ARTEMIS
CAPITAL MANAGEMENT

THE ALLEGORY OF THE HAWK AND SERPENT

HOW TO GROW AND PROTECT WEALTH FOR 100 YEARS

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THE ALLEGORY OF THE HAWK AND SERPENT

IMAGINE YOU HAVE THE OPPORTUNITY TO GRANT YOUR FAMILY GREAT WEALTH AND PROSPERITY FOR 100 YEARS

The opportunity is subject to one final choice. You must decide what assets to invest in and maintain that allocation for an entire century without ever changing it. The future of your children's children depends on your decision. What do you do?

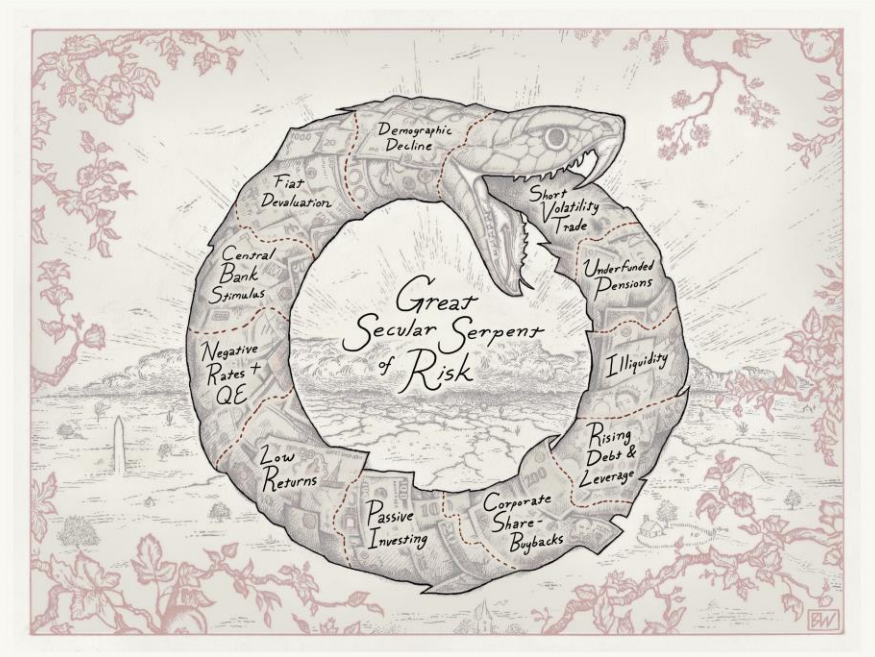
The **ALLEGORY OF THE HAWK AND THE SERPENT** is a philosophical map to understanding the generational cycle of wealth creation, destruction, and rebirth to help guide your investment decisions and protect your prosperity. As an image, the Hawk and Serpent are hidden in plain sight on the Great Seal of the United States of America, the Coat of Arms of Mexico, and have roots in Greek, Egyptian, Indian, and Aztec mythology[(1)]. The allegory evokes the spiritual conflict of opposites: the enlightened mind of the Hawk battling the primordial Serpent of the lower self. When left to its own devices, the Serpent is content to devour its own body in perfect symmetry, a state of infinite death and regeneration otherwise known as the Ouroboros. The struggle between the Hawk and the Serpent represents the collapse of a self-replicating system from which a new world order emerges[(2)]. It is a metaphor for maintaining cosmic balance during changing economic times.

The **SERPENT** represents a period of secular growth fueled by the virtuous cycle of value creation and rising asset prices. The growth cycle begins naturally through some combination of favorable demographics, technology, globalization, and economic prosperity. As the secular boom matures, it is corrupted by greed, as fiat devaluation and debt expansion replace fundamentals as critical drivers of asset price gains, not unlike a Serpent devouring its tail into oblivion.

The **HAWK** signifies the forces of secular change that will challenge and ultimately destroy the corrupted growth cycle of the Serpent. The left-wing of the Hawk is the deflationary path, whereby an aging population leads to low inflation, faltering growth, a financial crash, and then debt default. The right-wing of the Hawk represents inflation, fiat default, and helicopter money. Neither path is mutually exclusive, and they often occur sequentially. The pattern is as old as money itself.

The successful 100-year portfolio must be able to navigate the secular booms of the Serpent (1947-1963,1984-2007) while not losing capital on either wing of the revolutionary and regenerative eras of the Hawk (1929-1946, 1964-1983). The best portfolio balances assets that profit from either regime. Many investors assemble a varied portfolio of asset classes thinking there is safety in diversification, but in a crisis, the portfolio is exposed as a leveraged long-growth portfolio with no real diversification at all. Another class of investors believes they can always time the wild cycles of risk when, in fact, they can barely manage the demons of their greed and fear. The greatest threat to 100 years of prosperity is neglecting the lessons from long-term financial history and having no true diversification against secular change.

TO THRIVE, WE MUST EMBODY THE COSMIC DUALITY BETWEEN THE HAWK AND SERPENT



In our quest to find the best 100-year path to wealth creation and preservation, we recreated many modern financial engineering and institutional portfolio strategies and tested them through four generational seasons (~20 years) and one lifetime (~90 years) dating back to 1928. The goal is to apply financial engineering to the distant past to learn about our potential futures. Our conclusions rely on quantitative analysis, mathematics, and empirical data and not subjective narratives. What we discovered challenges many commonly held assumptions on investing and portfolio management.

To seek our fortune, we must first understand our place in history. Over the past four decades, a self-reinforcing Serpent of favorable demographics and dollar devaluation drove an unparalleled cycle of asset price gains that is unique to economic times past. The cycle began in the early 1980s as interest rates peaked at the highest levels in over 200 years (19% Fed Funds 1981), as presaged by dollar devaluation against gold a decade prior. The secular peak in rates occurred as the largest generation in American history (76 million Baby Boomers born 1946-1964) entered the workforce intent on buying or borrowing their way to the American Dream. The capital flows from Boomers in their prime earning years drove a self-feeding cycle of rising asset prices, falling interest rates, lower taxes, lower inflation, globalization, liquidity, and debt expansion. Four decades later, the result is historically high asset valuations, the highest corporate debt-to-GDP in American history, $17 trillion in negative-yielding debt globally, the lowest capital gains taxes in U.S. history, and historically high-income disparity[3]. The first wave of Boomers began retiring in 2017 and, over the next few decades, will draw down on $28 trillion in retirement assets to live on[4]. We are at the end of a forty-year demographic and debt super-cycle, a snake devouring its tail in a diminishing search for yield.

For the first time since the 1930s, a Hawk riding on the winds of secular change will challenge the entrenched debt Serpent, as capital withdraws from markets due to aging demographics in the developed world and rising hostility to globalization. As a four-decade self-reinforcing cycle of risk dies, it will touch all aspects of society: sociopolitical, geopolitical, and economic. A new period of secular decline began with the Great Recession and will likely end with entitlement default, helicopter money, and monetization of budget deficits before 2030. The pendulum will likely swing from wealth creation to redistribution.

A once in a lifetime secular boom has caused investors to over-allocate to risk assets at the expense of defensive alternatives. While modern portfolios are well-meaning, they are ill-equipped to perform in a secular decline with rates at the zero bound. In the event of an extended period of declining or flat returns, many entitlement programs will face insolvency requiring a government bail-out that will dwarf the banking crisis of the Great Financial Crisis ("GFC").

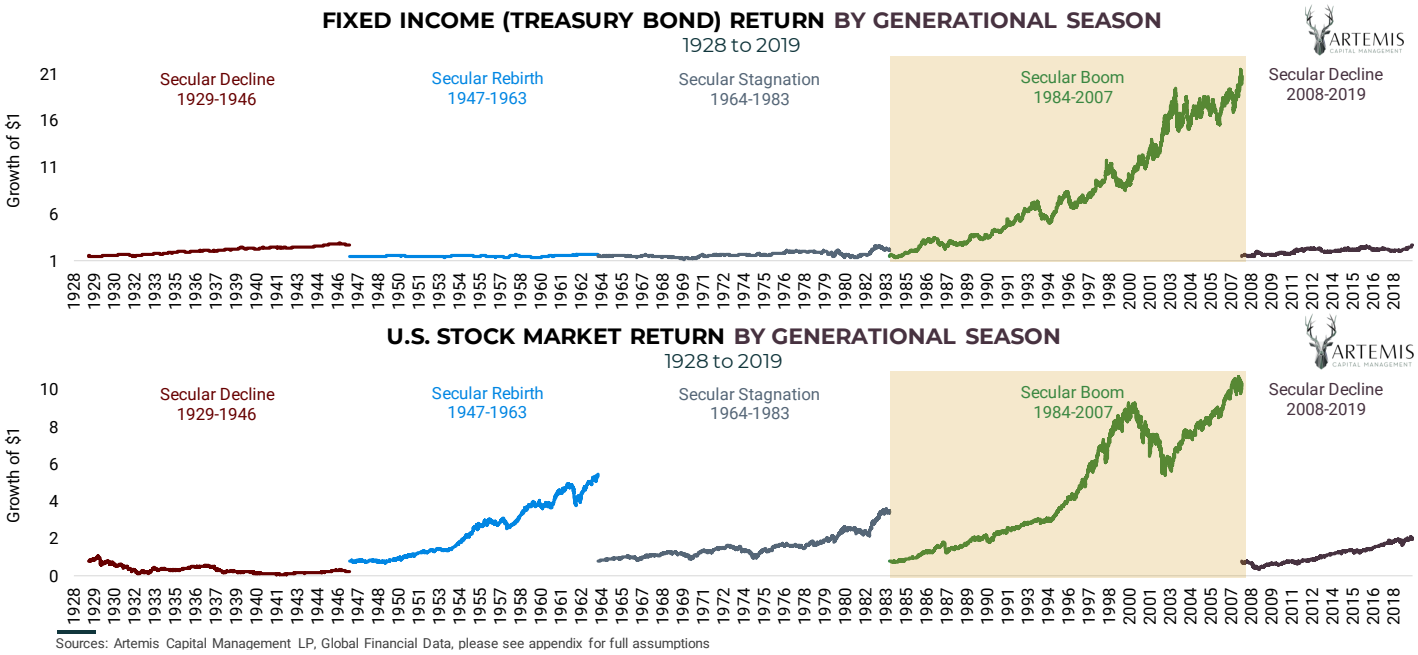
IT IS NOT ABOUT BEING AFRAID; IT IS ABOUT BEING PREPARED. We highlight what works over a century, not just a decade. The solution to secular decline is simple when you study financial history: find assets that can perform when Stocks and Bonds don't, and boldly size them in your portfolio regardless of short term performance. This research will outline, in detail, the 100-year benefits of a simple, diversified portfolio that performs and protects investors throughout all market regimes. Before we introduce this solution, we must first diagnose the root causes of the problem.

RECENCY BIAS IS NOW A SYSTEMIC RISK

By any measure of financial history, the last four decades were one of the most significant periods of asset price growth ever. A remarkable 91% of the price appreciation for a Classic Equity and Bond Portfolio (60/40) over the past 90 years comes from just 22 years between 1984 and 2007. 94% of the returns from Domestic Equities, 76% of the profit from Bonds, and 72% of the performance in Home Values were from this period as well (see graphs below). U.S. Equities achieved nearly 2x the return of the post-WWII era, and Treasury Bonds gained 15x what they earned over the Great Depression. Any strategy that overweighted Stocks and Bonds did spectacularly well during this unique period of financial history.

THE TRILLION-DOLLAR QUESTION WE NEED TO ASK OURSELVES, IS THIS REPEATABLE?

The average investment advisor is now 52 years old[5]. He/she entered the industry in the early 1990s and was a kindergartner during the stagflationary bear market of the 1970s. Even the oldest advisors spent their entire career in a secular bull market for Bonds and Equities. The period of 1984 to 2007 is an outlier comparative to any other period in economic history, yet both discretionary and quantitative managers treat this period as normalcy. Most of our consensus knowledge on investing is informed from four decades of unparalleled asset price appreciation and is not always true. The mantra of "buy on weakness" and the popularity of passive indexation would not have worked for most of the last 90 years. For example, if you bought on market declines consistently between 1929 and 1970, you would have gone bankrupt three times. A passive index realized a -86% peak-to-trough decline in the 1930s and two decades of lost performance. U.S. Treasury Bonds lost -25% unleveraged through the 1970s and -51% volatility adjusted to Equities. Many large quantitative asset managers do not test their strategies in periods without optimal data; hence their solution is to pretend that anything before 1980 didn't happen. We often forget the last forty years were an extraordinary time to allocate capital, and if you just held risk and applied leverage to growth, you did exceptionally well. History has rarely been so kind to investors.



Very few investors are willing to think critically about their success (or failure) and how much of it is due to their place in economic history. Bill Gross, nicknamed the 'Bond King' for his remarkable run at PIMCO in the 1990s-2000s summed it up best in an eloquent and humble 2013 thought piece entitled "Man in the Mirror".

"Let me admit something. There is not a Bond King or a Stock King or an Investor Sovereign alive that can claim title to a throne. All of us, even the old guys like Buffett, Soros, Fuss, yeah – me too, have cut our teeth during perhaps a most advantageous period of time, the most attractive epoch, that an investor could experience. Since the early 1970s when the dollar was released from gold and credit began its incredible, liquefying, total return journey to the present day, an investor that took marginal risk, levered it wisely and was conveniently sheltered from periodic bouts of deleveraging or asset withdrawals could, and in some cases, was rewarded with the crown of "greatness." Perhaps, however, it was the epoch that made the man as opposed to the man that made the epoch."

Bill Gross, Man in the Mirror April 12, 2013

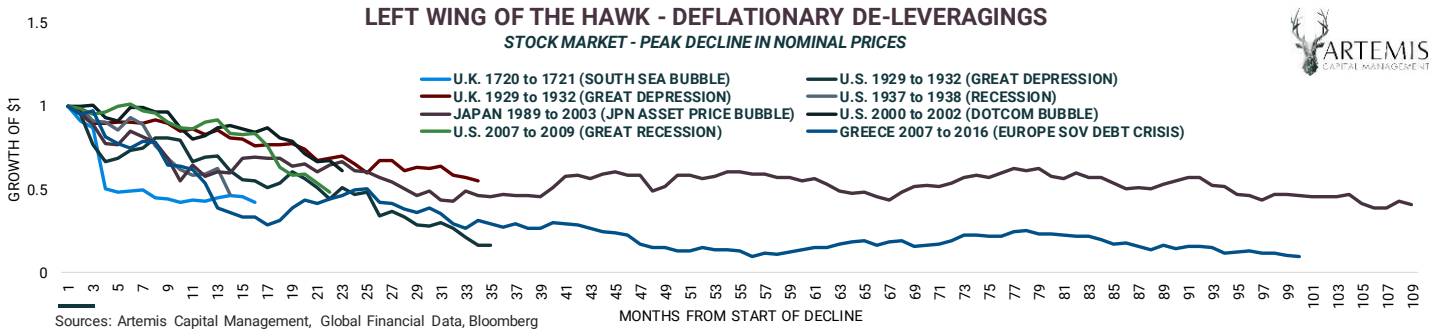
ON THE WINGS OF SECULAR DECLINE

The current economic expansion is now the longest bull market in American history, and a continuation of a remarkable four-decade run in Stocks, Bonds, and Real Estate. Stock prices, valuations, and corporate-debt-to-GDP are simultaneously at all-time highs (47% of GDP). Global Central Banks will do whatever it takes to prevent deflation. What used to be fringe policy ideas are now mainstream tools or being evaluated as such: negative interest rates, direct Fed purchases of debt and equity with printed money, monetization of budget deficits, lending directly to hedge funds, bail-outs of entitlement programs, and helicopter money. To some, the experimentation by central banks combined with disruptive technologies have permanently changed the rules of investing. To others, central banking is out of control, and the real narrative of technological disruption is one of overvaluation and malinvestment. Regarding the debate, the author agrees with the great **Harley Bassman**, who once wrote, ***"Pigs can fly if shot out of a large enough canon; until they come down to earth as bacon."***

Whether this is a new normal or madness is irrelevant, the point of this research is that you don't need to be right about markets to build a portfolio that outperforms over the next century. All you have to do is be aware of the root causes of secular change to understand how to protect yourself. A secular collapse is always the result of a slowdown in growth combined with too much debt, which cascades into crisis as debt holders are unable to service or roll obligations. Absent fundamental growth, there are only two ways to eliminate the overhang of debt: either through default with deflation (left wing of the Hawk); or fiat debasement with inflation (right wing of the Hawk).

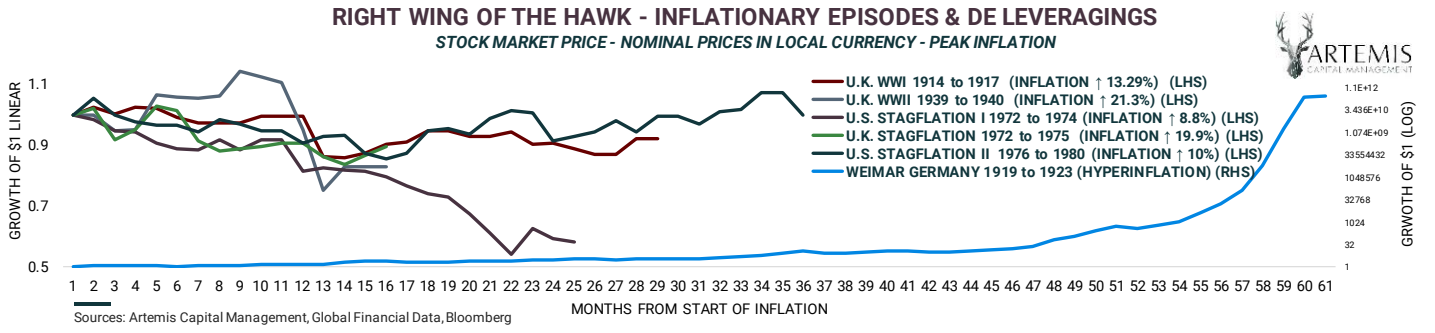
THE LEFT WING OF THE HAWK – DEFLATIONARY DE-LEVERAGINGS

World debt levels are currently at all-time highs, but each incremental dollar of debt is generating a smaller percentage of global GDP growth (11% less than from 2007-2009) (BIS). In theory, withdrawal of capital, loss of confidence, or higher interest rates may cause problems servicing high global debt and create a deflationary collapse regardless of the absolute level of rates. The history of markets is rich with examples of debt-overhangs that resulted in such asset price crashes.



THE RIGHT WING OF THE HAWK – INFLATIONARY DE-LEVERAGINGS

With the developed world in a deflationary rut, it seems hard to imagine what could ever cause inflation. The dark horse for price rises comes not from within markets, but from outside. As income disparity is at historic highs in the developed world, inflation may emerge when populism forces policymakers to stop printing money to buy assets, and start giving it directly to people to spend on things. In just a half a decade, +10% inflation a year can erase 50% of debt and savings levels.



If or when there is another crisis, conflicting economic interests between generations will rapidly emerge. Baby Boomers (23% of the population; 56-74 years old) are wealthy and nearing retirement with incentives to support policies that bail-out asset markets, but maintain the purchasing power of their savings. Millennials (26% of the population; 24-39 years old), will likely be the first U.S. generation to be worse off economically than their parents and have reason to support inflationary policies that redistribute capital directly to people but destroy debt. Any slowdown in secular growth could cause fissures in the social fabric with unpredictable ramifications. **How are institutional portfolios prepared for either outcome?**

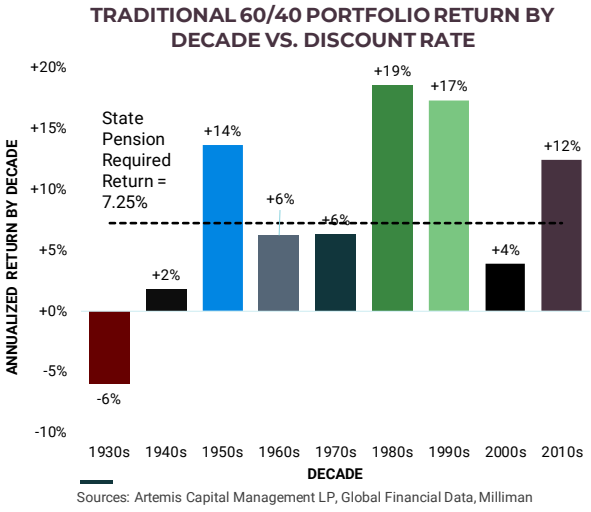
MOST INVESTORS WOULD RATHER FAIL CONVENTIONALLY THAN SUCCEED UNCONVENTIONALLY

While the modern portfolio is well-intentioned and performs excellently during periods of growth, it is not well-suited for secular change. The once in a lifetime boom in risk assets over the last forty years has caused investors to over-allocate to assets that profit from secular growth (Equity-Linked Investments, Credit, Real Estate) and under-allocate to non-correlated and active alternatives that profit from change (Gold, Active Long Volatility, Commodity Trend, and Global Macro). A generational decline in interest rates has caused overallocation to long-duration and illiquid assets hedged by high-quality Bonds. The influence of large financial institutions that have profited from this once in a generation asset growth cycle has limited critical evaluation of core investment strategies in alternative market regimes.

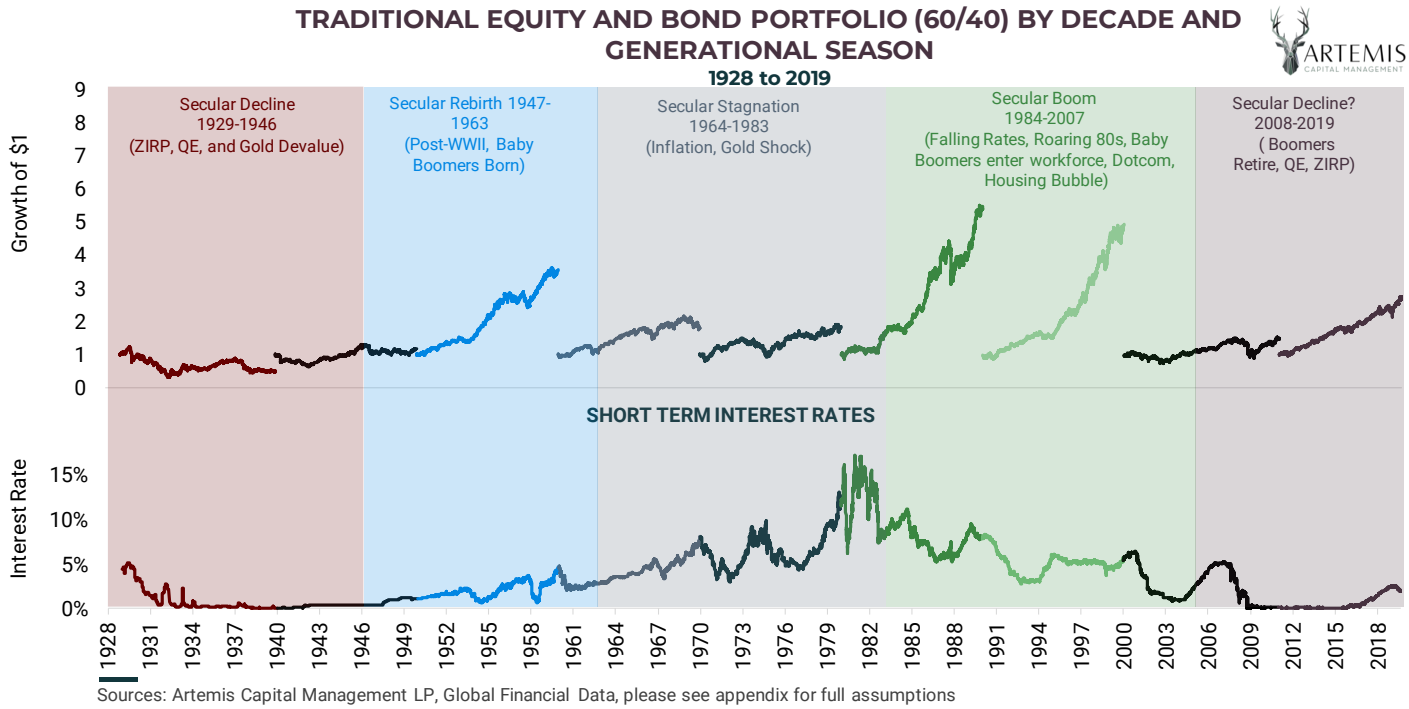
Traditional portfolios are not excessively risky or wrong, just not optimal. The Classic 60/40 Equity-Fixed Income, Risk Parity, and Passively Managed Portfolios suffer from recency bias and are highly reliant on assumptions derived from a once in a century bull market in Stocks and Bonds. While such portfolios perform during secular booms (1947-1963, 1984-2007, 2010-2019), they have an Achilles Heel. Namely, they struggle in periods whereby interest rates are at the zero-bound (the U.S. in the 1930s, Japan post-1990, Europe today) or when inflation is rapidly rising (the U.S. in the 1970s). During these periods, the Fixed Income leg offers little in the way of capital appreciation or, worse yet, becomes correlated to risk assets. In these regimes, a Traditional Portfolio faces weak performance or significant losses.

UNDERPERFORMANCE OF THE TRADITIONAL PORTFOLIO IS A SYSTEMIC RISK

While this may not seem like a world-ending problem, underperformance of retirement portfolios over long periods is a systemic risk that could collapse the entire financial system given current savings levels. The average U.S. State Pension System assumes a discount rate of 7.25% on plan assets. In the event returns are just -2% per annum lower, the average pension falls from 70% funded to under 50%, and over one-third of the State Pension Systems will have a funding ratio below 30%. The total underfunded pension liability expands from $1.4 trillion to $3 trillion, or 4x the cost of the bailout of the entire U.S. Banking system during the GFC, or the total FY 2020 tax revenues of the U.S. government[6,7,8,9]. A lot is riding on the assumption that the period of 1984-2007 (green in the chart below) is repeatable. If these assumptions prove wrong, a default in the pension and entitlement system is inevitable, setting up a once in a generation financial and social crisis.



Sources: Artemis Capital Management LP, Global Financial Data, Milliman



Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions

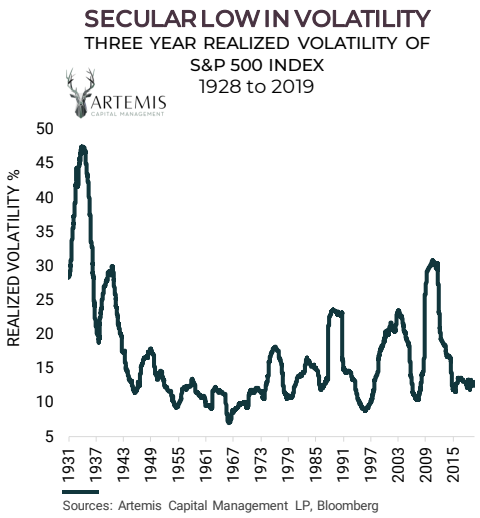
"WE CANNOT SOLVE OUR PROBLEMS WITH THE SAME THINKING THAT CREATED THEM" *EINSTEIN*

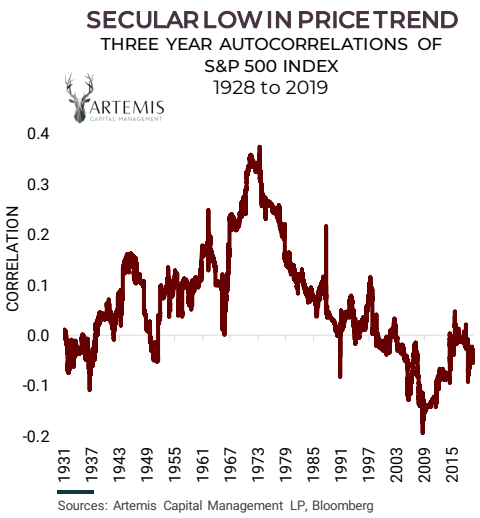
Instead of seeking strategies that can perform during a period of secular change, fiduciaries have done the exact opposite, layering on correlated risk searching for yield at the end of the business and credit cycle, distracted by short-term performance without seeing the big picture.

The predominant cause of the last financial crisis was a widespread delusion that home prices could not fall nationwide. Today there is a dangerous assumption that risk assets are immune to any form of price instability because central banks will always be willing and able to contain market stress. Both hypotheses are easy to disprove using historical data from financial markets in the past.

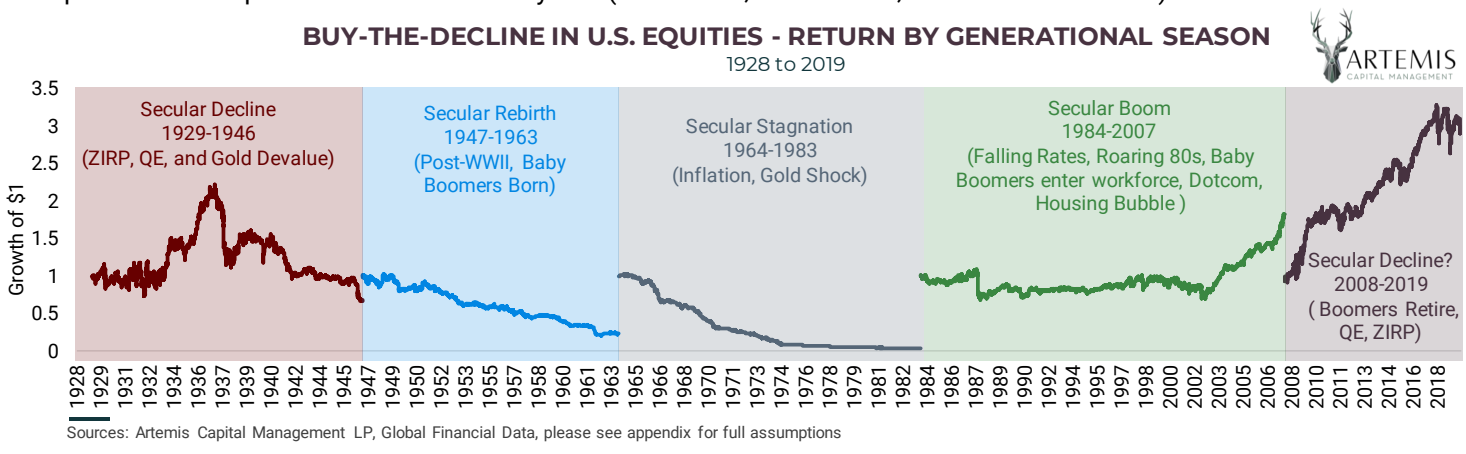
Emboldened by central banks, and starved for yield, many investors have crowded into Equity-Linked Investments like Private Markets, Passive Indexation, and Financial Engineering Products that leverage the assumption of stability and liquidity for excess return. While effective over the last three decades, over a lifetime, many of these yield-seeking strategies result in poor performance at best, or complete impairment of capital at worst (please see Appendix for full details). Today there is an estimated $3+ trillion in Financial Engineering Strategies in U.S. Equity markets alone that simultaneously exert influence over, and are influenced by, asset price volatility and mean reversion (as discussed in detail in the Artemis paper "Volatility and the Alchemy of Risk" from October 2017).

As we look at the forest from the trees, it is essential to understand the secular trends in asset price behavior that have encouraged this reach for yield. The last decade recorded multi-generational lows in 1) Volatility, 2) Asset Price Trending, 3) Interest Rates, and 4) Liquidity. Many modern investment strategies generate yield by assuming additional risks associated with these core factors. A reversal of any of these secular price trends could spell significant problems, and this is evident by modeling the returns of modern, yet historically untested, investment strategies over 90 years.



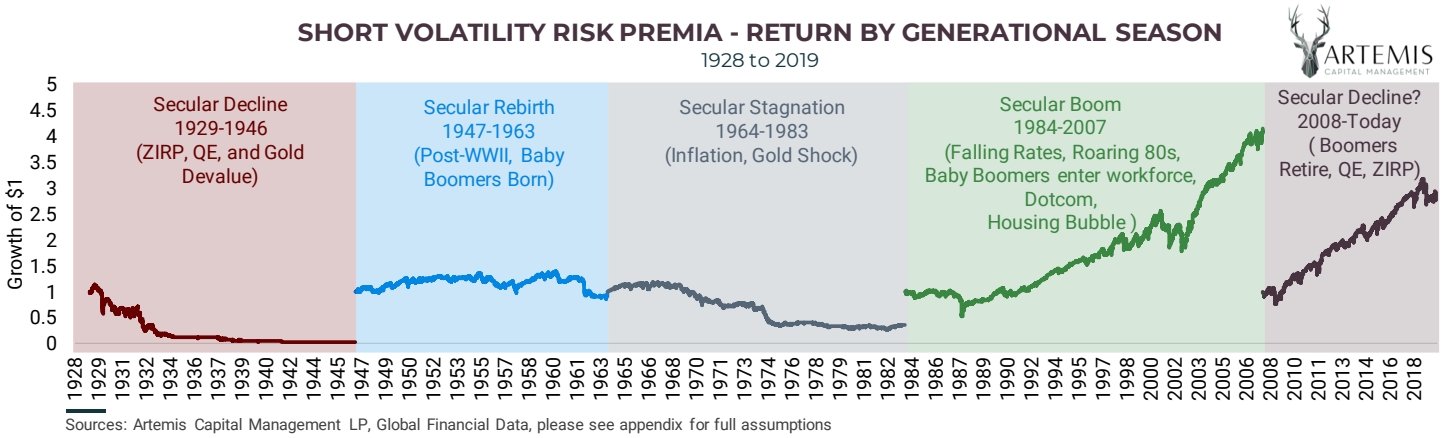


For a straightforward but forceful example, consider the popular retail strategy of buying any day after the Stock Market has fallen, expecting a rebound. The strategy is effectively a mean reversion trade that assumes market stability for excess returns. The approach has excellent performance over the last decade annualizing at +10% per annum but resulted in a complete loss of capital three times over 90 years (1936-1946, 1946-1960s, and the 1960s-1980s).



"DEMONS ARE WHAT MAKE PEOPLE MISTAKE THE SHADOW FOR SUBSTANCE" *SHERIDAN*

Many investors have turned to elaborate ways to generate excess yield by layering on added risk. Explicit Short Volatility (e.g., Put Writing Overlays, Buy-Write Programs, Short Volatility Exchange Traded Products) describes strategies that sell derivatives to profit from periods of market stability. The capital allocated to these tactics is ~$80 to $200 billion[10] in U.S. Equity markets alone. Despite the solid short-term performance, all Explicit Short Volatility strategies we tested demonstrated complete impairment of capital when implemented robotically over 90 years, even when fully collateralized.

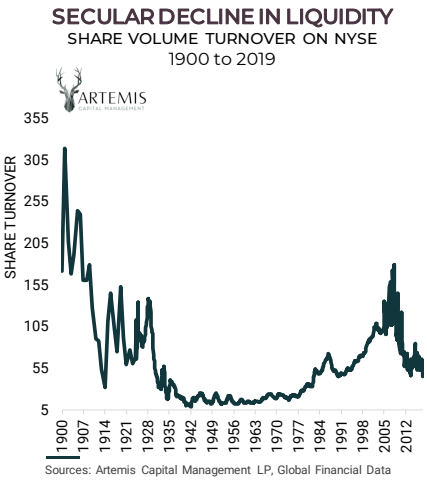


Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions

To understand why many of these strategies perform so poorly over a lifetime, consider that the mean reversion and low volatility properties of markets we take for granted today were not a feature for the majority of 90 years. In a secular decline like the 1930s, or stagflationary recession like the late-1960s to 1970s, there is a perpetual trend lower in equities and trend higher in volatility that persists for years. In the 1930s, volatility averaged 35+ for the entire decade. In the late 1960s, day-to-day movements of the market were correlated, wreaking havoc on mean reversion trades. With this history in mind, consider that between 2017 and 2018, a total of $8 billion in Short Volatility Products collapsed even though volatility and asset trend remained near historic lows. At current leverage levels, what could happen if volatility shocked higher and remained elevated at 30+ for an entire decade with -50% and +50% price swings in both directions, as experienced during the Great Depression? Is there a Short Volatility version of Lehman out there?

The prudent investor should not only avoid these strategies, but also counterparty risk to institutions that systematically apply them. There is a place for this form of risk-taking, but only when used tactically and with human discretion. In the wrong secular decline, Systematic Volatility Selling may be comparable to toxic Collateralized Debt Obligations ('CDOs') that infected the financial system during the Great Financial Crisis("GFC") of 2008. Like CDOs, the dealers of Short Volatility Strategies back-test using minimal data history (1986 to 2019), without a practical assessment of performance during generational shifts in the economy. All solvency problems aside, even when these strategies do work, they are overrated, because any additional yield comes from leveraging the growth cycle rather than finding diversified sources of return.

LIQUIDITY RISK is also at secular highs, and the trend toward Private and Passive Investing is amplifying this risk in exchange for yield. Private Investment Vehicles and Corporate Share-Buybacks soak up liquidity from public markets and reduce an investors' or companies ability to allocate capital in a crisis. The performance of Private Equity and Venture Capital has tracked the business cycle based on data to the 1980s and are not diversifiers (see Cambridge Associates Private Benchmarks). They add secular risk rather than reduce it, and block liquidity when you need it the most. The trend toward Passive Indexation is another liquidity problem, reducing the power of value-seeking active managers to act as liquidity providers during periods of stress. Passive Investing has evolved into a crowded "liquidity momentum" trade driven by once in a generation capital flows from retirement savings, that will reverse in the next decade. As we will show, based on mathematics and history, excess returns gained from business cycle-correlated assets are not worth the risk. There are better ways to construct a portfolio.



Sources: Artemis Capital Management LP, Global Financial Data

In the broad perspective of a lifetime of market history, these Financial Engineering Products are not solutions. They are part of the problem. To achieve the best results, investors can't apply more of what worked yesterday. If left unchecked, the trend toward increased risk exposure, lower liquidity, credit risk, passive, yield chasing, and shorting volatility is only contributing to systemic risk that will eventually result in a collapse of entitlement programs.

