

# Winners Repeat, Losers Repeat

Rob Brown, PhD, CFA

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## ABSTRACT

This article presents a tactical asset allocation (“TAA”) proof-of-concept portfolio. It is intended to successfully harvest the non-iid statistical characteristics of virtually all major sub-asset categories. In other words, it has as its objective to benefit from markets’ propensity to trend during both bull and bear market environments. The proof-of-concept portfolio relies on a simple quantitative rule that allows for rigorous evaluation over the last 102 years. The results presented herein, suggest that TAA is an investment management approach worthy of serious consideration. Moreover, the article suggests that a necessary condition for TAA success lies in correctly specifying its rather differentiated investment objective - one that may be unrelated to comparisons with popular third-party index benchmarks. Such benchmarks have correlations with TAA strategies that are so low as to make commonly used statistical comparisons irrelevant, i.e., not statistically significant. Our industry has done a remarkably good job of mischaracterizing, mis-selling, and over-promising all-things TAA. And doing so with a profound willingness to compare or “evaluate” TAA portfolios using inappropriate and/or dysfunctional comparative measures - serving to guarantee inevitable dissatisfaction. This article attempts to correct these misspecifications by more properly positioning TAA to a specific client need.

## KEY TAKEAWAYS

- The TAA portfolio earned an inflation-adjusted 11.1% over the aggregate time period (101.9 years). Whereas, a comparable passive index earned a lesser 6.7% (one that adopted the average asset weights experienced by the TAA portfolio, itself).
- TAA’s performance advantage resulted even after subtracting unusually high transaction costs from the TAA portfolio, while assuming that the comparable passive index could rebalance cost-free.
- The TAA portfolio’s greater relative success in achieving the stated investment objective did not diminish with the passage of time. If anything, it may have improved during the most recent time period (14.3% of the cases examined, Feb 2009 - Oct 2021).
- The causality underlying TAA’s relative success is attributable to three behaviors: trending, bear market longevity, and presence of episodic eras. Trending results from the time it takes for information to be reflected in portfolios and the herding behaviors of market participants.

## KEYWORDS

- Tactical Asset Allocation
- Systematic Investing
- Trending
- Momentum
- Client-Based Investment Objective

## **INTRODUCTION**

Tactical Asset Allocation (hereafter referred to as “TAA”) earned a poor reputation over the last thirteen years (since 3/9/2009, the bear market low). My objective is to mitigate a portion of the retail industry’s TAA-skepticism. This is an interesting topic, given the size of the retail industry and TAA’s prominence within it.

Direct and indirect, the retail industry is large and growing, currently estimated to be over \$16 trillion<sup>1</sup>. TAA first came into existence back in the 1980s and has grown consistently ever since, with occasional faster growth and modest shrinkage, generally associated with S&P 500 bull and bear market cycles. Today, assets under management within retail TAA strategies are measured in the hundreds of billions of dollars<sup>2</sup>.

Retail skepticism is an outgrowth of TAA’s failure to meet investor/adviser expectations. My argument is that this failure is the fault of investors/advisers who adopted incorrect performance expectations for TAA and/or selected TAA managers who relied excessively on forecasts and predictions of the future based on subjective human judgement (or complex forecasting/prediction models). I attempt to support this argument by presenting a new investment performance objective for TAA strategies and a proof-of-concept TAA portfolio designed to reliably meet this objective. The proposed differentiated performance goal is an outgrowth of the investor’s desire to meet their own future needs as opposed to the investment industry’s desire to sell more product.

## **BACKGROUND**

No widely accepted definition of TAA exists within the institutional, retail, or combined investment industry. Nevertheless, products proliferate and have grown significantly since first introduction by Bill Fouse and his firm Mellon Capital (founded back in 1983). For those professionals fully cemented within the investment industry, TAA is a little like “art,” they know it when they see it. But a universal definition eludes us. For the purposes of this article, I am defining retail TAA strategies as those portfolios that exhibit the following characteristics:

- Portfolio is built using commingled vehicles and/or derivatives (as opposed to individual stocks or individual bonds),
- Size of factor bets is above-average,
- Frequency with which the factor bets are changed is above-average,
- Tracking to blended benchmarks consisting of passive indices is extremely low,
- Tax efficiency is poor,
- Modest, but relatively dependable bear market mitigation is expected for bear markets lasting at least eight months,
- Portfolio suffers from occasional whipsaw risk, and
- Portfolio is delivered in the format of a separate account, 40-Act fund, or insurance sub-account.

A classic example of such a retail TAA portfolio would be provided by the \$40 billion of TAA products offered by F-Squared, Wellesley MA (now defunct for unrelated reasons).

Since the bear market low set back on March 9, 2009, the S&P 500 as measured by SPY returned +790% and the 7/10-year Treasury as measured by IEF earned +60% (through 11/8/2021). Few if

any TAA strategies have fared well against these comparative returns. In a study conducted by Morningstar, Inc., they examined the *"net annualized return, standard deviation, Sharpe ratio, and maximum drawdown from July 31, 2010, to December 31, 2011,"* of 163 tactical funds (Ptak 2012). They concluded that only a small percentage of firms outperformed the Vanguard Balanced Index (VBINX), which uses a static 60% stock, 40% bond allocation. Updated to June 2013, Morningstar found that 20 percent of TAA funds beat the Vanguard Balanced Index Fund, and just four had a superior Sharpe ratio.

Retail investor/adviser performance expectations for TAA strategies have been made worse by the investment industry's sales and marketing paradigm, which is focused on comparisons of 1-, 3-, 5-, 7-, and 10-year performance numbers to popular index benchmarks. Unfortunately, such comparisons offer no statistical significance concerning the future performance of a TAA strategy. Worse yet, they encourage selection criteria that have little or nothing to do with the end-investor's actual needs.

Our industry has done a remarkably good job of mischaracterizing, mis-selling, and over-promising all-things TAA. And doing so with a profound willingness to compare or "evaluate" TAA portfolios using inappropriate and/or dysfunctional comparative measures - serving to guarantee inevitable dissatisfaction. For example: *"TAA will provide participation and protection. When the market goes up, you get a large bite of the apple. When the market goes down, you're protected. But TAA didn't protect during the 33-day collapse in Feb/Mar of 2020, therefore TAA is a failure."* With these challenges in mind, I will be unusually specific and limited (placing many sub-topics in the parking lot), with the objective of sidestepping the well-laid traps placed by our industry's past mischaracterizations.

This article does not suggest how to construct a commercially viable TAA portfolio. Nor does it address a range of important TAA concerns. When these are encountered, I will place them in the parking lot<sup>3</sup>, while attempting to provide a brief but minimal response.

Nevertheless, the empirical results presented herein, suggest that TAA is a portfolio management approach that warrants serious consideration. Moreover, this article suggests that a necessary condition for TAA success lies in correctly specifying its rather differentiated investment objective - one that may be unrelated to comparisons with popular third-party index benchmarks.

