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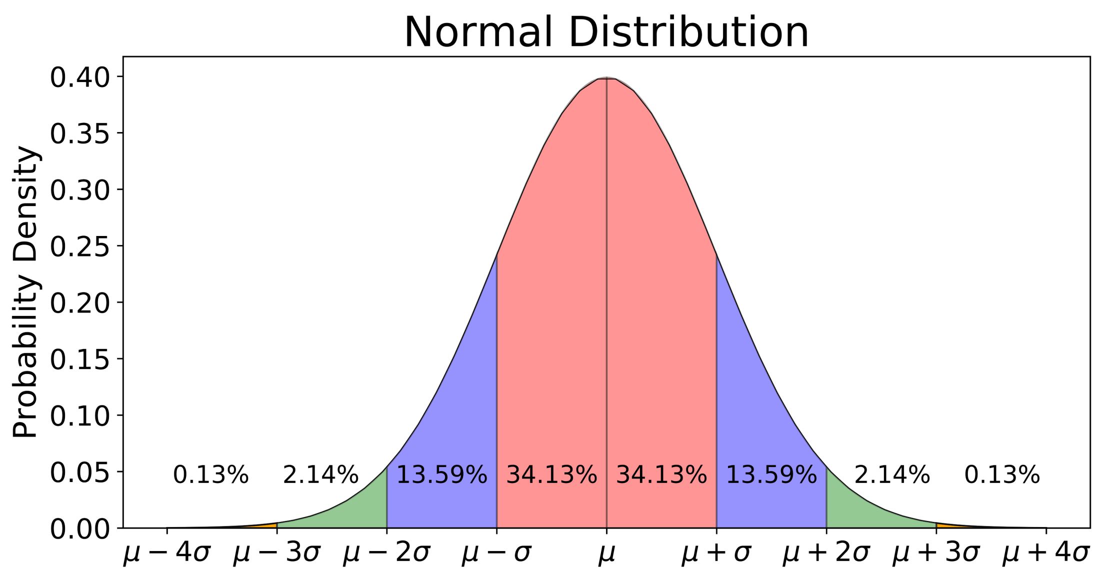
Tail Risk Hedge Investing for the Retired Investor

This paper will explain the importance of adding a tail risk hedge strategy to an investor's portfolio, and the effects it can have on the long term return of the portfolio. Our focus will be on those individuals who are either retired or who are approaching retirement. Investors are faced with many challenging decisions when approaching retirement. Their income will now consist entirely of their savings, investments, and social security. Rightfully so, this can shift an investors sentiment from risk taking to capital preservation. A fear of running out of one's money can drive them to make "safe" investments. Often times, these investments can have a negative impact on the compound annual growth rate of ones portfolio. Many times these investments only increase the chance that one will run out of money by making it harder to grow their wealth through retirement. Growing your wealth through retirement is a necessity to ensure you outpace inflation, and you are able to cover the growing cost of living and medical expenses. Most investors will not start saving until around the age of 30, and once they approach the age of 60 they start allocating toward more conservative investments. Using a life expectancy of 80, this would leave an investor with a conservative portfolio for 40% of the portfolio's life. Our goal, is to allow an investor to be aggressively allocated throughout their entire life while also maintaining proper risk mitigation so the investor does not worry about suffering catastrophic losses. Being more aggressively allocated should increase our investors compound annual growth rate while also increasing their annual income. In the following pages we will cover what tail risk hedging is, what tail risk hedging is not, compare different portfolios so we can see the long term performance, and in closing, show why tail risk hedging is a great alternative to many of today's "safe" investments.

What Tail Risk Hedging is:

Tail risk hedging is the process of hedging your portfolio against tail events, the most rare and unpredictable events. For this paper we will be focused on tail hedging our stock market, S&P 500 holdings. The word "tail" refers to the far ends of the bell curve. For our purposes, we will only be focusing on the left tail of the distribution, those would include the largest stock market crashes. We want to pay for a hedge that protects us against those large losses. Recent examples of these tail events would be September 11, 2001, the global financial crisis of the late 2000's, and the COVID-19 pandemic. These were extremely rare, unpredictable events that had a long lasting impact on an investor's portfolio.



