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Liability-Driven Investing

Solving the Retirement Income Problem

Retirement Planning:

How Liability-Driven Investing Can Help Solve the Retirement Income Problem.

According to the Transamerica Retirement Center's 2014 retirement study the biggest problem facing retirees today is the very real possibility they will run out of money before retirement ends. Longevity, market risk, and inflation are certainly the biggest enemies to building and sustaining a successful retirement plan. A close fourth is the threat of long term healthcare costs. As a result, retirement planning sets up a conflict between important but offsetting objectives. A retiree needs to protect and preserve capital at all costs. The greatest fear facing retirees is running out of money, but they may be forced to spend down their account faster than originally planned. Couple these realities with unexpected health care expenses and a case of sudden longevity – old age may be a major problem for many; retirement may be a disaster for many; Add to this the desire of parents to leave something for their children, and many find these conflicting pressures causing much stress and anxiety.

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different approaches to solving this problem. This booklet will look at what has emerged as the best option for many who are worried about sustaining an inflation adjusted income – a "new" solution that has been ignored by most advisors and investors. The solution is similar to how a defined benefit pension plan approaches the problem of providing income. It defines the liability associated with income. We call this method Liability Driven Investing (LDI). It is an exciting concept that should be carefully evaluated as part of the retirement matrix.

INTRODUCTION

If you think about it, retirement is a lot like a Rubik's Cube. There are many dimensions to retirement and they are interlocking. Fixing one problem, say inflation, could potentially create an unintended consequence because it could cause more risk. Looking down the tunnel of

retirement means developing a plan to cover both sides of the income statement – creating income and managing expenses. The first step is answering the key question that over 85% of all investors can't answer. What is your Number? They don't know how much capital will be needed to produce a sustainable income through retirement. This often means having to create a budget – a reasonable estimate of how much income will be required through retirement.

For many, an expense projection is often seen as confining. People resist budgeting because it means having to limit their wants and settle for their needs. During the working years, time seems infinite. People make financial decisions with no real thought to the long term consequences. They often use credit to facilitate their acquisition of items they desperately want, but don't necessarily need, – a new TV, car, or vacation. But in retirement, there is no time left to make up for errors or to pay off debt. Since retirement income needs to be stable, it requires a conservative strategy that converts assets to a sustainable income. This strategy needs to incorporate an investor's objectives and include a solution for inflation. Inflation is the hidden variable that erodes purchasing power and depletes capital.

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For most retirees, since capital preservation is the most preferred strategy, they must rely on bonds to produce income stability and preserve capital. However, rising interest rates will cause a well-designed bond portfolio to lose value and could defeat the strategy. The only way to protect income is to buy short duration bonds (1-5 year maturities) and hold them until maturity. Protection against interest rate risk dictates short maturities, which in turn means lower yields. If you hold bonds to maturity, the volatility does not matter because the face amount of the bond equals the liquidation value. When interest rates rise, bonds will lose value if liquidated prior to maturity and can be detrimental to the long term sustainability of a retirement income. As a result, it is important to match market risk and interest rate risk with a client's known income objectives. Laddering bonds is one way to protect in-

come. which means bonds are purchased based on when they mature. Instead of relying on capital to produce income, a laddered bond portfolio utilizes bond maturities contractually guaranteed to produce income, thus taking certain aspects of risk out of the portfolio.

While a capital preservation allocation has little market risk (notice that risk is not totally eliminated), it does not produce any assurance income will be sustainable throughout retirement. Preservation strategies may protect most of the capital from a market downturn, but the investor sacrifices appreciation for safety, which creates a conundrum. Another common problem is the inflexibility that accompanies a standard preservation strategy. Only those who are willing to refrain from spending capital can sustain their retirement income. If they invade principal, they can materially impact income in the later years because they already spent capital intended to create income. Preserving capital and funding retirement consumption is an example of liability management and is a common goal for many retirement households.

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This booklet is aimed at demonstrating how to best solve the volatility problem with bonds and explores the drivers underlying a successful retirement strategy protected from inflation. Hopefully, a useful starting point emerges for quantifying the tradeoffs between a capital preservation objective and the creation of an optimum income. Doing so, will give households a better alternative for managing the risks associated with both objectives.

SELECTING A FRAMEWORK FOR COMPARISON

It is important to understand there are two ways to measure outcomes – one is asset based, while the other is liability based. Measuring assets is the most common way to track the value of the investment account. Assets are measured as the investor seeks to reach a "dollar value" goal, and keeps wealth accumulation or capital preservation in mind.

