

MUTINY FUNDS

THE COCKROACH APPROACH



HOW LONG-TERM INVESTORS
CAN USE BETTER PORTFOLIO
CONSTRUCTION TO
COMPOUND WEALTH ACROSS
BOOM & BUST
ENVIRONMENTS

TAYLOR PEARSON
WITH JASON BUCK

“Life is like a dice, so watch the ones you’re rolling with.”

— Tupac Shakur

“Time and chance happeneth to them all.”

— Ecclesiastes 9:11

*“Life’s a gamble, a game we all play.
But you gotta save something for a rainy day.”*

— Lynyrd Skynyrd



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It's 1945. You are a 25-year-old World War II veteran looking to settle down and establish a family. You've got a good job and you're starting to accumulate some savings. What would you out look on investing be?

The stock market has seen a three-year rally but still hasn't full recovered from the last 17 years. You remember similar rallies over the 1930s that ended with the market declining yet again. You remember how the market lost over 50% in 1931 when you were in middle school. Then, just when it seemed to be recovering, it lost over 30% in 1937 during your junior year of high school.¹ Why would 1945 finally be a good time to invest in the stock market? No one you knew had done well by investing in stocks.

The Silent Generation (1925-1945) was shaped by these experiences and were much more risk averse investors than subsequent generations.² Those who succumbed to fear in the 1940s missed out on a once-in-a-generation secular boom in the 1950s, with the Dow Jones rising 238.8% over the course of the decade.³

Now the year is 1981.⁴ U.S. Treasury Bonds purchased in 1977 lost more than half their value in inflation-adjusted terms by 1981. Double-digit inflation is a normal thing and economists are coming to grips with the possibility of high inflation and high unemployment happening in tandem. How could this have happened?

Sitting on the couch with a college friend admiring Tom Selleck's robust mustache on *Magnum P.I.*, you are jealous of your friend's 12% mortgage rate. You discuss going to see *The Empire Strikes Back* for a second time before it goes out of theaters.

At this time, an investor heavily concentrated in bonds might have been laughed at. Yet, that is exactly what the most successful investors did. As interest rates fell continuously over the next 30 years, the value of their bonds increased dramatically.⁵

Times change. Human nature doesn't. If past generations fared poorly by assuming that their direct experience represented a universal truth about how markets worked, why would it be any different for us? We believe that nearly all investors alive today suffer from the same recency bias as those investors who preceded us. To succeed as long-term investors, we believe that we must be aware of our biases and truly take a long-term view across many years, many geographies, and many possible futures.

When we think about investing, we think about the course of an entire lifetime. How might we build an investment portfolio that can stand the test of time? For the past decade, we've been researching and working on answers to this question.

For us, investments are more than just numbers on a screen. They are savings. They represent the fruits of hard work in the past and the promise of being able to do things in the future, whether that's buying a house, providing for a loved one, creating a memorable experience with the people we love, or donating to a cause we believe in.

1 Source: YCharts. Dow Jones Industrial Average (^DJI)

2 Lehman, Nathaniel, and Sissy Osteen. "A Financial Professional's Guide to Generational Risk Analysis in Stock Market Investing." *Journal of Consumer Education*, vol. 29, 2012, pp. 60–69. Accessed 16 Aug. 2023.

3 Source: YCharts. Dow Jones Industrial Average (^DJI)

4 Source: YCharts. 30-year U.S. Treasury Rate, Monthly U.S. CPI.

5 Ibid. Quick bond price explainer: When interest rates fall, bond prices tend to increase. For example, if you bought a bond with a face value of \$100 and a 10% interest rate today, then it would pay you \$10 per year. Let's say that tomorrow the interest rate available is 5%. In order to get the same \$10 per year, you would need to buy a bond with a face value of \$200. As a result, that 10% interest rate bond is now worth \$200 because it pays more interest than what is available today. So, it is generally the case that when interest rates fall — as they did from the 1980s to 2010s — bond prices rise.

To achieve this, we approach investing with two goals in mind:

1. **We're trying to increase the long-term compounded return of our portfolios so that we have "a lot" of assets in the future.**
2. **We're trying to make sure that if we need to use our assets for a family emergency, illness, or other unexpected life event (dare I say a global pandemic?) in the near term, that we will have "enough" assets in the interim.**

To take inspiration from the great philosopher 50 Cent, we can state our goals more simply:

1. **Get Rich**
2. **Don't Die Tryin'⁶**

We call this the **Dual Mandate of Compound Growth**: how do we construct a portfolio that balances increasing long-term wealth while managing drawdowns in the short to medium term?⁷

This may seem so obvious as to be not worth talking about. Who wouldn't want to increase the returns of their portfolio and lower the drawdowns?

However, almost all financial media and most financial education seem to ignore the concepts that we believe are essential to achieving this goal. Effective portfolio construction is not about picking the "best" stock or asset. It's about picking the best *combination of assets*.

There is an old saying that "offense wins games, but defense wins championships."⁸ Winning a championship in almost any sport requires consistency. One bad playoff game can be all it takes to end a great season. While great offenses can score lots of points, great defense can maintain leads and control the pace of the game, increasing a team's consistency.

However, great defenses rarely make highlight reels. There's nothing spectacular to see just a group of players executing consistently on their roles to make life hard for the offense.

This is no different in other areas of life. As anyone who has embarked on a program of sustained weight loss knows, the article on "16 Tips for Sizzling Abs" will not do you much good. What worked for me was a vastly more boring and less clickable program of "eat fewer calories than you burn, and get enough sleep and exercise."

Just as much of the fitness industry tries to sell you [insert hot new workout program or diet], the incentive of financial media is to get you to focus on superstar stocks or bold macro predictions. When we turn on CNBC or read through an investment forum, we see that almost everything focuses on how to pick winners and people ask for hot stock tips.

This is not that. We are not in the hot stock tips business. We are not trying to pick what asset class is going to be the best next month or next year. We are in the business of seeking out investment approaches that perform consistently, compounding decade after decade. We are in the business of winning investment championships. That requires a much longer term perspective than most investors take.

6 While we're on the topic of life advice from Fiddy, I remind you also of his wise counsel that "You shouldn't throw stones if you live in a glass house and if you got a glass jaw, you should watch yo' mouth: cause I'll break yo' face."

7 Lest this seem like I have discovered a unicorn investment strategy, there is going to be some tradeoff here. The investor who wants to compound at 30% annually is going to have to take more risk than the investor who is happy to compound at 3% annually. However, as we will explore here, there are ways to build portfolios with looking at the return per unit of risk. I will advocate for trying to approach the problem by thinking about getting more return per unit of risk rather than just focusing on return. To the finance professional in the audience, I am aware that there is a whole financial literature on this topic to which I have made absolutely no novel intellectual contribution whatsoever. But, as someone who talks to nonprofessional investors frequently, few people seem to understand the concept, and fewer apply it, so I'm going to at least try to make it a bit more intuitive and fun.

8 The exact origin of the phrase is difficult to pinpoint, as it has been a part of sports culture and coaching philosophy for many years and across various team sports. One of the notable proponents of this philosophy was legendary football coach Paul "Bear" Bryant, who led the University of Alabama to six national championships. Vince Lombardi, another iconic football coach who led the Green Bay Packers to multiple NFL championships, including the first two Super Bowls, is also often associated with emphasizing the importance of defense. However, it's not clear if either of them coined the phrase.

Part I of this paper will present a framework for how we think about maximizing compound growth through portfolio construction.

If you are coming to this paper from popular investing pedagogy, it's important to note that the math around diversification and rebalancing I am offering in Part 1 of this paper are not "an alternative investment philosophy." They are not "another way to think about investing" — they are *mathematical facts* about maximizing compound growth.

The only reason you would ignore this framework is because you want to have lower compound growth and lower long-term wealth.⁹ They are educational examples, not based on real trading or returns. They are designed to help you develop an intuition around how certain core investment principles work and how to use it to make better investment decisions.

Part II of this paper presents various asset classes and investment strategies and explains how they have historically performed. It then goes into some reasoning about how we would expect them to perform in different economic regimes going forward. These are different tools in the toolbox for making an effective portfolio. Part III shows what we believe to be the best combination of those assets for maximizing compound growth.

Other people, including yourself, may have different opinions about what asset classes or strategies to include and their respective weightings in a portfolio. Since we believe no one can possibly know the future return path of an investment, reasonable people may disagree with our conclusions on which asset classes should be included and their relative weightings in a broader portfolio. Indeed, our opinions have changed over time as we have learned more, and we hope to keep learning and updating our opinions.

This paper is not intended for someone with a degree in quantitative finance or someone who spent a decade on an options desk. I'm not likely to say anything you don't already know, and, as you have probably picked up already, my jokes aren't very good.

However, if you're someone who thinks of yourself as an entrepreneur, stock picker, value investor, venture capitalist, engineer or small business owner who's looking to make better decisions about your savings and investment portfolio, then this paper is intended for you. It is intended to help you make better decisions not about a single investment, but about the compound growth of an investment portfolio over the course of your lifetime.

Compound growth is not an intuitive concept. A friend's mom recently informed him that she had earned a 500% return on her house over the 42 years she had owned it, a compounded return of about 4%. When he told her that increasing the annual compounded growth to 6% would have meant almost a 1500% return, she was shocked. When you deal with long periods like a lifetime, small changes in compounding rates matter quite a lot.

What we hope you take away from this is a new and useful framework for thinking about investing and some suggestions on where to start researching and applying that framework. Where you take it from there is up to you.

Authors Note: We, Taylor and Jason, have been working on the concepts around compound growth, rebalancing, and portfolio construction for the last five years jointly, and, individually, for some time before that. This paper represents our joint attempt to present what we feel are the most important ideas in the most clear way possible based on many years of research and discussion. The drafting of this paper was done by Taylor and so the use of first person singular refers to him.

⁹ In my experience, quite a few investors revealed preferences (rather than their stated preferences) are not to maximize compound wealth. As I observe them, some investors revealed preference is often to look smart to their friends by picking big winners or to not underperform a popular benchmark like the S&P 500. While this may seem a little pedantic, it's important to note that all the strategies I am aware of that seek to maximize long-term compound growth are likely to go through long periods of underperformance relative to popular benchmarks and will not always seem smart to your friends.



PART 1

THE ART OF PORTFOLIO CONSTRUCTION

The Misunderstood Reality of Possible Stock Market Returns

The U.S. stock market's stellar performance, especially post 2008, and its rarity of long-term losses have become something of a gospel. Renowned experts like Eugene Fama and Ken French support this belief, estimating high probability of substantial gains over extended horizons.¹⁰

As a result, a common asset allocation for investors today is to be heavily concentrated with 60% or more of their portfolio in stocks,¹¹ as stocks have historically had the highest return of the major asset classes, particularly in the United States.¹²

Real Returns for U.S. Assets

Time Frame	U.S. Stocks	10 yr T-Bonds	Cash	Gold
1930 - 2020	6.41%	2.15%	0.34%	2.05%
1970 - 2020	6.47%	3.39%	0.76%	4.28%

Source: Deutsche Bank. Past performance is not necessarily indicative of future results.

¹⁰ Fama, Eugene F. and French, Kenneth R., Long-Horizon Returns (November 20, 2017). Chicago Booth Research Paper No. 17-17, Fama-Miller Working Paper

¹¹ We use 60% as a threshold for being heavily concentrated in stocks due to the historically higher volatility of stocks compared to other asset classes. Even in a fairly conservative portfolio consisting of 55% stocks and 45% other assets, that 55% in stocks carries 87% of the portfolio's risk. To give an overly simplistic example, if you have a portfolio with 60% in stocks and 40% in cash, the cash isn't likely to go down by 20% in a year, whereas this type of behavior is well within the norm for stocks. Many other common asset classes (e.g. bonds, Real Estate) have historically had much lower volatility than stocks. That means most of the "risk" — that your portfolio's value could fall — is in the stocks holdings.

Generally the terms "risk" and "volatility" are used interchangeably in finance because the Capital Asset Pricing Model defines risk as the volatility of returns. The concept of "risk and return" is that riskier assets should have higher expected returns to compensate investors for the higher volatility and increased risk. Though I could write another paper on the many issues with equating volatility and risk, I will use the terms here in that way to stick with the accepted convention. Source: <https://www.institutionalinvestor.com/article/2bswrhqngdyo78ldzabk/portfolio/aqr-the-60-40-portfolio-wont-protect-investors-anymore>

¹² Reid, Jim, Nick Burns, et al., "The Age of Disorder." Deutsche Bank Research, 8 Sept. 2020.

Indeed, the U.S. stock market was the strongest performing market in the 20th century. As *Stocks for the Long Run* author Jeremy Siegel noted:

“... U.S. stocks have been the best long-term investment over the past century. For the entire period from 1926 to 1996, the average real return on U.S. common stocks has been about 7 percent, far higher than the real return on any other investment. This long-run performance is unique not only in U.S. experience but also in that of other developed and emerging markets. The U.S. stock market has outperformed all other equity markets in the 20th century.”¹³

Not only were the returns strong for U.S. stocks, but there was a low (1.2%) probability of a loss in real terms¹⁴ over a 30-year horizon.¹⁵ If you could throw some money in the U.S. market and not think about it for 30 years, your odds were pretty good.

A broader and longer study of global stock market performance challenges this belief and suggests that stocks are not as reliable of a long-term investment as many believe. Looking at developed markets around the world from 1841 to 2019, there seems to be a much higher probability of loss over a 30-year period at 12.1%.¹⁶

That means even at 30-year horizons across the world’s most developed markets, investors have historically had about a 1 in 8 chance of loss — only slightly better odds than playing Russian roulette.

How Rare Is a Stock Market Collapse Like Japan’s?

Following World War II, Japan seemed set to establish itself as an economic giant after tremendous economic growth over the decades leading up to the 1990s. At the end of 1989, Japan’s stock market was the largest globally in aggregate market capitalization.

Over the subsequent 30 years, an investment in Japanese stocks produced returns of -21% in real terms.

Japan’s -21% real return realization over 30 years is not exceedingly rare. Several developed countries have realized worse performance or even complete stock market failure. This observation lies in the 9th percentile of the distribution. That means that over the sample studied, there was almost a 1 in 10 chance of a comparable or worse outcome over a 30-year period.¹⁷

13 Siegel, Jeremy J. “The Long-term Returns on the Original S&P 500 Firms.” *The Journal of Finance*, vol. 53, no. 6, 1998, pp. 2105-2128. doi: 10.1111/0022-1082.00075.

14 Return numbers can be cited in *nominal* and *real* terms. The nominal rate of return is the percentage return you see on your investments before accounting for inflation. For example, if you invested \$100 and earned \$105 after a year, your nominal return would be 5% (\$5 profit/\$100 invested). However, inflation tends to gradually increase prices over time. So even though you earned 5% nominally, because of inflation, you may have slightly less buying power than when you first invested.

The real rate of return adjusts for inflation by subtracting the inflation rate from the nominal return. So if inflation was 3% in the year you earned 5% nominally, your real return would be about 2% (5% nominal - 3% inflation = 2% real). (Aside: this is not quite correct. Since inflation & returns compound, the full formula is $((1+\text{return})/(1+\text{inflation}))^t - 1$. The end result is pretty close to the same, and I think you get the idea.)

This real rate of return reflects how much your buying power has actually increased after accounting for inflation. While the nominal return is the straight percentage gain, the real return better represents the growth in what your money can actually buy.

So in summary, the nominal return is just the simple percentage gain, while the real return adjusts for inflation to show how your purchasing power changed.

15 Anarkulova, Aizhan and Cederburg, Scott and O’Doherty, Michael S., *Stocks for the Long Run?* Evidence from a Broad Sample of Developed Markets (January 18, 2021).

16 Anarkulova et al. The study characterized the distribution of long-term equity returns using bootstrap simulations based on the historical record of stock market performance in a broad cross section of 39 developed countries over the period from 1841 to 2018.











The authors noted that there is a survivorship bias in that continuous stock return data from successful markets are more readily available. The sample used in the study achieves substantially greater coverage of developed country periods compared to previous studies to minimize this bias. Survivor bias can lead to an upward bias in performance relative to ex-ante expectations (Brown et al., 1995). To combat survivor bias, researchers used a classification of developed countries and treatment of return data that doesn’t condition on eventual market outcomes. Before 1948, countries entered the developed sample when their agricultural labor shares declined below 50%, drawing on evidence about labor patterns from the economics literature (e.g., Kuznets, 1973). After 1948, researchers used membership in the Organisation for Economic Co-operation and Development (OECD) and its European predecessor, the Organisation for European Economic Co-operation (OEEC). The treatment of return data in instances of market disruptions and failures (e.g., the temporary closure of stock exchanges or the permanent disappearance of the stock market in Czechoslovakia) reflects investor experiences to minimize survivor bias.






17 Anarkulova et al.

An investor who learns about the distribution of 30-year returns using only the U.S. experience would assign a probability of just 0.5% that a return as extreme as the Japanese return realization could occur. The abundance of similar examples suggests that using the U.S. distribution is overly optimistic.

When we look at the history of a 60% stock/40% bond portfolio, we see a number of instances in developed countries where these portfolios struggled or collapsed completely.

WORST INVESTOR EXPERIENCES (ACROSS MAJOR COUNTRIES)

Major Cases of 60/40 Real Returns Below -40% over a 20-Year Window			
Country	20-Year Window	Worst 20-Year Return (Real, Cumulative)	Detail
 Russia	1900-1918	-100%	The Russian Civil War ended with communist rule, debt repudiation, and the destruction of financial markets.
 China	1930-1950	-100%	Asset markets closed during WWII and were destroyed when communist rule took hold in the late 1940s.
 Germany	1903-1923	-100%	Weimar Republic hyperinflation led to a collapse in assets following WWI.
 Japan	1928-1948	-96%	Japanese markets and currency collapsed as markets reopened post-WWII and inflation soared.
 Austria	1903-1923	-95%	Similar to Weimar Germany (though less infamous); hyperinflation led to poor asset returns post-WWI.
 France	1930-1950	-93%	The Great Depression, followed by WWII and German occupation, led to poor returns and high inflation.
 Italy	1928-1948	-87%	Similar to those of other Axis powers, Italian markets collapsed as WWII concluded.
 Italy	1907-1927	-84%	Post-WWII, Italy suffered from economic depression and high inflation, helping lead to Mussolini's rise.
 France	1906-1926	-75%	The early 20th century saw WWI, followed by France's inflationary currency crisis in the early 1920s.
 Italy	1960-1980	-72%	Italy endured a series of recessions, high unemployment rate and inflation, and currency declines in the 1960-70s.

 India	1955-1975	-66%	Post-Independence, a series of major droughts caused weak Indian economic growth and high inflation.
 Spain	1962-1982	-59%	The post-Franco transition to democracy coupled with the inflationary 1970s strained Spain's economy.
 Germany	1929-1949	-50%	The Great Depression followed by the devastation of WWII led to a terrible period for German assets.
 France	1961-1981	-48%	Like other European nations, the 1960-70s saw weaker growth, currency declines, and high inflation.
 UK	1901-1921	-46%	The early 20th century saw WWI, followed by the depression of 1920-21.

Source: Dalio, Ray, *A Changing World Order*. Avid Reader Press / Simon & Schuster, 2021. Past performance is not necessarily indicative of future results.

When Average Isn't Enough

One of the most interesting features of the research is the uncertainty over real investment outcomes faced by long-horizon investors.¹⁸

It's true that the average outcome is a 766% increase or a compound annual growth rate (CAGR) of 7.46%, very close to the commonly touted 7% annual return that is often thrown around in financial media as what investors can expect from stocks.

So while it is technically accurate to say a 7% CAGR is the average long-term return of an all-equity portfolio, what matters to me as an individual investor is not the average return but the *dispersion* of possible returns.

For an investor with a 30-year timeline, the 1st percentile of real payoff is just \$0.06 (a loss of -94%), whereas the 99th percentile is \$71.96 (more than 70x). That's a big difference!¹⁹

These are both extreme outcomes, so let's consider a more likely set of possibilities: the 25th and 75th percentile outcomes.

The 25th percentile profit on \$1 invested is \$1.82. This means that there was a 25% chance of 82% increase or less over a 30-year period.

¹⁸ The table shown below summarizes the distribution of real payoffs from a \$1.00 buy-and-hold investment across 1,000,000 bootstrap simulations at various return horizons. The underlying sample is the pooled sample of all developed countries. The real payoffs shown here are from the perspective of a global USD investor. Please see Anarkulova et al. for information on sources and calculations.

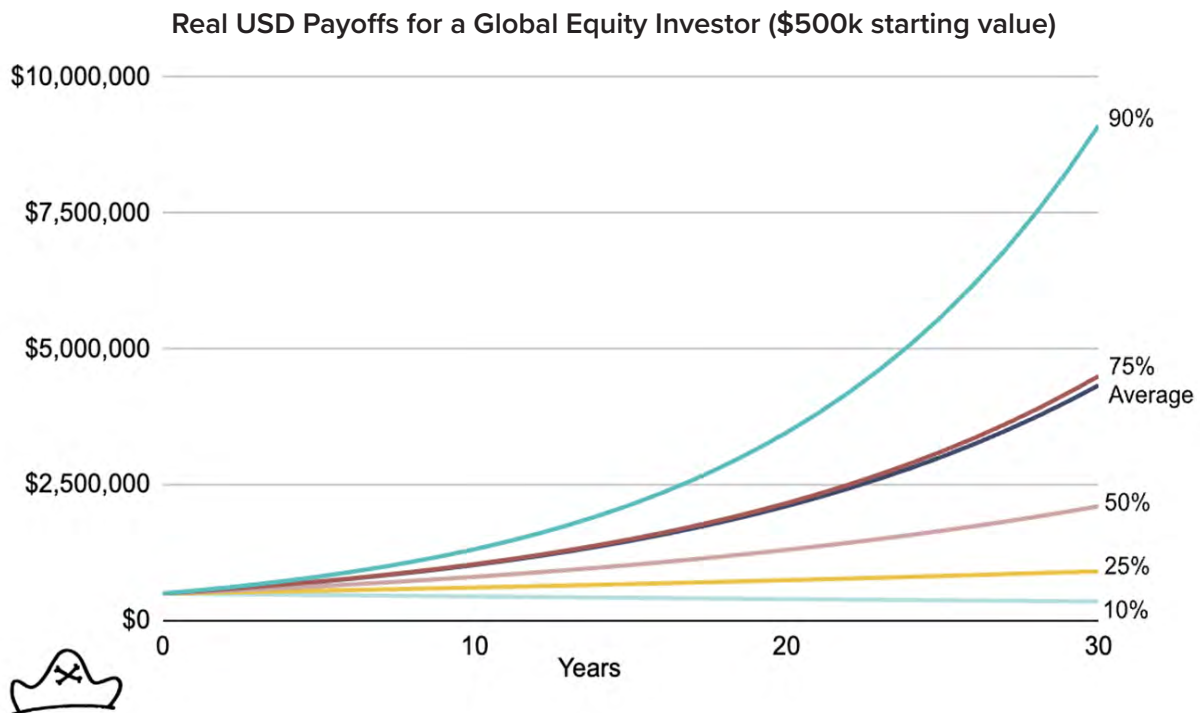
¹⁹ As a quick math refresher for the other liberal arts majors like me in the back of the room — the average return is the *mean* and is quite a bit higher than the 50th percentile because there are a few very good outcomes that make it higher. Percentiles are a way of ranking data points in a set from lowest to highest. They tell you what percentage of the data is below a certain value. For example, the 25th percentile means an investment return below which 25% of all returns fall. So in this example, the 25th percentile means 25% of outcomes were worse and 75% were better. The 99th percentile means 99% of all simulations did worse and only 1% better. The 50th percentile is the median outcome.

Real USD Payoffs for a Global Equity Investor (30-Year Period)

	Percentiles					
	Average	10%	25%	50%	75%	90%
Payoff for \$1 Invested	\$8.66	\$0.71	\$1.82	\$4.21	\$9.00	\$18.22
Profit (\$)	\$7.66	-\$0.29	\$0.82	\$3.21	\$8.00	\$17.22
Return (%)	766%	-29%	82%	321%	800%	1722%
CAGR (%)	7.46%	-1.14%	2.02%	4.91%	7.60%	10.16%

Source: Anarkulova et al., *Stocks for the Long Run? Evidence from a Broad Sample of Developed Markets (January 18, 2021). Journal of Financial Economics (JFE). Excerpts from Table 4.*

So while it is true to say that the average expected return is ~7% per year over a 30-year time horizon, what matters to me, and I think to most investors, is not the theoretical average returns of the market but maximizing the likelihood of doing “good enough.”



Source: Anarkulova et al., *Stocks for the Long Run? Evidence from a Broad Sample of Developed Markets (January 18, 2021). Journal of Financial Economics (JFE). Excerpts from Table 4. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.*

The average wealth of a group of ten people that includes one person with \$10 billion and 9 broke people is going to be \$1 billion. This is of little consolation to the broke people. They don't have the average wealth of the sample.

Averages can be very deceiving because you don't get the average. You get whatever happens on the path you are taking. You can drown in a river that is only two feet deep, *on average* if the river is 1 foot deep over 95% of its area, but contains a central channel that is 20 ft deep with a fast moving current.

In the same way, you can run into serious financial problems investing based on an expected average return.

When I hear that an all-equity portfolio has a one in four chance of only a 2% or worse annual compound growth rate, it makes me think *a lot* differently about an equity-heavy portfolio than when I hear it has an average return of 7%.

If I am starting with \$500,000 at age 35 and watching it compound until retiring at age 65, getting the 25th percentile returns means retiring with \$910,000.

Getting the “average” 7% means retiring with around \$3.8 million in assets. Using the popular 4% withdrawal rule, retiring with \$910,000 means an annual budget of \$36,400. Retiring with \$3.8 million means an annual budget of \$152,000. The lifestyle I could afford between those two is quite different.²⁰

What matters is the path that the investments take in your lifetime. If your peak earning years or retirement happen at an ‘unlucky’ time then it’s of little consolation that a mythical average person would have done well. What matters to me is maximizing the chance that I do good enough, not that some mythical “average investor” does good enough.

Is This Time Different?

One reasonable objection to these findings would be that markets change over time. The nature of financial markets in the 1890s and 1990s was very different in terms of the number of listed securities, concentration of firms across industries, trading technology, availability of pricing and financial information on listed firms, trading regulations, and investor protections, among other factors.

International equity markets in the late 19th and early 20th centuries were highly concentrated in railroad and mining-related firms. Why would we think that returns would be similar now versus then?

To take this into account, researchers looked at the distribution of real payoffs for samples starting roughly 40 years apart from the original 1841 sample: 1880, 1920, 1960, and 2000.

Bootstrap Distributions of 30-Year Payoffs with Additional Sample Screens						
	Average	10%	25%	50%	75%	90%
Base Case						
Full Sample	\$7.38	\$0.85	\$1.94	\$4.16	\$8.28	\$15.58
Sample Period						
Post-1880	\$7.41	\$0.83	\$1.91	\$4.13	\$8.30	\$15.71
Post-1920	\$8.50	\$0.95	\$2.16	\$4.65	\$9.43	\$18.08
Post-1960	\$8.73	\$1.09	\$2.25	\$4.66	\$9.49	\$18.46
Post-2000	\$4.33	\$0.65	\$1.29	\$2.53	\$4.88	\$9.09

Source: Anarkulova et al., *Stocks for the Long Run? Evidence from a Broad Sample of Developed Markets (January 18, 2021)*. *Journal of Financial Economics (JFE)*. Excerpts from Table 7.

²⁰ There are a number of issues I can point out with the 4% withdrawal rule which are beyond the scope of this paper and it is used here only because it's prevalence as a broadly accepted standard.

These alternative start dates show the original finding is robust - the distribution of returns are pretty similar at all these starting points. In all but the post-1960 sample, there is still a greater than 1 in 10 chance of having lost money at a 30-year horizon, and the 1960 sample results are just barely breaking even.

The 25th percentile outcome for the 1960 sample is similar with the best scenario being a 125% return over 30 years (2.74% CAGR).

To us, these results pretty clearly contradict any advice that stocks reliably produce 7% annual returns if you can hold them for a long time. Even at long horizons in the world's most developed markets, investors bear considerable risk of loss or well-below-average returns.

But, 'Muricah?

Another objection to this is that some investors believe in the U.S. economy and that it will continue its period of excellent performance from the 20th century. They cite factors like America's historical performance, entrepreneurial culture, and global reach.²¹

This may well play out, but the challenge in getting superior investment returns is that it is not merely enough to be correct. You must be contrarian, but correct.

While the U.S. performance in the 20th century may seem obvious now, a reading of financial history suggests to us that it was impossible to know this in advance. If you had asked inventors circa 1900 what country offered the most promising investment returns for the coming century, Germany or the UK would have been far more likely candidates than the U.S. Indeed, the U.S. performance may have been so strong over the 1930-2020 period precisely because it did not seem likely at the beginning of this period.

The U.S. equity market has had particularly strong performance in the 2009-2021 period that is fresh in investors' memories. For that to repeat, it is not enough merely for the U.S. economy to be strong and U.S. companies to do well. They must deliver even better performance than what is currently priced in.

Indeed, it is possible for the U.S. stock market to be the best performing stock market in the world and for U.S. stocks to still underperform their historical averages.

For us, this means that a heavily stock-focused portfolio may not be the best approach to achieve the "get rich" condition of our **Dual Mandate of Compound Growth**.

With an almost 1 in 8 chance of incurring losses over 30 years, there's not only the possibility that you don't end up with "a lot" of assets in the future but also the risk that you end up with less than you started with 30 years prior.

This brings us to the question of how a stock-focused portfolio fares with the second condition: Don't Die Tryin': Having 'enough' assets in the interim."

21 In my experience, they also have a higher than average likelihood of wearing an American Flag bathing suit on the 4th of July and referring to Budweiser as "Bud Diesel."

Should Expected Value Drive Your Investment Decisions?

Expected Value (EV) is a popular and often-cited concept among investors. Expected value is a calculation made by multiplying the probability of something happening by the magnitude of the outcome.

Let's say you give me a bet on a fair die. The die has 6 sides, so each side should show up 16.6% of the time — that's 6 to 1 odds.

