

Defined Duration Investing

How Investors Can Improve Financial Planning Needs and Portfolio Performance by
Implementing a Defined Duration Asset Allocation Strategy

September 2023

ABSTRACT

The goal of this paper is to provide a framework for understanding the appropriate time horizons for certain asset classes by quantifying their specific duration. We then use that duration framework to apply an asset-liability matching methodology across all time horizons with the goal of helping financial planners and investors implement more behaviorally robust and planning-based investment portfolios. This “Defined Duration” approach enhances behavioral alpha by giving investors more certainty in their portfolio across specific time horizons thereby reducing activity and maintaining a more predictable financial planning process. We believe financial planners can use this approach to help investors establish financial planning based portfolios that help advisors better communicate the goals of the assets relative to specific future liabilities thereby enhancing client relationships and improving performance by improving behavior.

Cullen O. Roche
CIO, Discipline Funds
cullenroche@disciplinefunds.com

Erica A. Fries
CEO, Discipline Funds
ericafries@disciplinefunds.com



Literature Review

This research is influenced by previous work on asset class duration and asset-liability-matching approaches to portfolio construction. We hope to build on this work and provide actionable implementations of these concepts to help financial advisors better service clients.

Liebowitz (1986) popularized the idea of using "equity duration" in a manner similar to fixed income duration management. This approach quantified equity duration as sensitivity to interest rates. Our research came to similar conclusions as Litterman (2005) which said: *"empirical evidence convincingly demonstrates the shortcomings of depending on equity duration as a useful, stable construct"*. This was reiterated more recently by Asness (2022) regarding specific factors and their sensitivity to interest rates.

We expand on this concept using a broader definition of "duration" as "point of Indifference", similar to Bernstein (1999). Instead of using interest rate sensitivity across time we apply probability of principal loss across time to quantify a probable point of indifference for certain asset classes and strategies. We build on Kahneman (1979) using a behavioral finance approach to quantify this point of indifference and apply a reasonable time horizon over which an investor is likely to be comfortable with potential principal losses in various asset classes and strategies.

Given the quantified "duration" using this methodology we are then able to apply an asset-liability matching methodology that can be utilized in the process of financial planning. In doing so we are then able to apply ALM approaches similar to Horan (2014) and Wilcox (2006). As Horan notes, this process is differentiated from the standard mean-variance optimization approach in that it helps match specific assets to specific liabilities across time.

This approach is novel in that it initiates the portfolio construction process by optimizing a portfolio based on expected liability *needs* as opposed to optimizing the portfolio based on expected asset return *wants*. This approach is based on a financial planning foundation with a goal of optimizing returns per unit of risk *across time*. This methodology can help investors apply a reasonable time horizon to assets that do not traditionally have a specified duration. This helps investors understand a reasonable time horizon for assets and match those assets to potential liability needs over time.

The Investor's Intertemporal Conundrum & Behavioral Biases

In this paper we will propose an approach to asset management that seeks to improve an investor's financial planning process by establishing a methodology that is consistent with optimizing behavioral alpha through asset-liability matching. Our goal is to quantify an approximate "duration" for common asset classes (and strategies) thereby giving the investor the ability to better match specific assets with personal liability needs. In doing so we seek to help investors (and advisors) better meet their goals by initiating an asset allocation strategy thru practical financial planning.

Ben Graham said *"the investor's worst enemy is likely to be himself."* We propose that the investor's worst enemy is not merely him/herself, but time. French (2022) stated: *"risk is uncertainty of lifetime consumption."* Consumption is uncertain because our future consumption needs evolve and are uncertain across time. Therefore, all of asset-liability management becomes a temporal conundrum that involves the behavioral hurdle of trying to have the proper quantity of assets at a certain time in life. When there are imbalances in this attempt to match certain assets with our future liabilities we expose ourselves to behavioral biases that threaten the viability of our financial plan.

No One Ever Panic Sold a 3 Month Treasury Bill¹

An investor who purchases a 3 month 5% yielding T-Bill knows all of the information they need to eliminate or reduce behavioral biases in this allocation:

- Time horizon
- Income
- Credit risk

The likelihood of panic selling a security is a function of certainty. That is, the investor can reduce the risk of overreacting by having near certainty about their future financial needs. The key ingredient in this mix is the element of risk across time. Assuming no credit risk, the owner of a T-Bill is able to plan their future with near precision around this instrument because they have certainty of risk relative to time horizon. The buyer of a 3 month 5% T-Bill who needs 4% income over that period matches assets with liability needs across time. The investor knows exactly what their duration is within this holding thereby reducing the risk of behavioral mistakes in managing the asset over time.