Pension plan trustees look at performance outcome much differently. They measure performance based on income promised. A pension formula defines an income and then measures the amount of capital required to deliver that income each and every year for life. This is called Liability Driven Investing (LDI). The income defines the liability and the pension is invested to deliver the capital required to fund the promised income.

The difference may seem subtle, but it is important. Asset management focuses on the amount of CAPITAL being invested, while LDI focuses on the amount of INCOME the capital will produce. If there is an unfunded liability, the shortfall is monitored annually and a strategy is developed to fill the gap. LDI focuses on the income assets produce, rather than on the size of the portfolio. The following example illustrates the difference between these two methods.

ILLUSTRATION

Consider two investors, Jill and Mary. Both desire to have $100 in ten years. Jill intends to reach her goal by buying zero coupon treasuries that mature at the end of ten years for $100. The cost of the bond depends on interest rates at the time of purchase. If rates are 3%, the cost of delivering $100 in ten-years, using the zero coupon bond, would be $75. If interest rates are higher, the amount needed would be less. If Jill invests $75 today, then, in ten-years the bond is guaranteed to mature for exactly $100. It is a contractual certainty.

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Importantly, even though treasuries exhibit some level of volatility, Jill does not care. Regardless of what happens to interest rates and the investment value during the interim, Jill knows she will still receive $100 at the end of ten-years. The bond will contractually mature for the full face value and the liability will be fully funded.

Mary, on the other hand, also needs $100 in ten-years. She would rath-

er invest in one-year notes and reinvest the funds each year during the ten-year period. Because of this investment preference, Mary is faced with two issues – how much to invest and the uncertainty of how much income her investments will produce. Mary needs to estimate how much to save today, in order to reach the $100 target. With interest rate fluctuations, she has to re-calibrate each year to stay on target. Unlike Jill, if her estimate is incorrect, she could miss her target, since the value at the end of 10 years is unknowable. This uncertainty makes planning difficult. Mary cannot know for sure she will have $100 when she reaches ten years.

With Jill's zeroes, the face amount of her bond is known. She knows she will have $100 year to year, with no risk. Granted, the liquidation value will be uncertain, but if her goal is $100 in ten years, she knows she will attain her objective and she knows exactly how much she has to invest. So there is a high degree of certainty. Mary's use of one-year, short term bonds, and rolling them every year, causes uncertainty. She might hit the target, or she might not. This method requires significant management. It may also require Mary to invest additional money to mitigate a possible shortfall in ten years.

For Mary to estimate her cost, she would start with today's yield on one-year notes. Short-term debt generally has lower returns than longer-term debt, so it is reasonable to assume her one-year notes are yielding 2% if the Treasury Inflation Protected Securities (TIPS) are paying 3%. Using a constant 2% yield, Mary must save $82 today to reach $100 in ten years instead of $75 for Jill. Jill is confident with $75 as she can "lock in" that price today.

Since interest rates change over time, Mary must deal with the reinvestment risk. Starting with $82, there is no way for her to know today how much it will take to reach $100 in ten years. Mary can manage this uncertainty by investing more than $82 to improve her probability of reaching her $100 goal. How much more will depend on the amount of certainty she is comfortable assuming. The cost to fund $100 with a high degree of certainty is going to be more expensive than $82, but it is also possible it will cost less if interest rates rise.

WHAT IS THE LESSON HERE?

Jill is able to lock down the amount $100 will cost by accepting the volatility during the intervening ten years. Mary wanted to avoid the volatility, but her price was the uncertainty of $100 at the end of ten years. Jill has virtually no uncertainty she will reach her goal. She knows the liquidation value will go up and down during the ten years, but so long as she maintains her investment, the treasuries will mature for the full face amount. The volatility does not matter so long as she does not liquidate.