Now let's say I offer you a bet that gives you 10 to 1 odds. You bet \$1. If you are right, you win \$10. If you are wrong, you lose \$1.

Would you take this bet?

It *probably* won't be the number you guess, so you'll *probably* lose a dollar. However, the concept of expected value suggests this is a good bet.

The probability of the die coming up on the number you guess is 16.6% and you get 10 to 1 odds. To calculate the expected value, you multiply the probability * magnitude of your winnings.

In this case, the expected value of your \$1 bet is \$1.66. You have a 16.6% of being right multiplied by a \$10 payoff (16.6% * \$10 = \$1.66).

This is an attractive bet: You are risking \$1 and your expected payoff is \$1.66.

EXPECTED VALUE = PROBABILITY OF BEING RIGHT x PAYOFF

EXPECTED VALUE = 16.6% x \$10 = \$1.66

Expected value is an important concept to understand that has broad applications across your life. Whether you are making an investment, career decision, or business decision, expected value is a valuable and important lens for thinking about it.

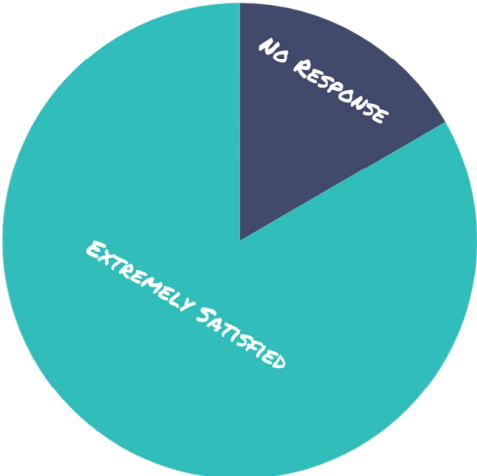
In my experience, the vast majority of investors use expected value as the primary model for thinking about an investment. When evaluating a new investment opportunity, they tend to try and determine the expected value of an investment and how it compares with other things they could invest in and to invest in the things which seem to have the highest expected value.

However, you don't get the expected value — you get what you get. As we saw above with investing in stocks, just because the average return is around 7% doesn't guarantee you get 7%. You might get the 25th percentile return of 2.02%.

How to Play Russian Roulette for Fun and Profit

A more fun (or perhaps more morbid) example of this phenomenon is Russian roulette. Let's say you are offered the chance to play a game of Russian roulette. If you survive, you win \$1 million.

If six different players play Russian roulette and you conducted an after-the-fact survey, five out of every six Russian roulette players would recommend it as an exciting and profitable game.



Post-purchase survey for six people playing one game of Russian roulette.

You might roll the dice and take \$1 million to play Russian roulette one time (though I wouldn't advise it!). But there's no amount of money that would make you play it six times in a row. You are guaranteed to lose!

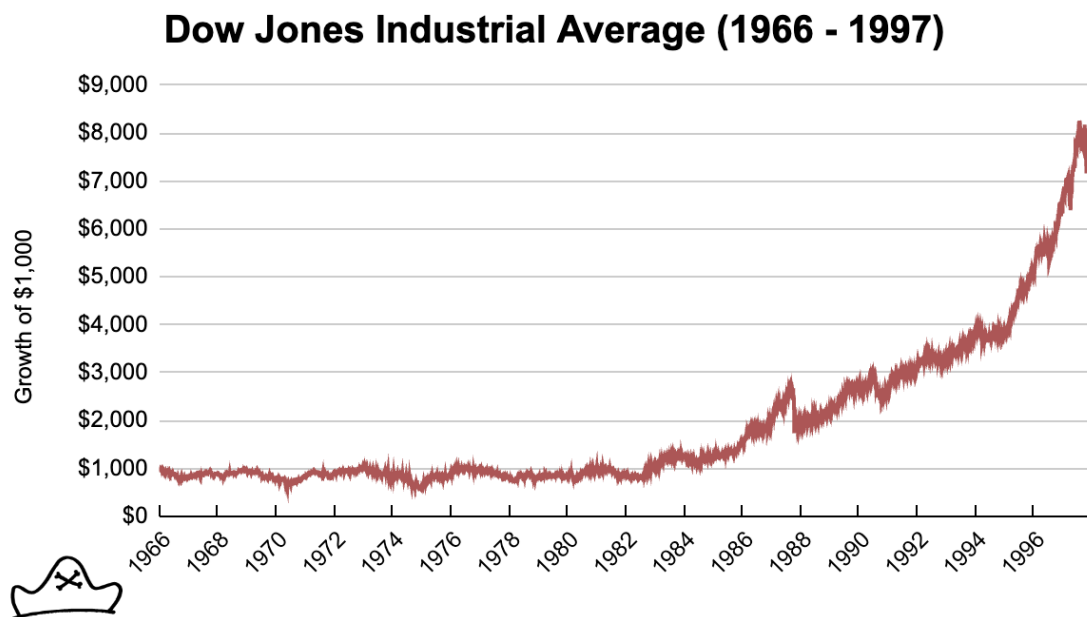


Post-purchase survey for one person playing six games of Russian roulette.

Investing has one important property that is similar to Russian roulette. You don't get the "average" outcome of all investors. You get what you get. You do not live 100 simultaneous lives. You live one life through time.

Assuming you are not routinely faced with the option to play Russian roulette, let's take a more practical example. From 1966 to 1997, the Dow Index grew about 715% — an 8% average annual return.

However, those returns varied greatly over time. From 1966 through 1982, there are essentially no returns. \$1,000 invested into the Dow Index at the beginning of 1966 was only worth about \$1,080 by the end of 1982. Then, from 1982 through 1997 the Dow grew at about 15% per year, taking the index from 875 to almost 8000.



Source: YCharts. Nominal returns. Past performance is not necessarily indicative of future results.

Even though the average return was 8% over that period, the implications for an investor vary dramatically based on what order the returns come in.

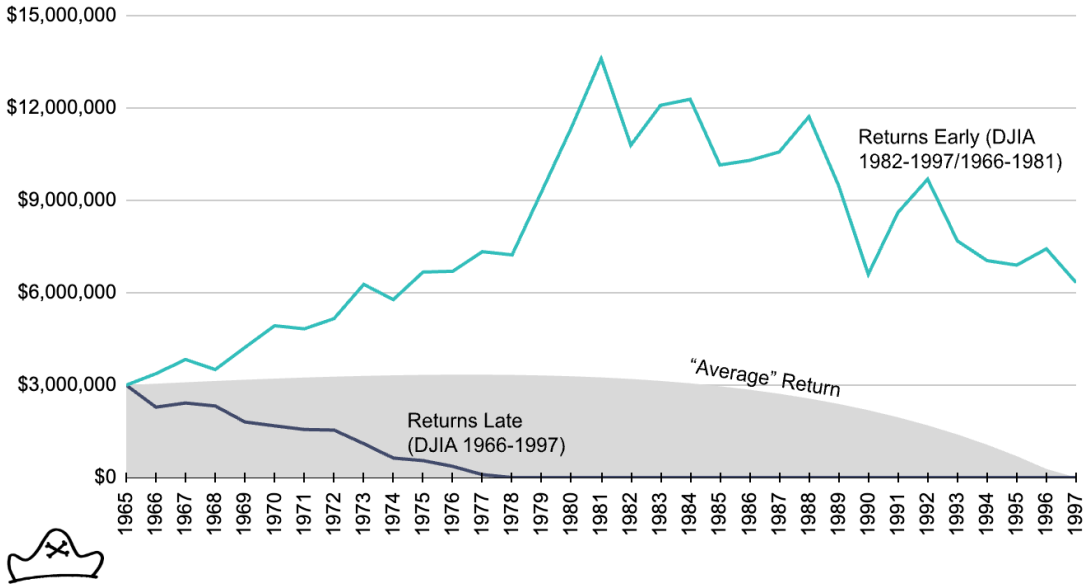
Consider a couple, Nick and Nancy, who have accumulated \$3 million in savings. They are ready to retire at age 63 and expect to draw \$180,000 per year for spending, with that amount increasing 3% each year to account for inflation.²²

If they experience the strong return period (1982-1997) first and the poor return period (1966-1982) last (light blue/teal line), then they will have more than enough funds to last through their retirement. Their wealth will increase even as they are withdrawing funds for the first decade or so, leaving them plenty to draw down on in their later years.

²² Credit to ReSolve Asset Management article "Path Dependency in Financial Planning" for this framing and concept. We have slightly modified and expanded on their original framing for illustrative purposes.

However, if they get the returns in the order they actually happened, with a long flat period for the first 15 years, they go broke at age 76 (dark blue line).

Returns Early vs. Returns Late (Retirement Portfolio)



Source: YCharts. Recreation of a chart from the article "PATH DEPENDENCY IN FINANCIAL PLANNING: RETIREMENT EDITION" by ReSolve Asset Management. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Time matters. If big positive returns come early, Nick and Nancy are in great shape. They can withdraw money from their account and still watch the value increase, but the increase is greater than what they are withdrawing.

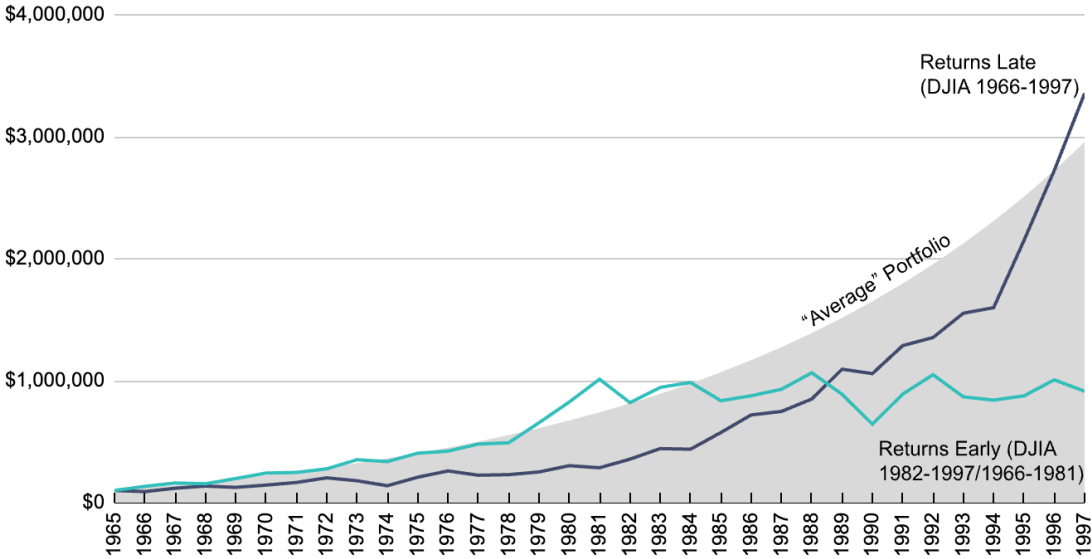
However, if they come late, they are ruined. Before the period of strong returns begins, they've already drawn down too much.

Returns Early vs. Returns Late		
Age	Returns Early (\$)	Returns Late (\$)
63	\$3,000,000	\$3,000,000
64	\$3,372,849	\$2,285,915
65	\$3,833,442	\$2,419,780
66	\$3,506,261	\$2,323,968
67	\$4,224,941	\$1,804,067
68	\$4,930,705	\$1,678,631
69	\$4,828,833	\$1,559,815
70	\$5,160,624	\$1,541,014
71	\$6,270,830	\$1,100,788
72	\$5,780,441	\$632,108
73	\$6,672,466	\$549,492
74	\$6,698,999	\$362,522
75	\$7,334,886	\$93,785
76	\$7,229,748	\$0

While the problem is most obvious in the case of retirement, anyone with outflows is subject to much the same dynamic. This could be someone who needed to use their savings at the worst possible moment (circa 1981 in this example) to buy a house, pay for their kids' college education or start the business they've been thinking about for many years.

Now take someone on the other end of their career. Josh is a 34-year-old starting with \$100,000 in savings and adding \$1,000 per month to their savings account. If they get the good returns early (when they have relatively little savings) and the flat returns late, then they finish with less than \$1 million (\$913,815) at age 65 when they are ready to retire. The high returns come when they have relatively little savings so there isn't as much of a base to compound off of.

Returns Early vs. Returns Late (Growth Portfolio)



Source: YCharts. \$100k starting value, contributions of \$12k/year. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Conversely, if the flat returns come early and good returns come later when they have more capital to compound, they arrive at age 65 with over \$3,355,768 in savings. Achieving the smoother average return of 8% arrives at a similar figure of \$2,955,960.

Using the popular 4% safe withdrawal rate, this is a difference between an annual expense budget of \$36,552.60 (returns early) and \$134,230.72 (returns late).

The difference between these two outcomes has nothing to do with how hardworking or diligent in saving one was versus the other. It doesn't even have to do with the average return over their investing lifetime! It's merely the luck of when they were born and the path of returns over that period.

This is particularly worth keeping in mind for millennials and the Gen X crowd who have experienced very strong post-2008 gains in equity markets. While strong equity returns may persist, history would suggest that it would be unwise to that outcome for granted. A decade or multi-decade flat period of equity returns would be extremely challenging for the mid-career equity-focused investor.

The Expected Value Is Not What You Should Expect

Just as you can drown in a river that is 2 feet deep on average, you can go broke using a 6% withdrawal rate on a portfolio that has 8% average returns. If you have any inflows or outflows to your investment portfolio, **you do not get the average returns of the market.**

While we see most investors tend to evaluate investments based on their expected *value*, we believe it would be more prudent to think about the distribution of possible paths. An investment strategy or asset with a higher average return but wide distribution of possible paths can be more risky than many investors think.

For us, this means that a heavily stock-focused portfolio maybe isn't as great as most people think for satisfying the second condition of our **Dual Mandate of Compound Growth:**

2. Don't Die Tryin' — making sure they have “enough” assets in the interim.

While stock-focused portfolios can go through periods of impressive growth, historical performance suggests to us that they have a wider distribution of possible returns than is commonly believed. A 25% chance of delivering only a 2% annual return over 30 years is probably not what most investors expect.

Depending on an investor's “path” or timing, these periods can lead to their funds being depleted or significantly underperforming “average” expectations.

How do we need to reimagine a portfolio to achieve our dual mandate?

Our dual objectives are not at odds with one another. They are linked. Large drawdowns really hurt long-term compounding. A 50% drawdown requires a 100% gain to recover.

Reducing large drawdowns or extended periods of low to no returns not only reduces sequencing risk so that you can be more confident about withdrawing funds, but it can also increase your long-term returns — our **Dual Mandate of Compound Growth.**

The Iron Law of Volatility Drag: A Quiet Culprit Behind Underperforming Portfolios

Here's a trivia question: You have two return streams (e.g., two stocks or two trading strategies). You know that both will *average*²³ an annual return of 10%.²⁴

There is only one difference between the two return streams:

- » **The first return stream, let's call it *Valley Path*, has an annualized volatility of 10%.²⁵ Like walking through a valley with rolling hills, it's just modestly chugging along.**
- » **The second return stream, let's call it *Mountain Climb*, has an annualized volatility of 20%. It's scaling up and down a series of steep mountains.**

In investing terms, which one will have a higher compounded annual growth rate or will they be the same? (Don't look down the page and cheat!)

- Valley Path (10% annual return/10% volatility) will have a higher compounded annual growth rate**
- Mountain Climb (10% annual return/20% volatility) will have a higher compounded annual growth rate**
- They will have the same compounded annual growth rate.**

Got your answer?

The long-term compound growth rate for taking the Valley Path return stream will be 9.5%, while the long-term compounded growth rate for taking the Mountain Climb will be 8%.

How can two return streams with the same average annual returns have different compounded growth rates?

As a simple example, let's say you have a \$1 million portfolio. In Year 1, it suffers a 50% draw-down. Ouch!

The next year ends with a breathtaking rally of 100%. Amazing!

Over that two-year period, your average annual return is a *positive* 25%.²⁶

$$\frac{(-50\% \text{ year 1} + 100\% \text{ year 2})}{2 \text{ years}} = 25\%$$

However, what is the total portfolio value at the end of the second year? Well, your \$1 million declined to \$500,000 in Year 1 (a loss of -50%) and then grew 100% from there to get back to exactly where you started: \$1 million, a 0% compounded growth rate.

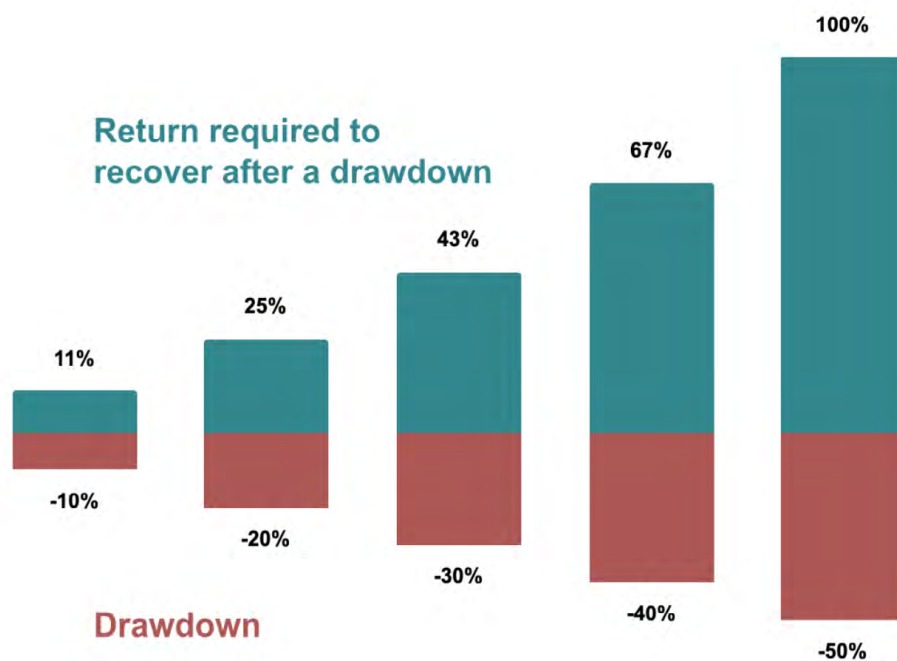
If your goal is to grow your wealth over time, the compounded growth rate is all that matters. Having a big boom followed by big bust years drags down the rate of compounding compared to a "smoother" path.

23 For the more mathematically inclined reader, please note that "average" as used throughout this paper refers to the arithmetic mean where compound annual growth rate (CAGR) refers to the geometric mean. We use them in this way as this is how they are typically used in financial publications and research in our experience.

24 As will become very apparent if it is not already, we believe it's impossible to know what some asset will return in the future, but bear with me for this stylized example.

25 Annualized volatility refers to the standard deviation of an investment's returns over a one-year period. Saying a return stream has an annualized volatility of 10% means that, assuming the data distribution is approximately normal, about 68% of the years, there will be a 10% or less move in the price. In the real world of investing, distributions are, in fact, not normal. But for the purposes of this example, that's not super relevant and the important thing is just to note that one of these investments is more volatile than the other.

26 As mentioned in a prior footnote, this is the difference between arithmetic averages and geometric averages. A lot of financial media quotes arithmetic averages (25% in this case), but what matters to long-term wealth is the geometric average (0% in this case). Compound Annual Growth Rate (CAGR) is a specific application of a Geometric average applied to a growth rate calculation.



Despite the breathtaking rally, your wealth is not growing over that time period but merely recovering to where it started.

All else equal — the more volatility in a return stream, the worse the long-term returns.²⁷

A 10% average annual return stream with 40% volatility will compound at only 2% per year.

A 10% average annual return stream with 50% volatility will actually lose money over time!

In our hiking analogy, you're spending energy going vertically up and down the mountain (volatility) instead of using that same energy to move horizontally across the terrain (compound growth). If the goal is to end up with as much money as possible (hike the farthest distance for the least energy), you want to spend as much energy moving horizontally across the terrain as possible.

The northwest face of Half Dome in Yosemite National Park is a famous big-wall climbing route. It's about 2,200 feet high and is one of the original technical climbing routes up Half Dome. This climb is typically rated 5.12 or 5.13, which is considered a very difficult climb requiring advanced rock climbing skills.

For an experienced and well-prepared climbing team, it often takes between two and three days to complete the route. Rock climbing burns around 700 calories per hour. Assuming eight hours per day of climbing over three days, it will require 16,800 calories to get to the top.



²⁷ As with any time that someone uses the phrase "all else equal" — all else is not equal outside this stylized example. I'll return to that and address it in the next section. However, I think it's important to understand the concept of volatility drag in principle before we make it any more complicated.

The eastern side can be climbed by a hiker without any climbing skills. It's still a pretty strenuous hike of about 15 miles round trip with an elevation gain of 4,800 feet. That's no joke, but it's doable in about 12 hours by a reasonably fit individual. Hiking burns around 500 calories per hour, so a 12-hour hike would require about 6,000 calories.

Whichever route you take, you end up in the same place, but the climb requires double the time and energy. While I can admire the climber with the skill and fitness to take the harder route in the case of Half Dome, I'm not trying to make my investing journey three times harder or longer.

Compare the investor who had -50% loss followed by the big 100% rally to get back to even versus an investor who had the same average return of 25% over two years rather than big wins and big losses. In this example, their portfolio grows exactly 25% in year one and 25% in year two. The second investor, with no volatility in the return stream, ends the two-year period with \$1,562,500, a gain of 56.2%.

Play this out further and we can see that two portfolios with the same average annual returns can have disparate growth rates.

	Mountain Climb		Valley Path	
	Annual Return	Growth	Annual Return	Growth
		\$1,000,000.00		\$1,000,000.00
Year 1	-50%	\$500,000.00	25%	\$1,250,000.00
Year 2	100%	\$1,000,000.00	25%	\$1,562,500.00
Year 3	75%	\$1,750,000.00	25%	\$1,953,125.00
Year 4	75%	\$3,062,500.00	25%	\$2,441,406.25
Year 5	-25%	\$2,296,875.00	25%	\$3,051,757.81
Year 6	-25%	\$1,722,656.25	25%	\$3,814,697.27

	Mountain Climb	Valley Path
Average Annual Return	25%	25%
Annual Volatility	65.19%	0%
Compounded Annual Return	9.49%	25%
Volatility Drag	15.51%	0%

Disclaimer: The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Even though both these portfolios have an average annual return of 25%, their long-term growth rate is very different.

This is the **Iron Law of Volatility Drag: the higher the volatility of a portfolio, the worse the long-term compound rate of growth of a portfolio.**

Reducing the volatility of a return stream also helps to address the second part of our Dual Mandate: Don't Die Tryin'.

The investor who gets exactly a 25% return per year doesn't have the same sequencing risk incurred by the investor who gets either 100% or -50% returns.

As with Nick and Nancy, if the investor on the Mountain Climb needs to withdraw funds the year they are down 50% because of unplanned illness, college tuition, retirement or a leaky roof — their returns can be even worse.

Let's say the Mountain Climb investors need to withdraw \$50,000 from their portfolio after year 1 due to an unplanned emergency. Their \$500,000 drops to \$450,000. The breathtaking rally comes, and their wealth doubles to \$900,000. But due to the unplanned withdrawal, their wealth after year 2 has declined by \$100,000 compared to the scenario without the withdrawal.

Lest this seem a little too tin foil hat, it's not as unusual as many people think. As mathematician Benoit Mandelbrot noted in the 1960s - volatility clusters.²⁸ Extreme events tend to happen at the same time as other extreme events. They are not evenly distributed throughout time. In the more memorable words of Vladimir Lenin:

“There are decades where nothing happens; and there are weeks where decades happen.”

In 2008, many people discovered that the stock market declined, their home values declined, and incomes fell. Just when people needed their savings most, it was the worst time to withdraw them. In 2022, many tech workers who had all their savings invested in the Nasdaq found out that their incomes and tech stocks were more correlated than they had expected.

As an individual, the average returns of the market are not what impacts your life. What matters are *your* returns.

If you had to withdraw money from your investment accounts in 2009 to make ends meet while you looked for a new job or your business faltered, you would be better off with a portfolio closer to the Valley Path.

This is a stylized example; however, it shows how reducing the volatility of a portfolio is instrumental in achieving our Dual Mandate of Compound Growth:

- » **Get Rich (Having “a lot” of assets in the future): Reducing volatility can help assets better compound to a higher end value**
- » **Don't Die Tryin' (Having “enough” assets in the interim): Reducing volatility can help decrease drawdowns so there are more assets during tough times.**

This applies to the 30-year-old who isn't thinking about retirement but wants to compound their wealth effectively over the long run as well as the retirees like Nick and Nancy who want to make sure their funds are there to see them through retirement.

How can we go about building a portfolio that has strong average returns and also minimizes volatility drag in the real world?

One way to do it is to invest in assets or investment strategies that all have strong returns and low volatility. We return here to the caveat of “all else being equal.” Well, all else ain't equal.

Herschel Walker Syndrome: Are You Chasing Stars at Your Portfolio's Expense?

In our experience, investors tend to focus too specifically on seeing a single investment in isolation, as opposed to the overall portfolio. They want to identify individual assets with high returns (and ideally low drawdowns as well): a complex we refer to as Herschel Walker Syndrome.

Herschel Walker was a formidable running back in the late 1980s and early 1990s. He was drafted and played the first part of his career with the Dallas Cowboys. He amassed 8,225 rushing yards and scored 61 rushing touchdowns throughout his career. At a time when few running backs were also receivers, he recorded 4,859 receiving yards, which contributed to his reputation as a potentially game-changing player.

In 1989, the Minnesota Vikings decided they had to have him. They believed he would be the final piece they needed to win a Super Bowl, leading them to give up a total of eight draft picks, including three first-round picks and three second-round picks, along with five players.

However, Walker was never able to live up to those expectations in Minnesota and was gone from the team within three seasons.

The Cowboys used the wealth of draft picks they received to build a dynasty in the 1990s. They drafted future Hall of Famers Emmitt Smith and Darren Woodson, as well as several other key contributors to their championship teams. The Cowboys won three Super Bowls with those players in 1992, 1993, and 1995.

Minnesota was thinking about one amazing player. Dallas was thinking about the whole team. The trade became known as “The Great Train Robbery” because of how one-sided the outcome was in Dallas’s favor. It’s used as a prime example of how focusing on a single player rather than the whole team can be a colossal mistake.

This approach of seeing the team as a whole rather than individual superstars has become more common in sports as analytics have gotten better. Famously, the Michael Lewis book/movie *Moneyball* about the Oakland A’s baseball team showed how a team of seemingly mediocre individual players could actually succeed. Similar approaches have been adopted in basketball, football and other team sports.

As with every business, investors have limited time and resources. Especially for the individual investor or small institution, where are their resources best spent? In our experience, many investors tend to make the same type of mistake that the Minnesota Vikings made — they focus too much on the selection of individual assets (players) rather than on portfolio construction (the overall team).

While skill at picking individual investments — be they stocks, private companies, or anything else — can be additive, it matters within the context of the broader portfolio. The Iron Law of Volatility Drag shows that a few big winners can still be dragged down by a few big losers. Rather than looking for the best player, Herschel Walker, we believe in thinking about how to put the best team on the field.

Historically, there aren’t a lot of individual assets or investment strategies that have high average annual returns and smooth, up-and-to-the-right growth trajectories.

Assets with higher returns *typically* also have higher volatility (e.g. tech stocks) associated with them and assets with low volatility *typically* have lower returns (e.g. 3-month Treasury Bills). When you look at an individual asset, reducing volatility drag *typically* also reduces long-term returns.²⁹

²⁹ I’m using “typically” because you can, of course, find exceptions to this with particular assets over particular time frames. But generally low volatility, magic money machines don’t persist as they get competed away. In my experience, if someone found a low-risk way to earn 15% real returns, they tend to shut up about it. More commonly from what I’ve seen, when people think they found a low-risk way to earn 15% real returns but they really found a strategy with blow up risk that just hasn’t materialized yet - e.g. the infamous picking up nickels in front of a steamroller strategy.

If that's the case, how do you reduce volatility drag while still having a strong expected return?

We believe most investors' best opportunity to improve their long-term compounding is to look at how they can combine different asset classes and strategies into a portfolio (team) that works together. Once there is a framework in place for thinking about building a team, investors can focus on identifying the best assets within that framework. We're not looking to pick the best player; we're looking to build a championship team. For this framework, we turn to the work of Harry Browne.

Stability through Volatility: The Unreasonable Effectiveness of the Permanent Portfolio

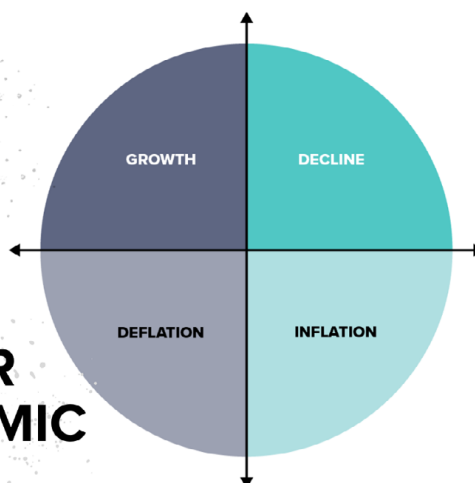
Harry Browne was a little-known financial advisor in the 1970s and 1980s living in Franklin, Tennessee. Browne's research divided economic history into four possible macroeconomic regimes:

1. **Growth**
2. **Decline**
3. **Inflation**
4. **Deflation**

Browne believed that any period of recorded economic history in any country in the world could be fit into one (or a combination) of these four regimes.³⁰



WE BELIEVE
TRUE
DIVERSIFICATION
**REQUIRES
A PORTFOLIO
THAT CAN
WEATHER FOUR
MACROECONOMIC
REGIMES.**



Browne's historical perspective from the 1980s was different from ours today. He had lived through a period of low growth and high inflation that came to be known as stagflation — a combination of stagnant or slow economic growth and high inflation.

³⁰ A similar model was proposed by Ray Dalio around the same time. I suspect the end of the gold standard in 1971 and the stagflationary period that followed was a wake-up call for many that led to a [multiple discovery](#) situation. We first learned about it from Harry Browne.

