Cliff's Perspective

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The Raisons d'être of Managed Futures

Why So Many Managers Bucked the Trend That Was Supposed to Be Your Friend

August 17, 2022

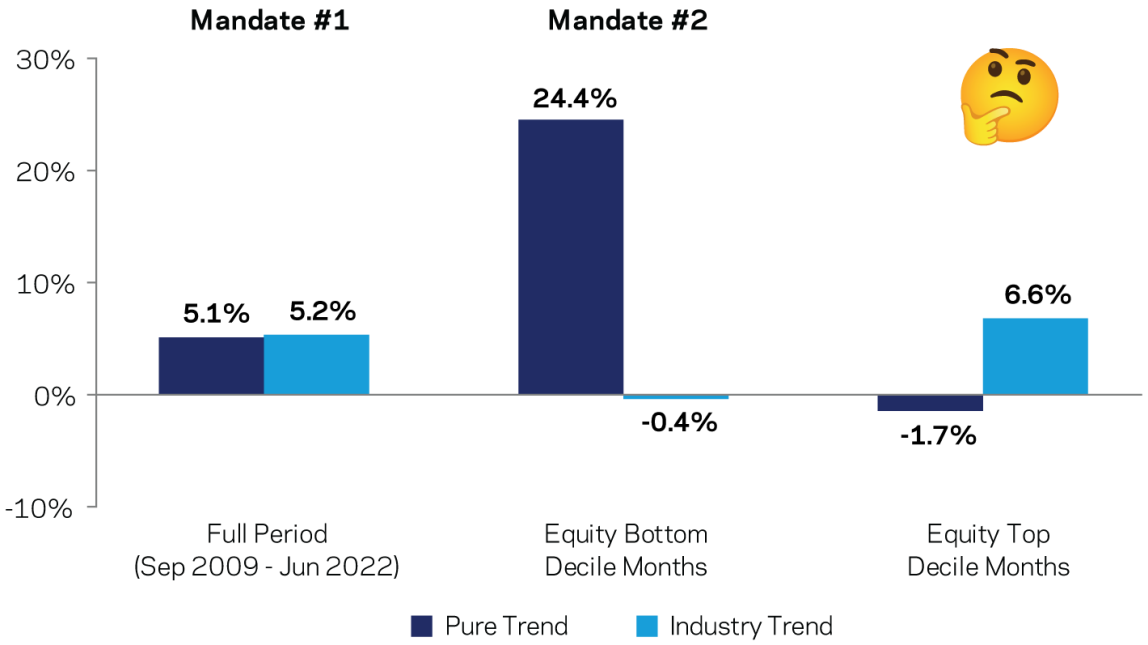
The Federal Reserve has an explicit dual mandate. Managed Futures strategies have an implicit one – specifically, 1) deliver positive returns on average and 2) generate especially attractive returns during large equity market drawdowns.[1] This dual mandate is one of the big reasons managed futures strategies can be valuable in a portfolio. Unfortunately, by and large, the industry—intentionally or not—has been optimizing for one at the expense of the other. Admittedly I have a self-serving axe to grind here as we believe we stuck to the dual mandate and suffered for it for quite a while (but not lately!).

Exhibit 1 shows what I'm talking about, using the SG Trend Index as a proxy for the industry ("Industry Trend"), and the AQR Managed Futures Composite as a proxy of "Pure" trend-following (more on what I mean by that later). Both pass Mandate #1 (positive average returns), but not Mandate #2 (especially attractive returns when most needed). How can this be? The rightmost set of bars—performance when equities did especially well—is the smoking gun (I know it may seem odd for me to crow over the periods when we underperformed, but I think it will make sense soon).

[1] Managed futures is pretty unique among strategies that seek to perform well during equity drawdowns. For instance, Put-buying strategies also have the second mandate, but not the first (i.e., positive returns on average). The main reason puts have trouble with the first mandate is that option premiums can cost a lot over the long term, which makes a lot of sense if you think about how insurance works. This also helps explain why puts tend to do best during short, sudden market crashes. Granted, managed futures aren't a perfect hedge, particularly when a crash comes out of the blue (i.e., without some early warning in terms of market trends), but it tends to work pretty darn well in longer-term bear markets and protracted drawdowns (e.g., the first half of this year) which, by definition of being protracted, are the kind investors should be more worried about anyway.

Exhibit 1: Trend Performance during Top and Bottom Decile Equity Months

September 1, 2009 – June 30, 2022



Source: AQR, Bloomberg. "Pure Trend" is the AQR Managed Futures Full Volatility Strategy; "Industry Trend" is the SG Trend Index. Dates chosen to coincide with the inception of the AQR Strategy. Equity Top and Bottom Decile Months are the best and worst 10th percentile months for MSCI World over the period shown. All data is shown net of fees. Pure Trend is net of a 1.36% management fee per annum. Past performance is not a reliable indicator of future performance. For illustrative purposes only.