WE NEED TO THINK OUTSIDE THE PARADIGM OF THE LAST FORTY YEARS IF WE WISH TO THRIVE OVER THE NEXT TWO DECADES

The Standard Portfolio is dominated by assets that are linked to secular growth, leaving institutions and retirees exposed to sudden change and crisis. Worse yet, the factors that fund the portfolio, namely income from a job or tax receipts, are also correlated to that same economic growth and will decline in tandem with risk assets, compounding the problem. Layering on more correlated risk doesn't solve any of these concerns. If you own a portfolio dominated by growth and funded by economic and debt expansion, you are a snake eating your tail without realizing it. The Serpent lacks the self-introspection to understand whether it is genuinely eating prey or devouring itself by accident.

On the other end of the spectrum is the overly Defensive Portfolio, with a small allocation to growth assets, hoarding Gold, Cash, and Portfolio Insurance. While this approach appears conservative, it is ironically risky because the portfolio fails to participate in any secular growth and can underperform during fiat devaluation. If you are a portfolio advisor, your client will fire you if this portfolio is not timed perfectly with the business cycle. Hence you face career risk. The Hawk is a powerful predator flying in the winds of change but is highly fragile when standing still.

What to do then? How can you generate the returns you need to live within the margin of safety required to sleep at night? The answer lies in the ancient practice of **cosmic duality**.

LAW OF COSMIC DUALITY

In nature and in investing, there is great power to the duality of opposing and complementing energies. Yin and Yang, the Hawk and the Serpent, winter and summer, male and female, are all examples of this cosmic balance. A positive and negative process can be more powerful together than the same force duplicated many times over. This is a rule for life, and the power of duality applies across a wide range of disciplines beyond just investing.

In THEOLOGY, there is a concept called the Middle Path that Gautama Buddha highlighted as the key to spiritual enlightenment. Buddhist monks seek a middle ground between the extremes of sensory self-indulgence and the severe austerity of self-denial. If you attach yourself to a world of sensual pleasure, you are perpetually in a state of wanting. If you focus only on asceticism, you deny your humanity. The Middle Path acknowledges both but indulges in neither[(11)].

In WAR, a contradictory strategy can lead a smaller force to victory over more massive armies. Genghis Kahn conquered most of Eurasia around 1200 A.D. by defeating greater armies with hit and run tactics. The Mongol army was highly mobile and well trained in archery and horsemanship. Kahn would engage the enemy with a unit of horse-mounted archers and then feign retreat drawing enemy forces forward. When the enemy formation broke in pursuit, secondary waves of Mongol attackers aggressively surrounded and annihilated them. Kahn's use of conflicting but simultaneous attack and retreat movement confused European armies that relied on a traditional unified front and center attack[(12)].

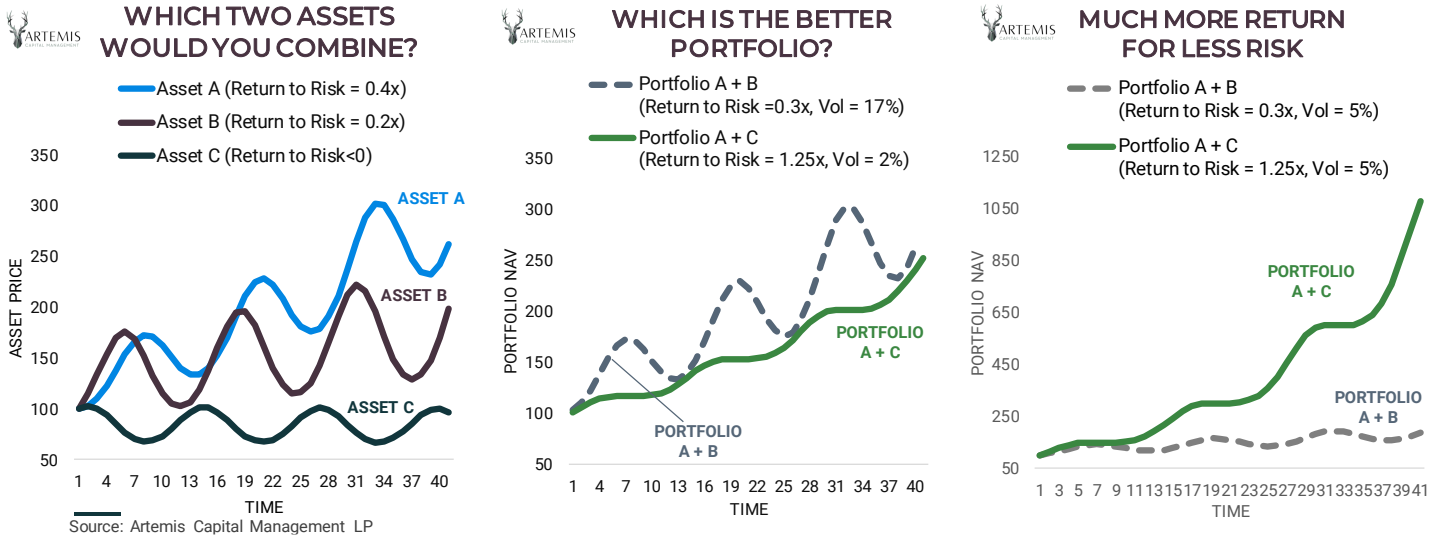
In COOKING, a chef must balance the role of each ingredient in a dish. The taste of a chocolate cake is primarily cocoa and sugar; however, the texture comes from baking powder giving rise to the batter in the oven. A naïve child tasting individual ingredients may be confused as to why the bland baking powder is just as crucial as the tasty chocolate[(13)].

In SPORT, a good defense can create an even better offense. Dennis Rodman is currently the lowest scoring inductee in the Basketball Hall of Fame. Rodman couldn't score consistently outside of five feet, but counter-intuitively, whenever he was on the floor, the offensive efficiency of his team improved dramatically. The reason is that Rodman was exceptional at one specific skill, rebounding the basketball. At his peak, Rodman was over six standard deviations better at rebounding than anyone else in the league[(14)]. When other players missed a shot, Rodman gave his teammates a second and third opportunity to score by rebounding the miss. Rodman was a key contributor to five championship teams (see Artemis 2016 market view "Dennis Rodman and the Art of Portfolio Optimization")

LAW OF COSMIC DUALITY IN INVESTING

In the ART OF INVESTING, we can demonstrate the concept of cosmic duality using a simple example. Let's imagine you have the ability to buy two assets out of a possible three choices. The first two assets have positive returns but closely track one another and the business cycle (**Asset A** & **Asset B**). The third asset loses money overall. However, **Asset C** is countertrend and makes profits opposite the business cycle, with the most substantial gains reserved for the periods when the other assets are in crisis.

What is the best portfolio? Counterintuitively, the portfolio that combines the opposing forces of positive and negative cycle assets (**Assets A + C**) outperforms dramatically, even if one of those assets has a negative yield. In this example, by combining two assets that are negatively correlated, you generate the same returns with 1/10th the volatility of the other pairing. If you need to meet a return target, you are far safer, leveraging the balanced portfolio (**Assets A + C**) rather than adding correlated risk (**Assets A + B**). ***In other words, anti-correlation is worth more than excess return.***



Source: Artemis Capital Management LP

The law of cosmic duality proves that, counter-intuitively, a defensive asset can be precious to the total portfolio, even if it fails to make money consistently. There is a unique power to assets that make asymmetric returns when secular growth fails that is not fully understood or appreciated. Risky growth assets do not become undervalued in a crisis because investors are irrational or stupid, but rather because they lack money, liquidity, financing, or the risk tolerance to buy or hold them. It is difficult to predict with accuracy when risk and liquidity panics will occur, and they are understood only in retrospect. Hence, Traditional Portfolios lose money in unpredictable, correlated, and underestimated fashions. Countertrend assets dampen aggregate volatility and give the investor the ability to re-allocate capital to undervalued assets in real-time. It is always hard to "catch a falling knife," as per the old market adage, but it is a lot easier when you are wearing protective gloves and armor. The problem is that traditional investment analysis does not value defensive and countertrend assets accurately within the broader perspective of long-term wealth creation.

THOSE WHO PLACE THE POWER OF MAN ABOVE THE NATURAL LAWS OF THE UNIVERSE DO SO AT THEIR PERIL

As ego-driven humans, we have trouble accepting that the self-destruction of any natural or self-organizing system is an inevitable law of nature. Of the fifty most significant companies operating in 1917, only three are still members of the S&P 500 index in their current form (Forbes). The odds are that Amazon, Apple, and Facebook will not be around in 100 years or will be unrecognizable from the companies they are today.

Even in a world where money or monetary policy did not exist, economic growth would periodically and inevitably lead to a collapse (volatility) as a consequence of resource extraction, population explosions, war or political strife, biological risks, and climate change (please see the work of Jared Diamond in "Collapse" and the Pulitzer Prize-winning "Guns, Germs, and Steel"). To envisage that any process of expansion, economic or otherwise, can continue unabated forever ignores lessons from thousands of years of human civilization and millions of years of natural laws and entropy. If you only embody the growth cycle in your portfolio, your foundation for long-term success is unbalanced and brittle. If we wish to survive, we must embrace the inevitability of our fragility as a strategy unto itself.

THE COMBINATION OF DEFENSIVE AND OFFENSIVE ASSETS FORMS A COSMIC BALANCE THAT LEADS TO WEALTH CREATION AND PRESERVATION.

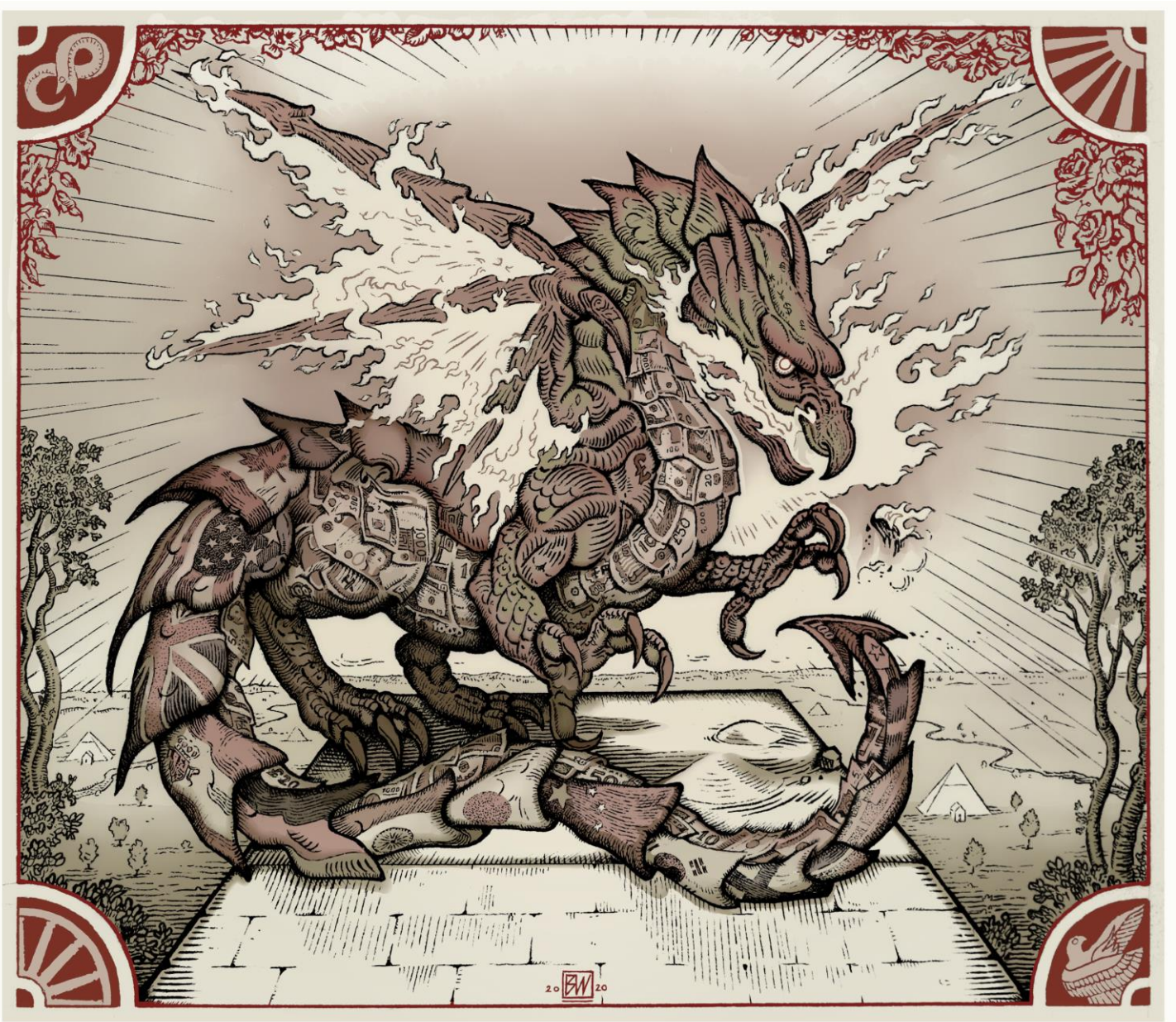
THE DRAGON - ANIMAL OF COSMIC BALANCE

The philosopher Pliney the Edler, in his work "Natural History" (c.100AD), refers to a Serpent so tightly wound around a Hawk that they appear as one animal[15]. The cosmic balance between these two fighting creatures is the winged serpent, otherwise known as a Dragon. Dragons appear in all cultures as a symbol of power and prosperity.

Like the Dragon, the most effective century-long portfolio seeks equilibrium between the juxtaposed forces of the Hawk and Serpent; principally assets that perform during eras of secular change (Hawk), versus those that perform best during economic stability and growth (Serpent).

The solution to the successful 100-year portfolio is unbelievably simple when you study financial history: find assets that can perform when Stocks and Bonds collapse, and boldly own them regardless of short term performance. Long Volatility, Gold, Commodity Trend, and Discretionary Global Macro should be core portfolio holdings, much like Bonds, and not just periphery investments. The elegant simplicity of this solution belies the incredible complexity of actually implementing a strategy that runs counter to consensus thinking.

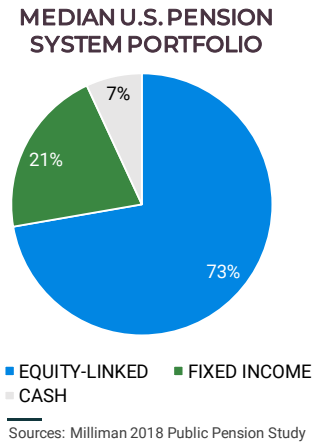
TO THRIVE OVER 100 YEARS, BALANCE ASSETS THAT PROFIT FROM SECULAR GROWTH WITH THOSE THAT PROFIT FROM SECULAR DECLINE

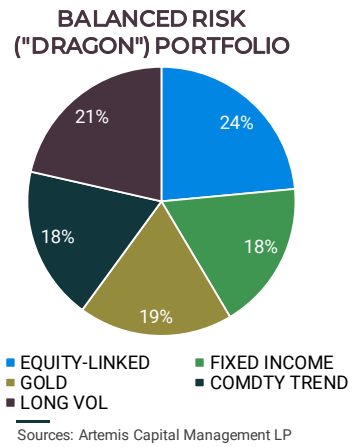


THE SECRET TO A PORTFOLIO THAT STANDS THE TEST OF TIME IS DIVERSIFICATION OVER A CENTURY, NOT A DECADE

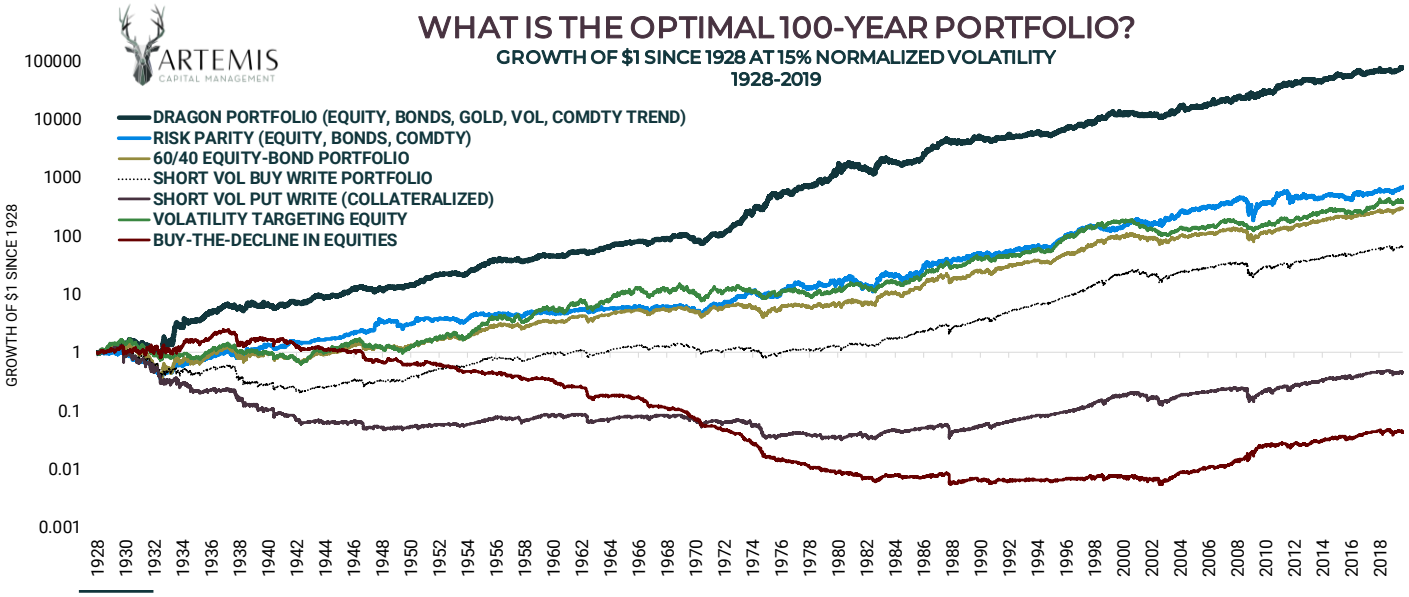
What we learned from our in-depth study of financial history is that investors should prioritize **SECULAR NON-CORRELATION** over **EXCESS RETURNS**. The key to superior portfolio returns is to make surprisingly large allocations to alternative assets that perform when Stocks and Bonds do not. The investor can then apply margin to the risk-balanced portfolio to meet return targets, rather than seek the excess return from components. Assets like Long Volatility, Gold, Commodity Trend, and Discretionary Global Macro should be core portfolio holdings. The optimal portfolio, since 1929, included risk-weighted combinations of Domestic Equity (24%), Fixed Income (18%), Active Long Volatility (21%), Trend Following Commodities (18%), and Physical Gold (19%). This allocation is highly unorthodox compared to a Traditional Pension Portfolio dominated by Equity-Linked assets (73%) and Fixed Income (21%)[16].

Most investors think the role of DEFENSIVE ASSETS is to make money during a rainy DAY, but history shows the real reason to hold these assets is to make money during a rainy DECADE.





The balanced **DRAGON PORTFOLIO** substantially outperformed all alternatives throughout the last 90 years when adjusted for risk. It performed in all economic eras with tolerable drawdowns. The portfolio compounded at +14.4% per annum (at 15% annualized volatility) between 1928 and 2019, with a return to risk ratio of 0.98x, with almost half the max drawdown of the Classic 60/40 Equity-Fixed Income or Risk Parity Portfolios. On an unadjusted basis, the Dragon Portfolio generates approximately the same returns as a Traditional 60/40 Portfolio with half the risk. Returns are excellent through secular booms (1946-1964, 1984-2007, 2009-2019) and declines (1928-1946, the 1970s, 2008), including stable profits in all four generational seasons. A modern implementation of the Dragon Portfolio is possible using passive indices and hedge funds with impressive results (see page 25). Please refer to the Appendix for a full set of detailed assumptions and analysis relating to all relevant strategies and assets discussed herein.

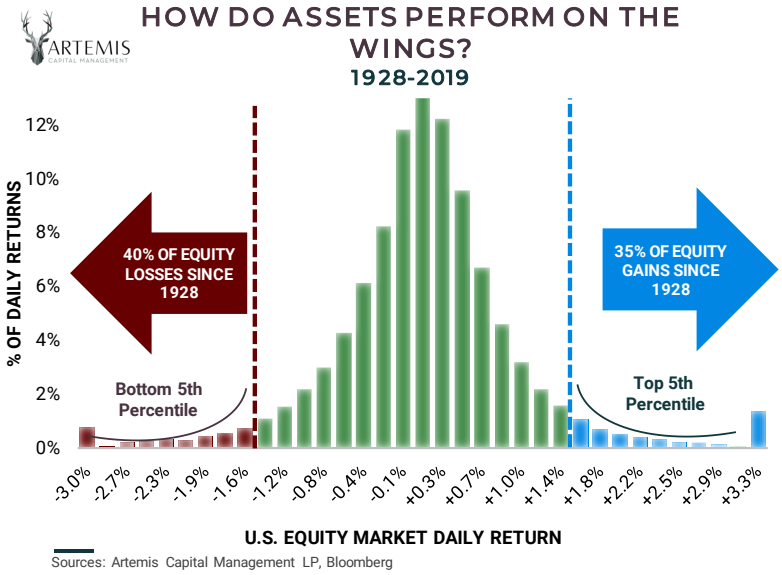


Sources: Artemis Capital Management LP, Global Financial Data
Hypothetical performance back to 1928 requires assumptions based on avalaible data, please see appendix for specific details. Past performance not indicative of future returns.

THE WINGS OF THE RETURN DISTRIBUTION

A Hawk hunts by spreading its wings in short bursts of speed. The Serpent hunts by coiling around and steadily suffocating its prey in the middle. Different asset classes mirror these respective forms of attack. The violent dance between these two styles of returns creates a balanced and consistent performance throughout all regimes.

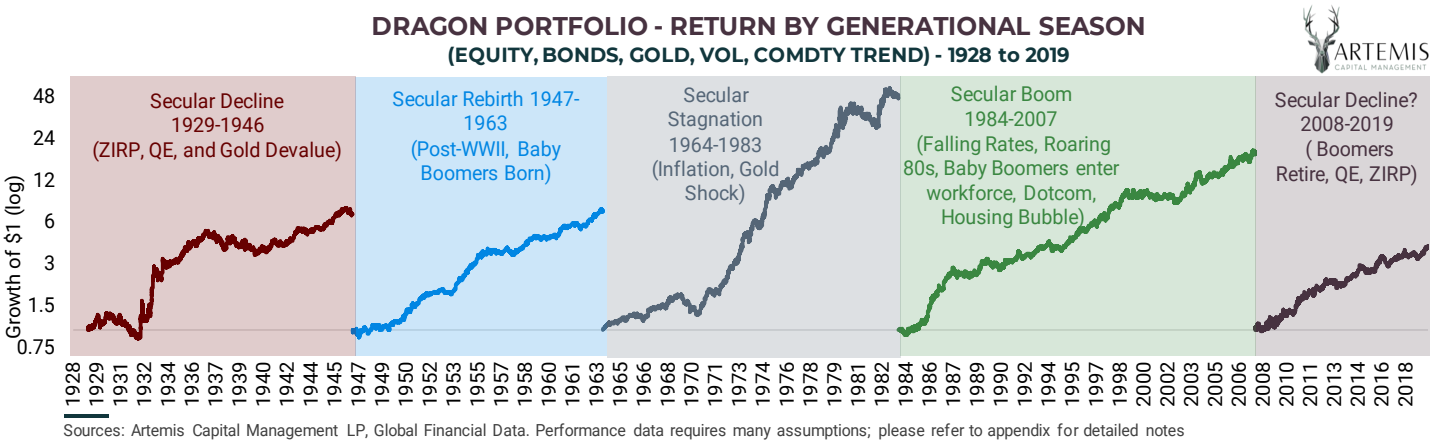
We find it puzzling that institutions focus on superficial asset buckets but fail to categorize investments by what matters. The return of an asset on an average day, or "middle" of the return distribution, tells you very little about its value. What matters is the performance on the most extreme days, months, and decades, otherwise known as the "wings" of the return distribution. The chart to the right shows the return distribution of U.S. Equities since 1928. Consider the fact that the bottom 5th percentile of the down days is responsible for 40% of the total losses since 1929. The top 5th percentile of the up days is responsible for 35% of the overall gains in the index since 1929. Most investors only focus on what happens in the middle but fail to realize that the key to lasting performance, good or bad, occurs on tails.



A SERPENT asset derives steady gains during periods of stability and growth (1947-1963,1984-2007) in exchange for a substantial loss in the event of secular change. Traditional Serpent assets include Equity, Credit, Real Estate, Risk Premia, Private Equity, and other Equity-Linked products. For pro-growth assets, most of the excess return comes from applying leverage to the middle of the return distribution (linearity), based on the cyclical availability of credit. The more credit becomes available, the greater the debt expansion, and the higher the asset prices will rise in a spiral. At first, debt expansion is financed by cash flow and growth. Then, as animal spirits grow and greed replaces fear, financing is extended based on the speculative expectation of perpetual asset price growth and liquidity. At this point, the growth cycle enters into a dangerous and unstable phase, hence the analogy of a Serpent devouring its tail until it kills itself.

A HAWK asset accumulates small losses or neutral performance during a period of stability and exponential gains during periods of change (1928-1948,1964-1983, 2007-2008). The change could be on the left-wing through deflation (the 1930s) or the right-wing through rampant inflation (1970s). Hawk assets include Gold, Volatility, Commodity Trend Following, and Global Macro Trading. Hawk assets generally require active management with excess returns coming from explosive price momentum in either direction.

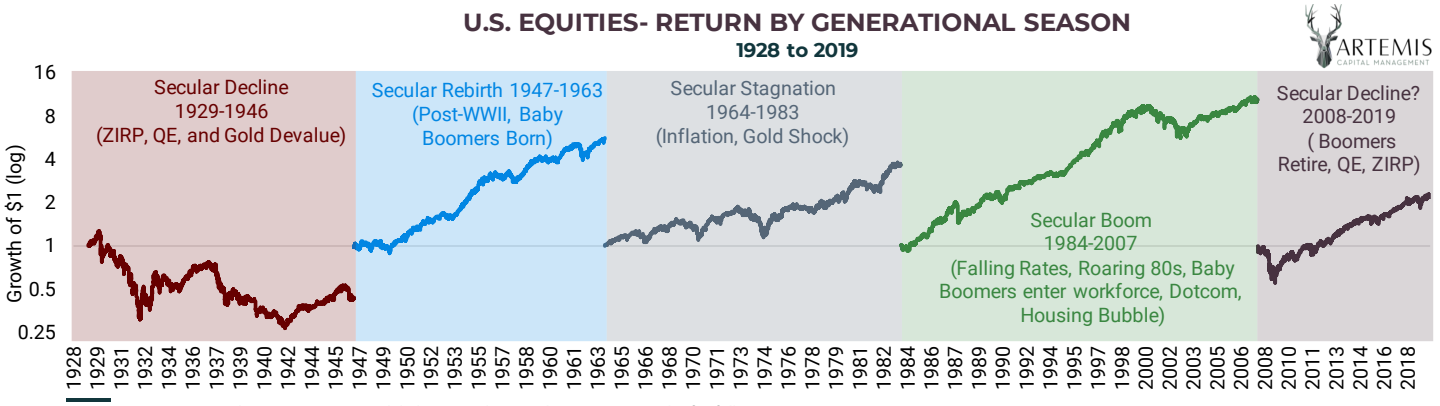
A DRAGON combines the exposures of the Hawk and the Serpent to create an aggregate asset that performs throughout all market cycles. The Dragon Portfolio makes money in the middle, but is most explosive on either wing of the return distribution, generating consistent risk-adjusted returns that are safely leverageable to meet the desired return target.



SERPENT ASSETS PROFIT FROM SECULAR GROWTH AND STABILITY

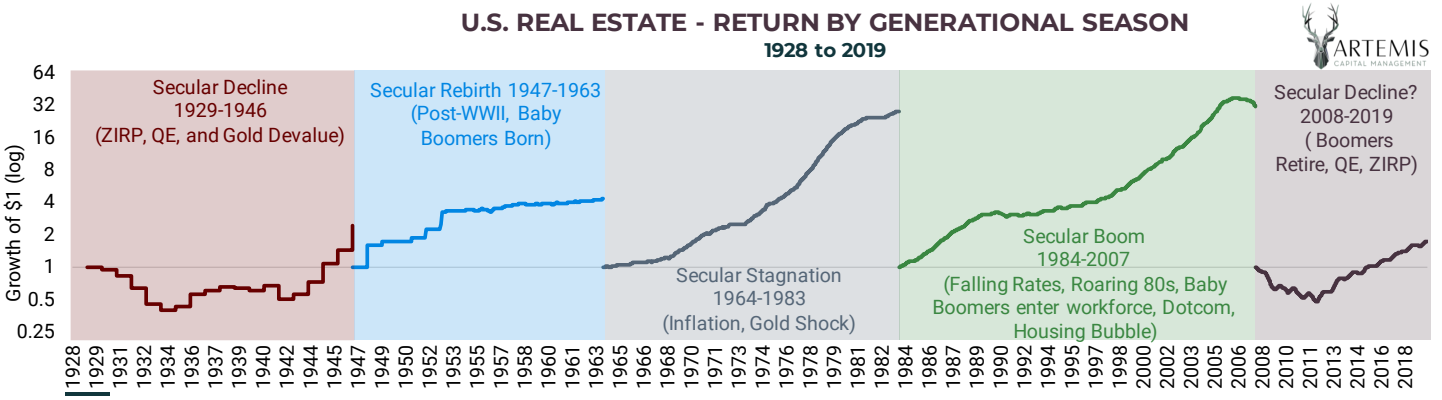
Equity, Real Estate, Corporate Bonds, and Equity-Linked investments are the core of the secular growth portfolio because they consistently leverage the middle of the risk distribution to profit from economic expansion. Like a Serpent, they compress inward, gathering strength from the credit cycle. At the same time, these assets are not true diversifiers.

EQUITY MARKET performance is correlated to the business cycle and relies on stability and the assumption of growth for performance. The mythology that Stocks always rebound from losses is uniquely American. For example, Japanese investors that bought Equities in the late 1980s, or Spanish, Greek, or Italian investors in mid-2007, still have not recovered.



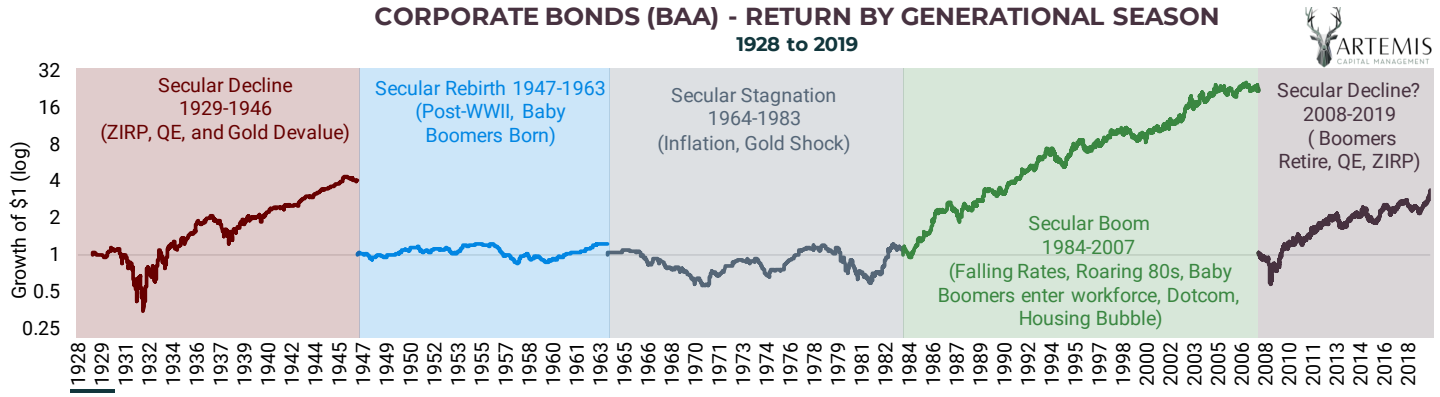
Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions.

REAL ESTATE, defined herein as price appreciation of a single-family home in the United States, is one of the most important investments for the typical American family. The salaryman(woman) that owns a house with a mortgage at a 20% downpayment has replicated a 5x leveraged exposure to the business cycle. While the return to risk is better than Equities (especially after taxes), this investment will still suffer during periods of secular decline, including the periods between 1929-1944 and 2007-2011. Real Estate has the highest return to risk of any single asset we tested over 90 years.



Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions.

CORPORATE BONDS are currently yielding at the lowest level since the 1940s, while corporate debt as a percentage of GDP is at all-time highs (47%). Corporate Bonds are affected by the growth and rate cycle, in addition to investor perception of credit risk. Falling rates and rising asset prices resulted in a magic combination throughout most of the last forty years, but Credit underperformed Equities throughout the growth cycle of the 1950s. Rising rates and higher credit spreads resulted in multi-year losses throughout the 1960s and 1970s during the era of stagflation.



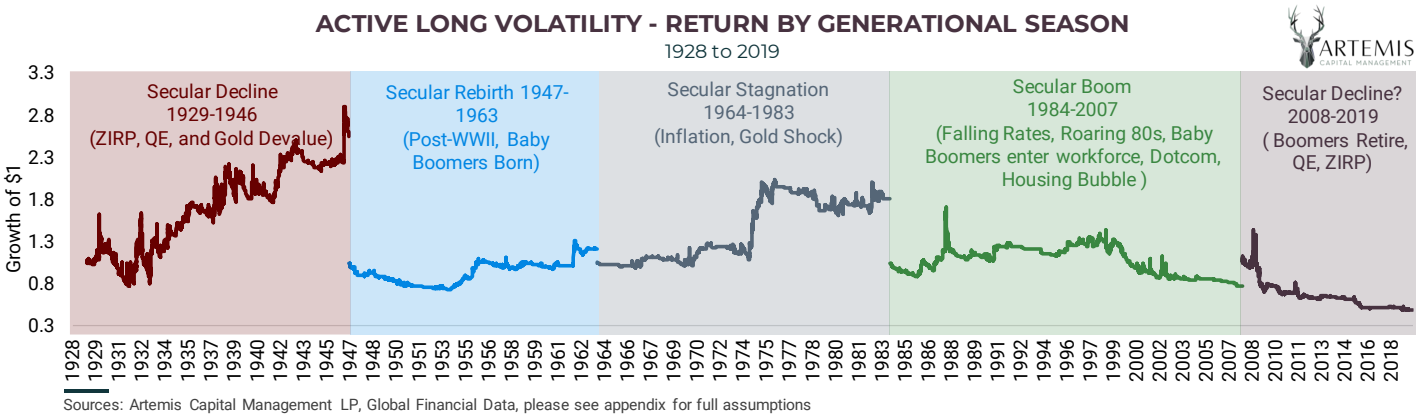
Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions.

HAWK ASSETS PROFIT FROM SECULAR CHANGE

Hawk assets profit from periods of deflation or fiat debasement, making money in large bursts on the wings of the risk distribution. What few realize is that these periods of outperformance can last months, years, or even a decade. Most investors chase these assets after the fact rather than allocating pro-actively as part of a balanced portfolio. It is foolish to seek out defensive assets when markets have already crashed or to liquidate completely after a stretch of challenging performance. Hawk assets are difficult emotionally, as their profit profile runs counter to our behavioral programming.

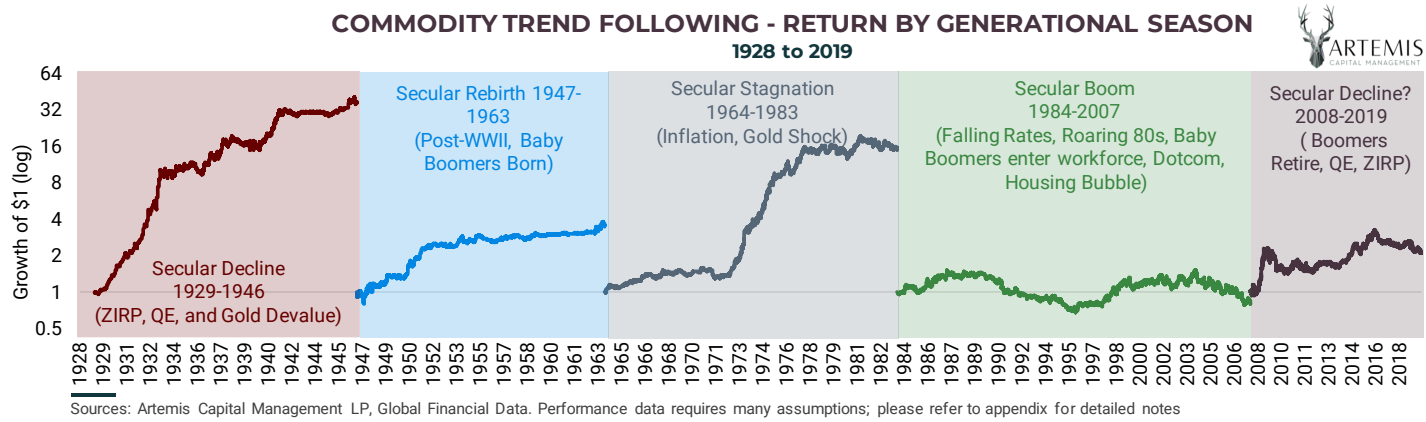
ACTIVE LONG VOLATILITY is mathematically one of the most under-allocated assets in the tool-box based on its protective properties. Long Volatility describes strategies that buy options opportunistically to profit from turbulence while seeking to minimize the cost as a "smart" insurance policy against deflation or fiat debasement. The approach is comparable to a defensive player or goalie in a sport, whereby value comes from preventing losses rather than from scoring.

As a countertrend asset, Active Long Volatility is just as essential to wealth preservation as Fixed Income according to portfolio optimizations run over 90 years. The primary value-add of Long Volatility is anti-correlation to the growth cycle and explosive performance during market crises. The strategy is differentiated from Portfolio Insurance ("Tail Risk Hedging") because it forgoes continuous protection for more dynamic hedging to lower costs. Long Volatility is intended to profit from melt-ups (the late-1990s, late-1950s, 1970s) or melt-downs (1930s, 2008) in markets and requires volatility and trend to perform. We modeled the strategy as buying Equity volatility (via options) in the direction of the market after a move greater than +/- 5% in either direction over any rolling three months. The strategy, as presented, is intended to represent a profoundly simple (and less effective) replication of what Active Long Volatility managers do for their clients.



Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions

COMMODITY TREND FOLLOWING is an active strategy that seeks to monetize the tendency for raw goods prices (e.g., crude oil, natural gas) to break higher or lower from an established price range due to supply and demand. Commodities trend higher in periods of extreme inflation (the 1970s) and lower in deflation (1930s, 2008), and a strategy that profits from those trends have shown non-correlation to Stocks and Bonds. To test this strategy over 90 years, we applied a simple fifty-day moving average signal to buy or sell a broad basket of commodities using data back to 1928.

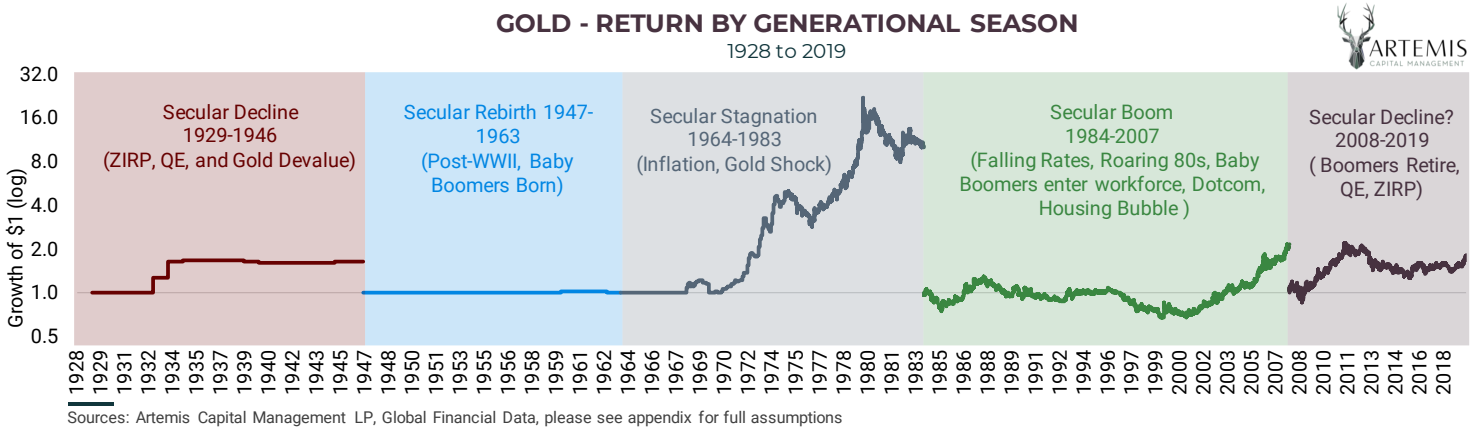


Sources: Artemis Capital Management LP, Global Financial Data. Performance data requires many assumptions; please refer to appendix for detailed notes

The traditional method for investors to access Long Volatility and Commodity Trend is through private hedge funds. Rather than relying on any single fund, savvy investors often combine several defensive funds in a mosaic approach. For a starting point, consider constituent members of the **CBOE Eurekahedge Long Volatility Hedge Fund Index** and the **HFRX Macro Systematic Diversified CTA Index**. Discretionary Global Macro investing, through hedge fund vehicles, has also traditionally served as a defensive style of investment depending on the manager. As there is no way to test this asset class systematically into the past, we have excluded it from our analysis, but urge its consideration.

HAWK ASSETS THAT PROFIT FROM MONETARY DEBASEMENT

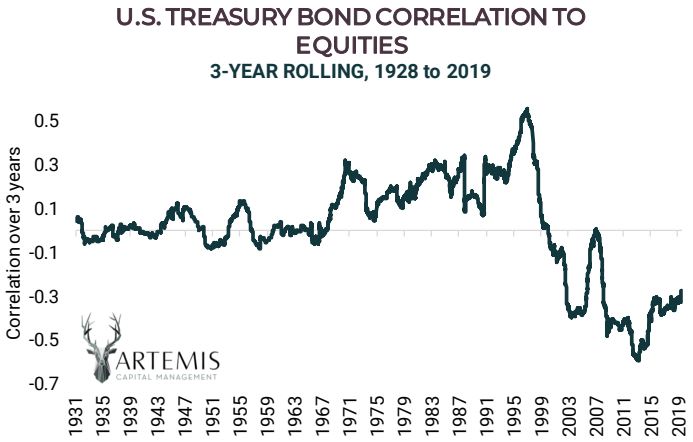
GOLD has been an insurance policy against fiat debasement for 4,000 years. The performance of Physical Gold during the 1930s, 1970s, and 2000-2012 demonstrates how it can protect a portfolio from devaluation, political risk, and war. Gold has, surprisingly, outperformed the stock market on a price appreciation basis over the past 48 years since Nixon de-linked U.S. dollar-based convertibility on August 5th, 1971. Any student of market history knows how Gold has played an important role in wealth preservation since Roman times. Gold is also severely under-allocated in Pension and retirement portfolios.



Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions

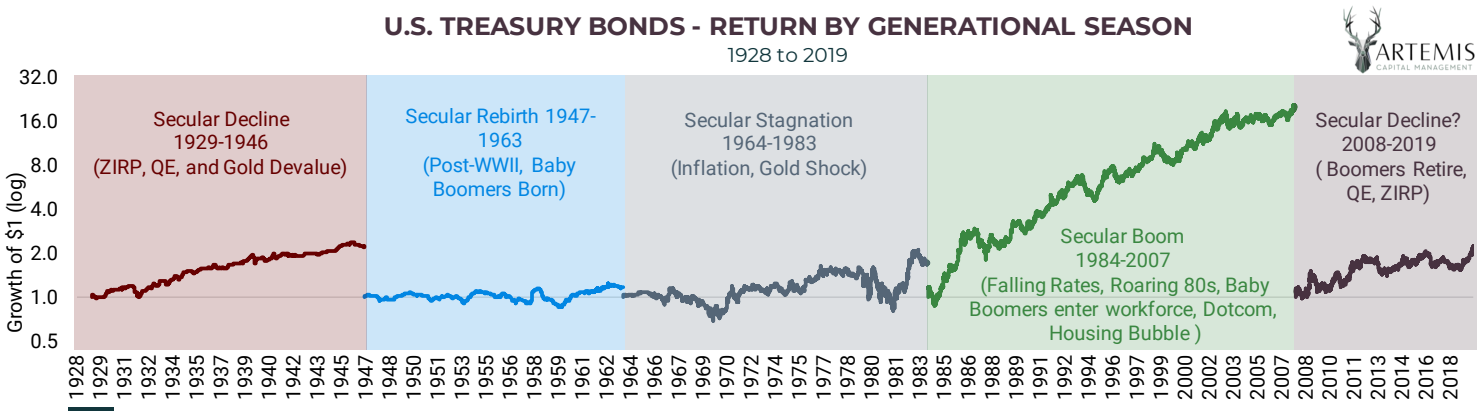
A HAWK AND SERPENT HYBRID WITH AN ACHILLES HEEL

HIGH-QUALITY BONDS are a unique hybrid between the Serpent and the Hawk. For the past 40 years, U.S. Treasuries have served as the perfect defensive asset, providing consistent positive carry and high capital appreciation during periods of financial stress. The excellent performance of Bonds over the past 40 years is the direct result of policymakers aggressively cutting rates (19% in 1981 to 0% by 2009) during any period of crisis. Unfortunately, modern portfolios have become dangerously reliant on Bonds as a source of diversification, just as correlations to Equities are near multi-decade lows. For Treasury Bonds to generate the same capital appreciation today that they did in 2008, the 10-year would have to move to -1.5% percent. While this is possible, it is not probable and has serious social consequences if adopted. Bonds also underperform in periods of rapidly rising inflation (the 1970s).



Sources: Artemis Capital Management, Global Financial Data

Many investors assume that Stocks are always anti-correlated to Bonds, but at the zero bound, Fixed Income can struggle as a diversifier. It is essential to understand that these problems are not new; the Fed lowered interest rates close to the zero bound and attempted a version of quantitative easing as far back as the 1930s. Bonds also struggled for nearly four decades between the late-forties and early-1980s, returning ~+1% a year unadjusted for volatility. Stocks and Bonds have spent more time-correlated to one another than anti-correlated.



Sources: Artemis Capital Management LP, Global Financial Data, please see appendix for full assumptions

THE REAL PROBLEMS OF PORTFOLIO MANAGEMENT ARE CULTURAL AND NOT ECONOMIC

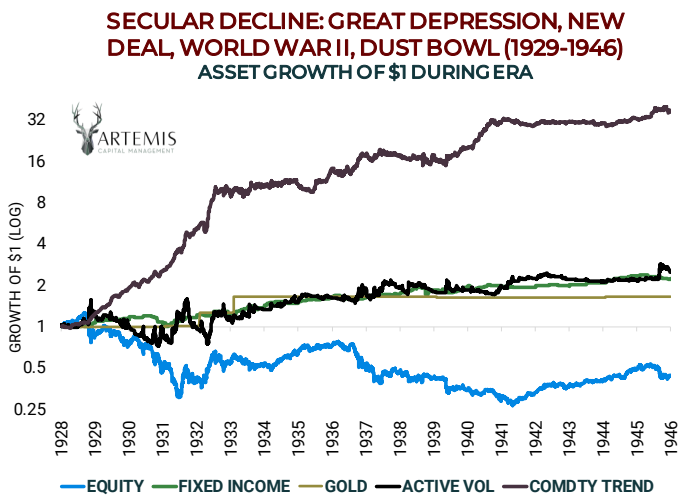
Self-discipline is the hardest part of implementing a successful 100-year portfolio. What is extremely important to understand is that in the balanced portfolio, each of the five core asset classes (Equity, Fixed Income, Gold, Active Volatility, Commodity Trend) can go a decade or more without performing, but what matters is that they are all non-correlated to one another. The average investor may look at these results and mistakenly think they can time the business cycle, but this makes for a grave error.

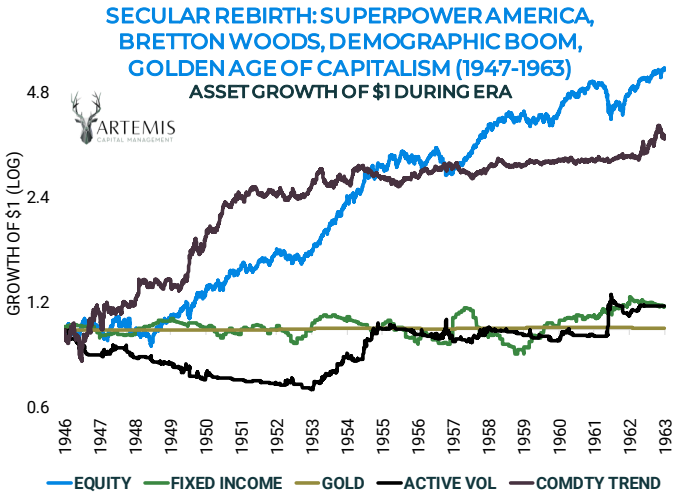
As an investor, you are unlikely to have the freedom to reallocate to undervalued assets if you have not systematized your response to secular decline.

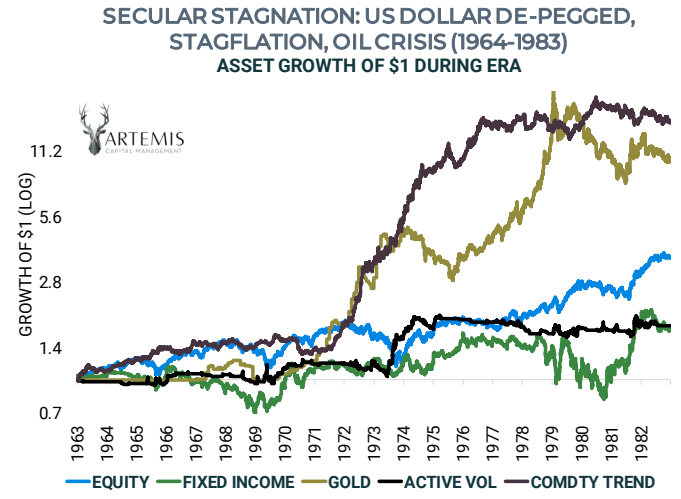
When Stocks and Bonds were struggling in the 1930s and 1970s, Commodity Trend Following and Long Volatility outperformed. When Long Volatility and Commodity Trend underperformed from 2012 to 2019, Stocks and Bonds outperformed. Gold and Long Volatility have historically provided explosive performance during periods of fiat debasement as well. While Hawk assets have underperformed over the last decade, Active Long Volatility (+3.3% per annum), Commodity Trend (+14.4% per annum), and Gold (+5.2% per annum) achieved positive returns from 1928 to 1984. It may be surprising, but the last forty years of losses in defensive assets where an anomaly and not the norm.

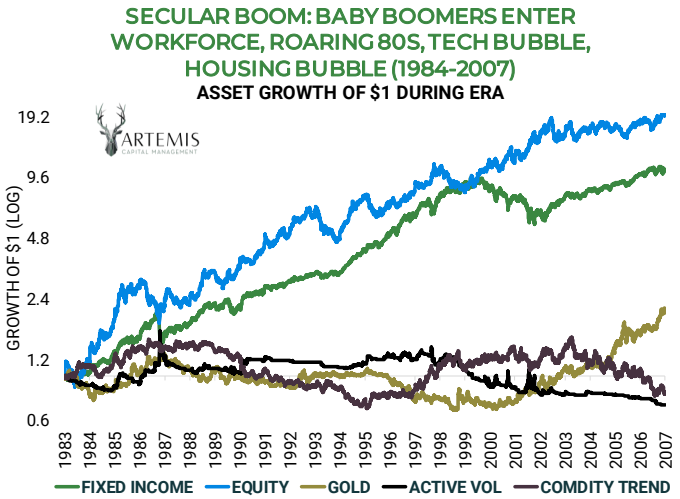
It is challenging for an investor to hold a position in defensive assets when Stocks and Real Estate are exploding higher at the end of the bull market. Ironically, it is equally as challenging to maintain a position in Equities after a -50% decline in the market, at which point defensive assets are back in demand. It is human nature to seek insurance after the storm.

The act of abandoning any of these assets, even after a decade of underperformance, destroys the point of the balanced portfolio. Very few fiduciaries understand this effect, and even fewer have the emotional and intellectual discipline to implement this portfolio.









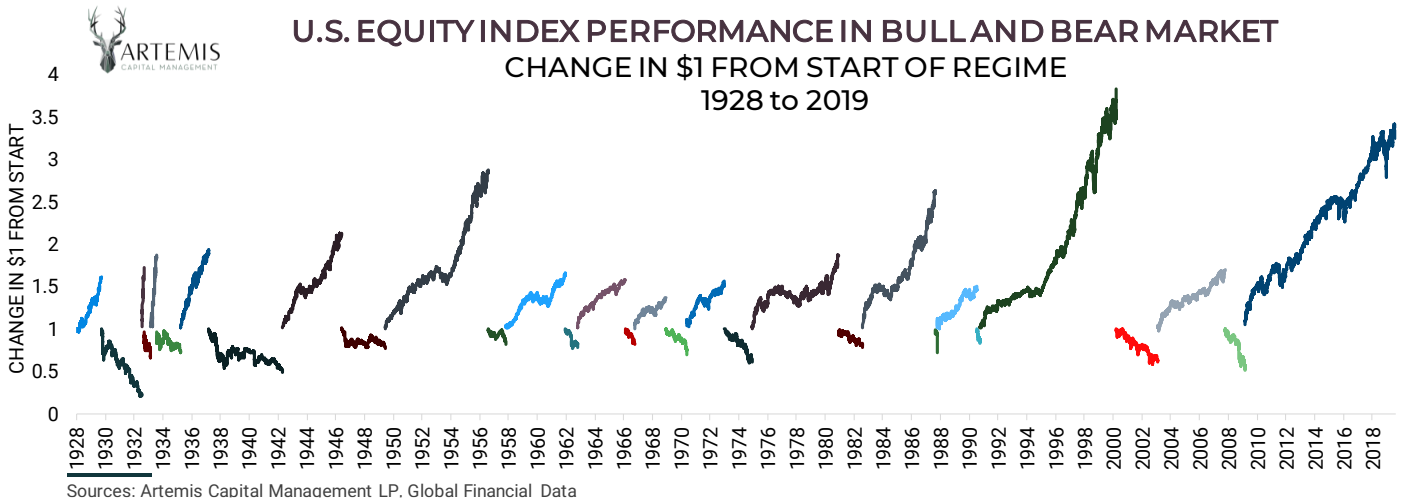
Sources: Artemis Capital Management LP, Global Financial Data
Hypothetical performance back to 1928 requires assumptions based on avalaible data, please see appendix for specific details. Past performance not indicative of future returns.

THE MOST CHALLENGING HURDLE TO CONSTRUCTING A PORTFOLIO THAT THRIVES OVER 100 YEARS IS SOCIAL AND NOT FINANCIAL

As humans, we feel real pain when we go against the grain because we are biologically programmed to be part of a group. The average investor is not emotionally equipped to run a near-equal allocation between traditional and non-traditional assets. It is not intuitive to reallocate gains from a performing asset to something that hasn't made money in a decade.

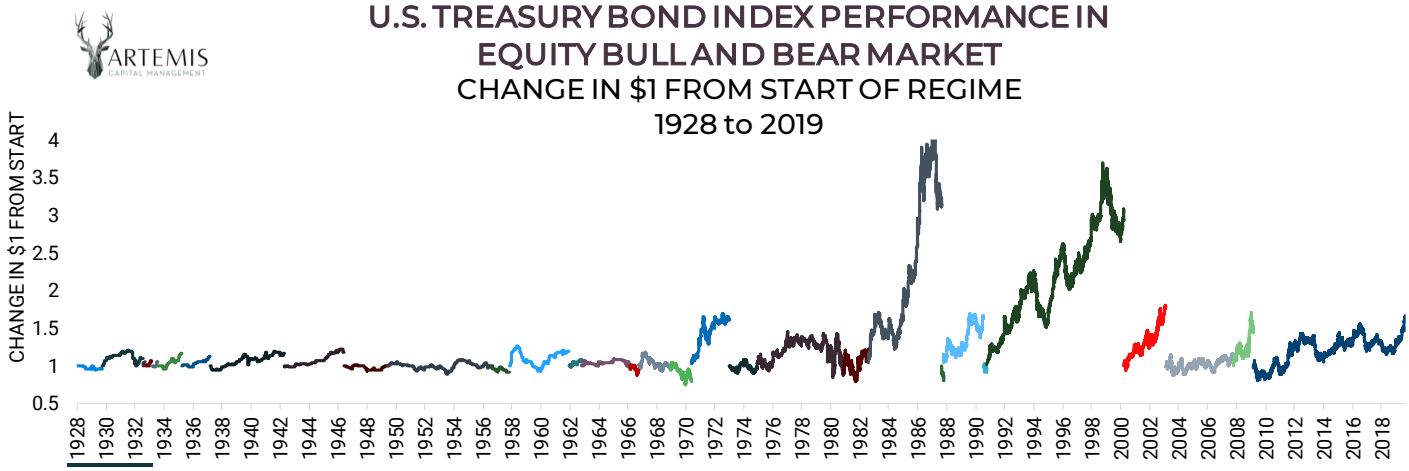
It may be helpful to contextualize recency bias by looking at periods where the collective knowledge today worked in reverse. The charts below are visualizations of asset performance through 30 combined bull and bear markets over 90 years of marketplace history. Imagine the emotional swings behind these significant market moves across history.

THE YEAR IS 1945, and you are a WWII veteran in your mid-twenties looking to settle down and establish a family. The market feels like gambling. You remember how your parents lost everything in the Great Depression, including their home. Despite a three year rally, the stock market has yet to recover losses from the last 17 years. Friends and family were routinely tricked by speculative rallies over the 1930s, only to see the market continue to decline. You saw it all in the 1930s: near-zero interest rates, fiscal spending projects, bank holidays, money printing to buy Bonds, tariffs, Gold devaluation, and then war. Why would 1945 finally be a good time to invest when you could put your money in a secure Certificate of Deposit? The Silent Generation (1925-1945) maintained this aversion to the risk assets their entire lives. Those who succumbed to fear in the 1940s missed out on a once in a generation secular boom in the 1950s and the 1980s.



Sources: Artemis Capital Management LP, Global Financial Data

IT WAS THE EARLY 1980S, and risk-free was somehow risky. U.S. Treasury Bonds lost half their value between 1977 and 1981 (at 15% volatility) as double-digit inflation raged in a stagflationary bear market. In an old episode of the television show "The Golden Girls," one of the lead characters discussed how she couldn't beat her "low" 10% mortgage rate if she ever sold her home[17]. In a Detroit-area car commercial from the mid-1980s, Mel Far "Superstar" entices the viewer to buy a Ford Mustang with an auto-loan at a low 19% APR[18]. At this time, the brave analyst that recommended Bonds as an 'Equity hedge' would have likely faced ridicule and humiliation. Times change, and carrying "consensus knowledge" forward is often damaging to the investor.



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avalaible data, please see appendix.

Today we have very different emotional responses to Stocks, Bonds, and Real Estate based on our generational biases toward risk. We must be aware of our prejudices within the context of the secular cycle of risk. We cannot assume that what we know from direct experience represents a universal truth through all eras. We might have had entirely different emotional pre-dispositions to risk assets if we lived in a different generation.

RECENCY BIAS IS NOW A SYSTEMIC RISK, the full social implications of which will become increasingly clear over the next decade. The average institutional and retail portfolio is essentially a wager that the once in a lifetime returns from the secular boom of 1984-2007 will somehow repeat, against all historical odds. In the event of an extended period of declines or mediocre returns, State Pension Systems will collectively require a $3 to 10 trillion dollar bailout or face insolvency[19]. Those bail-out numbers do not even account for underfunding in corporate and private portfolios. With 76 million baby boomers retiring, this issue will define the next decade, and investment risk will become even more socialized.

There is no need to occupy Wall Street
because Wall Street will eventually occupy itself[20]

In the event of a global recession, financial crash, or merely a decade of below-average returns, social tensions will likely force policymakers to bail out the entire entitlement system. The most likely solution is that the Federal Reserve will print money to buy Pension Obligation Bonds from State and Local governments at artificially low-interest rates to plug a multi-trillion dollar unfunded liability. The proceeds from the sale will then be reinvested into financial assets propping up markets. The government may even prohibit systemically essential institutions like banks and large asset managers from selling. If this happens, it will be the first step toward full fiat devaluation and helicopter money. There is a genuine risk that populist anger and bail-outs may threaten the social fabric of our democracy.

The pendulum is swinging from wealth creation to wealth redistribution. The truth is that if fiduciaries study economic history and have the courage to think differently, we can avoid a social calamity

IT IS NOT ABOUT BEING AFRAID. IT IS ABOUT BEING PREPARED

For my family, exposure to assets that profit from change (Volatility and Gold) through the last financial crisis had a life-changing impact, shielding their entire portfolio from a catastrophic loss, and allowing my Father and Mother to retire as planned. If we want to protect the quality of life of those we love, we must be bold in pushing beyond the conventions that created our problems in the first place.

The successful 100-year portfolio must be able to navigate the secular booms of the Serpent while not losing capital during periods of turbulent change represented by the Hawk. An awareness of these secular regimes is useful, but timing them is not necessary or even helpful. The portfolio that maintains cosmic balance at all times will perform through all secular cycles, be it growth or decline.

NEVER EMBODY ONLY THE HAWK OR THE SERPENT

BECOME A DRAGON

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ARTEMIS
CAPITAL MANAGEMENT

RISK CANNOT BE DESTROYED; IT CAN ONLY BE SHIFTED THROUGH TIME AND REDISTRIBUTED IN FORM. IF YOU SEEK TOTAL CONTROL OVER RISK, YOU WILL BECOME ITS SERVANT. THERE IS NO SUCH THING AS CONTROL. THERE ARE ONLY PROBABILITIES

“For suddenly, just as the men tried to cross,

A fatal bird sign flashed before their eyes,

An eagle clutching a monstrous bloody serpent in both talons, still alive,

Still struggling - it had not lost its fight,

Writhing back to strike it fanged the chest of its captor

The eagle flung it away to earth, dashed it down

Amidst the milling fighters, loosed a shriek

And the bird veered off along the gusting wind”

Homer, The Iliad

STRATEGY PERFORMANCE BY GENERATIONAL SEASON (1928 to 2019) (NOMINAL RETURNS)

Secular Era	PORTFOLIO				SERPENT			HAWK			HYBRID	LEFT WING	LEVERAGED SERPENT			
	Dragon Portfolio *(Eqty, Bonds, Gold, Vol, Comdty Trend)*	Classic 60/40 Portfolio *(Equity,Bonds)*	Risk Parity Portfolio *(Equity, Bonds, Comdty)*	Volatility Target	Equity	Real Estate	Corporate Bonds (Baa)	Gold	Comdty Trend	Active Volatility	U.S. Treasury Bonds	Portfolio Insurance *(Left Tail Risk / Put Buying)*	Equity Buy-on-Decline	Short Volatility *(Put + Call Selling)*	Put Write Strategy *(Sell Put w. Collateral)*	Buy Write Strategy *(Eqty + Call Selling)*
1928 to August 2019																
Annual Return (15 vol)	+14.4%	+7.9%	+9.1%	+6.7%	+6.4%	+11.2%	+6.8%	+4.7%	+9.2%	+0.7%	+5.9%	-3.5%	-3.4%	-2.3%	-0.8%	+4.7%
Annual Return (Cash)	+5.4%	+6.1%	+4.1%	+7.3%	+7.5%	+4.0%	+4.0%	+4.8%	+7.7%	+0.7%	+2.9%	-1.9%	-3.1%	-1.8%	-0.6%	+3.9%
Return to Risk	0.98x	0.59x	0.66x	0.51x	0.49x	0.77x	0.51x	0.38x	0.67x	0.12x	0.46x	-0.16x	-0.15x	-0.08x	0.02x	0.38x
Max Drawdown (15 vol)	-34%	-74%	-65%	-64%	-79%	-61%	-69%	-69%	-55%	-81%	-51%	-99%	-100%	-100%	-98%	-86%
Secular Decline: Great Depression, New Deal, World War II, Dust Bowl (1929-1946)																
Annual Return (15 vol)	+11.3%	-3.3%	+5.7%	-0.4%	-4.5%	+5.0%	+8.1%	+2.8%	+22.2%	+5.2%	+4.6%	+8.3%	-2.1%	-17.7%	-15.8%	-7.5%
Annual Return (Cash)	+4.5%	-2.0%	+2.6%	-0.5%	-6.0%	+2.4%	+4.9%	+2.9%	+18.2%	+3.6%	+2.1%	+5.7%	-1.8%	-14.9%	-13.3%	-5.7%
Return to Risk	0.68x	-0.04x	0.54x	0.06x	-0.09x	0.31x	0.49x	0.33x	1.31x	0.33x	0.66x	0.45x	0.02x	-0.70x	-0.62x	-0.25x
Max Drawdown (15 vol)	-34%	-74%	-65%	-64%	-79%	-60%	-69%	-3%	-24%	-54%	-16%	-45%	-70%	-98%	-96%	-86%
Secular Rebirth: Superpower America, Bretton Woods, Demographic Boom, Golden Age of Capitalism (1947-1963)																
Annual Return (15 vol)	+12.4%	+10.8%	+7.5%	+11.1%	+10.7%	+9.0%	+1.2%	+0.1%	+7.8%	+0.9%	+0.9%	-4.1%	-8.1%	-0.3%	+2.0%	+7.9%
Annual Return (Cash)	+4.6%	+8.0%	+3.3%	+12.2%	+13.0%	+3.3%	+0.7%	+0.1%	+6.4%	+0.6%	+0.5%	-2.5%	-7.5%	-0.2%	+1.8%	+6.4%
Return to Risk	1.40x	1.13x	0.79x	0.77x	1.11x	0.57x	0.26x	0.21x	0.79x	0.16x	0.17x	-0.49x	-0.83x	0.01x	0.27x	0.88x
Max Drawdown (15 vol)	-13%	-22%	-30%	-33%	-23%	-5%	-32%	0%	-22%	-33%	-26%	-58%	-80%	-38%	-30%	-25%
Secular Stagnation: US Dollar De-Pegged, Stagflation, Oil Crisis (1964-1983)																
Annual Return (15 vol)	+21.3%	+7.5%	+9.1%	+3.6%	+6.8%	+18.2%	+0.5%	+12.3%	+14.5%	+2.9%	+2.7%	-1.4%	-14.5%	-4.9%	-2.1%	+2.5%
Annual Return (Cash)	+7.9%	+5.7%	+4.1%	+3.9%	+8.1%	+6.1%	+0.5%	+12.9%	+12.2%	+1.7%	+1.6%	-0.7%	-13.6%	-4.1%	-1.7%	+2.1%
Return to Risk	1.25x	0.66x	0.67x	0.33x	0.67x	2.61x	0.11x	0.63x	1.03x	0.35x	0.24x	-0.11x	-1.53x	-0.42x	-0.16x	0.30x
Max Drawdown (15 vol)	-34%	-39%	-43%	-48%	-39%	-2%	-52%	-64%	-25%	-21%	-51%	-49%	-97%	-77%	-63%	-45%
Secular Boom: Baby Boomers enter workforce, Roaring 80s, Tech Bubble, Housing Bubble (1984-2007)																
Annual Return (15 vol)	+13.1%	+13.7%	+14.9%	+10.4%	+10.3%	+15.4%	+14.0%	+3.2%	-0.8%	-1.4%	+13.4%	-8.9%	+2.5%	+6.1%	+7.2%	+13.2%
Annual Return (Cash)	+4.9%	+10.3%	+6.4%	+11.4%	+12.3%	+5.2%	+7.9%	+3.3%	-0.5%	-0.6%	+6.2%	-5.3%	+2.4%	+5.3%	+6.2%	+10.7%
Return to Risk	0.95x	0.98x	1.00x	0.73x	0.79x	2.40x	0.94x	0.29x	0.02x	-0.05x	0.77x	-0.61x	0.26x	0.54x	0.60x	0.97x
Max Drawdown (15 vol)	-20%	-34%	-23%	-46%	-41%	-17%	-31%	-48%	-55%	-57%	-39%	-91%	-37%	-49%	-43%	-39%
Secular Decline: Great Recession, Global Everything Bubble (2008-2019)																
Annual Return (15 vol)	+12.7%	+9.4%	+6.0%	+7.0%	+7.2%	+4.8%	+11.0%	+5.2%	+6.7%	-6.8%	+7.1%	-11.1%	+9.8%	+9.5%	+5.5%	+5.4%
Annual Return (Cash)	+4.9%	+7.2%	+3.3%	+7.6%	+8.4%	+1.7%	+6.5%	+5.3%	+5.8%	-3.5%	+3.5%	-6.7%	+9.2%	+8.1%	+4.8%	+4.6%
Return to Risk	0.84x	0.69x	0.36x	0.51x	0.50x	0.56x	0.62x	0.37x	0.42x	-0.34x	0.47x	-0.60x	0.66x	0.68x	0.41x	0.38x
Max Drawdown (15 vol)	-17%	-39%	-59%	-29%	-45%	-54%	-46%	-43%	-39%	-69%	-30%	-83%	-24%	-28%	-43%	-48%

Sources: Artemis Capital Management LP, Global Financial Data, Bloomberg.

Hypothetical performance results require numerous assumptions based on avaliable data. Please refer to the appendix for a full description of these assumptions. Past performance is not indicative of future sucess.
Performance stated includes impact of inflation at the Consumer Price Index.

Legend:
Annual Return (15 volatility): The return per annum of the strategy normalized to an annual volatility of 15% since 1928. Financing charges are not applied.
Annual Return (cash funding): The return per annum of the strategy assuming it is fully cash funded.
Return to Risk: The ratio of the per annum return to the realized annual volatility over the specified time period. Does not include risk-free rate.
Max Drawdown: The largest peak to trough drawdown the strategy experienced in the given time period.

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HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM. ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING

STRATEGY PERFORMANCE BY GENERATIONAL SEASON (1928 to 2019) (ADJUSTED FOR INFLATION)

Secular Era	PORTFOLIO				SERPENT			HAWK			HYBRID	LEFT WING	LEVERAGED SERPENT			
	Dragon Portfolio *(Eqty, Bonds, Gold, Vol, Comdty Trend)*	Classic 60/40 Portfolio *(Equity,Bonds)*	Risk Parity Portfolio *(Equity, Bonds, Comdty)*	Volatility Target	Equity	Real Estate	Corporate Bonds (Baa)	Gold	Comdty Trend	Active Volatility	U.S. Treasury Bonds	Portfolio Insurance *(Left Tail Risk / Put Buying)*	Equity Buy-on-Decline	Short Volatility *(Put + Call Selling)*	Put Write Strategy *(Sell Put w. Collateral)*	Buy Write Strategy *(Eqty + Call Selling)*
1928 to August 2019																
Annual Return (15 vol)	+10.1%	+3.9%	+5.0%	+2.7%	+2.3%	+7.0%	+2.7%	+0.7%	+5.1%	-3.1%	+1.9%	-7.1%	-7.0%	-6.0%	-4.6%	+0.7%
Annual Return (Cash)	+1.5%	+2.1%	+0.2%	+3.2%	+3.4%	+0.1%	+0.1%	+0.8%	+3.7%	-3.1%	-1.0%	-5.6%	-6.7%	-5.5%	-4.3%	+0.0%
Return to Risk	0.72x	0.33x	0.40x	0.25x	0.23x	0.51x	0.26x	0.12x	0.41x	-0.14x	0.20x	-0.42x	-0.41x	-0.34x	-0.24x	0.12x
Max Drawdown (15 vol)	-49%	-78%	-70%	-77%	-82%	-67%	-88%	-93%	-89%	-98%	-83%	-100%	-100%	-100%	-100%	-89%
Secular Decline: Great Depression, New Deal, World War II, Dust Bowl (1929-1946)																
Annual Return (15 vol)	+9.7%	-4.6%	+4.2%	-1.8%	-5.8%	+3.6%	+6.6%	+1.4%	+20.5%	+3.7%	+3.1%	+6.8%	-3.5%	-18.9%	-17.0%	-8.8%
Annual Return (Cash)	+3.0%	-3.4%	+1.1%	-1.9%	-7.3%	+0.9%	+3.5%	+1.5%	+16.5%	+2.2%	+0.6%	+4.2%	-3.2%	-16.1%	-14.6%	-7.1%
Return to Risk	0.61x	-0.10x	0.41x	-0.04x	-0.15x	0.25x	0.42x	0.18x	1.22x	0.28x	0.46x	0.38x	-0.04x	-0.76x	-0.68x	-0.31x
Max Drawdown (15 vol)	-38%	-78%	-69%	-69%	-82%	-67%	-71%	-13%	-24%	-57%	-18%	-48%	-72%	-98%	-97%	-89%
Secular Rebirth: Superpower America, Bretton Woods, Demographic Boom, Golden Age of Capitalism (1947-1963)																
Annual Return (15 vol)	+9.6%	+8.0%	+4.8%	+8.4%	+8.0%	+6.3%	-1.3%	-2.4%	+5.1%	-1.6%	-1.6%	-6.5%	-10.4%	-2.8%	-0.5%	+5.3%
Annual Return (Cash)	+2.0%	+5.3%	+0.7%	+9.4%	+10.2%	+0.8%	-1.8%	-2.4%	+3.8%	-1.9%	-2.0%	-4.9%	-9.8%	-2.7%	-0.7%	+3.8%
Return to Risk	1.11x	0.87x	0.53x	0.61x	0.86x	0.47x	-0.23x	-8.22x	0.54x	-0.18x	-0.16x	-0.80x	-1.10x	-0.26x	-0.01x	0.61x
Max Drawdown (15 vol)	-16%	-23%	-32%	-35%	-24%	-11%	-41%	-34%	-23%	-40%	-39%	-70%	-86%	-53%	-37%	-26%
Secular Stagnation: US Dollar De-Pegged, Stagflation, Oil Crisis (1964-1983)																
Annual Return (15 vol)	+12.7%	-0.1%	+1.4%	-3.7%	-0.8%	+9.8%	-6.6%	+4.4%	+6.5%	-4.4%	-4.5%	-8.4%	-20.5%	-11.6%	-9.0%	-4.7%
Annual Return (Cash)	+0.3%	-1.8%	-3.2%	-3.4%	+0.5%	-1.4%	-6.6%	+5.0%	+4.2%	-5.4%	-5.5%	-7.7%	-19.7%	-10.9%	-8.6%	-5.1%
Return to Risk	0.81x	0.06x	0.17x	-0.18x	-0.01x	1.49x	0.11x	0.31x	1.03x	-0.42x	-0.16x	-0.93x	-2.26x	-1.11x	-0.89x	-0.43x
Max Drawdown (15 vol)	-49%	-48%	-55%	-77%	-50%	-13%	-84%	-74%	-50%	-59%	-77%	-82%	-99%	-94%	-89%	-73%
Secular Boom: Baby Boomers enter workforce, Roaring 80s, Tech Bubble, Housing Bubble (1984-2007)																
Annual Return (15 vol)	+7.3%	+7.9%	+9.1%	+4.8%	+4.7%	+9.6%	+8.2%	-2.0%	-5.8%	-6.4%	+7.6%	-13.5%	-2.7%	+0.7%	+1.8%	+7.5%
Annual Return (Cash)	-0.4%	+4.7%	+1.0%	+5.7%	+6.6%	-0.1%	+2.4%	-1.9%	-5.5%	-5.6%	+0.8%	-10.1%	-2.8%	-0.1%	+0.8%	+5.1%
Return to Risk	0.58x	0.61x	0.65x	0.39x	0.41x	1.54x	0.60x	-0.07x	-0.34x	-0.46x	0.49x	-0.98x	-0.14x	0.12x	0.20x	0.59x
Max Drawdown (15 vol)	-30%	-38%	-27%	-53%	-46%	-23%	-34%	-77%	-80%	-84%	-42%	-97%	-77%	-61%	-46%	-43%
Secular Decline: Great Recession, Global Everything Bubble (2008-2019)																
Annual Return (15 vol)	+11.8%	+8.6%	+5.2%	+6.2%	+6.4%	+4.0%	+10.1%	+4.4%	+5.9%	-7.5%	+6.3%	-11.8%	+9.0%	+8.6%	+4.7%	+4.6%
Annual Return (Cash)	+4.1%	+6.4%	+2.5%	+6.8%	+7.6%	+1.0%	+5.7%	+4.5%	+5.0%	-4.2%	+2.7%	-7.4%	+8.3%	+7.3%	+4.0%	+3.8%
Return to Risk	0.79x	0.64x	0.33x	0.46x	0.46x	0.47x	0.58x	0.33x	0.39x	-0.39x	0.43x	-0.65x	0.61x	0.63x	0.36x	0.34x
Max Drawdown (15 vol)	-17%	-41%	-59%	-30%	-47%	-55%	-47%	-44%	-39%	-71%	-30%	-84%	-24%	-29%	-44%	-49%

Sources: Artemis Capital Management LP, Global Financial Data, Bloomberg.