Stocks tend to do well in periods of higher than expected growth because companies are earning more money than expected, which tends to cause share prices to rise.

Bonds tend to do well in periods of lower than expected inflation because their fixed interest payments retain more purchasing power when the inflation rate is stable or declining. The lower inflation regime often leads to a decrease in interest rates, which can cause the price of existing bonds with higher yields to rise, providing capital gains to bondholders.

On the flip side, a stagflationary period of lower than expected growth and higher than expected inflation can be challenging for stock-and-bond-focused portfolios. The high inflation means the fixed interest payments from bonds can lag behind inflation and companies' earnings are sluggish.³¹

Adjusting for inflation, the S&P 500 Total Return Index peaked in 1972 and then fell almost 38% by 1982. The S&P 500 Total Return Index didn't return to its inflation-adjusted 1972 level for 10 years. Bonds did poorly too over the 1970s, which had repeated bouts of high inflation. The real returns of \$1,000 invested in a classic 60/40 stock/bond portfolio in 1968 were around zero for 15 years — finishing 1982 at \$985.

60/40 Portfolio: S&P 500 TR/US 7-10 Year Treasury (Real Returns, 1968-1987)							
Year	Return	Year	Return	Year	Return	Year	Return
1968	2.59%	1973	-16.76%	1978	-7.73%	1983	7.25%
1969	-14.02%	1974	-26.09%	1979	-4.50%	1984	2.75%
1970	1.93%	1975	12.90%	1980	2.48%	1985	23.12%
1971	7.69%	1976	12.18%	1981	-11.61%	1986	16.17%
1972	6.58%	1977	-12.59%	1982	19.81%	1987	-2.38%

Source: YCharts, ReSolve Asset Management. The 60/40 Portfolio represents a 60% allocation to the S&P 500 Total Return Index and a 40% allocation to IEF (with GFD extension). Returns are inflation adjusted according to monthly US CPI. This example is for illustrative purposes only, and does not represent trading in actual accounts. PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.

In some ways, this period would be more challenging than anything most investors alive today have lived through. The recessions caused by the 2008 global financial crisis and COVID were sharp but relatively short-lived. After bottoming out in 2009, the S&P 500 made new all-time highs in 2012 (nominal) and 2013 (real). The COVID recovery was even quicker, with the March 2020 lows being fully recovered by the end of the year.

Imagine yourself 15 years older than you are today. What will your life be like? If you have kids, how old will your kids be? What will your career look like? What will your financial needs be? Now imagine that you have less savings than you do today.

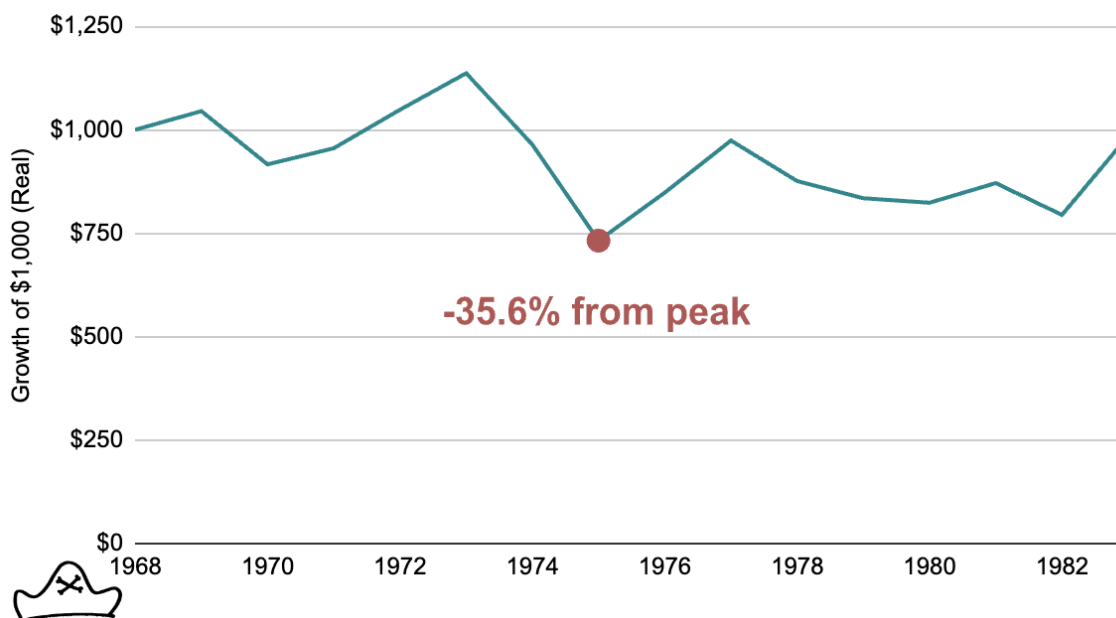
31 I use terms here like "lower than expected inflation" and "higher than expected growth" to reflect the fact that asset prices tend to change based on performance relative to expectations. For example, if a company is expected to grow 10% every year and only grows 5% every year, most stock valuation models would predict that its stock price will decrease because the future earnings will be lower than what was previously expected even though it is growing.

In the same way, if you expect inflation to be 1% and your bond is paying 5%, then you are expecting a 4% real return. If inflation turns out to be 2%, then your real return is only 3%. As a result, the value of the bond is likely to decrease even though we might not consider 2% a "high inflation regime."

For readability and simplicity's sake, I will refer to the four economic regimes as growth, inflation, deflation, and decline rather than the more accurate but tedious "higher/lower than expected..." I am clarifying here that those terms are always intended in a way that is relative to expectations. As we looked at in "Stocks for the Long Run?" — it's possible for the U.S. economy to do well and U.S. companies to do well but for U.S. stock performance to be poor if growth is positive but not as strong as what is priced in at the time of investing.

What does that imply about your life at that point? Are you able to retire? Pay for your kid's schooling? Give money to the people or causes that you care about?

60/40 Portfolio (Real Returns, 1968-1982)



Source: YCharts, GFD. The 60/40 Portfolio represents a 60% allocation to the S&P 500 Total Return Index and a 40% allocation to IEF (with GFD extension). Returns are inflation adjusted according to monthly US CPI. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Browne lived through a period like this, and it led him to recognize the need for assets that could perform well in periods of low growth or high inflation to help make up for where stock-and-bond-focused portfolios struggled.

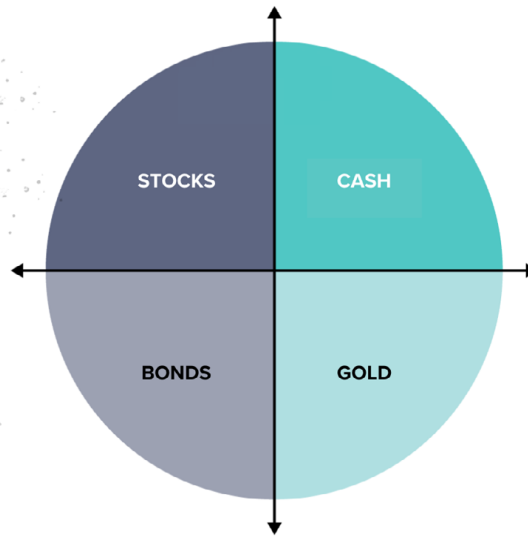
Looking at the tools he had available at the time, he came up with a simple and elegant portfolio:

- » **25% in stocks, which should do well in growth**
- » **25% in cash, which should do well in a decline**
- » **25% in bonds, which should do well in deflation**
- » **25% in gold, which should do well in inflation**

By directly including assets which should do well in decline and inflation periods like the stagflationary period the U.S. lived through, we believe Browne made a large improvement to the traditional 60% stock/40% bond portfolio. He called his alternative the Permanent Portfolio — permanent, because it was designed to handle each of these macroeconomic regimes, regardless of which showed up.



PERMANENT PORTFOLIO



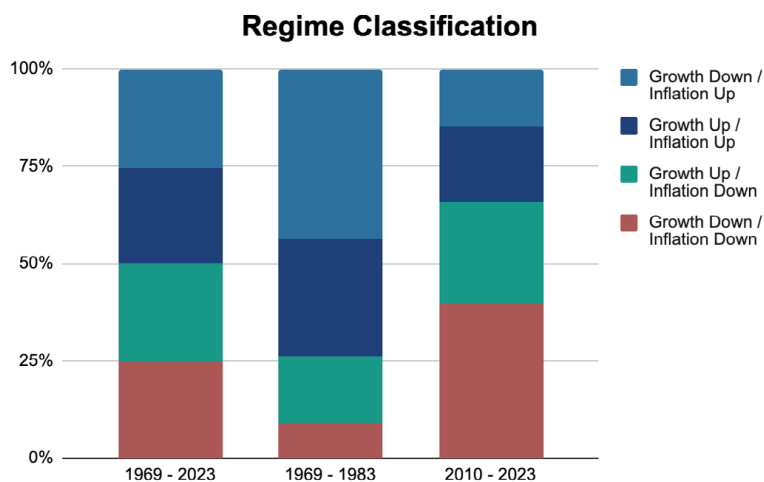
Like the GI coming home after World War II who was afraid to invest in stocks right before a major bull market, many investors seem to anchor to recent history and expect that their experience is indicative.

However, the most recent 10- or 15-year period is usually not representative of the range of possibilities over an investing lifetime.

Over the 54-year period from 1969 to 2023, about one investing lifetime, we calculated growth and inflation regimes and combined them to create four combined regimes:³²

- 1. Growth Up & Inflation Down
- 2. Growth Up & Inflation Up
- 3. Growth Down & Inflation Down
- 4. Growth Down & Inflation Up

What we see is that one sub-period can look very different from what happened in another sub-period. Comparing the total period of 1969-2023 with two 14-year sub-periods (1969-1983 and 2010 to 2023), we see a pretty different mix of regimes.



Source: St. Louis Federal Reserve Economic Data; Federal Reserve of Philadelphia Survey of Professional Forecasters. Dec. 1969 - May 2023. See Appendix for regime definitions.

³² Following the methodology of Ilmanen, Maloney, and Ross in their paper cited here, these are normalized so that each of these combined regimes occurs approximately 25% of the time from the period from December 1969 to May 2023 in the U.S. See Appendix B for methodology. Ilmanen, Antti & Maloney, Thomas & Ross, Adrienne. (2014). Exploring Macroeconomic Sensitivities: How Investments Respond to Different Economic Environments. The Journal of Portfolio Management. 40. 87-99. 10.3905/jpm.2014.40.3.087. Thank you to Corey Hoffstein for surfacing this paper for us and providing feedback on the calculations.

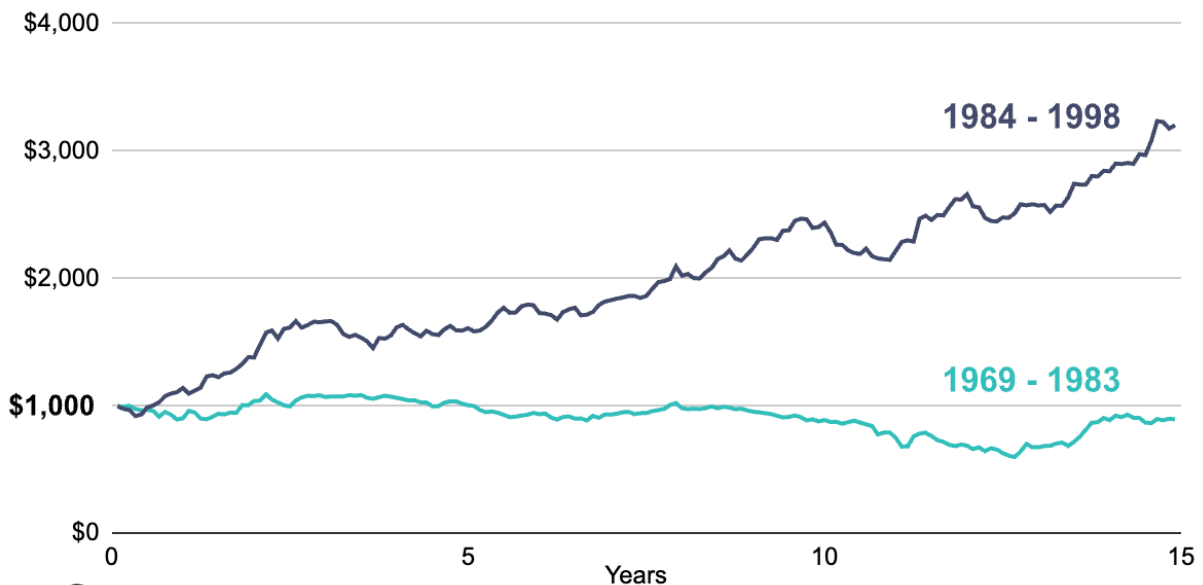
2010 to 2023 was a period of low inflation, with over 60% of the period being categorized as low inflation. From 1969 to 1983, only about 25% of the period was marked with low inflation, leaving almost 75% as having higher inflation.

We believe one of the most common mistakes investors make is to over optimize their portfolios for the recent regime.

The high inflation from 1969 to 1983 led to pretty lousy performance by bonds. The investors in 1982 who referred to bonds as “certificates of confiscation” were not unjustified in their feelings.

However, if they decided to remove bonds from their portfolios, they likely regretted it. The subsequent period saw much lower inflation and better performance by bonds.

Bond Performance Comparison (Real Returns)



Source: YCharts, GFD. 1969 - 1998. Bonds are represented by IEF (w/ GFD extension) adjusted for monthly inflation. Past performance is not necessarily indicative of future results.

With apologies to Kurt Vonnegut, “[Financial] history is merely a list of surprises. [...] It can only prepare us to be surprised yet again.”

Optimizing your portfolio for the recent past in 1983 meant you were not in the best position going forward. We have every reason to believe that the same is true today.³³

One solution is to be able to predict changes in macroeconomic regimes going forward. I suspect that there is nothing I can say here to convince someone who truly believes they can predict the macroeconomy that they are wrong, though I will try.

³³ A reasonable push back to this point would be that markets have changed over time and that we should take those factors into consideration. This is true. Markets in the 2020s are not like markets in the 1920s in terms of their size, asset class mix, types of participants and many other factors. However, our reading of financial history and what we see in the data is that over-optimizing to any short period comes with significant risks and can exclude major macroeconomic environments (e.g. stagflation). So while it seems reasonable some additional consideration should be given to recent history, ignoring everything beyond that seems to create a substantial risk of getting caught on the wrong side of a major regime shift (e.g. low inflation to high inflation).

In his 2011 book, *Expected Returns*, AQR's Antti Ilmanen outlined his views on the next 20 years that "seem[ed] close to the consensus":

First, I see only moderate returns from risky assets over the medium term. Growth prospects are not promising, given the pendulum shift against free markets and the still stretched private and public balance sheets. Starting yields are historically low. Risky asset valuations are unlikely to improve on a sustained basis, thanks to wealth-dependent risk aversion and lingering memories of the crisis, higher macroeconomic volatility, less trust all around, and less benign inflation prospects for risky assets.

He went on to suggest that if any risky assets did well, it was likely to be international stocks rather than U.S. stocks.

On the date of the book's publication, March 14, 2011, the S&P 500 was at 1296.39. As of the end of 2023, 12 years into the forecast, it was at 4769.83, a 267.93% gain.³⁴ This 13.5% CAGR is in the top 10% percent of outcomes based on our longer return data.³⁵ This is not to throw shade on the prediction. Indeed, it's interesting because it was a thoughtful and reasonable prediction submitted with a great deal of epistemic humility and based on thoroughly researched historical data made by a professional investor who had spent decades doing research on that data with all the tools of one of the most well-regarded quantitative investment firms in the world.

To give a more recent example, I don't know anyone who had "global pandemic leads to global stock market crash followed by enormous tech bull market and real estate boom" on their 2020 forecast.

Most, if not all, investors who I have seen get famous for making big macroeconomic predictions have failed to follow up on it. Most of the investors made famous in Michael Lewis's *The Big Short* had poor performance in the subsequent ten years, to give only one example.³⁶

For us, the complexity of the global economy and follow-on effects are simply unpredictable, and attempts to definitively forecast them are likely to do more harm than good.³⁷

The Permanent Portfolio approach resonated with us because it didn't try to predict the future. It tried to be prepared by including assets designed to perform in each of these macroeconomic regimes. We came to believe the Permanent Portfolio approach was an important step in the right direction from stock-and-bond-focused portfolios toward our objective of maximizing long-term wealth while letting us be confident that we and our families will have the financial resources to deal with what life throws at us.

The real magic is not in just how the individual asset selection covers different regimes, but how the combination of assets, the overall portfolio construction, works.

³⁴ Calculations performed using nominal SPX returns.

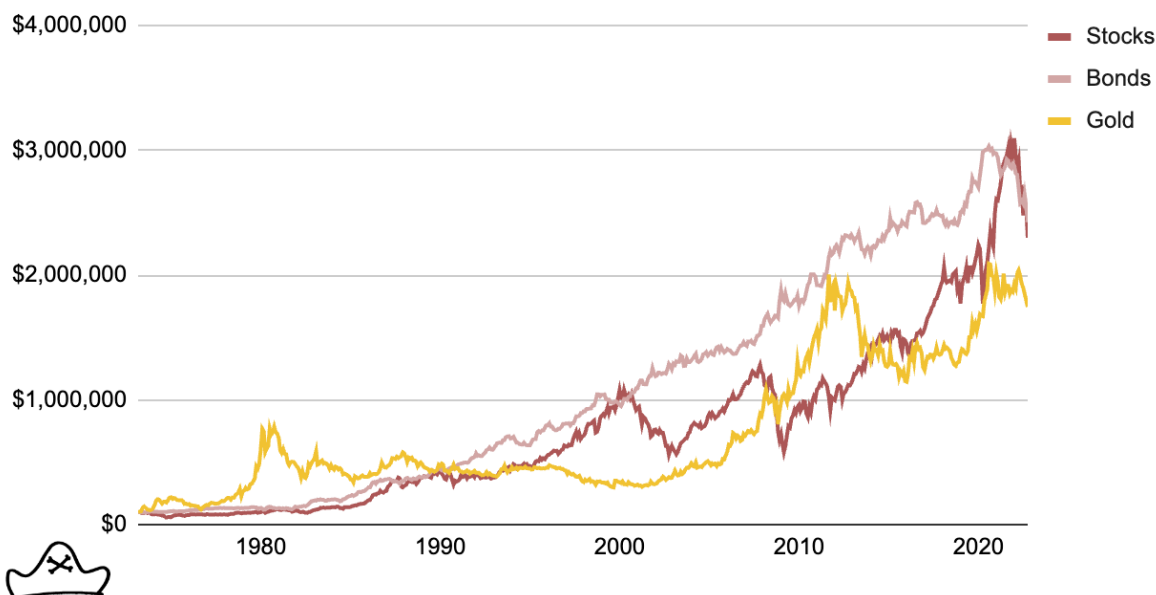
³⁵ Anarkulova et al., *Stocks for the Long Run? Evidence from a Broad Sample of Developed Markets* (January 18, 2021). *Journal of Financial Economics* (JFE). Excerpts from Table 4.

³⁶ "John Paulson and Kyle Bass suffered a series of losses and client defections. Both Paulson and Bass seem to have been swept up with looking for other bubbles. Bass has predicted collapses everywhere from Japan to Europe to Hong Kong that have not yet materialized. Paulson has lost money on a variety of positions over the years and recently converted his firm into a family office." Brown, Aaron and Dewey, Richard, *Toil and Trouble, Don't Get Burned Shorting Bubbles* (February 9, 2021).

³⁷ There are a number of much more reasonable approaches to market timing which maintain broad diversification but use modest tilts towards one asset class or style premia based on certain valuation metrics or other indicators. We can debate the relative merit of these approaches, but they are certainly much more reasonable in our view than the "put all your assets in the S&P 500" or "gold only" type approaches advocated by some macro forecasters.

Let's take the three principal components of the Permanent Portfolio: Stocks, Bonds, and Gold. Over the period from 1973 to 2022, stocks and bonds were the best returning assets and gold was the worst.³⁸

Stocks, Bonds, and Gold (1973 - 2022) Growth of \$100k



Source: YCharts, GFD. Feb. 1973 - Sep. 2022. Nominal returns. Stocks, bonds, and gold are represented by ACWI, IEF, and GLD respectively. GFD extension used where necessary. Past performance is not necessarily indicative of future results.

Asset Statistics			
	Stocks	Bonds	Gold
Final Value	\$2,299,711	\$2,424,755	\$1,744,819
CAGR	6.53%	6.64%	5.94%
Volatility	15.19%	7.83%	19.38%
Max DD	-54.62%	-20.02%	-61.99%
MAR	0.12	0.33	0.10
Sharpe Ratio	0.43	0.85	0.31

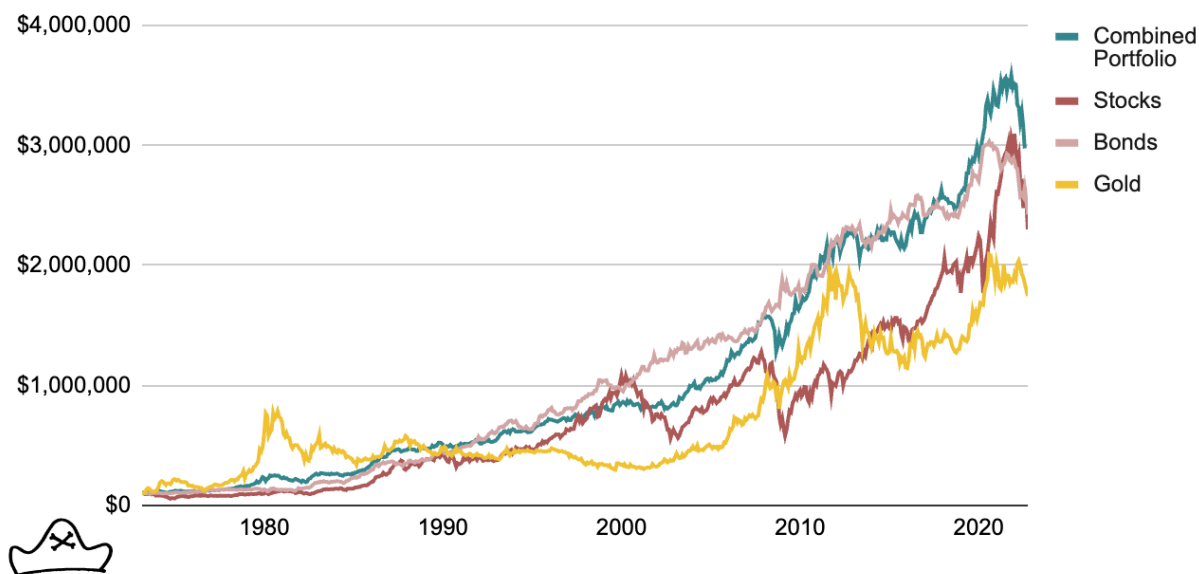
Based on this, you might think, “I want to get the best long-term performance, so I should invest in bonds and maybe some stocks.”

Well, what happens if we combine all three into an equally weighted portfolio and rebalance it monthly?

The combination of the three does something pretty cool. It performs better than the best performing individual asset — bonds.

³⁸ We selected this period because it was the longest period for which we are able to get what we considered reliable data. A lot of asset allocation backtests tend to start with 1973 because global equities, commodities, and currencies tend to have more issues pre-1972. Of course, it would be interesting to see a longer period, but given that this is intended merely as an instructive example of investing over one lifetime, a ~49 year period seems like a suitable one and contains some periods of inflation, deflation, growth and decline. If anything, my guess would be that this period in the U.S. is more skewed to deflation and growth. I suspect that a longer term, more international track record (say globally back to 1800) would have more inflation and more declines but that's just a hunch based on a broad reading of financial history and not something I have hard data for.

Combined Portfolio (1973 - 2022) Growth of \$100k



Source: YCharts, GFD. Feb. 1973 - Sep. 2022. Nominal returns. Stocks, bonds, and gold are represented by ACWI, IEF, and GLD respectively. GFD extension used where necessary. Combined Portfolio represents 33.33% allocations to each of stocks, bonds, and gold rebalanced monthly. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts. Past performance is not necessarily indicative of future results.

Combined Portfolio Statistics	
Final Value	\$2,975,082
CAGR	7.08%
Volatility	9.26%
Max DD	-23.30%
MAR	0.30
Sharpe Ratio	0.76

The combination of the three does something pretty cool. It performs better than the best performing individual asset — bonds.

Stocks and bonds have the higher returns over this period. Gold has the lowest return and highest drawdown of the three assets, so it would seem like adding it would decrease the overall performance. However, it actually increased it!

The whole Permanent Portfolio is greater than merely the sum of its parts. Adding a lower returning asset — gold — increased the overall portfolio performance.

Gold was mostly uncorrelated with stocks and bonds over this period, meaning it performed well in periods where they did not — most notably in the late 1970s and late 2000s. So even though its overall returns were lower, it delivered those returns at a great time. Rebalancing the gains in gold into stocks and bonds in the late 1970s turned out to be a great trade. Stocks and bonds delivered strong performance in the 1980s and 1990s.

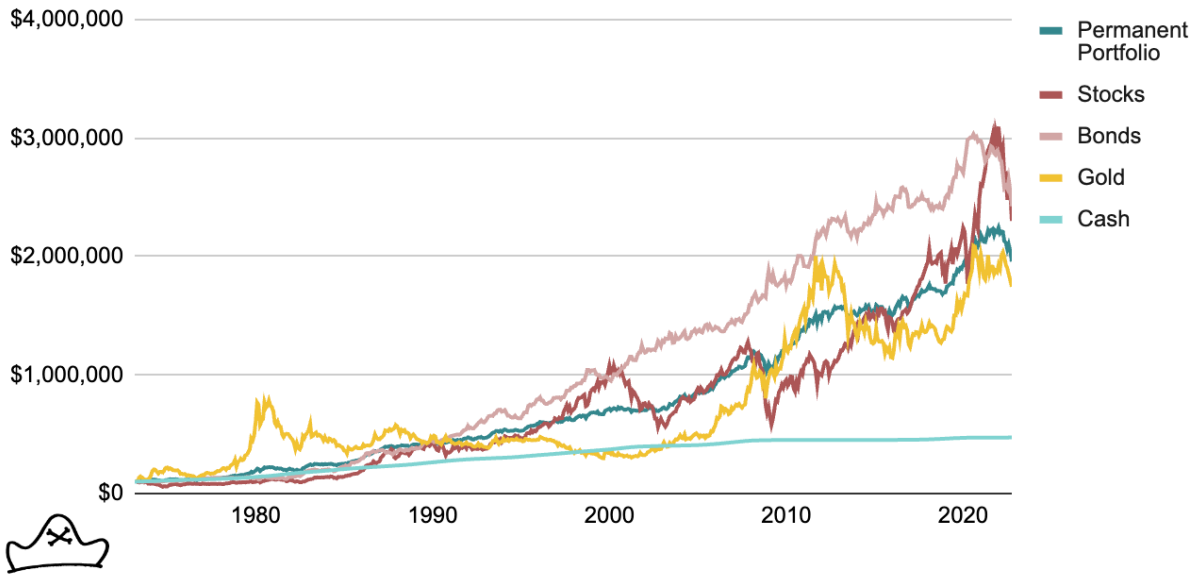
As we saw above, it's not just the expected return that matters; it's the expected path. Because gold's path was complementary — it performed well in a couple of periods where one or both of the other assets struggled — it improved the portfolio meaningfully.

This is the key lesson of the permanent portfolio: **Adding a lower-returning asset with a complementary (AKA uncorrelated) path can improve the overall portfolio.**

This simple three-asset portfolio better achieves our Dual Mandate of Compound Growth than any of the individual components!

- » **Get Rich (Having “a lot” of assets in the future): It offers a higher return than any of its individual components.**

Permanent Portfolio Growth of \$100k



Source: YCharts, GFD.. Feb. 1973 - Sep. 2022. Nominal returns. Stocks, bonds, gold, and cash are represented by ACWI, IEF, GLD, and IRX respectively. GFD extension used where necessary. Permanent Portfolio represents 25% allocations to each of stocks, bonds, gold, and cash rebalanced monthly. The above is an illustrative example of the topic used for educational purposes

- » **Don't Die Tryin' (Having “enough” assets in the interim): It offers reduced volatility compared to stocks and gold.**

The inclusion of cash³⁹ in the portfolio as Browne originally proposed reduces the return (6.18%) but also reduces the volatility (6.95%) and max drawdown (-15.09%).

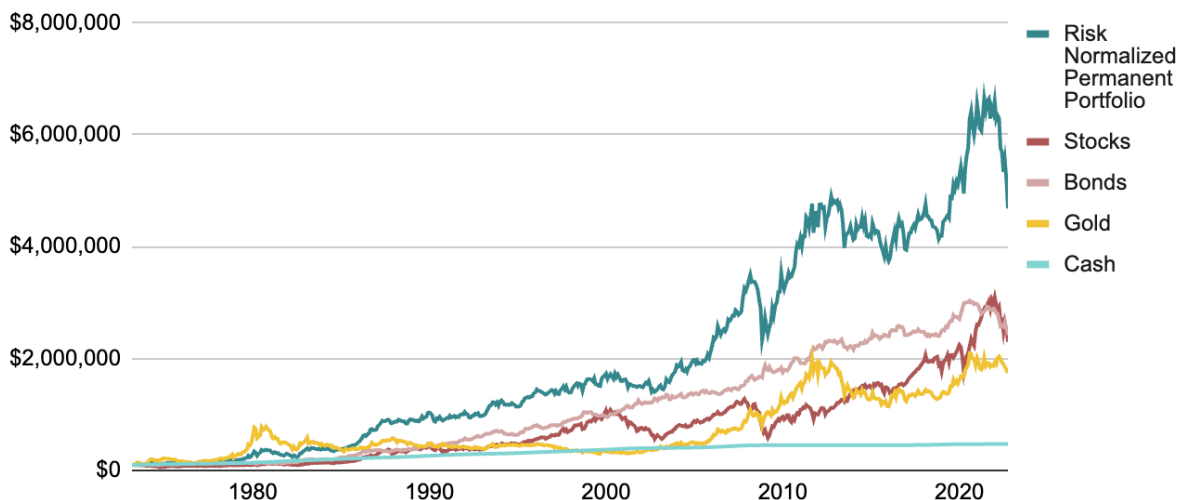
Permanent Portfolio Statistics	
Final Value	\$1,957,602
CAGR	6.18%
Volatility	6.95%
Max DD	-15.09%
MAR	0.41
Sharpe Ratio	0.89

³⁹ In a lot of financial literature, the word “cash” often refers to short-term treasury bills, most commonly 90 day t-bills. This is confusing because you will sometimes read research papers about how “cash outperformed in the inflationary 1970s,” and this is largely because the short-term interest rates were relatively high in that period, which helped offset some of the inflation costs. For example, if the 90-day t-bill rate is 11% and inflation is running at 10%, then the real return on t-bills is 1% even though actual “cash,” like the dollar bill in your pocket, would have a real return of -10%. I will use the same convention with the word cash referring to short term t-bills.