## **INVESTMENT OBJECTIVE**

I begin by setting the table with an appropriate investment objective. One that is implementable, and a direct outgrowth of the retail and institutional financial/investment planning communities. Since this article's objective is to provide a TAA proof-of-concept portfolio, we have the luxury of simplifying from real world investment needs.

I assume the investor has "spending" needs arriving ten to fifteen years in the future. Taking the midpoint of this interval, we assume an unimpeded investment time period of 12 ½ years. Moreover, I assume that the investor faces then-current prices, in other words, they are subject to the vagaries of consumer price inflation.

This characterization is well-grounded within both the institutional and retail communities. And has been most frequently referred to as asset/liability matching, immunization, time segmentation investing, or the bucket approach. The concept being, identify the investor's "spending" needs.

Position them in time. Break the investor's portfolio into a series of distinct and relatively independent portfolios, each designed to serve/support the investor's future "spending" needs during different future date ranges. For example, using six buckets, one might segment the investor's needs into years 0-4, 5-9, 10-14, 15-19, 20-24, and 25 and greater.

Most investors face spending or liabilities that fluctuate with inflation. For this reason, the analysis presented herein is reported in after-inflation or "real" terms<sup>4</sup>. And this article assumes the following investment objective: *"Maximize the probability of earning at least 4 ¼% after-inflation over any and all investment time periods of 12 ½ years in length."* Notice that the operative word here is *"at least."*

One could debate whether 4 ¼% or some other level is appropriate. As important as this issue is, it is not the objective of this article. Therefore, I am placing it in the parking lot<sup>3</sup>. Suffice it to say that by assuming a minimum required after-inflation return of 4 ¼%, I leave room for practical implementation costs, e.g., fees and expenses.

To recap - the objective is not to beat a benchmark. Nor is it to mitigate the market's decline during a certain time window or event. The objective is not defined by alpha, beta, or omega. As one of my institutional clients is fond of reminding me: *"The foundation can't spend relative outperformance, whether risk-adjusted or not. We can only spend what we literally earned, and then only after adjusting for inflation. So, Rob, let's stay focused on the real world. I can't spend alpha, beta, or omega. The foundation's future plans are cast in stone. What I need from you is a solid, defensible estimate as to the probability that we'll meet those future plans. Is it 99.9%, 99%, or just 55%? That's the only framework worth discussing with the foundation's investment committee!"*

## **PROOF-OF-CONCEPT TAA PORTFOLIO**

Most of the retail and part of the institutional communities rely on portfolio construction techniques (mean variance optimization, scenario analysis, Monte Carlo simulation, etc.) that most frequently assume iid-probability distributions (independent and identically distributed periodic asset class returns). In an iid-world, markets don't trend, bull and bear markets don't exist, and episodic eras are absent.

To the extent such behaviors arise, they are strictly accidental outcomes resulting from random processes. In an iid-world, mean variance optimization is likely to be an optimal strategy for portfolio construction.

But what if markets do trend, causal bear markets exist, and episodic eras occasionally unfold? Under such a circumstance, there would be a tendency for winners and losers to repeat. More specifically, there would be a tendency for those asset categories that performed most strongly (weakly) relative to others, to perform well (poorly) for just one more period. Essentially, winners repeat, losers repeat (Asness et al 2014), (Gupta and Kelly 2019), (Hurst, Ooi, and Pedersen 2017), (Ilmanen et al 2019). In such a world, Markowitz mean variance optimization would be patently sub-optimal.

If this is true (i.e., markets aren't iid), then a portfolio construction technique based on over-weighting recent relative winners and under-weighting recent losers, should excel. Such an approach is the basis for the proof-of-concept TAA portfolio examined herein. And, I would

argue, serves as the inherent foundational basis for all successful retail TAA approaches<sup>17</sup>. Similarly, if markets fail to trend, then constructing a portfolio in such a fashion should deliver performance degradation, instead of enhancement, particularly on a risk-adjusted basis.

Note that a portfolio construction technique designed to harvest asset class trending does not need to be complex to be powerful. The opposite is more likely to hold true. Perhaps, *“If you can’t explain it to a six-year-old, you don’t understand it yourself.”*<sup>5</sup> or *“Life is really simple, but we insist on making it complicated”*<sup>6</sup> are two quotes that best capture this observation.

Finally, to evaluate TAA’s ability to serve the stated investment objective more robustly than traditional investment approaches, I attempt to avoid the following traps:

- Ignoring application of the Scientific Method (i.e., Observation, Question, Hypothesis, Experiment, Results, and Conclusion),
- Cherry picking a time period designed to support the TAA methodology,
- Selecting portfolio construction rules based on what worked well in the past,
- Choosing asset categories that are supportive of the TAA approach,
- Assuming zero trading costs,
- Utilizing portfolio performance objectives that fail to directly serve the real world needs of retail and institutional investors, and
- Comparing results to inapplicable or non-implementable index benchmarks.

## PORTFOLIO CONSTRUCTION

The TAA portfolio is constructed and evaluated using monthly total return indices spanning the time period 1/31/1919 through 10/31/2021. Returns are reported after inflation-adjustment using the CPI (Consumer Price Index)<sup>4</sup>. Data were provided primarily by Global Financial Data, Inc., but were supplemented by the Kenneth R. French - Data Library - Dartmouth College<sup>7</sup>.

27 asset categories<sup>8</sup> were selected spanning this 102.8-year time window. The starting date of 1/31/1919 was selected for the following reasons:

- It includes shocks (in part but not in whole) resulting from the Russian revolution, global pandemic (The Spanish Flu), disaster of the Weimar Republic, the Great Florida Land Boom and Bust, Great Depression of 1920, and an era characterized by the most profound decline in U.S. inflation for over 150 years,
- Almost all of data series started on or before that date, and
- In a small number of cases, where the data did not extend back to 1/31/1919, reasonable estimates going back to 1919 could be made<sup>9-12</sup> that did not impact the relative performance of the TAA portfolio versus its comparative benchmarks.

If one were building a commercially viable TAA portfolio, would they select these specific 27 asset categories? Of course not. These are the asset categories for which high-quality data exists for the last 102.8 years. The issues defining how best to go about selecting asset categories for a commercial TAA product are fairly straightforward, but are also not the objective of this article and therefore this question goes into the parking lot<sup>3</sup>. Suffice it to say, the key criteria underlying selection during a commercial build include: cross-correlations, time series properties (trending

attributes), number of asset categories, vehicle availability, adequate safe harbors, adequate engines for growth, and trading costs.

The 27 asset categories used in this article are of three types, stocks, bonds, and commodities. Exhibit 1 provides a bird’s-eye view of how the 27 break out.