¹—We cannot be certain that no one ever panic sold a T-Bill. In fact, after the speculative fervor of the last few years we cannot be certain about most things in finance.

While this concept cannot be applied with the same degree of precision across all asset classes we believe an approximate conceptualization of duration can be applied to help investors instill better discipline in their portfolios and build more behaviorally robust portfolios that are more consistent with their financial planning needs.

The Arithmetic of Asset-Liability Matching

Investors too often treat long-term assets like they are short-term investments and in doing so increase taxes, fees and behavioral mistakes. These frictions can be mitigated or even eliminated when the proper time horizon is applied to these specific asset classes.

William Sharpe's *Arithmetic of Active Management* showed that the average passive investor must outperform the average active investor after taxes and fees. If we applied this concept to all asset classes in a perfectly efficient market, investors would hold all of their assets for the exact period across which they exist. In other words, a 10 year Treasury-Note buyer would hold for exactly 10 years, a 1 year T-Bill buyer would hold for exactly 1 year—so on and so forth. Investors do not do this, in part, because they have an inherent intertemporal conundrum where their liabilities are unpredictable, and so the assets they hold cannot always be held for the entirety of their full maturity. In addition, asset lifetimes and returns can be uncertain because of default risk and the issuance of longer more perpetual style instruments like equities.

Further, investors suffer from well known behavioral biases that result in holding asset classes for inappropriate time horizons. Equities, for example, are inherently long-term instruments; however investors routinely trade them in a hyperactive manner that, in aggregate, can only reduce average aggregate returns. But this is not necessarily irrational or even inefficient—it is partially the result of this inherent need for some level of activity in portfolio management as investors try to meet uncertain liabilities across time.

In a theoretical world where all assets are held to their full maturity our investors would earn higher average returns because they would be applying an efficient temporal version of Sharpe's original *Arithmetic*. We further contend that these investors would increase their average excess return by behaving better. In other words, not only would they increase their returns by reducing their taxes and fees across time, but they would improve their average returns by reducing the potential for fear-based selling and FOMO-based buying.¹

1– FOMO or “fear of missing out” refers to the behavioral bias of buying high because of the fear of missing out on gains that others are earning.

Given all this, we can arrive at a similar conclusion to Sharpe's Arithmetic:

"The average investor who holds their assets to maturity will earn a higher after tax and fee return when compared to the average investor who tries to trade that asset in an attempt to earn more than it is designed to earn across its lifetime."

In other words, the average holder of our 3 month T-Bill cannot trade that instrument into earning more than what it is designed to payout over its lifetime. In the aggregate these traders can only earn 5% before taxes and fees and they cannot force this instrument to earn more than 5% in aggregate even if some investors time their purchases better than others. This concept can be applied to all asset classes; however, the trick is in understanding the proper duration over which to hold assets so as to optimize activity.

Duration and the Point of Indifference

In a 1977 *Forbes* article Warren Buffett went into some detail about how stocks are very similar to bonds in that they have a sticky coupon across long periods of time:

"I believe...that stocks, in economic substance, are really very similar to bonds."

A diversified portfolio of equities can be thought of as being similar to a high quality multi-decade instrument that pays a 5-7% coupon on average. We propose applying a specific duration to this and other instruments in order to clarify the time horizons over which this instrument can be appropriately utilized in a diversified portfolio.

Bernstein (1999) described the "duration" of stocks as being the point where the investor is indifferent to a certain decline after accounting for future dividends. Applying Kahneman and Tversky's concept of loss aversion, we propose that the average investor's "point of indifference" is their real break-even relative to historical average returns and drawdowns. In other words, given a certain level of potential principal loss, how long can an investor expect to experience a loss before they are "made whole"? From a behavioral finance perspective this is the true "point of indifference" because the investor is indifferent to losses over this time period.

The figure below shows our findings of duration calculations across many common asset classes and can be applied more broadly to virtually any asset class, strategy or factor with a long enough empirically supported track record.

The goal of good financial planning is to maximize certainty of asset flows and levels across time. However, there is an important inverse correlation in many of these asset classes and their time horizons. The short duration instruments will tend to be relatively poor real return instruments whereas the longer duration instruments will tend to be superior real return instruments. Conversely, the short duration instruments are more consistent with principal stability whereas the longer duration instruments can expose us to significant principal uncertainty in the short-term. But by applying a “Defined Duration” approach we can resolve this asset class paradox.



