Summer 2022

THE GOODMAN REPORT

Simplifying Bonds: Pricing & Interest Rates

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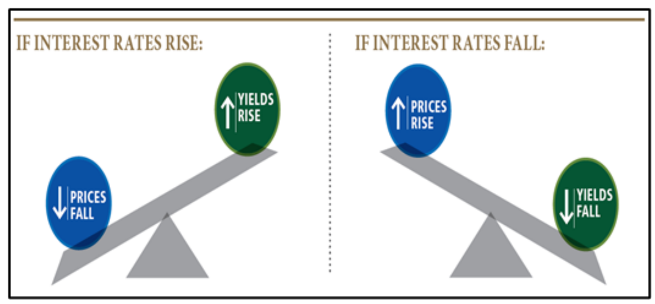
Bonds can be a daunting subject. You see their prices changing and yields varying, but how does all that work? What happens to bond prices as interest rates change? This article will attempt to provide investors with a better understanding of the relationship among market interest rates, bond prices and yield to maturity (YTM) of bonds. Before moving on, let's provide some definitions for various aspects of bonds:

- **Bond Price**: The current market price of a bond available for sale in the market
- **Par Value:** The price a bond investor receives at the time of maturity, usually $1,000; Sometimes referred to as "Face Value"
- **Coupon Rate:** The stated interest rate paid by a bond when it was originally issued, usually fixed for the duration of the bond's life
- **Current Yield:** This is the bond's coupon divided by the current bond price
- **Maturity:** The length of time in years before a bond reaches its maturity date
- **Yield to Maturity (YTM):** The percentage rate of return for a bond at any given time assuming that the investor holds the bond to its maturity date. Considers current bond price, coupon rate and the time to maturity (at par value)

A fundamental principal of bond investing is that market interest rates and bond prices move in opposite directions. This can be seen in the chart below. But why is that? Let us attempt to explain it by illustrating a couple of examples. In both examples, we start with the purchase of a newly issued 10-year maturity bond at par value of $1,000 with a 3% coupon which matches the current market interest rate of 3%.



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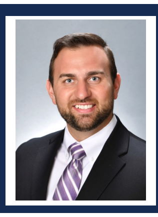

Retirement Planning Success: Impact of Market Declines on Monte Carlo Simulations

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As we know, markets move in three directions: up, down, and sideways. When the market declines, it can leave many wondering "am I still on track to meet my financial goals?" Monte Carlo simulation is one tool within a financial plan that can help address this question.

Monte Carlo simulation incorporates market downturns into planning by randomizing the individual annual returns that achieve an expected long-term rate of return. A typical Monte Carlo simulation will run a portfolio and its contributions and distributions through 1000 different sequences of returns, or trials. If the portfolio still has money in it at the end of the trial it is considered successful. If the portfolio runs out of money along the way, the trial is considered unsuccessful. These trials can then be aggregated to see how many times the plan was successful on a percentage basis. If 810 of the 1000 trials are successful, there is an 81% chance that the portfolio's returns will support the financial goals of the plan. The range of trial outcomes can also be graphed to show the spread and probability of different ending portfolio values as shown on page 3.

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In Example 1, after the first year market ***interest rates decrease*** from 3% to 2%. In that instance, our 3% bond suddenly looks very attractive to other bond investors, who would then be willing to pay more than par value for our bond so that it would then deliver a 2% market yield to the new investor over the remaining life of the bond. This would cause the ***bond price to increase*** to $1,082, or an 8.2% increase in price (we will spare you the math involved here!). The bond would now be trading at a "premium" to the $1,000 par value.

This certainty of a "Pull to Par" value can be seen in the previous chart, which shows how the price of a bond trading at a premium or discount degrades or accretes to par value over time to its maturity.

At the time of a bond purchase, a few things are known with certainty: 1) the investor will receive the stated coupon interest rate over the life of the bond; 2) They will receive par value upon the bond's maturity; and 3) They will lock in a certain,

Example 1

Financial Term	Today	One Year Later ↓
Market Interest Rate	3%	2%
Coupon Rate (semi-annual payments)	3%	3%
Face Value	$1,000	$1,000
Maturity	10 years	9 years remaining
Price	$1,000	$1,082
Yield to Maturity	3%	2%

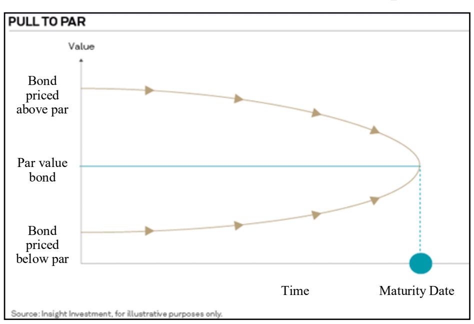
Conversely, in Example 2, market ***interest rates increase*** from 3% to 4% after the first year. In that instance, our 3% bond is now not as attractive to other bond investors, who would have to offer a lower price in order that it would then deliver to them a 4% market yield over the remaining life of the bond. This would cause the ***bond price to decrease*** to $925, or a 7.5% decrease in price, and the bond would now trade at a "discount" to par value. So, as you can now see, bond prices will adjust inversely to changes in interest rates.