On a risk-adjusted basis, the portfolio with cash is the best performer, as it has a lower return but even lower volatility and drawdowns.⁴⁰

An investor looking to achieve higher returns could take the combined portfolio of stocks, bonds and gold and increase the leverage to match that of stocks over that period, yielding a higher return for the same amount of volatility.

Risk Normalized Permanent Portfolio Growth of \$100k



Source: YCharts, GFD. Feb. 1973 - Sep. 2022. Nominal returns. Stocks, bonds, gold, and cash are represented by ACWI, IEF, GLD, and IRX respectively. GFD extension used where necessary. Volatility Normalized Permanent Portfolio represents 25% allocations to each of stocks, bonds, gold, and cash rebalanced monthly; returns are normalized to 15.19% annual volatility to match

Risk Normalized Permanent Portfolio Statistics	
Target Volatility	15.19%
Leverage Cost (Annual)	4%
Final Value	\$4,682,602
CAGR	8.07%
Volatility	15.19%
Max DD	-35.51%
Sharpe Ratio	0.53

⁴⁰ As a way to easily compare investment strategies, it's customary to use the risk-adjusted return of a strategy: How much return are you getting per unit of risk? The idea is that if you have a strategy with a good risk-adjusted return, then you can apply leverage to get more return if desired and that this is preferable to simply allocating to a higher-return but even higher-risk strategy. In my opinion, this is generally sound reasoning.

Typically the compound growth (CAGR) of the strategy is used as a metric of return, and the volatility of the strategy is used as a measure of risk. So your CAGR/volatility = risk-adjusted return. This is called a Sharpe ratio after its creator, William Sharpe. In this case, the Sharpe ratio of the combined portfolio of stocks, bonds and gold is 0.76, while the Sharpe ratio of stocks alone is 0.43.

I could write an entire separate paper on the ways in which historical volatility is not always the best way to evaluate risk and that there are a number of types of strategies which are very low volatility most of the time but occasionally have huge losses (mortgage backed securities and Long-Term Capital Management, to name but two examples). We often use alternative ratios such as Ulcer, Sortino, and MAR, which define risk differently. However, I think it's generally a reasonable thing to say that assets that go up fast can also go down fast (Exhibit A: bitcoin), so using their historical volatility as a measure of risk is a reasonable first-order approximation. As it's an industry-standard term, I won't try to reinvent the wheel here.

This is a pretty big difference! With the same amount of volatility as an all-stock portfolio, the Permanent Portfolio achieved a 208% greater return. If you started with \$100,000, then the difference after 50 years would be ending up with \$4.68 million vs. \$2.3 million.⁴¹

By taking assets that do well in different macro regimes and rebalancing between them, our combined portfolio can create *stability through volatility*: a smoother return path for the portfolio as a whole, even though the individual elements may be more volatile.

Research from Meb Faber shows the challenge of investing in just one asset class if you are trying to build a safe portfolio.

Real Returns After Inflation (1926 - 2022)						
	Cash Under Mattress	Cash T-bills	US Stocks	Foreign Stocks	10 Year Bonds	Gold
Annualized Returns	-2.94%	0.36%	6.85%	4.61%	1.82%	2.00%
Max Drawdown	-94.22%	-48.91%	-79.18%	-78.01%	-60.63%	-84.39%
Worst 1 Year Returns	-16.90%	-16.58%	-63.95%	-56.75%	-24.69%	-42.24%

Source: Global Financial Data, Meb Faber as of 12/31/22. Performance is hypothetical. Past performance is not necessarily indicative of future results.

Even cash had a -48% drawdown in the period studied! Because of the impact of diversification and rebalancing, a portfolio of “more risky” assets can actually have a lower drawdown than just holding what seems like a very “safe” asset.

That’s why we believe building a portfolio that’s more like a Valley Path than a Mountain Climb doesn’t just mean finding the one asset that has the most favorable characteristics. It means finding the right *combination* of assets that can be combined to create a more robust portfolio.

Even though the stock and gold charts look more like the Mountain Climb than the Valley Path, rebalancing them as part of the broader portfolio reduced the overall volatility of the portfolio.

This is what we would expect *true diversification* to look like. Over a 50-year period which included periods of growth, recession, inflation, and some deflation, the Permanent Portfolio chugged along, providing solid returns with manageable levels of risk.

We like to talk about the Permanent Portfolio because it is an elegant example of how adding a lower returning asset with a complementary path can improve the overall portfolio. But is it the best possible mix of assets? The logical next question is how to decide which assets are complementary? How do you build a truly diversified portfolio?

41 A brief aside on the use of leverage which, for many investors, is a controversial topic. Ultimately, there are only 3 ways I know of to boost the long-term returns of a portfolio:

1. Raise the weight of riskier assets in the portfolio. E.g. Own 100% tech stocks.
2. Have more skill and pick better investments.
3. Use modest leverage on a broadly diversified portfolio of both offensive and defensive assets.

We think options 2&3 can be combined for the best outcome: The use of a broadly diversified portfolio with modest leverage should be a starting point with investors who wish to do so using their skill to try and enhance returns within one of the quadrants that correlates to their skill.

We believe that when it comes to leverage, ‘the dose makes the poison.’ I suspect very few investors would be concerned about leveraging their portfolios 1% so that they had \$1.01 of exposure for every \$1 invested. Many investors would (reasonably) be concerned about leveraging their portfolio 100x.

From what we’ve seen, popular stories of blow ups due to leverage are typically related to either undiversified portfolios and/or very high levels of leverage. For example, Lehman Brothers’ leverage ratio, which compares total assets to shareholders’ equity, was about 31:1 at the end of its 2007 fiscal year. This meant that for every dollar of equity, Lehman had \$31 in assets, which were largely financed by debt.

However, given a very diversified portfolio, we believe a modest amount of leverage in the range of 1.5x to 3x would be more appropriate for investors seeking to enhance returns than concentrating on riskier investments.

An all stock portfolio starting with \$100,000 over 1973-2022 had a ~54.62% drawdown with a terminal value of \$2.3mm. Over the same period, the leveraged Permanent Portfolio using ~219% leverage had a drawdown of -35.31% a terminal value of \$4.6mm.

Once all skill has been factored in, we believe there are only three options for investors:

1. Accept higher drawdowns on a more concentrated portfolio
2. Accept lower returns on a more diversified portfolio
3. Use modest leverage on a diversified portfolio

The standard disclaimer applies that leverage increases the percentage gains and losses of an investment as compared to its normal operation, and may incur borrowing costs or implied interest rates which could negatively impact the benefits of applying leverage.

Cargo Cult Diversification: How the Illusion of Diversification Could Undermine Your Financial Future

During The Second World War, the U.S. armed forces began to fly large resource packages of food and other cargo to small islands in the Pacific. The U.S. military shared some of the cargo — manufactured clothing, medicine, canned food, and tents — with the island's residents. Many of the inhabitants of these islands had never encountered anyone from a developed country. They loved their sudden access to goods they had never even imagined.

When the war ended, the military forces left, and the food drops stopped. The island's native inhabitants wanted the food and cargo deliveries to resume. What did they do?

They imitated the visible structures that had accompanied the cargo. They built ornate airports and straw planes. They formed cults that worshiped nonspecific Americans having names like "John Frum" or "Tom Navy," whom they identified as the spiritual entity that would bring cargo to them again.



A straw plane built by the inhabitants of one of the islands

This seems irrational to us, but only because we have other models and knowledge of the world to explain how that cargo showed up.

We know clothing and canned food don't just fall out of the sky — there's a whole supply chain that makes it. There is nothing intuitive about that, though. It's only because of our knowledge and life experience that we know the islanders' techniques weren't going to make the cargo come back.

If the only model you have for receiving cargo is that when a ground crew made up of guys with names like John Frum and Tom Navy wave their sticks next to a plane on the runway, then

it is a reasonable and rational decision to build straw planes and imitate what you saw happening.

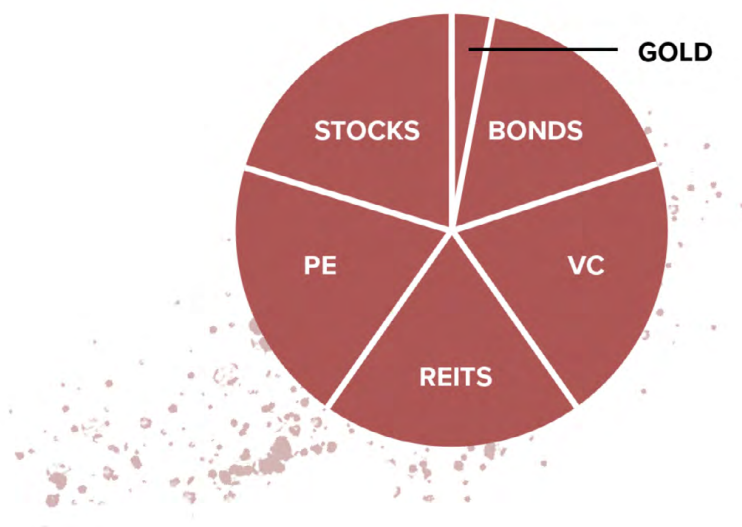
After similar monuments and rituals were discovered on a handful of islands, the phenomenon came to be called cargo culting. Cargo culting doesn't just happen on isolated Pacific islands — it's all around us.

The famous physicist Richard Feynman characterized much of what passes for science as "cargo cult science." They imitate the visible structures of real science, including publication in scientific journals, but they lack any basis in honest experimentation. It's just going through the motions of science without engaging in the real rigor.

The term "cargo cult programming" describes software that contains elements that have been successfully used elsewhere but are completely unnecessary for the task at hand. A cargo cult programmer looks at the code used in some successful applications and copies it to his own application, believing that the presence of the code will make his application useful.

Cargo culting exists in investing as well. While talking about the benefits of diversification may seem somewhat trite as it's one of the most common items covered in financial education, we observe that few investors implement what we would consider *true diversification*.

Investors read about diversification and often build portfolios that look something like this.



PE stands for private equity, VC for venture capital, and REITs for Real Estate Investment Trusts or similar real estate investments.

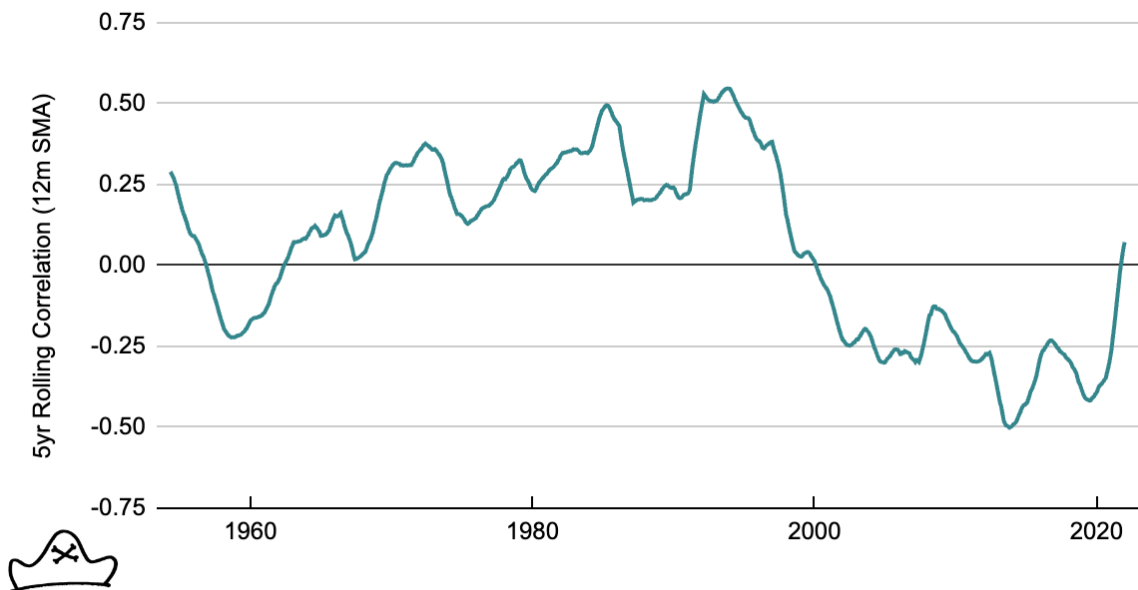
On the surface, this may seem like a well-diversified portfolio of many different asset classes.

However, with the exception of gold, all the assets in this portfolio are designed to do well in deflationary and growth periods — the dominant paradigm in the U.S. and much of the rest of the world since the early 1980s.

Stocks and bonds have been largely uncorrelated in the post-2000 period, and traditional 60% stock/40% bond portfolios have fared relatively well over that time. But a longer look back suggests that bonds are likely less reliable as a diversifier than recent history suggests.

With the exception of 2000-2021 and a brief period in the 1950s and early 60s, stock/bond correlations have been persistently positive going back to the U.S. Civil War, meaning that bonds have historically not been an effective long-term diversifier for stock-focused portfolios.

Stock/Bond Correlation Over Time S&P 500/7-10yr Treasury Bonds



Source: YCharts, GFD. Stocks and bonds are represented by the S&P 500 Index and IEF respectively. GFD extension used where necessary. Correlations are calculated on monthly returns with a 5-year lookback. Results are smoothed with a 12-month simple moving average. Past performance is not necessarily indicative of future results.

The line represents the correlation between stocks and bonds — when it is high, stocks and bonds are correlated and bonds do not act as effectively as a diversifier for stocks. When it is low, they are acting in a more complementary way and bonds are a more effective diversifier.

For most of this period, it is above 0, indicating that stocks and bonds have historically not been complementary. It's only the post-2000 period where this changes.⁴²

While data for private investments like private equity, venture capital, and private credit is more limited, we believe that their return drivers are fundamentally the same as their public counterparts. To us, it doesn't seem to matter if a company is public or private — their earnings growth is tied to broader economic growth in much the same way.

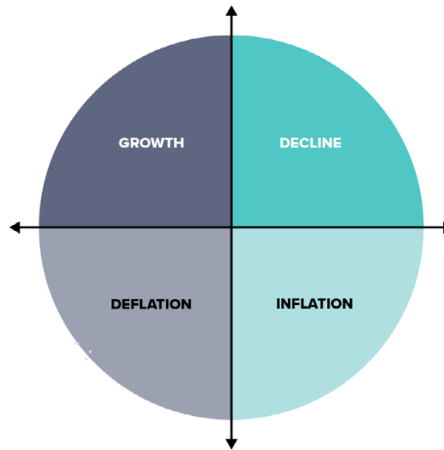
With this longer stretch of history as a backdrop, just how diversified are portfolios that contain 90% or more of their assets in stocks and bonds (or private alternatives such as private equity, venture capital, and private credit)? We would argue that they are not very diversified.

We believe that *true diversification* requires exposure to the four macroeconomic regimes of growth, decline, deflation and inflation.

⁴² Sources: Arnott–Bernstein (2002), Haver Analytics, Bloomberg via Ilmanen, Antti. Expected Returns (p. 344). Wiley. Kindle Edition.



WE BELIEVE
TRUE
DIVERSIFICATION
**REQUIRES
A PORTFOLIO
THAT CAN
WEATHER FOUR
MACROECONOMIC
REGIMES.**



We believe that investors' first attempts at diversification often result in a slightly different Mountain Climb, rather than actually including assets that would make it more like a Valley Path.

They are taking a bean-counting approach to diversification — “look at how many different things are on my pie chart!” — rather than considering how the things they are investing in correspond to the four macro regimes.

Offense Wins Games, but Defense Wins Championships

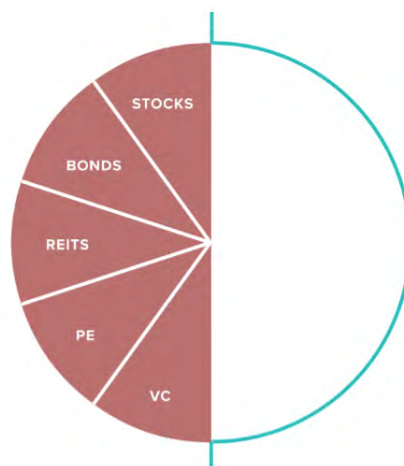
We believe that all financial assets can be seen as either offensive or defensive and that the balance of offense and defense allows one to compound wealth through all economic cycles most effectively.

This is a key insight of the Permanent Portfolio approach. Though it contains stocks and bonds, it only allocates half its exposure to them.

In our experience, most investors' portfolios are almost all offense. We group any asset that benefits from economic growth into the offensive sub-strategy. Stocks, bonds, real estate, private equity, and venture capital all fall into this category. These assets are typically correlated with economic growth.



TYPICAL
DIVERSIFICATION:
**OFFENSE
ONLY**

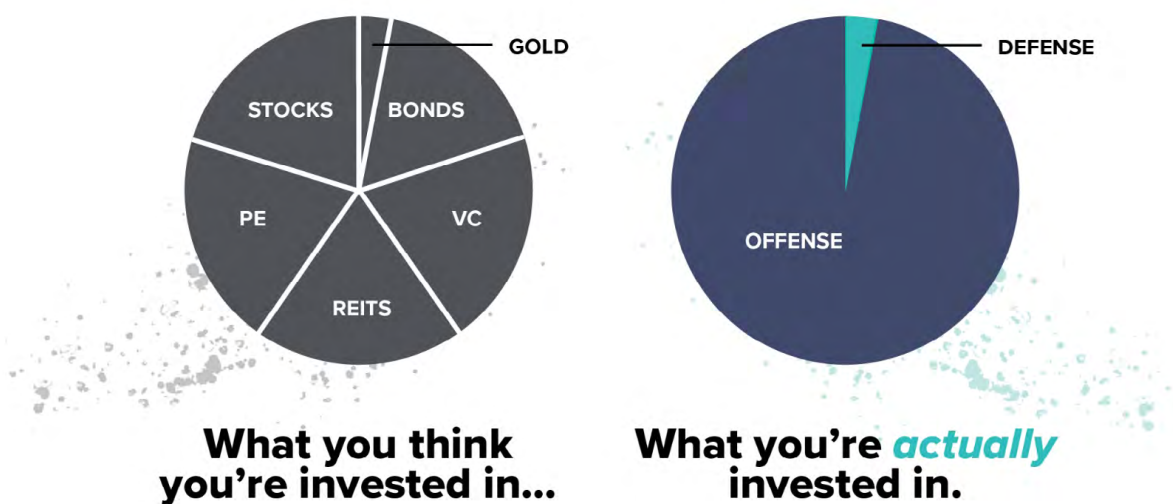


They are assets that perform well most of the time, but when they perform badly, they can perform *really* badly, as we've seen in prior crises.

In 2008, a traditional stock-and-bond-focused portfolio with some private equity and real estate sprinkled around the edges turned out not to be as diversified as many would have thought.



We consider these portfolios cargo cult diversification. Like a straw plane seeming to be the way to get cargo delivered, these portfolios *seem* diversified on the surface. But, when you really dig under the hood, they are all just bets on the good times continuing.



While offensive assets have their role in a portfolio, to compound wealth over the long run while minimizing drawdowns, we believe investors should combine equal amounts of offensive assets — those that do well in periods of low inflation and growth — with defensive assets — those that do well in periods of higher inflation and decline.

The Permanent Portfolio uses gold and cash as its defensive assets. We'll look at gold in more detail in Part II, but it's a good example of a defensive asset because it has two attributes that most other defensive assets we've identified have:

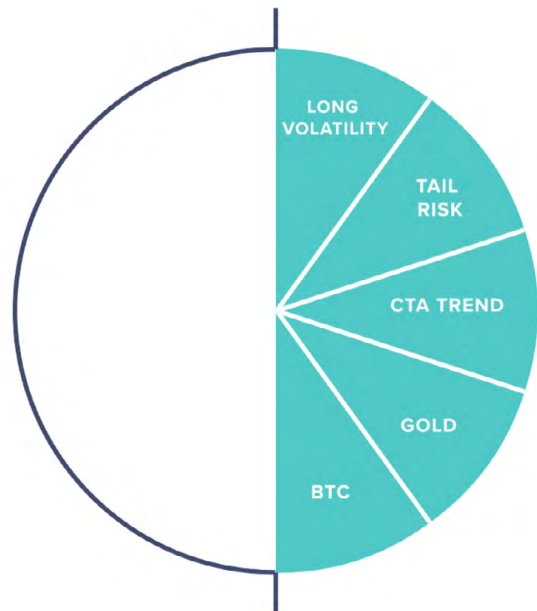
- 1. Lower standalone returns than offensive assets: It underperformed stocks and bonds over the 1973-2022 period.**
- 2. Even with this lower return, its inclusion in the portfolio improved the overall portfolio performance.**

This is typically the case with what we consider defensive assets. They are often overlooked because on a standalone basis, their returns are less attractive than offensive assets. But, we are not trying to pick the best asset; we are trying to build the best portfolio.

Defensive assets are ones that tend to perform best when offensive assets are at their worst, making them ideal candidates for rebalancing as part of a holistic portfolio.

NEED TO:

**COMBINE
WITH
DEFENSE**



While gold is a good starting point for many investors, we believe that other defensive assets not widely available in the 1970s can be included to improve the portfolio. These include strategies like Long Volatility, Tail Risk, Commodities and Trend Following which we will look at in Part II.

The Three Stages of Investing

The hardest part about implementing a truly diversified approach that can do well across economic regimes is that it requires a change in how most investors think about their role.

Most investors I've met think of "investing" as synonymous with "picking high-returning assets," and so the way they spend their time tends to reflect that. This framework redefines investors as portfolio managers looking at the overall composition of the portfolio first. Picking individual assets is still a meaningful part of that role, but it is reframed to think about assets within the context of their overall macroeconomic sensitivities.

Broadly speaking, I break the evolution of how most people think about investing down into three stages.⁴³

Stage 1 is framed by thinking in terms of probability. People in this stage tend to make investment decisions by asking the question “Is this likely to make money?”

Probability is a powerful tool for helping people make better investment decisions, and even a basic understanding of probability can make a big difference. People who use probability investing are going to avoid some of the worst possible investment decisions like buying lottery tickets or gambling, but they still have an overly simplified model.

Stage 2 is framed by thinking in terms of expected value. It improves on thinking strictly in terms of probability, because it also considers the potential payoff. An outcome with only a 20% probability but a 10x pay off can still be an intelligent investment.

In my experience, the vast majority of investors are at this stage of investing. When evaluating a new investment opportunity, they tend to try and determine the expected value of an investment and how it compares with other things they could invest in.

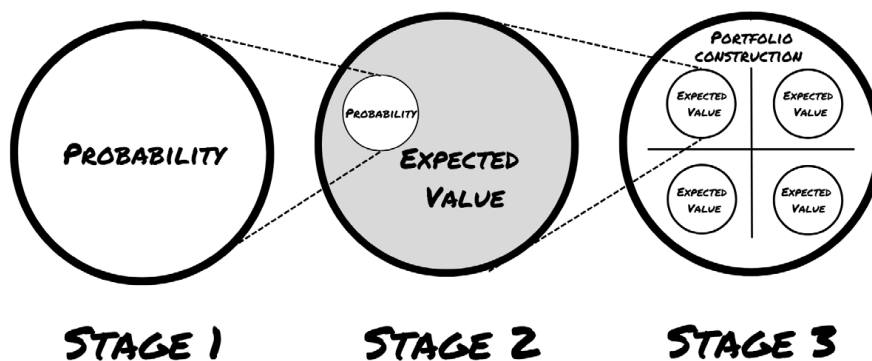
Most investing discussions we see are discussions around the expected value of different assets or strategies. They say, “I like this stock and that stock.” They look at each individual piece on its own: “Which of these investments is going to do the best?” Their dominant mental models are expected value and opportunity cost with some considerations for factors like liquidity and tax efficiency.

Stage 3 is framed by thinking in terms of portfolio construction. In the same way that thinking solely in terms of probability seems limiting from the Stage 2 perspective, thinking about assets solely in terms of expected value is limiting from the Stage 3 perspective.

From Stage 3, an investor thinks about not just the expected value but the *expected path*. They consider the portfolio holistically and see how investing in lower-returning but complementary individual assets can create a superior outcome at the portfolio level.

Using the principles of diversification, Stage 3 investors are thinking “I should put some of my money in the investment that I think is going to do the best and then also put some in investments that I think won’t do as well but are complementary, because if I rebalance between them, I improve the overall performance of the portfolio.”

Thinking in terms of expected value does not discard the concept of probability; rather, it incorporates it into a broader model. In the same way, thinking in terms of portfolio construction does not discard the concept of expected value; it just places it within the context of the overall portfolio. Indeed, we believe that thinking in terms of expected value is made even more valuable in Stage 3 because it puts it in a more productive context.



⁴³ This structure is loosely inspired by [Robert Kegan's model of human psychological development](#), which built on the work of Jean Piaget, with the general idea being that each stage subsumes and incorporates the previous stage in a sort of Hegelian thesis → antithesis → synthesis way. Stage 3 does not ignore Stage 1 or Stage 2 but incorporates them into a broader framework.

We believe that investors looking to pick individual assets like stocks, private companies or real estate will be most successful if they do that from a Stage 3 perspective — looking at individual investments within the context of a broadly diversified portfolio that includes components that can do well in each macroeconomic regime.

If you're a stock picker or private equity investor, this would imply including assets that can do well in periods of inflation or decline.

Most investors we know today are concentrated in offensive assets like stocks, bonds, and real estate. They have invested overwhelmingly in periods where these assets performed exceedingly well, which we think has created a strong recency bias toward those offensive assets, particularly if viewed through the Stage 2 lens of expected value.

But, we've seen that offense-only portfolios can suffer through periods of extended poor performance. Are offense-only investors today avoiding defensive assets in the same way that the GI in 1945 didn't want to touch stocks? Or the Baby Boomer in 1980 who didn't want to touch bonds?

In Part 2, we'll take a Stage 3 look at some of the most common offensive and defensive assets and how we think about incorporating them into a broader portfolio.



PART II

A BRIEF REVIEW OF POPULAR INVESTMENT ASSETS AND STRATEGIES

Offensive Assets and Strategies

Offensive assets tend to derive steady gains during periods of stability and growth (1947-1963, 1984-2007) in exchange for a substantial loss in the event of a major change in market regime (2008-2010).

In the early stages of a bull market, debt expansion is typically financed by cash flow and growth. If a company can borrow money at 4% and invest that in a project which generates 6% growth, this is sustainable. The increased revenue from the growth can pay down the debt.

Offensive assets tend to do well in periods of stable growth with relatively low inflation. Since most periods of financial markets are characterized by growth, we believe that they should constitute core portfolio holdings.

However, stable growth periods tend to be followed by periods of decline and/or inflation. In the late stages of a bull cycle, fiat devaluation (inflation) and/or debt expansion replace fundamentals.⁴⁴

Financing can become extended based on the expectation of perpetual asset price growth. Companies or investors finance more speculative projects or those with lower expected rates of return. At this point, the growth cycle enters into an unstable phase where even relatively small shocks can become destabilizing. This is where the defensive assets come in.

First, we'll cover (in brief) four of the most common offensive assets: stocks, real estate, corporate bonds, and government bonds.⁴⁵ There are many other types of assets that we consider offensive which are not listed but could be included, such as private equity, private credit, and venture capital, to name only a few. While each asset class certainly has its own nuances, we make the case that all of these are offensive as they tend to benefit from economic stability and growth. As such, we believe they should be included as part of the offensive portion of a portfolio.

⁴⁴ Minsky, Hyman P., The Financial Instability Hypothesis (May 1992). The Jerome Levy Economics Institute Working Paper No. 74.

⁴⁵ Many books could be and have been written on each of these asset classes as well as individual components of them. Our discussion of them here is very far from complete and intended only to show how historical data and our analysis of them situates them as offensive within the context of our framework.

Stocks

Stock performance is correlated to the business cycle and relies on stability and the assumption of growth to perform. When GDP is increasing, corporate profits tend to increase as well, which is the long-term driver of stock prices (though there can be plenty of fluctuations in the short to medium term).

Stocks have the highest long-term historical returns of the three major asset classes (stocks, bonds and commodities), making them a key holding of any portfolio focused on long-term growth.

As we saw in Part 1, long-term returns across different countries' equity markets can vary quite a bit.

The U.S. performance is particularly strong, with a 6.2% real return over that period. The recent experience of most investors alive today is even better, with investors often expecting 10% annual returns on their equity investments.

However, as we looked at in "Stocks for the Long Run?", the sequence of those returns can vary quite a bit. In the U.S. over the period from 1802-2009, rolling 20-year real returns varied between 1% and 13% annual growth rates. The highest 20-year real returns took place after calamities such as the Civil War, World War II, and the 1970s stagflationary period.⁴⁶

In the past century, there have been three periods of stocks remaining relatively flat or underwater for extended periods.

Two of those periods of extended stock down were periods of decline and recession:

- 1. The Great Depression in the 1930s and into the 1950s.**
- 2. The back-to-back tech bubble, and the global financial crisis in the early 2000s.**

The other was the stagflationary regime in the 1970s, where stocks remained relatively flat over that period.