ASSET CLASS DURATIONS



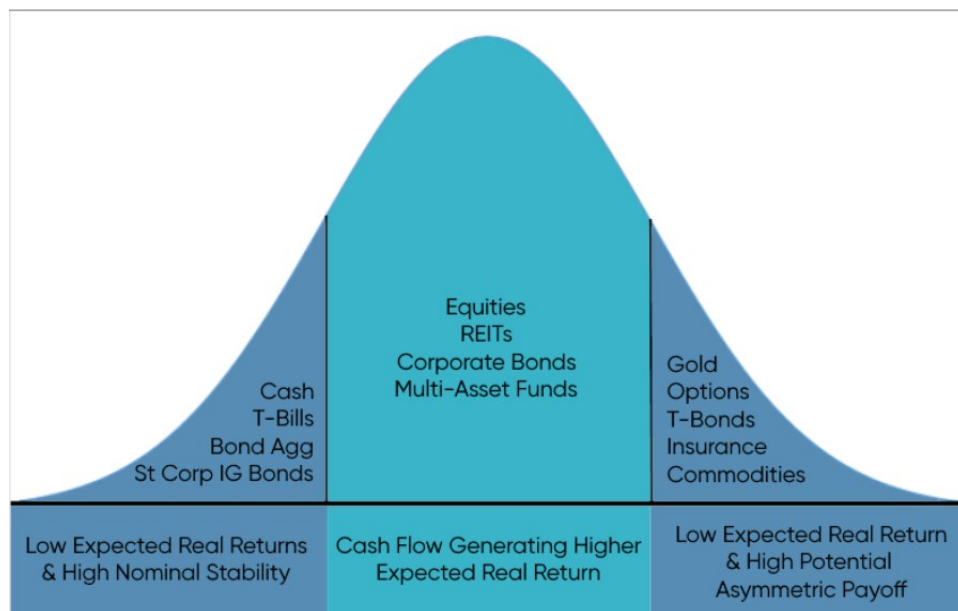
GFAP refers to the Global Financial Asset Portfolio, the current market cap of global stocks & bonds.

As a general framework for allocation using expected future returns relative to nominal and real asset class risks it can be helpful to think of different asset class allocations across a bell curve where the distribution is comprised of higher expected real return instruments like stocks, corporate bonds, REITs and diversified multi-asset funds. The tails would reflect lower quantities in asset classes that have the potential to provide extreme nominal stability as well as extreme real stability.

Specifically, cash, for example, provides us with absolute nominal stability and short-term certainty with the potential for very high real uncertainty. On the other hand, an instrument like a life insurance contract provides us with low nominal certainty (the premiums are a net negative cash flow) and the potential for very high asymmetric real returns. Instruments such as gold, commodities, options and T-Bonds tend to exhibit similar characteristics in that they’re typically longer duration instruments that will likely generate low/unstable real returns in the short-term while also providing us with the potential for high short-term real returns in *specific* environments (death for insurance, deflation for T-Bonds, inflation for gold/commodities).

NB—We quantify “point of indifference” using post-war max drawdowns across asset classes combined with average long-term expected real returns. For example, if an investor purchased equities today and experienced an immediate one time principal loss of –55% it would take 17.75 years for the investor to be made whole in real terms assuming a real return of 4.65%.

With this understanding, an appropriately allocated Defined Duration financial plan could prudently include many of these instruments in a manner that is similar to an All Weather strategy with the foundation of the plan being based on the investor's specific temporal/financial needs. Importantly, this curve would need to be customized and shifted according to each investor's underlying financial plan. A retiree, for instance, might require fatter tails to better suit their need for insurance and short-term cash flow certainty. Likewise, a young investor can likely afford thinner tails since they likely have a lower need for cash and insurance instruments.



This concept is useful for anyone trying to apply asset-liability matching to their financial planning and asset management process because it places specific instruments in the proper temporal perspective while maintaining the broader benefits of asset class diversification. This not only helps match assets with liabilities, but it will help the investor implement a more patient and disciplined approach across asset classes thereby helping them optimize their own behavioral alpha. While similar approaches are commonly used in bank balance sheet management as well as pension fund management, we believe this approach can also be applied at the retail investor level.