Hypothetical performance results require numerous assumptions based on avaliable data. Please refer to the appendix for a full description of these assumptions. Past performance is not indicative of future sucess.
Performance stated includes impact of inflation at the Consumer Price Index.

Legend:
Annual Return (15 volatility): The return per annum of the strategy normalized to an annual volatility of 15% since 1928. Financing charges are not applied.
Annual Return (cash funding): The return per annum of the strategy assuming it is fully cash funded.
Return to Risk: The ratio of the per annum return to the realized annual volatility over the specified time period. Does not include risk-free rate.
Max Drawdown: The largest peak to trough drawdown the strategy experienced in the given time period.

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HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM. ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING

CORRELATION MATRIX OF KEY ASSETS AND PORTFOLIOS (1928 to 2019)

		PORTFOLIO				TRADITIONAL ASSETS					DEFENSIVE			LONG VOLATILITY			SHORT VOLATILITY				MEAN REVERSION	
		Dragon Portfolio (Eqty, Bonds, Gold, Vol, Comdty Trend)	Classic 60/40 Portfolio (Eqty, Bonds)	Risk Parity Portfolio (Eqty, Bonds, Comdty Trend)	Volatility Target Equity	Equity	Real Estate	Corporate Bonds (Baa)	U.S. Treasury Bonds	Comdty	Gold	Comdty Trend	Active Long Volatility	Portfolio Insurance (ATM Put + Call Buying)	Portfolio Insurance Left Tail (OTM Put Buying)	Portfolio Insurance Right Tail (OTM Call Buying)	Short Volatility (ATM Put + Call Selling)	Put Write Strategy (Sell Put w. Collateral)	Buy Write Strategy (Eqty + Call Selling)	Naked Call Selling (Sell Calls Unhedged)	Equity Mean Reversion	Equity Buy-on-Decline
PORTFOLIO	Dragon Portfolio (Eqty, Bonds, Gold, Vol, Comdty Trend)	1.00	0.67	0.51	0.04	0.63	0.02	0.12	0.25	0.23	0.52	0.41	0.11	0.02	-0.38	0.56	0.13	0.43	0.45	-0.55	0.02	0.43
	Classic 60/40 Portfolio (Eqty, Bonds)	0.67	1.00	0.62	0.06	0.97	0.02	0.11	0.21	0.15	0.00	-0.02	-0.32	-0.30	-0.79	0.64	0.49	0.83	0.84	-0.62	0.11	0.71
	Risk Parity Portfolio (Eqty, Bonds, Comdty Trend)	0.51	0.62	1.00	0.04	0.55	0.01	0.17	0.37	0.58	0.12	0.00	-0.14	-0.13	-0.41	0.37	0.24	0.44	0.47	-0.35	0.06	0.40
	Volatility Target Equity	0.04	0.06	0.04	1.00	0.05	0.00	0.02	0.04	0.00	0.00	-0.01	0.00	0.00	-0.02	0.03	0.03	0.04	0.03	-0.02	-0.01	0.02
TRADITIONAL ASSETS	Equity	0.63	0.97	0.55	0.05	1.00	0.02	-0.01	-0.02	0.16	-0.01	-0.03	-0.35	-0.32	-0.82	0.65	0.51	0.86	0.88	-0.63	0.12	0.74
	Real Estate	0.02	0.02	0.01	0.00	0.02	1.00	-0.01	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.00
	Corporate Bonds (Baa)	0.12	0.11	0.17	0.02	-0.01	-0.01	1.00	0.53	-0.05	0.03	0.01	-0.01	0.01	0.01	-0.01	0.00	-0.01	-0.01	0.01	-0.01	-0.01
	U.S. Treasury Bonds	0.25	0.21	0.37	0.04	-0.02	0.01	0.53	1.00	-0.06	0.04	0.01	0.08	0.07	0.06	0.02	-0.05	-0.04	-0.05	-0.02	-0.03	-0.04
	Comdty	0.23	0.15	0.58	0.00	0.16	0.00	-0.05	-0.06	1.00	0.19	0.07	-0.06	-0.03	-0.12	0.12	0.06	0.13	0.14	-0.12	0.02	0.12
DEFENSIVE	Gold	0.52	0.00	0.12	0.00	-0.01	0.01	0.03	0.04	0.19	1.00	-0.01	0.02	0.02	0.02	0.00	-0.02	-0.02	-0.03	0.00	0.00	-0.01
	Comdty Trend	0.41	-0.02	0.00	-0.01	-0.03	-0.01	0.01	0.01	0.07	-0.01	1.00	0.07	0.06	0.05	0.02	-0.06	-0.05	-0.05	-0.02	-0.01	-0.02
	Active Volatility	0.11	-0.32	-0.14	0.00	-0.35	0.00	-0.01	0.08	-0.06	0.02	0.07	1.00	0.69	0.63	0.14	-0.67	-0.57	-0.54	-0.16	-0.21	-0.36
LONG VOLATILITY	Portfolio Insurance (ATM Put + Call Buying)	0.02	-0.30	-0.13	0.00	-0.32	0.00	0.01	0.07	-0.03	0.02	0.06	0.69	1.00	0.75	0.42	-0.93	-0.68	-0.64	-0.44	-0.27	-0.39
	Portfolio Insurance Left Tail (OTM Put Buying)	-0.38	-0.79	-0.41	-0.02	-0.82	0.00	0.01	0.06	-0.12	0.02	0.05	0.63	0.75	1.00	-0.27	-0.81	-0.95	-0.89	0.26	-0.23	-0.69
	Portfolio Insurance Right Tail (OTM Call Buying)	0.56	0.64	0.37	0.03	0.65	0.01	-0.01	0.02	0.12	0.00	0.02	0.14	0.42	-0.27	1.00	-0.24	0.31	0.30	-0.99	-0.08	0.39
SHORT VOLATILITY	Short Volatility (ATM Put + Call Selling)	0.13	0.49	0.24	0.03	0.51	0.00	0.00	-0.05	0.06	-0.02	-0.06	-0.67	-0.93	-0.81	-0.24	1.00	0.84	0.79	0.27	0.28	0.52
	Put Write Strategy (Sell Put w. Collateral)	0.43	0.83	0.44	0.04	0.86	0.00	-0.01	-0.04	0.13	-0.02	-0.05	-0.57	-0.68	-0.95	0.31	0.84	1.00	0.94	-0.30	0.23	0.72
	Buy Write Strategy (Eqty + Call Selling)	0.45	0.84	0.47	0.03	0.88	0.00	-0.01	-0.05	0.14	-0.03	-0.05	-0.54	-0.64	-0.89	0.30	0.79	0.94	1.00	-0.28	0.22	0.72
	Naked Call Selling (Sell Calls Unhedged)	-0.55	-0.62	-0.35	-0.02	-0.63	-0.01	0.01	-0.02	-0.12	0.00	-0.02	-0.16	-0.44	0.26	-0.99	0.27	-0.30	-0.28	1.00	0.08	-0.37
MEAN REVERSION	Equity Mean Reversion	0.02	0.11	0.06	-0.01	0.12	0.00	-0.01	-0.03	0.02	0.00	-0.01	-0.21	-0.27	-0.23	-0.08	0.28	0.23	0.22	0.08	1.00	0.74
	Equity Buy-on-Decline	0.43	0.71	0.40	0.02	0.74	0.00	-0.01	-0.04	0.12	-0.01	-0.02	-0.36	-0.39	-0.69	0.39	0.52	0.72	0.72	-0.37	0.74	1.00

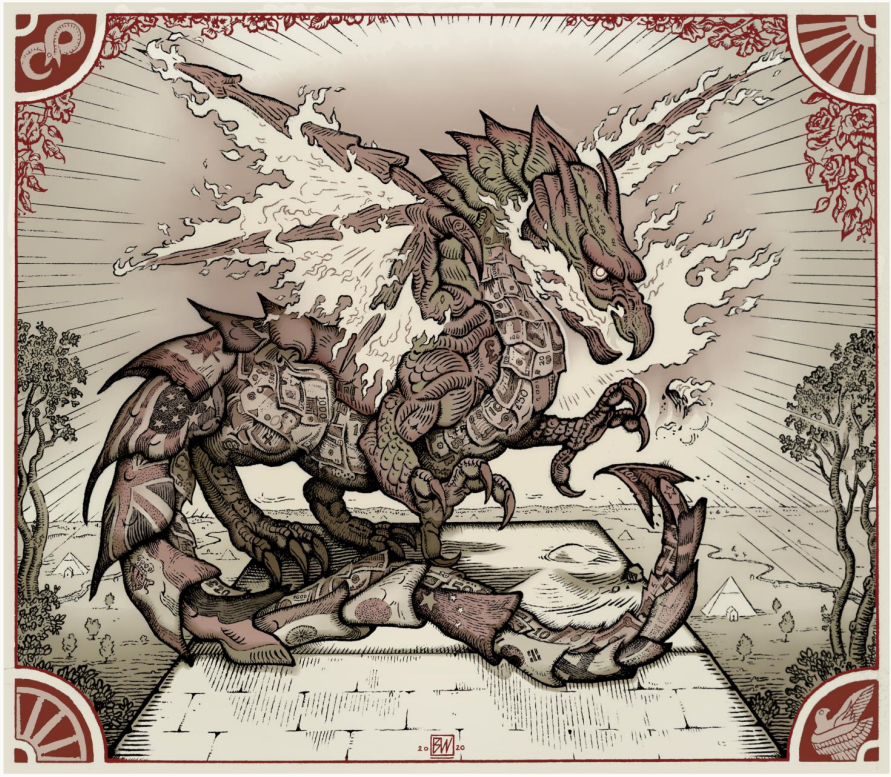
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance results require numerous assumptions based on avaliable data. Please refer to the complete notes in the Appendix for a full description of these assumptions.
Performance stated does not include the impact of inflation or finacing fees or inflation.

ARTEMIS
CAPITAL MANAGEMENT

APPENDIX AND SUPPLEMENTARY MATERIALS TO

THE ALLEGORY OF THE HAWK AND SERPENT

QUANTITATIVE ANALYSIS OF PORTFOLIO STRATEGIES OVER 90 YEARS



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QUANTITATIVE ANALYSIS OF PORTFOLIO STRATEGIES OVER 90 YEARS

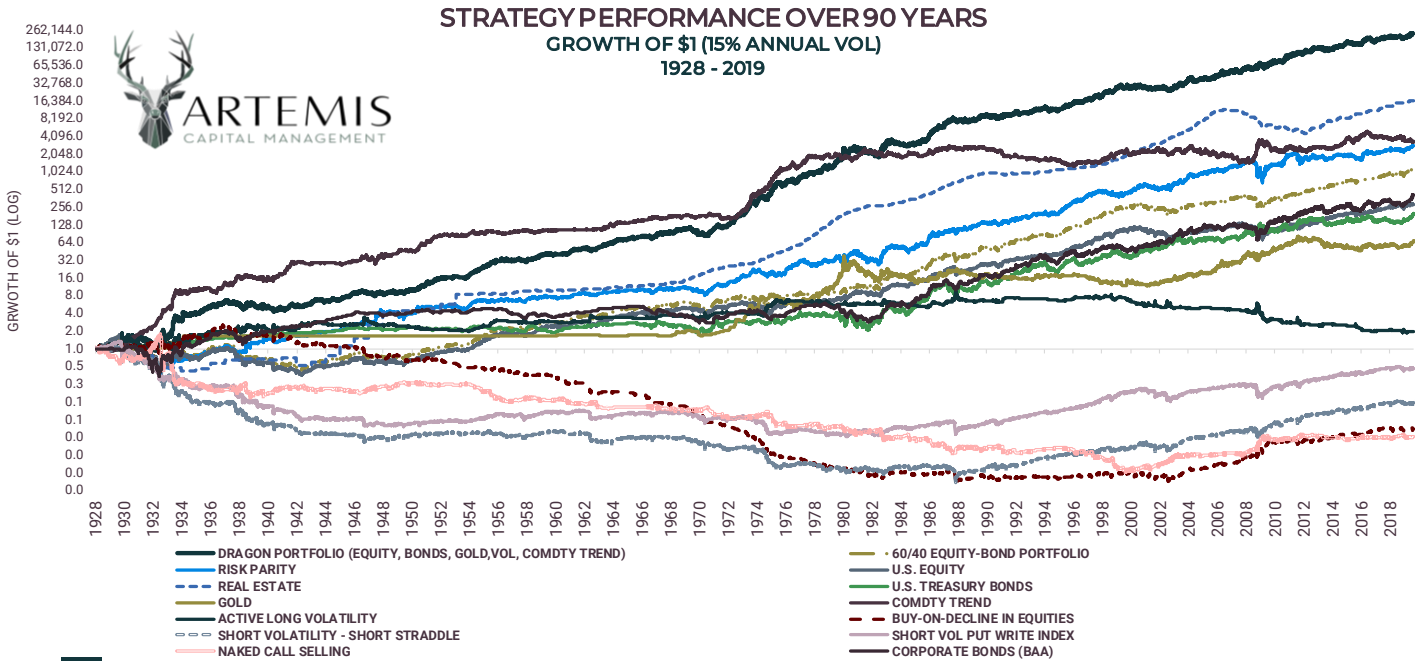
ARTEMIS analyzed the risk-reward of a wide variety of institutional investment strategies through four generational seasons (~20 years) and one lifetime (~90 years). The goal is to apply financial engineering to the distant past to learn about potential futures. The results presented herein reflect our best efforts at replicating portfolio engineering strategies going back to the Great Depression using real data derived from historical records. **It is essential to understand that these results are indicative and hypothetical only.**

We do not represent our composite portfolios as realized performance, but rather as our best effort at understanding how a given asset or portfolio strategy would have performed had it existed in the distant past. It is impossible to accurately model the interplay between buyers and sellers, regulatory changes, or the liquidity impact of any modern strategy re-imagined into history. At the same time, the exercise provides valuable insights into market regimes from beyond our lifetimes to avoid recency bias. To give a fair comparison between strategies, we risk-adjust all performance metrics to an annualized volatility of 15% (as shown in graphs and in-line references). For reference, we also provide cash funded returns by strategy alongside the risk-adjusted in all return tables. In some cases, the investor may need to use financing or derivatives to leverage a portfolio to reach a target return or volatility. The table in the back of this Appendix provides portfolio returns after financing charges; however, in many cases, the institutional investor can achieve target volatility for less using derivatives or portfolio margin. Portfolios with fixed asset exposures rebalance daily unless otherwise noted.

Key data inputs, such as implied volatility, may not exist over historical periods. Hence, reasonable estimates are applied based on available data sources to create replication indices. In these cases, such as Volatility Risk Premia, we tested the replication index against a market index to ensure reasonability. Full calculation methodologies are described herein and in the reference section. In some instances, component assets like Active Long Volatility and Commodity Trend are best accessible via hedge funds. In our analysis, we used simplified and systematic replications of various active strategies without fees; however, we also believe these replication indices to be less profitable than a skilled manager. Market data is compiled from sources we believe to be reliable: however, any resulting investment decisions taken due to the analysis is at the sole risk of the recipient.

CONCLUSIONS

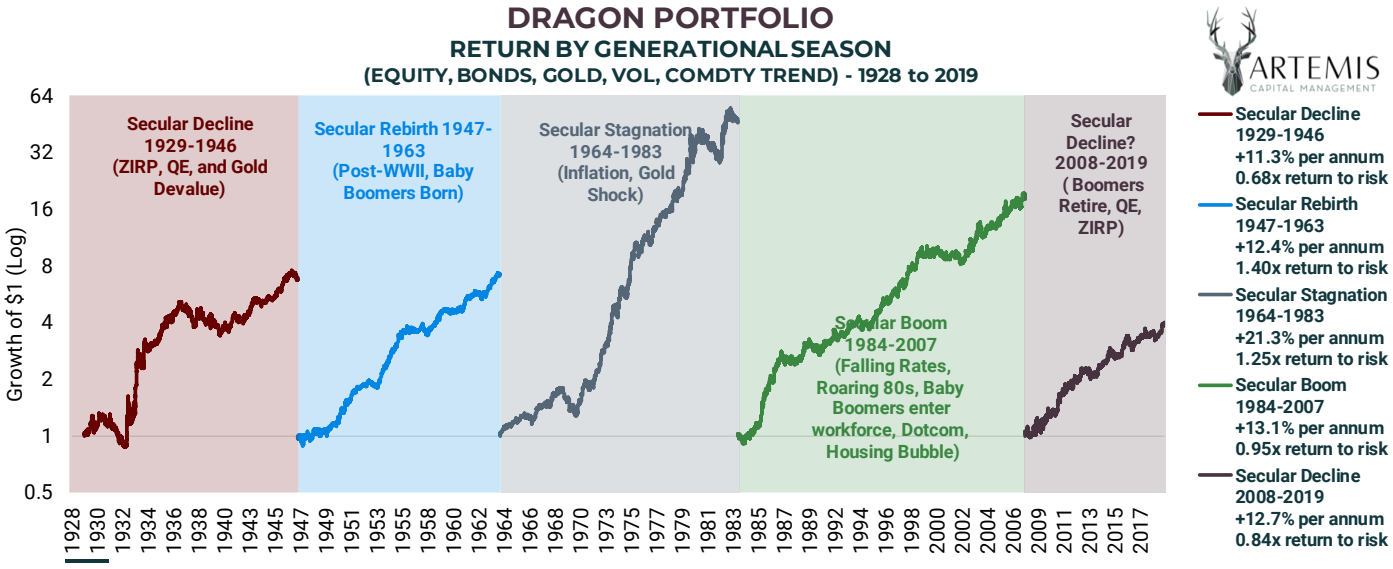
Our conclusions show that the ideal portfolio over 90 years balances assets that perform in secular growth with those that excel during secular declines. To achieve the optimal results, investors should prioritize secular non-correlation over excess returns when selecting assets. We find traditional portfolios typically overweight Equity-Linked Products and Bonds while underweighting non-correlated assets such as Gold, Active Long Volatility, and Commodity Trend. An asset allocation strategy based on these principals ("Dragon Portfolio") outperformed alternatives by a wide margin using historical data back to 1928. A modern replication of the Dragon Portfolio using index data from 2005 to 2019 also outperformed. Investors should avoid financial products that systematically short options (Explicit Short Volatility) or apply systematic mean reversion (Implicit Short Volatility) as they resulted in complete impairment of capital over our 90-year testing period.



Sources: Artemis Capital Management LP, Global Financial Data. Results are estimated and hypothetical based on avalaibility of data and modeling assumptions, please read full disclosure.

DRAGON PORTFOLIO
(EQUITY, FIXED INCOME, GOLD, COMMODITY TREND, AND ACTIVE LONG VOLATILITY)

The optimal portfolio between 1929 and 2019 balances assets that perform during periods of secular growth (1947-1963,1984-2007) against those that excel in periods of secular decline (1929-1946, 1964-1984). Based on this principle, we find that a risk-weighted combination of U.S. Equity (24%), U.S. Treasury Bonds (18%), Active Long Volatility (21%), Commodity Trend Following (18%), and Gold (19%) is optimal. This non-conventional portfolio outperforms traditional and more sophisticated alternatives that primarily rely on exposure to Equity-Linked assets and Bonds. The Dragon Portfolio achieved double-digit returns in all four generational seasons, 2x the risk-adjusted performance of a Classic 60/40 Portfolio or Risk Parity Strategy, with half the drawdown risk over 90 years. It was the best performing portfolio adjusted for risk.



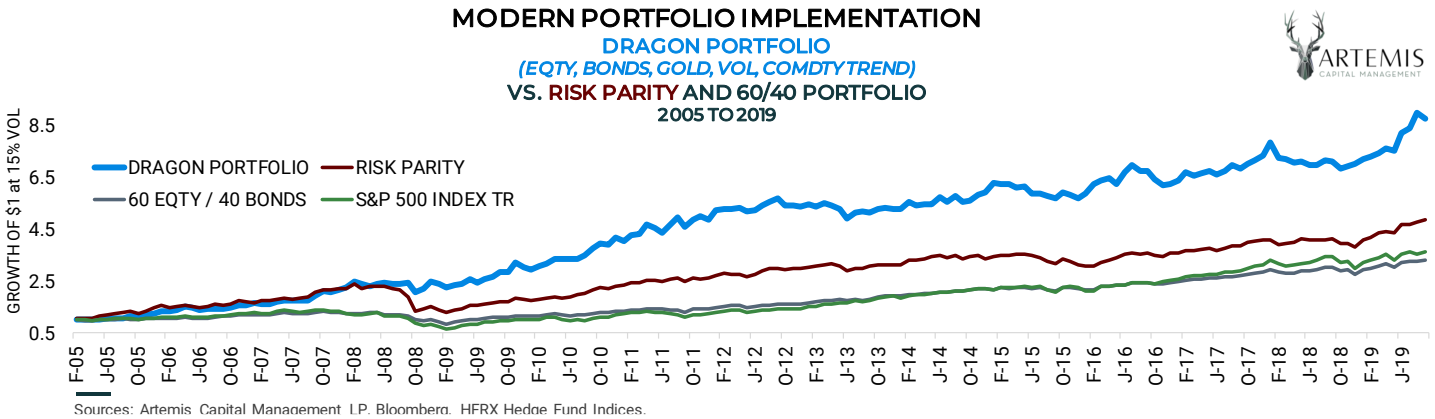
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

MODERN IMPLEMENTATION OF DRAGON PORTFOLIO

The Dragon Portfolio is accessible to the contemporary investor by assembling a combination of hedge funds and passive indices. The investor may consider passive investments that track the S&P 500 Total Return Index (Equity), Bloomberg Barclays U.S. Treasury Bond Total Return Index (Bonds), Gold, and a portfolio of hedge funds from the HFRX Macro Systematic Diversified CTA Index (Commodity Trend) and Eurekahedge CBOE Long Volatility Hedge Fund Index (Active Volatility) at referenced weights. The institutional investor can apply leverage to the portfolio to meet a return target using derivatives, and in the case of hedge fund exposure, overlays and separately managed accounts. Since 2005 the portfolio annualized at +15.8% (normalized for 15% volatility) while outperforming popular alternatives (Risk Parity, Classic 60/40) by a wide margin risk-adjusted.

ARTEMIS CAPITAL MANAGEMENT	DRAGON PORTFOLIO (EQTY,BONDS,GOLD, ACTIVE VOL, COMDTY TREND)	60/40 PORTFOLIO (EQTY, BONDS)	RISK PARITY (Eqty, Bonds, Comdty)	S&P 500 INDEX TR
PORTFOLIO RETURNS: LEVERAGED TO 15% VOLATILITY				
Annual Return	+15.8%	+12.6%	+11.0%	+9.1%
Return to Risk	1.10x	0.90x	0.83x	0.68x
Max Drawdown	-17%	-50%	-46%	-53%
Volatility	15%	15%	15%	15%
PORTFOLIO RETURNS: CASH FUNDED				
Annual Return	+6.4%	+7.0%	+6.4%	+8.6%
Return to Risk	1.10x	0.90x	0.83x	0.68x
Max Drawdown	-7%	-31%	-28%	-51%
Volatility	6%	8%	9%	14%

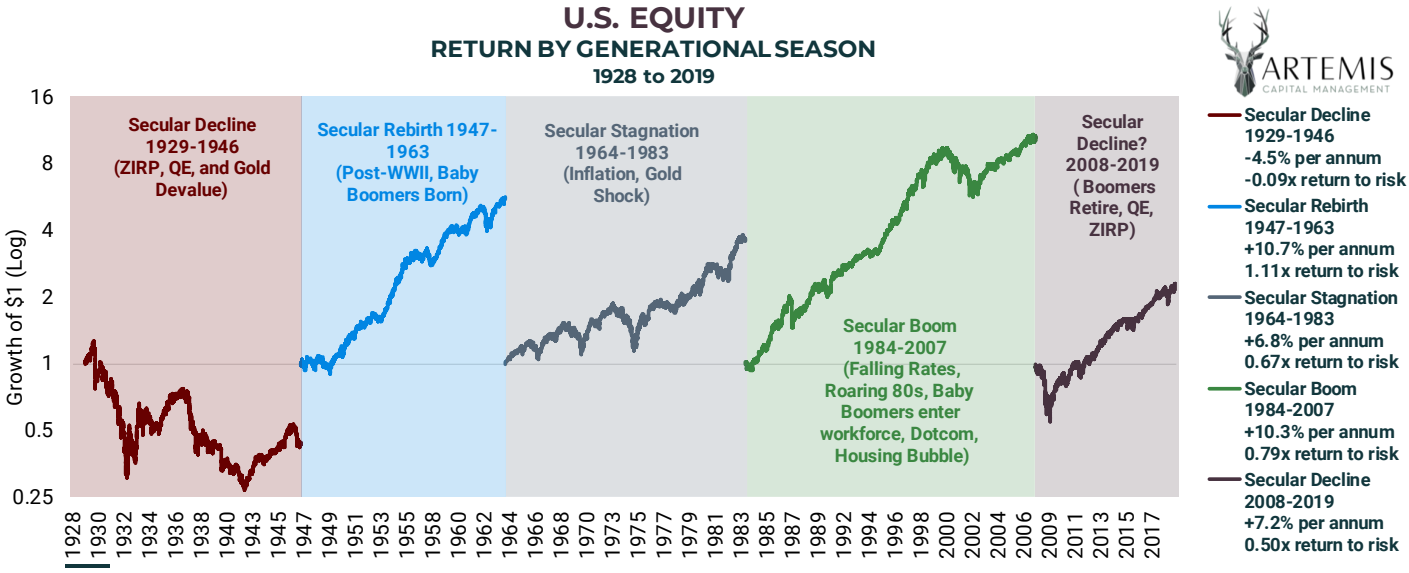
Sources: Artemis Capital Management LP, Bloomberg, HFRX.



Sources: Artemis Capital Management LP, Bloomberg, HFRX Hedge Fund Indices.

U.S. EQUITY

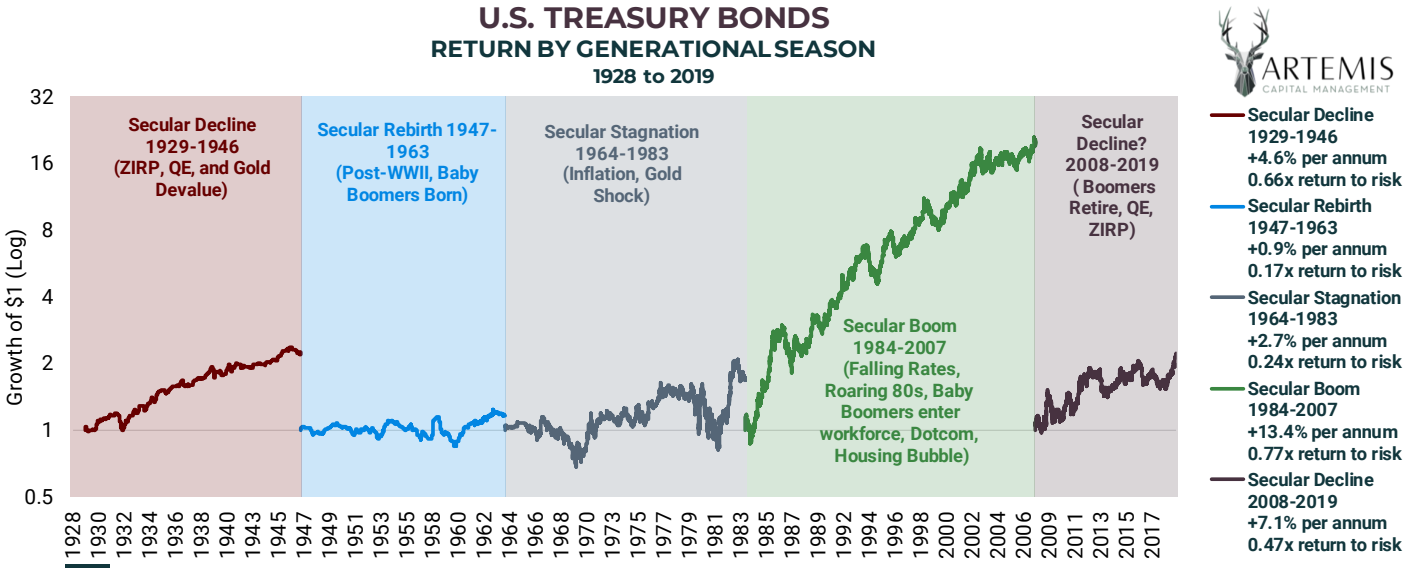
Equity and Equity-Linked products are the meat and potatoes of the traditional asset allocation, and the largest beneficiary of retirement capital flows from Baby Boomers since the 1990s. Almost a decade of unprecedented global monetary stimulus has resulted in some best risk-adjusted returns for Passive Equities in over 200 years. Since 2009, the S&P 500 Index has experienced the longest bull market in history at a +231% gain over 10.5 years. Equity has had quite a run recently, but history demonstrates high losses in other periods. A passive investment in U.S. Equity lost -80% from 1929 and took two decades to recover. It would have also realized -40% max drawdowns in nearly every generational season over 90 years. An index fund provided no price appreciation for the twenty years between 1929 and 1949, the eleven years between 1964 and 1975, and the twelve years between 2000 and 2012. Many experts have compared the demographic challenges facing the U.S. and Europe to Japan's economic problems over the past two decades. If Japan is any guide, a passive investment in the Nikkei index is still down nearly -50% below its peak in 1989.



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

U.S. TREASURY BONDS

A portfolio of U.S. Treasury Bonds experienced remarkable performance over the last forty years as the 10-year yield declined from nearly 16% in 1981 to 1.47% in 2019. While Treasury Bonds remain an integral part of the institutional portfolio, it is vital to understand why the secular outperformance of Bonds, driven by globalization and retirement savings by the largest generation in American history, is not likely to repeat. Like U.S. Equities, Treasury Bonds have gone an entire decade without gains during the era of rising inflation between 1964 and 1974.



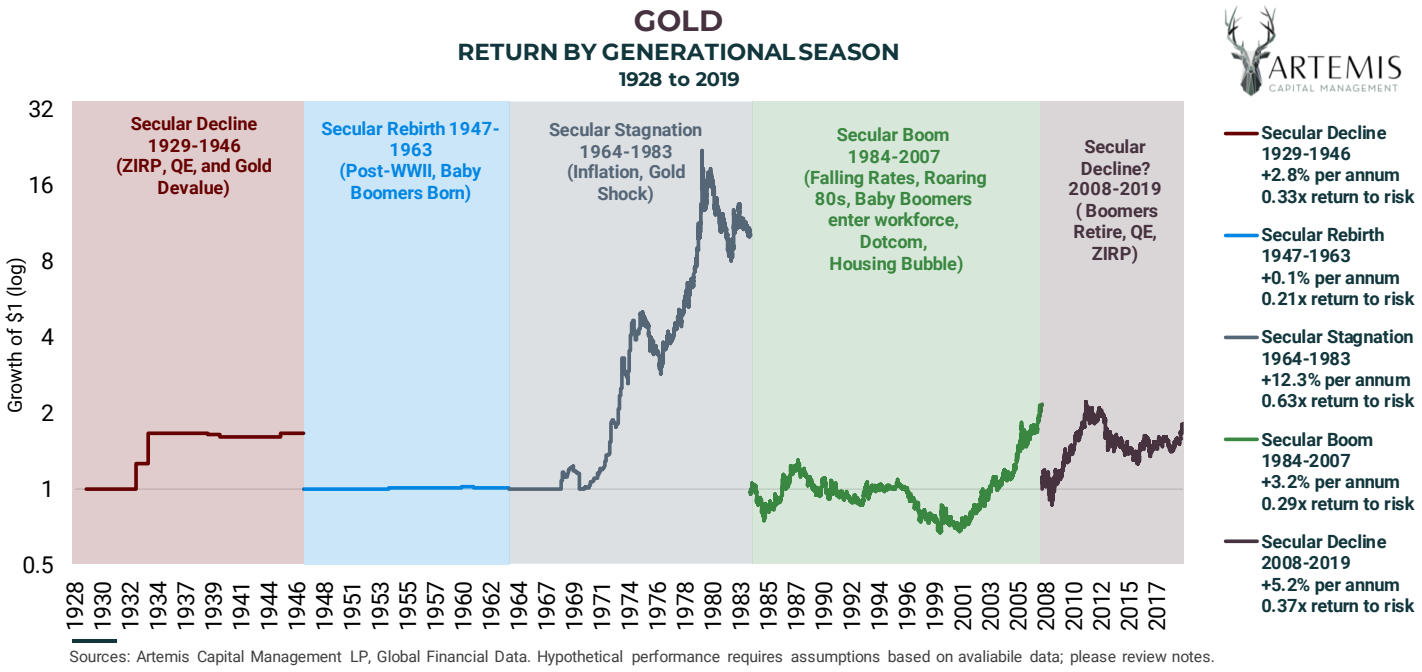
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

GOLD

Gold is one of the most critical long volatility assets because it protects against fiat devaluation. The so-called "barbarous" relic has held value for over 4,000 years as many other forms of fiat have come and gone. Throughout wars, revolutions, and political strife, Gold is a form of insurance against the corruption of government because the supply cannot exceed what is below the ground. To this point, as the U.S. monetary base has grown 9% a year since 1971, Gold has grown only 1.7%[(21)].

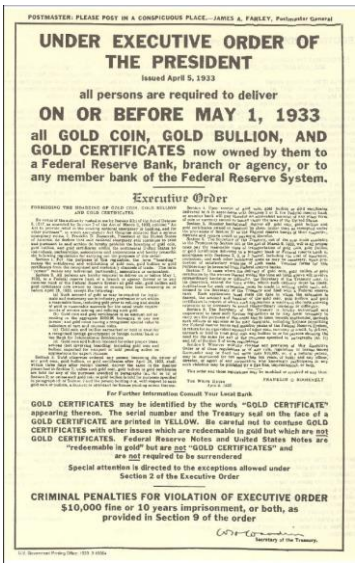
It is a little known fact is that Gold has outperformed the stock market on a price appreciation basis over the past 48 years since Nixon de-linked U.S. dollar-based convertibility on August 5th, 1971. Notice that the axis on the chart below is log-scaled, simply because the high price appreciation of Gold after the Nixon shock was so parabolic. The movement of Gold in the decade after the 1971 shock (+811%) was so extreme that it dwarfed other vital periods of U.S. dollar devaluation, such as between 1932 and 1935 (+69%) and since 2000 (+421%). In the event of helicopter money or the advent of modern monetary policy, expect similar gains in the price of the barbarous relic. Remember, it is not Gold that is appreciating, but the value of fiat that is collapsing.

It is essential to differentiate between Physical Gold and Fiat Gold. There is speculation that in a global crisis, policymakers may attempt to suppress the price of Gold through liquid derivatives markets as a method to stabilize major reserve currencies. Without venturing into the realm of conspiracy theory, however, there are many reasons to conclude that during a period of fiat debasement, the price of Gold-Backed Funds and Derivatives may deviate from the price of Physical Gold (e.g., taxation, capital controls, liquidity problems). It makes sense to own real, physical, Gold.



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

Cryptocurrencies such as Bitcoin have similar characteristics to Gold as there is a limited supply, they exist outside the system, and in theory, can be valued using a stock-to-supply model. Despite this fact, while Gold has performed over the past 4,000 years, the verdict is still out on Bitcoin or other currencies like it. The value of these currencies is either infinite or nothing. There are substantial questions regarding custody, security regulations, and liquidity, but the benefits outweigh the risk when sized appropriately. The prudent investor may consider owning Cryptocurrencies speculatively and sized appropriately to the high risk.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UNDER EXECUTIVE ORDER OF THE PRESIDENT

Issued April 5, 1933

all persons are required to deliver

ON OR BEFORE MAY 1, 1933

all GOLD COIN, GOLD BULLION, AND GOLD CERTIFICATES now owned by them to a Federal Reserve Bank, branch or agency, or to any member bank of the Federal Reserve System.

Executive Order

GOLD CERTIFICATES may be identified by the words "GOLD CERTIFICATE" appearing thereon. The serial number and the Treasury seal on the face of a GOLD CERTIFICATE are printed in YELLOW. Be careful not to confuse GOLD CERTIFICATES with other issues which are redeemable in gold but which are not GOLD CERTIFICATES. Federal Reserve Notes and United States Notes are "redeemable in gold" but are not "GOLD CERTIFICATES" and are not required to be surrendered

Special attention is directed to the exceptions allowed under Section 2 of the Executive Order

CRIMINAL PENALTIES FOR VIOLATION OF EXECUTIVE ORDER

$10,000 fine or 10 years imprisonment, or both, as provided in Section 9 of the order

In the event of helicopter money and the elimination of physical cash, expect the government to seize or control Gold and Cryptocurrencies. There is a long-standing precedent for this. In 1933, an executive order by President Roosevelt forbid the ownership of Gold, as made legal under the authority of the "Trading with the Enemy Act of 1917". It has happened before and will happen again, but not before the astute investor realizes significant portfolio hedging benefits.

ACTIVE LONG VOLATILITY

Active Long Volatility describes a collection of dynamic strategies that use derivatives to profit from periods of turbulence in markets while minimizing the cost, similar to a "smart" insurance policy. Active Long Volatility is, mathematically, the most under-allocated asset in the toolbox, when evaluated by portfolio optimization, due to its negative correlation to Equity-Linked Investments and Bonds.