**Exhibit 1**  
**27 asset categories utilized**

<b>Stocks</b>		<b>Bonds</b>	
Europe (7)		U.S. Treasury (6)	
U.S. categories (7)		<b>Commodities</b>	
Asia and Australia (2)		Precious metals (1)	
		Diversified agricultural (1)	

At a more granular level, this article uses seven types of U.S. stocks, nine categories of non-U.S. stocks, six versions of U.S. Treasuries, two types of corporate bonds, one version of international treasuries, and two commodity indices. The non-U.S. stocks span Europe, Asia, and Australia. The U.S. Treasuries span maturities (interest rate sensitives) and inflation protection. Corporate bonds span duration (interest rate sensitivity). The two commodities are drawn from precious metals and agriculture. Collectively, the 27 assets span risk-aversion, economic growth, and inflationary behaviors<sup>8</sup>. The single precious metal selected was palladium. Some readers might have expected the choice of gold instead. However, the U.S. Federal government fixed the price of gold at \$20.67 in 1919 and at \$35.00 in 1934. During the 1930’s, a Congressional act made the ownership of gold coins and bullion illegal. It wasn’t until the Nixon administration in 1971, did the price of gold freely float. For these reasons the use of gold would be inappropriate, i.e., biased and non-representative.

Once each month, the TAA portfolio is reconstituted so as to be equal-weighted across the eight asset categories that trended most strongly over the eleven months just ended. Trending scores are calculated to be the percentage that an index (total return index value) is above its eleven-month average level (using only month-end index values).

As before, if one is building a commercially viable TAA strategy, is this the portfolio construction rule that one would employ? Of course not. How one goes about selecting such a rule or rules is straightforward and of great commercial interest (and therefore will most likely not be published).

It is also not the objective of this article and therefore goes into the parking lot.<sup>3</sup> Suffice it to say that during a commercial build, different assets should be weighted differently (if they are one of the “selected eight”) depending upon the role they play within the portfolio. For example, 10-year Treasuries might be weighted more heavily than palladium. Moreover, trading costs might be mitigated by preventing the addition of a new asset category (or removal of an already existing asset category) from the portfolio if its trending score is right at the cusp of inclusion/exclusion.

Transactions costs are imposed on the TAA portfolio but not on the comparative index benchmarks. Exhibit 2 provides the assumed one-way trading costs by asset category. These were based on an examination of dollar trading volumes and bid/ask spreads for the largest and most liquid ETFs currently available for the 27 asset categories. For example, LQD is the largest/most liquid ETF for investment grade intermediate-term corporate bonds. It has an unusually tight bid/ask spread and trades dependably in extremely high dollar volumes throughout the trading day. As a result, I assume a relatively low one-way trading cost for this asset category (18 basis points).

In contrast, PALL is the largest/most liquid ETF for palladium. PALL offers a relatively wide bid/ask spread and fairly intermittent dollar trading levels throughout the day. As a consequence, this article assumes the highest one-way trading cost for palladium (101 basis points). To help place these two examples in context, the typical mid-day bid/ask spreads for these two ETFs are 1bps and 27bps, respectively. If we assume that fair value is located at the midpoint of the bid/ask spread and that all buys/sells can be executed at the asks/bids (i.e., no market impact), then this article’s assumed trading costs for LQD and PALL are 3,500% and 648% greater than those existing in the market today, respectively.

**Exhibit 2**

**Assumed one-way trading (a BUY or a SELL) costs, shown in basis points**

All stocks and U.S. Treasury bonds	Intermediate-term U.S. investment grade corporate bonds	International treasury bonds	Long-term U.S. high-grade corporate bonds	Diversified agricultural commodities	Physical palladium
1	18	67	76	84	101

Trading costs for TAA portfolios are non-trivial. However, determining the correct transaction cost assumption for each asset category (needed when building a commercially viable TAA product) is not the objective of this article, and is therefore placed in the parking lot<sup>3</sup>. Suffice it to say that the correct level will depend on many factors including the size of the portfolio being managed, the use of derivatives versus physicals, the asset categories employed, and the ability or inability to rebalance/trade at less crowded moments in time.

Application of Exhibit 2’s assumed trading costs to the TAA demonstration portfolio, leads to an average performance burn of 49.1bps per annum across the aggregate time period (geometric mean burn). Some retail TAA strategies exist that trade once each month and restrict themselves to a handful of highly liquid stock and bond futures contracts. Such strategies experience radically lower trading cost burns than the 49.1bps assumed herein.

## COMPARATIVE INDEX BENCHMARKS

As stated earlier, the objective of the TAA portfolio is to “*Maximize the probability of earning at least 4 ¼% after-inflation over any and all investment time periods of 12 ½ years in length.*” This objective is an outgrowth of the real-world financial planning process, whether retail or institutional. Thus, the objective of the TAA Portfolio is not to earn more than (or otherwise “beat”) some index benchmark. Instead, it is to deliver a higher probability of client-success than the practical index alternatives. When determining success or failure of the proof-of-concept TAA portfolio, or its reward or risk, such determinations must be conducted through the lens of the stated objective.

To shed additional light on the impact of including/excluding certain sub-asset categories from the comparative benchmarks, this article evaluates the TAA portfolio relative to five distinct benchmarks<sup>13</sup>, described in Exhibit 3. As stated earlier, transactions costs have not been subtracted from these benchmarks and it is assumed that they rebalance cost-free once each month, back to their assigned weightings.

### Exhibit 3

#### Comparative passive benchmark definitions

Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
35.43% U.S. stocks, 40.78% international stocks, 5.03% U.S. Treasuries with maturities between 0 and 5 years, 6.85% U.S. Treasuries with maturities greater than 5 years and also TIPS bonds, 4.38% U.S. investment grade corporate bonds, 2.19% international treasuries, 5.34% commodities	80.50% U.S. stocks, 19.50% U.S. bonds	80.50% global stocks, 19.50% global bonds	80.50% U.S. stocks, 19.50% U.S. bonds	60% global stocks, 40% global bonds
Exactly matches the average asset allocation experienced by the TAA portfolio, using the 27 asset categories	U.S. stocks are equal-weighted across the 7 U.S. stock indices	Global stocks are equal-weighted across the 7 U.S. and 9 international stock indices	U.S. stocks are defined as the S&P 500 Index	Global stocks are equal-weighted across the 7 U.S. and 9 international stock indices
	U.S. bonds are equal-weighted across the 8 U.S. bond indices (6 Treasury and 2 investment grade corporate)	Global bonds are equal-weighted across the 8 U.S. bond indices (6 Treasury and 2 investment grade corporate) and 1 international treasury index	U.S. bonds are defined as the constant maturity 10-year Treasury bond	Global bonds are equal-weighted across the 8 U.S. bond indices (6 Treasury and 2 investment grade corporate) and 1 international treasury index

These benchmarks differ with respect to the breadth of their respective asset class diversification. Ranging from, at one extreme, diversification across the 27 asset categories used by the TAA portfolio (but using the average weights experienced by the TAA portfolio), to a benchmark restricted to the S&P 500 and 10-year constant-maturity U.S. Treasury bond. Finally, a traditional 60/40 stock/bond mix is offered as a fifth comparative benchmark due to the sheer popularity of this blend. Keep in mind that the proof-of-concept TAA portfolio is meaningfully disadvantaged relative to these five comparative benchmarks due to the subtraction of unusually-high trading costs from the portfolio but not from the benchmarks.