This framework can help financial planners better match specific strategies to help reduce potential conflicts between asset managers and planners. Too often, we find that there is a conflict between financial planning and investment management where the investment management community is charging high fees for the hope of market beating returns whereas the financial planning community is trying to apply financial discipline in client portfolios that is consistent with their financial goals. The conflict arises when the investment managers are taking risk to earn returns that increase behavioral risk and reduces the potential of meeting financial goals. This conflict is often the result of the aforementioned asset-liability mismatch where the investment manager is taking duration risk in assets that create uncertainty for the end investor. Matching specific strategies to specific client needs can help reduce or eliminate this conflict.

Importantly, from a financial planning perspective, it's helpful to understand that there are four primary ways to alter our average portfolio duration:

1. **Diversification** decreases/increases duration by creating a portfolio of temporally variable average return streams.
2. **Rebalancing** a portfolio can reduce duration by rebalancing away from high growth longer duration instruments into lower return and lower duration instruments & vice versa.
3. **Income** reduces duration by establishing a short-term stream of cash flows that enhance short-term asset certainty.
4. **Insurance** reduces duration by providing an asymmetric short-term outcome that provides potential income during a long duration period of uncertainty.

Diversification as a Temporal Optimization Tool

We often talk about how diversification across asset classes can be a powerful return optimization tool. But from a financial planning and behavioral finance perspective diversification of time horizons is equally important and can be a complement to the diversification of asset classes. In fact, one of the interesting findings in our research is that the diversification of various asset classes substantially reduces the average duration of those combined asset classes. This is not surprising, but it is useful as multi-asset portfolios and strategies can be utilized to meet moderate duration financial planning needs without sacrificing low returns for safety.

For example, investment managers can use this concept to blend certain asset classes in multi-asset products to target specific durations that can improve temporally risk adjusted returns relative to similar duration based asset classes. For example, if we assume equity returns of 8% per year, 10 year yields of 4% and T-Bill rates of 3% over 10 years we can assume a multi-asset portfolio of 60% T-Bills and 40% equities will generate 5% average annual returns across a duration of 7.4 years when compared to a constant maturity 10 year bond fund return of 4% with a duration of 6.8. As a result, we've maintained a similar duration to a 10 year T-Note, but increased our expected return by 1% by blending assets in a multi-asset portfolio.

This approach is best utilized by merging the worlds of financial planning and investment management via the asset-liability matching approach. That is, we can merge the worlds of investment management with financial planning by trying to quantify someone's future liability needs and then combining those liability needs with an asset allocation that is likely to generate greater returns than the allocator's liabilities over their lifetime.

As a simple example, a moderately conservative 55 year old couple, Mr. & Mrs. Smith, are planning for retirement at 65 with an expected 4% withdrawal rate. They therefore seek to achieve a minimum target return of 4% with high predictability over ~10 years.

If we were to assume 10 year bond returns of 4% and 20 year stock returns of 8% then the asset allocator can comfortably invest in a 6%+ expected return 50/50 stock/bond portfolio based on the estimate that this portfolio will, on average, match their asset returns with the liability needs over an approximate 10 year time horizon.

Buying a single 50/50 multi-asset fund gives investors an average duration of 10 years according to our methodology. While this simple solution matches their average withdrawal need with their asset return goals the investor is still confronted with the temporal/behavioral uncertainty across future time horizons because we've bundled high volatility assets with lower volatility assets *in one constant duration pool of assets*. This creates one moderately long duration, thereby making it difficult for the investor to prepare, behaviorally, for short-term liabilities while also the creating behavioral risk of not being protected from long-term real return needs.¹ In other words, a multi-asset portfolio needs *at least* one other pool of assets to increase temporal certainty, both in the long-term and the short-term.

The solution to this problem is to match specific assets and liabilities across our other temporal needs by unbundling the allocation across its specific durations. This can be achieved by maintaining the same style of broad diversification but better matching the investor's specific assets with their specific liabilities using individual instruments matching those time horizons.