As we'll look at below, these were periods where we believe defensive assets such as gold, long volatility, and commodity trend following would have been the better performers.

Real Estate

Real estate is one of the most important investments for many people, particularly in the United States, where many people own their own homes. Real estate has done particularly well in most living investors' lifetimes. The period from 1984 to 2007 saw strong growth in home values, as did the post-GFC period from 2012 to 2023.

Like stocks, real estate performed poorly during periods of secular decline, including the periods between 1925-1932 and 2007-2011.⁴⁷

This is not too surprising because a house is a bet on the local labor market. One major input to home prices is the availability and median wage of jobs. (Exhibit A: the Bay Area. Exhibit B: Detroit.)⁴⁸ The availability and median wage of jobs is largely tied to the business cycle — when companies are doing well and unemployment is low, it's easier to get a job and workers have more negotiation power on raises.

46 IImanen, Antti. Expected Returns (pp. 122-123). Wiley. Kindle Edition.

47 U.S. home prices derived by Robert Shiller.

48 Sklarz, Michael, and Norman Miller. "A Longer-Term Look at Housing Prices Versus Employment." Collateral Analytics, 26 Aug. 2019.

One argument for real estate as a defensive asset rather than an offensive asset is its effectiveness as an inflation hedge. The logic goes that it's a real asset and so should do well in the case of higher levels of inflation. You can "print" more cash, but you can't print more houses. The problem with this argument is that it doesn't appear to be true. U.S. residential real estate had a negative annualized real return of -2% during eight inflationary regimes between 1926 and 2020.⁴⁹

Residential Real Estate Annualized Real Performance		
Inflationary Regime	Other Regimes	All Regimes
-2%	2%	1%

It had a positive return in only two of the eight inflationary periods: The "End of WW2" inflationary episode (1945-46) and the Iranian Revolution episode (1977-1980). While performance was positive in both of those regimes, the positive performance failed to keep up with inflation.

Residential Real Estate Real Return Performance in 8 Inflationary Regimes								
Regime	US Enters WW2	End of WW2	Korean War	Ending of Bretton Woods	OPEC oil Embargo	Iranian Revolution	Reagan's Boom	China demand boom
Start Month	Apr 1941	Mar 1946	Aug 1950	Feb 1966	Jul 1972	Feb 1977	Feb 1987	Sep 2008
End Month	May 1942	Mar 1947	Feb 1951	Jan 1970	Dec 1974	Mar 1980	Nov 1990	Jul 2008
Total Price Level Change	15%	21%	7%	19%	24%	37%	20%	6%
Total Residential Real Estate Real Return	-17%	4%	-4%	-2%	-7%	11%	0%	-13%

Source: Neville, Henry and Draaisma, Teun and Funnell, Ben and Harvey, Campbell R. and van Hemert, Otto, *The Best Strategies for Inflationary Times* (May 25, 2021). Please see the paper for sources and material assumptions.

Given its best period of performance came during a high-growth, low-inflation regime (1984-2007) and its poor performance in inflationary periods, we view real estate as an offensive asset that tends to do well during periods of growth and low inflation.

Corporate Bonds

Corporate bonds are debt securities issued by companies to raise capital. Investors who buy corporate bonds are effectively lending money to the issuing company. In return, the company promises to pay back the principal on a specified maturity date and to make regular interest payments, typically referred to as coupon payments. Corporate bonds can be categorized by their credit quality, which is assessed by credit rating agencies such as Standard & Poor's (S&P), Moody's, and Fitch.

Broadly, corporate bonds are broken down into "investment grade" and "junk."

Investment-grade bonds are issued by companies with higher credit ratings and thus offer lower yields compared to bonds with higher risk in exchange for a perceived relatively low risk of default. The investment-grade category is typically subdivided into AAA, AA, A, and BBB.

⁴⁹ Neville, Henry and Draaisma, Teun and Funnell, Ben and Harvey, Campbell R. and van Hemert, Otto, *The Best Strategies for Inflationary Times* (May 25, 2021).

Junk bonds, also known as high-yield bonds, are issued by companies that are considered more likely to default on their debt. They have lower credit ratings (BB or below) and therefore offer higher yields to compensate for the increased risk.

For the 1984-2019 period, falling rates and rising asset prices resulted in a magic combination for corporate bonds.

However, corporate bonds underperformed equities throughout the growth cycle of the 1950s.

They also fared poorly in the secular stagnation from 1964 to 1983, when rising rates and higher credit spreads resulted in multi-year losses due to stagflation (stagnant growth combined with high inflation).⁵⁰

Their potential to perform well in growth and low-inflation environments like 1984-2019 and their relatively poor performance in periods of stagnation or higher inflation situates them as an offensive asset in our framework. (Aside: for investors using ETF and mutual funds, it's important to note that many bond investment funds contain both corporate and government bonds, so both this section and the following may be relevant.)

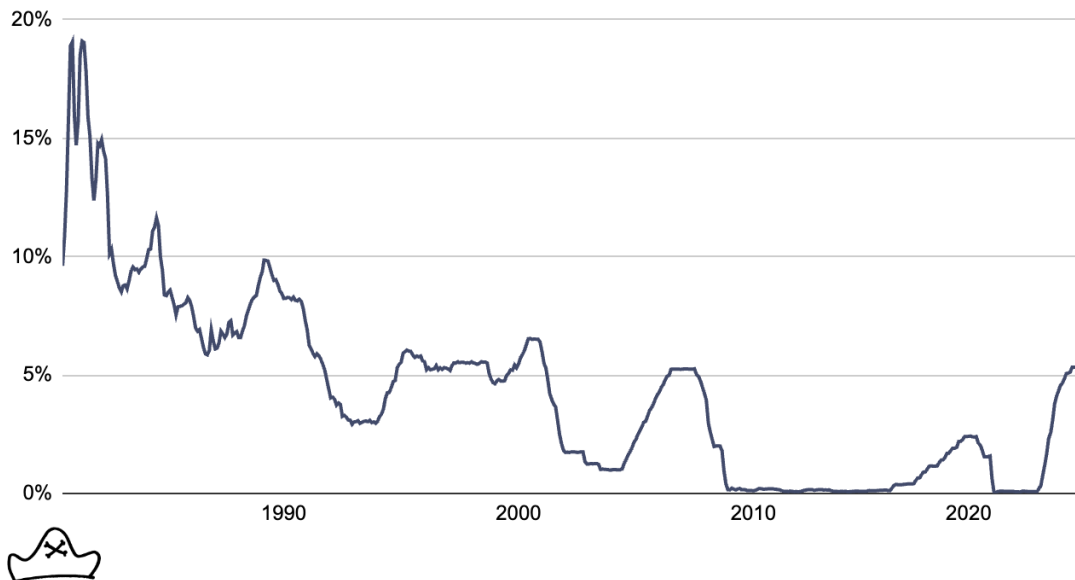
High-Quality Government Bonds

High-quality government bonds such as U.S. Treasury bonds seem to have a Janus-like quality, exhibiting both offensive and defensive traits at varying times.

For the 30-year period from 1990 to 2021, U.S. government bonds acted as a remarkably effective addition to a stock-focused portfolio.

One reason is that they offered very strong returns over that period. Policymakers persistently cut rates (19% in 1981 to 0% in 2021). A 30-year down trend in rates meant, for the most part, a 30-year up trend in bond prices and positive returns for bond holders.⁵¹

Federal Funds Effective Rate



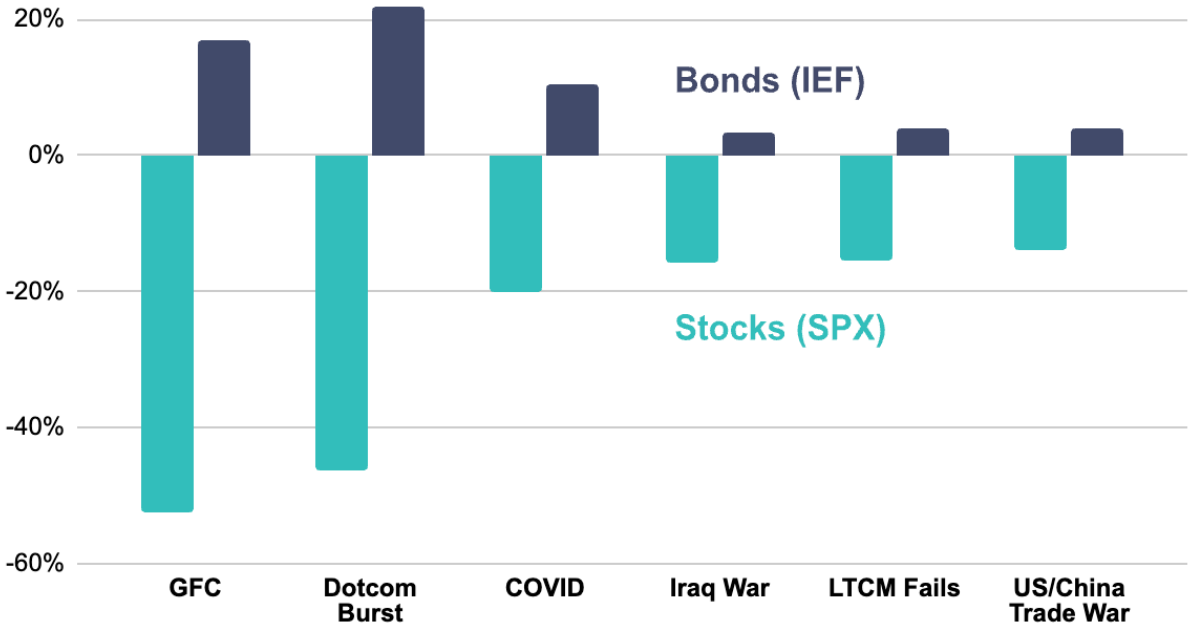
Source: Federal Reserve Bank of St. Louis. Aug. 1980 - Jan. 2024. Past performance is not necessarily indicative of future results.

50 Own Calculations

51 Recall our earlier point that when interest rates fall, bond prices increase. For example, if you bought a bond with a face value of \$100 and a 10% interest rate today, then it would pay you \$10 per year. Let's say that tomorrow the interest rate available is 5%. In order to get the same \$10 per year, you would need to buy a bond with a face value of \$200. As a result, that 10% interest rate bond is now worth \$200, because it pays more interest than what is available today. So, it is generally the case that as interest rates fell — as they did from the 1980s to 2010s — bond prices rose.

At the same time, the correlation between stocks and bonds tended to be positive when stocks were going up and negative when stocks were going down. This meant bonds both added to stocks' gains and helped to mitigate their losses by performing well in crisis periods such as the dot-com bust, GFC, and more recent COVID crash.

Bond Performance During Crisis Periods



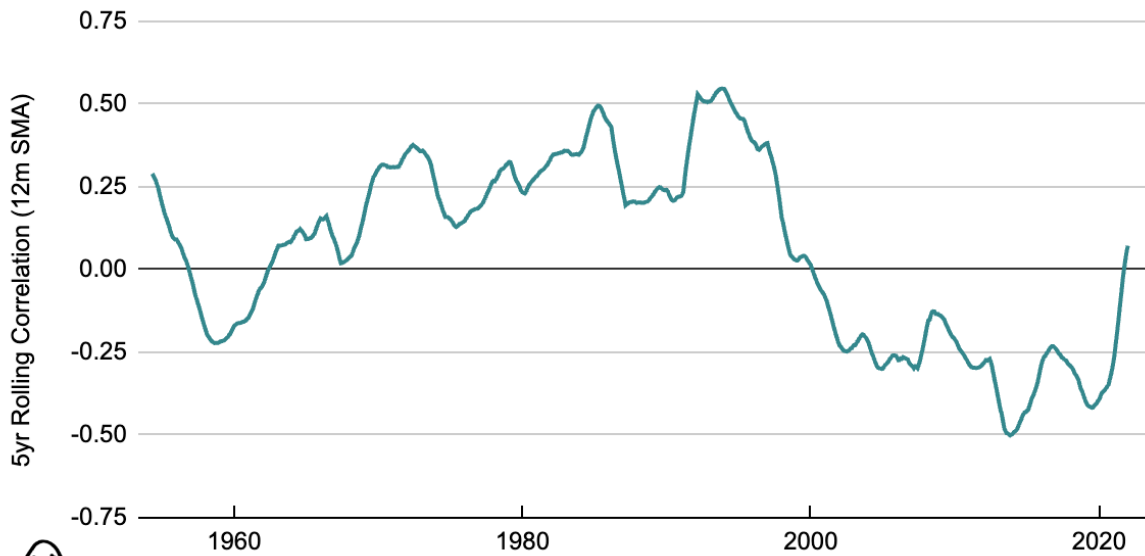
Source: YCharts, GFD. Peak-to-trough drawdowns on the S&P 500 Index between Apr. 1990 and Aug. 2020 greater than -10% alongside performance of IEF during the same period. Past performance is not necessarily indicative of future results.

However, their longer-term performance both as a stand-alone and as a diversifier for stocks is more checkered.

The stock/bond correlation was mildly positive from around the mid-1960s to 2000, meaning that bonds were not as effective a diversifier over that period as they have been in the post-2000 period.

Government bonds also struggled to provide returns during the stagflationary period of the late 1960s into the 1980s that was accompanied by rising interest rates and higher inflation.

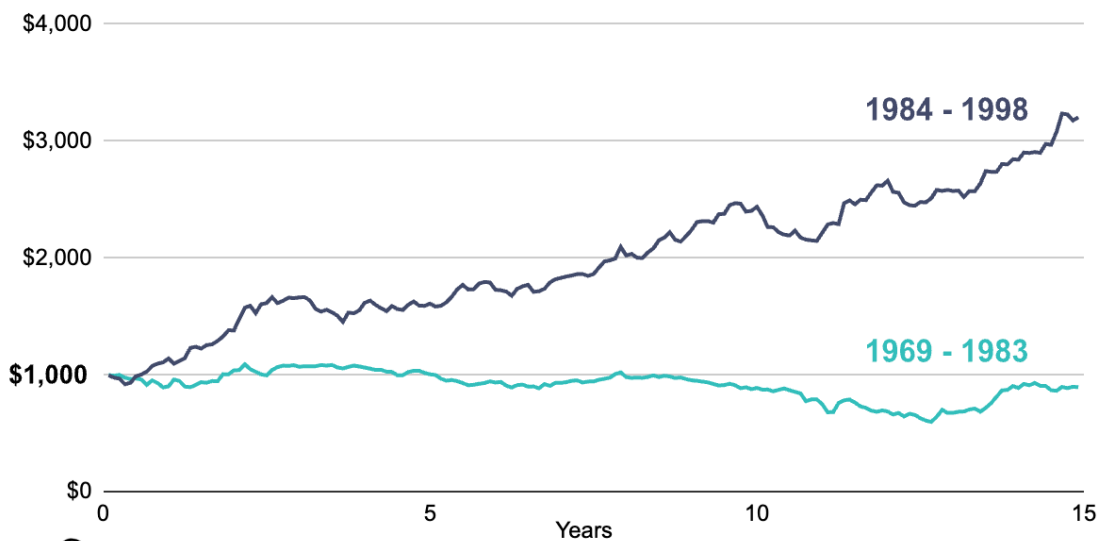
Stock/Bond Correlation Over Time S&P 500/7-10yr Treasury Bonds



Source: YCharts, GFD. Stocks and bonds are represented by the S&P 500 Index and IEF respectively. GFD extension used where necessary. Correlations are calculated on monthly returns with a 5-year lookback. Results are smoothed with a 12-month simple moving average. Past performance is not necessarily indicative of future results.

While there is an argument for viewing government bonds as a defensive asset, we think their longer run history situates them as more of an offensive asset and vulnerable to periods of higher inflation. We believe periods in which they can also act as a diversifier for stocks should be viewed more as a bonus than something to be relied upon, and their primary role in a portfolio should be in a deflationary regime as shown by the divergence in performance in the inflationary 1970s vs. deflationary 1980s and 90s.

Bond Performance Comparison (Real Returns)



Source: YCharts, GFD. 1969 - 1998. Bonds are represented by IEF (w/ GFD extension) adjusted for monthly inflation. Past performance is not necessarily indicative of future results.

Defensive Assets and Strategies

Defensive assets are those that tend to accumulate small losses or have less impressive performance during periods of stability. However, they seek large gains during market shocks and recessionary and inflationary periods (1928-1948, 1964-1983, 2007-2008, 2022). If they're able to achieve this, they can help improve a portfolio's long-term compound growth even with a lower overall return.

While most people are familiar with offensive assets like equities, real estate, and bonds, defensive assets tend to be less commonly used and poorly understood for two reasons:

- 1. Offensive assets have done so well over most current investors' lifetimes that few investors have looked more broadly.**
- 2. Defensive strategies can be somewhat more complex and some are actively traded strategies rather than passive holdings.**

Here we will look at what we see as the most promising defensive strategies investors should consider in their portfolios.

Gold

Gold is the oldest defensive asset and has acted as an insurance policy against fiat debasement and hyperinflation for 4,000 years.

The performance of physical gold in a stock/bond portfolio over the 1973-2022 period showed that it can be additive to a portfolio's overall performance even when its return is not as high as offensive assets like stocks or bonds.

The Great Depression of the 1930s, stagflation of the 1970s, and dot-com/GFC busts of 2000-2012 were periods where gold helped a stock/bond focused portfolio.

However, it's important to note the limitations of gold. The absence of a pronounced upward or downward trend in the real price of gold supports the idea that gold's real rate of return might be, on average, close to zero.

Compare the pay of a Roman centurion in the era of Emperor Augustus (reigned from 27 B.C. to 14 A.D.) to a modern captain in the U.S. Army in the 2010s. Remarkably, despite a 2,000-year difference, there is only a 20% pay difference.⁵²

Military Pay in Ounces of Gold			
	U.S. Army Captain	Roman Centurion	Growth Rate
Salary	\$44,543	\$61,730	-0.02%
Price of Gold	\$1,600	\$1,600	
Ounces of Gold	27.84	38.58	-0.02%

Source: Erb, Claude B. and Harvey, Campbell R., *The Golden Dilemma* (May 4, 2013). *Financial Analysts Journal*, vol. 69, no. 4 (July/August 2013) 10-42.,

⁵² A centurion commanded a century of 80 legionaries and had a rank somewhat similar to a captain in the U.S. Army. Source: Erb, Claude B. and Harvey, Campbell R., *The Golden Dilemma* (May 4, 2013). *Financial Analysts Journal*, vol. 69, no. 4 (July/August 2013) 10-42.

Maintaining its long-term purchasing power makes gold an effective hyperinflation hedge — a real return of zero seems unsexy until you’ve lived through a significant fiat devaluation or hyperinflationary period.

However, we have not seen robust evidence that gold is an effective diversifier against mild to moderate inflation.

It’s important to note that the period of strongest gold returns in the last hundred years was the 1970s. In August 1971, U.S. President Richard Nixon ended the direct convertibility of the U.S. dollar to gold at \$35 an ounce. He took the U.S. and the world off the last vestiges of the gold standard.

In January 1980, gold spiked to \$850 an ounce when U.S. interest rates were as high as 20%. This 2,400% gain through this period of higher inflation in the U.S. left a strong mark on investors as to the value of gold. We believe there isn’t good evidence to suggest that this will repeat in a similar period of moderate inflation, as the gold standard no longer exists in any major economy.

This suggests that gold is an important defensive asset that acts as an insurance policy against hyperinflation or outright fiat devaluation — and has done so reliably for millennia. While it can also perform well in periods of mild to moderate inflation, we don’t think it should necessarily be relied upon to do so.

If gold isn’t a good diversifier in mild to moderate inflation, where should we turn? A sustained period of moderate inflation (say, 7%) can still be pretty damaging to a portfolio. A ten-year period of 7% annual inflation would see the purchasing power of a dollar decline by 43.66%. A portfolio worth \$1 million in Year 1 would have a purchasing power equivalent to \$566,400⁵³ after a period of 10 years with a 7% annual inflation rate. That’s the kind of loss that we’re trying to avoid on our Valley Path.

What are the best options for strategies that do well in inflationary periods like this?

Commodities

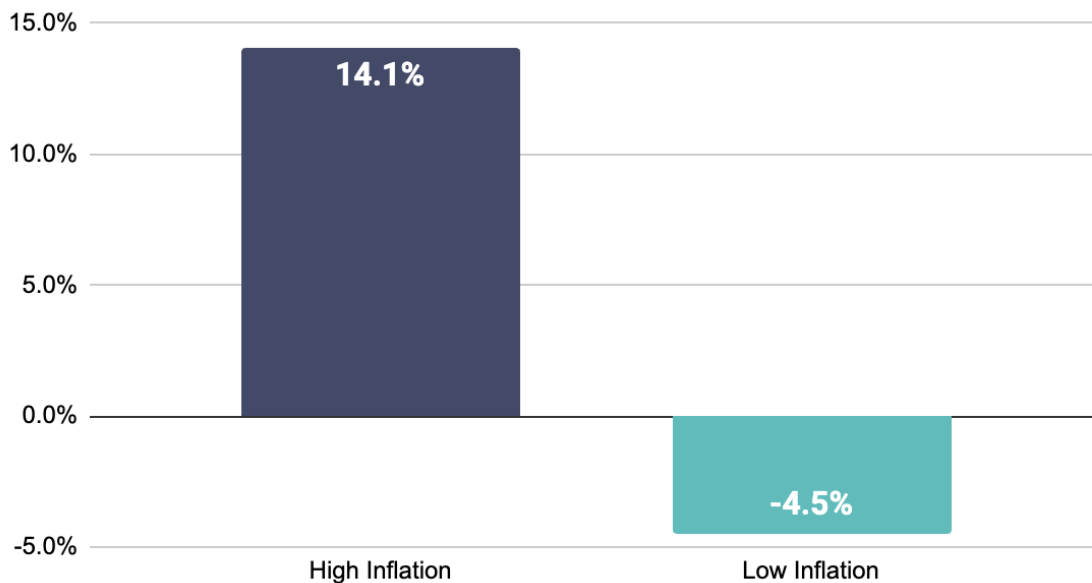
One reasonable approach would be to use a basket of commodities. Since inflation is measuring an increase in the costs of goods and services, which often have commodity inputs (e.g., you need grain to bake bread), investing in a diversified basket of commodities would seem like a way to get widespread coverage against inflation wherever it shows up.

Looking at the period of 1877-2015, we see that commodities perform well during inflationary periods. The commodity indices studied had an average annual return of 14.1% versus -4.5% in high-inflation versus low-inflation periods.⁵⁴

53 Measured in Year 1 dollars

54 Levine, Ari, Yao Hua Ooi, and Matthew Richardson. “Commodities for the Long Run.” NBER Working Paper No. 22793, National Bureau of Economic Research, 2016.

Commodities Average Annual Returns 1877-2015



Source: Levine, Ari, Yao Hua Ooi, and Matthew Richardson. "Commodities for the Long Run." NBER Working Paper No. 22793, National Bureau of Economic Research, 2016.

This performance in inflationary periods makes commodities a promising addition to a mostly offensive portfolio of stocks and government bonds. The optimal portfolio over this period allocated 17% to commodities, 29% to stocks, and 54% to government bonds.⁵⁵ This is a much higher allocation to commodities than we tend to see in most people's portfolios today.

Like gold in the Permanent Portfolio, the inclusion of commodities improved risk-adjusted returns by acting as a defensive asset that can do well in an inflationary period where stocks and bonds struggle. A basket of commodities is attractive because rather than relying on a single commodity — gold — you're able to get exposure across commodities. If a significant part of inflation is a result of a rise in oil prices, it makes sense to have some exposure to oil.⁵⁶

However, commodities can also go through extended periods of flat or negative returns. So while they have historically been an effective inflation hedge, they can be a significant drag on the portfolio at other times. It would be better if you could get commodity exposure at the "right" times. This is what commodity trend following strategies seek to do.⁵⁷

⁵⁵ Ibid.

⁵⁶ A basket of commodities is also attractive because it can benefit from rebalancing effects. Even if the long run return of all commodities is flat, if they are uncorrelated to each other and rebalanced regularly then this can produce a positive return. Combine this with the carry characteristics of commodity futures contracts which are the most common instruments used for commodity exposure in portfolios and Levine et al. (2016) found "long-run evidence that both components of commodity futures returns are positive: the excess-of-cash spot returns and the convenience yield. Following the practitioner literature, we denote the returns associated with the convenience yield as the interest rate adjusted carry yield. These positive returns exist both in early and later subperiods of the last 139 years. For example, breaking the sample into the period 1877-1945 and 1946-2015, average excess spot returns on an equal risk-weighted index are 2.4% and 1.6%, respectively, while the average adjusted carry yield on the same index is 2.8% and 4.4%."

⁵⁷ A brief aside on confusing nomenclature. Commodity Trend Following is sometimes used interchangeably with the term Commodity Trading Advisors (CTAs). Technically, a CTA is any individual or organization who is retained by a fund or individual client to provide advice and services related to trading in futures contracts, commodity options and/or swaps rather than an investment strategy. Historically, the vast majority of CTAs have used trend following strategies, often focused on commodity markets in particular, and so the terms "CTA," "trend following," and "commodity trend following" are often used interchangeably. Since you can technically employ a trend-following approach to any market, not just commodities, I will try to clarify exactly what is being referred to by using the terms "commodity trend following" to refer to trend-following strategies that have mostly commodity exposure and "trend following" or "all asset trend" to refer to strategies which trade both commodities and other assets such as bonds, stocks, and currencies. I will avoid using the term "CTA" but mention it here as it's used fairly often in discussions on trend-following strategies.

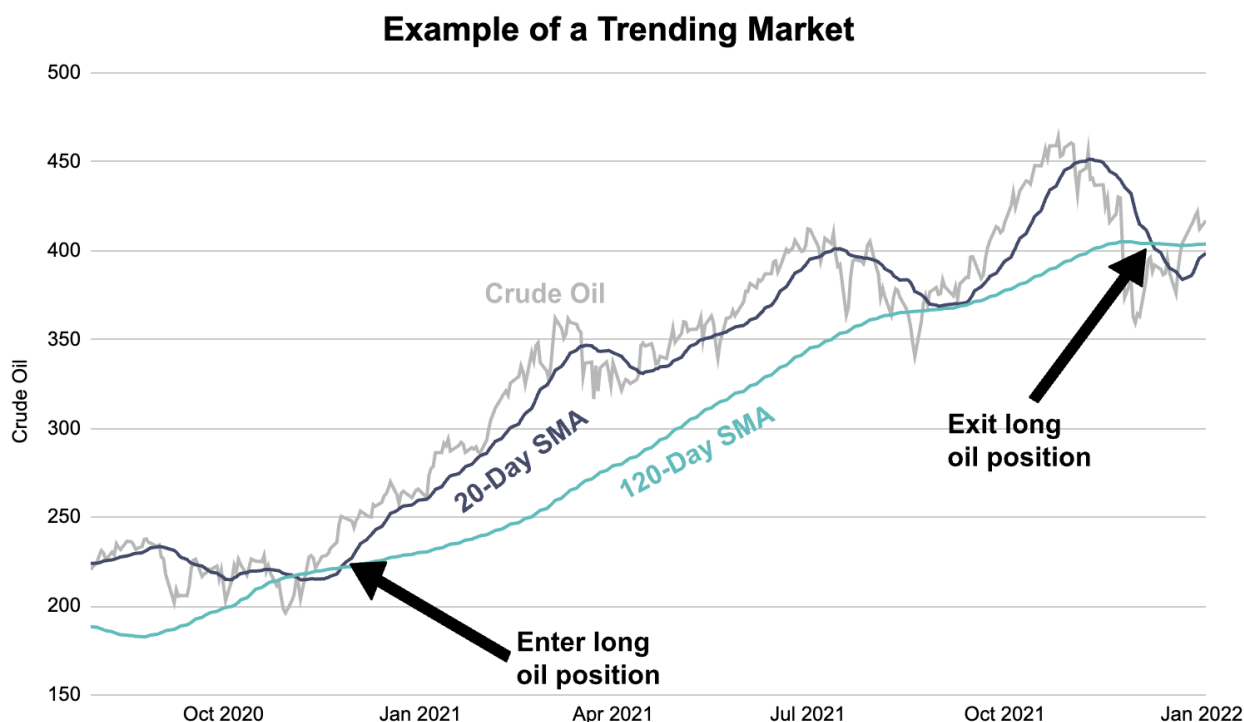
Commodity Trend Following

Commodity trend following is a way to try and invest more effectively in commodities like oil, gold, or wheat. The idea is simple, if counterintuitive: if the price of a thing is going up, buy it. If the price is going down, sell it.

Practitioners typically start by using some systematic method to identify prices trending up or down. One example would be to use a 20-day/120-day moving average crossover point as a way to identify a trend.

This entails buying or selling a commodity when two moving averages of different periods (such as the 20-day and 120-day simple moving average) cross over one another. When the recent price (average price over the last 20 days) is higher than the longer-term price (average price over the last 120 days), then we can say that the market is “trending” higher.

Using oil as an example, the 20-day moving average of oil’s price crossed above the 120-day moving average on December 2, 2020, indicating an up-trending market. This approach would have still been holding the position until December 16, 2021, when the trend reversed and the strategy went to cash with oil prices more than 100% higher.



Source: YCharts. S&P GSCI Crude Oil from Aug. 2020 - Dec. 2021. 20-day simple moving average and 120-day simple moving average are used as signals for going long/short the underlying product. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts. PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.

By only having exposure to markets when there is a clear trend, commodity trend following seeks to benefit in inflationary regimes where commodity prices are rising. But unlike an outright commodity allocation, which is always long, Commodity Trend can also benefit in recessionary periods where commodity prices are falling. This can create a much more attractive return profile with less volatility and smaller drawdowns than owning commodities outright.

Looking at the period from 1941 to 2008, we see its strong performance relative to buy-and-hold commodities in inflationary regimes and particularly non-inflationary regimes.