Tail hedging is a protection against the largest of losses only, 5% and 10% losses to our portfolio are not what we want to protect against. These are common occurrences when investing in the equities market. Our hedge will aim to protect against loses around the 20% range. Our portfolio will hold roughly 97% S&P 500, and 3% tail hedge. If I have a $100,000 portfolio, I would be looking to spend around $750 every quarter, or $3,000 every year to hedge it. This means we are willing to spend roughly 3% every year to protect our portfolio from these rare events. We will accomplish this by holding put options on the S&P 500. These options act somewhat similar to an insurance contract. They will have a massive payout if our rare event, a market crash, occurs. If no event occurs, the options will expire worthless. You can think of these options as similar to your home owners insurance, or car insurance premiums.

Tail hedging is a better hedge for equites than anything current portfolios offer. Most people in retirement are uncomfortable with a large percentage of their assets in equities, which is understandable. Throughout an investor's career they might have an allocation of 70% stocks, and 30% bonds, but at retirement they could shift to 40% stocks and 60% bonds. Investors will look for alternative investments that either have downside protection, or perform inversely with their equity position. Some of these alternative investments include mutual funds, structured products, dividend paying stocks, annuities, and bonds. We will cover some of these investments in more detail later, and aim to prove the long term cost of some of these investments, as well as the uncertainty of how they may perform in the next market crash.

What Tail Risk Hedging is not:

Tail hedging is not a short term, speculative bet against the stock market. It is actually a long term bullish view of the U.S. economy. We assume we have no ability to predict when tail events occur, which is why we aim to always hold our hedge no matter how quiet market conditions might seem. This will result in us paying for our tail hedge for years, without ever having a large crash. The more frequent market sell offs of 5% and 10% become much less worrisome when the investor knows that they are hedged. One of the main benefits of tail hedging is that it allows you to remain long equities without shaking you out of your position when markets begin to sell off. It allows us to take emotion out of investing. Emotional investing always leads to poor decision making.

Tail hedging is not a doomsday investment. A lot of critics of tail hedging claim it is just betting against the market, and hoping for a crash. This statement could not be further from the truth. The goal of tail hedging is to allow us to more aggressively allocate into equities. A risk averse investor with no tail hedge might only be comfortable with 40% of their retirement in equities, while an investor who is hedged might be more comfortable at 80% in equities. This increase in allocation can have a dramatic impact on the long term growth of an investor's portfolio. Being able to comfortably hold twice the amount of assets in equities will have a large effect on our investor's wealth.

Tail hedging is not just throwing away 3% a year on your hedge. Since you can go many years without your hedge ever paying off, a common argument is that paying for a tail hedge is a waste of money. Many people will say you are better off just weathering the market sell off because the market will always come back. This is an incorrect and simplistic approach to investing. We will go in depth to disprove this argument as it is a common one. The following are factors not taken into account by someone saying "You should just weather the storm of a market crash, it will always come back. The yearly premium spent on hedging is just a waste":

- Asset allocation: If an investor knows they are hedged, this gives them the confidence to hold 75% in equities where otherwise they would only be comfortable holding 40%.
- Emotions: It is easy to say you should not sell when markets crash. However, this is much easier said than done. Market sell offs are especially impactful for retired investors. By not

having any new salary coming in, they know capital preservation is their main priority. The first sign of a large market sell off can create panic in an investor, and can lead to selling at the worst time.

