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Dedicated Portfolio Theory versus Modern Portfolio Theory

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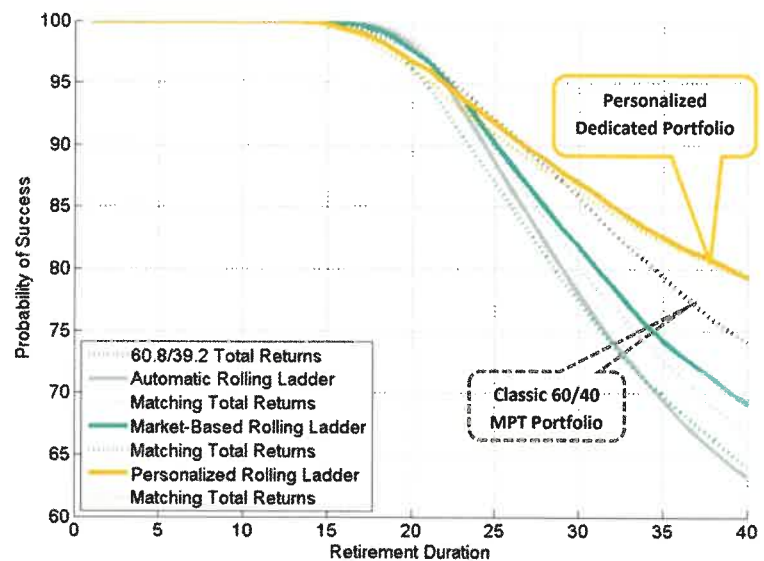
It's time for advisors to consider Dedicated Portfolio Theory (DPT) instead of Modern Portfolio Theory (MPT). This is especially true for advisors who manage assets for clients who'll need income in retirement. It can work for clients who'll need a steady or a lumpy flow of income. However, using DPT will require investing in individual bonds instead of bond funds.

MPT is a great place to start any serious study of finance. Its creator, Nobel Laureate Harry Markowitz, was the first to demonstrate quantitatively the trade-off between return and volatility. He defined a portfolio as "efficient" if it offered a higher return per unit of volatility than any other allocation. This is old stuff for most planners, most of whom have had ample training in MPT.

Research suggests MPT is showing its age, however, and DPT could be better suited to constructing retirement portfolios than MPT. For example, Wade Pfau, a widely respected retirement researcher, concluded that retirement portfolios that utilize time segmentation based on DPT provided higher probabilities for long-term success.¹ Figure 1, taken directly from his article, demonstrates its superiority compared with a classic 60/40 portfolio based on MPT. The horizontal axis is the portfolio's time horizon, while the vertical axis shows the probability of

1. Wade Pfau, "Is Time Segmentation a Superior Strategy, part 3," *Advisor Perspectives*, April 3, 2017 (<https://www.advisorperspectives.com/articles/2017/04/03/is-time-segmentation-a-superior-strategy>)

Figure 1:
Retirement Duration versus Probabilities of Success



Source: Wade Pfau, "Is Time Segmentation a Superior Strategy? part 3," *Advisor Perspectives*, April 3, 2017. Reproduced with permission.

the portfolio lasting as long as needed. Clearly, the dedicated portfolio provides the best results.

Understanding the Elements of Dedicated Portfolio Theory

Portfolios based on DPT are designed to generate a secure, predictable stream of future cash flows. In a sense, the portfolios are "dedicated" to producing these cash flows. For retirees, these cash flows will fund withdrawals for annual living expenses and other foreseeable items, such as car replacements, special vacations, grandchildren's college expenses, etc. The predictability is achieved by purchasing

bonds and holding them to maturity, and then collecting coupon and redemption payments as income in retirement. The trick is to buy the bonds in just the right quantities and maturities so they exactly match the predicted future liabilities. For this reason, DPT is sometimes called "cash matching" or "liability-driven investing." This security and predictability makes DPT appeal to retirees.

DPT can be best understood by examining the four key elements needed to take it from theory to actual implementation in the real world: the desired cash flow stream, the income portfolio, the growth portfolio, and the "critical path."

1. Cash flow stream

The DPT process starts with identifying the stream of cash flows desired for each year of the retiree's life span. This requires serious, detailed planning. Fortunately, most planning software generates this stream as a primary output. The plan should include the cash flows needed for the projected withdrawals from the portfolio each year. DPT's goal is to provide these cash flows at minimum cost with the maximum probability of success for the duration of the plan.

2. Income Portfolio

The individual bonds purchased and held to maturity become the "Income Portfolio." This portion of the overall portfolio is dedicated to providing income over the specified time horizon. The planner can set a minimum and maximum length for this time horizon. A horizon of five to 10 years is typical. To minimize default risk, the Income Portfolio uses only investment-grade or government bonds. Figure 2 displays a fictitious 10-year Income Portfolio starting in 2018, and offering variable, rather than steady, cash flows.