## COMPARISON

Many people when comparing one investment relative to another will immediately jump to cumulative return over the aggregate time period (geometric mean return per annum). Such a comparison is not relevant to this analysis since it does not address the investment objective as stated earlier. Nevertheless, to put this question to bed, Exhibit 4 provides the comparative statistics over the entire period in inflation-adjusted terms. It also reports the correlations for the five comparative benchmarks. These correlations are so low as to emphasize the difficulty of selling/marketing TAA strategies based on relative performance comparisons to popular index benchmarks.

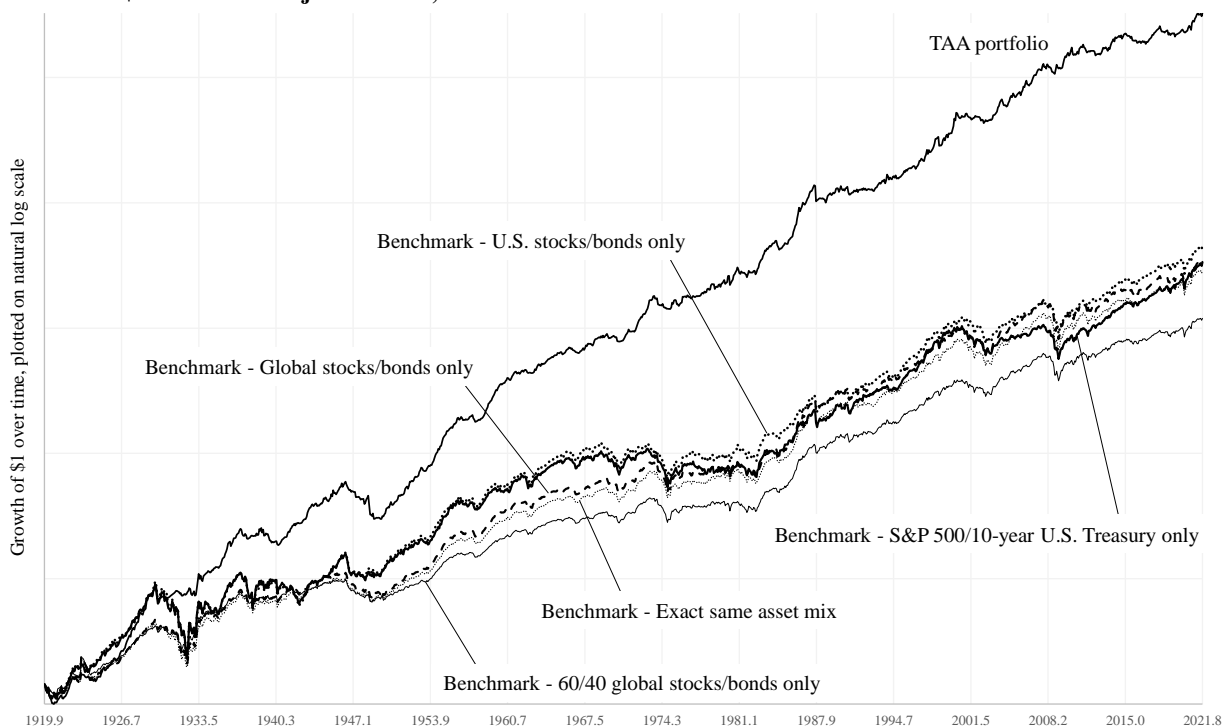
### Exhibit 4

#### Geometric mean inflation-adjusted return (in %) over entire time period (101.9 years) - And related statistics

	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
Real return	11.08	6.70	7.12	6.84	6.82	5.90
Correlation with TAA portfolio	1	0.68	0.60	0.66	0.60	0.67
Annualized standard deviation	11.60	11.87	15.09	12.42	15.11	9.70
Return per unit of volatility	0.96	0.56	0.47	0.55	0.45	0.61

The consistency of the TAA portfolio's relative outperformance over the aggregate 101.9-year period can be shown by plotting the growth of \$1 on log scale. Exhibit 5 provides this view. As expected, the 60/40 portfolio delivered the lowest cumulative growth due to its underweighting to equities. Similarly, the diversified benchmark restricted to U.S. stocks/bonds delivered the greatest growth (of the five benchmarks) due to the selection bias associated with restricting itself to that single country which delivered the greatest economic growth story of the past hundred years.

**Exhibit 5**  
**Growth of \$1 in inflation-adjusted terms, first invested back on 11/30/1919**



The TAA portfolio’s relative outperformance is not surprising for one who already understood the extent to which markets (stocks, bonds, commodities, and currencies) trend. This was demonstrated by the higher return, lower risk, and superior risk-adjusted return. But all of these summary statistics have the potential to be seriously misleading in a world where asset class returns are not iid, i.e., where they trend. In such environments, the time series properties of asset class returns become all-important to the investor’s likelihood of success or failure. Or to put it somewhat differently, no investor has the luxury of waiting 102 years in order to achieve their personal goal.

The correct comparison is defined by the original investment objective, i.e., examine performance over rolling 12 ½-year investment periods. Exhibit 6 provides the summary statistics (mean and median) for this length investment holding period - again in inflation-adjusted terms.

**Exhibit 6**

**Anticipated annualized inflation-adjusted return for the typical 12.5-year investment time period**

Statistic	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
<b>MEAN 12.5-year inflation-adjusted return (in %) over 1,074 different rolling time windows</b>	11.50	6.64	6.69	6.81	6.30	5.82
<b>MEDIAN 12.5-year inflation-adjusted return (in %) over 1,074 different rolling time windows</b>	11.22	6.27	7.09	6.43	6.53	5.53

Mean and median are helpful communicating the “typical.” But they tell us nothing about the dispersion of results or the frequency of that which is atypical. Exhibit 7 addresses this greater need by presenting the percentile outcomes.