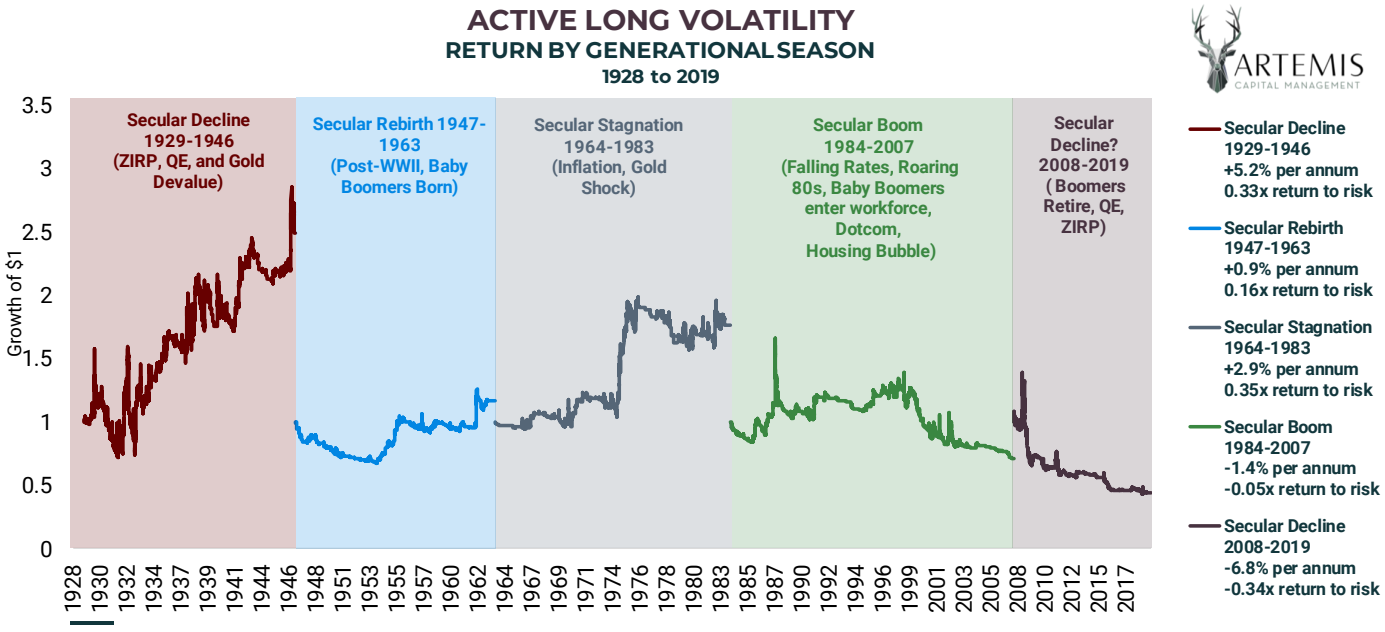
Long Volatility must be differentiated from traditional Portfolio Insurance ("Tail Risk Hedging") because it forgoes continuous protection for a lower carrying cost. The concept is to sacrifice the first move in an asset in exchange for lower costs while capturing the explosive second and third moves up or down. In our historical simulations, we sought to replicate an Active Long Volatility strategy by buying out-of-the-money equity put options if the market is down -5% or more and purchasing out-of-the-money equity call options if the market is up +5% or more over any rolling three months. We chose these parameters to provide a simple (and less effective) replication of what many professional volatility managers do for their clients. Our long volatility replication strategy is intentionally simple to provide transparent imitation over 90 years based on limited assumptions. Long Volatility is not easily accessible to the retail investor and often requires allocations to hedge funds. A good starting point is to look at constituents of the Eurekahedge CBOE Long Volatility Hedge Fund Index.

The power of Active Long Volatility is to provide cost-efficient anti-correlation to Stocks and Bonds, which is extremely valuable in building a balanced portfolio. As we've discussed, investors put too much significance on excess returns and not enough a non-correlation (see Artemis 2016 "Dennis Rodman and the Art of Portfolio Optimization"). While the performance of Active Long Volatility is not impressive by-itself, when paired with other asset classes, it plays a vital role in the portfolio optimization process.

Active Long Volatility maintains an impressive -0.35 negative correlation to Equities and no correlation to Bonds over 90 years. The strategy carries positively over 90 years at a +0.7% per annum return and has shown positive gains in three out of five generational periods earning +3.3% per annum between 1928 and 1983. The last decade represented the worst period in history for the strategy at -6.8% per annum return between 2008 and 2019. Even when including the most challenging era in the history of Active Long Volatility, a 50/50 combination of the CBOE Long Volatility Hedge Fund Index and the S&P 500 Total Return Index outperformed the average hedge fund by +148% since 2005 with better risk-adjusted performance and nearly 1/4th the maximum drawdown of a passive index fund.

ACCORDING TO PORTFOLIO OPTIMIZATIONS RUN OVER 90 YEARS, LONG VOLATILITY IS AS CRUCIAL TO AGGREGATE PORTFOLIO PERFORMANCE AS BONDS

Diversification is powerful and essential. Many investors mistakenly believe that the role of Long Volatility in the portfolio is to hedge momentary shocks in equity markets (vega profits). While partly true, the primary benefit of long volatility is to hedge sustained trends in equity markets (up or down) that persist over months and years (gamma effect). For example, markets trended lower day-after-day in the 1930s, and between 2007-2008 and ground high-and-higher in the 1970s (nominal price basis) and the 1950s, resulting in profits for the Active Long Volatility investor in each of these eras. The autocorrelation, or daily trend in returns, can be just as significant as the rise in realized market volatility for performance.



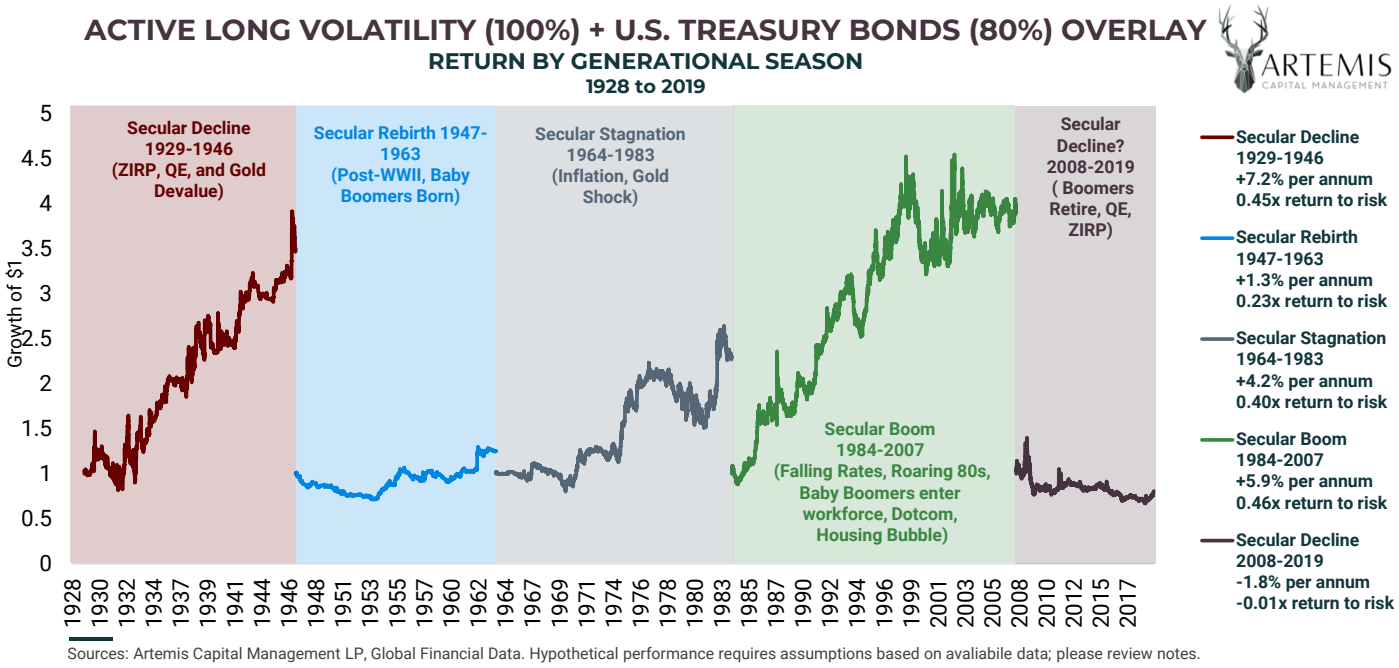
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

ACTIVE LONG VOLATILITY AS A FINANCIAL OVERLAY

Active Long Volatility is a capital-efficient asset class, and this presents unique opportunities for the sophisticated investor to pair exposure with other assets without requiring additional monies. For example, it is possible to "overlay" Long Volatility strategies on top of Equity or Fixed Income as a hedge with little or no additional capital in a separately managed account. This unique structuring is possible because a long option position offers leverage, unlimited upside at all times, but a known downside loss capped at the premium paid. In our portfolio performance analysis, we've intentionally assumed cash funding of all strategies for simplicity, but this severely handicaps long option strategies.

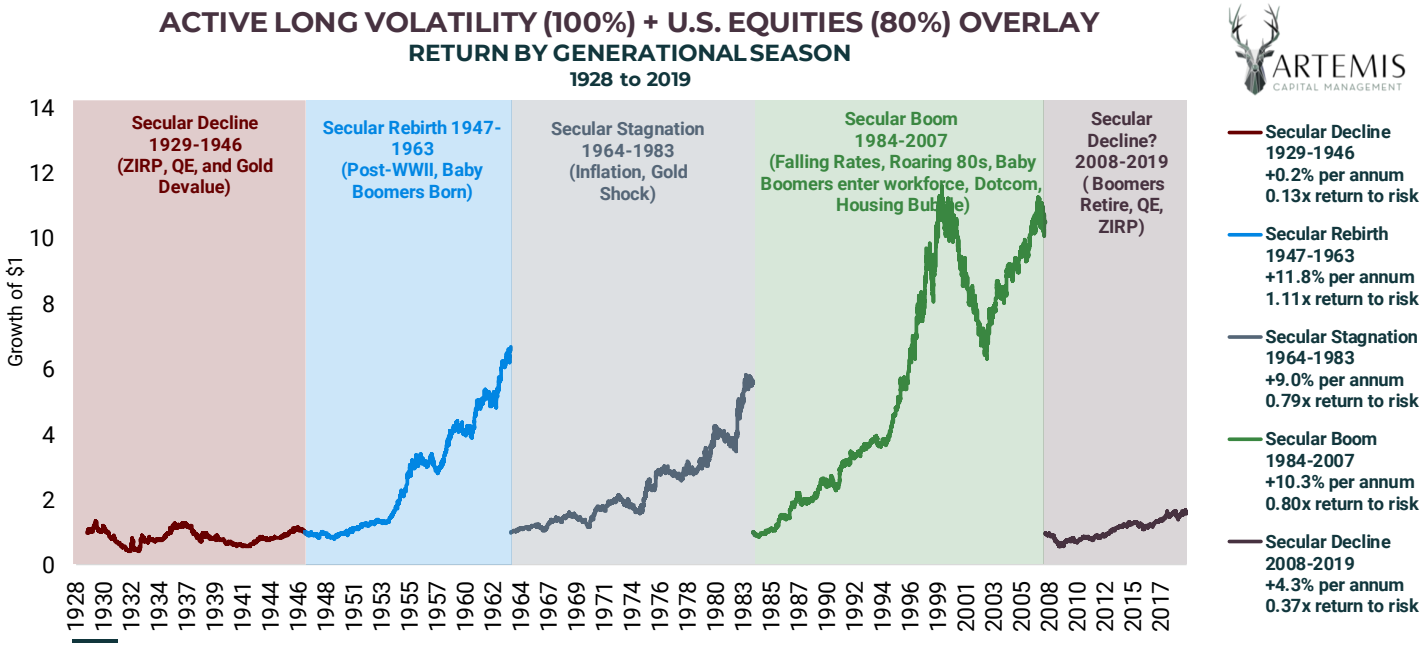
CREATE YOUR OWN UNIQUE ASSET

The capital efficiency of long options strategies can aid the creative investor in generating unique return streams and hybrid assets when merging volatility with real money allocations. For example, consider the behavior of Active Long Volatility (100% exposure / 20% cash funding) combined with U.S. Treasury Bonds (80% cash funded). This hybrid asset demonstrated incredible properties returning +4% per annum over 90 years with negative correlations to U.S. Equities and non-correlation to U.S. Treasury Bonds.



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

A classic technique is to overlay Active Long Volatility (100% exposure / 20% cash funding) on U.S. Equities (80% cash funded), which generates a better risk-adjusted return than stand-alone Stocks in every era except for the last decade.



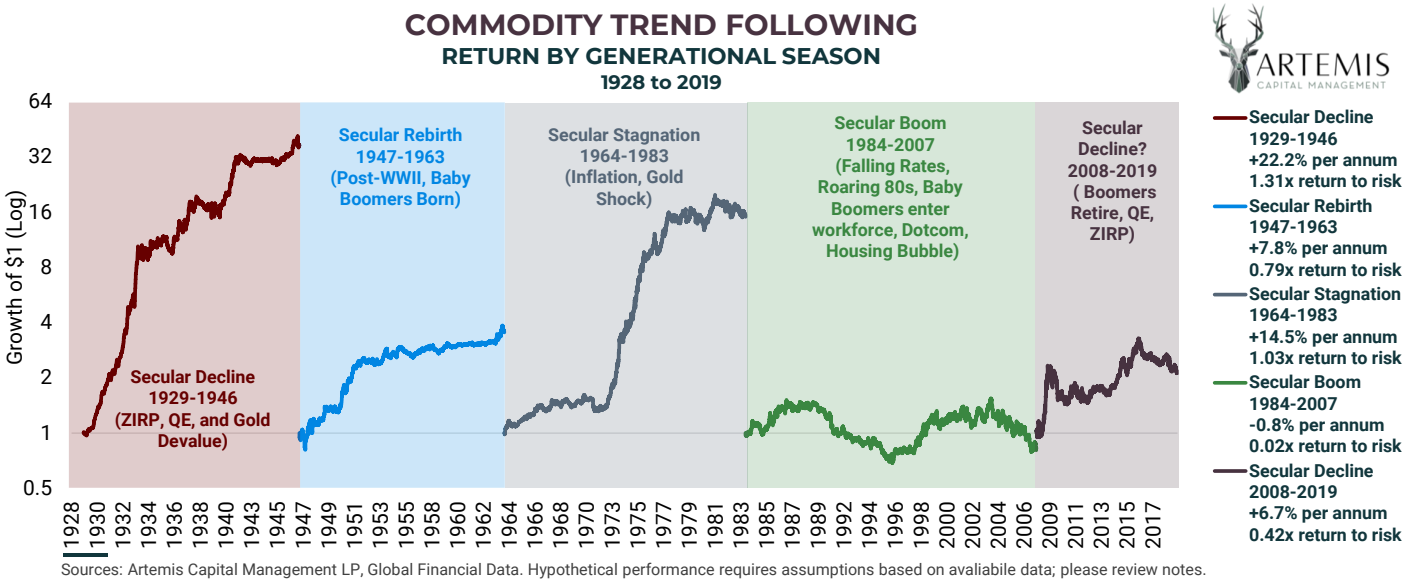
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

COMMODITY TREND FOLLOWING & COMMODITIES

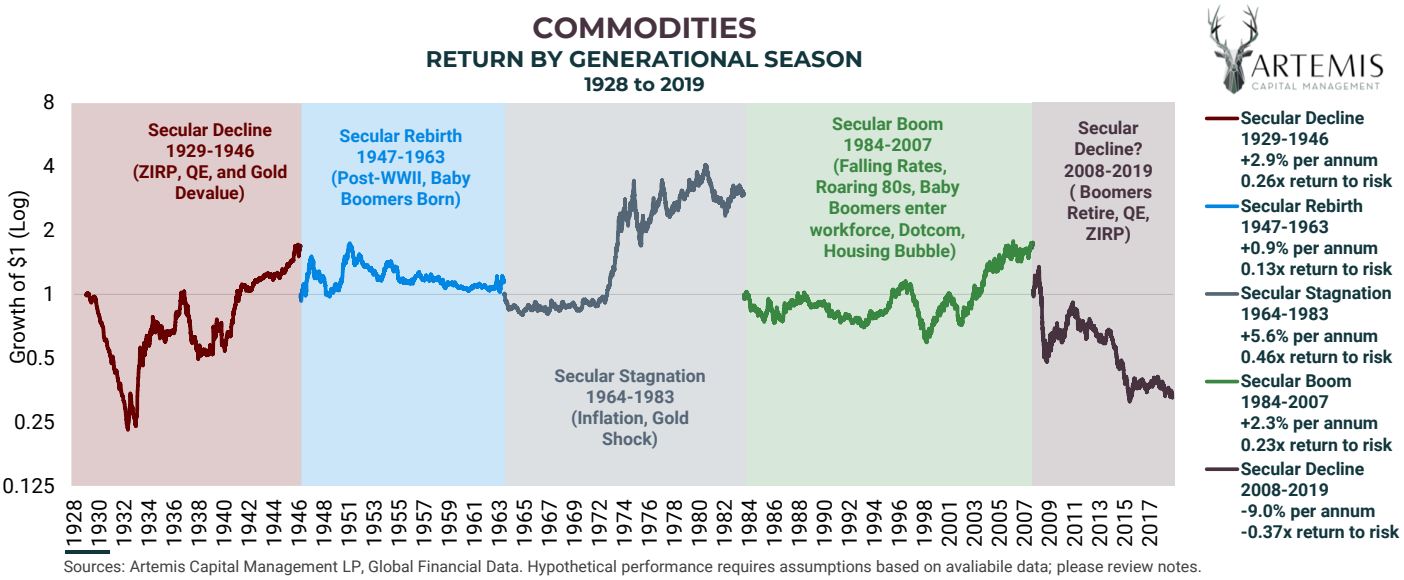
Commodity Trend Following ('CTAs' or 'Commodity Trend') is a strategy that seeks to monetize the tendency for prices of goods (e.g., crude oil, natural gas, soybeans, copper) to break-out in trends up or down using rules-based systematic trading. The strategy has traditionally shown non-correlation to Stocks and Bonds and has performed during periods of market duress. To test this strategy over 90 years, we applied a simple 50-day moving average rule to buy or sell a broad basket of commodities using data back to 1928. The modern equivalent of the strategy is accessible via hedge funds, such as those in the HFRX Macro Systematic Diversified CTA Index and through select Exchange Traded Products.

Commodity Trend shows excellent performance over 90 years of history, earning +9.2% a year with a return to risk ratio of 0.67. It was the second-best performing asset overall next to Real Estate. Commodity Trend Following has shown an ability to perform in periods of deflation (the 1930s, 2008) and inflation (1970s). Despite substantial performance from 1928 to 2008, the strategy has been flat for the last decade, and, like Long Volatility hedging, has fallen out of favor with many investors. It is important to note that our CTA replication index does not include reinvestment in or use of U.S. Treasury Bonds or rate derivatives, and such inclusion would likely help the performance during the period of 1984 to 2007.

Commodity Trend is a crucial part of our optimal 100-year portfolio (18%). Despite this fact, it still has a lower risk weighting than Active Long Volatility (21%). It is essential to understand why. Commodity Trend Following has a higher correlation to equities (-0.02) than Active Long Volatility (-0.35) over 90 years, and this has a substantial impact on how mathematics optimize these assets. Many portfolios include broad Commodity exposure. While this is a solid diversifier during periods of stagflation (the 1970s), removing the trend component reduces risk-adjusted-performance substantially



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

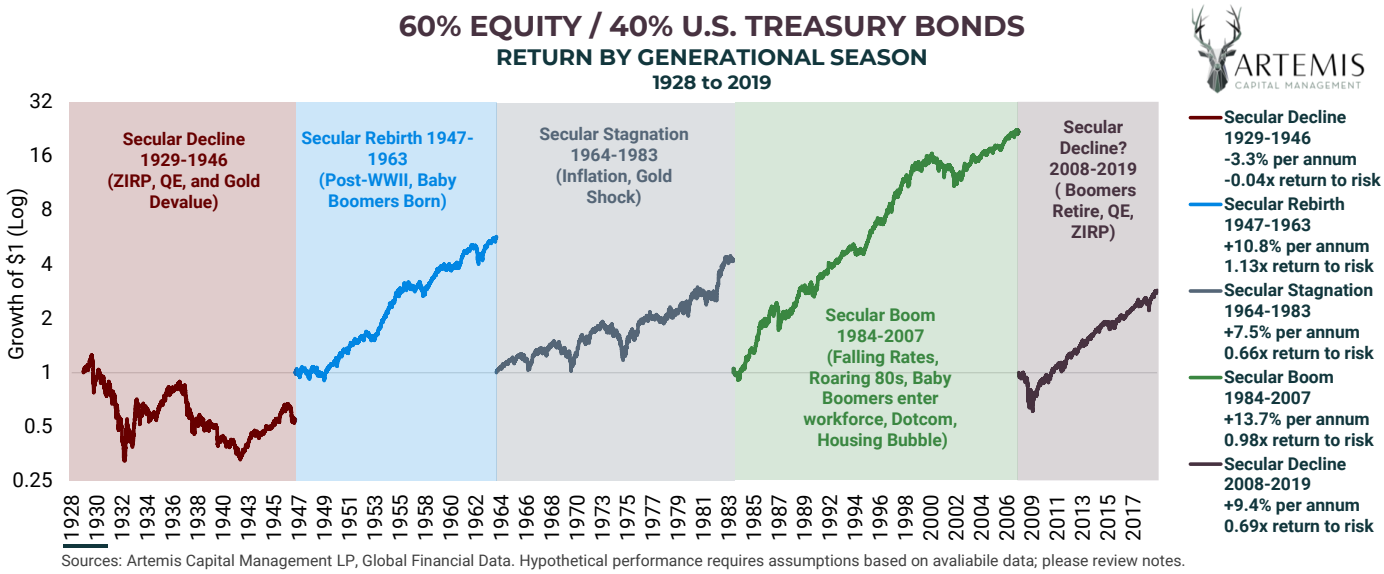


Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

CLASSIC 60% EQUITY / 40% FIXED INCOME PORTFOLIO

The Classic 60/40 Portfolio allocation between Equity and U.S. Treasury Bonds achieved +7.9% per annum return (leveraged), but the distribution of returns is highly uneven between secular declines and booms. The strategy performs best during periods of low inflation and high growth such as the Secular Rebirth of 1947 to 1963 (+10.8% per annum) and the Great Moderation period of 1984 to 2007 (+13.7% per annum), but suffers during secular declines of the Great Depression-era of 1929-1946 (-3.3% per annum) and the stagnation of 1964 to 1983 after inflation is taken into account.

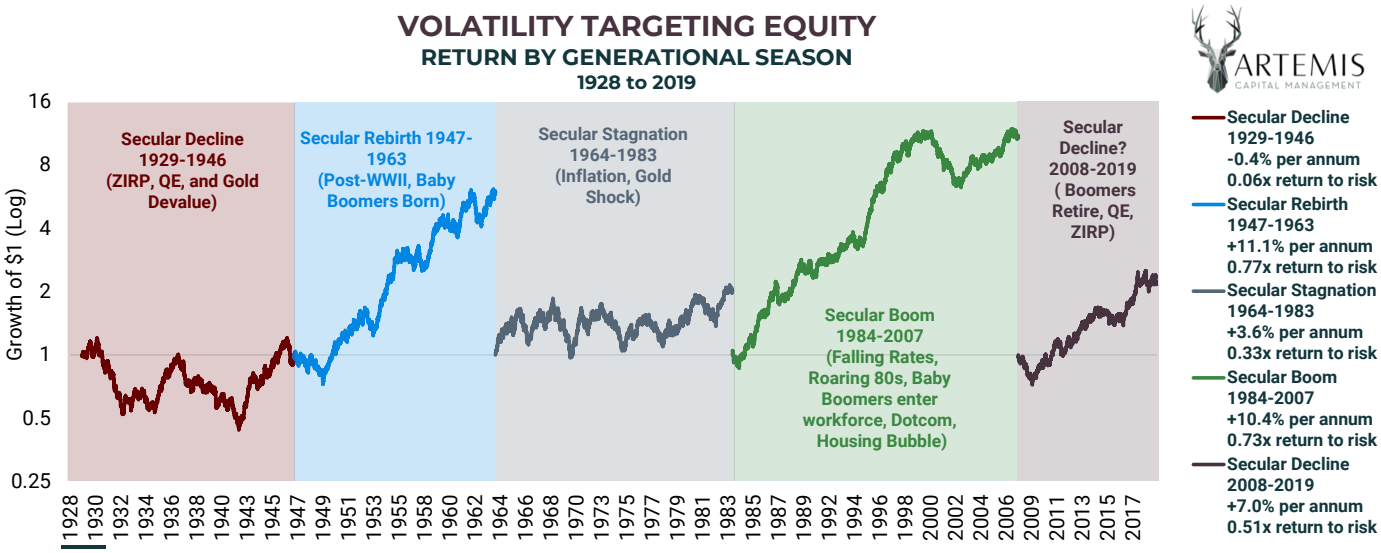
The 60/40 Equity-to-Bond Portfolio experienced a -78% drawdown over 16 years during the Great Depression. The period of 1964 to 1974 was also a lost decade as Stocks and Bonds declined together during stagflation. The +5.7% cash funded return per annum between 1963-1983 did nothing to help investors in an era whereby inflation averaged 6.3% per year. When short term interest rates are under 2%, the annualized return of the strategy drops to just +5% per annum, which should be alarming for pension systems expecting 7.25% at the zero bound of interest rates. Since the 1980s, a 60/40 Portfolio has delivered an exceptional performance as both Stocks and Bonds have risen in tandem. It is clear from a study of history that a repeat of that era is unlikely with Stocks at rich valuations and Bonds close to the zero-bound of yields.



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

VOLATILITY TARGETING EQUITY PORTFOLIO

Volatility Targeting Portfolios adjust Equity exposure based on a trailing variance target. In our 90 year sample, the strategy outperforms passive investing with risk-adjusted performance compared to the Classic 60/40 Portfolio. The strategy underperforms during periods of high volatility and melt-ups in risk assets, including the late 1990s dot-com bubble and dollar devaluation rallies during the Great Depression. Volatility Targeting preserves capital during a deflationary crash but is not the best strategy in the event of fiat devaluation, as evidenced by flat performance throughout the 1970s.



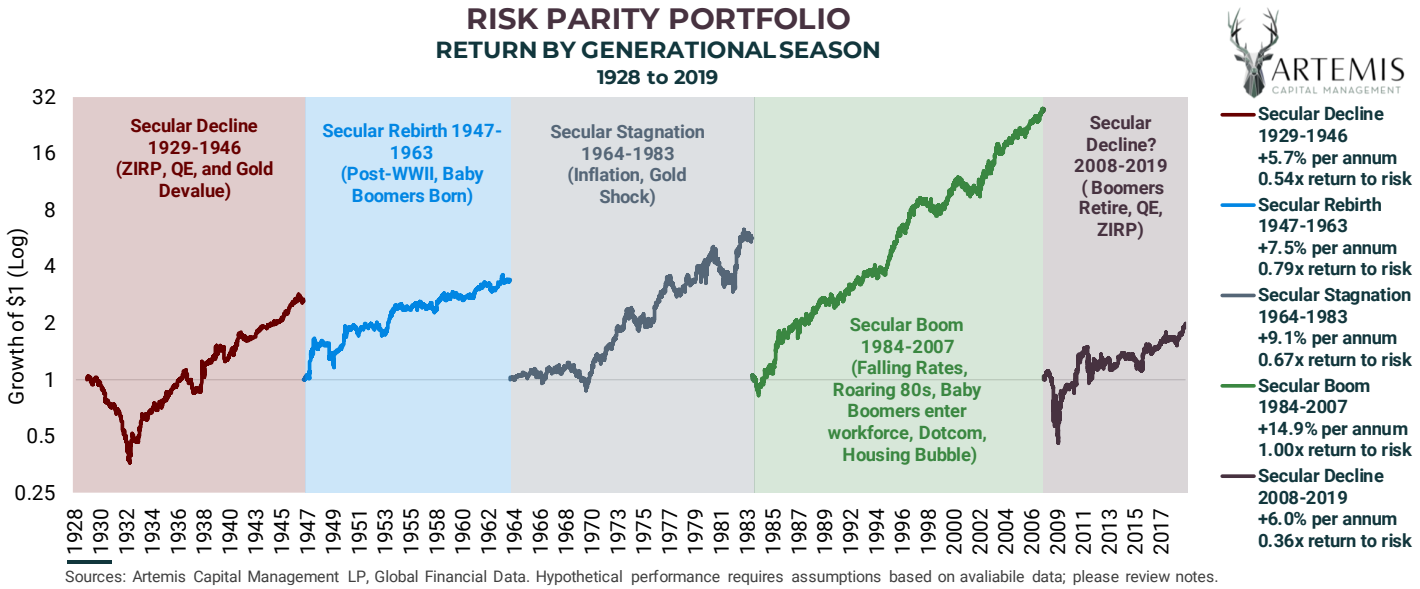
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

RISK PARITY PORTFOLIO

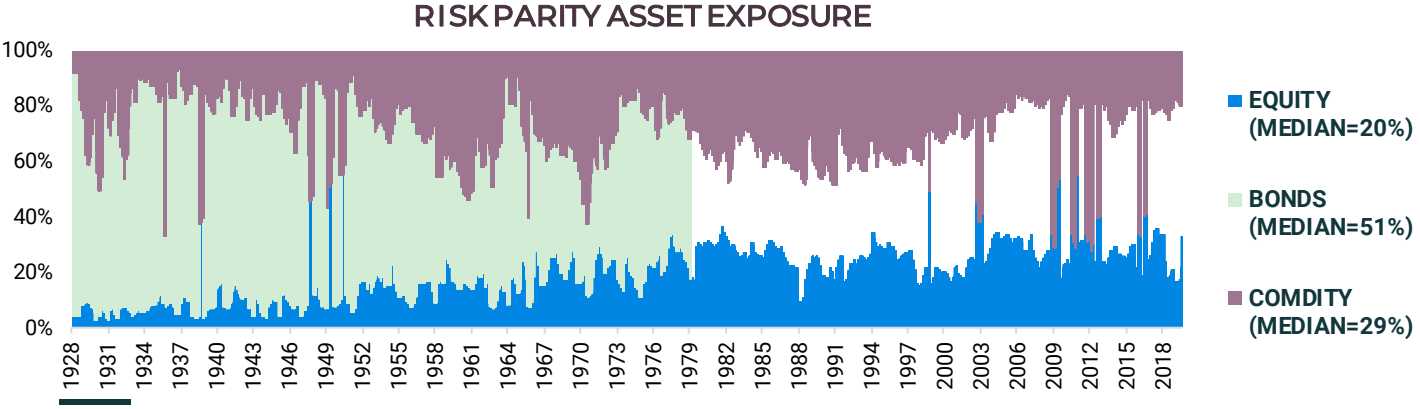
Risk Parity is a popular institutional investment strategy with close to half a trillion dollars in exposure[22]. There are many iterations, but the classic version of the strategy allocates risk between Equity, Fixed Income, and Commodities based on volatility and correlations. An essential criticism is that Risk Parity relies on an overallocation to Fixed Income and effectively is short the correlation between Stocks and Bonds to generate excess returns. To test the performance of the strategy over history, we recreated a Classic Risk Parity Portfolio of U.S. Equities, U.S. Treasury Bonds, and Commodities using data back to 1928. The replication portfolio rebalanced monthly using three-month rolling correlations and volatility for portfolio optimization.

The Risk Parity Portfolio performed admirably over the past 90 years, earning an annual return of +9.1% per annum at a return to risk of 0.66x. Despite this fact, the majority of its performance (81%) is from the period of 1984 to 2007, whereby interest rates dropped 10%, and Bonds outperformed. If we remove this period from the 90-year history of Risk Parity, performance drops to just +6.25% per annum with a 0.45 return to risk ratio. The strategy also did not protect investors during the Great Depression (-65% drawdown). More than any other portfolio, Risk Parity is harmed by the assumption of financing fees because the strategy relies heavily on leveraging U.S. Treasury Bonds. In practice, financing costs may be reduced through the use of derivatives, however there are trade-offs. For a full impact assessment please see back tables.

Risk Parity has performed throughout history and is not a bad portfolio strategy compared to many alternatives; however, it is likely to disappoint investors expecting the 10%+ returns from 1987-2019 going forward. It is highly reliant on Fixed Income and has an Achilles Heel of being simultaneously exposed to a decline in both Equities and Bonds. This weakness is likely to be tested with rates at all-time lows and stocks at historically high valuations. Over the past 90 years, approximately 60% of the returns for a Risk Parity Portfolio came from Fixed Income and 90% of the profit from the combination of Bonds and Equities. With such high concentration in these assets classes, the Risk Parity struggles to perform with rates at the zero bound and when economic growth is low. Risk Parity relies on sound logic, but its performance is highly reliant on falling interest rates and secular growth. If history is any guide, it will underwhelm going forward if economic growth slows, but interest rates remain anchored at the zero bound.



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.



Sources: Artemis Capital Management LP, Global Financial Data. Performance data requires many assumptions; please refer to appendix for detailed notes

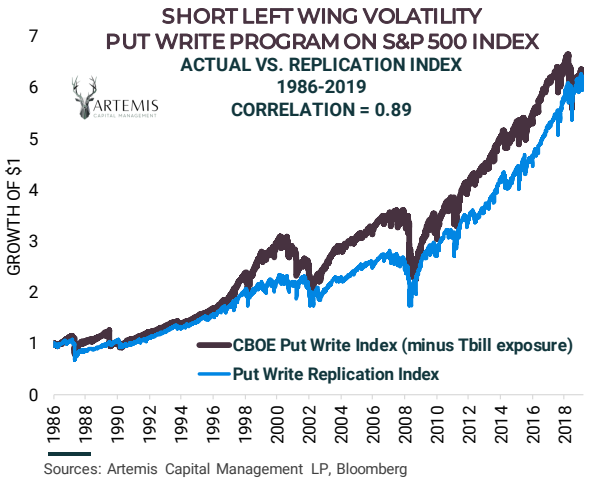
REPLICATING VOLATILITY RISK PREMIA OVER 90 YEARS

Volatility Risk Premia ("Explicit Short Volatility", "Selling Volatility," "Systematic Short Volatility") describes a class of strategies that sells options to generate an excess return from asset price stability. These strategies seek to monetize the "Volatility Risk Premium," defined as the spread between implied and realized volatility, as an "alternative" source of yield. As rates have fallen, institutional and retail investors have flocked to strategies that are either short a rolling collateralized put option (CBOE Put Write Index) or go long a passive index and short a "covered" call option (CBOE Buy-Write Index). Alternatively, the strategies can be executed together in the form of a Short Straddle (covered or uncovered), representing a naked short put and call option together. There is an estimated $80 to $200 billion committed to option overwriting strategies in the U.S. alone based on a private survey of multiple dealers. The fastest-growing segment is selling ultra-short dated options expiring in less than a week.

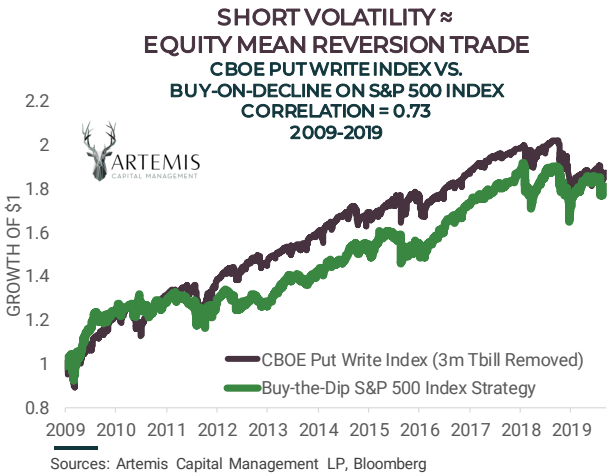
Volatility Risk Premia strategies gained traction after the decline in interest rates following the Global Financial Crisis. Those who support the efficacy of Volatility Risk Premia strategies point to reliable performance and back-tests using data from the start of the options market in 1986 to today. Despite the institutional and retail popularity of Volatility Risk Premia strategies, there is no study estimating how these strategies would have performed before the advent of listed options markets in the mid-1980s.

Effectively, the modus operandi of volatility sellers is that history doesn't matter before 1986, because there is no options data available.

BUT THERE IS DATA. The majority of the primary inputs for option pricing models are readily available via historical databases, including stock prices, interest rates, dividends, and realized volatility. Nonetheless, the most challenging part of assessing the theoretical performance of a volatility strategy in the past is estimating the cost of implied volatility. How do you create a volatility surface going back to 1928? To solve this problem, we took real implied volatility data from 2000 to 2019 and ran a multivariable regression to predict the S&P 500 implied volatility at different delta and expiration levels, using measurable historical data features like index realized volatility (10-day, 21-day, and 63-day) and SPX index returns (10-days and 63-days). All regressions had R-Squared levels greater than 0.85. This technique allows us to create an S&P 500 Index implied volatility surface that we used to estimate the hypothetical performance of popular options strategies before 1986. To test the effectiveness of our replication indices, we compared their returns to actual short volatility indices from 1986 to 2019. The chart to the right shows the performance of the CBOE Put Write Index (minus T-bill exposure) as compared to our replication index. The short volatility replication index demonstrates comparable return and risk characteristics with a correlation greater than 89% (R-Squared at 0.69) to the real index between 1986 and 2019. As an additional reality check, we also evaluated model-free strategies that are highly correlated to Volatility Risk Premia but do not require implied volatility estimates. As an example, Equity Mean Reversion strategies perform very similarly to Explicit Short Volatility and are easily back-tested to 1928 without extraneous assumptions. For evidence, consider the similarities between the CBOE Put Write Index (T-bill exposure removed) and a Buy-the-Decline strategy in the S&P 500 index, which demonstrates a high correlation (0.73) since 1986.