An Industry That Got Carried Away

Let's go back a decade or so. Managed futures were a rare bright spot among alternatives in the Global Financial Crisis (GFC). However, since then—and until fairly recently—strategies built to profit from price trends have had a hard road to hoe. Since the GFC, markets have trended less than their historical norm. Also until fairly recently, while there have been some scary times, markets have generally been quite strong. Markets trending less than normal (i.e., a challenge for Mandate #1) and few tails to hedge (i.e., little need for Mandate #2)[2] has been a desultory combination for the managed futures industry.[3]

But bad times happen to good strategies. Everybody knows that. So, what's the right thing to do when a good strategy with over 100 years of evidence across a very wide range of markets and with solid economic intuition has *a decade* of tepid performance for reasons that are quite easy to explain? Naturally, you change it, right? This (in an admittedly snarky nutshell) is what seems to have happened to much of the managed futures industry.

Let's look at the facts. The first thing we'll want to analyze is exposure to equities,[4] as during a bull market, exposure to markets should be a boon to average returns and a detractor in bad times. I use two versions of

[2] The big tail event that did occur, March 2020, indeed did come out of the blue and reversed practically instantly—a pretty lousy roundtrip for managed futures, but also a time that most portfolios ended up not needing much help at all.

[3] It'll shock none of my regular readers that a desultory decade doesn't change our opinion by much. Though it clearly moves so many others' opinions. Great minds in investing are always devoted to coming up with ex post reasons for anything disappointing (or anything amazing for that matter). These reasons are grist for the mill of those who always want to sell what's not working and buy what's working. And a decade seems like an eternity (including to me!) when statistically, it's not that long a time. The result for managed futures: a strategy beloved after the GFC when it was needed is then slowly sold out of portfolios over the next decade, and when a rainy day (OK, a rainy six months) hits, it's not there for many. It's a bit ironic that I'm complaining about people essentially using trend-following to enter or leave a trend-following strategy. I think I can square this circle by considering the time horizon used. Trends on average have been effective from the short term out to about a year. But longer-term trends, particularly once you get out to the three- to five-year horizon, have tended to be a contrarian signal. People chasing returns are what I've often called "momentum investors at a value time horizon." I elaborate on this here.

[4] This has been my "first thing to look at" for over 20 years now—because equity market risk is the most important risk for most portfolios. That said, if we turn to the other common concern *du jour*, inflation risk, it would be easy to show that trend-following has done well during large inflation moves. This is not surprising because trend-following likes large moves, especially when they are protracted, and major inflation news tend to be gradual rather than sudden. A topic for another day.

managed futures: the first is AQR's version of trend-following ("Pure Trend"), and the second is the industry in general, proxied by the SG Trend Index ("Industry Trend") and regress each on the global stock market.

	Pure Trend	Industry Trend
Alpha	5.5%	3.9%
(t-stat)	1.16	1.23
Market Beta	-0.10	0.09
(t-stat)	-1.07	1.37

Source: AQR, Bloomberg. "Pure Trend" is the AQR Managed Futures Full Volatility Strategy; "Industry Trend" is the SG Trend Index. Regression analysis is versus the MSCI World Index. Analysis is from September 1, 2009 through June 30, 2022 Dates chosen to coincide with the inception of the AQR Composite. All data is shown net of fees. Pure Trend is net of a 1.36% management fee per annum. Past performance is not a reliable indicator of future performance. For illustrative purposes only.

Over the whole period it looks like a behind-the-scenes victory for Pure Trend (i.e., AQR). If anything, we have been a *slight hedge* against market moves (though not statistically significantly),[5] and the SG Index the opposite. Thus, the "problem" for Pure Trend isn't its alpha—it's that markets have gone up spectacularly. But we think it means we've stuck more to what managed futures is supposed to do.

Let's add one more thing to the regression. Anecdotally (from lots of sources) many managed futures managers try to improve their Sharpe ratios and realized total returns by adding carry strategies. That's fine if you're trying to improve Mandate #1, but carry is often a "risk on" strategy. Thus, it can become a real problem when it comes to Mandate #2. So now we'll add a simple carry strategy[6] to our regression.

	Pure Trend	Industry Trend
Alpha	5.5%	3.0%
(t-stat)	1.14	0.94
Market Beta	-0.10	0.05
(t-stat)	-0.99	0.79
Carry	-0.01	0.13
(t-stat)	-0.05	1.53

Source: AQR, Bloomberg. "Pure Trend" is the AQR Managed Futures Full Volatility Strategy; "Industry Trend" is the SG Trend Index. Regression analysis is versus the MSCI World Index and the Hypothetical Multi-asset Carry Strategy described at the end of this piece. Analysis is from September 1, 2009 through June 30, 2022. Dates chosen to coincide with the inception of the AQR Strategy. All data is shown net of fees. Pure Trend is net of a 1.36% management fee per annum. Past performance is not a reliable indicator of future performance. For illustrative purposes only. Hypothetical data has inherent limitations, some of which are disclosed at the end of this piece.