**Exhibit 7**

**Percentile outcomes expressed as annualized inflation-adjusted returns for a random 12.5-year long time period**

Percentile	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
99.5	2.35	0.06	-1.35	0.00	-1.91	-0.38
99	2.99	0.45	-1.11	0.38	-1.74	-0.14
98	4.12	1.13	-0.81	0.97	-1.65	0.31
97	4.66	1.65	-0.67	1.53	-1.37	0.84
96	5.10	1.94	-0.45	1.82	-1.15	1.01
95	5.40	2.14	-0.24	2.06	-0.88	1.21
90	7.92	2.68	0.95	2.61	0.39	1.77
85	8.43	3.15	2.31	3.10	0.98	2.21
80	8.79	3.67	3.12	3.60	1.83	2.91
75	9.11	4.23	3.91	4.07	3.25	3.66
70	9.40	4.62	4.95	4.61	4.42	4.14
65	9.90	5.22	5.52	5.24	5.06	4.51
60	10.45	5.68	6.11	5.73	5.62	4.85
55	10.83	5.97	6.55	6.07	6.10	5.16

The first row of Exhibit 7 reports the 99.5<sup>th</sup> percentile outcomes. In other words, 99.5% of the time, the TAA portfolio will return more than 2.35% (annualized and inflation-adjusted) over a randomly selected 12 ½-year investment time period. In contrast, the S&P 500/10-year Treasury benchmark delivers a less attractive -1.91%.

Or at the 55<sup>th</sup> percentile, the TAA portfolio has a 55% probability of earning more than 10.83% after-inflation per annum as opposed to the S&P 500/10-year Treasury benchmark’s 6.10%. Exhibit 7 provides a comprehensive view as to the distributional properties of the proof-of-concept TAA portfolio and its five comparative benchmarks - far more than is revealed by standard deviation or some other simple summary statistics, which generally serve to hide the inherent time series properties of most asset class returns.

But to complete the comparison, we must examine tail risk issues. Essentially, addressing the black swan concern, when the unexpected happens, just how bad can it get. By utilizing data spanning 1/31/1919 through 10/31/2021, this article explores some of the most problematic market episodes drawn from war, pandemic, financial crises, depressions, terrorist acts, assassinations, bank runs, inflation, deflation, and market failures. Exhibit 8 presents the 16 worst-ever 12 ½-year long investment holding periods. These are the 16 worst for the TAA portfolio and for each of the comparative benchmarks, and for this reason they are located at different points in time.

**Exhibit 8**

**Annualized inflation-adjusted return for the sixteen worst-ever 12.5-year investment time periods (drawn from 1,074)**

Different 12.5-year long investment time periods	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
worst-ever	1.49	-0.58	-2.49	-0.67	-2.59	-0.91
2nd worst	1.62	-0.17	-2.27	-0.23	-2.49	-0.60
3rd worst	1.70	-0.13	-1.83	-0.18	-2.19	-0.51
4th worst	1.80	-0.07	-1.49	-0.15	-2.05	-0.48
5th worst	2.08	-0.03	-1.45	-0.07	-1.98	-0.42
6th worst	2.22	0.04	-1.38	-0.04	-1.92	-0.38
7th worst	2.58	0.10	-1.28	0.05	-1.90	-0.37
8th worst	2.59	0.29	-1.25	0.19	-1.89	-0.35
9th worst	2.61	0.33	-1.22	0.24	-1.85	-0.22
10th worst	2.68	0.40	-1.18	0.34	-1.78	-0.18
11th worst	2.90	0.44	-1.14	0.36	-1.77	-0.15
12th worst	3.02	0.45	-1.09	0.39	-1.73	-0.14
13th worst	3.22	0.49	-0.93	0.42	-1.72	-0.14
14th worst	3.31	0.55	-0.92	0.47	-1.71	-0.06
15th worst	3.36	0.56	-0.91	0.53	-1.71	0.00
16th worst	3.54	0.63	-0.91	0.55	-1.71	0.01

Returning to the stated investment objective of earning at least 4 ¼% net of inflation over rolling time windows of 12 ½ years, the more practical question is what is the probability of success for the TAA portfolio and the five benchmarks. Exhibit 9 provides the results.

**Exhibit 9**

**Likelihood of success relative to stated objective**

	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
<b>Probability of earning more than 4.25% inflation-adjusted over a randomly selected 12.5-year long investment time period</b>	97.8	74.8	73.6	73.1	70.9	68.1

Few data more powerfully support the notion of a TAA portfolio than those presented herein. The TAA portfolio offers a 98% probability of success versus just 71% for the S&P 500/10-year Treasury benchmark with an identical average stock/bond mix or a lesser 68% for the globally diversified 60/40 benchmark.

Evaluation of the proof-of-concept TAA portfolio must be conducted through the lens of the stated investment objective. In other words, how likely is it to achieve the investor’s goals. And if it fails to achieve those goals, just how badly will it fail. The data provided by Exhibits 6-9 best answer this need.

## A CHINESE PROVERB

*“If your plan is for one year plant rice. If your plan is for ten years plant trees. If your plan is for one hundred years educate children.”<sup>6</sup>”*

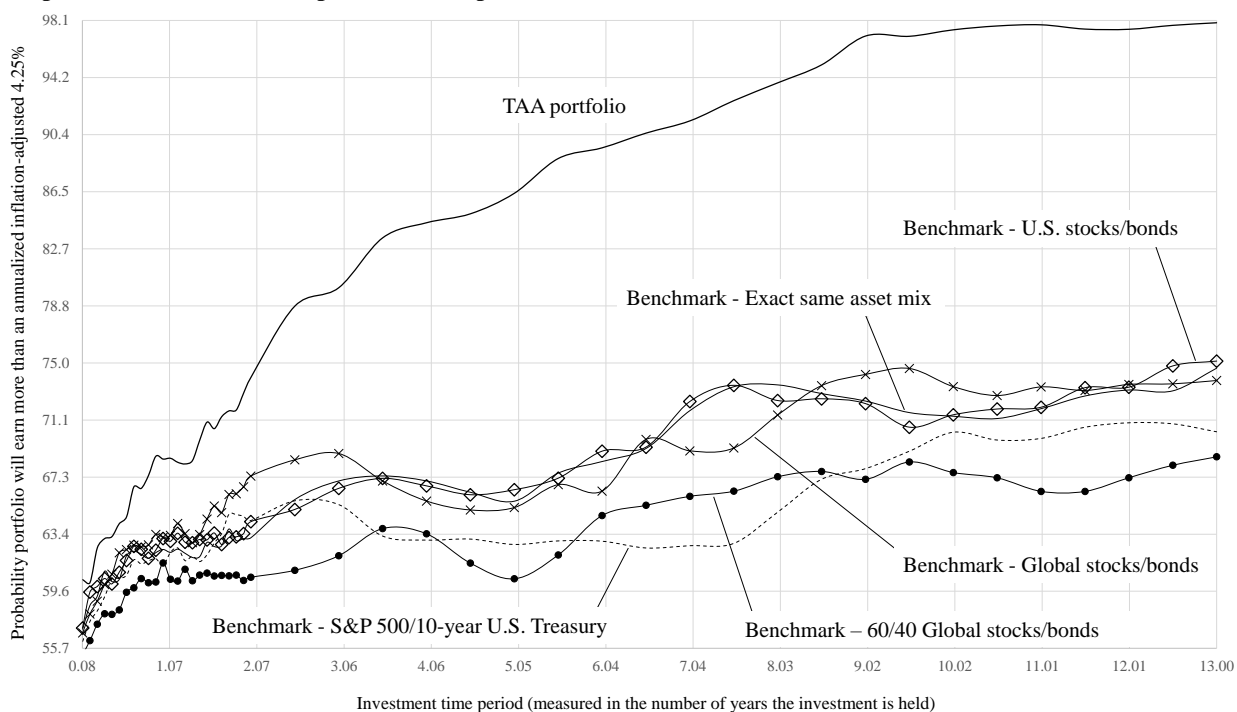
This proverb reminds us that different types of investments require different lengths of time to sprout, grow, mature, bear fruit, and eventually be harvested successfully. Our industry is rife with the mis-selling and mis-characterization of TAA. Often this takes the form of leading the unsuspecting investor to believe that TAA will both participate and protect. That it will rise along with the market, while avoiding market declines. Such an outcome is a bridge too far, if the fuel that drives TAA’s success is nothing more than market trending, bear market longevity, and the existence of episodic eras.