- Liquidity creation: When the stock market crashes most investors are looking to sell positions to cover losses in certain areas of their portfolio. A tail hedge portfolio actually creates liquidity during crashes. When the market crashes more than 20% we will start selling our options for a large profit which will create cash. This is a huge advantage of tail hedging. During crashes our portfolio generates cash. We now have the ability to put that cash to work by buying the S&P 500 after it has already dipped by more than 20%. When the market returns to all time highs, we now have on a much better average price because we were able to put cash to work during the melt down. We have the ability to outperform the S&P 500 on large time scales by avoiding crashes and buying more shares of the S&P 500 during crashes.
- Volatility tax: This refers to the damage large losses have on your portfolio. If you lose 10%, you need to make 11.11% to get back to even. If you lose 25%, you have to make 33.33% to get back to even. If you lose 50%, you have to make 100% to get back to even. As you can see, the larger the loss the more we have to make to get back to even. Avoiding these losses will have a large impact on our long term compound annual growth rate. Sacrificing a small amount on good years, allows us to smooth the volatility of our equity position which will increase our compound annual growth rate.

Performance Compared to Alternatives:

For us to prove that tail hedge investing is viable, we need to compare it to other diversified portfolios. We have created four portfolios we can compare to see the long term results depending on how you allocate your assets. Each portfolio has a different mix of investments, so we can see the long term effects on the different portfolios.

Portfolio 1: All Weather	**Portfolio 2: Annuity**	**Portfolio 3: Target Date**	**Portfolio 4: Tail Hedge**
40% Long Term Bond Fund	50% Index Annuity	40% S&P 500	75% Tail Hedge (97% S&P 500, 3% tail hedge)
30% S&P 500	25% S&P 500	27% International Stocks	12.5% REIT
15% Intermediate Bond Fund	12.5% REIT	23% Intermediate Bond Fund	12.5% Preferred Shares
7.5% Gold	12.5% Preferred Shares	10% International Bond Fund	
7.5% Commodities			

Even though the combinations of available portfolios are endless, this gives us a good look at how some current investors are allocated. The goal of our tail hedging portfolio is to give us down side protection, while also letting our money grow at the highest rate for the longest amount of time.

Starting in the year 2010 with a balance of $1,000,000 when our investor is the age of 55. We will let each portfolio grow for 10 years without touching it. Our investor will retire at 65, and will start withdrawing annually to help cover their yearly costs. The results from backtesting the following portfolios from 2010 - 2020 are as follows:

	Portfolio 1: All Weather	Portfolio 2: Annuity	Portfolio 3: Target Date	Portfolio 4: Tail Hedge
CAGR	7.57%	11.25%	8.15%	14.33%
End Balance	$2,333,870	$3,308,616	$2,466,279	$4,358,150

This was a great decade to be invested in equites as we have saw from the performance of the annuity and tail hedge portfolios. The COVID-19 pandemic gave our tail hedge portfolio a boost that helped us outperform the other portfolios substantially.

Our annuity payout comes out to $67,366 per year. That payout is equal to 4% of our final annuity value when our investor hits the age of 65. We will also withdraw $67,366 from each portfolio to simulate the investor paying themself, and make things equal between the portfolios.

Now comes the difficult part of guessing how these portfolios will perform in the future. In the "All Weather" portfolio we will continue to use 7.57% as our CAGR. In the annuity portfolio, half of our portfolio is the annuity so this will stop growing once the payouts start. The other half is evenly split between stocks and dividend paying securities. Since stocks have historically returned 10% and these dividend paying stocks have been averaged 5% we will assume we can get 7.5% a year out of our remaining investments. Our target date fund will continue to shift our investor into treasures as they get older. Once they are fully retired their allocation will look more like 30% stocks and 70% bonds. This allocation returned 5.6% the last decade, so we will use that as our CAGR. We want to make it as difficult as possible for our tail hedge portfolio, and assume our tail hedge never pays off. Since the S&P 500 has historically returned 10% by giving our tail hedge portfolio a CAGR of 7% this would assume there are no crashes.

Our ending balance will be in the year 2047 when our investor has passed away at the age of 92. Once again, they withdrew $67,366 each year to help cover living expenses.