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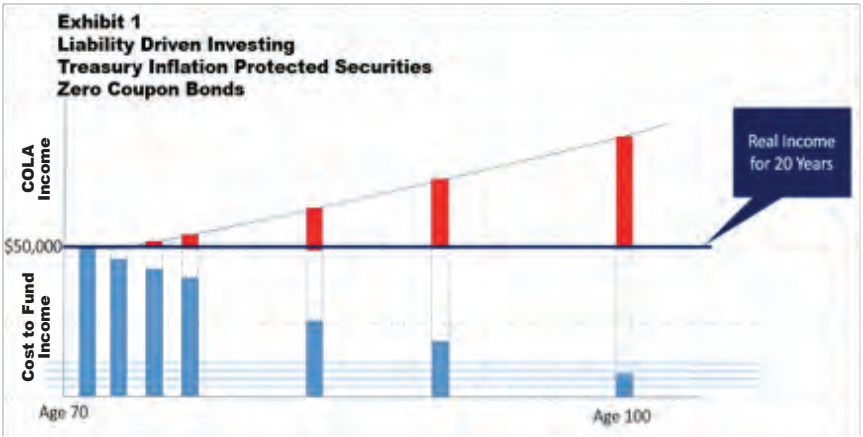
The same cannot be said of Mary's investment strategy. She has an uncertain investment pattern and an uncertain outcome. Mary's preference for stability of principal causes her to choose short-term bonds with a low duration risk, but this preference has a cost. Mary must determine the amount she needs to save today. Then, she is faced with considerable risk she may not fund her liability target if interest rates decline. In short, Mary is using the wrong investment instrument for her stated objective.

A common objective for most retirement plans is to build a sustainable, inflation-adjusted income stream for their entire life. Conceptually, an inflation-adjusted income stream could be constructed using a set of zero coupon bonds maturing annually over a defined number of years (Exhibit 1).



Here $50,000 is the target income annually. But the cost to fund the income becomes less and less, the further the target income date is from the funding start date. The real income remains $50,000, but the actual income is increased annually by the cost of living. Using this method provides a high certainty the retiree will not suffer from a loss in purchasing power due to inflation.

The cost of this income stream is measurable at the beginning of the period. There is a benchmark to determine performance because the income is knowable, with certainty, which is similar to how a pension plan operates. As interest rates change, the distributions will remain the same, despite changes in the account value. If real interest rates rise (fall) the cost of the income stream will fall (rise), but the distribution amount will remain constant. With a Pension, inflation can erode the purchasing power of the distributions. A pension is not designed or funded to meet the inflation contingency. As a result, pensions need to have a supplemental income added to it, to offset inflation.

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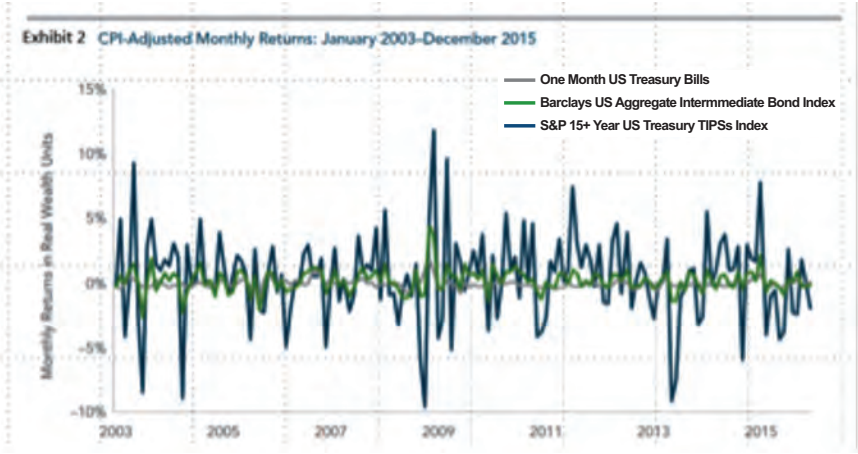
Knowing the cost to deliver $1 of income at a specific date, referred to as income units, can be used by an investor to convert their account balance now into income later. Performance (particularly, when there is volatility of the returns) can be measured by either the account balance or number of income units. This difference provides a way to compare investment strategies designed to achieve the same goals and highlight the tradeoffs an investor should consider.

THE DATA

Since inflation is one of the three critical retirement elements, an inflation-adjusted income unit is an important factor to consider. All returns need to consider the impact of inflation. The consumer price index (CPI) can be used as a good estimate of how inflation affects these models on both the real wealth as well as the income units. Performing this analysis requires real interest rate data.

When planning an income stream, there is a potential mismatch between assets and liabilities if interest rates are considered. Rates are an important driver for determining how effectively assets can be managed when trying to attain a given goal. Remember, when interest rates go up, bond values go down. So if income is going to be paid as a percentage of assets, rising interest rates can have a detrimental impact on the value of the retirement account because the portfolio would decline in value and therefore produce less income. To explore this relationship, consider three common fixed income indices with different maturities and interest rate risk: one-month US Treasury bills, the Barclays US Aggregate Intermediate Bond Index (Barclays index), and the S&P 15+ Year US Treasury TIPS Index (S&P 15+ year TIPS index) Exhibit 2.