Front of mind examples of this challenge are provided by the investment industry’s TAA products during the hyper-short market collapse of Feb/Mar 2020 and the three-month bear market of late-1987 (the shortest bear market in history<sup>14</sup>). In both cases, the industry’s TAA portfolios generally performed quite poorly.

If the fuel that drives TAA’s superior performance (as communicated by Exhibits 4-9) is winners/losers repeat (i.e., markets trend), then this should show up in the data. In other words, we should expect that TAA’s relative advantage disappears as we shorten the investment time period from our original 12 ½ years down to a single month. Exhibit 10 answers this inquiry. It provides the probability of success (likelihood of earning more than 4 ¼%, annualized and inflation-adjusted) for different investment holding periods (ranging from 1 month to 13 years).

### Exhibit 10

#### Impact of investment time period on the portfolio’s likelihood of success



For investment periods as short as one, two, or three years, the benefits of TAA relative to passive index benchmarks is highly questionable. In contrast, a sweet spot is reached at the eleven-year mark - perhaps giving trending the time it requires to sprout, grow, mature, and be successfully harvested.

At eleven years, the TAA portfolio has a 97.8% probability of success in contrast to the S&P 500/10-year Treasury benchmark offering a miserly 69.9% likelihood of doing so. And these results assume unusually-high transactions costs for the TAA portfolio and none for the five index benchmarks (even though they trade every single month so as to maintain their constant fixed-weight allocations).

Exhibit 10 also sheds light on why some of the largest investment management organizations shy away from offering TAA products within the retail channel. First, TAA does not track commonly used index benchmarks as demonstrated by the correlations reported in Exhibit 4. Second, TAA takes several years to prove its worth as demonstrated by Exhibit 10.

When combined together, these two attributes disrupt and/or undermine the traditional selling/buying behaviors across retail channels. To oversimplify, “*what sells is what has outperformed the S&P 500 over the last 1-, 3-, and 5-years,*” and that is just not the inherent design feature of TAA.

## **OBJECTIONS**

I often here three objections and will address each in turn. First, is the fear that TAA is a strategy designed for bear markets, but not for bull markets. The concern is that TAA delivers its superior relative performance during and as a result of stock bear markets, but is disadvantaged during stock bulls, during which it will underperform. To address this concern, this article examines the relative success of the proof-of-concept TAA portfolio during investment time periods ending during past bear markets and also during bull markets - comparing the two sets of market environments.

Using index data since January 1919, there are 1,074 unique 12 ½-year long investment time periods, 150 of these ended during bear markets and the remaining 924 ended during bull markets (as defined by the S&P 500 Index<sup>15</sup>). Exhibit 11 reports the results during these two alternate market environments.

## Exhibit 11

### Performance during bull and bear markets (as defined for the S&P 500 Index)

Market environment	Statistic	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
<b>For all periods ending during a BULL market</b>	Median inflation-adjusted return (in %) for a 12.5-year period	11.46	6.45	7.47	6.62	7.05	5.76
	Probability of earning more than 4.25% (annualized inflation-adjusted) for a 12.5-year period	97.4	74.1	74.5	72.7	72.0	66.9
<b>For all periods ending during a BEAR market</b>	Median inflation-adjusted return (in %) for a 12.5-year period	10.74	5.86	5.32	6.03	5.18	5.31
	Probability of earning more than 4.25% (annualized inflation-adjusted) for a 12.5-year period	100.0	78.7	68.0	75.3	64.0	75.3

These results suggest that the relative likelihood of success for TAA versus the five comparative passive benchmarks is just as good during bull markets as it is during bear markets, and potentially slightly better. To be practical, this result is not surprising to anyone who starts with the presumption that markets trend just as strongly during both bull and bear markets, and it is this trending behavior that serves as TAA's primary fuel.

A second objection is that the TAA portfolio will be unbalanced or sharp-edged at just the wrong moment in time. Yes, the proof-of-concept TAA portfolio trounces the five comparative benchmarks over rolling time windows of 12 ½ years in length, i.e., over the stated investment objective. But human beings are susceptible to behavioral or psychological flaws.

Perhaps if the investor experiences a sufficiently disastrous 12-month window, they'll react by selling out of the portfolio at the exact wrong time - failing to wait out the requisite 12 ½ year investment holding period. To address this so-called behavioral knockout risk, Exhibit 12 provides the ten worst-ever 12-month results for the TAA portfolio and its five comparative benchmarks.

## Exhibit 12

### Behavioral knockout risk - Worst 12-month time windows ever experienced (drawn from 1,212)

Different 12-month long investment time periods	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
worst-ever	-29.7	-40.9	-56.2	-40.9	-55.1	-31.5
2nd worst	-27.2	-38.2	-49.9	-38.4	-49.9	-30.0
3rd worst	-27.1	-36.7	-45.0	-37.7	-44.5	-29.5
4th worst	-26.9	-36.3	-41.7	-36.8	-40.5	-29.0
5th worst	-25.6	-35.7	-40.7	-36.8	-39.8	-27.8
6th worst	-25.3	-33.9	-39.4	-35.7	-39.4	-27.6
7th worst	-24.9	-33.7	-38.2	-34.6	-37.1	-27.4
8th worst	-24.2	-32.7	-36.6	-33.8	-37.0	-25.8
9th worst	-24.0	-32.2	-36.5	-32.6	-35.4	-25.2
10th worst	-23.4	-32.1	-34.0	-32.6	-34.6	-24.2

These data demonstrate that the TAA portfolio is meaningfully less susceptible to knockout risk than any of the five comparative benchmarks.