Regimes			
	Inflation (19%)	Other (81%)	All (100%)
Strategy	Real Return (Annualized)		
Commodity Trend Following	20%	8%	10%
Commodities - Aggregate	14%	1%	4%

Source: Neville, Henry and Draaisma, Teun and Funnell, Ben and Harvey, Campbell R. and van Hemert, Otto, The Best Strategies for Inflationary Times (May 25, 2021). Please see the original paper for important notes about sources and calculations performed. FUTURES TRADING INVOLVES SUBSTANTIAL RISK OF LOSS AND IS NOT SUITABLE FOR ALL INVESTORS.

Though no one can definitively say why this strategy has historically outperformed buy-and-hold commodities, it's reasonable to think that the long-run return of commodities may be low. Unlike a company, they are not generating profits and growing. They are raw materials. However, they can go through long periods of upward and downward trends. There can be a long feedback loop in the production of many commodities.

For example, during the 2010s, U.S. shale oil production increased. With low interest rates and new technology, lots of capital flowed into oil production, and that helped keep prices low. This was great for consumers but not great for investors, who may not have seen the returns they expected based on historical oil prices.

Investors began expecting management to focus on profitability and capital returns rather than unprofitable growth. This led to decreased investment. Since shale oil wells can deplete quickly and require continued investment, this led to decreased supply and higher oil prices. Regardless of the cause, any market with big cyclical trends can be an excellent situation for trend-following strategies, which are able to profit from both rising and falling prices.⁵⁸

Commodity trend following strategies typically don't just trade one market like oil; they trade dozens of markets across the globe, including sectors like energy, livestock, cocoa, precious metals and grains.

If corn prices hit a record high one year, farmers may choose to plant corn instead of wheat or soybeans the next year to capture those high prices. But, by the time of harvest, all that extra planting can create more supply and cause prices to fall. This can create a series of both up trends and down trends which commodity trend following can profit from, where a buy-and-hold approach would suffer losses as commodity prices declined.

By focusing on a broad basket of commodities instead of just a single commodity like gold, we believe commodity trend strategies can better capture inflation wherever it shows up. Looking more broadly at popular assets in the period from 1941 and 2008, it's a compelling defensive addition.

⁵⁸ As noted below in the list of resources, there is a history of trends across many markets beyond commodities, so a more fundamental behavioral explanation may be more probable than merely the cycle inherent in commodities. The truth is no one really knows why trend following has worked historically, but the financial literature pretty broadly supports its persistence across markets and times. Arguably, this example is a good example of where it's hard to know what *really* caused the movements. At the same time, OPEC made a concerted effort to basically get oil below the cost of shale production. So perhaps it wasn't that lots of capital flowed in and kept prices low.

Regimes			
	Inflation (19%)	Other (81%)	All (100%)
Strategy	Real Return (Annualized)		
All Asset Trend Following	25%	15%	16%
Commodity Trend Following	20%	8%	10%
Commodities - Aggregate	14%	1%	4%
Commodities - Gold	13%	-1%	1%
Real Estate - Residential	-2%	2%	1%
Long Equities - Market Composite	-7%	10%	7%
Fixed Income - Investment Grade	-7%	6%	3%
Fixed Income - 30 Yr. Treasury	-8%	5%	3%

Source: Neville, Henry and Draaisma, Teun and Funnell, Ben and Harvey, Campbell R. and van Hemert, Otto, The Best Strategies for Inflationary Times (May 25, 2021). Please see the original paper for important notes about sources and calculations performed. FUTURES TRADING INVOLVES SUBSTANTIAL RISK OF LOSS AND IS NOT SUITABLE FOR ALL INVESTORS.

As we would expect, we see that offensive assets struggled during inflationary periods:

- » **Stocks** tended to do poorly in inflationary regimes, with U.S. equities returning -7% annualized over the eight inflationary regimes analyzed in their study.
- » **High-Quality Government Bonds**, represented by the 30-year U.S. Treasury bonds, returned -8% annualized during the inflationary periods.
- » **Investment-Grade Corporate Bonds** fared little better at -7%.
- » **Real Estate**, which is often touted as an inflation hedge because it's a real asset, also fared poorly, losing -2% annualized during the inflationary periods.

By contrast, the defensive assets we've looked at did a fair bit better:

- » **Gold** fared well, though we see that its exceptional performance over the two periods in the 1970s following the end of the gold standard played a huge role.
- » **Commodities** held passively also did well in inflationary periods, returning 14% annualized over the periods studied.
- » **Commodity Trend Following** performance was even better in those periods, with a 20% annualized return. Being able to go both long (bet on) and short (bet against) commodity prices was a significant benefit, as it could profit from periods of both rising and falling commodity prices.

Specific Inflation Regimes								
	US enters WW2	End of WW2	Korean War	Ending of Bretton Woods	OPEC oil embargo	Iranian Revolution	Reagan's Boom	China demand boom
Start Month	Apr 1941	Mar 1946	Aug 1950	Feb 1966	July 1972	Feb 1977	Feb 1987	Sep 2007
End Month	May 1942	Mar 1947	Feb 1951	Jan 1970	Dec 1974	Mar 1980	Nov 1990	Jul 2008
Strategy	Real return (total)							
All Asset Trend Following	20%	23%	19%	135%	196%	100%	65%	17%
Commodity Trend Following			1%	54%	173%	33%	132%	25%
Commodities - Aggregate		12%	6%	26%	85%	38%	84%	21%
Commodities - Gold					166%	154%	-18%	27%
Real Estate - Residential	-17%	4%	-4%	-2%	-7%	11%	0%	-13%
Long Equities - Market Composite	-24%	-27%	24%	-7%	-46%	-14%	12%	-17%
Fixed Income - Investment Grade	-7%	-12%	-3%	-23%	-20%	-43%	-5%	1%
Fixed Income - 30 Yr. Treasury	-17%	-17%	-6%	-20%	-28%	-41%	13%	2%

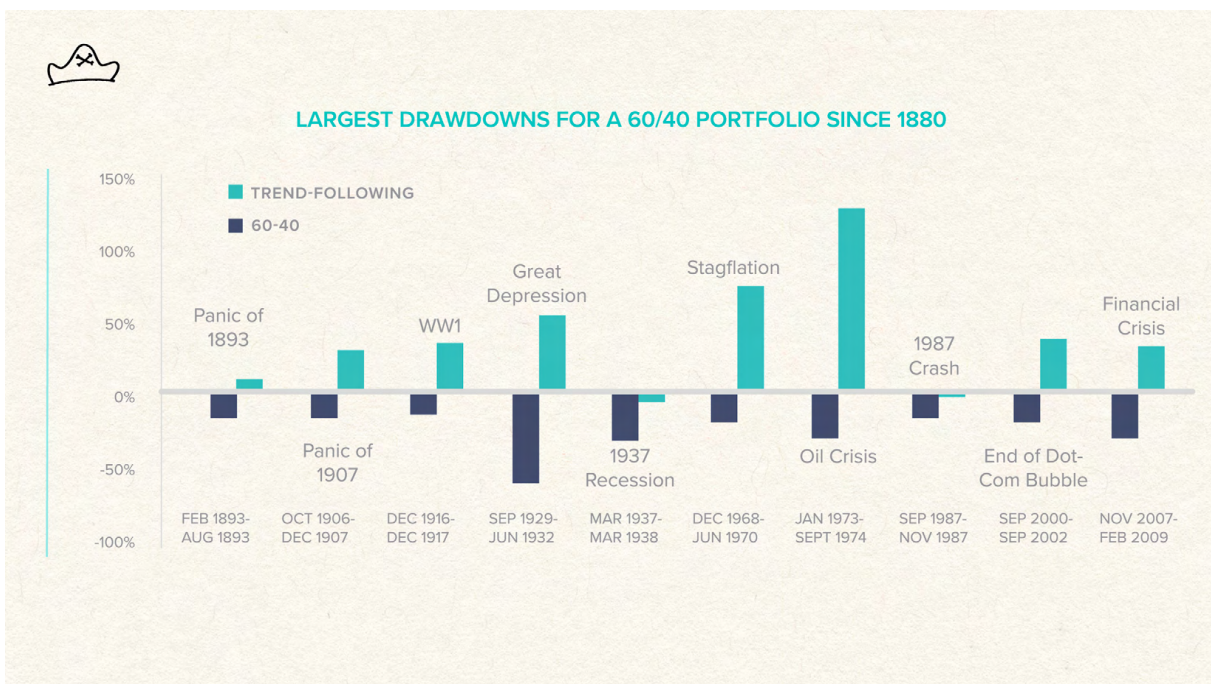
Source: Neville, Henry and Draaisma, Teun and Funnell, Ben and Harvey, Campbell R. and van Hemert, Otto, *The Best Strategies for Inflationary Times* (May 25, 2021). Please see the original paper for important notes about sources and calculations performed. **FUTURES TRADING INVOLVES SUBSTANTIAL RISK OF LOSS AND IS NOT SUITABLE FOR ALL INVESTORS.**

The other thing that jumps out from this study is that “all-asset trend following” — which includes commodities as well as stock, bonds and currencies — performed even better than commodity trend following during inflationary periods and non-inflationary periods. It posted an annualized real return of 25% in inflationary periods and a 16% return over the entire period studied.

Importantly for our goal of providing an effective diversifier to offensive assets in an inflationary period, all-asset trend following had a positive return in all eight of the inflationary cycles studied.

Since an all-asset trend following approach is agnostic to whether prices are trending up or down, it also has the ability to perform well in deflationary periods where prices are trending down. This makes it even more attractive to include as part of a portfolio.

A paper from AQR recreating historical trend following has performed well in 8 of the 10 largest drawdowns for a 60/40 stock/bond portfolio since 1893.



Source: AQR . The above is an educational example and does not represent trading in actual accounts.

Because of all-asset trend following's stronger track record and more widespread coverage of markets, we believe it's the most effective strategy for providing positive performance in an extended inflationary regime as well as providing stronger overall returns throughout economic cycles.

While the existence of commodity cycles owing to over- and under-production may explain why trend following works on commodities, a few behavioral models for all-asset trend following's success seem plausible, including investors' tendency to extrapolate past returns and keep buying things that are going up. Similarly, overreaction to popular stories and herding is another possible explanation.

One interesting web-based study designed to establish the independence of taste and preference in music with 14,000 participants suggests this may explain why trends develop.⁵⁹

Participants were asked to explore, listen to, and rate music. One group of participants would be able to see how many times a song was downloaded and how other participants rated it; the other group would not be able to see downloads or ratings. The group that could see the number of downloads ("social influence") was then subdivided into eight distinct, random groups where members of each sub-group could only see the download and ratings statistics of their sub-group peers.

Did "good music" get the same amount of market share regardless of the existence of social influence?

Nope. Each social-influence group had its own hit songs, which commanded a much larger market share of downloads than songs in the socially-independent group.

The long-run success of a song depended on the decisions of a few early-arriving individuals, whose choices are subsequently amplified and eventually locked in.

It may be that trends are persistent in markets due to fundamental human nature, explaining their persistence over time.⁶⁰

Regardless of the exact explanation, we believe the track record of trend following strategies in inflationary periods as well as some deflationary periods make it an excellent candidate for an addition to a portfolio as a defensive asset and a more reliable choice than gold in mild to moderate periods of inflation.

While we find trend following a very compelling addition to a stock/bond-focused portfolio because of its potential to do well in both inflationary periods and extended recessions, it can struggle in sharp sell-offs. The COVID crash in Q1 of 2020 was a difficult period for many trend followers. When a market sells off very quickly and then rebounds very quickly, as many markets did in early 2020, trend followers can get caught on the wrong side — exiting the trend after suffering losses and not re-entering the trend until after the market has recovered and gains have come back.

59 Hoffstein, Corey. "Two Centuries of Momentum." *Flirting with Models*, Newfound Research, 23 Mar. 2018.

60 As noted in the start of Part 2, this is only intended as a cursory overview of trend following, with many nuances being necessarily excluded for space considerations. If you are interested in learning more about the research supporting trend following, we include some resources we have found helpful and explanatory below:

The Best Strategies for Inflationary Times — A paper analyzing the performance of commodity trend strategies in periods of high inflation. Neville, Henry and Draaisma, Teun and Funnell, Ben and Harvey, Campbell R. and van Hemert, Otto, *The Best Strategies for Inflationary Times* (May 25, 2021).

A Century of Evidence for Trend Following — A broad look at evidence of trend following working across time and markets. Hurst, Brian K., et al. "A Century of Evidence on Trend-Following Investing." 1 Nov. 2017.

Value and Momentum Everywhere — Asness, Clifford S., et al. "Value and Momentum Everywhere." *The Journal of Finance*, vol. 68, no. 3, 20 May 2013, pp. 929–985.

Two Centuries Of Momentum. — Another broad look at evidence of trend following working across time and markets. Hoffstein, Corey. "Two Centuries of Momentum." *Flirting with Models*, Newfound Research, 23 Mar. 2018.

Expected Returns Chapter 14 — A summary of the academic literature on trend following. Antti Ilmanen. *Expected Returns*. John Wiley & Sons, 20 Apr. 2011.

Shedding Light on the Black Box — A paper looking at why an ensemble of trend managers and time frames seems preferable to a single manager. *CTAs: Shedding Light on the Black Box*. Hermes BPK Partners.

Diversifying Diversification — An overview of how to incorporate trend following inside a broader defensive portfolio. Bhansali, Vineer, and Jeremie Holdom. "Diversifying Diversification: Downside Risk Management with Portfolios of Insurance Securities." *SSRN Electronic Journal*, 2020.

Long Volatility and Tail Risk

Long volatility and tail risk strategies seek to profit from sharp crashes and significant market turbulence like Black Friday in 1987, the dot-com bust, the 2008 GFC, or March 2020.⁶¹

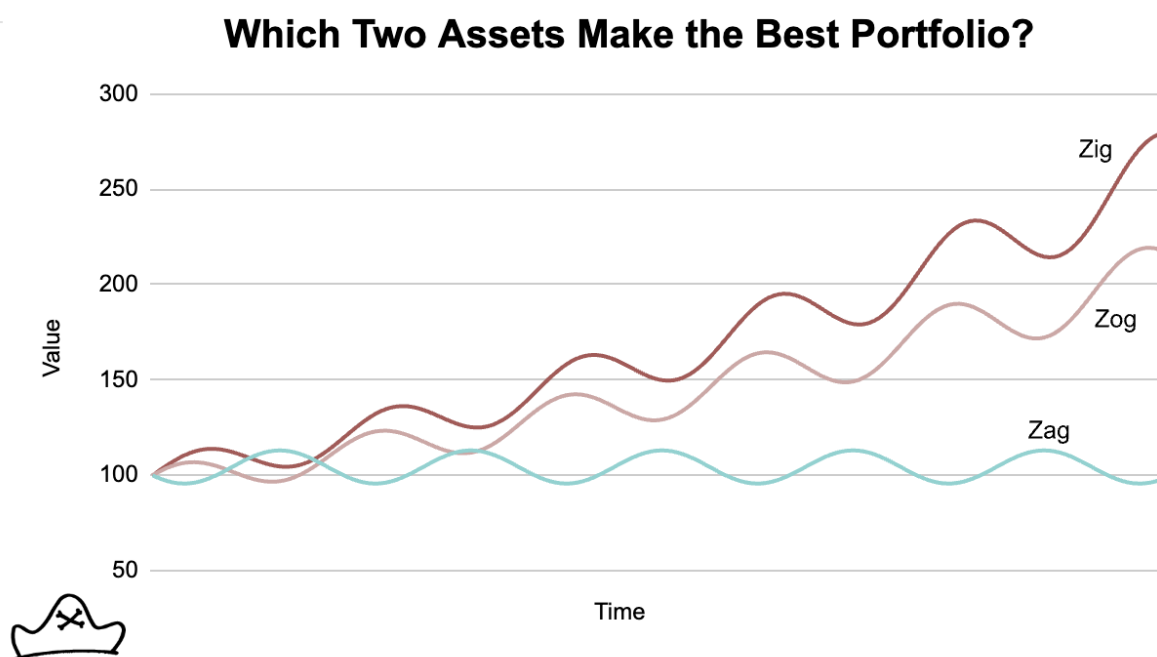
We view long volatility and tail risk as an improvement on the cash quadrant of a traditional Permanent Portfolio. The primary purpose of cash or cash equivalents in the Permanent Portfolio was to be a source of liquidity in a sharp sell-off. By having a cash position, an investor is able to purchase stocks, bonds, gold, and other assets at a time when no one else has the liquidity to do so.

In sharp sell-offs, almost all asset classes can sell off together in the rush for liquidity as investors need to meet margin calls or panic sets in. Cash can be used to buy these distressed assets at historically low prices.

Long volatility and tail risk strategies try to improve on this ability to purchase other assets during sharp market sell-offs by generating excess returns at those times. In sharp sell-offs such as October 2008 or March 2020, long volatility strategies seek to produce their largest returns, which can then be used to buy other assets at historically low prices.

Similar to other defensive assets, even though their long return may be less than traditional offensive assets, it's their performance during periods where offensive assets struggle that can make them additive to a portfolio. We saw how adding gold to stocks and bonds could improve the overall portfolio, even with its lower returns. But let's take it a step further. Could adding an asset with a long-term return of zero improve a portfolio?

Consider this toy example for illustrative purposes. Let's say you have the ability to buy two assets out of a possible three choices: Zig, Zog and Zag.



Disclaimer: The return streams above were calculated using sine waves adjusted for long-run return expectations and shifted in the wave cycle. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

⁶¹ I equate long volatility and tail risk strategies here, as they are similar in most investors' minds and tail risk is a more widely understood term. To be precise, long volatility is typically differentiated from tail risk because it forgoes continuous hedging for more dynamic hedging in an effort to lower costs and improve returns. Tail risk is typically more like an "always-on" insurance policy, while long volatility tends to be an on-and-off insurance policy seeking to either time markets or pick specific assets to outperform a more passive tail risk approach. Long volatility is intended to profit from melt-ups (the late-1990s, late-1950s, and 1970s) or melt-downs (1930s, 2008) in markets. I will use them both here in the very broad sense of "strategies that seek to profit from stock market volatility." I provide some additional nuance in Part III though, again, you could write many books about the intricacies of this type of strategy.

The first two assets, Zig and Zog, have the highest returns, so they seem like the obvious choices, right? Zag has a long-run return of about zero, so it seems like the least attractive option, right?

However, there's one wrinkle here: Zig and Zog are highly correlated with one another. Both do well when markets are up and poorly when markets are down.

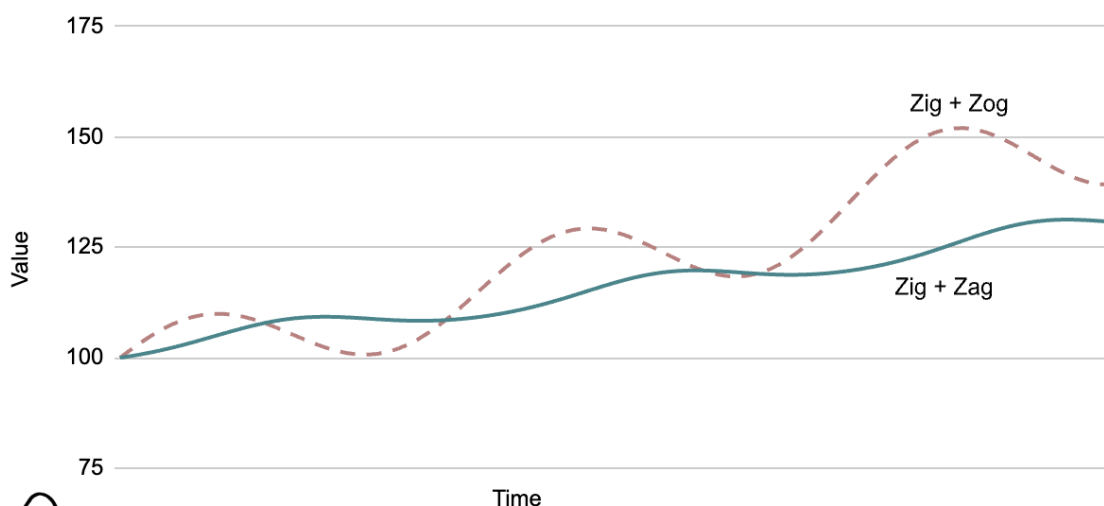
Even though Zag has an expected return of zero, it goes up in periods where Zig and Zog go down. Its most substantial gains come when the other two assets are performing poorly.

If you can only buy one asset, Zig is the obvious answer. It has the highest total return.

But, if you can buy two, what is the best overall portfolio?

If you are rebalancing regularly between the assets, the Zig+Zag portfolio actually gives you pretty similar returns with a lot less volatility.⁶²

Zig + Zag Gives You Similar Returns For Less Risk



Disclaimer: Asset combinations were calculated using a 50/50 weighted average of the individual asset returns. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

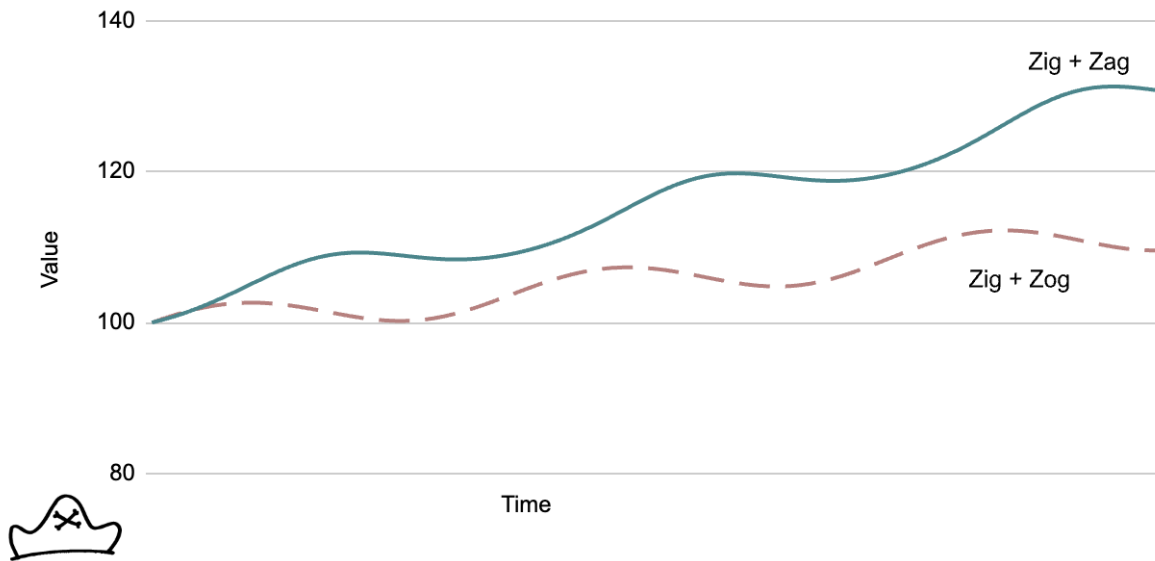
Because Zag is negatively correlated to Zig, a portfolio that rebalances between them creates a much smoother return stream — something more like a Valley Path. It has similar returns with much lower volatility and drawdowns.

If you match the volatility level of Zig+Zag to Zig+Zog, you get a much stronger return stream.⁶³

⁶² Shown over the first 100 periods in this simulation.

⁶³ This is basically analogous to the example of leveraging the Permanent Portfolio to match the volatility of stocks. You're taking a return stream with a better risk-adjusted return and leveraging it to match the risk of another higher return asset.

Zig + Zag Gives You More Return For The Same Risk



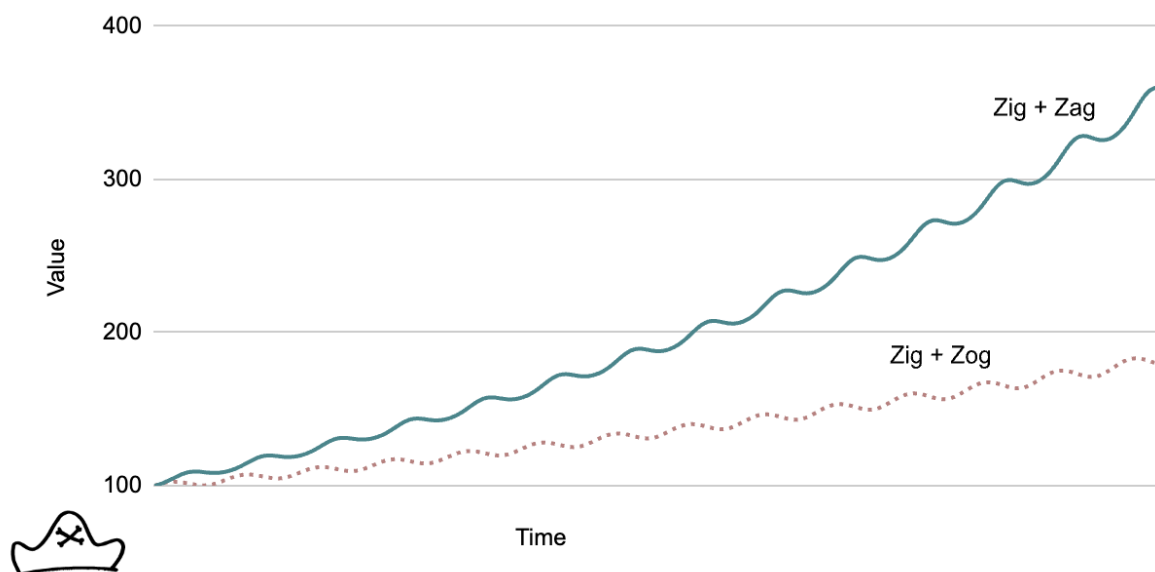
Disclaimer: Asset combinations were calculated using a 50/50 weighted average of the individual asset returns adjusted to match volatility. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Even though Zag has a long-term expected return of zero, the power of negative correlation and rebalancing makes it additive.

Combining Zig+Zag gives you the option to either have a casual stroll along the Valley Path (similar returns with lower volatility) or zip along the Valley Path and make faster progress than taking the Mountain Trail (better returns with similar volatility).

Due to the power of compounding, this modestly improved return with similar volatility adds up over time.

The Longer You Compound, the Greater the Outperformance of Zig + Zag



Disclaimer: Asset combinations were calculated using a 50/50 weighted average of the individual asset returns adjusted to match volatility. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Long volatility and tail risk strategies attempt to be Zag-like. Though their stand-alone returns may look disappointing compared to offensive assets, if they are able to provide returns at the right time, then they can make a substantial impact on the overall portfolio performance.

A strategy that can provide not just a flat return but a significant positive return in these periods is very additive to the long-term compounding returns because it allows investors the liquidity to rebalance and purchase the out-of-favor asset classes at precisely the time they are most attractively priced.

Long volatility and tail risk strategies typically rely on put options or similar types of instruments that are directly linked to the underlying indices such as the S&P 500.

A put option is conceptually similar to an insurance policy. When you buy car insurance, typically you pay the premium up front (the price of the option to have your car replaced if it gets wrecked), and then you are on the hook for the deductible (the difference between the option's strike price and current price). Beyond that, the insurance kicks in and covers any expenses. If you have a \$20,000 car with an annual insurance premium of \$1,000 premium and a \$1,000 deductible, then your maximum loss is capped at \$2,000 — the cost of the premium plus the deductible.⁶⁴

Like an insurance policy that may last 6 or 12 months, a put option also typically has an expiration date. So purchasing a S&P 500 Index put option with an expiry one year from today with a strike price of 3,000 would give you protection beyond that price level for one year.⁶⁵

Unlike other types of defensive strategies, options have a few benefits. One benefit is being directly connected to the asset they are hedging. The structure and link between the option pricing formula and the underlying stock/stock indices is direct, rather than merely relying on historical correlations.

As a result, long volatility and tail risk strategies can be more confident that their insurance policy will pay out if the underlying index goes below the strike price. The flip side is that, like an insurance policy, if nothing “bad” happens then the option is likely to decline in value and expire worthless — just like if you don't wreck your car in a given year, you “lose” the price of the premium for that time period.

If the price declines but not as much or as fast as the option price indicates, then it's possible that it will lose money at the same time as the thing it is hedging. In our car insurance analogy, this would be like doing \$999 of damage to your car. It's not enough to meet your deductible, so you owe the \$1,000 of insurance premium and have to foot the bill for the \$999 of repair work.

Similar to buying insurance, tail risk by itself is a long-term losing strategy. Over the long run, insurance companies are profitable, so the total premiums paid in is more than the amount paid out. However, this doesn't mean buying insurance is dumb.⁶⁶

As expected, the performance of a tail risk strategy on the S&P doesn't look very attractive. Over a nearly 20-year period, it has lost money.

64 There are, of course, a gajillion clauses insurance companies use in practice to try and avoid paying out claims, so this is simplified, but you get the point.

65 The difference between the current index level (say 4,000 for the S&P) and strike price (3,000 in this example) is the equivalent of a deductible in our analogy. In this example, you could lose up to 1,000 points on the S&P but would be “insured” beyond that.

66 The London Mathematical Laboratory and their work on ergodicity have shown how insurance can be beneficial even with a negative expected value. Skjold, Benjamin. “Insurance as an Ergodicity Problem.” *Ergodicity Economics*, 8 Aug. 2023.

Figure 4: Cumulative simulated performance of systematic hedge (1-year 30-delta S&P 500 puts, delta hedged)



Notes: Rolled quarterly, targeting new 1-year 30-delta puts, skew delta neutral initially and rehedge daily. Targeting a constant gross dollar notional size. Performance shown as a % of target notional. Simulated transactions include transaction costs of 0.1x vega. It is worth noting that QVR's option transaction cost attribution, as independently estimated by SpiderRock, is consistently positive, indicating buying below theoretical mid-market and selling above theoretical mid-market on average.

Source: QVR Advisors. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Why would anyone invest in this defensive strategy that loses money over time when they could invest in something that makes money over time?

The popular understanding I most often hear is that it's because these people are "scared" or "not thinking long-term."

However, what happens when we add this exact (money-losing) strategy to a 60% stock/40% bond portfolio with quarterly rebalancing between all three components?

The blue line is the 60% stock/40% bond portfolio and the orange line includes adding in the put buying strategy.

Figure 5: Simulated cumulative impact of adding 1-year put hedge to 60/40



Notes: Hedge portfolio simulation as described in above paragraph, with quarterly rebalancing staggered in tranches at 2-week intervals to average out rebalance timing luck.