An Income Portfolio based on DPT differs significantly from a bond portfolio under MPT. A DPT bond portfolio consists entirely of individual bonds held to maturity—not bond funds. The volatility of intervening values of the bonds before maturity does not matter because the coupon payments and face values are locked in. As a result, there's no need to worry about the market values of bonds in the Income Portfolio. The easiest way to build such Income Portfolios is to use zero-cou-

pon bonds. Coupon bonds provide higher yields, but require the use of more sophisticated mathematics.

In contrast, MPT makes no distinction between individual bonds and bond funds. It ignores the volatility in the value of bond funds that occurs because the bonds in them are not held to maturity. MPT essentially treats all fixed income investments as sluggish stocks.

Another important distinction between DPT and MPT is that DPT's bond allocation is tied directly to a specified income stream over a specified time horizon using a specific set of bonds. As a practical matter, it turns out that each year of income for someone following the Four Percent Rule for withdrawals typically costs about 4 percent to 5 percent of the overall portfolio, given the low level of interest rates over the past 15 years or so. That means that when a client asks, "Why do I have 40 percent in fixed income?" the DPT planner can answer "Because you wanted to protect the next eight years of income," figuring $8 \times 5 = 40$. Five years of protection would require about 25 percent, and 10 years, about 50 percent. DPT-style allocations become more intuitive, making clients more likely to stick with the plan because they understand it.

MPT doesn't offer such a direct linkage. Instead, its bond allocation is usually defended by saying it is based on the client's risk tolerance. In MPT, "risk" is defined as volatility. The question then becomes "Are risk tolerance questionnaires valid?" According to many psychometricians and planners, the answer is "No—not valid!" Most people define risk as running

out of money, not the standard deviation of month-to-month portfolio values, which is how volatility is measured. This raises troubling questions about the whole idea of risk tolerance questionnaires. Many advisors still use them, but some admit they use them primarily to protect themselves, not because they believe them to be valid.

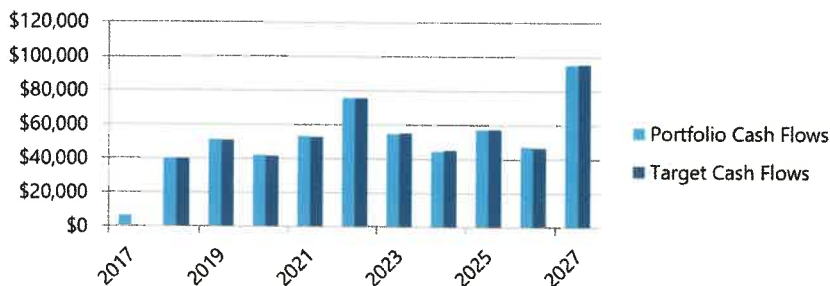
3. Growth Portfolio

With DPT, equities are dedicated to growth. The Growth Portfolio's purpose is to grow fast enough to replenish the Income Portfolio as its bonds mature each year. For example, if a client starts with an eight-year time horizon, one year later, only seven years of income remains sheltered in the Income Portfolio. If the client and planner agree they wish to maintain the original eight years of protected income, the planner must sell equities out of the Growth Portfolio to purchase a new eight-year bond.

In the research that led to Figure 1, Wade Pfau modeled stocks in his Monte Carlo simulations as the returns for the asset class of large cap stocks (this is typically measured by the S&P 500 index). But the Growth Portfolio should be designed to match the same time horizon as the Income Portfolio to get the most out of DPT. Theoretically, any time horizon is possible. In practice, most planners following DPT must choose from a limited selection of time-segmented portfolios because time segmentation is still a relatively new idea.

For example, growth portfolios targeted for segments of one to three years, four to six years, seven to 15 years, and 15+ years are available. The methodology used to develop these portfolios was based on the "minimax principle" from modern decision theory. The minimax principle seeks the allocation among mutual funds (mostly index funds) that minimize the impact of a worst-case scenario for the growth portfolio over the desired time horizons. Most portfolios are built to maximize the average gain. These minimax time-segmented portfolios are different: they are built to maximize the minimum gain over the specified time horizon.

Figure 2
Target Cash Flows versus Actual Income Portfolio Cash Flows



Source: Asset Dedication

4. Critical Path

As each year passes and a bond matures, the time horizon of the protected stream of income embedded in the Income Portfolio becomes one year shorter. An initial eight-year Income Portfolio ladder will become a seven-year ladder. The decision must be made, therefore, whether to roll the portfolio forward by buying another bond at the back end to maintain the horizon.

Guiding this “roll-don’t roll” decision is the Critical Path analysis. It plots the path the overall portfolio should follow over the lifetime of the plan to achieve an acceptable probability of success in meeting all financial goals.