Third, I often here the objection: “*Yes, TAA worked in the past, but it won’t work in the future because everything is moving more quickly and as a result, trending will diminish and cycles will shorten.*” I remain a devout skeptic. My understanding is that trending occurs for two primary reasons:

**Information** - Information takes time to develop, be noticed, processed, and eventually reflected across portfolios and different types of investors operate at different speeds and on different cycles.

**Herding** - Market participants have a tendency to herd. The development, growth, and eventual dispersion of herds, takes time.

I see no evidence that either of these two potential causal elements is dissipating. If they are, then one would expect to see some diminishment in TAA’s relative success over time, when compared to the five index benchmarks. Exhibit 13 sheds light on this issue.

This article took the aggregate time period and broke it into seven equal-length time windows. Each window contains 153 (or 154) possible 12 ½-year long investment time periods. Exhibit 13 reports the likelihood of success (meeting the stated investment objective) for the TAA portfolio and the five benchmarks.

**Exhibit 13**

**Probability of earning more than 4.25% inflation-adjusted during a random 12.5-year long investment time period**

Number of unique 12.5-year long investment time periods that end during the date range shown to the right	Date range	TAA portfolio	Benchmark - Exact same asset mix	Benchmark - U.S. stocks/bonds only	Benchmark - Global stocks/bonds only	Benchmark - S&P 500/10-year U.S. Treasury only	Benchmark - 60/40 global stocks/bonds only
153	Feb 2009 - Oct 2021	99.3	79.1	66.0	69.3	58.2	69.3
153	May 1996 - Jan 2009	100.0	100.0	98.7	99.3	96.7	100.0
154	Jul 1983 - Apr 1996	100.0	82.5	81.2	80.5	77.9	79.9
153	Oct 1970 - Jun 1983	100.0	29.4	19.6	26.1	19.0	20.9
154	Dec 1957 - Sep 1970	100.0	100.0	100.0	100.0	100.0	92.2
153	Mar 1945 - Nov 1957	85.0	39.9	80.4	40.5	75.2	15.0
154	May 1932 - Feb 1945	100.0	92.2	68.8	95.5	68.8	98.7

The first row shows the results for the most recent time period, i.e., the 153 rolling time periods spanning the window Feb 2009 through Oct 2021. This most recent interval, provides one of the strongest relative time periods for TAA versus the five index alternatives. TAA succeeded.

**CONCLUSION**

The proof-of-concept TAA portfolio worked. Such an observation is helpful but insufficient. We must also have some appreciation for why it worked, so that we have a firmer basis for concluding



that past success is likely to continue into the future. Answering the causal question of “why” is not the objective of this article, so once again I place it in the parking lot<sup>3</sup>. But let me attempt to close this issue out with a tentative suggestion as to causality.

**Markets Trend** - Historical data suggests that stock, bond, commodity, and currency markets trend, in the sense that winners and losers repeat in a relative sense. The causality underlying this trending pattern may be two-fold. First, it takes time for information to be reflected in markets. Second, herding behavior arises from time to time. It takes time for herds to form, establish a direction, and subsequently de-herd.

**Bear Markets Last** - Bear markets are not short-lived events. By one measure, the mean (median) bear market lasts 19.8 months (17.5 months) (Brown 2021a). This longevity provides the basis for backward-looking trend-following strategies to outperform relative to passive fixed-weight alternatives. Exhibit 14 sheds light on this observation by providing the results of timing between stocks and cash or between stocks and bonds<sup>16</sup>. This exhibit shows that even getting the timing wrong, i.e., always getting out of stocks too late and getting back in too late, one still comes out ahead versus passive alternatives. The causality or driver underlying this exhibit’s results, is nothing more than the longevity of bear markets.

**Exhibit 14**

**Bear and bull markets last such a long time, that even shifting nine months late still adds value**

Portfolio ingredients	Get out of stocks AFTER the BEAR market has already begun - with this time delay	Get back into stocks AFTER the BULL market has already begun - with this time delay	Probability of earning more than 4.25% inflation-adjusted during a random 12.5-year long investment time period
U.S. stocks	na	na	73.4
60% U.S. stocks, 40% 90-day T-Bills	na	na	60.2
60% U.S. stocks, 40% 10-year Treasury bond	na	na	65.7
Perfect timing between stocks and cash	na	na	96.3
Perfect timing between stocks and Treasury bond	na	na	95.0
Imperfect timing between stocks and cash (always shifting late, after the bull/bear has started)	1 month	1 month	95.1
	2 months	2 months	93.6
	3 months	3 months	92.2
	4 months	4 months	88.6
	5 months	5 months	86.4
	6 months	6 months	82.4
	7 months	7 months	80.7
	8 months	8 months	75.4
	9 months	9 months	75.6
Imperfect timing between stocks and Treasury bond (always shifting late, after the bull/bear has started)	1 month	1 month	91.1
	2 months	2 months	89.9
	3 months	3 months	89.3
	4 months	4 months	86.1
	5 months	5 months	85.1
	6 months	6 months	82.1
	7 months	7 months	81.9
	8 months	8 months	77.1
	9 months	9 months	77.3

**Episodic Eras Exist** - Data suggests that two such episodic eras might be characterized by the bond bull market (interest rates falling) running from Nov 1865 through Dec 1908 (43.1 years) and the more recent bond bull market starting Sep 1981 and ending Jul 2020 (38.8 years) (Brown 2021b).

However, even if markets exhibit the three attributes listed above, a commercially viable TAA portfolio requires two additional elements. First, adequate reflection of transactions costs incurred as a result of TAA's inordinately high portfolio turnover. The TAA portfolio presented herein experienced average monthly portfolio turnover of 23% bi-directional (or 46% one-directional, a buy or a sale).

Second, the portfolio must be sold/communicated with the correctly stated investment objective. The successful harvesting of markets' non-iid trending attributes requires time. And time is not a year, two, or three (as suggested earlier, the TAA portfolio presented herein had a sweet spot of perhaps eleven years). This last issue will be a challenge for the largest investment management organizations. However, it leaves opportunity for the small and for the retail advisory community who have the opportunity to specify and continuously reinforce more relevant and achievable investment outcomes - whether for the \$1 million retail client or the \$100 million small local foundation/endowment/pension.

My experience has been trust but verify. Echoing a phrase popularized by one of our nation's past presidents. Before dismissing or disputing the findings herein, I encourage you to examine the data. If I can help in your examination, then reach out and I will provide any assistance possible within the strictures of existing data licensing agreements. There are no secrets here and simple portfolio construction rules tend to be the most robust.

Finally, if the numbers are really as good as presented herein, then the largest investment management organizations should be all over TAA product design and delivery. Once again, the reasons why this is not happening are not the objective of this article and therefore go into the parking lot<sup>3</sup>. But I will attempt to close this last issue out by suggesting it is all about tracking error, length of time it takes for the crop to mature and be ready for harvest, and the lack of a colorful emotion-laden marketing story (markets being non-iid is not a particularly engaging narrative).