[5] Above we showed that we have done very well in extreme (worst decile) equity drops. That is not inconsistent with having a small negative beta. Linear beta is not the same thing as how you do in extremes. Managed futures strategies are designed to be somewhat "convex" in this way.

[6] This is a hypothetical carry strategy applied across multiple asset classes, net of estimated transactions costs.

The alpha gap has widened once more, with AQR now adding near double the alpha net of these exposures (exposures you don't want in managed futures if its job is to save you in a downturn). Which brings us to the betas—what about the exposure to stuff that compromises Mandate #2? The above table shows a 1.53 t-statistic on carry for the industry, and that doesn't pass traditional hurdles of statistical significance. So maybe there's really nothing there?

Actually, there is something but you can't see it in the above regressions. Below is an easier way to see it. It's the same table we just saw, but in the last column I take Industry Trend minus Pure Trend to show how far managed futures as an industry have strayed from what they purport to do.[7]

	Pure Trend	Industry Trend	Industry minus Pure Trend
Alpha	5.5%	3.0%	-0.70%
(t-stat)	1.14	0.94	-0.45
Market Beta	-0.10	0.05	0.12
(t-stat)	-0.99	0.79	3.75
Carry	-0.01	0.13	0.13
(t-stat)	-0.05	1.53	3.31

Source: AQR, Bloomberg. "Pure Trend" is the AQR Managed Futures Full Volatility Strategy; "Industry Trend" is the SG Trend Index. "Industry minus Pure Trend" is the difference between Industry Trend and Pure Trend, with Pure Trend scaled to achieve the same volatility as Industry Trend. Regression analysis is versus the MSCI World Index and the Hypothetical Multi-asset Carry Strategy described at the end of this piece. Analysis is from September 1, 2009 through June 30, 2022. Dates chosen to coincide with the inception of the AQR Strategy. All data is shown net of fees. Pure Trend is net of a 1.36% management fee per annum. Past performance is not a reliable indicator of future performance. For illustrative purposes only. Hypothetical data has inherent limitations, some of which are disclosed at the end of this piece.

This last table is why we feel pretty good about the choices we've made compared to the industry. The differences hurt us when things were mostly very good for the world—i.e., when market beta and carry strategies were doing well. But we didn't stray from our purpose. Our version of managed futures has been competitive, though slightly behind the SG Trend Index over the past five or so years of a raging bull market. And unfortunately, that's a horizon over which much of the world compares managers. However, adjusted for the industry's general bullish equity and carry exposures, we've actually won (albeit by a statistically weak amount) over our full history (and we argue that adjusting for these exposures fits the point of managed futures).

Tattle-Tail Hedgers

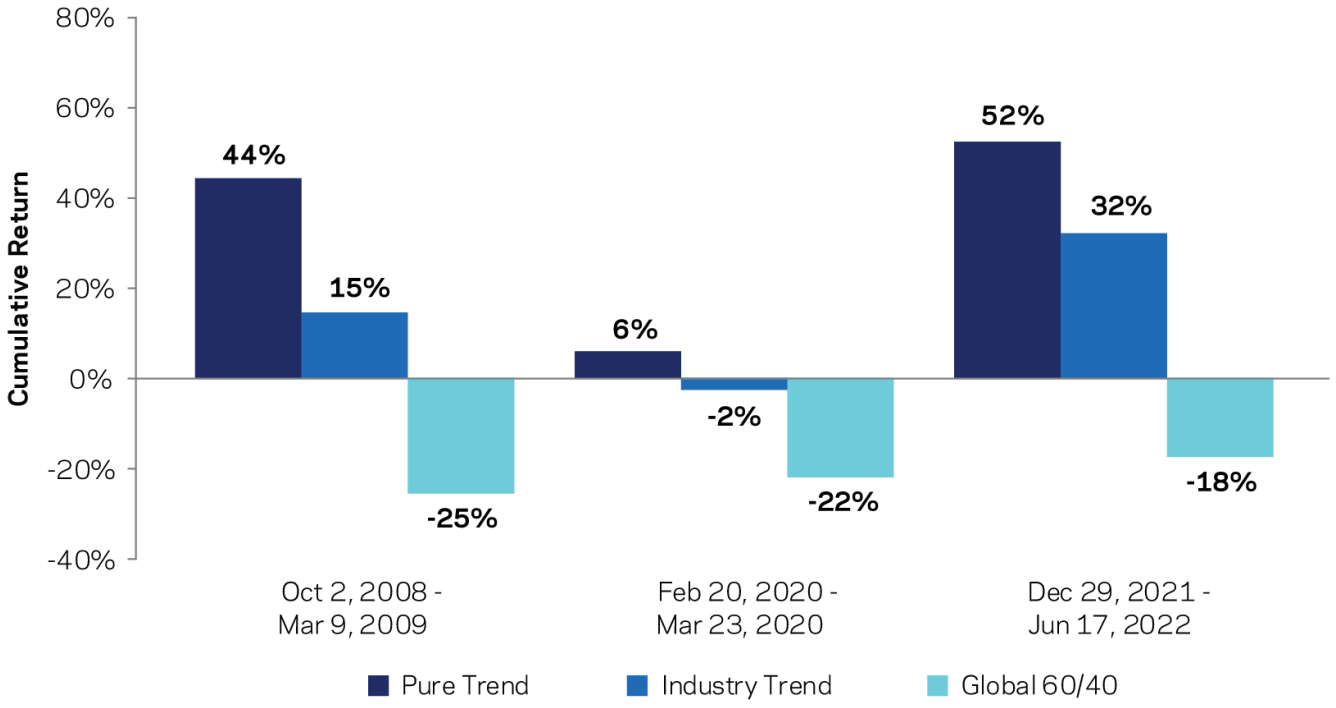
We've now seen how "Pure Trend" and "Industry Trend" have differed on average. Industry Trend, in seeking to look better on Mandate #1 (positive returns on average), picked up exposure to things we'd expect to weaken its ability to deliver on Mandate #2 (especially attractive returns when most needed). We can see this more directly, and perhaps more relevantly—regression averages are nice, but huge drawdowns for traditional assets are more to the point—by comparing their performance during the three worst drawdowns for traditional portfolios since the GFC.[8]