To get real interest data, the S&P TIPS indices from January 2003 to December 2015 are used. Income payouts typically do not start until retirement, so income stream will start January 2016. The model assumes a hypothetical investor will retire in January, 2016 and has a lump sum of money to provide future income. Each month, the model computes the theoretical price of an income stream that begins payments in January 2016 and makes monthly payments for 25 years. This will be referred to as the estimated "cost of retirement income."

During the sample period, there are two equity market declines and significant interest rate volatility during a declining interest rate cycle. When

measuring "success," the focus needs to be on the variability of a strategy in wealth and income units. While this sample period is relatively short, it provides useful information about the ability of different fixed income instruments to manage risk associated with real capital preservation or real liability matching over different market environments.

Using the returns of one-month T-bills and returns on the Barclays index as a benchmark for an intermediate-term fixed income investment, the model projects a simple capital preservation strategy. The returns on the S&P 15+ year TIPS index is used to represent the returns on a long-term bond strategy that is more closely aligned with the cost of an income stream that is sensitive to interest rates.

RESULTS

Exhibits 2 shows the returns of the three fixed income strategies in wealth units. When measuring returns based on assets, one-month T-bills have the lowest volatility while the S&P 15+ year TIPS index has the highest. However, if you look at Exhibit 3, it is striking how this pattern is reversed when measured in consumption units – T-bills have the most volatile returns.

Exhibit 3 Monthly Returns in Units of a Real Consumption Stream: January 2003–December 2015

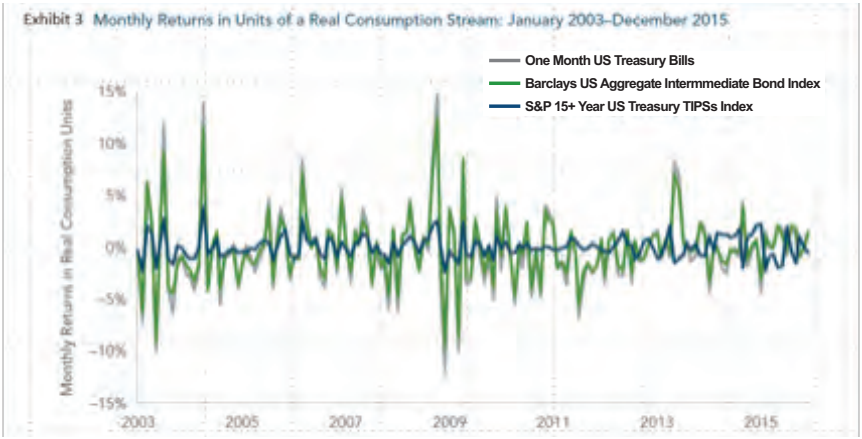


Exhibit 3 uses the same data but shows what happens if the data is illustrated based on income units. The TIPS are much less volatile when compared to the income projections from intermediate bonds or from short term treasuries. The dark blue line depicts the data for the TIPS in both charts.

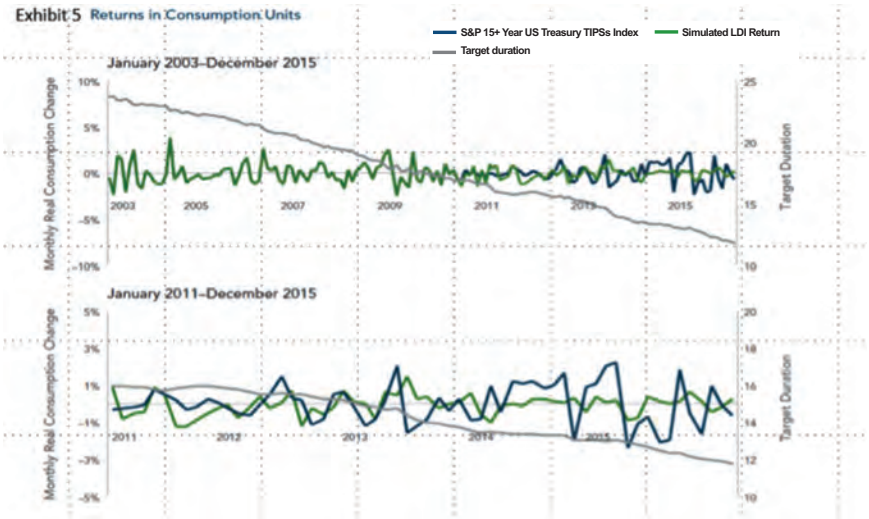
Exhibit 4 Returns in Real Wealth and Consumption Units: January 2003–December 2015