calculated YTM for the remaining life of the bond assuming that it is held to maturity. In an environment like today's where interest rates have risen rather dramatically, a bond investor will likely see unrealized losses in their portfolio. But those unrealized losses will slowly disappear as the bond accretes up to par value over its remaining life, assuming it is held to maturity. Ultimately, the YTM at the time of a bond's purchase is the true measure of expected return for that bond investment, regardless of up or down price movements due to inevitable

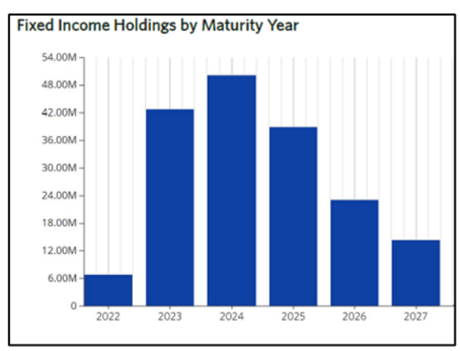
Example 2

Financial Term	Today	One Year Later ↑
Market Interest Rate	3%	4%
Coupon Rate (semi-annual payments)	3%	3%
Face Value	$1,000	$1,000
Maturity	10 years	9 years remaining
Price	$1,000	$925
Yield to Maturity	3%	4%

In the above examples, the bond we had purchased at par subsequently traded at either a premium or discount to its par value after the first year. This is actually the normal state of affairs for bonds almost immediately after they are originally issued (at par), due to the fact that interest rates change daily. Since we rarely buy bonds at their issuance when they sell for par value, we usually buy them at a premium or discount to par value depending on current market rates and the bond's stated coupon. In the instance of buying a bond at a premium, we would incur a loss on the bond upon maturity, receiving par value then. But, of course, over the remaining life of that bond, we would have received a coupon rate that was above market interest rates at the time of purchase. Conversely, we might buy a bond with a coupon below prevailing market interest rates at the time of purchase, and therefore pay a discount to par value for the bond. In this instance, we would recognize a gain on the bond at maturity when we receive the higher par value at that time, offsetting the lower than market coupon rate that we received prior to maturity.



changes in interest rates over the term of holding it. We believe the best way to manage that interest rate risk is by "laddering" a bond portfolio. By this, we mean constructing a bond portfolio where some of the bonds mature every year over a select number of years. In the accompanying chart, we show a recent Goodman Financial Corp. aggregate composite bond ladder that is fairly representative of most client portfolios. You can see that this ladder extends no further out than 2027, with maturities in each of the intervening years and skewed to the earlier years in the ladder. So, while we might have had to lock in lower YTM's for bonds purchased over the past couple of years than we would have liked, we will have the opportunity to reinvest those bonds as they mature each year at higher interest rates, assuming the rising interest environment we are currently experiencing continues to hold or rise even further.



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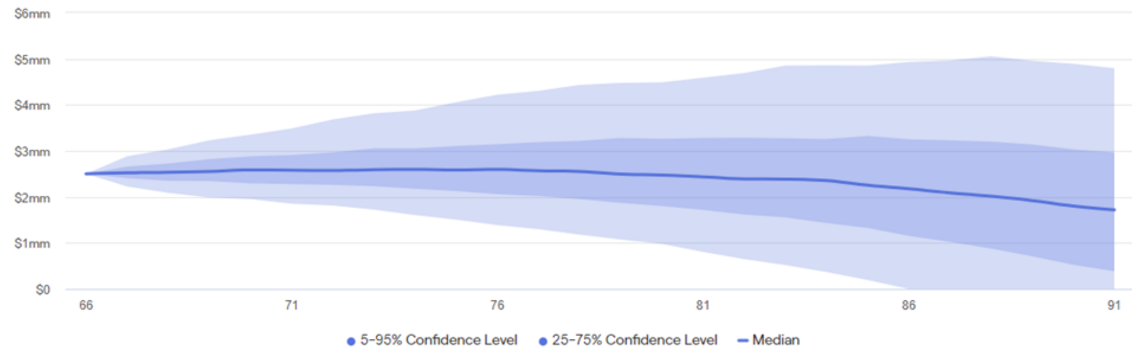
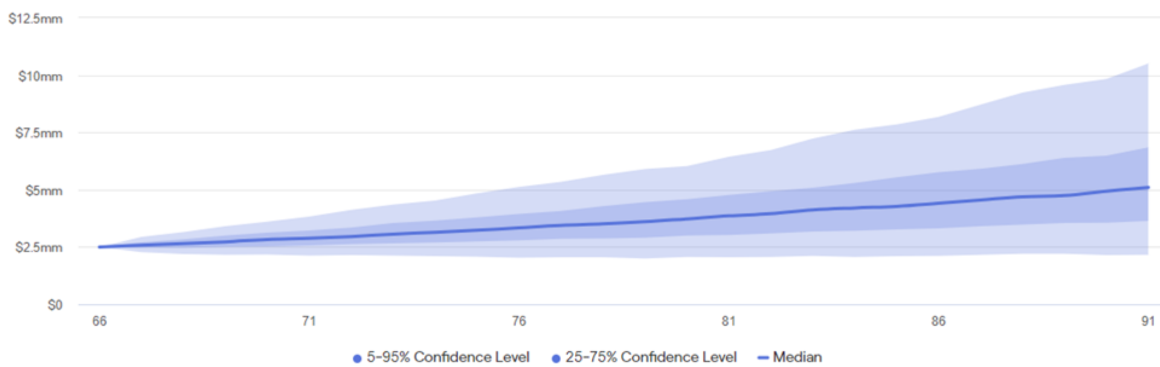