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## FOOTNOTES

1. Sources: ICMA (International Capital Market Association) analysis using Bloomberg Data (August 2020), Ned Davis Research, and The Visual Capitalist at [www.visualcapitalist.com](http://www.visualcapitalist.com)
2. Sources: Investment Company Institute, YCharts, Morningstar, BlackRock, Inc., and the Insurance Information Institute
3. The parking lot. There are many pertinent issues related to TAA. But the objective of this article is quite narrow and therefore does not seek to cover any and all issues related to TAA. Important sub-issues related to TAA not addressed by this article are placed in this parking lot. These issues include (but are not limited to): (i) What is the correct minimum inflation-adjusted annualize return objective, (ii) What are the correct transaction costs to be assumed when doing a commercial build, (iii) How to select the asset categories for use in a commercial build, (iv) What are the portfolio construction rules to follow within a commercial portfolio, (v) What is the causal basis for TAA, i.e., why does it work, and (vi) Why don't the largest investment management organizations build and offer TAA products?
4. All of the results presented in this article are expressed in real (inflation-adjusted) terms. The definition of inflation that was used is the Consumer Price Index, All-Urban, Not Seasonally-Adjusted Index as provided by the U.S. Bureau of Labor Statistics
5. Attributed to Albert Einstein
6. Attributed to Confucius
7. The primary data source was Global Financial Data, Inc. at <https://globalfinancialdata.com/>. The secondary data source was Kenneth R. French - Data Library - Dartmouth College at [https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)
8. The 27 asset categories that were used to construct the TAA portfolio were as follows: (1) S&P 500 Total Return Index (w/GFD extension), (2) S&P 500 Utilities Total Return Index 55, (3) Dow Jones Industrials Total Return Index, (4) Dow Jones Transportation Average Return Index, (5) S&P 500 Industrials Total Return Index 20, (6) Energy Industry Sector (Kenneth R. French Data Library) market-cap weighted, (7) Hi-Tech Industry Sector (Kenneth R. French Data Library) market-cap weighted, (8) UK FTSE All-Share Return Index (w/GFD extension), (9) Japan Topix Total Return Index, (10) Germany CDAX Total Return Index (w/GFD extension) , (11) Australia ASX Accumulation Index-All Ordinaries, (12) Finland OMX Helsinki All-Share Gross Index, (13) Sweden OMX Stockholm Benchmark Gross Index (GFD extension), (14) Denmark OMX Copenhagen All-Share Gross Index, (15) France CAC All-Tradable Total Return Index, (16) Belgium Brussels All-Share Return Index (w/GFD extension), (17) GFD Indices USA Total Return T-Bill Index, (18) USA 30-year Government Bond Return Index, (19) USA 5-year Government Note Total Return Index, (20) USA 3-year Government Note Return Index, (21) GFD Indices USA 10-year Government Bond Total Return Index, (22) BofA Merrill Lynch US Inflation-Linked Treasury Total Return Index, (23) Dow Jones Corporate Bond Return Index, (24) GFD Indices USA Total Return AAA Long-Term Corporate Bond Index, (25) GFD Indices World x/USA Countries Government Bond GDP-weighted Return Index, (26) Palladium (USD per Troy Ounce) , and (27) World Bank Agriculture Commodity Price Index
9. The Kenneth R. French Energy Industry Sector Index did not exist prior to 1926. Prior to that date, it was estimated using stepwise regression. The regression was based on the following index series: S&P 500, West

Texas Intermediate Oil, Industrial Production, Reuters CRB Core Commodity, and S&P 500 Gold Stocks. This process delivered an adjusted R-Squared of 0.65 with t-statistics varying from 37.8 to 3.1 across the five series

10. The Kenneth R. French Hi-Tech Industry Sector Index did not exist prior to 1926. Prior to that date, it was estimated using stepwise regression. The regression was based on the following index series: S&P 500, S&P 500 Utilities, Palladium, Platinum, and Dow Jones Transportation. This process delivered an adjusted R-Squared of 0.82 with t-statistics varying from 40.2 to 3.4 across the five series
11. The BofA Merrill Lynch US Inflation-Linked Treasury Total Return Index did not exist prior to 1997. Prior to that date, it was estimated using stepwise regression. The regression was based on the following index series: Dow Jones Corporate Bond, USA 5-year Government Note, Thomson Reuters Core Commodity CRB, Consumer Price Index, and Platinum. This process delivered an adjusted R-Squared of 0.55 with t-statistics varying from 9.0 to 3.3 across the five series
12. The USA 3-year Government Note Return Index did not exist prior to 1940. Prior to that date, it was estimated using a linear combination of the USA 5-year Government Note Total Return Index and the GFD Indices USA Total Return T-Bill Index
13. “Benchmark - Exact same asset mix” uses all 27 asset categories. The weight on each asset category is the average experienced by the TAA portfolio over its entire life. The remaining four benchmarks exclude exposure to commodities. Their weightings to stocks and bonds correspond to the average stock/bond weighting experienced by the TAA portfolio over its entire life (with the exception of the 60/40 benchmark which is allocated 60% to stocks and 40% to bonds)
14. The Feb/Mar 2020 stock market decline lasted just 33 calendar days. It bounced back and fully recovered its loss in a similar number of days. It appears to have had no impact on investor’s (both retail and institutional) appetite for risk. If anything, it served to meaningfully reinforce investor’s willingness to “buy on the dip.” It is difficult to define such a decline as a bear market when taken in the context of bear market declines over the last 175 years. The bear market decline of late-1987 appears to satisfy traditional bear market definitions and remains consistent with bear markets over the last 175 years. Moreover, it appears to be the shortest bear market on record (Brown 2021a)
15. Bear markets are defined herein using the inflation-adjusted total returns on the S&P 500 Index restricted to month-end values. This article adopts the definition provided by Brown 2021a
16. “Cash” is defined as 90-day T-Bills. “Treasury bond” is defined as a 10-year constant-maturity U.S. Treasury bond. “U.S. stocks” are defined as the S&P 500 Index, however, prior to 1871 the Dow Jones Transportation Index was used. Only month-end total return data was utilized throughout. The start and end of stock bear and bull markets were as defined by (Brown 2021a). Statistics presented in the table are based on data that started on 12/31/1846 and ended on 10/31/2021. How to read the table? For example, consider the eighth row in the table. This row shows how moving between stocks and cash, but always getting out of stocks 3 months AFTER the bear market has already begun, and then subsequently getting back into stocks 3 months AFTER the bull market has already begun, would have delivered a 92.2% probability of success
17. However, I do recognize that some TAA strategies also utilize macroeconomic, monetary, behavioral, market supply/demand, and fundamental valuation metrics. Moreover, many trend following TAA strategies refine their rules based on reversion to the mean type overlays. Often this last is intended to improve the usefulness of the trend following signals in terms of calibration and timing.