Sources: Artemis Capital Management LP, Bloomberg



Sources: Artemis Capital Management LP, Bloomberg

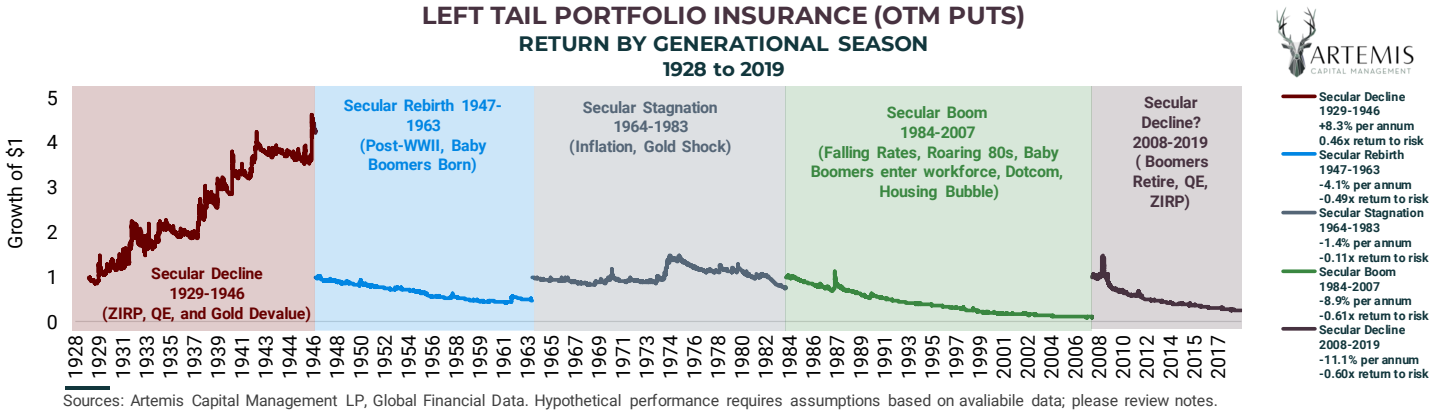
We readily admit it is impossible to know with complete accuracy how a rolling short or long option strategy would have performed over 90 years. Any option strategy is highly path-dependent, and different methods of execution can yield wildly different results depending on roll-periods, option selection, and delta hedging. The options markets interact with the stock market through dealer hedging, and it is impossible to model these relationships back in time. While not perfect, our work represents the best effort at replicating basic volatility premia strategies to give a broad sense of the performance of these strategies through time.

PORTFOLIO INSURANCE ("TAIL RISK HEDGING")

Most people buy home insurance, car insurance, and life insurance, but very few are willing to buy Portfolio Insurance to protect their retirement. Portfolio Insurance ("Tail Hedging") involves any strategy that continuously purchases option premiums to protect against a market outcome (rising or falling). The strategy is philosophically different than Active Long Volatility (see earlier analysis), the difference being that the former buys options opportunistically, and the later is a pure insurance policy. The choice between Tail Risk and Active Long Volatility (discussed earlier) primarily comes down to the prioritization of cost-of-carry vs. certainty of performance. The most popular Portfolio Insurance Strategy involves rolling out-of-the-money S&P 500 index put options on an equity index (CBOE 5% Put Protection Index). Ironically, Tail Risk Hedging was the most popular immediately after the last financial crisis. If you attended the CBOE Risk Management conference in 2010, Tail Risk Hedging to protect against "black swans" was all the rage, but only a few years later, the discussion flipflopped to selling volatility. When volatility hit all-time lows in 2017, one manager joked they should change the name from "Risk Management" to the "Short Volatility Yield Enhancement" Conference.

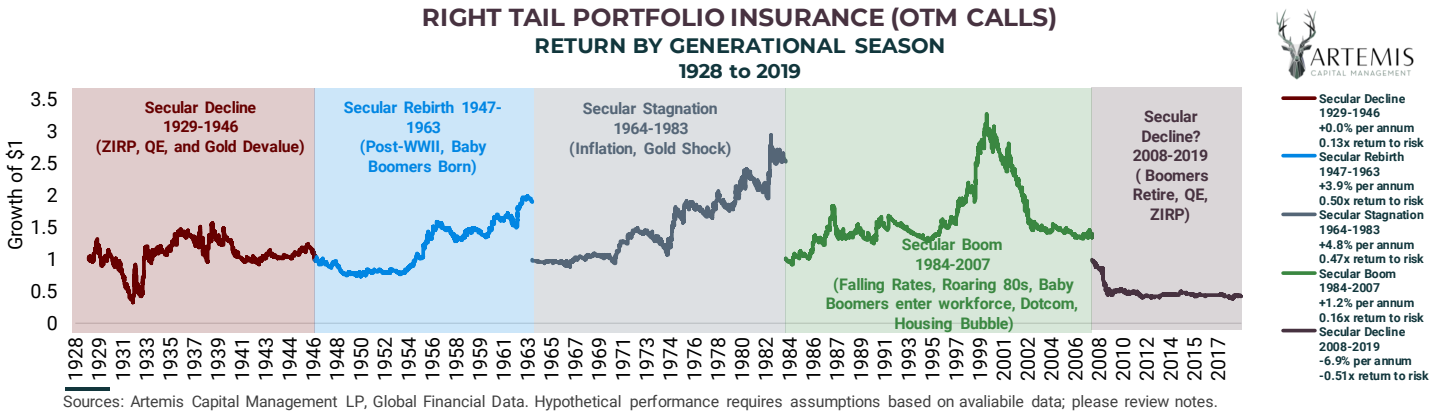
TAIL RISK CARRIED POSITIVELY THROUGHOUT THE 1930s AND EARLY 1940s

The 90-year performance of Portfolio Insurance may be surprising to most investors. A Long Straddle (long puts and calls) carried positively for 18 years between 1928 and 1946 and seven years between 1968 to 1975. If you have trouble believing the idea that Portfolio Insurance could have a positive return for years on end, consider the mathematical fact that equity volatility realized over 35+ for the decade ending in 1939 (see below). A consistently inverted volatility term structure with high realized volatility could have resulted in continuous pay-offs for Long Volatility in the 1930s. If the CBOE Risk Management conference existed in 1946, investment banks would be pitching Long Volatility strategies for yield enhancement!



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

The same recency bias that causes us to overweight Stocks and Bonds also causes us to undervalue Portfolio Insurance and Long Volatility. The period between 2008 and 2019 has been the worst period on record for tail risk, even when factoring in the crash of 2008. A Long Volatility Straddle (long call and put option) carried at -14.1% a year, Left Tail Portfolio Insurance (rolling long put option) at -11.1% a year, and Right Tail Portfolio Insurance (rolling long call option) at -6.9% per year. The last decade has seen some of the lowest recorded volatility readings in history with volatility consistently averaging in the low-teens.



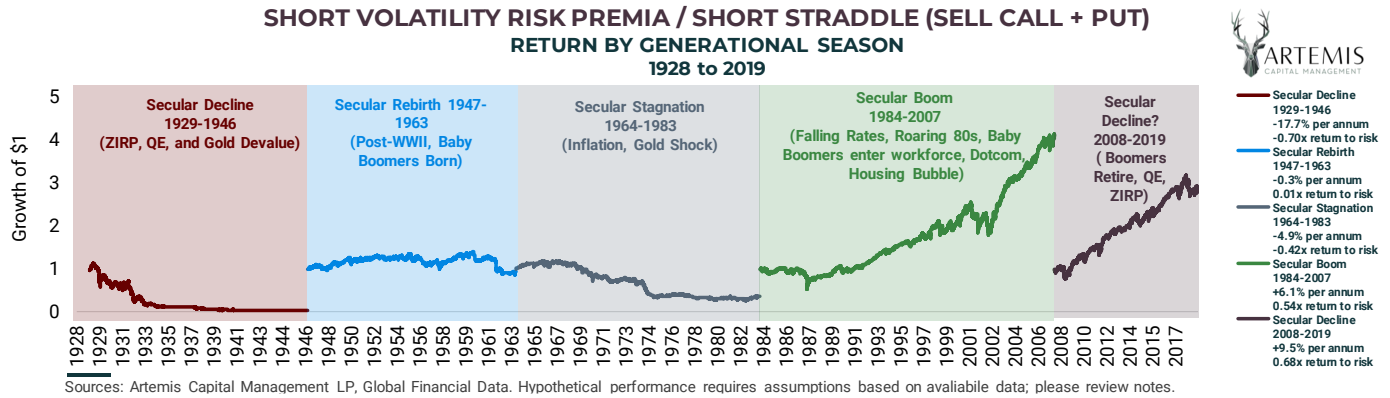
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

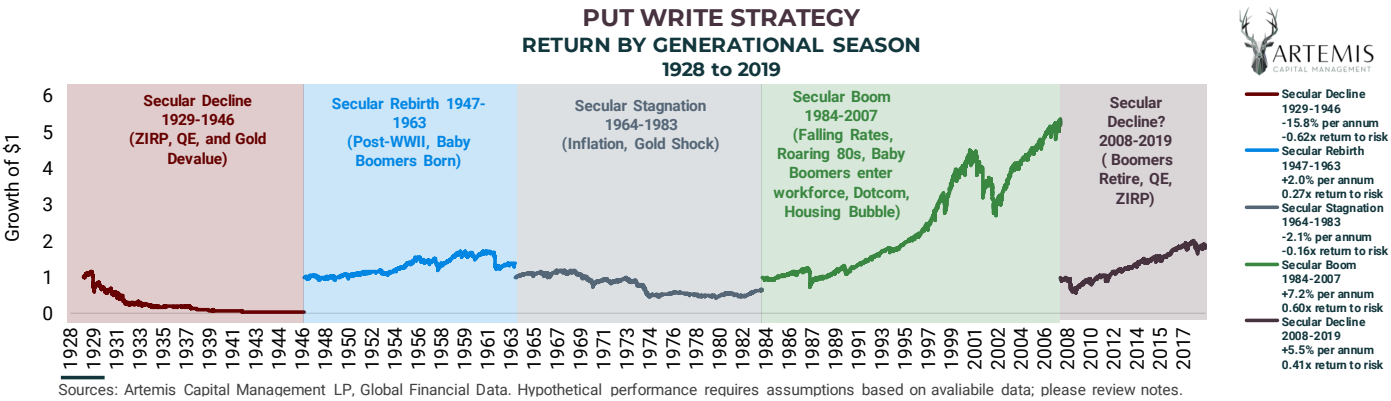
VOLATILITY RISK PREMIA ("EXPLICIT SHORT VOLATILITY")

The pitch for Volatility Risk Premia is to generate equity-like returns with less risk. The track record since 1986 is impressive at first glance. The CBOE Put Write Index has returned +9.59% annualized since 1986, (dropping to +5.78% per annum, without the U.S. Treasury bills). The CBOE Buy-Write Index returned +8.64% per annum, which bests the S&P 500 index with a better return per unit of risk since 1986. More than any other strategy, Explicit Short Volatility suffers from extreme recency bias. According to our testing, a Short Straddle lost -2.3% per annum over 90 years with a near -100% drawdown; collateralized put selling lost -0.8% per anum with a -98% drawdown, and naked call selling lost -3.7% per year with close to -100% drawdown; a mean reversion strategy that buys on equity declines lost -3.4% per annum with a near -100%, and a linear strategy that buys on equity declines and sells on gains lost -10% a year with a close to -100% drawdown.

Explicit Volatility Selling was the worst-performing class of strategies evaluated over 90 years of history. All Short Volatility Strategies demonstrated complete loss of capital when implemented systematically. As equity volatility rose above 35 for years on end in the 1930s, a consistently inverted term structure selling implied below realized would have caused continuous losses for Volatility Premia Strategies. If this occurred in a modern context, it would likely result in creditworthiness problems for institutions or hedge funds shorting volatility. After five years of realized volatility above 40 by 1936, forced exits of Short Volatility Sellers may cause implied volatility to re-price at a premium rather than a discount. To this effect, a VIX index averaging greater than 40 or 50 for years at a time would be realistic. It is tough to estimate how implied volatility would be re-priced throughout a decade like the 1930s, but we are confident that the era would decimate Volatility Risk Premia. There is no denying that linear strategies with a high correlation to Explicit Short Volatility (e.g., Buy-Equity-on-Declines with 0.73 correlation) suffered similar catastrophic drawdowns in the 1930s and 1970s, even without the complexity of modeling a volatility surface. The prudent investor should not only avoid these strategies, but also counterparty risk to institutions that methodically apply them. Short Volatility can be used effectively on a tactical basis or for trades with specific objectives, but this class of strategies is not appropriate for a fully systematic application.

A common misconception about Short Volatility is that the worst-case scenario is a one-day catastrophic volatility spike (e.g., -20% Black Monday crash on October 21, 1987). While a crash of this magnitude is harmful to the volatility seller, nonetheless, if hedged appropriately, the strategy may fare better than the overall market during a recovery period if correctly sized. Advocates of the approach are quick to make all these legitimate points, but this is far from the worst-case scenario for a Short Volatility position. In a secular decline like the 1930s or stagflationary decline like the 1970s, there is a perpetual trend lower in equity prices and trend higher in instability that persists for years. Imagine elevated volatility on-par with the 2008 financial crisis lasting a decade, and this is what occurred in the 1930s. That is the real risk of Short Volatility.





VOLATILITY RISK PREMIA ("EXPLICIT SHORT VOLATILITY") (CONTINUED)

To understand why Explicit Short Volatility performs so poorly over the more extended history, consider that the mean reversion properties of equity we take for granted today were not a feature of markets for the more significant part of 90 years. The stock market demonstrated significant autocorrelation between the 1960s and late 1970s, which wreaked havoc on any strategy that was short gamma. High volatility regimes for extended history were also a problem. In the 1930s, volatility averaged 30+ for over a decade. If you keep selling implied volatility at a discount to the realized volatility of the market continuously over ten years, that is a big problem.

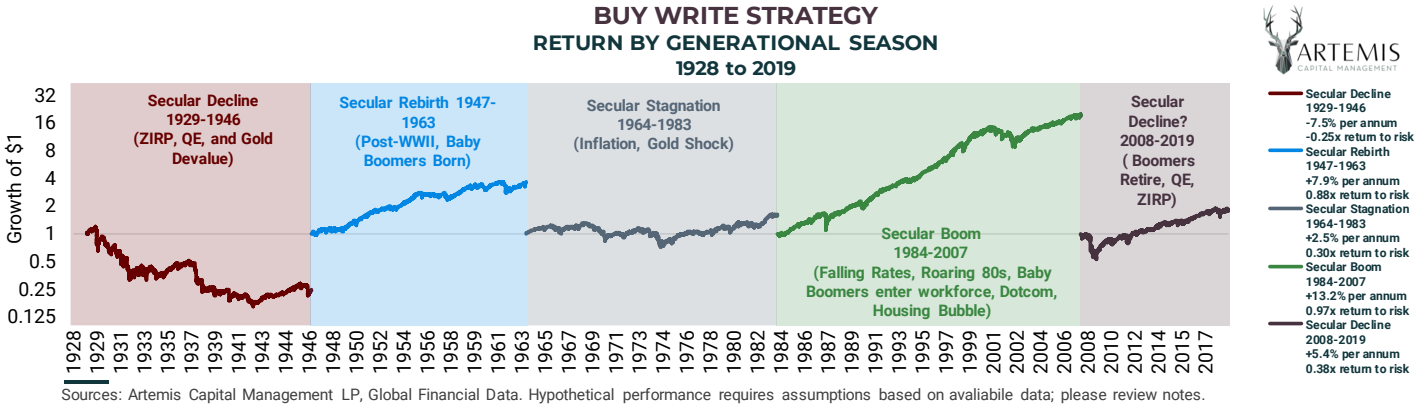
There is a popular myth that a collateralized rolling short option position can never underperform its reference index because exposure to price movement (delta) is always a fraction of the index. That logic ignores the fact that the pay-off of the option is highly path-dependent and exposed non-linearly to risk factors like volatility, asset price trend, and higher-order sensitivities. Take a look at the day-to-day equity price movements in the 1930s and 1970s for evidence of where this can go wrong. While it is highly likely that the price of implied volatility and skew would adjust to reflect these new realities, the truth is that the Short Volatility Portfolio would be insolvent before it does. While the 1930s and 1940s were a terrible time for short volatility strategies, I expect that our replication process understates the performance of Short Volatility Risk Premia in the late 1940s and 1950s because premiums would rise to reflect the bankruptcy of short volatility investors in the prior decade.

The point of this exercise is that the wrong debt-default recession or helicopter money regime could result in disastrous drawdowns for any institution that executes Short Volatility systematically, even on a fully collateralized basis. The fact that the institutional asset management community doesn't realize what a repeat of secular declines like the 1930s or 1970s can do to a Short Volatility portfolio is alarming.

BUY WRITE STRATEGY AND NAKED CALL SELLING

Here is an interesting question, which strategy fared worse during the Great Depression-era of the 1930s? A short rolling put, or a short rolling call? The truth may surprise many investors.

Naked Call Selling was the second-worst strategy we tested over 90 years. The potential for Right Tail volatility is often severely underestimated over periods of fiat devaluation (see our 2012 paper "Volatility at World's End"). For example, in the event helicopter money or fiat devaluation is announced, we expect Buy-Write and Naked Call Selling strategies to experience significant drawdowns as asset prices rise with high realized volatility.



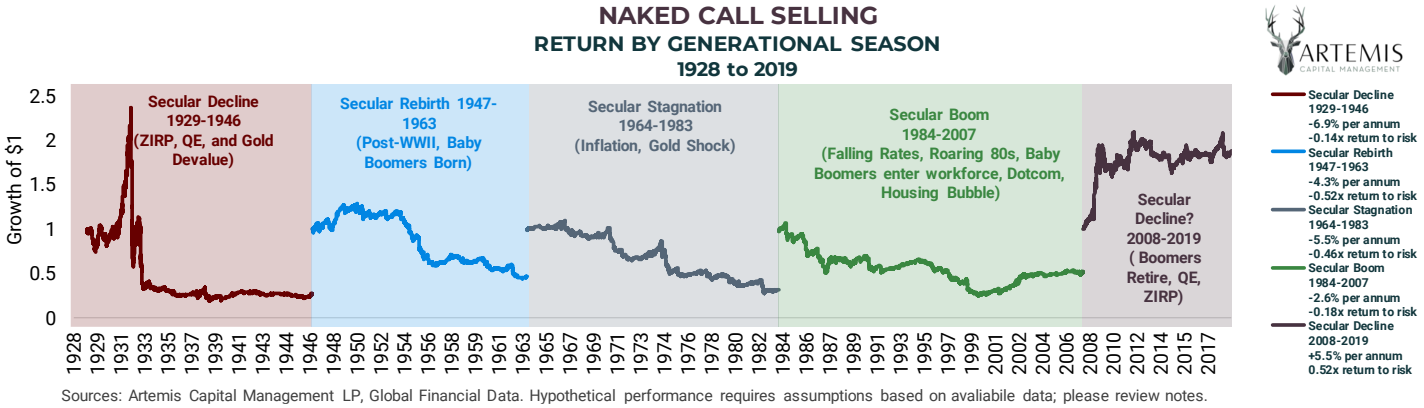
Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

The stock rallies during the Great Depression are a great example of this phenomenon. Most investors only associate the Depression with price declines and forget the extreme volatility associated with price increases following periods of government action. For example, after a brutal 3-year decline of -80%, the market rallied +72% in just 1.5 months between July and September 1932 following the signing of the Banking Act. In 1933 a +88% rebound over 4.5 months occurred after Rosevelt de-valued the dollar against Gold following a -33% decline the previous winter. These periods in 1932 and 1933 are short bursts of extreme right tail volatility in a left tail secular decline.

If you had implemented a buy-write strategy between 1929 and 1933, you would have realized a -70% loss (vs. -80% for market) between 1929 and 1932 but would have only gained +12% (vs. 72% for market) during the relief of 1932 due to losses on your covered call position. Eventually, after significant losses, the options skew would compensate right tail risk (not shown in our back-tests). Buy-Write Strategies are not "safe" during a secular decline, even though they did better than Equities in the 2007-2008 crisis.

RIGHT TAIL RISK

Naked Call Selling underperformed Portfolio Insurance strategies over 90-years. While Naked Call Selling has returned +5.5% a year since 2008, it suffered catastrophic drawdowns and compounded at -6% a year between 1928 and 1983, bleeding money through good times and bad. In a world where we are approaching helicopter money, ask yourself whether the risk of missing a massive rally is worth 30-60 basis points a year of "excess return."



Sources: Artemis Capital Management LP, Global Financial Data. Hypothetical performance requires assumptions based on avaliabile data; please review notes.

SHORT VOLATILITY AND COUNTERPARTY RISK

When evaluated over a longer-term history, Systematic Short Volatility strategies are comparable to the toxic Collateralized Debt Obligations ('CDOs") that infected the financial system between 2007-2008. Like CDOs, the sellers of systematic short volatility assume conditions about the world based on a minimal view of history (1986 to 2019). The fatal assumption during the GFC was that housing prices would not decline nationwide. The dangerous assumption with Short Volatility Strategies is that volatility mean-reverts over short periods. It is easy to disprove either hypothesis using historical data over 90 years.

In the financial crisis, investors were unable to sell downgraded CDOs, leading to solvency and liquidity crisis. The risk with short volatility strategies is similar. The core problem is a "gamma trap," when many market participants attempt to exit a crowded short volatility position en masse, and dealer re-hedging reinforces the price movement of the underlying asset in a self-reinforcing doom loop (higher or lower). There have already been two episodes of severe short volatility shakeouts on both tails of the return distribution since 2017 despite secular lows in volatility and asset price trend.

LEFT TAIL: On February 5th, 2018, a routine decline in Equities caused a liquidity squeeze in retail-dominated short VIX products resulting in a self-reflexive spiral of buying pressure. At the end of the trading session, the VIX levered, and short exchange-traded products ("ETPs") required more vega notional exposure than was available in the entire market. The VIX registered the second-largest draw up (+177%) in its 28-year history. During this period, market re-hedging wiped out a popular Short VIX ETP ("XIV") and many similar strategies lost years worth of profits in a single afternoon. The $772 million LJM Preservation and Growth fund, which sold strangles on the S&P 500 index, lost -85% on that day alone. In one swoop $4 billion of Short Volatility Products were wiped out overnight (as Artemis predicted in our 2015 and 2017 research)

RIGHT TAIL: The rise and fall of the Catalyst Hedged Futures Mutual Fund (HFXAX) in 2017 is another cautionary story. Catalyst pursued an aggressive strategy of shorting upside volatility using 1 x 3 call spreads in S&P 500 index options. From 2013 and 2016, the Catalyst fund returned +7.85% annualized return with $4.2 billion. Morningstar gave the fund an impressive four stars for performance and capital preservation. Following the 2016 US election, the stock market went on a tear increasing +12.37%, and Catalyst found itself on the wrong side of a short options trade. In February 2017, at $4.2 billion in assets, Catalyst was unable to roll positions at their size easily, and when they tried the size of the orders forced dealers to buy SPX futures to hedge the exploding delta, further causing Catalyst short call options to move deeper and deeper into the red. It was a negative feedback loop, and the fund lost approximately -30%.

What is incredible is that we have experienced $8 billion in Short Volatility Fund collapses even though volatility has remained below the historical average of 20. Imagine what could happen if volatility averages above 40+ for an extended period with -50% and +50% price swings in both directions, as experienced during the Great Depression. In many ways, XIV, LGM Preservation and Growth, and Catalyst are like subprime lenders, such as New Century Financial, that went bankrupt in 2006 before the GFC. The question is whether there is a "short volatility" version of Lehman out there. We advise not only staying away from Volatility Risk Premia strategies but limiting exposure to counterparties that use or sell them robotically. While these strategies have thrived over the last decade, they are unlikely to survive the next century.

STRATEGY PERFORMANCE BY GENERATIONAL SEASON (1928 to 2019)

NOMINAL RETURNS - NO FINANCING CHARGES - ESTIMATED

	PORTFOLIO				TRADITIONAL ASSETS					DEFENSIVE			LONG VOLATILITY			SHORT VOLATILITY				MEAN REVERSION	
Secular Era	Dragon Portfolio *(Eqty, Bonds, Gold, Vol, Comdty Trend)*	Classic 60/40 Portfolio *(Eqty, Bonds)*	Risk Parity Portfolio *(Eqty, Bonds, Comdty Trend)*	Volatility Target	Equity	Real Estate	Corporate Bonds (Baa)	U.S. Treasury Bonds	Comdty	Gold	Comdty Trend	Active Long Volatility	Portfolio Insurance *(ATM Put + Call Buying)*	Portfolio Insurance Left Tail *(OTM Put Buying)*	Portfolio Insurance Right Tail *(OTM Call Buying)*	Short Volatility (Put + Call Selling)	Put Write Strategy (Sell Put w. Collateral)	Buy Write Strategy (Eqty + Call Selling)	Naked Call Selling (Sell Calls Unhedged)	Equity Mean Reversion	Equity Buy-on-Decline
1928 to August 2019																					
Annual Return (15 vol)	+14.4%	+7.9%	+9.1%	+6.7%	+6.4%	+11.2%	+6.8%	+5.9%	+1.2%	+4.7%	+9.2%	+0.7%	-1.6%	-3.5%	+1.5%	-2.3%	-0.8%	+4.7%	-3.7%	-10.2%	-3.4%
Annual Return (Cash)	+5.4%	+6.1%	+4.1%	+7.3%	+7.5%	+4.0%	+4.0%	+2.9%	+1.2%	+4.8%	+7.7%	+0.7%	-0.8%	-1.9%	+0.9%	-1.8%	-0.6%	+3.9%	-1.5%	-12.7%	-3.1%
Risk to Return	0.98x	0.59x	0.66x	0.51x	0.49x	0.77x	0.51x	0.46x	0.15x	0.38x	0.67x	0.12x	-0.04x	-0.16x	0.17x	-0.08x	0.02x	0.38x	-0.18x	-0.64x	-0.15x
Max Drawdown	-34%	-74%	-65%	-64%	-79%	-61%	-69%	-51%	-80%	-69%	-55%	-81%	-98%	-99%	-84%	-100%	-98%	-86%	-100%	-100%	-100%
Pre-Modern Era of Finance: Great Depression, Post-WWII Boom, Stagflation (1928-1984)																					
Annual Return (15 vol)	+15.4%	+5.3%	+7.3%	+5.1%	+4.6%	+10.8%	+3.0%	+2.6%	+3.0%	+5.2%	+14.4%	+3.3%	+3.7%	+0.6%	+3.4%	-7.9%	-5.3%	+1.0%	-6.0%	-16.1%	-8.3%
Annual Return (Cash)	+5.8%	+4.1%	+3.3%	+5.5%	+5.3%	+4.0%	+1.9%	+1.3%	+2.6%	+5.4%	+11.9%	+2.1%	+2.7%	+0.6%	+1.8%	-6.6%	-4.4%	+1.0%	-2.5%	-19.7%	-7.7%
Risk to Return	1.02x	0.41x	0.64x	0.41x	0.37x	0.64x	0.29x	0.27x	0.28x	0.42x	1.04x	0.28x	0.31x	0.12x	0.28x	-0.44x	-0.28x	0.14x	-0.28x	-1.07x	-0.49x
Max Drawdown	-34%	-74%	-65%	-64%	-79%	-60%	-69%	-51%	-80%	-64%	-28%	-54%	-50%	-66%	-75%	-99%	-98%	-86%	-98%	-100%	-100%
Modern Asset Boom: Baby Boomers reach peak savings and retirement ages (1984-2019)																					
Annual Return (15 vol)	+12.9%	+12.3%	+11.9%	+9.3%	+9.2%	+11.8%	+13.0%	+11.3%	-1.5%	+3.9%	+1.6%	-3.2%	-9.5%	-9.6%	-1.5%	+7.2%	+6.6%	+10.6%	-0.0%	-0.1%	+4.9%
Annual Return (Cash)	+4.9%	+9.2%	+5.4%	+10.1%	+11.0%	+4.1%	+7.4%	+5.3%	-1.1%	+3.9%	+1.5%	-1.6%	-6.1%	-5.8%	-0.5%	+6.2%	+5.8%	+8.7%	+0.1%	-0.4%	+4.6%
Risk to Return	0.91x	0.88x	0.70x	0.66x	0.68x	1.64x	0.80x	0.67x	-0.01x	0.32x	0.18x	-0.16x	-0.65x	-0.60x	-0.07x	0.59x	0.53x	0.74x	0.05x	0.06x	0.41x
Max Drawdown	-20%	-40%	-59%	-46%	-48%	-61%	-49%	-39%	-77%	-48%	-55%	-81%	-98%	-98%	-84%	-49%	-43%	-48%	-77%	-88%	-37%
1928 to Aug. 5 1971 (Pre-Gold Devaluation)																					
Annual Return (15 vol)	+11.4%	+4.2%	+5.7%	+5.6%	+3.7%	+7.5%	+2.7%	+2.0%	+1.0%	+1.5%	+12.4%	+3.3%	+4.0%	+1.3%	+2.7%	-8.5%	-6.1%	+0.1%	-5.7%	-13.9%	-6.7%
Annual Return (Cash)	+4.4%	+3.3%	+2.5%	+6.1%	+4.2%	+3.0%	+1.8%	+1.0%	+1.0%	+1.6%	+10.3%	+2.2%	+2.9%	+1.1%	+1.6%	-7.0%	-5.1%	+0.3%	-2.4%	-17.1%	-6.1%
Risk to Return	0.87x	0.34x	0.59x	0.44x	0.31x	0.44x	0.27x	0.28x	0.14x	0.25x	0.99x	0.28x	0.32x	0.16x	0.24x	-0.44x	-0.30x	0.09x	-0.24x	-0.84x	-0.34x
Max Drawdown	-34%	-74%	-65%	-64%	-79%	-60%	-69%	-40%	-80%	-19%	-28%	-54%	-50%	-63%	-75%	-98%	-96%	-86%	-96%	-100%	-98%
Aug. 5 1971 (Post-Gold Devaluation) to 2019																					
Annual Return (15 vol)	+15.9%	+12.3%	+10.6%	+7.6%	+8.8%	+29.9%	+10.1%	+8.2%	+1.4%	+5.8%	+6.0%	-1.4%	-7.1%	-8.1%	+0.9%	+4.4%	+4.9%	+9.6%	-1.9%	-7.5%	-0.3%
Annual Return (Cash)	+6.4%	+8.6%	+5.5%	+8.4%	+10.5%	+5.0%	+6.1%	+4.6%	+1.3%	+7.8%	+5.5%	-0.7%	-4.1%	-4.6%	+0.3%	+3.2%	+3.7%	+7.3%	-0.7%	-8.4%	-0.2%
Risk to Return	1.06x	0.84x	0.73x	0.57x	0.68x	1.96x	0.70x	0.57x	0.16x	0.47x	0.46x	-0.06x	-0.44x	-0.51x	0.09x	0.34x	0.38x	0.67x	-0.10x	-0.44x	0.05x
Max Drawdown	-34%	-40%	-59%	-46%	-48%	-61%	-52%	-51%	-77%	-69%	-55%	-81%	-98%	-99%	-84%	-76%	-56%	-48%	-91%	-100%	-89%
Secular Decline: Great Depression, New Deal, World War II, Dust Bowl (1929-1946)																					
Annual Return (15 vol)	+11.3%	-3.3%	+5.7%	-0.4%	-4.5%	+5.0%	+8.1%	+4.6%	+2.9%	+2.8%	+22.2%	+5.2%	+10.0%	+8.3%	+0.0%	-17.7%	-15.8%	-7.5%	-6.9%	-3.6%	-2.1%
Annual Return (Cash)	+4.5%	-2.0%	+2.6%	-0.5%	-6.0%	+2.4%	+4.9%	+2.1%	+2.6%	+2.9%	+18.2%	+3.6%	+7.1%	+5.7%	+0.8%	-14.9%	-13.3%	-5.7%	-2.5%	-5.1%	-1.8%
Risk to Return	0.68x	-0.04x	0.54x	0.06x	-0.09x	0.31x	0.49x	0.66x	0.26x	0.33x	1.31x	0.33x	0.52x	0.46x	0.13x	-0.70x	-0.62x	-0.25x	-0.14x	-0.05x	0.02x
Max Drawdown	-34%	-74%	-65%	-64%	-79%	-60%	-69%	-16%	-77%	-3%	-24%	-54%	-48%	-34%	-75%	-98%	-96%	-86%	-92%	-85%	-70%
Secular Rebirth: Superpower America, Bretton Woods, Demographic Boom, Golden Age of Capitalism (1947-1963)																					
Annual Return (15 vol)	+12.4%	+10.8%	+7.5%	+11.1%	+10.7%	+9.0%	+1.2%	+0.9%	+0.9%	+0.1%	+7.8%	+0.9%	-1.2%	-4.1%	+3.9%	-0.3%	+2.0%	+7.9%	-4.3%	-18.9%	-8.1%
Annual Return (Cash)	+4.6%	+8.0%	+3.3%	+12.2%	+13.0%	+3.3%	+0.7%	+0.5%	+0.8%	+0.1%	+6.4%	+0.6%	-0.7%	-2.5%	+1.8%	-0.2%	+1.8%	+6.4%	-2.0%	-22.8%	-7.5%
Risk to Return	1.40x	1.13x	0.79x	0.77x	1.11x	0.57x	0.26x	0.17x	0.13x	0.21x	0.79x	0.16x	-0.09x	-0.49x	0.50x	0.01x	0.27x	0.88x	-0.52x	-2.14x	-0.83x
Max Drawdown	-13%	-22%	-30%	-33%	-23%	-5%	-32%	-26%	-41%	0%	-22%	-33%	-41%	-58%	-29%	-38%	-30%	-25%	-65%	-97%	-80%
Secular Stagnation: US Dollar De-Pegged, Stagflation, Oil Crisis (1964-1983)																					
Annual Return (15 vol)	+21.3%	+7.5%	+9.1%	+3.6%	+6.8%	+18.2%	+0.5%	+2.7%	+5.6%	+12.3%	+14.5%	+2.9%	+2.1%	-1.4%	+4.8%	-4.9%	-2.1%	+2.5%	-5.5%	-23.9%	-14.5%
Annual Return (Cash)	+7.9%	+5.7%	+4.1%	+3.9%	+8.1%	+6.1%	+0.5%	+1.6%	+4.8%	+12.9%	+12.2%	+1.7%	+1.6%	-0.7%	+2.3%	-4.1%	-1.7%	+2.1%	-2.5%	-28.8%	-13.6%
Risk to Return	1.25x	0.66x	0.67x	0.33x	0.67x	2.61x	0.11x	0.24x	0.46x	0.63x	1.03x	0.35x	0.27x	-0.11x	0.47x	-0.42x	-0.16x	0.30x	-0.46x	-2.63x	-1.53x
Max Drawdown	-34%	-39%	-43%	-48%	-39%	-2%	-52%	-51%	-51%	-64%	-25%	-21%	-27%	-49%	-28%	-77%	-63%	-45%	-74%	-100%	-97%
Secular Boom: Baby Boomers enter workforce, Roaring 80s, Tech Bubble, Housing Bubble (1984-2007)																					
Annual Return (15 vol)	+13.1%	+13.7%	+14.9%	+10.4%	+10.3%	+15.4%	+14.0%	+13.4%	+2.3%	+3.2%	-0.8%	-1.4%	-7.2%	-8.9%	+1.2%	+6.1%	+7.2%	+13.2%	-2.6%	-4.2%	+2.5%
Annual Return (Cash)	+4.9%	+10.3%	+6.4%	+11.4%	+12.3%	+5.2%	+7.9%	+6.2%	+2.1%	+3.3%	-0.5%	-0.6%	-4.6%	-5.3%	+0.7%	+5.3%	+6.2%	+10.7%	-1.1%	-5.4%	+2.4%
Risk to Return	0.95x	0.98x	1.00x	0.73x	0.79x	2.40x	0.94x	0.77x	0.23x	0.29x	0.02x	-0.05x	-0.49x	-0.61x	0.16x	0.54x	0.60x	0.97x	-0.18x	-0.26x	0.26x
Max Drawdown	-20%	-34%	-23%	-46%	-41%	-17%	-31%	-39%	-49%	-48%	-55%	-57%	-90%	-91%	-59%	-49%	-43%	-39%	-77%	-88%	-37%
Secular Decline: Great Recession, Global Everything Bubble (2008-2019)																					
Annual Return (15 vol)	+12.7%	+9.4%	+6.0%	+7.0%	+7.2%	+4.8%	+11.0%	+7.1%	-9.0%	+5.2%	+6.7%	-6.8%	-14.1%	-11.1%	-6.9%	+9.5%	+5.5%	+5.4%	+5.5%	+8.9%	+9.8%
Annual Return (Cash)	+4.9%	+7.2%	+3.3%	+7.6%	+8.4%	+1.7%	+6.5%	+3.5%	-7.2%	+5.3%	+5.8%	-3.5%	-9.2%	-6.7%	-2.9%	+8.1%	+4.8%	+4.6%	+2.8%	+10.7%	+9.2%
Risk to Return	0.84x	0.69x	0.36x	0.51x	0.50x	0.56x	0.62x	0.47x	-0.37x	0.37x	0.42x	-0.34x	-0.94x	-0.60x	-0.51x	0.68x	0.41x	0.38x	0.52x	0.61x	0.66x
Max Drawdown	-17%	-39%	-59%	-29%	-45%	-54%	-46%	-30%	-77%	-43%	-39%	-69%	-86%	-83%	-61%	-28%	-43%	-48%	-22%	-28%	-24%

Sources: Artemis Capital Management LP, Global Financial Data, Bloomberg.
Hypothetical performance results require numerous assumptions based on avaliable data. Please refer to the complete notes inthe appendix and reference section for a full description of these assumptions. Past performance is not indicative of future sucess.

Legend:
Annual Return (15 volatility): The return per annum of the strategy normalized to an annual volatility of 15% since 1928. Leveraged returns may require financing charges.
Annual Return (cash funding): The return per annum of the strategy assuming it is fully cash funded.
Return to Risk: The ratio of the per annum return to the realized annual volatility over the specified time period. Does notinclude risk-free rate.
Max Drawdown: The largest peak to trough drawdown the strategy experienced in the given time period.