	Real Wealth Units			Real Consumption Units (Simulated)		
	One-Month US Treasury Bills	Barclays US Aggregate Intermediate Bond Index	S&P 15+ Year US Treasury TIPS Index	One-Month US Treasury Bills	Barclays US Aggregate Intermediate Bond Index	S&P 15+ Year US Treasury TIPS Index
Average (annualized)	–0.8%	1.9%	4.5%	–4.1%	–1.7%	–0.5%
Std. Dev. (annualized)	1.2%	3.2%	11.8%	13.3%	11.3%	3.8%
Best Month	1.8%	4.3%	11.8%	14.6%	12.5%	3.8%
Worst Month	–1.1%	–2.7%	–9.7%	–12.0%	–9.5%	–2.5%
Best Quarter	3.1%	12.5%	29.1%	23.9%	21.1%	5.4%
Worst Quarter	–3.6%	–4.0%	–20.4%	–11.7%	–9.9%	–4.7%
Best Year	3.6%	7.6%	12.4%	21.9%	22.4%	11.3%
Worst Year	–1.8%	–3.1%	–17.1%	–24.7%	–19.9%	–6.2%

Past performance is no guarantee of future results. Indexes are not available for direct investment.

Exhibit 4 shows the summary statistics measured as monthly changes in account balance and in income units. Again, one-month T-bills protect capital against large swings, but they have the highest volatility when providing income units: 1.2% vs. 13.3%. The S&P 15+ year TIPS index has the highest standard deviation in the wealth portfolio (11.8%) and the lowest in consumption units 3.8%. The low annualized standard deviation of one-month T-bills highlights the strength of this strategy for preserving capital. The minimum monthly return (in units of real wealth) is –1.1%. The S&P 15+ year TIPS index is the least suitable (-20.4%) when capital preservation is the objective.

The question is simply, can TIPS be more efficient and effective? Exhibit 5, compares a simulated monthly return for the liability driven approach using 7–10 year TIPS and 15+ year TIPS in bond combination to create income units. In this model, income payments are illustrated for the last 13 and 5 years prior to retirement for a hypothetical investor. If there was a way to provide perfect hedging of income risk (e.g., by just holding units of a "theoretical" retirement bond that matches all the cash flows), the chart would be a flat line.



The LDI strategy based on duration matching is not a perfect hedge because the price income stream does not change linearly with respect to the underlying interest rate. The ability to hedge income risk using

the LDI strategy can be a helpful tool for investors seeking to "lock in" at least partially, an income goal prior to retirement. This exhibit shows how, theoretically, the LDI improved the matching of income to the flat line.

CONCLUSION

Investors can focus on either wealth risk or income risk, or some combination between income and wealth variability for selected investment strategies. There are substantial differences when switching performance metrics from wealth units to income units. These differences suggest an investor who is concerned with capital preservation might benefit more from focusing on wealth risk, while investors concerned with retirement consumption might benefit more from focusing on income volatility.

For income focused investors, the simple LDI strategy is designed to manage the income risk by diversifying the portfolio into annual income units. The analysis reveals that managing wealth variability and income variability are two entirely different investment goals and strategies. An investment portfolio with low wealth risk can have high income risk, while a portfolio with low income risk can have high wealth risk. The key is to identify the right investment strategy by deciding what matters most—wealth or retirement income. The conclusion from this study is that risk reduction depends on the cash flow requirements for each retiree. Risk management needs to reflect the goals and income targets and attempt to match the sensitivity of the goal to key risks for the goal (a liability management framework). Done properly, the income sensitive investor should have less stress and concern about their wealth lasting as long as they do.

The key is to identify the right investment strategy by deciding what matters most—wealth or retirement income.

Exhibits 2-5 were an explanation provided by Massi De Santis Ph.D in a March 2016 study for Dimensional Funds.

All investing involves risk, including the potential for loss of principal.
There is no guarantee that any strategy will be successful.

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