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TOPIC #2: **Fixed Income + Monte Carlo in our PPA**

PROMPT: **What are the advantages and disadvantaged of developing a retirement plan with fixed portfolio return assumptions, relative to using Monte Carlo simulation?**

Using Monte Carlo simulation, researchers and practitioners alike can examine the probable ability for a portfolio to successfully meet the retirement goals of a client by function of multiple assumptions. Typically, 500 to 10k trials of various outcomes will be run in a monte carlo series to provide a span of distributions that support a percentage rate of success. The general consensus is, most clients feel more comfortable the closer that success rate reaches 90%. Of the multiple assumptions in monte carlo analysis, researchers typically include current age, retirement age, current income level, income replacement ratio, current portfolio amount but very important is the portfolio asset allocation, particularly because of its impact on income growth rate. These last two factors call into question the advantages and disadvantages of securities such as stocks and bonds. Such securities have historical volatile trends and a monte carlo analysis that lumps returns into a fixed number overestimates smoothness of ride and often the result of outcomes for a given client.

Much of the buzz in today's retirement market is on bonds or fixed income products, not only because rates are particularly low in the wake of the Federal Reserve's response to the 2008 recession, but more generally there are more baby boomers retiring, and often these retirees bring a psychological mindset that bonds have inherent characteristics of less risk and high stable income—two complimentary traits for retirement years. In reality, developing a retirement plan with fixed income return assumptions has advantages and disadvantages which can have positive and negative effects on the monte carlo results, and additionally may be impractical for portfolio creation.

Interestingly, monte carlo simulations as shown by Milevsky & Abaimova (2006) and Blanchett et. al (2012) tend to report that despite the volatility and dependence upon the amount of withdrawal, the more stocks allocated to a given portfolio the higher probability of return. Furthermore, the longer those stocks are allowed to remain invested the higher the probability of return. This suggests that if an advisor was to model an all fixed income portfolio to justify his/her fixed income assumption, it will likely yield a lower return than an all stock portfolio with unknown returns. With this said, there is a higher probability of "ruin" on all client's equities which hurts a portfolios probability of success. To guard against this downside risk, diversification of investments comes into focus, and with it our conversation quickly comes back to the role of fixed income.

Bernstein (2012) proposes that retirees should heavily weight their portfolios with laddered bonds (or fixed income annuities) Driving their portfolios closer to a fixed return, although finding the optimum time to transition from more equities to more fixed income securities can be difficult. This transition period may last between age 40 and 70, or one rule of thumb is "age equals bonds". The important issue to frame is that longevity risk is an uphill battle for the fixed income investor as the total return is expectantly lower than stocks—meaning one will need quite a lot of starting capital, but the portfolio delivers less vulnerability to catastrophic loss.

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Big advantages with fixed portfolio returns is they allow advisors and clients alike to easily calculate estimate total return, and the withdrawals therefore can be shown to be stable throughout a given time period. Bernstein (2012) discusses monte carlo simulations on 20 and 25 year TIPS ladders with 2% ROR, for a 65 year old couple. A huge advantage that stocks simply do not have is that TIPS are backed by US government not to default. If retirees have amassed enough assets that they can live on a 2% real spending rate, having a fixed income assumption could be "bullet proof". If that withdrawal requirement is 3% the retirees may still be mostly safe, but a spending rate of 4% does not return a confident probability factor in monte carlo.

Disadvantages of fixed portfolio returns is that they do not account for highly improbable or unprecedented occurrences, illuminated by the percentage of fail rate exposed in a monte carlo analysis. This is especially true if using a high fixed income assumption. Fixed income assets also have market risk, annuities may also have issuer risk. Modeling fixed return is one thing, but building a portfolio in reality to fit the model is altogether different. For example, a portfolio may include callable bonds where one could lose income stream, or rates may be competitive forcing a retiree to pay a premium to buy bonds cutting into YTM and available assets. There is liquidity risk if buying individual bonds or fixed annuities, or if in a bond fund one could experience high unexpected cap gains or lose NAV.

Pfau (2013) concludes that various combinations of income tools can be used to optimize withdrawal planning for clients, and systematic withdrawals from annuitized products can bring us closer to the efficient frontier—but most importantly, there should be no bias in approach for the decisions must be individualized to each client, and model assumptions should be based on actual historical results for the products considered.

**References:**

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No investment strategy can guarantee a profit or protect against loss. All investments carry some level of risk including the potential loss of principal invested.

Although stocks have historically outperformed bonds, they also have historically been more volatile. Investors should carefully consider their ability to invest during volatile periods in the market.

With fixed income securities, such as bonds, interest rates and bond prices tend to move in opposite directions. When interest rates fall, bond prices typically rise and conversely when interest rates rise, bond prices typically fall. This also holds true for bond mutual funds. When interest rates are at low levels there is risk that a sustained rise in interest rates may cause losses to the price of bonds or market value of bond funds that you own. At maturity, however, the issuer of the bond is obligated to return the principal to the investor. The longer the maturity of a bond or of bonds held in a bond fund, the greater the degree of a price or market value change resulting from a change in interest rates (also known as duration risk). Bond funds continuously replace the bonds they hold as they mature and thus do not usually have maturity dates, and are not obligated to return the investor's principal. Additionally, high yield bonds and bond funds that invest in high yield bonds present greater credit risk than investment grade bonds. Bond and bond fund investors should carefully consider risks such as: interest rate risk, credit risk, liquidity risk and inflation risk before investing in a particular bond or bond fund. With fixed income securities, such as bonds, interest rates and bond prices tend to move in opposite directions.

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