The probability of success and range of trial outcomes will change depending on the goals of the plan. These include but are not limited to life expectancy, spending rates, and risk/return assumptions. Here is another range of trial outcomes for a portfolio where the spending need is lower.

When losses in a trial happen toward the end of the distribution phase (typically the end of the plan), those losses tend to have less of an impact on results because spending goals have already been achieved up to that point.



In these ways, Monte Carlo simulations help us quantify the impact of varying year over year returns. For someone retired and relying on portfolio distributions to cover spending, the sequence of returns can affect the portfolio's longevity. *Graphic 1* below shows a $2,500,000 portfolio, with a $100,000 annual withdrawal rate and 5.98% annualized rate of return yielding different ending values depending on the sequence of returns. For trials where negative returns happen earlier in the distribution phase of the plan, the inability to recoup the losses on the amount distributed is what can lead to unsuccessful trials.

Graphic 1:

More Favorable Outcome					
Year	**Starting Value**	**Return %**	**Return $**	**Withdrawal**	**Ending Value**
1	$2,500,000	18.00%	$450,000	-$100,000	$2,850,000
2	$2,850,000	8.00%	$228,000	-$100,000	$2,978,000
3	$2,978,000	11.00%	$327,580	-$100,000	$3,205,580
4	$3,205,580	-10.00%	-$320,558	-$100,000	$2,785,022
5	$2,785,022	5.00%	$139,251	-$100,000	$2,824,273

Less Favorable Outcome					
Year	**Starting Value**	**Return %**	**Return $**	**Withdrawal**	**Ending Value**
1	$2,500,000	-10.00%	-$250,000	-$100,000	$2,150,000
2	$2,150,000	8.00%	$172,000	-$100,000	$2,222,000
3	$2,222,000	5.00%	$111,100	-$100,000	$2,233,100
4	$2,233,100	11.00%	$245,641	-$100,000	$2,378,741
5	$2,378,741	18.00%	$428,173	-$100,000	$2,706,914

Annualized Return	5.98%	**Difference**	$117,359

While Monte Carlo simulation is a great tool that considers the numerous assumptions within a financial plan and helps quantify the uncertainty of future market returns in an easily digestible percentage figure, it isn't without its limitations. For one, while the final percentage probability may seem predictive, it isn't. In reality, the market returns will only end up playing out to be one sequence of returns and even if it is similar to one of the 1000 trials, it is impossible to know which trial is being lived through. Another limitation is that Monte Carlo simulations may produce different probabilities of success year to year as market cycles unfold and actual returns are realized. In one year, the probability of success may be 80% and the next 75% if there was a year of negative returns between running the simulations. While this makes sense on a surface level, which set of simulations should be trusted for the long-term? The one performed in the down year, or the one performed the year before.

Overall, despite some limitations, Monte Carlo simulations are incredibly useful. The analysis tool helps facilitate more meaningful conversations about the impacts of markets that move up, down and sideways that would be hard to visualize and understand otherwise. By calculating a probability of success, Monte Carlo simulations can provide investors with a certain degree of confidence that their financial goals may not be derailed because markets are currently in decline.

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The Goodman Report

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New Team Member Addition

Goodman Financial is continuing to add credentialed and diverse professionals to our team. We are proud to announce our newest addition: Abrin Berkemeyer! As an Associate Advisor, Abrin oversees the day-to-day relationship with his clients, addressing their financial advisory needs, participating in client meetings, and servicing their accounts. Prior to joining Goodman Financial, Abrin was a Lead Financial Advisor who built financial plans, implemented investment strategies, and conducted portfolio reviews for his clients.

Abrin is a 2017 graduate from Worcester Polytechnic Institute, with a Bachelors of Science in Actuarial Mathematics. During his free time, Abrin enjoys weightlifting, DIY home projects, and podcasts. When he isn't reading his favorite novel by Jordan Peterson, *12 Rules of Life,* Abrin enjoys playing cornhole and pool. Born and raised in Maine, we're excited to have Abrin join our Goodman Financial Team and cannot wait to see his unique impact and contribution to our firm.

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