Source: QVR Advisors. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts. Past performance is not necessarily indicative of future results.

The portfolio which includes the money-losing defensive strategy has higher long-term returns.

How can adding a strategy which loses money over the long-term increase the portfolio returns?

Because, even though the defensive strategy loses money on average, it makes money at the times when the rest of the portfolio struggles. The outsized performance of the defensive during large market drawdowns allows a regularly rebalanced portfolio to buy offensive assets in the periods immediately following those large market drawdowns. This can be enough to compensate for the fact that it is a losing strategy as a stand-alone.⁶⁷

That's why effective diversification including both offensive and defensive strategies can make such a big impact on long-term wealth.

Compared to the other assets and strategies covered here, long volatility and tail risk are the most difficult to evaluate historically. The publicly listed options market in the United States didn't begin until April 26, 1973, when the Chicago Board Options Exchange (CBOE) opened its doors. Options and derivatives markets have evolved dramatically and bear little resemblance today to their pre-2000 selves. However, their return profile pairs well with trend following strategies because they seek to cover a scenario where trend can struggle (a sharp sell-off) while trend following strategies can do well in scenarios where long volatility and tail risk strategies may struggle, like a protracted and slow decline. We believe their intrinsic characteristics and what evidence we do have supports their inclusion as a defensive asset.

Volatility strategies may or may not do well in an extended inflationary period — given that they are relatively new strategies and there has not been a prolonged (5+ year) period of inflation in any developed country since their advent, it's hard to know how they will perform. This is another reason why pairing them with trend following seems sensible to us.

⁶⁷ Note that the point of this section is not to do a detailed analysis and comparison of many different long volatility and tail risk strategies, but rather to illustrate the way that a hedge which has negative or zero long-run expected returns but reduces drawdowns can actually be additive to long-run compound returns within a broader portfolio framework. The exact details of how the strategy is implemented, trading costs, and other relevant factors should be carefully considered but are beyond the scope of this paper.

We began working on the Cockroach Portfolio in 2018, originally under the name Ataraxia, a Greek word meaning “calmness untroubled by mental or emotional disquiet.”⁶⁸

Our goal has always been to construct a portfolio that best accomplished our dual mandate of portfolio construction:

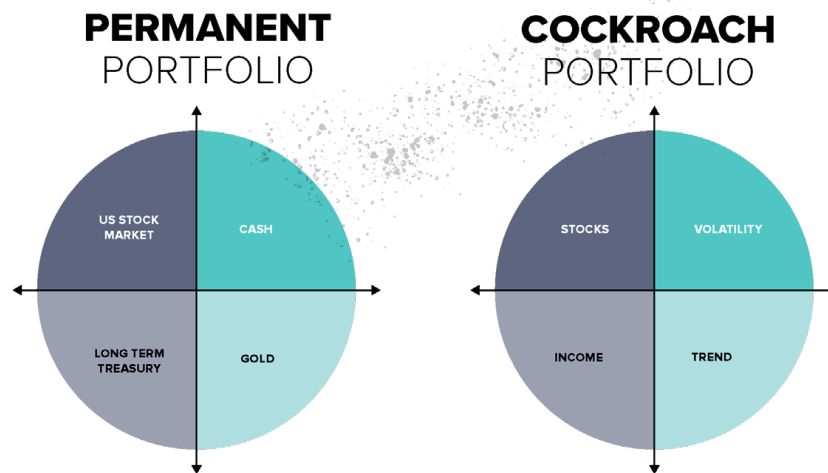
- 1. Get Rich — compound capital effectively.**
- 2. Don't Die Tryin' — invest our savings without constantly worrying about the next crash.**

We named our approach the Cockroach Portfolio. Cockroaches aren't cuddly, but they do two things well that we also want out of our portfolios: they're really hard to kill, and they compound fast.

Cockroaches have been around for 320 million years. By evolutionary standards, they are a remarkably successful species. But no one would call them “smart.” They don't have iPhones or nuclear physics or know how to forecast the weather. They don't know much about predicting the future. The Cockroach Portfolio is based on that idea. Suppose you didn't think you could predict the future; how would you build a portfolio?

Though stock- and bond-focused portfolios have performed well over the past four decades, investors using that approach are betting on the greatest bull market in history repeating itself.

The Cockroach Portfolio was modeled after the Permanent Portfolio. It includes equal exposure to assets designed to perform in growth, decline, inflation and deflation.



However, we made two changes that we think are substantial improvements.

- 1. Utilize Modern Defensive Strategies — Long volatility and trend following approaches were less popular and accessible in Harry Browne's day. As we saw above, they have the potential to offer a substantial improvement on the traditional Permanent Portfolio approach.**
- 2. Embrace Fractal Diversification — Similar to the Permanent Portfolio approach, we believe diversification across the four major macro quadrants is a better starting point than most investors use, but there is no reason not to try to further enhance returns through diversification within each quadrant: what we call *fractal diversification*.**

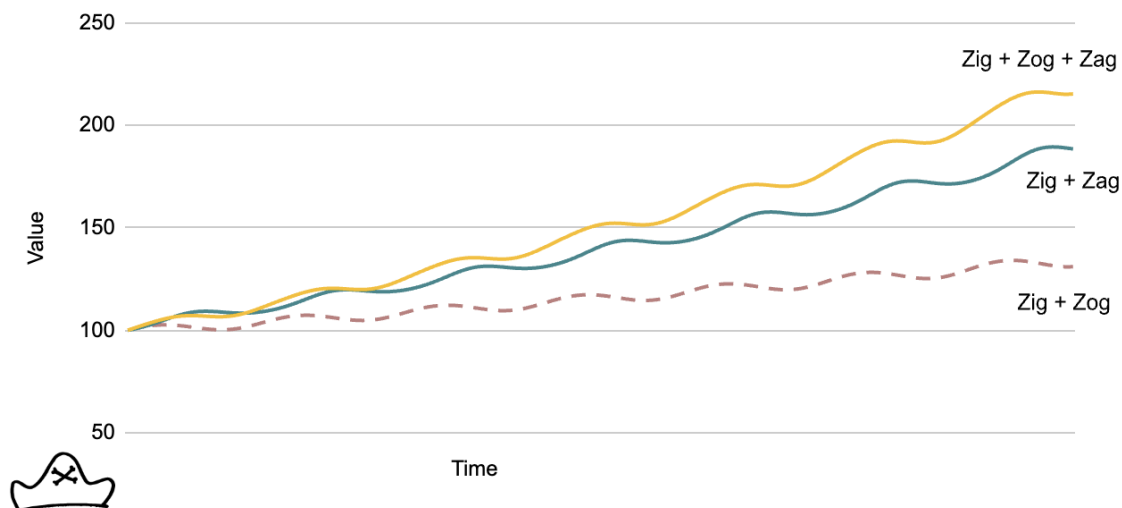
⁶⁸ We gave up on the name when no one could spell it and few could pronounce it, though we never gave up on the sentiment. Probably for the better as the world doesn't need another financial term from an obscure Greek or Latin word.

Fractal Diversification and The Cockroach Portfolio

In our Zig+Zag model, we artificially limited ourselves to two assets. What if we could also include Zog for a three-asset portfolio? Would that be additive?

It would.

Zig + Zag + Zog Gives You Even More Return For The Same Risk

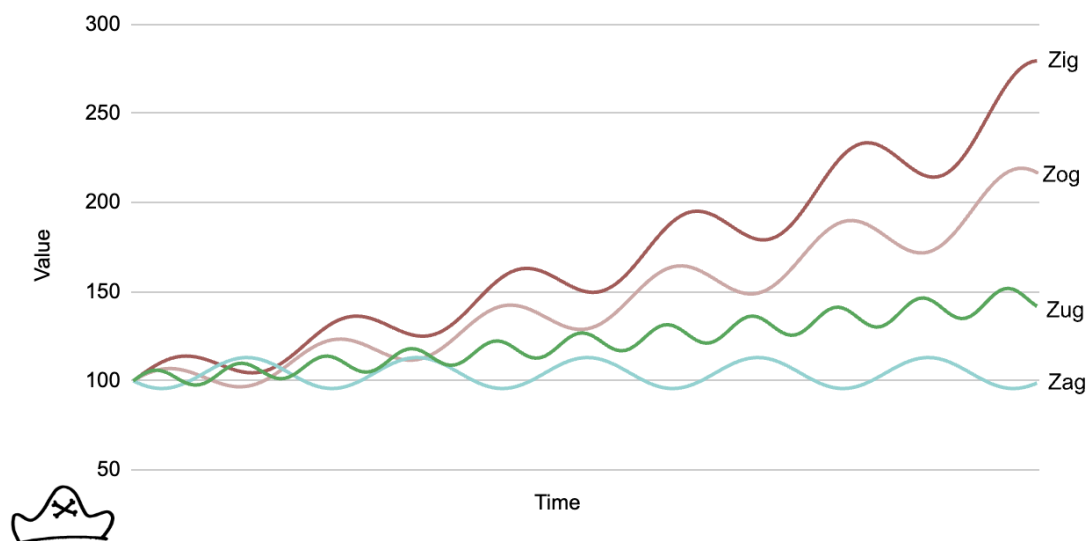


Disclaimer: The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Incorporating Zog into the portfolio would further improve the risk-adjusted returns. Even though it is more correlated to Zig than Zag is, it still is not *perfectly* correlated, allowing us to use its differentiated return stream for diversification.

We can keep going with this. What if we add another asset to the mix, Zug, which has a lower long-term return than Zig and Zog but is uncorrelated to any of the other assets?

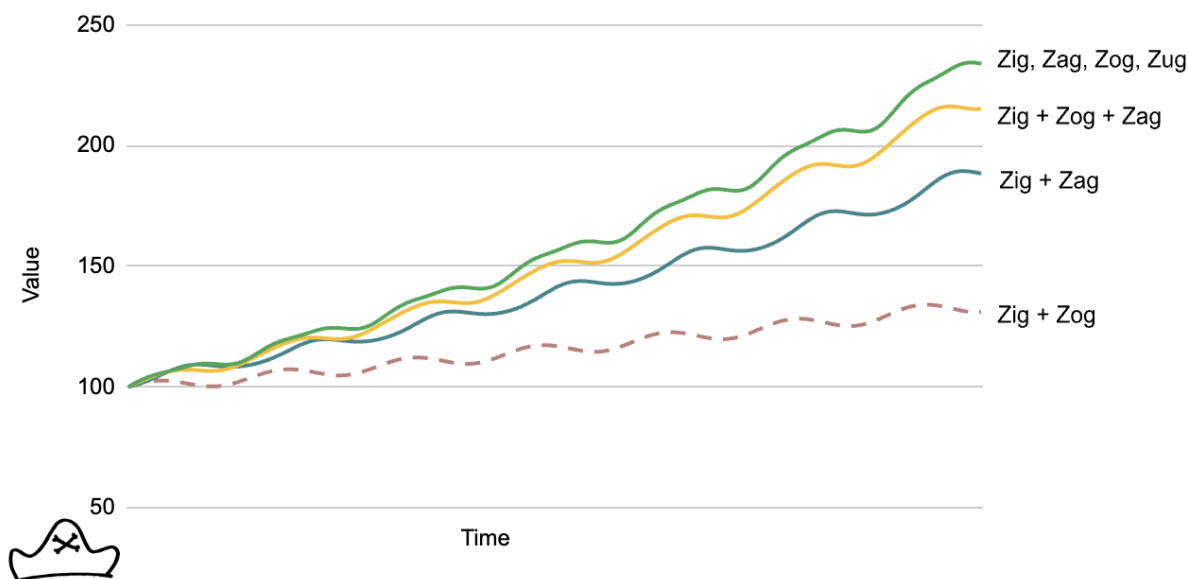
Which Assets Make the Best Portfolio?



Disclaimer: The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

Well, that helps too.

4 Zs is Greater than 3



Disclaimer: The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.

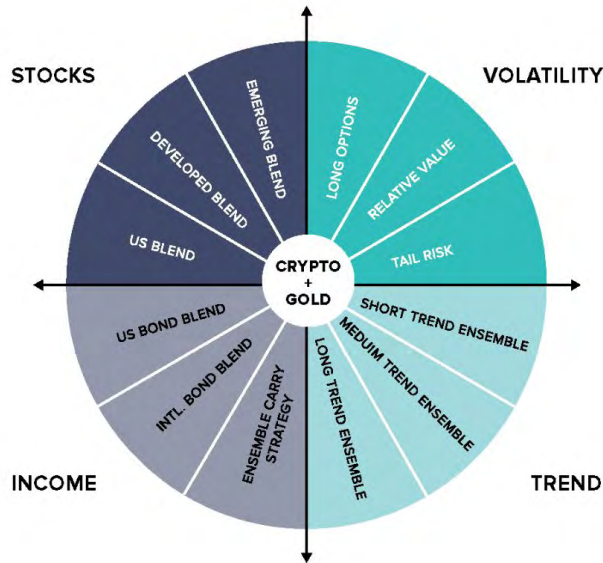
The combination of Zig+Zag makes the biggest impact on the portfolio's long-term compounding, but the addition of other return streams can still be additive.

It's important to remember that this is a toy model. In the real world, you can't know for certain the future returns or correlations of a given asset or strategy. Nor are there an unlimited number of additive return streams to include. But, if we accept that diversification is the only free lunch in investing, we're going back for seconds, thirds and stuffing some rolls in our pockets on the way out.

The Cockroach Portfolio further diversifies by including a broad mix of assets and sub-strategies within each of the four major quadrants. In doing so, it seeks to create the most robust long-term portfolio possible without needing to be "smart" and predict global macro-regimes.

- 1. Stocks — Rather than relying on U.S. stocks, it utilizes global stocks including U.S., developed, and emerging market stock indices.**
- 2. Income — Rather than relying on just U.S. treasuries, it utilizes global bond exposure and alternative income producing strategies such as a carry strategy.**
- 3. Trend Following (Trend) — Rather than relying on a single lookback period like the 20/120 moving average crossover point example we looked at, it diversifies across lookback periods (short, medium, and long) and monetization techniques as well as accessing as many markets as possible.**
- 4. Long Volatility and Tail Risk (Volatility) — Rather than using a single-tail risk strategy, it uses a blend of three different sub-strategies: long options, relative value, and tail risk.**

It also includes a fiat hedge allocation consisting mostly of gold and a little crypto, intended to perform well in the event of a sustained period of high inflation or fiat devaluation.



Disclaimer: The Firm uses CME Bitcoin and Ethereum futures, not cash crypto.

By diversifying within each quadrant, the Cockroach Portfolio seeks to further improve its long-term compounding and create a more Valley Path-like return stream.

Stocks

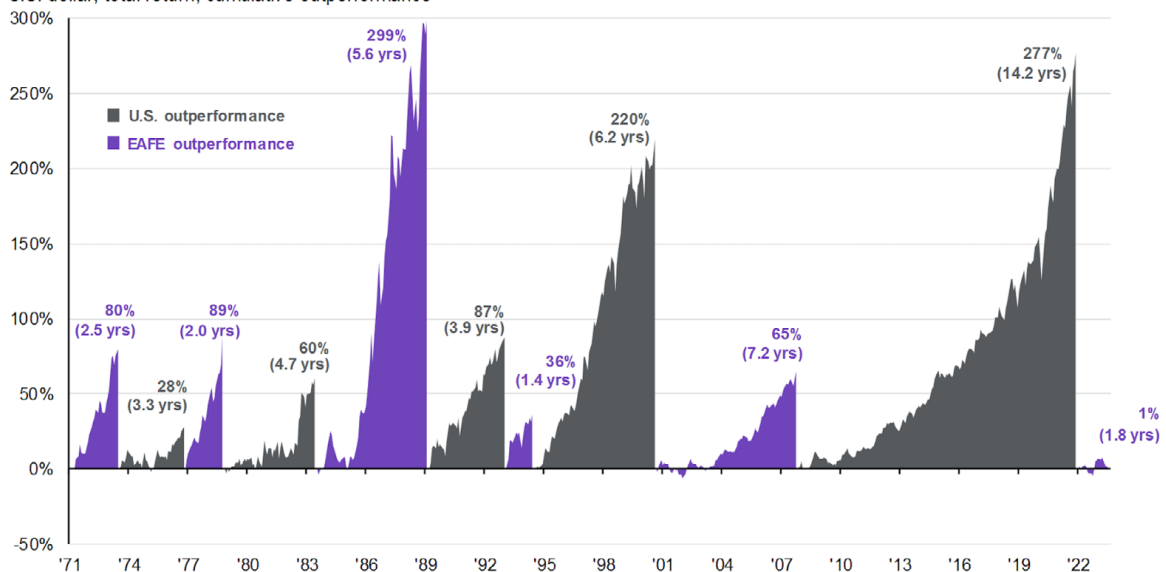
In the Cockroach Portfolio, the Stocks sub-strategy includes U.S., developed, and emerging markets. Though stocks generally do well in growth, we do not know where that growth will happen.

The 2010s were an incredible period for U.S. stocks compared to international stocks. But the 2000s were the reverse: a much better period for international stocks and a struggling period for U.S. stocks.

Looking at the longer history of international vs. U.S. stock performance, it's been the case that they tend to go through alternating periods of outperformance.⁷⁵

MSCI EAFE and MSCI USA relative performance

U.S. dollar, total return, cumulative outperformance



Source: FactSet, MSCI, J.P. Morgan Asset Management.
Regime change determined when cumulative outperformance peaks and is not reached again in the subsequent 12-month period.
Guide to the Markets - U.S. Data are as of August 31, 2023.

The post-2008 U.S. performance has been incredibly strong relative to international performance, causing many investors, particularly North American investors, to be heavily invested in U.S. stocks. The United States represents less than 60% of the world market capitalization.⁶⁹ Yet, many U.S. investors we've talked with still allocate all or a substantial portion of their portfolio to U.S. stocks exclusively.

The U.S. stock market has had particularly strong performance in the 2009-2023 period, which is fresh in investors' memories. For that to repeat, it is not enough merely for the U.S. economy to be strong and U.S. companies to do well. They must deliver even better performance than what is currently priced in. While that may be the case, it is not a foregone conclusion.

Looking at real returns from 1950 to 2008, Japanese, German, U.K., French and U.S. investors all went through 10-year periods of significant underperformance relative to global indices.

Taking an average of the worst 10-year period in those countries and comparing to global returns over the same periods, there was a 73% average difference between the returns investors in their home country got in that period versus what they would have gotten had they invested globally.

How Did the Global Portfolio Do When You Needed it Over the Long-Term?		
Rolling Real Returns from Each Investor's Perspective Since 1950		
Home Country	10-Year Periods	
	Worst Home Country Returns	Global Returns in the Same Period
Japan	-53.8%	152.0%
Germany	-44.6%	-5.1%
U.K.	-61.3%	-6.9%
France	-57.9%	-21.2%
U.S.	-39.9%	-11.3%
Average	-51.5%	21.5%
Global minus Home Average		73.0%

Source: AQR, *Seven Thoughts on Running Big Money*.

So, while we noted that global stocks have become more correlated over time, we believe there is still some diversification benefit to using a global stock approach. Even though Zog is pretty correlated to Zig, it still offers some marginal benefit, and we view global stock diversification in the same light.

Income

In the Income sub-strategy, the Cockroach Portfolio includes U.S. government bonds like the Permanent Portfolio but diversifies into international government bonds (across the bond curve) and into a multi-asset carry strategy.

⁶⁹ "Global Investment Returns Yearbook 2023." Credit Suisse.

Historically, government bonds do well in more deflationary regimes, but we don't necessarily know which bonds. Just as with stocks, we believe including a diversified basket of bonds helps improve the probability of capturing returns wherever they show up, so we utilize a global bond approach that includes exposure to government bonds in North America, Europe, and Asia.

In addition to diversifying across different geographies, we diversify across different bond durations. Duration itself is a straightforward concept. A 2 year bond has a duration of two years. A 10 year bond has a duration of ten years.

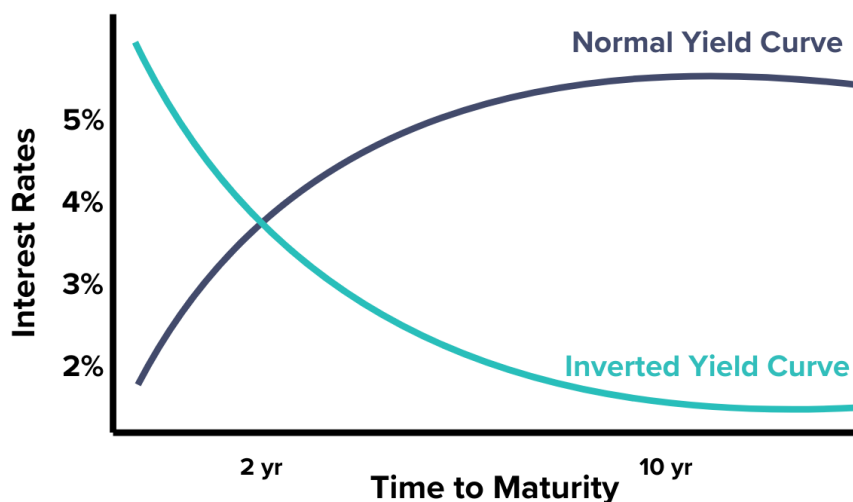
Duration in bonds gets complex when thinking about the sensitivity of a bond to changes in interest rates. If a new bond comes out offering higher interest rates, the one you're holding becomes less valuable since it's paying a lower amount. If you have a 2-year bond, you're not too worried because you can switch to the better bond sooner. But if you have the 10-year bond, you're stuck with a lower rate for a longer time.

As a result, short-term bonds like a 2-year bond tend to be less sensitive to interest rate changes because the investor gets the principal back sooner and can reinvest at the new rates. Long-term bonds are more sensitive because the investor must wait longer to reinvest at potentially higher rates.

The flipside is equally true. If you have a 10 year bond and interest rates go down, it becomes more valuable because it's locked in at the higher rate for a longer time.

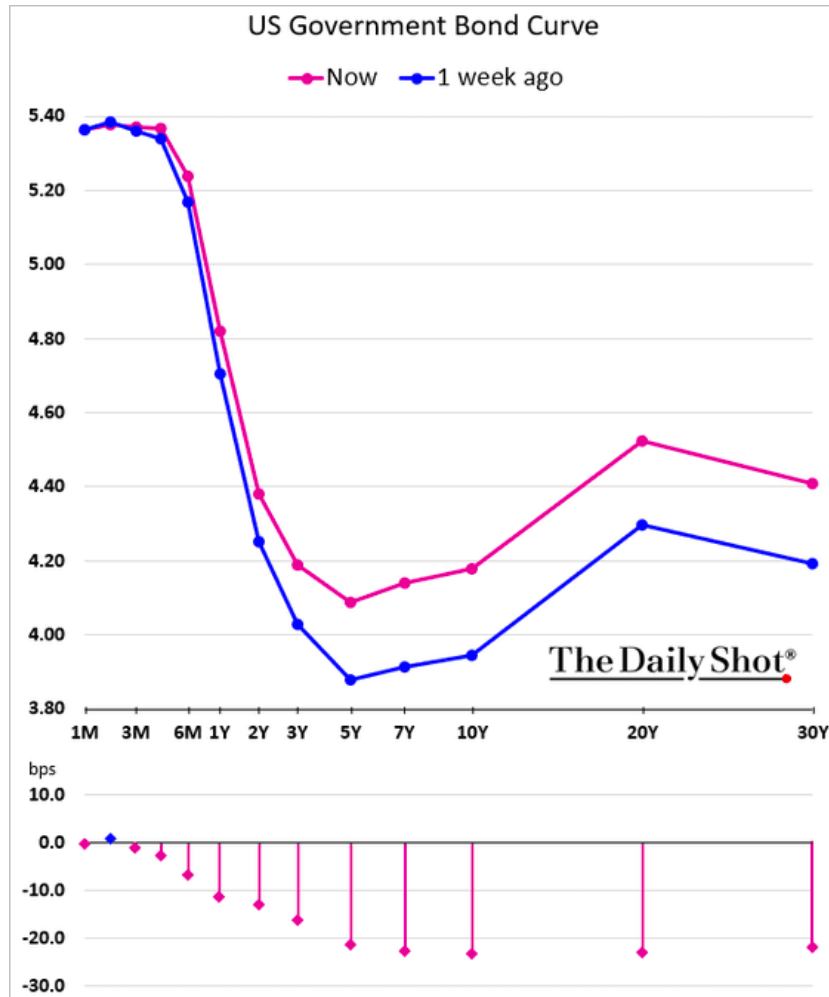
The bond yield curve is a graph that shows how much money you'll make from bonds that mature at different times. In a "normal" yield curve, the longer you have to wait for the bond to mature, the more interest you should get. That's because you're taking more risk by having your money tied up for longer, and you want to be rewarded for that.

Yield Curve



This example is for illustrative purposes only, and does not represent trading in actual accounts.

However, the yield curve can be almost any shape, as different maturities have different yields depending on a large variety of macroeconomic factors. For example, the yield curve on February 1, 2024, was inverted up to the 5-year maturity then had a more "normal" shape from the 5-year onwards.



U.S. Government Bond Yield Curve: February 1, 2024 vs. one week prior. Source: The Daily Shot.

Diversifying across the yield curve means owning some short-term (e.g. 2-year) bonds, some medium-term (e.g. 10-year) bonds, and some long-term (e.g. 30-year) bonds. The Cockroach Portfolio owns bonds across the curve to achieve a higher level of diversification. It adjusts this mix to have an average duration of around 15 years.

If you just had one bond with an average duration of 15 years, you're betting on one outcome, exactly what that point in the curve does. By spreading out bond exposure across different durations and rebalancing between them, the Cockroach Portfolio seeks to be prepared for a range of scenarios. If interest rates go up, your short-term bonds can be reinvested at those higher rates sooner. If rates go down, your long-term bonds suddenly look like a great deal because they lock in the higher rates for a long time.

As with the rest of the portfolio, the goal is to be prepared for an unknown future with many different possible paths and use the power of fractal diversification to try and harvest additional benefits along the way.

In addition to diversifying across U.S. and international bonds as well as different bond durations, the Cockroach Portfolio includes a diversified carry trading strategy in the Income sub-strategy.

A carry trade is a trading strategy that involves going short or long on various bond, stock or commodity markets based on their potential to provide a yield.

To provide a simple example, imagine you own a fruit stand where you sell apples and oranges. Every day, you buy fresh fruits from a wholesaler across town, and you sell them to your customers in your store near their homes where it's more convenient for them to shop. You hope to sell your fruits at a higher price than you bought them due to the convenience of shopping with you, making a profit.

Now, suppose you figure out that you can also profit from the time differences when fruits are ready for selling. For example, ripe oranges are more valuable in the winter because they're not in season, and people are willing to pay more for them. Similarly, apples are more valuable in the spring when they're not in season.

So, instead of just buying fruits and selling them the same day, you start to plan ahead. You buy oranges when they're cheap in the summer, store them properly, and sell them in the winter when their price is high. You do the same with apples, buying them in the fall and selling them in the spring. The basic intuition is that there is a "time value" to these goods — apples are worth more or less to someone depending on the time of the year. A carry strategy is seeking to profit from that time value.

This strategy of buying and storing fruits to sell them at a higher price in the future is similar to a Carry strategy in finance. Instead of fruits, you're dealing with global stock, bond, commodity and currency markets (which don't have the whole "going rotten" problem our apples and oranges do). And instead of seasons, you consider various factors like interest rates and economic conditions.

Similar to trend following, carry strategies have been a strong predictor of expected returns globally across asset classes that's not explained by other factors. A diversified carry portfolio shows significant diversification benefits of applying carry trades across asset classes.⁷⁰ This makes a diversified carry strategy a compelling addition as a form of fractal diversification that we believe can further enhance the overall portfolio.

Since carry strategies in almost all asset classes are exposed to global liquidity shocks and negatively exposed to volatility — meaning a sharp sell-off like March 2020 would likely be harmful — we consider it an offensive asset.⁷¹

It is included in the income bucket because similar to a bond that pays a yield, a carry strategy seeks to generate a yield but does so in a different way.

Trend

We saw that trend strategies have had a robust performance in inflationary regimes compared to just using a single asset like gold. The Cockroach Portfolio uses a multi-asset trend strategy that includes an emphasis on commodities to try and ensure that it performs well in inflationary regimes where it is needed most.⁷²

However, there are many different types of implementations of trend strategies, and the exact nature of the implementation can have a material impact on the ultimate performance of the strategy.

Within Trend, we believe there are three important dimensions to diversify across:

- 1. Asset Class Exposure — what asset classes trends are being identified and traded on**
- 2. Trend Models — what techniques or signals are used to determine what qualifies as a trend**
- 3. Timing and Lookback Periods — the time period over which a trend is being identified**

70 Kojien, Ralph S. J. and Moskowitz, Tobias J. and Pedersen, Lasse Heje and Vrugt, Evert B., Carry (November 1, 2016). Fama-Miller Working Paper.

71 Kojien et al. (2016) did show that for a sufficiently diversified carry strategy, it might not be so exposed to sharp sell offs which would be an additional benefit but we take the more conservative approach.

72 Going forward, I will simply use the term "Trend" to refer to the Cockroach Portfolio's trend following sub-strategy.

For asset class exposure, the Cockroach Portfolio Trend sub-strategy diversifies across dozens of commodities markets around the world covering stocks, bonds, and currencies.

