk is front-loaded. Retirement, a home purchase and Mr. Drewl's health all land in the next several years. Their previous advisor built an expensive, complicated portfolio that doesn't show them how any of their assets line up with any of that. Worse, the high fees were sold as the price of beating the market. The new advisor starts with the liabilities.

Step 1: Quantify the liabilities

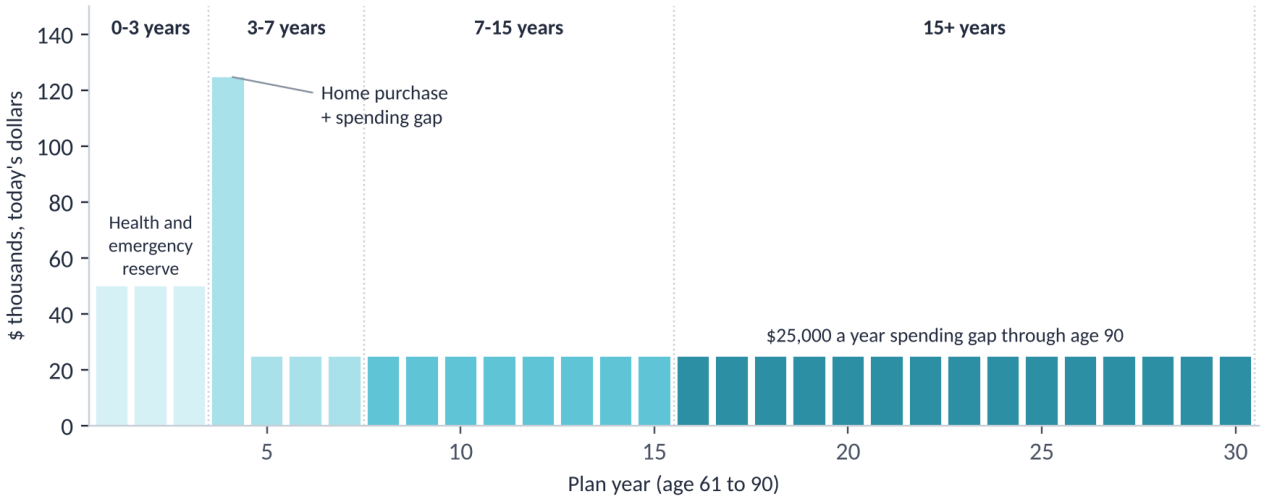
The advisor maps out what the Drewls will need and when, in today's dollars, and prices each year's need off the TIPS curve. Once they retire, the gap between spending and income is $25,000 a year.

Table A1. The Drewls' liabilities

Bucket	What it covers	Amount	Present value
0-3 years	Health and emergency reserve, two years of spending	$150,000	$150,000
3-7 years	Home purchase in year 4 plus the spending gap in years 4-7	$200,000	$179,600
7-15 years	Spending gap in years 8-15	$200,000	$147,500
15+ years	Spending gap in years 16-30	$375,000	$193,500
Total		**$925,000**	**$670,600**

Present values discount each year's need at the TIPS real yield curve on October 28, 2026 (FRED series DFII5, DFII10 and DFII30, interpolated). The reserve is held today and isn't discounted.

Figure A1. Liability timeline



Step 2: Measure the funded status

With $1,000,000 in assets against $670,600 in liabilities, the Drewls are about 149% funded. That's a strong position. They don't need to take much risk to meet the plan, and they have roughly $330,000 of surplus that can go toward long-term growth and their legacy goal. Their $10,000 a year of savings before retirement is extra cushion.

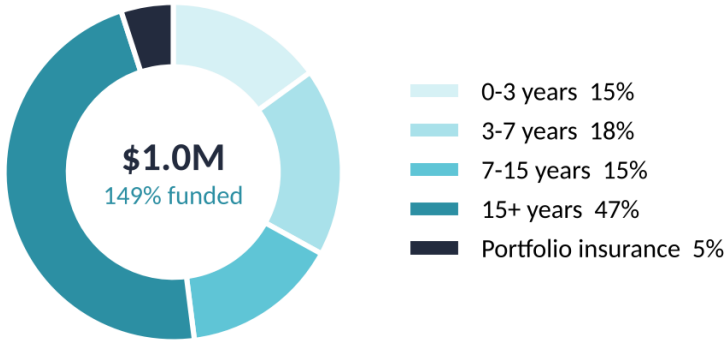
Step 3: Match assets to liabilities

Table A2. The Drewls' Defined Duration allocation

Bucket	Allocation	Amount	Instruments	Defined Duration
0-3 years	15%	$150,000	T-bill ladder out to three years	Under 2
3-7 years	18%	$180,000	Short and intermediate Treasuries and TIPS	About 4
7-15 years	15%	$150,000	Low cost balanced multi-asset fund	10 to 14
15+ years	47%	$470,000	Global equities with a value tilt	15 to 20
Portfolio insurance	5%	$50,000	Gold or trend following, optional	n/a

Bucket amounts are present values rounded, with the surplus assigned to the 15+ year bucket.

Figure A2. Allocation by bucket



A few details matter here.

- **Account location.** The $100,000 in taxable savings pays for the house. Pulling that money out of the IRA instead would create a big taxable distribution in a single year. The IRA funds everything else.
- **The short end.** A T-bill ladder that runs out to three years, rather than three to nine months, actually covers the 0-3 year bucket. TIPS in the 3-7 year bucket protect the spending gap from inflation.
- **Health risk.** Given Mr. Drewl's diagnosis, new life or long-term care insurance is probably unavailable or very expensive. The plan self-insures instead, through the 0-3 year reserve and the surplus.
- **Minimums.** Every core bucket holds at least 10% of the portfolio.

Using current yields and valuations, the portfolio should earn something like 5% a year in nominal terms, or about 2.5% to 3% after inflation.[4] That's an estimate, not a promise. But it sits comfortably above the 2.4% to 3.1% real yields used to price their liabilities, and they're already overfunded.

The result is a much simpler portfolio. The Drewls go from more than 40 holdings to fewer than 10, with lower fees, better tax efficiency and better cash management. More importantly, they can look at their accounts and see which money pays for the house, which money covers the next few years and which money is meant to sit for decades. When stocks fall, they'll know the next several years are covered. That's what keeps a plan intact.

It's simpler for the advisor too. Less time goes into portfolio construction and more goes into the planning, tax and estate work that clients actually value and that deserves the attention.

This example is simplified. Real plans need full cash flow modeling, tax projections and regular review.

Notes

1. We can't prove that no one has ever panic sold a T-bill. After the speculative frenzy of the last few years, we can't prove much of anything in finance.

2. FOMO, or fear of missing out, is the bias of buying high because everyone else seems to be making money.

3. We define high cost as annual fund expenses above 1%.

4. Estimate uses the October 28, 2026 3-month T-bill yield (4.0%) for the 0-3 year bucket, the 5-year Treasury yield (4.85%) for the 3-7 year bucket, a 50/50 blend for the 7-15 year bucket, global equities at their CAPE earnings yield (3.4%) plus 10-year breakeven inflation (2.35%) for the 15+ year bucket, and inflation for the insurance sleeve. Sources: FRED and Siblis Research.

Important Disclosures

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