Kitces 2014 shows the portfolio returns from a bucketing style strategy are similar to a broad multi-asset rebalancing strategy. However, we would argue that asset-liability matching with specific individual durations creates a more behaviorally robust strategy because the investor has more "tangible" durations.¹ Said differently, when a diverse portfolio like a 60/40 Balanced Index is down 30% in 2008, the investor is indifferent to the fact that there is cash and short-term bonds *inside* the 60/40 index because they are a forced seller into the downturn to meet any short-term or medium-term needs. This investor's behavioral risk is increased because they cannot see and feel the stability of the short-term assets within the overall allocation. Instead, they experience a homogeneous asset class risk because the 60% equity slice exposes the portfolio to 85% of the volatility resulting in the behavioral risk that their diversified portfolio feels too much like an equity portfolio. And when they sell to meet liquidity needs they become a forced seller of both the stocks, bonds and cash in the portfolio when all they need access to is the cash.

Instead, we propose that the investor break out the allocation into a series of simple, low fee and discernible duration allocations that we can quantify and match with specific liability needs. This gives our diversified multi-asset investor a style of certainty that is more similar to bond laddering where we are laddering specific durations across all asset classes to meet the investor's personal needs.

1-This becomes especially magnified in a stock/bond fund when stock/bond correlations move to 1 in years such as 2022.



Practical Implications for Financial Advisors

The Defined Duration methodology can be utilized by financial planners and financial advisors to help better align the client's financial planning needs with their asset allocation. While the traditional asset allocation process begins with asset return optimization the Defined Duration approach instead starts with a financial planning process by quantifying the client's liabilities across specific time horizons. The advisor can then match specific assets to specific liabilities to optimize the certainty in the client's portfolio. This approach achieves several goals that can help improve the financial planning process including:

1. Communicating clear time horizons for specific assets.
2. Giving clients greater certainty and clarity around why they own specific assets.
3. Improving performance by reducing activity, fees and taxes across specific time horizons.
4. Increasing behavioral alpha by helping the client behave better.
5. Improved client retention by aligning the long-term goals of the advisor with that of the client.

Summary Conclusion

It's well known that *time in the market* is more important than *timing the market*. However, every asset allocator has a certain need to time the market in the sense that they have an inherent asset-liability mismatch across their financial planning needs. By establishing specific durations for specific assets we hope to better integrate the financial planning process with the investment management process by establishing a more behaviorally robust and temporally consistent methodology that will help investors better understand their liability time horizons and the assets that match appropriately to those time horizons.

If you would 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 Applying Defined Duration Investing

Mr. and Mrs. Drewl are fully employed 60 year olds looking forward to retirement in a few years. Mr. Drewl was diagnosed with a degenerative brain defect that creates uncertainty about his life expectancy and healthcare costs. Mrs. Drewl is healthy and has a life expectancy of 90. Their primary goals are to maintain their current standard of living, optimize certainty and hopefully leave some money for their 20 and 25 year old children.

Taxable Savings Until Retirement: \$10,000 per year

Annual Retirement Income: \$50,000 per year

Annual Retirement Expenses: \$75,000

Currently own a \$500,000 home, but plan to downsize near retirement.

Home purchase within 5 Years: \$100,000 for down payment & moving expenses

Current portfolio: \$900,000 IRA with an allocation of 50% stocks and 50% bonds diversified across 30 individual stocks, 5 high cost domestic equity mutual funds and 5 diversified high fee medium duration bond mutual funds and closed end funds.¹

Savings accounts: \$100,000 in a bank account earning 0%.

Despite having a life expectancy of 90 years and a potential 30+ year time horizon, the Drewls have front-loaded behavioral risk around their upcoming retirement, health concerns, 5 year home purchase plans and retirement plan. All of this exacerbates their average temporal uncertainty and future consumption. The Drewls require a balance of various durations to generate a high enough total return while also meeting all these various time horizon needs. Unfortunately, their previous financial advisor put together a portfolio of high fee instruments and an overly complex asset allocation that does not give the Drewls sufficient understanding of how their assets will match their liabilities over time. Worse, the high fees are sold as justifying the allocation because it will “generate market beating returns”. All of this exacerbates their temporal uncertainty and creates unnecessary behavioral risks that could derail their plan as they navigate retirement.

The Drewls contact another financial advisor to review their existing allocation and help them navigate a potential change. The advisor utilizes a Defined Duration approach to help them better understand how their portfolio should be allocated to meet their specific financial needs.

¹—We assume “high cost” to be anything over 1% in annual fund fees.

Appendix—A Case Study in Applying Defined Duration Investing

Instead of approaching the portfolio construction process from the asset side of the equation with the goal of generating the most efficient risk adjusted returns the advisor instead starts with a financial plan to quantify the client's liabilities over time. The advisor models a full financial plan and concludes that the Drewls should buffer their financial plan for the following potential liabilities across specific time horizons, starting with their short-term liabilities and modeling them out across longer durations.