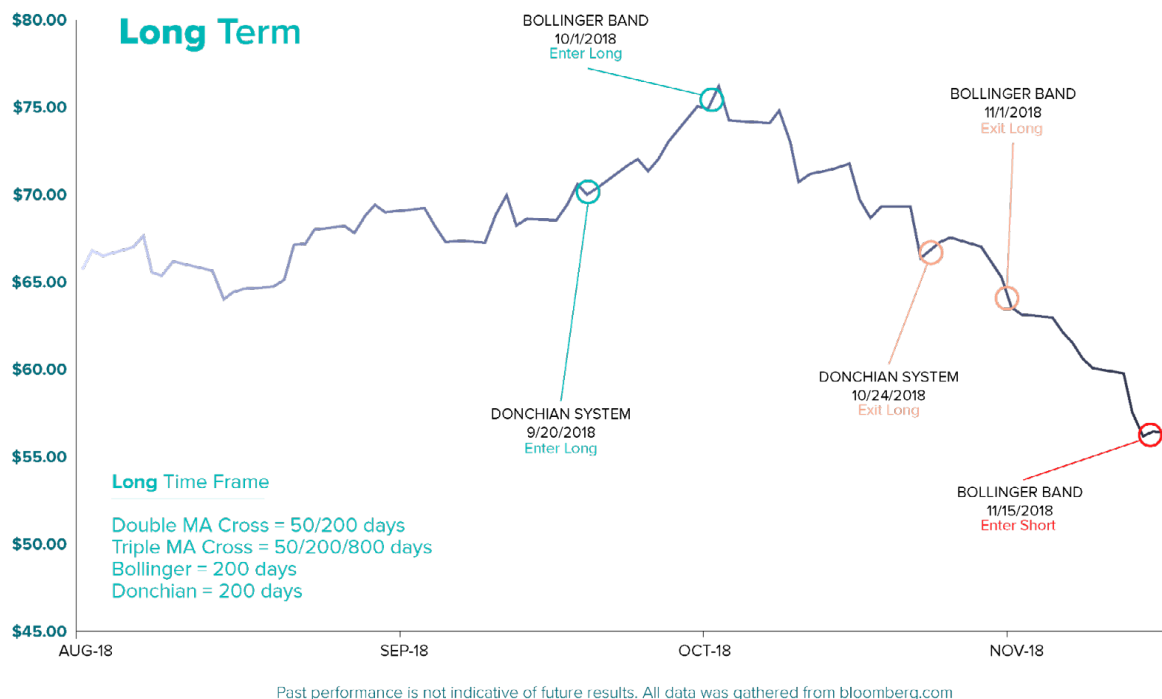


A broadly diversified trend following approach can cover financial markets like stocks, bonds, and currency markets in addition to commodity markets like energies, softs, grains and precious metals.

Some implementations of trend approaches utilize a more limited subset of markets. We take the view that actually trading as many markets as possible offers the greatest diversification and reduces the risk of “missing” a trend in another market.

Other trend strategy implementations do not include very significant allocations to commodities. One reason may be that commodity markets are not as large as bond, stock or currency markets and so, at a certain size, trend strategies are forced to use larger markets and reduce their commodity exposure. Since the primary role of Trend in the Cockroach Portfolio is to perform well in an extended period of inflation, it seeks to keep at least 30% (and ideally more like 40% to 50%) of its exposure in commodities to maximize its performance in an inflationary period where other stocks and bonds can struggle.

In terms of trend models, we looked at a simple example of a trend model using the 20/120 moving average crossover to determine what qualifies as a trend. However, there are techniques other than a double moving average crossover as well. Trend strategies gained their first wave of popularity in the 1970s and practitioners have developed many other techniques with empirical support, such as the triple moving average crossover, Donchian System, and Bollinger Bands.



Source: RCM Alternatives. Past Performance is not indicative of future results. All data from Bloomberg.com.

In essence, these different trend models are all seeking to accomplish the same basic goal of identifying a trending market (up or down) and following the trend, but they define what constitutes a trend in somewhat different ways.

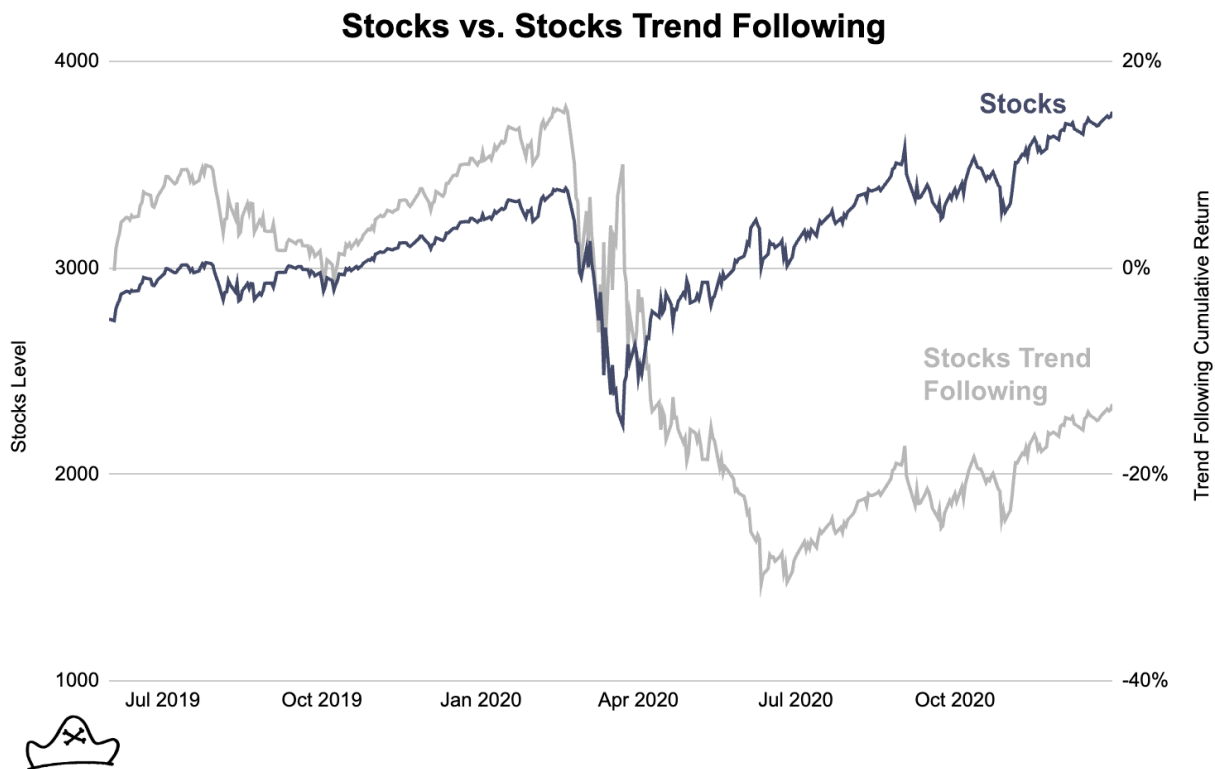
By diversifying across varying models, we believe we are improving the ability to capture trends in whatever way they show up. Some of the models may enter earlier or stay later. Some may take profits to reduce risk while others let the trend ride. In total, the Cockroach Portfolio’s diversification strives to deliver performance akin to a commodity-tilted trend index, with more consistent trend performance not overly reliant on any one type of model or time frame.

Trend strategies can also use different lookback periods. Instead of a 20/120-day moving average crossover, a shorter term trend model might use a 20/50-day moving average crossover. A longer-term model might use a 50/200-day moving average crossover.

The challenge with trend strategies is that different trend models and lookback periods can substantially change the returns of a strategy, a form of timing luck.⁷³

A painful example for many longer-term trend following strategies was the March 2020 sell-off, where the market moved sharply down and then sharply back up. Many strategies using longer lookbacks sold near the bottom and didn’t get back in the market until it had recovered significantly — locking in all the losses while missing out on most of the gains from the recovery.

73 Corey Hoffstein of Newfound Research has written extensively on the concept of timing luck, and we would direct you to his research to learn more.



Source: YCharts. Stocks represented by S&P 500 (\$SPX) from Jun. 2019 - Dec. 2020. 20-day simple moving average and 120-day simple moving average are used as signals for going long/short the underlying product. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts. PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.

Shorter-term strategies, by contrast, got out much sooner and got back in much sooner, which led to superior performance.

The flipside is equally possible. After bonds declined throughout 2022, many trend followers were short bonds going into 2023. When bonds aggressively rallied in anticipation of Fed rate cuts in the spring, many short-term trend followers took sizable losses. When the market reversed and bonds began their decline again, shorter-term trend followers missed out where many longer-term trend followers stayed in the trade the whole time and so were able to recoup some or all their losses from the bond rally.

Hoffstein (2020) found that “...constructed indices exhibit high levels of rebalance timing luck, often exceeding [1%] annualized...”⁷⁴ We believe this supports the idea that fractal diversification within the Trend sub-strategy could improve performance compared to a single trend model or lookback timing.

By diversifying across different trend models and lookback periods, the Trend sub-strategy in the Cockroach Portfolio seeks to more reliably capture trends wherever they show up and minimize the impact of timing luck.

While it’s tempting to try and identify the “best” signal or “best” lookback period, this sort of over-fitting to history is exactly what the Cockroach Portfolio approach is trying to avoid. What was “best” over the past year may not be best in an unknown future.

As with the other components of the Cockroach Portfolio, the goal is not to predict the future but to identify strategies that can all do well across a broad regime — inflationary periods in the case of Trend — and add another layer of diversification within that strategy to try and improve the long-term compounding.

⁷⁴ Ibid.

Long Volatility and Tail Risk

While it's conceptually pretty straightforward to think about long volatility and tail risk strategies as a type of insurance against sharp market sell-offs, the actual implementation of a long volatility or tail risk strategy is nuanced.

Unlike car insurance which is usually pretty standardized, there are a huge variety of ways to trade a long volatility or tail risk strategy. Consider just strategies using options on the S&P 500 Index. Options can be bought with different tenors (times to expiry, akin to how long the "policy" lasts) and strikes (prices at which they pay off, akin to deductibles).

Across these options are many choices. If you want a year of protection, are you better off buying a one-month to expiry option every month for 12 months? Or do you buy a one-year option? Do you want the equivalent of a "high-deductible" or "low-deductible" policy?

Imagine you also have the ability to buy more or less insurance on your car at different times or just insure it in the same way all the time.

When the roads are crowded and it's pouring rain so visibility is low in a particular area, you might be more inclined to stock up on insurance. However, the insurance may also be pricier at those times.

When the roads are empty and visibility is great, you might think it's not worth it. But, when the roads are empty and visibility is great, it might be a great time to stock up on insurance because it's relatively "cheap," as no one else is expecting to get in a wreck.

Though car insurance doesn't function this way, option markets do, with the price of options constantly changing based on investors' view of how risky a market is and how much volatility is likely to happen. It's not enough just to know that wrecks are more likely when roads are crowded and it's raining; you have to know the odds better than what is priced into the market.

If you buy the "wrong" option, you could lose money even if you are correct about what direction the market is going to move. If you buy high-deductible car insurance then get in a minor fender bender, you are out both the cost of the repair and the insurance premium. Conversely, if you buy extremely comprehensive coverage and there is no wreck, you paid a big premium without any compensation.⁷⁵

Secondly, even if you purchase the "right" option, there is a question of when do you cash it in? For example, let's say someone bought a one year option in January and there was a market crash in April where their option position was up 50% on the worst day.⁷⁶

Do you sell that option for a 50% return? If you do, then you lock in your profits, but you don't have any protection left — what if the market keeps falling? Do you hold onto it in that case?

What if the market reverts sharply (as it did in March 2020), and now you've given back most of your gains? Do you sell half then or hold for a potential second leg down in markets?⁷⁷

Broadly, there are two ways we think about approaching this problem.

One approach is to do it somewhat akin to buying car insurance — e.g. always buy a 12-month option that is 20% below the current market, and buy a new one as soon as it gets close to expiring.

This "always-on" approach of constantly having protection is typically called "tail risk" strategies. They are more predictable than an actively traded strategy that is coming in and out of the market and dialing exposure up or down, but may be unnecessarily expensive or merely sub-optimal.

⁷⁵ Please see our post on [What is the VIX and Why Does It Matter](#) for a bit more detail on the relationship between implied volatility and stock market declines.

⁷⁶ This figure is not based on actual trading and is used strictly for educational purposes.

⁷⁷ I realize my car insurance analogy is breaking down pretty hard at this point; while a car insurance policy typically covers any wreck you are in for the duration of the policy, an option is constantly updating in price. For instance, if you buy a 1-year option in January, there is a crash in April and then the market fully recovers and volatility declines, your option may still expire worthless at the end of one year. There's also the fact that with car insurance you are always insuring the same "underlying" asset — your car — whereas you can buy options on individual stocks, stock indices, currencies, commodities and many other financial instruments.

The alternative is to try to detect when the riskiest times are and where in the market they are happening and just “insure” at those times. This is a more actively managed approach that is trying to evaluate various conditions to determine which options to buy at which times, akin to what are typically called “long volatility” strategies or just “volatility trading” strategies. They are less predictable than pure tail risk strategies but have the potential to outperform over time.

If an active manager picks the right times and amounts to be invested in successfully, they will limit their losses in good times because they aren’t paying for insurance when they’re unlikely to get in a wreck. They are just focusing on the riskiest times and places where a wreck could happen and get most of the coverage at a small fraction of the price.

The Cockroach Portfolio uses a combination of sub-strategies to try and provide robust coverage across different volatility regimes and potential market paths. These include some “always-on” approaches that are more like tail risk as well as some actively traded strategies.

In essence, the Cockroach Portfolio wants to have some insurance on all the time because we’re never sure exactly what could happen. At the same time, it recognizes that there may be certain times and places where a bit more or less insurance is appropriate, and good active management tries to target those.

We think incorporating an ensemble of actively managed strategies rather than a single one should somewhat increase the predictability and reliability. If you have 10 different managers evaluating when the riskiest times are, it’s OK at the portfolio level if two of them are wrong — you have some backup. While it’s valuable throughout a portfolio, we believe fractal diversification is especially important in the long volatility and tail risk component of the Cockroach Portfolio.

Fiat Hedge

Since the four core sub-strategies (Stocks, Volatility, Trend, and Income) in the Cockroach Portfolio are predominantly denominated in U.S. dollars, the portfolio includes a fiat hedge component. While we saw gold is not necessarily an effective diversifier against mild to moderate inflation, it does have a reliable historical performance as an insurance policy against high or hyperinflation over longer periods and is included for that purpose. It also has some noncorrelation to the other components during more normal periods which can make it an effective addition to the portfolio

We believe the strongest theoretical argument for why gold is a safe haven is a combination of its historical significance and the fact that it’s pretty expensive to get it out of the ground. It’s harder and more expensive to build a new gold mine or increase production in an existing one than it is to print a currency by fiat. Some of the same logic exists for owning cryptocurrencies such as Bitcoin and Ethereum, which rely on techno-economic incentives to limit the rate of new issuance. Bitcoin and Ethereum additionally offer some benefits gold does not — namely their transportability (it’s hard to move big bars of gold compared to a USB stick) and divisibility (it’s tricky to cut a gold coin in half but not that hard to send someone 0.5 bitcoin).

A full discussion of the merits and risks of various cryptocurrencies is beyond the scope of this paper. Given their potential, but cognizant of the risks, we believe a small allocation is appropriate. Again, the approach here is not to believe we can pick the “best” thing in any environment, but to use a fractally diversified combination of many reasonable approaches to maximize our possibility of doing well in many possible futures.

I Like It, But What About...

As we noted in the introduction, other people, including yourself, may have different opinions about what asset classes or strategies to include and their respective weightings in a portfolio than what we've advocated here. Some approaches advocate weighting based on long-run historical volatility, others on short run volatility, while still others use different fixed weightings. Some only use passive exposure to asset classes while others incorporate more types of active trading strategies. Others tout the benefits of illiquid private investments in lieu of their public counterparts. Since we believe no one can possibly know the future return path of an investment, reasonable people may disagree with our conclusions about specific allocations and their weights.

The asset classes and strategies covered here represent what we believe are the most effective tools for building a truly diversified portfolio of liquid assets. As new asset classes and strategies emerge, we are always interested in considering how they fit into the Cockroach Portfolio.

The core idea of the Permanent Portfolio — to balance a portfolio across macroeconomic regimes — is a timeless one yet not well understood. In our view, it's much more important that an investor with no commodity or inflation-protected components of their portfolio find some way to include a meaningful allocation there that works for their setup than to endlessly debate the optimal way to do it ... only to end up making a 2% allocation.

Being down -20% on 98% of your portfolio and up +20% on 2% of your portfolio means being down -19.2% at the portfolio level rather than -20%. While this is better in a strictly mathematical sense, it seems to us akin to rearranging deck chairs on the Titanic. We believe the inclusion of material defensive assets and strategies (at least >10% and ideally 50% in our opinion) is the biggest potential room for improvement in long-term compounding potential.

The most common argument we hear against including defensive assets in a portfolio is that even if they would improve an investor's portfolio, they would also make them look bad relative to their peers at certain points, so they might give up on it at the worst possible time. Quitting on your inflation strategy right before a bout of inflation is indeed not a great outcome. However, we believe in telling investors to pursue the best long-term strategy regardless of what is in fashion with their peers.

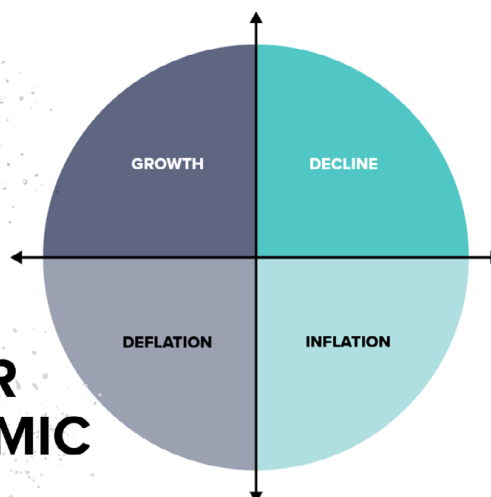
On 'Alpha' and Individual Competitive Advantage

Individual investors with specific expertise may be able to find other ways to get exposure to superior assets in certain quadrants.

A sophisticated private equity or stock investor may prefer to pick individual stocks or deals because they believe they can outperform passive exposure to stock indices.



WE BELIEVE
TRUE
DIVERSIFICATION
**REQUIRES
A PORTFOLIO
THAT CAN
WEATHER FOUR
MACROECONOMIC
REGIMES.**



An investor with deep expertise in health care, real estate or franchising may be able outperform in those areas compared to a broad index. However, we would point out that they are still subject to macroeconomic forces that they can't control. It didn't much matter how good of a home builder you were in 2007 and 2008; the macroeconomic forces rolled over you as the U.S. residential real estate market was crushed.

In our view, the important thing is to keep exposure balanced across all four macro-regimes. We view private versions of the above asset classes (e.g., private equity and venture capital) as fitting into the same quadrant of a portfolio as their public counterparts (e.g. in the growth quadrant with stocks).

While the private equity investor may prefer to get their exposure to the growth quadrant via their private investments, we believe they would be best served by utilizing the Cockroach Portfolio framework and diversifying across the other quadrants to ensure their portfolio does well in regimes where stocks or private equity are likely to struggle (most notably, recessionary and inflationary environments where we would expect long volatility and trend to perform well as well as bonds).

We also believe investors should consider their portfolios holistically, which for many people includes thinking about the value of their human capital.

If you consider the typical mid-career individual, the single biggest item on their theoretical balance sheet is the net present value of their future wages. Unless you're fairly late in your career or made some very savvy trades, your future earnings from your job or business dwarfs your savings and investments.

We view that someone with a career in a cyclical industry like tech, holding a portfolio of almost all stocks, is highly exposed to a single quadrant — growth. While it's anyone's choice to do that — and it was a pretty phenomenal trade from 2010 to 2023 — we have found that few investors in that position understand the historical risks of making such a concentrated bet.

We believe the key from a financial perspective is to prepare for a situation where the markets drop and your income gets hit at the same time. If history is a guide, then it will likely happen to everyone at some point in their lifetime.

For most portfolios we have seen, this means the inclusion of much larger allocations to defensive assets capable of doing well in periods of decline and inflation.

Building a Championship Team

During their dominant run in the early to mid-1990s, the Dallas Cowboys had several key contributors.

Troy Aikman (Quarterback) was the team's field leader and an efficient passer, whose decision-making and accuracy were crucial to the team's success. Emmitt Smith (Running Back) was the cornerstone of the Cowboys' ground game and provided a consistent rushing attack. Michael Irvin (Wide Receiver) was Aikman's primary target and a big-play threat with his ability to make tough catches in crucial moments.

The Offensive Line, often referred to as "The Great Wall of Dallas," was one of the best in NFL history including standouts like Larry Allen, Nate Newton, Mark Tuinei, and Erik Williams. They were pivotal in both pass protection and run blocking, enabling the success of Aikman, Smith, and Irvin.

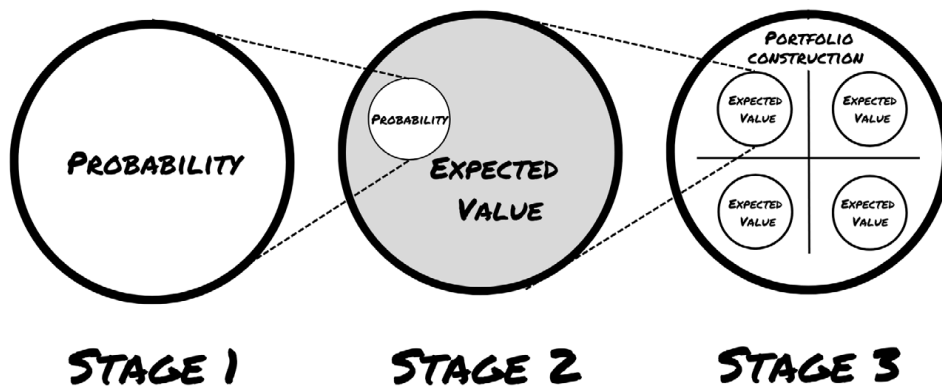
The defense was no slouch either. Charles Haley (Defensive End) was a disruptive force on the defensive line, known for his ability to rush the passer and play the run. Deion Sanders (Cornerback) was only part of the 1995 championship team but his impact was immediate as he was one of the best cover corners in the game.

The success of these Cowboys teams underscores the importance of a well-rounded team effort. While they had star players, their Super Bowl victories were the result of contributions from across the roster, including role players and a strong defensive unit.

Championship teams need a "portfolio" of players and strengths to win a championship. It's not about one individual player, it's about how they all work together. The same is true of an investment portfolio.

Many investors tend to be too focused on expected value, trying to identify individual investments that can outperform in all market conditions and all reporting periods. They want a single investment that will let them walk the Valley Path. There is no such player. There is no such single investment.

Just as the goal of a team is to win a Championship, not a single game, the goal of an investor is to construct the best portfolio. Picking superior individual assets certainly helps, but it's only part of the picture.



Our hope is that this paper helps many investors move from Stage 2 to Stage 3 in how they view their investments. A Stage 3 investor thinks about not just the expected value but the expected path. They consider the portfolio holistically and see how investing in lower-returning but complementary individual assets can create a superior outcome at the portfolio level. They are thinking about how to win championships, not games. They try to combine diverse assets to create a Valley Path-like portfolio.

The Cockroach Portfolio provides a framework for thinking about portfolio construction to accomplish the Dual Mandate of Compound Growth:

- » **Get Rich — Have “a lot” of assets in the future**
- » **Don’t Die Tryin’ — Have “enough” assets in the interim**

Most investors today are not prepared for a future that is radically different from the 40-year period of declining deflation and growth that has characterized most of recent history. Their deflationary stupor leaves their portfolios exposed to prolonged recessions or inflationary periods.

On the other end of the spectrum is the overly defensive portfolio with a small allocation to growth assets and hoarding of gold, cash, and other defensive assets. While this approach appears conservative, it’s likely that this portfolio will fail to achieve enough growth and slowly be whittled away by small losses.

In a championship team, any one player should be able to have a bad game without the championship hopes going out the window. The rest of the team should be good enough to step up and support them. Similarly, each of the core asset classes can go a decade or more without performing as long as another steps up to support the overall portfolio.

The inverse also happens. Sometimes you have one player that’s particularly hot for a few games. That doesn’t mean getting rid of everyone else on the team. Similarly, any one asset or strategy can get hot for a period of time. That doesn’t mean abandoning the other parts of the portfolio.

Looking at a simple permanent portfolio, the experience of long-term superior performance can feel disappointing. Over any shorter period of a year or two or five, one individual asset is likely to outperform the whole portfolio.

Stock Envy				
Diversification can feel dissapointing				
Years	World Stocks	Permanent Portfolio	Best Performing Asset	
2000-2002	-44.16%	-13.38%	Bonds	😡 "I lost money!"
2003-2007	+100.29%	+119.81%	Gold	😊 "I matched the market"
2008	-39.89%	-17.20%	Bonds	😡 "I lost money!"
2009-2017	+168.90%	+68.93%	Stocks	😐 "I didn't make as much."
2018	-9.18%	-8.90%	Cash	😡 "I lost money!"
2019-Sep.2022	+29.80%	+11.59%	Stocks	😐 "I didn't make as much."
Total Return	+113.10%	+170.73%		
Growth of \$100K	\$213,101.28	\$270,728.73		👉 "Diversification wins!"

PERMANENT PORTFOLIO

Source: YCharts, GFD. Permanent Portfolio is represented by 25% allocation to each of the following: ACWI, IEF, Gold, and Cash. The above is an illustrative example of the topic used for educational purposes only and does not represent trading in any actual accounts.. Past performance is not necessarily indicative of future results.

If you're always comparing the overall portfolio performance to its highest performing asset in the last year, you're setting yourself up to feel disappointed and underperform in the long run.

The hardest part to the Cockroach Portfolio approach is sticking with it. It's not a coincidence that a diversified strategy like the Cockroach Portfolio is hard to stick with. *In fact, we believe it is a necessary precondition to it being effective.* If an investment approach is viewed as easy money, enough people will adopt it that the inflows will drive out the excess return.

The pain of those periods of underperformance relative to whatever the then-hot asset is keeps the strategy from getting crowded and allows it to work over the long run. Abandoning an out-of-favor asset or strategy, even after a decade of underperformance, destroys the point of the balanced portfolio. Just when an asset class or strategy is most hated is often when it is poised to succeed.

There's no doubt that it's challenging for an investor to hold a position in defensive assets when stocks and real estate are exploding higher at the end of the bull market.

It is equally as challenging to maintain a position in stocks after a 50% decline in the market, at which point defensive assets are back in demand. In the early 1980s, the media sometimes referred to bonds as "certificates of confiscation." What followed was an enormous bond bull market.

The GI returning from WWII and being tentative about buying stocks or the Baby Boomer in the early 1980s being tentative about buying bonds were not "dumb" people — it's hard to invest in something that has struggled for a long time.

Many portfolios are fully prepared to succeed in the previous decade. We believe the worst thing an investor can do is to build a portfolio based on what would have worked well over the prior 10 years, yet that's typical. But, what matters to long-run performance is being prepared for the unknown next decade.

Want to Learn More?

For investors interested in learning more about Mutiny Funds offerings, you can visit our website at MutinyFund.com. For qualified investors, you can see our past performance. If you have any questions, please contact us either through our website or by emailing us at research@mutinyfund.com.

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Have Feedback?

Leonardo da Vinci (probably apocryphally) said that “Art is never finished, only abandoned.” Though it’s quite the stretch to refer to a paper on portfolio construction as art, it is not a stretch to say it was “abandoned” in the sense that there is a good deal more that we considered including but didn’t. As with all our research, this is a work in progress and we welcome any feedback (positive or constructively critical) that would help us improve.⁷⁸ We have sought to be as transparent and intellectually honest as possible in the presentation of this material. We were sometimes limited by data source availability or the complexity of certain calculations and tried to note that where relevant. Having said that, we’d welcome any feedback on any points to that effect which could be more clearly explained in a future revision.

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⁷⁸ If you would like to complain about some immaterial nuance that you have bizarrely made your life’s crusade or perceived slight to your favorite asset class or strategy, I invite you to go somewhere else on the internet and shout into the void.

and you should not rely on any of the information as a substitute for the exercise of your own skill and judgment in making such a decision on the appropriateness of such investments. This paper provides information regarding the following commodity pools: The Long Volatility Fund LLC and The Cockroach Fund, LLC (collectively the “US Funds”) and Mutiny Funds Cayman Ltd. (together with the US Funds, collectively the “Fund(s)”), which are managed and operated by Attain Portfolio Advisors LLC and Mutiny Funds LLC (the “Managers”). Investments in the US Funds are only available to Accredited Investors as defined in Rule 501 of Regulation D of The Securities Act of 1933. Investments in Mutiny Funds Cayman Ltd. are only available to non-US investors. This content is being provided for information and discussion purposes only and should not be seen as a solicitation for said Fund(s). Any information relating to the Fund(s) is qualified in its entirety by the information included in the Fund’s offering documents and supplements (collectively, the “Memorandum(s)”) described herein. Any offer or solicitation of the Fund(s) may be made only by delivery of the Memorandum(s). Before making any investment in the Fund(s), you should thoroughly review the Memorandum(s) with your professional advisor(s) to determine whether an investment in the Fund(s) are suitable for you in light of your investment objectives and financial situation. The Memorandum(s) contain important information concerning risk factors, including a more comprehensive description of the risks and other material aspects of an investment in the Fund(s), and should be read carefully before any decision to invest is made. This paper is not intended for European investors, and nothing herein should be taken as a solicitation of such investors. Use the following links to view the full terms of use and risk disclaimer and our privacy policy.

Appendix

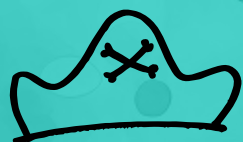
The **Growth** and **Inflation** regimes are each constructed from two distinct data series (four total). Each series is initially standardized into z-scores by deducting the full sample mean from each value and dividing by the full sample volatility. The two z-scores for each regime are then averaged into a final measure for that regime. The “**Up**” and “**Down**” periods are defined as those times when the measures are above or below their full sample median, splitting each regime evenly into 50% Up and 50% Down. The data series used in the regime calculations are as follows:

Growth:

- » **Chicago Fed National Activity Index (CFNAI)**
- » **Industrial Production (INDPRO) minus prior year industrial production forecast from the Survey of Professional Forecasters**

Inflation:

- » **Year-over-year CPI change**
- » **Year-over-year CPI change minus prior year NGDP forecast from the Survey of Professional Forecasters**



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