	Portfolio 1: All Weather	Portfolio 2: Annuity	Portfolio 3: Target Date	Portfolio 4: Tail Hedge
CAGR	7.57%	7.5%	5.6%	7%
End Balance	$11,234,850	$11,798,393	$10,461,325	$22,063,292

Now these are just guesses on how investments can act in the future, but it does a good job pointing out if the U.S. economy continues to perform well, the tail hedge portfolio can provide superior performance. The tail hedge portfolio performed almost two times better than our annuity portfolio with a historically conservative estimated performance. This would make perfect sense because our annuity loses any ability to continue to grow once we start receiving payments. This has very large long term consequences. Half your portfolio loses its ability to grow.

Portfolios 1 and 3 both lagged because of their heavy allocation to bonds. With yields as close to zero as possible, these portfolios appear to become more risky as there seems to be very little upside left for bonds. If the inverse correlation of bonds and equities breaks, and both sell off, it could leave investors confused as to why they aren't protected.

The importance of this data is realizing our investor still had 27 years of compounding left after they retired at the age of 65. Risk mitigation is extremely important when approaching retirement, but the investor must realize long term growth is also important. Tail hedging is a great combination of both risk mitigation and long term growth.

We will now look at a slightly different scenario. Our investor wants to withdraw more than the $67,366 we used in the previous example. They determine taking out 3% per year will provide them with enough money to take vacations, visit family, and generally live a much more comfortable retirement. The 3% withdrawals will begin at retirement when our investor is the age of 65. The following table does not include our $67,366 annual payout, each portfolio equally withdraws that, we will keep that separate for this example. We will calculate the 3% withdrawal rate from the age of 65 until our investor's passing at the age of 92.

	Portfolio 1: All Weather	**Portfolio 2: Annuity**	**Portfolio 3: Target Date**	**Portfolio 4: Tail Hedge**
Average Annual Payout	$99,337.15	$100,204.53	$75,423.95	$202,852.95
Sum of all Annual Payouts	$2,682,103.16	$2,705,522.40	$2,036,446.53	$5,477,021.58
End Balance	$4,565,687.33	$5,585,325.46	$2,485,799.14	$9,756,763.75

The tail hedge portfolio gave our investor on average twice the amount of spending money per year more than any of the other portfolios. The tail hedge also gave them a much higher ending balance. This is continuing evidence, being more heavily allocated towards equities gives our investor the best chance to grow their wealth through retirement. Remember we used 7% annually for our tail hedge portfolio. We used the historical return of 10% from the S&P 500, and assumed our tail hedge never paid off for all 27 years during our investor's retirement. If the current boom/bust market cycle continues, and we see a few crashes followed by new highs in the stock market our tail hedge portfolio would perform considerably better.

The goal of this simulation was to show a tail hedge portfolio has the potential to outperform diversified portfolios even during long periods where there are no crashes. It is vital to understand the cost on most diversified portfolios. In decades prior, bonds were held as a hedge against equities, and also because they provided a steady yield for your portfolio. In today's current environment, bonds offer little to no yield. Bonds have simply turned into an equity hedge for most portfolios. A tail risk hedge is a more efficient hedge on equities than bonds. It outperforms in long bull market runs, providing you with explosive upside if there ever is a crash. The key takeaway is our tail hedge portfolio can outperform diversified portfolios if we go decades without a crash.

The main issue with holding bonds as your hedge against equities is that there is no guarantee that if equities sell off, bonds will rally. The saying, "flight to quality", assumes when markets sell off people will take their money out of equites and put it in a quality investment like U.S. treasuries. If at some point U.S. treasuries no longer seem like a quality investment, this correlation could break. Even though we have not seen a large spike in inflation in decades, this is another factor that could play into the stocks/bonds correlation breaking. If yields spike because of inflation this would cause treasuries to sell off. A sharp spike in inflation could spook equities markets and cause them to also sell off. This will leave an investor holding stocks and bonds while both are selling off. Bond prices have essentially rallied for the last 40 years. This has resulted in yields getting being extremely low since price and yield have an inverse relationship in bonds. It is important to understand that just because performance and correlation have existed for decades is no guarantee that it will always continue. An investor that is heavily allocated in bonds, might find themselves not as protected as they think they are.