STRATEGY PERFORMANCE BY GENERATIONAL SEASON (1928 to 2019)

INFLATION ADJUSTED RETURNS - NO FINANCING CHARGES - ESTIMATED

	PORTFOLIO				TRADITIONAL ASSETS					DEFENSIVE			LONG VOLATILITY			SHORT VOLATILITY				MEAN REVERSION	
Secular Era	Dragon Portfolio *(Eqty, Bonds, Gold, Vol, Comdty Trend)*	Classic 60/40 Portfolio (Eqty, Bonds)	Risk Parity Portfolio (Eqty, Bonds, Comdty Trend)	Volatility Target	Equity	Real Estate	Corporate Bonds (Baa)	U.S. Treasury Bonds	Comdty	Gold	Comdty Trend	Active Long Volatility	Portfolio Insurance *(ATM Put + Call Buying)*	Portfolio Insurance Left Tail *(OTM Put Buying)*	Portfolio Insurance Right Tail *(OTM Call Buying)*	Short Volatility (Put + Call Selling)	Put Write Strategy (Sell Put w. Collateral)	Buy Write Strategy (Eqty + Call Selling)	Naked Call Selling (Sell Calls Unhedged)	Equity Mean Reversion	Equity Buy-on-Decline
1928 to August 2019																					
Annual Return (15 vol)	+10.1%	+3.9%	+5.0%	+2.7%	+2.3%	+7.0%	+2.7%	+1.9%	-2.6%	+0.7%	+5.1%	-3.1%	-5.4%	-7.1%	-2.4%	-6.0%	-4.6%	+0.7%	-7.3%	-13.6%	-7.0%
Annual Return (Cash)	+1.5%	+2.1%	+0.2%	+3.2%	+3.4%	+0.1%	+0.1%	-1.0%	-2.7%	+0.8%	+3.7%	-3.1%	-4.6%	-5.6%	-2.9%	-5.5%	-4.3%	+0.0%	-5.2%	-16.0%	-6.7%
Risk to Return	0.72x	0.33x	0.40x	0.25x	0.23x	0.51x	0.26x	0.20x	-0.10x	0.12x	0.41x	-0.14x	-0.29x	-0.42x	-0.09x	-0.34x	-0.24x	0.12x	-0.43x	-0.90x	-0.41x
Max Drawdown	-49%	-78%	-70%	-77%	-82%	-67%	-88%	-83%	-95%	-93%	-89%	-98%	-100%	-100%	-94%	-100%	-100%	-89%	-100%	-100%	-100%
Pre-Modern Era of Finance: Great Depression, Post-WWII Boom, Stagflation (1928-1984)																					
Annual Return (15 vol)	+10.9%	+1.2%	+3.2%	+1.1%	+0.6%	+6.5%	-0.9%	-1.3%	-1.0%	+1.2%	+10.0%	-0.7%	-0.3%	-3.2%	-0.6%	-11.4%	-9.0%	-2.8%	-9.6%	-19.3%	-11.8%
Annual Return (Cash)	+1.7%	+0.1%	-0.7%	+1.4%	+1.2%	-0.0%	-2.0%	-2.5%	-1.3%	+1.3%	+7.6%	-1.8%	-1.3%	-3.2%	-2.1%	-10.2%	-8.1%	-2.9%	-6.3%	-22.7%	-11.2%
Risk to Return	0.76x	0.16x	0.32x	0.15x	0.11x	0.42x	0.00x	-0.05x	0.00x	0.15x	0.76x	0.03x	0.06x	-0.15x	0.05x	-0.69x	-0.53x	-0.12x	-0.51x	-1.32x	-0.74x
Max Drawdown	-49%	-78%	-70%	-77%	-82%	-67%	-88%	-83%	-83%	-74%	-51%	-73%	-84%	-95%	-78%	-100%	-100%	-89%	-100%	-100%	-100%
Modern Asset Boom: Baby Boomers reach peak savings and retirement ages (1984-2019)																					
Annual Return (15 vol)	+8.8%	+8.2%	+7.8%	+5.3%	+5.2%	+7.7%	+8.8%	+7.2%	-5.1%	+0.0%	-2.1%	-6.7%	-12.8%	-12.9%	-5.1%	+3.3%	+2.7%	+6.5%	-3.7%	-3.8%	+1.0%
Annual Return (Cash)	+1.1%	+5.2%	+1.5%	+6.1%	+6.9%	+0.2%	+3.5%	+1.4%	-4.7%	+0.1%	-2.2%	-5.2%	-9.6%	-9.2%	-4.2%	+2.3%	+1.9%	+4.7%	-3.5%	-4.1%	+0.7%
Risk to Return	0.65x	0.62x	0.50x	0.41x	0.42x	1.10x	0.58x	0.47x	-0.23x	0.08x	-0.05x	-0.43x	-0.91x	-0.85x	-0.39x	0.31x	0.26x	0.49x	-0.28x	-0.20x	0.14x
Max Drawdown	-30%	-42%	-59%	-53%	-55%	-64%	-53%	-42%	-85%	-77%	-81%	-93%	-99%	-99%	-90%	-61%	-47%	-50%	-91%	-96%	-77%
1928 to Aug. 5 1971 (Pre-Gold Devaluation)																					
Annual Return (15 vol)	+8.6%	+1.5%	+2.9%	+2.9%	+1.0%	+4.8%	+0.1%	-0.7%	-1.6%	-1.1%	+9.5%	+0.7%	+1.3%	-1.3%	+0.0%	-10.8%	-8.6%	-2.5%	-8.2%	-16.1%	-9.1%
Annual Return (Cash)	+1.6%	+0.7%	-0.1%	+3.3%	+1.5%	+0.3%	-0.9%	-1.7%	-1.7%	-1.0%	+7.4%	-0.4%	+0.3%	-1.5%	-1.1%	-9.4%	-7.5%	-2.3%	-4.9%	-19.3%	-8.6%
Risk to Return	0.68x	0.17x	0.33x	0.27x	0.14x	0.31x	0.07x	-0.04x	-0.06x	-0.13x	0.78x	0.12x	0.16x	0.00x	0.09x	-0.60x	-0.46x	-0.08x	-0.39x	-1.00x	-0.50x
Max Drawdown	-38%	-78%	-70%	-69%	-82%	-67%	-72%	-64%	-83%	-58%	-31%	-57%	-71%	-83%	-78%	-99%	-99%	-89%	-98%	-100%	-99%
Aug. 5 1971 (Post-Gold Devaluation) to 2019																					
Annual Return (15 vol)	+3.2%	+4.8%	+0.8%	+2.8%	+3.6%	-0.8%	+1.6%	-0.8%	-3.9%	+1.9%	+0.4%	-11.1%	-15.1%	-16.3%	-12.4%	-2.5%	-1.7%	+2.8%	-14.6%	-11.5%	-6.0%
Annual Return (Cash)	+1.3%	+3.4%	+0.4%	+3.1%	+5.2%	-0.1%	+1.0%	-0.4%	-3.6%	+2.6%	+0.4%	-5.5%	-8.8%	-9.2%	-4.5%	-1.8%	-1.3%	+2.1%	-5.5%	-12.8%	-5.1%
Risk to Return	0.75x	0.49x	0.45x	0.24x	0.32x	1.26x	0.39x	0.32x	-0.13x	0.22x	0.16x	-0.43x	-0.81x	-0.87x	-0.31x	-0.04x	0.01x	0.33x	-0.51x	-0.80x	-0.32x
Max Drawdown	-49%	-48%	-59%	-67%	-55%	-64%	-70%	-69%	-94%	-93%	-89%	-97%	-100%	-100%	-91%	-94%	-86%	-57%	-99%	-100%	-99%
Secular Decline: Great Depression, New Deal, World War II, Dust Bowl (1929-1946)																					
Annual Return (15 vol)	+9.7%	-4.6%	+4.2%	-1.8%	-5.8%	+3.6%	+6.6%	+3.1%	+1.4%	+1.4%	+20.5%	+3.7%	+8.4%	+6.8%	-1.4%	-18.9%	-17.0%	-8.8%	-8.2%	-4.9%	-3.5%
Annual Return (Cash)	+3.0%	-3.4%	+1.1%	-1.9%	-7.3%	+0.9%	+3.5%	+0.6%	+1.1%	+1.5%	+16.5%	+2.2%	+5.6%	+4.2%	-0.6%	-16.1%	-14.6%	-7.1%	-3.8%	-6.4%	-3.2%
Risk to Return	0.61x	-0.10x	0.41x	-0.04x	-0.15x	0.25x	0.42x	0.46x	0.17x	0.18x	1.22x	0.28x	0.46x	0.40x	0.07x	-0.76x	-0.68x	-0.31x	-0.20x	-0.11x	-0.04x
Max Drawdown	-38%	-78%	-69%	-69%	-82%	-67%	-71%	-18%	-80%	-13%	-24%	-57%	-52%	-35%	-78%	-98%	-97%	-89%	-92%	-86%	-72%
Secular Rebirth: Superpower America, Bretton Woods, Demographic Boom, Golden Age of Capitalism (1947-1963)																					
Annual Return (15 vol)	+9.6%	+8.0%	+4.8%	+8.4%	+8.0%	+6.3%	-1.3%	-1.6%	-1.6%	-2.4%	+5.1%	-1.6%	-3.6%	-6.5%	+1.3%	-2.8%	-0.5%	+5.3%	-6.7%	-20.9%	-10.4%
Annual Return (Cash)	+2.0%	+5.3%	+0.7%	+9.4%	+10.2%	+0.8%	-1.8%	-2.0%	-1.7%	-2.4%	+3.8%	-1.9%	-3.1%	-4.9%	-0.7%	-2.7%	-0.7%	+3.8%	-4.4%	-24.7%	-9.8%
Risk to Return	1.11x	0.87x	0.53x	0.61x	0.86x	0.47x	-0.23x	-0.16x	-0.12x	-8.22x	0.54x	-0.18x	-0.39x	-0.80x	0.20x	-0.26x	-0.01x	0.61x	-0.83x	-2.41x	-1.10x
Max Drawdown	-16%	-23%	-32%	-35%	-24%	-11%	-41%	-39%	-59%	-34%	-23%	-40%	-56%	-70%	-33%	-53%	-37%	-26%	-76%	-98%	-86%
Secular Stagnation: US Dollar De-Pegged, Stagflation, Oil Crisis (1964-1983)																					
Annual Return (15 vol)	+12.7%	-0.1%	+1.4%	-3.7%	-0.8%	+9.8%	-6.6%	-4.5%	-1.8%	+4.4%	+6.5%	-4.4%	-5.1%	-8.4%	-2.6%	-11.6%	-9.0%	-4.7%	-12.2%	-29.3%	-20.5%
Annual Return (Cash)	+0.3%	-1.8%	-3.2%	-3.4%	+0.5%	-1.4%	-6.6%	-5.5%	-2.6%	+5.0%	+4.2%	-5.4%	-5.6%	-7.7%	-4.9%	-10.9%	-8.6%	-5.1%	-9.4%	-33.9%	-19.7%
Risk to Return	0.81x	0.06x	0.17x	-0.18x	-0.01x	1.49x	0.11x	-0.16x	-0.05x	0.31x	1.03x	-0.42x	-0.45x	-0.93x	-0.17x	-1.11x	-0.89x	-0.43x	-1.11x	-3.34x	-2.26x
Max Drawdown	-49%	-48%	-55%	-77%	-50%	-13%	-84%	-77%	-65%	-74%	-50%	-59%	-66%	-82%	-49%	-94%	-89%	-73%	-93%	-100%	-99%
Secular Boom: Baby Boomers enter workforce, Roaring 80s, Tech Bubble, Housing Bubble (1984-2007)																					
Annual Return (15 vol)	+7.3%	+7.9%	+9.1%	+4.8%	+4.7%	+9.6%	+8.2%	+7.6%	-2.8%	-2.0%	-5.8%	-6.4%	-11.9%	-13.5%	-3.9%	+0.7%	+1.8%	+7.5%	-7.6%	-9.1%	-2.7%
Annual Return (Cash)	-0.4%	+4.7%	+1.0%	+5.7%	+6.6%	-0.1%	+2.4%	+0.8%	-3.1%	-1.9%	-5.5%	-5.6%	-9.4%	-10.1%	-4.4%	-0.1%	+0.8%	+5.1%	-6.1%	-10.2%	-2.8%
Risk to Return	0.58x	0.61x	0.65x	0.39x	0.41x	1.54x	0.60x	0.49x	-0.13x	-0.07x	-0.34x	-0.46x	-0.87x	-0.98x	-0.29x	0.12x	0.20x	0.59x	-0.65x	-0.64x	-0.14x
Max Drawdown	-30%	-38%	-27%	-53%	-46%	-23%	-34%	-42%	-77%	-77%	-80%	-84%	-96%	-97%	-73%	-61%	-46%	-43%	-91%	-96%	-77%
Secular Decline: Great Recession, Global Everything Bubble (2008-2019)																					
Annual Return (15 vol)	+11.8%	+8.6%	+5.2%	+6.2%	+6.4%	+4.0%	+10.1%	+6.3%	-9.7%	+4.4%	+5.9%	-7.5%	-14.7%	-11.8%	-7.6%	+8.6%	+4.7%	+4.6%	+4.7%	+8.1%	+9.0%
Annual Return (Cash)	+4.1%	+6.4%	+2.5%	+6.8%	+7.6%	+1.0%	+5.7%	+2.7%	-7.9%	+4.5%	+5.0%	-4.2%	-9.9%	-7.4%	-3.7%	+7.3%	+4.0%	+3.8%	+2.0%	+9.8%	+8.3%
Risk to Return	0.79x	0.64x	0.33x	0.46x	0.46x	0.47x	0.58x	0.43x	-0.40x	0.33x	0.39x	-0.39x	-0.99x	-0.65x	-0.57x	0.63x	0.36x	0.34x	0.45x	0.57x	0.61x
Max Drawdown	-17%	-41%	-59%	-30%	-47%	-55%	-47%	-30%	-78%	-44%	-39%	-71%	-87%	-84%	-64%	-29%	-44%	-49%	-22%	-29%	-24%

Sources: Artemis Capital Management LP, Global Financial Data, Bloomberg.
Hypothetical performance results require numerous assumptions based on avaliable data. Please refer to the complete notes inthe appendix and reference section for a full description of these assumptions. Past performance is not indicative of future sucess.

Legend:
Annual Return (15 volatility): The return per annum of the strategy normalized to an annual volatility of 15% since 1928. Leveraged returns may require financing charges.
Annual Return (cash funding): The return per annum of the strategy assuming it is fully cash funded.
Return to Risk: The ratio of the per annum return to the realized annual volatility over the specified time period. Does notinclude risk-free rate.
Max Drawdown: The largest peak to trough drawdown the strategy experienced in the given time period.

STRATEGY PERFORMANCE BY GENERATIONAL SEASON (1928 to 2019)

NOMINAL RETURNS - FINANCING CHARGES APPLIED WHEN LEVERAGE IS USED TO REACH 15% VOLATILITY TARGET - ESTIMATED

Secular Era	PORTFOLIO				TRADITIONAL ASSETS					DEFENSIVE			LONG VOLATILITY			SHORT VOLATILITY				MEAN REVERSION	
	Dragon Portfolio *(Eqty, Bonds, Gold, Vol, Comdty Trend)*	Classic 60/40 Portfolio (Eqty, Bonds)	Risk Parity Portfolio (Eqty, Bonds, Comdty Trend)	Volatility Target	Equity	Real Estate	Corporate Bonds (Baa)	U.S. Treasury Bonds	Comdty	Gold	Comdty Trend	Active Long Volatility	Portfolio Insurance *(ATM Put + Call Buying)*	Portfolio Insurance Left Tail *(OTM Put Buying)*	Portfolio Insurance Right Tail *(OTM Call Buying)*	Short Volatility (Put + Call Selling)	Put Write Strategy (Sell Put w. Collateral)	Buy Write Strategy (Eqty + Call Selling)	Naked Call Selling (Sell Calls Unhedged)	Equity Mean Reversion	Equity Buy-on-Decline
1928 to August 2019																					
Annual Return (15 vol)	+7.3%	+6.5%	+3.6%	+6.7%	+6.4%	+3.5%	+3.6%	+0.9%	+0.4%	+4.7%	+8.3%	-2.3%	-3.6%	-5.8%	-3.3%	-3.0%	-1.5%	+3.7%	-7.7%	-10.2%	-3.7%
Annual Return (Cash)	+5.4%	+6.1%	+4.1%	+7.3%	+7.5%	+4.0%	+4.0%	+2.9%	+1.2%	+4.8%	+7.7%	+0.7%	-0.8%	-1.9%	+0.9%	-1.8%	-0.6%	+3.9%	-1.5%	-12.7%	-3.1%
Risk to Return	0.54x	0.50x	0.31x	0.51x	0.49x	0.29x	0.31x	0.14x	0.10x	0.38x	0.61x	-0.08x	-0.17x	-0.32x	-0.15x	-0.13x	-0.03x	0.32x	-0.46x	-0.64x	-0.17x
Max Drawdown	-58%	-75%	-72%	-64%	-79%	-72%	-83%	-89%	-80%	-69%	-60%	-96%	-99%	-100%	-97%	-100%	-98%	-87%	-100%	-100%	-100%
Pre-Modern Era of Finance: Great Depression, Post-WWII Boom, Stagflation (1928-1984)																					
Annual Return (15 vol)	+8.0%	+3.9%	+1.9%	+5.1%	+4.6%	+3.0%	-0.1%	-2.3%	+2.1%	+5.2%	+13.4%	+0.1%	+1.6%	-1.8%	-1.5%	-8.6%	-6.0%	+0.1%	-9.9%	-16.1%	-8.6%
Annual Return (Cash)	+5.8%	+4.1%	+3.3%	+5.5%	+5.3%	+4.0%	+1.9%	+1.3%	+2.6%	+5.4%	+11.9%	+2.1%	+2.7%	+0.6%	+1.8%	-6.6%	-4.4%	+1.0%	-2.5%	-19.7%	-7.7%
Risk to Return	0.58x	0.32x	0.21x	0.41x	0.37x	0.24x	0.06x	-0.13x	0.22x	0.42x	0.98x	0.09x	0.18x	-0.05x	-0.01x	-0.48x	-0.32x	0.08x	-0.53x	-1.07x	-0.51x
Max Drawdown	-58%	-75%	-72%	-64%	-79%	-72%	-83%	-89%	-80%	-64%	-29%	-60%	-62%	-90%	-78%	-100%	-98%	-87%	-100%	-100%	-100%
Modern Asset Boom: Baby Boomers reach peak savings and retirement ages (1984-2019)																					
Annual Return (15 vol)	+6.1%	+10.9%	+6.5%	+9.3%	+9.2%	+4.3%	+9.7%	+6.2%	-2.3%	+3.9%	+0.8%	-6.0%	-11.3%	-11.7%	-6.0%	+6.5%	+5.9%	+9.6%	-4.1%	-0.1%	+4.6%
Annual Return (Cash)	+4.9%	+9.2%	+5.4%	+10.1%	+11.0%	+4.1%	+7.4%	+5.3%	-1.1%	+3.9%	+1.5%	-1.6%	-6.1%	-5.8%	-0.5%	+6.2%	+5.8%	+8.7%	+0.1%	-0.4%	+4.6%
Risk to Return	0.48x	0.80x	0.43x	0.66x	0.68x	0.64x	0.63x	0.41x	-0.06x	0.32x	0.13x	-0.37x	-0.79x	-0.76x	-0.46x	0.54x	0.48x	0.68x	-0.31x	0.06x	0.39x
Max Drawdown	-37%	-41%	-60%	-46%	-48%	-68%	-52%	-43%	-77%	-48%	-60%	-92%	-99%	-99%	-92%	-51%	-43%	-48%	-91%	-88%	-40%
1928 to Aug. 5 1971 (Pre-Gold Devaluation)																					
Annual Return (15 vol)	+6.6%	+3.3%	+2.1%	+5.6%	+3.7%	+2.4%	+0.6%	-1.3%	+0.5%	+1.5%	+11.8%	+1.2%	+2.6%	-0.3%	-0.6%	-8.9%	-6.6%	-0.5%	-8.4%	-13.9%	-6.9%
Annual Return (Cash)	+4.4%	+3.3%	+2.5%	+6.1%	+4.2%	+3.0%	+1.8%	+1.0%	+1.0%	+1.6%	+10.3%	+2.2%	+2.9%	+1.1%	+1.6%	-7.0%	-5.1%	+0.3%	-2.4%	-17.1%	-6.1%
Risk to Return	0.55x	0.28x	0.25x	0.44x	0.31x	0.20x	0.12x	-0.12x	0.10x	0.25x	0.94x	0.16x	0.24x	0.06x	0.05x	-0.47x	-0.33x	0.05x	-0.40x	-0.84x	-0.35x
Max Drawdown	-42%	-75%	-72%	-64%	-79%	-72%	-71%	-70%	-80%	-19%	-28%	-56%	-58%	-76%	-78%	-98%	-97%	-87%	-99%	-100%	-98%
Aug. 5 1971 (Post-Gold Devaluation) to 2019																					
Annual Return (15 vol)	+15.9%	+12.3%	+10.6%	+7.6%	+8.8%	+29.9%	+10.1%	+8.2%	+1.4%	+5.8%	+6.0%	-1.4%	-7.1%	-8.1%	+0.9%	+4.4%	+4.9%	+9.6%	-1.9%	-7.5%	-0.3%
Annual Return (Cash)	+6.4%	+8.6%	+5.5%	+8.4%	+10.5%	+5.0%	+6.1%	+4.6%	+1.3%	+7.8%	+5.5%	-0.7%	-4.1%	-4.6%	+0.3%	+3.2%	+3.7%	+7.3%	-0.7%	-8.4%	-0.2%
Risk to Return	0.55x	0.72x	0.36x	0.57x	0.68x	0.66x	0.46x	0.25x	0.10x	0.47x	0.39x	-0.35x	-0.64x	-0.74x	-0.41x	0.27x	0.31x	0.59x	-0.56x	-0.44x	0.02x
Max Drawdown	-58%	-42%	-60%	-46%	-48%	-68%	-65%	-75%	-77%	-69%	-60%	-95%	-99%	-100%	-95%	-81%	-61%	-48%	-99%	-100%	-91%
Secular Decline: Great Depression, New Deal, World War II, Dust Bowl (1929-1946)																					
Annual Return (15 vol)	+8.7%	-3.7%	+3.7%	-0.4%	-4.5%	+2.3%	+6.9%	+2.8%	+2.6%	+2.8%	+21.8%	+4.0%	+9.1%	+7.4%	-1.7%	-17.9%	-16.0%	-7.8%	-8.3%	-3.6%	-2.2%
Annual Return (Cash)	+4.5%	-2.0%	+2.6%	-0.5%	-6.0%	+2.4%	+4.9%	+2.1%	+2.6%	+2.9%	+18.2%	+3.6%	+7.1%	+5.7%	+0.8%	-14.9%	-13.3%	-5.7%	-2.5%	-5.1%	-1.8%
Risk to Return	0.55x	-0.06x	0.37x	0.06x	-0.09x	0.21x	0.44x	0.41x	0.24x	0.33x	1.29x	0.29x	0.49x	0.42x	0.06x	-0.71x	-0.63x	-0.26x	-0.20x	-0.05x	0.02x
Max Drawdown	-42%	-75%	-71%	-64%	-79%	-71%	-71%	-18%	-78%	-3%	-24%	-56%	-50%	-35%	-78%	-98%	-96%	-87%	-92%	-85%	-70%
Secular Rebirth: Superpower America, Bretton Woods, Demographic Boom, Golden Age of Capitalism (1947-1963)																					
Annual Return (15 vol)	+7.8%	+9.8%	+4.0%	+11.1%	+10.7%	+4.1%	-0.8%	-2.2%	+0.3%	+0.1%	+7.2%	-1.1%	-2.5%	-5.6%	+0.7%	-0.8%	+1.6%	+7.3%	-6.9%	-18.9%	-8.3%
Annual Return (Cash)	+4.6%	+8.0%	+3.3%	+12.2%	+13.0%	+3.3%	+0.7%	+0.5%	+0.8%	+0.1%	+6.4%	+0.6%	-0.7%	-2.5%	+1.8%	-0.2%	+1.8%	+6.4%	-2.0%	-22.8%	-7.5%
Risk to Return	0.92x	1.04x	0.45x	0.77x	1.11x	0.38x	-0.13x	-0.25x	0.08x	0.21x	0.73x	-0.11x	-0.25x	-0.68x	0.13x	-0.04x	0.22x	0.82x	-0.86x	-2.14x	-0.85x
Max Drawdown	-19%	-22%	-32%	-33%	-23%	-29%	-38%	-43%	-45%	0%	-22%	-39%	-50%	-66%	-35%	-39%	-30%	-25%	-77%	-97%	-81%
Secular Stagnation: US Dollar De-Pegged, Stagflation, Oil Crisis (1964-1983)																					
Annual Return (15 vol)	+7.3%	+4.9%	-1.0%	+3.6%	+6.8%	+3.2%	-5.1%	-6.3%	+4.0%	+12.3%	+12.8%	-2.9%	-1.7%	-5.8%	-4.3%	-6.2%	-3.3%	+0.7%	-12.8%	-23.9%	-15.0%
Annual Return (Cash)	+7.9%	+5.7%	+4.1%	+3.9%	+8.1%	+6.1%	+0.5%	+1.6%	+4.8%	+12.9%	+12.2%	+1.7%	+1.6%	-0.7%	+2.3%	-4.1%	-1.7%	+2.1%	-2.5%	-28.8%	-13.6%
Risk to Return	0.52x	0.46x	0.01x	0.33x	0.67x	0.53x	0.11x	-0.27x	0.35x	0.63x	1.03x	-0.25x	-0.11x	-0.62x	-0.33x	-0.55x	-0.28x	0.13x	-1.18x	-2.63x	-1.59x
Max Drawdown	-58%	-42%	-60%	-48%	-39%	-31%	-79%	-83%	-51%	-64%	-29%	-52%	-51%	-69%	-63%	-82%	-68%	-50%	-94%	-100%	-97%
Secular Boom: Baby Boomers enter workforce, Roaring 80s, Tech Bubble, Housing Bubble (1984-2007)																					
Annual Return (15 vol)	+3.6%	+11.7%	+7.2%	+10.4%	+10.3%	+4.8%	+9.4%	+6.2%	+1.2%	+3.2%	-1.9%	-5.3%	-9.7%	-11.8%	-5.1%	+5.1%	+6.2%	+11.9%	-8.0%	-4.2%	+2.1%
Annual Return (Cash)	+4.9%	+10.3%	+6.4%	+11.4%	+12.3%	+5.2%	+7.9%	+6.2%	+2.1%	+3.3%	-0.5%	-0.6%	-4.6%	-5.3%	+0.7%	+5.3%	+6.2%	+10.7%	-1.1%	-5.4%	+2.4%
Risk to Return	0.33x	0.86x	0.54x	0.73x	0.79x	0.81x	0.67x	0.42x	0.16x	0.29x	-0.06x	-0.37x	-0.69x	-0.84x	-0.40x	0.46x	0.53x	0.88x	-0.70x	-0.26x	0.23x
Max Drawdown	-37%	-36%	-28%	-46%	-41%	-39%	-33%	-43%	-52%	-48%	-60%	-80%	-94%	-95%	-78%	-51%	-43%	-40%	-91%	-88%	-40%
Secular Decline: Great Recession, Global Everything Bubble (2008-2019)																					
Annual Return (15 vol)	+11.3%	+9.2%	+5.0%	+7.0%	+7.2%	+3.3%	+10.3%	+6.1%	-9.2%	+5.2%	+6.6%	-7.3%	-14.4%	-11.5%	-7.7%	+9.3%	+5.3%	+5.2%	+4.6%	+8.9%	+9.7%
Annual Return (Cash)	+4.9%	+7.2%	+3.3%	+7.6%	+8.4%	+1.7%	+6.5%	+3.5%	-7.2%	+5.3%	+5.8%	-3.5%	-9.2%	-6.7%	-2.9%	+8.1%	+4.8%	+4.6%	+2.8%	+10.7%	+9.2%
Risk to Return	0.76x	0.67x	0.32x	0.51x	0.50x	0.40x	0.59x	0.42x	-0.37x	0.37x	0.42x	-0.38x	-0.97x	-0.63x	-0.59x	0.67x	0.40x	0.37x	0.45x	0.61x	0.65x
Max Drawdown	-17%	-40%	-60%	-29%	-45%	-57%	-47%	-30%	-77%	-43%	-39%	-70%	-87%	-84%	-65%	-29%	-43%	-48%	-22%	-28%	-24%

Sources: Artemis Capital Management LP, Global Financial Data, Bloomberg.
Hypothetical performance results require numerous assumptions based on avaliable data. Please refer to the complete notes inthe appendix and reference section for a full description of these assumptions. Past performance is not indicative of future sucess.

Legend:
Annual Return (15 volatility): The return per annum of the strategy normalized to an annual volatility of 15% since 1928. Leveraged returns may require financing charges.
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Return to Risk: The ratio of the per annum return to the realized annual volatility over the specified time period. Does notinclude risk-free rate.
Max Drawdown: The largest peak to trough drawdown the strategy experienced in the given time period.

The table above shows the conservative performance of each portfolio or asset, including financing charges whenever leverage is applied to reach the 15% volatility target. Leverage may be obtained at a lower cost than presented using derivatives and portfolio margining techniques, which can substantially benefit portfolios like the Risk Parity or the Dragon Portfolio. Financing costs measured using commercial paper yields as a proxy going back to 1928. Investors should understand that for specific portfolios (Risk Parity, Dragon Portfolio, and 60/40 Portfolio) the effect of financing charges may significantly understate returns when cheaper derivative or structuring solutions are available. Institutional investors must carefully evaluate options to layer strategies together at the lowest possible cost. The table above represents a conservative estimate of total performance when leverage is applied, but may not accurately asses the best modern solution. For retail and real money investors, the cash funded annual return represents the best assumption.

QUANTITATIVE NOTES

ARTEMIS analyzed the risk-reward of a wide variety of institutional investment strategies through four generational seasons (~20 years) and one lifetime (~90 years). The goal is to apply financial engineering to the distant past to learn about potential futures. The results presented herein reflect our best efforts at replicating portfolio engineering strategies going back to the Great Depression using real data derived from historical records. It is essential to understand that these results are indicative and hypothetical only. We do not represent our composite portfolios as realized performance, but rather as our best effort at understanding how a given asset or portfolio strategy would have performed had it existed in the distant past. It is impossible to accurately model the interplay between buyers and sellers, regulatory changes, or the liquidity impact of any modern strategy re-imagined into history. At the same time, the exercise provides valuable insights into market regimes from beyond our lifetimes to avoid recency bias. To give a fair comparison between strategies, we risk-adjust all performance metrics to an annualized volatility of 15% (as shown in graphs and in-line references). For reference, we also provide cash funded returns by strategy alongside the risk-adjusted in all return tables. In some cases, the investor may need to use financing or derivatives to leverage a portfolio to reach a target return or volatility. Please see tables referencing financing charges; however, in many cases, the institutional investor can achieve target volatility for less using derivatives or portfolio margin. Portfolios with fixed asset exposures rebalance daily unless otherwise noted. Key data inputs, such as implied volatility, may not exist over historical periods. Hence, reasonable estimates are applied based on available data sources to create replication indices. In these cases, such as Volatility Risk Premia, we tested the replication index against a market index to ensure reasonability. Full calculation methodologies are described herein and in the reference section. In some instances, component assets like Active Long Volatility and Commodity Trend are best accessible via hedge funds. In our analysis, we used simplified and systematic replications of various active strategies without fees; however, we also believe these replication indices to be less profitable than a skilled manager. Market data is compiled from sources we believe to be reliable: however, any resulting investment decisions taken due to the analysis is at the sole risk of the recipient.

All return series expressed in US Dollars. Portfolios assume constant re-balancing according to weights unless otherwise indicated. No transaction fees or portfolio rebalancing costs assumed unless stated otherwise. No management or performance fees applied to replicated hedge fund products. S&P 500 Index Dividend are included in relevant U.S. Equity exposures unless explicitly stated. Mean-Variance Optimization used in order to ascertain the "optimal" portfolio. Risk and realized volatility are used interchangeably in the paper

PORTFOLIO REPLICATION

Equity
The portfolio utilizes the S&P 500 Index split-adjusted with distributed S&P 500 Monthly Dividend Yield as derived from the GFD database.

Real Estate
U.S. Home Prices derived by Robert Shiller. Many of these price indices, including twenty cities, low- medium- and high- tier home price indices, condominium indices, and a U.S. national index, are now published as the S&P/CoreLogic/Case-Shiller Home Price Indices by Standard & Poor's, and are available to the public on Standard & Poor's web site or Global Financial Database. No transaction fees, taxes, or payments are applied.

Corporate Bonds (Baa)
A portfolio intended to replicate the passive strategy of holding a collection of corporate bonds weighted at a 20 to 30-year maturity. Corporate bond replication index used the Moody's Corporate BAA Yield from the GFD database. Artemis modeled the issuance of hypothetical on-the-run 25-year corporate bond at par using the Baa yield, and calculating the price and coupon effect of holding that position for 6-months, selling it, and rolling into a new corporate bond at new yields.

U.S. Treasury Bonds
A portfolio intended to replicate the passive strategy of holding a collection of U.S. Treasury Bonds weighted at a 10-year maturity. U.S. Treasury Bond replication index used the U.S. 10-year Bond Constant Maturity Yield from the GFD database. Artemis modeled the issuance of hypothetical on-the-run U.S. Treasury Bond at par using the yield, and calculated the price and coupon effect of holding that position for 6-months, selling it, and rolling into a new on-the-run bond.

Commodities
Price movement of a basket of raw goods or commodity futures. From 1933 to 2019 the Bloomberg Commodity Index is utilized, which is composed of futures contracts on 19 physical commodities (see description herein). Prior to 1933 weekly data was utilized from the USA Bureau of Labor Statistics Commodity Index. This is a combination of several raw material/commodity price indices that were kept on a weekly basis.

Gold
Derived by the Gold Spot Price-London PM Fixing (US$/ounce). No storage fees are applied.

Dragon Portfolio
A continuously re-balanced portfolio including the following asset classes: U.S. Equity (24% weight), U.S. Fixed Income (18% weight), Gold (19% weight), Commodity Trend Following (18% weight), and Active Long Volatility (21% weight) based on portfolio optimization. The portfolio utilizes the S&P 500 Index split-adjusted with distributed S&P 500 Monthly Dividend Yield as derived from the GFD database. U.S. Treasury Bonds exposure is derived through the U.S. Treasury Bond Replication methodology described herein. Gold is obtained through the GFD database. Commodity Trend Following exposure is obtained through the Commodity Trend Replication methodology described herein. Active Long Volatility exposure is derived from the Active Long Volatility Replication methodology described herein.

Classic 60/40 Portfolio
A continuously re-balanced portfolio including the following asset classes: U.S. Equity (60% weight) and U.S. Fixed Income (40% weight) The portfolio utilizes the S&P 500 Index split-adjusted with distributed S&P 500 Monthly Dividend Yield as derived from the GFD database. U.S. Treasury Bonds exposure is derived through the U.S. Treasury Bond Replication Index described herein.

Risk Parity Portfolio
A dynamically re-balanced portfolio that is intended to replicate the hedge fund strategy of Risk Parity. The dynamic portfolio includes the following asset classes: U.S. Equity, U.S. Fixed Income, and Commodities. The portfolio utilizes the S&P 500 Index split-adjusted with distributed S&P 500 Monthly Dividend Yield (applied after re-optimization) as derived from the GFD database. U.S. Treasury Bonds exposure is derived through the U.S. Treasury Bond Replication Index described herein. Commodities exposure is derived based on the Bloomberg Commodity Index and, prior to 1933, the USA Bureau of Labor Statistics Commodity Index. Risk Parity Replication Index will dynamically reallocate to these asset classes based on an equal risk-weighted portfolio optimization using 126-day rolling volatility, returns, and covariance matrices by asset class. Portfolio re-optimization occurs every 21 trading days. No financing charges are applied to the Risk Parity Portfolio (except when noted in tables). A leveraged version of the Risk Parity Replication Portfolio may be achievable, however, returns without financing charges likely overstate results, as S&P futures are not eligible for dividend distributions (as modeled in our replication process).

Volatility Target Equity
Dynamic reallocation of equity exposure based on specific realized volatility targets for the portfolio. The portfolio utilizes the S&P 500 Index split-adjusted from the GFD database. We do not include dividends and assume the strategy is executed with futures to isolate price exposure. Realized volatility is calculated over the previous 21 days of the S&P 500 Index price movement, and the portfolio is adjusted higher or lower to match target volatility (15%). Leverage may be applied.

Equity Mean Reversion
Dynamic reallocation of equity exposure based on the previous day price movement of the underlying index. The portfolio utilizes the S&P 500 Index split-adjusted from the GFD database. We do not include dividends and assume the strategy is executed with futures to isolate price exposure. If the underlying index increased the previous day, the strategy shorts the underlying exposure. If the underlying index decreased the previous day, the strategy goes long the underlying exposure. No leverage is applied, and the entire net-asset-value of the portfolio is applied to the long or short leg.

QUANTITATIVE NOTES (CONTINUED)

Equity Buy-on-Decline
Dynamic reallocation of equity exposure based on the previous day price movement of the underlying index. The portfolio utilizes the S&P 500 Index split-adjusted from the GFD database. We do not include dividends and assume the strategy is executed with futures to isolate price exposure. If the underlying index decreased the previous day, the strategy goes long the underlying exposure. If the underlying index increased the previous day, the strategy is flat.

Commodity Trend Following
A dynamically re-balanced portfolio that is intended to replicate the hedge fund strategy of Commodity Trend Following or HFRX Systematic Macro CTA Index. The Commodity Trend Following Replication Index will go long or short a basket of commodities exposure based on specific price signals. When the price of the commodity basket is above a 50-day moving average, the replication index goes long, and when the price is below the 50 days moving average the replication index will go short. When the price is in the middle, no position is taken. No management fees or performance fees are applied. From 1933 to 2019 the Bloomberg Commodity Index is utilized, which is composed of futures contracts on 19 physical commodities (see description herein). Prior to 1933 weekly data was utilized from the USA Bureau of Labor Statistics Commodity Index. This is a combination of several raw material/commodity price indices that were kept on a weekly basis.

Data for U.S. index options did not exist prior to 1986. In order to calculate theoretical results, certain assumptions and quantitative models were required.