0-2 Years: \$250,000 to cover up to 3 years worth of potential expenses for emergencies, lost income and economic/market changes.

2-5 Years: \$100,000 to cover a potential move and home down payment.

5-15 Years: \$300,000 to cover intermediate liabilities including retirement.

15 Years+: \$300,000 to cover long-term needs and potential multi-generational funding.

25+ Years: \$50,000 to fund insurance-like needs.

After reviewing their financial plan the advisor determines that the Drewls could simplify their portfolio, reduce fees and create a portfolio that is diversified across asset classes and specific time horizons. As such, the advisor recommends matching the liabilities with the following assets:

Duration Bucket	% Allocation	Holding	Specific Duration	Needs
0-2 Years	25%	T-Bills & MMF	0-1 Year	Emergency and short-term spending
2-5 Years	10%	ST Govt Bonds	3 Years	Potential home purchase
5-15 Years	30%	Multi-Asset Fund	10 Years	Retirement planning – start of retirement
15+ Years	30%	Global Equities	~17 Years	Long-term planning – through retirement & potentially multi-generational
25+ Years	5%	Insurance	Unknown	Ultra-long term planning

NB—The example in this section is simplified and planners and investors will need to fully customize the implementation to properly quantify the asset-liability matching process in reality.

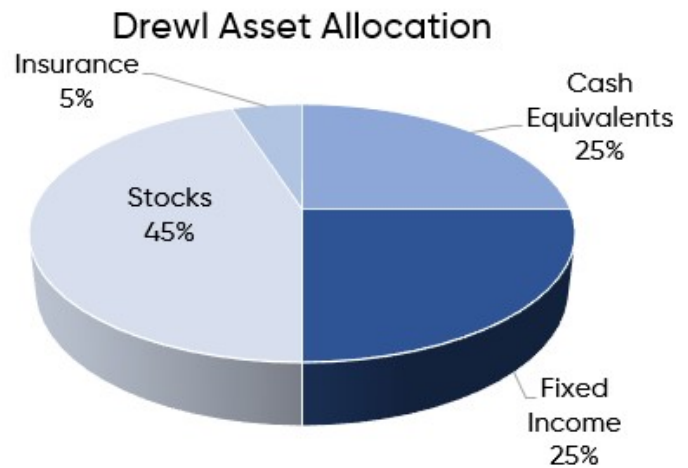
The advisor can safely assume a nominal average return of 5.5% based on the following 10 year projected average annual returns:

Cash Equivalents: 3.5%

Fixed Income: 4%

Stocks: 8%

More specifically, the advisor recommends that the Drewls construct a 3/6/9 month T-Bill ladder to put their taxable cash to work and help boost the returns on their ultra short duration instruments.



The advisor adds two low cost short-term government bonds ETFs to cover their 2-5 year time horizon.

These shorter duration allocations provide the Drewls with substantial certainty as they navigate the uncertainty of the next 5 years. It also frees up significant behavioral bandwidth to take longer duration risk across the 5-15 and 15+ year time horizons. The advisor recommends that the Drewls fill in those time horizons using a multi asset ETF with a stock/bond blend that creates an average 10 year duration. And for their longer duration needs the advisor recommends an allocation to domestic and foreign equities using two low cost ETFs. Their allocation is rounded out with a 5% allocation to life insurance and other portfolio hedges to mitigate asymmetric risks that might arise over time.

All in all the portfolio is vastly simplified, but is much more efficiently allocated across time. This new asset allocation is similar to the prior asset allocation, but instead of being one high cost disorganized "market beating" portfolio it is structured as a behaviorally robust duration targeting portfolio. The Drewls now own 8-10 holdings that have reduced the complexity of the portfolio, reduced fees, improved tax efficiency, improved cash management and better aligned the assets to meet specific liability needs across time. And more importantly, the Drewls can now look at their portfolio and intuitively understand how long they should own certain instruments and how those instruments are working to achieve specific time-based financial goals within a broader financial plan.

And perhaps most importantly for the financial advisor, this process helps them match a sophisticated, but streamlined asset allocation process to a specific financial plan while also freeing up bandwidth to focus less on portfolio construction and more on adding value to client relationships through financial planning, tax planning, estate planning and other aspects of financial advisory services that deserve greater attention and compensation.

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