Conclusion

Tail risk hedging provides an investor with liquidity. Liquidity is the ability to quickly sell your investment. Our tail hedge positions are owning the S&P 500 and options on that. If cash is needed, you have the ability to sell your S&P 500 position and the options any time the stock market is open. You do not have to wait for the options to expire. Options are actively traded just like stocks. You can immediately cash out. Other investments such as annuities, and structured notes are not liquid. Your money is tied up for the life of the contract. You can do an early withdrawal of an annuity, but will see large fees. Structured notes can sometimes be sold early, but usually are redeemed below face value.

Tail risk hedging takes on no counter-party risk. Counter-party risk is the chance that one party won't be able to meet their obligation of a contract. Structured notes issued by banks have counter-party risk. If a bank fails, all of their notes have a chance of being worthless. Even though this is very rare, it must be taken into consideration by an investor. Annuities also carry this risk. Even though structured notes and annuities are thought of as a safe investment, they are only as safe as the underlying company who sold them to you. We hold the S&P 500 ETF and options on it, we don't have to worry about a bank or investment firm failing and us losing our investment.

Tail risk hedging allows an investor to take a lot of the emotion out of investing. Knowing you are always holding downside protection on your S&P 500 position takes away the guessing part of investing. The ideal investment approach is one that allows you to not have to check your portfolio balance every day. Investors with no hedge can be very jittery at the first sign of a sell off. The media and market pundits can fuel this fear, and force investors to liquidate at the worst times. Being hedged, allows an investor to not fear dips in the market.

Tail risk hedging allows you to collect dividends on the S&P 500. The current dividend on the S&P 500 is 1.47% annually, so for a $100,000 investment you would receive $1,470 in dividends this year. This small amount of yield does not seem like a big deal, but makes a huge difference over the long term. From 1993 to 2018 if you did not reinvest dividends you would have seen your investment grow a little over 600%, if you did reinvest your dividends you would have seen your investment grow around 1000%. Structured notes and annuities do not include dividends they merely track the performance of their underlying.

Tail risk hedging allows you to have a larger allocation in equities. This is one of the most important concepts to understand. By giving an investor the confidence that their equity position is protected, it gives them the ability to be more aggressive with how much equities they hold in their portfolio. As we showed in our simulation, being able to allocate twice the amount into equities can have a massive impact on the long term wealth creation of your portfolio.

Tail risk hedging is best implemented using a tax deferred account such as an IRA. We use options to hedge our equity exposure. During most years where the stock market continues to climb, our options will give us a loss on those positions. We will be actively buying and selling option positions, so in a typical year a portfolio of $100,000 will show on average $3,000 in short term losses if our options expire worthless. If you're using a cash/brokerage account you would be able to claim that $3,000 in losses which will help lower your tax bill. However, when the market does crash and we sell out of our options for a large profit we will show short term capital gains. If this trade is done through an IRA no taxes will need to be paid, but if this trade is done in a cash/brokerage account taxes will need to be paid on the profits of our options. Having to pay taxes because you incurred a large profit during a crash is clearly a good problem to have. However, implementing this strategy in an IRA lets you not worry about paying any taxes unless you withdraw funds. For a lot of investors who have a 401k , but not an IRA, they can roll their 401k into an IRA where they can implement this tail risk hedge strategy.

The goal of this paper is to show that tail risk hedging is a far superior form of risk mitigation than alternatives offered today. It does a great job protecting from large losses while also letting your money grow for the long term. Since 1926 there has been a bear market, greater than 20% drop, on average every 6 years. There have been 3 major crashes within the last 20 years. The dot com bubble, global financial crisis, and the COVID-19 pandemic all wreaked havoc on most investors portfolios. Stock market crashes will always be impossible to predict in frequency and impact. We attempted to prove that you don't need to have market crashes for a tail hedge to still outperform most diversified portfolios. Our tail hedging portfolio has performed better than most diversified portfolios during long bull market runs while also providing large upside if the market does crash. This gives us a great union of risk mitigation and capital growth that will allow our investors to grow their wealth throughout their entire life.

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