Implied Volatility before 1986
Implied volatility for S&P Index options is only available between 1986 and 2019. To generate theoretical options chains before 1986, we must estimate a realistic implied volatility measure at various skew and term structure points. Artemis assembled implied volatility data from 2000 to 2019 using data from Bloomberg and LiveVol and ran a multivariable regression using measurable data as inputs that exist back to 1928 including; equity realized volatility over 10 trading days, 21 trading days, and 63 trading days and SPX returns over 10 trading days and 63 trading days. 14 different multi-variate regressions were run at constant maturity monthly implied volatility at various points on the skew including; 10 delta Put implied vol,25 delta Put implied vol, 40 delta Put implied vol, 50 delta Put implied vol, 60 delta Put implied vol, 75 delta Put implied vol, 90 delta Put implied vol, 10 delta Call implied vol,25 delta Call implied vol, 40 delta Call implied vol, 50 delta Call implied vol, 60 delta Call implied vol, 75 delta Call implied vol, 90 delta Call implied vol. The R-squared on each of these regressions was between 0.85 and 0.90. In order to develop an appropriate volatility estimate for in-between these delta levels, a cubic spline interpolation was used based on the linear chain of solved implied volatilities at various delta levels. To this effect, an entire theoretical skew and term structure between 1928 and 1986 was created. This technique allows us to map the behavior of the S&P 500 index volatility skew onto historical index price movements going back to 1928.

Active Long Volatility
A dynamically re-balanced derivatives strategy that is intended to replicate exposure to an actively managed long volatility hedge fund strategy or the Eurekahedge CBOE Long Volatility Hedge Fund Index. The strategy seeks exposure to the S&P 500 2.5% Monthly Rolling Put Index when the S&P 500 index price has fallen more than -5% over the past 63 trading days, or exposure to the S&P 500 2.5% Monthly Rolling Call Index when the S&P 500 index price has increased more than +5% or more over the past 63 days. Actual options data is available from 1986 to 2019, but prior to this point replication portfolio assumptions must be applied. Please see individual examples. No management or performance fees are applied.

Put Write Strategy
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure of the CBOE Put Write Index ("PUT") minus the reinvestment of the three-month Treasury Bill rate. The PUT strategy is designed to sell a sequence of one-month, at-the-money, S&P 500 Index puts and invest cash at one-and three-month Treasury Bill rates. The number of puts sold varies from month to month but is limited so that the amount held in Treasury Bills can finance the maximum possible loss from the final settlement of the SPX puts. Our performance history utilizes actual CBOE Put Write Index returns (subtracting for the Treasury Bill investment) from July 1986 to 2019. Prior to July 1986 a Put Write Replication methodology is applied using 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Implied Volatility derived from a multi-variate regression (see explanation above). Artemis then calculated the theoretical value of an option using real and derived price inputs. The theoretical at-the-money Put option was re-priced daily, and rolled every month, based on the same logic as the underlying CBOE Put Write Index to create the extended return history.

Buy-Write Strategy
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure of the CBOE S&P 500 BuyWrite Index (BXM). The Cboe S&P 500 BuyWrite Index (BXM) is a passive total return index based on (1) buying an S&P 500 stock index portfolio, and (2) "writing" (or selling) the near-term S&P 500 Index (SPXSM) "covered" call option, generally on the third Friday of each month. The SPX call written will have about one month remaining to expiration, with an exercise price just above the prevailing index level (i.e., slightly out of the money). The SPX call is held until expiration and cash-settled, at which time a new one-month, near-the-money call is written. Our performance history utilizes the actual CBOE S&P 500 BuyWrite Index (BXM) returns from July 1986 to 2019. Prior to July 1986 a Put Write Replication methodology is applied using 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Implied Volatility derived from a multi-variate regression (see explanation). Artemis then calculated the theoretical value of an option using real and derived price inputs. The theoretical at-the-money option was re-priced daily, and rolled every month, based on the same logic as the underlying CBOE S&P 500 BuyWrite Index to create the extended return history in combination with the S&P 500 Index exposure.

Short Volatility (or "Short Straddle")
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure of selling the S&P 500 At-The-Money Monthly Straddle Index. The strategy sells an S&P 500 At-The-Money Call and S&P 500 At-The-Money Put, each maturing in a month, and sized to the notional of the portfolio, holds, and then rolls that exposure prior to expiration. Actual options data is available from 1986 to 2019, but prior to this point replication portfolio assumptions must be applied. The replication index uses the following data inputs 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Estimated Implied Volatility derived from a multi-variate regression (see explanation). Prior to options data starting in 1986, Artemis calculated the theoretical value of an options portfolio using options pricing models and the requisite historical data (estimating implied volatility) and sized an appropriate number of contracts based on the notional of the portfolio at the roll period. The Call and Put Options in the portfolio are re-priced daily, with a new option contract being selected before the roll date each month.

Long Volatility ("Long Straddle)
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure of buying the S&P 500 At-The-Money Monthly Straddle Index. The strategy buys an S&P 500 At-The-Money Call and S&P 500 At-The-Money Put, each maturing in a month, and sized to the notional of the portfolio, holds, and then rolls that exposure prior to expiration. Actual options data is available from 1986 to 2019, but prior to this point replication portfolio assumptions must be applied. The replication index uses the following data inputs 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Estimated Implied Volatility derived from a multi-variate regression (see explanation above). Prior to options data starting in 1986, Artemis calculated the theoretical value of an option portfolio options pricing models and the requisite historical data (estimating implied volatility) and sized an appropriate number of contracts based on the notional of the portfolio at the roll period. The Call and Put Options in the portfolio are re-priced daily, with a new option contract being selected before the roll date each month.

Left Tail Risk (S&P 500 2.5% Monthly Rolling Put Index)
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure of the S&P 500 2.5% Monthly Rolling Put Index. The S&P 500 2.5% Rolling Put Index is designed to track the performance of a hypothetical strategy buys a monthly 2.5% out-of-the-money (approximately 25 deltas) S&P 500 Index (SPX) Put option as a hedge sized to the notional of the portfolio, holds, and then rolls that exposure prior to expiration. Actual options data is available from 1986 to 2019, but prior to this point replication portfolio assumptions must be applied. The replication index uses the following data inputs 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Estimated Implied Volatility derived from a multi-variate regression (see explanation above). Artemis calculated the theoretical value of the option using these inputs and sized an appropriate number of contracts based on the notional of the portfolio at the roll period. The 2.5% out-of-the-money Put options and portfolio are re-priced daily, with a new option contract being selected before the roll date each month.

QUANTITATIVE NOTES (CONTINUED)

Right Tail Risk (S&P 500 2.5% Monthly Rolling Call Index)
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure of the S&P 500 2.5% Monthly Rolling Call Index. The S&P 500 2.5% Rolling Call Index is designed to track the performance of a hypothetical strategy that buys a monthly 2.5% out-of-the-money (approximately 25 delta) S&P 500 Index (SPX) Call option as a hedge sized to the notional of the portfolio, holds, and then rolls that exposure prior to expiration. Actual options data is available from 1986 to 2019, but prior to this point, replication portfolio assumptions must be applied. The replication index uses the following data inputs 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Estimated Implied Volatility derived from a multi-variate regression (see explanation). Artemis calculated the theoretical value of the option using these inputs and sized an appropriate number of contracts based on the notional of the portfolio at the roll period. The 2.5% out-of-the-money Call options and portfolio are re-priced daily, with a new option contract being selected before the roll date each month.

Naked Call Selling (S&P 500 Naked Call Selling Index)
A dynamically re-balanced derivatives strategy that seeks to replicate the exposure to the S&P 500 Naked Call Selling Index. The S&P 500 Naked Call Selling Index is designed to track the performance of a strategy that sells a monthly At-the-Money S&P 500 Index Call option with a monthly maturity sized to the notional of the portfolio, holds, and then rolls that exposure prior to expiration. Actual options data is available from 1986 to 2019, but before this point, replication portfolio assumptions must be applied. The replication index uses the following data inputs 1) S&P 500 Index price; 2) S&P 500 Index Dividend Yield 3) At-the-money strike rate derived monthly 4) 3-month U.S. Treasury Bill rate from GFD 5) Actual Implied Volatility or Estimated Implied Volatility derived from a multi-variate regression (see explanation on prior page). Artemis calculated the theoretical value of the option using these inputs and sized an appropriate number of contracts based on the notional of the portfolio at the roll period. The 2.5% out-of-the-money Call options and portfolio are re-priced daily, with a new option contract being selected before the roll date each month.

DATA SOURCES

Global Financial Data utilized for historical time series data going back as far as 1200.
Security price data from Bloomberg
Options data from Market Data Express with calculations executed by Artemis Capital Management LP

Specific details on indices used are below.

USA 10-year Bond Constant Maturity Yield: Richard E. Sylla, Jack Wilson and Robert E. Wright, Price Quotations in Early U.S. Securities Markets, 1790-1860, Hunt's Merchants Magazine (1843-1853), The Economist (1854-1861), The Financial Review (1862-1918), Federal Reserve Bank, National Monetary Statistics, New York: FRB, 1941, 1970 (annually thereafter); and Salomon Brothers, Analytical Record of Yields and Yield Spreads, New York: Salomon Brothers, 1995
Notes: Current yields on the 6s of 1790 are used from 1800 through August 1820, and the 5s of 1821-1835 are used from September 1820 to 1834. The Federal government completely paid off its debt in the 1830s, so New York State Canal 5% bonds are used from 1835 to June 1843. US Government 5% bonds are again used from July 1843 to 1852 and 6% bonds are used from 1853 to 1865. From 1866 to June 1877, the 5/20s are used and from July 1877 to January 1895, the 4% U.S. Government Bonds of 1907 are used, and from February 1895 until September 1918, the 4% U.S. Government Bonds of 1925 are used. Where no trades were recorded during a given month, the previous month's yield was used. The source for this data is William B. Dana Co., The Financial Review, New York: William B. Dana Co. (1872-1921) which reprinted data published by The Commercial and Financial Chronicle. Beginning in 1919, the Federal Reserve Board's 10-15 year Treasury Bond index is used. 10-year bonds are used beginning in 1941. Data for 1872 through 1918 are taken from the Financial Review. The interest rate series dating back to 1919 are taken from the Federal Reserve, National Monetary Statistics, New York: Federal Reserve Board which was published in 1941, 1970 and annually since then. The Commercial Paper data for 1835 through 1871 are taken from Walter B. Smith and Arthur H. Cole, Fluctuations in American Business, Cambridge: Harvard Univ. Press, 1935, and the Broker Call money data are taken from F. R. Macaulay, The Movements of Interest Rates, Bond Yield, and Stock Prices in the United States since 1856, New York: National Bureau of Economic Research, 1938. Yields on Treasury nominal securities at 'constant maturity' are interpolated by the U.S. Treasury from the daily yield curve for non-inflation-indexed Treasury securities. This curve, which relates the yield on a security to its time to maturity, is based on the closing market bid yields on actively traded Treasury securities in the over-the-counter market. These market yields are calculated from composites of quotations obtained by the Federal Reserve Bank of New York. The constant maturity yield values are read from the yield curve at fixed maturities, currently 1, 3 and 6 months and 1, 2, 3, 5, 7, 10 and 20 years. This method provides a yield for a 10-year maturity, for example, even if no outstanding security has exactly 10 years remaining to maturity. Similarly, yields on inflation-indexed securities at 'constant maturity' are interpolated from the daily yield curve for Treasury inflation-protected securities in the over-the-counter market. The inflation-indexed constant maturity yields are read from this yield curve at fixed maturities, currently 5, 7, 10, and 20 years. Yields on treasury securities at constant, fixed maturity are constructed by the treasury department, based on the most actively traded marketable Treasury securities. Yields on these issues are based on composite quotes reported by U.S. government securities dealers to the Federal Reserve Bank of New York. To obtain the constant maturity yields, personnel at the treasury construct a yield curve each business day and yield values are then read from the curve at fixed maturities. Although the bond yield calculated by the Fed uses a constant maturity bond which is always exactly ten years from maturity, because the Fed does not provide the coupon on the underlying securities for their constant maturity yield, it is not possible to provide the duration.

S&P 500 Composite Price Index: The Standard and Poor's Composite combines a number of different indices. From 1791 to 1801, GFD has calculated an equal-weighted index using data from 7 banks (Union National Bank of Boston, Massachusetts National Bank of Boston, the First Bank of the United States, Bank of the State of New York, Bank of Pennsylvania, Bank of South Carolina, and the Bank of America), 3 insurance companies (New York Insurance Company, Insurance Co. of Pennsylvania, Insurance Co. of North America) and two transport companies (Philadelphia and Lancaster Turnpike Company and Schuylkill Permanent Bridge Company). Using Walter B. Smith and Arthur H. Cole, Fluctuations in American Business, 1790-1860, Cambridge: Harvard Univ. Press, 1935, the index combines the monthly price indexes of Bank stocks (1802-1815, Bank and Insurance Stocks (February 1815-December 1845), and Rails (1834-1862) from Smith and Cole, ibid.: and Railroads (1863-1870) from Frederick R. Macaulay, The Movements of Interest Rates, Bond Yields and Stock Prices in the United States Since 1856, New York: National Bureau of Economic Research, 1938. Where these indices overlap, the indices have been weighted according to the number of stocks included in the indices. Beginning in 1871, the Cowles/Standard and Poor's Composite Index of stocks is used. The Standard and Poor's indices were first calculated in 1918, and the Cowles Commission back-calculated the series to 1871 using the Commercial and Financial Chronicle. For more information, see Standard and Poor's, Security Price Index Record, New York: Standard and Poor's, 2000 and Cowles Commission for Research in Economics, Common-Stock Indexes, 2nd ed., Bloomington: Principia Press, 1939. The 90-stock Composite was calculated from 1926 through February 1957 when S&P introduced the S&P 500 stock average including 425 industrials, 25 rails, and 50 utilities, weighting the index substantially in favor of the industrials. S&P did not calculate the 500-stock index prior to March 1957 but used the old 90-share index (as well as the old 50 industrials, 20 rails, and 20 utility indices) to extend the data back to 1928. The daily closes listed in the Security Price Index Record consist of the 90 stock averages adjusted to the new 1941/43 base from 1926 through February 1957, and the 500 stock averages starting on March 1957. Similarly, the weekly/monthly data for these indices uses the 90 stock average, rather than the more extensive indices of industrials that included 400 stocks, and were calculated on a weekly rather than a daily basis.High-low-close are available since January 1930 except for 1/2/41-7/30/46, 2/28/47-3/5/47, 10/24/47-10/28/47, 3/5/48-3/10/48, 5/6/49-5/11/49, 12/23/49-1/23/52, 6/27,30/1952, 9/5,8,9/1952. The indices were revised again in July 1976 when the rail index was dropped and was replaced by the Transportation index, and a Financial Index was added. Until that time, financial shares had been excluded from the S&P 500 because many were over-the-counter stocks making it difficult to calculate exact prices for the averages. The components were changed from 425 industrials, 60 utilities, and 15 rails to 400 industrials, 40 utilities, 20 transportation and 40 financial stocks in 1976. On April 6, 1988, exact numerical allocations were abandoned allowing the sectoral composition of the S&P 500 index to change as new stocks were removed and added to the S&P 500. Data for the S&P 500 index is theoretical through 1983 and actual, real-time data from January 3, 1984, on. Where possible, we have included high-low-close data for the indices, which meant readjusting the data for the period prior to March 1957 to the old indices. High-low-close is currently available for 1930-1941, September 1946-December 1949, and beginning in January 1956. Other dates have the close only. The primary sources for these data are Standard Statistics Corp., Base Book, New York: Standard Statistics Corp., 1931, Standard and Poor's Security Price Index Record, New York: Standard and Poor's (1940, 1941, 1948, 1955, 1957, 1962, and biannually since then), Standard and Poor's, Outlook, New York: Standard and Poor's (published weekly) and Standard and Poor's, Statistical Service, New York: S&P. For a detailed history of the components of both the 90 and the 500 stock averages see the current and past issues of the biannual Security Price Index Record published by Standard and Poor's.
S&P has recently introduced two new versions of the S&P 500. The S&P Equal Weight index gives equal weight to each index rather than weighting the indices by capitalization. The O-Strip index is an index of all the stocks in the S&P 500 that are listed on the NASDAQ.
The original 500 share indices included 90-95% of the capitalization of the New York Stock Exchange providing the most comprehensive index of stocks then available; however, the rapid expansion in Nasdaq and growth in the NYSE has meant that the S&P indices now represent a smaller proportion of total market capitalization than in the past. The Wilshire 5000, Russell 3000 and Investor's Business Daily 6000 all cover substantially more shares than the S&P 500. Nevertheless, the S&P 500 still represents about 75% of the stock market's capitalization. To update their index, S&P introduced a 400-share Mid-cap index (which was calculated back to 1981), in June 1991, and then introduced a Small Cap 600-share index in October 1994, which was calculated back to December 31, 1993. The 1500-share Supercomposite was introduced in July of 1995 and calculated back to December 31, 1993. In January 2002, S&P introduced the S&P 1000 which includes all the stocks in the S&P 400 Midcap and the S&P 600 Small Cap Index. Beginning in March 2004, S&P began adjusting their indices so they would reflect the free float on their stock indices rather than the total capitalization. The free float method reduces the influence of stocks such as Wal-Mart for which 40% of the stock is privately held and not publicly traded.
Volume data are for the stocks traded on the NYSE, not for the S&P 500 stocks.

U.S. Real Estate
The U.S. Home Price Indices, which Karl Case and Shiller originally developed, which were produced 1991-2002 by the firm Case Shiller Weiss, Inc. under the direction of Allan Weiss, are now produced by CoreLogic under the direction of Linda Ladner and David Stiff. Many of these price indices, including twenty cities, low- medium- and high- tier home price indices, condominium indices, and a U.S. national index, are now published as the S&P/CoreLogic/Case-Shiller Home Price Indices by Standard & Poor's, and are available to the public onStandard & Poor's web site. Eleven of these indices are traded at the Chicago Mercantile Exchange. Information on these futures markets can be found at http://homepricefutures.com.

QUANTITATIVE NOTES (CONTINUED)

Gold

Data from 1257 to 1792 are based upon data for the price of gold in London. Data are annual to 1723 and monthly thereafter. The data use the exchange rate ratio between the US Dollar gold price and London gold price in 1792 to create an index of gold in US Dollars going back to 1257. The data are based upon the series calculated by Lawrence H. Officer, "What Was the Price of Gold Then? Importance, Measurement and History," EH.net. Historical prices for the United States are taken from George F. Warren and Frank A. Pearson, World Prices and the Building Industry, New York: John Wiley & Sons, 1937 for the period 1792 through 1933 and from the Commodity Research Bureau, Commodity Yearbook, Chicago: CRB since 1933. Data on gold/silver ratios from 1252 to 1700 for various European countries can be found in the file WPI.XLS. From January 30, 1934 until March 1968, the gold transactions of the U.S. Government for both monetary and industrial purposes were made at $35 per fine ounce, plus or minus a handling charge of one quarter of one percent and less mint charges. In 1968 a two-tiered gold system was instituted under which the private commodity price of gold was permitted to fluctuate without official intervention, while the official price and role of monetary gold remained unchanged among monetary authorities. This system was terminated on November 10, 1973 because of the wide variations between "official" prices and market prices. From 1973 on, separate series are provided for the daily PM Fixing price for gold in London and the daily price of gold in New York.

1933 to 2019 Bloomberg Commodity Index

This index replaced the Dow Jones Futures Price Index, and was renamed and rebased in 1999. The index was back-calculated to 1990. Data in the index from 1933 to 1989 is from the Dow Jones Futures Index, and data from 1990 on is from the Dow Jones-AIG Commodity Index. The Dow Jones - AIG Commodity Index (DJ-AIGCI)® is designed to be a highly liquid and diversified benchmark for commodities as an asset class. Commodities have demonstrated a low historic correlation with stocks and bonds and positive returns over time. Including commodities in a traditional investment portfolio may increase diversification and reduce overall portfolio risk. The DJ-AIGCI is composed of futures contracts on 19 physical commodities. Unlike equities, which entitle the holder to a continuing stake in a corporation, commodity futures contracts specify a delivery date for the underlying physical commodity. In order to avoid delivery and maintain a long futures position, nearby contracts must be sold and contracts that have not yet reached the delivery period must be purchased. This process is known as "rolling" a futures position. The DJ-AIGCI is a "rolling index." The DJ-AIGCI is composed of commodities traded on U.S. exchanges, with the exception of aluminum, nickel and zinc, which trade on the London Metal Exchange (LME). Trading hours for the U.S. commodity exchanges are between 8:00 am and 3:00 pm ET. A daily settlement price for the index is published at approximately 5:00 pm ET.The Bloomberg Commodity Index (BCOM) is a broadly diversified commodity price index distributed by Bloomberg Indexes. The index was originally launched in 1998 as the Dow Jones-AIG Commodity Index (DJ-AIGCI) and renamed to Dow Jones-UBS Commodity Index (DJ-UBSCI) in 2009, when UBS acquired the index from AIG. On July 1, 2014, the index was rebranded under its current name.The BCOM tracks prices of futures contracts on physical commodities on the commodity markets. The index is designed to minimize concentration in any one commodity or sector. It currently has 22 commodity futures in seven sectors. No one commodity can compose less than 2% or more than 15% of the index, and no sector can represent more than 33% of the index (as of the annual weightings of the components). The weightings for each commodity included in BCOM are calculated in accordance with rules that ensure that the relative proportion of each of the underlying individual commodities reflects its global economic significance and market liquidity. Annual rebalancing and reweighting ensure that diversity is maintained over time.

Prior to 1933 weekly data was utilized from the USA Bureau of Labor Statistics Commodity Index

This is a combination of several raw material/commodity price indices that were kept on a weekly basis. From August 7, 1914 until December 28, 1920, The Annalist index of Agricultural Commodity Prices is used; from January 4, 1921 to August 13, 1947, Barron's Spot Commodity Price Index is used; from August 24, 1947 until October 28, 1965, the Bureau of Labor Statistics Commodity Price Index is used, and from November 3, 1965 until December 27, 1974, the BLS Raw Material Price Index is used. Beginning August 20, 1947, Barron's discontinued publication of its index of Sensitive Spot Prices and substituted the BLS Index of 28 Basic Commodities. The same method of computation was used in the two indexes and all of the 13 commodities used in Barron's index were included in the BLS index. Barron's Index was available back to 1921. When adjusted to the August 1939 base used by the BLS Index it may be compared directly with the BLS Index for a long-term picture of the movement of sensitive prices. To convert Barron's Index which was computed on the 1926 base to the level of the BLS Index which is relative to August 1939 as 100, multiply the Barron's Index by 1.912, or divide the BLS Index by 1.912. The Barron's Sensitive Spot Commodity Price index included burlap, cotton print cloths, cottonseed oil, hides, lard, rubber, shellac, silk, steel scrap, tallow, wheat, wool, and zinc.

U.S. 10 Year Constant Maturity Bond Yield

Sources: Richard E. Sylla, Jack Wilson and Robert E. Wright, Price Quotations in Early U.S. Securities Markets, 1790-1860, Hunt's Merchants Magazine (1843-1853), The Economist (1854-1861), The Financial Review (1862-1918), Federal Reserve Bank, National Monetary Statistics, New York: FRB, 1941, 1970 (annually thereafter); and Salomon Brothers, Analytical Record of Yields and Yield Spreads, New York: Salomon Brothers, 1995 Notes: The United States defaulted on its debt during the Revolutionary War and remained in default until its finances were reorganized by Alexander Hamilton through the Funding Act of 1790. The federal government assumed all the debts of the individual states and refunded the debt with 4/9ths in 6% bonds (trading at 70), 1/3rd in 3% bonds (trading at 36.75) and 2/9ths in Deferred 6% bonds (trading at 30) that didn't pay any interest until 1800. This worked out to $50 in exchange for $60 in Depreciated Unfunded or Continental Currency Bonds. The United States 6% Depreciated Unfunded Bonds (BGUSA6DU) are used from August 1786 to September 1790 and paid no interest. The United States 3% Bonds of 1790 (BGUSA3S) are used from October 1790 to December 1832. From 1790 to 1832, the government generally ran surpluses and redeemed its outstanding debt. By 1833, no debt was outstanding and no federal government bonds traded between 1833 and 1842. New York had the largest and most liquid debt during this period of time, so the New York 5% Canal Bonds due 1845 (BSNY5C45) is used between January 1833 and November 1842. New government bonds were introduced in 1843 and the federal government has had outstanding debt ever since. The United States 6% Bonds due 1862 (BGUSA662) are used between December 1842 and June 1848, the United States 6% Bonds of 1868 (BGUSA668) are used between July 1848 and July 1858, the United States 5% Bonds due 1874 (BGUSA574) are used between August 1858 and October 1860, the United States 6% Bonds of 1881 (BGUSA681) are used between November 1860 and December 1869, the United States 6% Bonds of 1896 Registered (BGUSA696) are used between January 1870 and June 1877, the United States 4% Bonds of 1907 with Coupons (BGUSA407C) are used between July 1877 and December 1895, the United States 4% Bonds of 1925 with Coupons (BGUSA425C) are used between January 1896 and November 1917, the United States 4% Liberty Loan of 1932-47 with coupons (BGUSA4L47) are used between November 1917 and December 1918. Beginning in 1919, the Federal Reserve Board's 10-15 year Treasury Bond index is used. 10-year bonds are used beginning in 1941. Data for 1872 through 1918 are taken from the Financial Review. The interest rate series dating back to 1919 are taken from the Federal Reserve, National Monetary Statistics, New York: Federal Reserve Board which was published in 1941, 1970 and annually since then. From 1941 on, the Fed's Index of 10-year bonds is used.The source for this data is William B. Dana Co., The Financial Review, New York: William B. Dana Co. (1872-1921) which reprinted data published by The Commercial and Financial Chronicle.

The Commercial Paper data for 1835 through 1871 are taken from Walter B. Smith and Arthur H. Cole, Fluctuations in American Business, Cambridge: Harvard Univ. Press, 1935, and the Broker Call money data are taken from F. R. Macaulay, The Movements of Interest Rates, Bond Yield, and Stock Prices in the United States since 1856, New York: National Bureau of Economic Research, 1938. Yields on Treasury nominal securities at 'constant maturity' are interpolated by the U.S. Treasury from the daily yield curve for non-inflation-indexed Treasury securities. This curve, which relates the yield on a security to its time to maturity, is based on the closing market bid yields on actively traded Treasury securities in the over-the-counter market.

These market yields are calculated from composites of quotations obtained by the Federal Reserve Bank of New York. The constant maturity yield values are read from the yield curve at fixed maturities, currently 1, 3 and 6 months and 1, 2, 3, 5, 7, 10 and 20 years. This method provides a yield for a 10-year maturity, for example, even if no outstanding security has exactly 10 years remaining to maturity. Similarly, yields on inflation-indexed securities at 'constant maturity' are interpolated from the daily yield curve for Treasury inflation-protected securities in the over-the-counter market. The inflation-indexed constant maturity yields are read from this yield curve at fixed maturities, currently 5, 7, 10, and 20 years. Yields on treasury securities at constant, fixed maturity are constructed by the treasury department, based on the most actively traded marketable Treasury securities. Yields on these issues are based on composite quotes reported by U.S. government securities dealers to the Federal Reserve Bank of New York. To obtain the constant maturity yields, personnel at treasury construct a yield curve each business day and yield values are then read from the curve at fixed maturities.Although the bond yield calculated by the Fed uses a constant maturity bond which is always exactly ten years from maturity, because the Fed does not provide the coupon on the underlying securities for their constant maturity yield, it is not possible to provide the duration.

Corporate Credit

Moody's Corporate BAA Yield

Moody's tries to include bonds with remaining maturities as close as possible to 30 years. Moody's drops bonds if the remaining life falls below 20 years, if the bond is susceptible to redemption, or if the rating changes.Moody's keeps a number of long-term bond indices. The composite indices are available back to 1919 for corporate bonds and 1948 for Municipal bonds. Data were taken from the Commercial and Financial Chronicle from 1930 until 1940, and from the Federal Reserve, National Monetary Statistics, New York: Federal Reserve Board, 1941, 1970 and annually thereafter, or from weekly editions of Moody's Bond Survey which has been recently renamed Moody's Credit Survey. Yield data on Industrial and utility bonds of different ratings are available beginning in 1980. All data are expressed in terms of yields. The Corporate AAA Bond data have been extended backward by including Macaulay's Bond Yield from 1857 to 1918. The Moody's Municipal Composite uses the Dow Jones 20-year Municipal Bond Yield index from 1928 through 1947. The Rails indices provide average monthly yields of approximately 20 long-term railroad bonds (4 Aa, 5 A and 4 Baa). Prior to 1928, 20 bonds were used. All yields were calculated to maturity dates and the list of bonds was adjusted when required to reflect rating changes or other reasons so that each of the series was comparable throughout the entire period. The Rail AAA index was discontinued on December 18, 1967, and all rail averages were discontinued on July 17, 1989 because of insufficient frequently tradable bonds. The index for new Rail capital is annual from 1860 through 1920, quarterly from 1921 to 1941, and annual from 1941 through 1958. Moody's consistently uses long-term bonds for their indices. They keep the average maturity of their bonds is in the 25-30 year range with a duration of about half the maturity. The Moody's Utilities Preferred AA Series includes Moody's Preferred Stocks, Low Dividend Series, High-Grade Public Utilities series from January 1946 through June 1975, and Moody's Utilities Preferred BAA series includes Moody's Referred Stocks, Low Dividend Series, Medium Grade Public Utilities from January 1946 through June 1975. The number of bonds currently included in each index is given in parentheses. For the exact components, see the January issue of Standard and Poor's Credit Survey.Source: Federal Reserve Bank of St. Louis. The data is collected from the FRED database. The FRED database uses data from the Board of Governors of the Federal Reserve System, the Federal Reserve Bank of Philadelphia, the Federal Reserve Bank of St. Louis, the Office of Federal Housing Enterprise Oversight, The White House Council of Economic Advisors and Office of Management and Budget, the Congressional Budget Office, the U.S. Department of Commerce, the U.S. Department of Housing and Urban Development, the Bureau of Labor Statistics and the U.S. Department of the Treasury.

REFERENCES AND FOOTNOTES

Special thanks to Akshobhya Mann for her illuminating ideas on control, probability, and quantum physics, which greatly informed the ideas presented in this paper.

Artwork
"Allegory of Hawk and Serpent" artwork by Brendan Wiuff based on a concept created by Brendan Wiuff and Christopher Cole. All Rights reserved
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Illustration of a winged, fire-breathing dragon by Friedrich Justin Bertuch from 1806
Executive Order 6102 U.S. Government Printing Office - http://www.goldline.com/images/conf-order.pdf

Footnotes & Citations

1. "US Great Seal Origins" | http://www.wisdom-square.com/us-great-seal.html
2. www.misfitsandheroes.com | https://misfitsandheroes.wordpress.com/tag/eagle-and-serpent/
3. Data from Global Financial Data, Bloomberg, Artemis Capital
4. Company Institute & Federal Reserve Board of Labor Data
5. "America's Top Next-Gen Wealth Advisors: Millenials Who Survived 2008 are Now Managing Billions" by Halah Touryalai / Forbes July 25, 2017
6. 2018 Public Pension Funding Study | Milliman White Paper
7. "Pension Fund Outlook Brightens in 41 States" by Danielle Moran | Bloomberg October 12, 2018
8. Bloomberg Rankings of U.S. States by Pension Funding Ratios 2017 Notes: Bloomberg ranked U.S. states based on their pension funding ratios in 2017 (unless otherwise noted) under the Government Accounting Standards Board Statement No. 67. The funding ratio, which is calculated by dividing each state's aggregated fiduciary net position by its aggregated total pension liability, provides an indication of the financial resources available to meet current and future pension obligations. To assemble these figures, the Bloomberg municipal fundamentals team collected and supplemented data from each state's Comprehensive Annual Financial Report, a set of government financial statements. Where specific data were missing in the consolidated reported totals, the pension funds were contacted directly. Data are for individual states' respective fiscal year-ends as of the date of publication of the CAFR. Fiscal year-end of supplemental pension reports may differ from the state's CAFR. In 2012, GASB released Statement No. 67, which affects financial reporting for pension plans. Implementation of GASB 67 is contingent upon the pension plan type, and figures are not available for four states. They use FASB 25, the previous standard. Calculated medians exclude those four states.
9. Artemis Capital Management calculations based on pension data from Milliman and Bloomberg.
10. Based on independent and private survey of investment banks by Artemis Capital Management LP
11. "Middle Way" | Wikipedia.org https://en.wikipedia.org/wiki/Middle_Way
12. "Genghis Khan and the Making of the Modern World" by Jack Weatherford | Crown and Three Rivers Press 2004
13. "Basic Chocolate Cake" Food Network Kitchen https://www.foodnetwork.com/recipes/food-network-kitchen/basic-chocolate-cake-recipe-2120876
14. "The Case for Dennis Rodman" https://skepticalsports.com/the-case-for-dennis-rodman-guide/
15. "Natural History" by Pliny the Elder | Ancient Rome
16. 2018 Public Pension Funding Study | Milliman White Paper
17. The Golden Girls | NBC
18. "Mel Far Superstar Commercial" | YouTube https://www.youtube.com/watch?v=aF3n_PA1-1w
19. Artemis Capital Management calculations based on pension data from Milliman 2018 Pension Study and Bloomberg Ranking of U.S. States by Pension Funding Ratios.
20. Bailey Korell penned this phrase, I am merely borrowing it per his permission. Future attribution should always be to Bailey for the record.
21. "Gold: The Story of Man's 6000 Year Obsession – episode 1" Real Vision | Grant Williams | www.realvision.com
22. Marko Kolanovic,PhD | J.P. Morgan Research

Notes & Data
Global Financial Data utilized for historical time series data going back as far as 1200.
Security price data from Bloomberg
Options data from Market Data Express with calculations executed by Artemis Capital Management LP

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HAWK WITH SNAKE IN CLAWS LIKELY SPARKED MONTANA FIRE

By Karl Puckett Great Falls (Mont.) Tribune Aug 24, 2017

GREAT FALLS, Mont. — The acting assistant chief of a Montana fire department has a pretty good idea what caused a fire that burned 40 acres Wednesday.

It wasn't lightning.

It wasn't farm equipment.

It wasn't arson.

It was a hungry hawk with dinner in its claws.

"A dead hawk was found burned and it had contacted the power lines," said Dave Lee of the Black Eagle (Mont.) Fire Department.

"The amazing thing is it still had a small snake gripped in its talons."

VOLATILITY IS AN INSTRUMENT OF TRUTH

Volatility as a concept is widely misunderstood. Volatility is not fear. Volatility is not the VIX index. Volatility is not a statistic or a standard deviation, or any other number derived by an abstract formula.

Volatility is no different in markets than it is in life.

Regardless of how it is measured, volatility reflects the difference between the world as we imagine it to be and the world that actually exists.

We will only prosper if we relentlessly search for nothing but the truth, otherwise the truth will find us through volatility.

Artemis Capital Management L.P. is an investment, research, and technology firm that seeks to transform stock market volatility into opportunity for our clients. The firm employs quantitative, systematic, and behavioral-based trading models to fulfill this mission. Artemis strategies provide non-linear exposure to the left and right sides of the return distribution, and when combined with traditional investments, are expected to improve the risk-adjusted performance of the institutional portfolio.

The firm was founded in 2009 by Christopher Cole, CFA following verified and substantial proprietary account gains realized during the 2008 financial crisis.

Artemis Capital Management is registered with the Securities and Exchange Commission (“SEC”) as an Investment Advisor, the Commodity Futures Trading Commission (“CFTC”) as a commodity pool operator (“CPO”), and is a member of the National Futures Association (“NFA”). Artemis Capital Management is registered with the Commodity Futures Trading Commission (“CFTC”) as a commodity pool operator (“CPO”), with the Securities and Exchange Commission (“SEC”), and is a member of the National Futures Association (“NFA”). For more information please contact info@artemiscm.

ADDITIONAL RESEARCH

ARTEMIS
CAPITAL MANAGEMENT

RESEARCH

Volatility and the Alchemy of Risk: Reflexivity in the Shadows of Black Monday 1987

The Ouroboros, a Greek word meaning 'tail devourer', is the ancient symbol of a snake consuming its own body in perfect symmetry. In extreme heat, a snake is unable to differentiate its own tail from its prey and will attack itself, self-cannibalizing until it perishes. Volatility is now an input for risk-taking and the source of excess returns in the absence of value. Like a snake blind to the fact it is devouring its own body, the same factors that appear stabilizing can reverse into chaos. The danger is that the multi-trillion-dollar short volatility trade, in all its forms, will contribute to a violent feedback loop of higher volatility resulting in a hyper-crash.

Volatility and the Allegory of the Prisoner's Dilemma – Q3 2015

Dorothy Thompson once said, "peace is not the absence of conflict". Never forget there is a form of peace and stability reinforced by a foundation of underlying volatility. Game theorists call this the paradox of the Prisoner's Dilemma, and it describes a dangerously fragile equilibrium achieved only through brutal competition. The Prisoner's Dilemma is the most important paradigm for understanding shadow risk in modern financial markets at the pinnacle of a multi-generational debt cycle unparalleled in the history of finance. The paper argues that institutions should utilize a barbell approach to targeting the return distribution going forward

Volatility at World's End: Deflation, Hyperinflation, and the Alchemy of Risk – Q1 2012

This thought piece launched Artemis in the institutional derivatives community and was credited for shifting the pricing of long-dated skew in S&P 500 index options. The premise argued that the left tail of the equity return distribution was dramatically overvalued, while the right tail remained inexpensive when compared to the potential of reflation, particularly far out on the volatility term structure.

Star Wars Convexity – January 2017

The directing and writing deal that George Lucas negotiated for Star Wars in 1976 is an excellent case study for how a long convexity position can be held at neutral to positive carry.

Dennis Rodman and the Art of Portfolio Management – April 2016

Dennis Rodman's ability to rebound a basketball made him, statistically, one of the most valuable players in NBA history. Even though he couldn't score, his six sigma rebounding dramatically improved the offensive efficiency of the players around him helping his teams win five championships. Long volatility exposure offers a similar benefit to the institutional portfolio.