In Figure 3, the Critical Path is the white dotted line that separates the green Safety Zone from the red Danger Zone in a hypothetical example. The yellow line represents the value of the total portfolio at the end of each year. In Figure 3, the portfolio fell below the Critical Path at the end

of the first year. That means the portfolio has a less-than-acceptable probability of success. In this case, the decision would be “don’t roll.” That is, do not sell equities to replenish the Income Portfolio. Instead, let it ride for another year to see if the market turns around and the Growth Portfolio recovers. As a result, the Income Portfolio contains seven years instead of the desired eight years of protected income.

At the end of Year Two, when the Income Portfolio contained six years of income, a turnaround happened, boosting the portfolio to its Critical Path. So, enough stocks were sold to roll the Income Portfolio out by one year, to seven years.

At the end of Year Three, the market dropped, so the Income Portfolio again contained six years of income. As a result, the Income Portfolio again was not replenished. It fell to five years of protected income.

At the end of Year Four, when the Income Portfolio was down to four years,

the market recovered and boosted the portfolio’s overall value back up to its Critical Path, so sufficient equities were sold to extend back out to five years. Research suggests that if it had been below by more than 20 percent, the probabilities of success would continue to drop below acceptable levels, and the advisor would need to consult with the client.

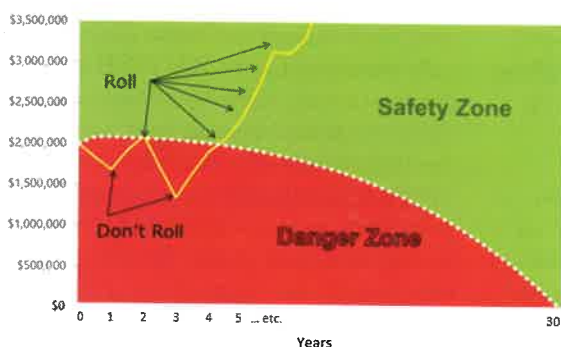
In the following years, the market continued to grow, and each year the portfolio was replenished by selling equities to maintain it at five years.

Looking ahead, if the Income Portfolio rises to 20 percent or more above the Critical Path, it may be extended out two years, and/or ultimately back out to its original eight years. With continued growth, the advisor, in consultation with the client, may even decide to extend the original horizon out to nine years or longer. At some point, they may decide that the Income Portfolio is as large as they think reasonable (say, 15 years), and simply keep it there,

replenishing it only one year at a time to maintain it at a maximum of 15 years. In engineering terms, the Critical Path is the dynamic control mechanism for rebalancing the allocation of investments between bonds and stocks. The old MPT practice of rebalancing every year is gone. Rebalancing is now based on each client’s financial plan, where it should have been all along.

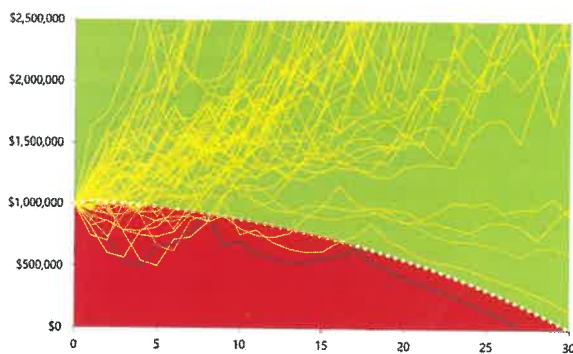
Historical data allows estimates of the probability the portfolio will finish in the Safety Zone. Figure 4 traces the paths a portfolio could follow for the next 30 years with this strategy if the client had retired in any of the 30 years from 1927 to 1986. In this example, the portfolio failed only once—for someone who retired in 1929, the dawn of the Great Depression, when the portfolio would have lasted only 27 years (see blue line). This failure includes the unlikely assumption that the person would not change their spending habits even if they were below the Critical Path.

Figure 3
Critical Path



Source: Asset Dedication

Figure 4
Historical Audit Trails of Total Portfolio Values Over All 30-Year Spans Since 1927



Source: Asset Dedication

DPT is better for individuals

Modern Portfolio Theory has had a good run and continues to serve as a great starting point for understanding the choices one must make when investing. But, as its author, Harry Markowitz has said, it was designed originally for institutional investors, not people. For retirees, Dedicated Portfolio Theory appears to provide a more intuitive investment approach and better results.

More importantly, DPT provides another way for NAPFA advisors to differentiate themselves from other advisors who do not make planning the cornerstone of their practice. Most brokers, who may call themselves advisors, are likely to continue singing the same MPT song as they always have. It is unfortunate for the general public that while everyone recognizes that technology has improved, some pseudo-advisors seem to be stuck in 1950s when it comes to investment strategies.

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