[7] Specifically, I've volatility-scaled Pure Trend to match Industry Trend, then taken the difference to make things more apples-to-apples comparable.

[8] We do this starting "intra-GFC" as that's the period of live returns. If we looked over the full GFC I promise the victory of pure trend vs. "trend plus beta plus carry" would be better (though it's possible that back then the industry hadn't added as much beta and carry as they have over the full period).

Exhibit 2: Hypothetical[9] Performance in Three Drawdowns of Global 60/40

Oct 1, 2008 – June 30, 2022



Source: AQR, Bloomberg. "Industry Trend" is the SG Trend Index. "Pure Trend" is a hypothetical AQR Managed Futures series which is scaled to 15% volatility to approximate the volatility of the average strategy in the SG Trend Index. All data is shown net of fees. The hypothetical Pure Trend series is net of a 1.2% management fee per annum. Please see the end of this piece for a detailed description of this hypothetical data. Global 60/40 is 60% MSCI World and 40% Barclays Global Aggregate Hedged USD. Hypothetical data has inherent limitations, some of which are disclosed at the end of this piece.

These are not inconsequential numbers. The average drawdown of 60/40 across the three above is -22%. The average return of Pure Trend is 34%, meaning a 10% allocation to Pure Trend saved 5.6% on average in these drawdowns (and if it were a nice 20% allocation, you know you could double that, because math!). In contrast, Industry Trend saved you a bit more than half that.

I've got nothing against exposure to equities and carry strategies— but when wrapped into managed futures it can be a problem, as it is contrary to part #2 of their reason for living. In good times (e.g., most of the post-GFC period), the kinds of managed futures everybody likes best are the ones with the highest average return (as opposed to ones having the best defensive characteristics). However, what that can mean is the investors themselves[10] have traded off one mandate for the other. Whether they've done that intentionally or by chasing returns too much is another question unanswerable with the data.

A weakened ability to deliver on Mandate #2 may be especially problematic today. One of the biggest areas of growth in the "alternatives" industry is in illiquids, such as private equity. I've cathartically written about how "great" smoothed returns can be for the investment manager—but for the investor, what you often get is a mirage of lower volatility[11] and lower market risk, even though the underlying economic exposures are pretty much the same.[12] Smoothing returns helps conceal market drops that quickly recover, like the COVID shock. However, it can't help against a very protracted bear market where eventually you need to mark your positions. The bright side for managed futures strategies, though, is that they are designed to do well in exactly these types of slow-moving train wrecks. In other words, tough times for private equity tend to be great for trend-following. Thus,

[9] Note: we've actually run managed futures strategies over the whole period shown here, but in the first year as a sleeve of a multi-strategy portfolio – which is why the whole chart is labeled "hypothetical" as it combines those two track records.

[10] Whether they know it and like it, or their managers have made this trade-off and they don't know it.

[11] My phrase for this is "volatility laundering."

[12] Or even more in private equity, as they are in general non-trivially levered.

Mandate #2 is likely especially important for investors who've increased their allocations to privates and illiquids since the GFC.

Stand By Your Mandates

Like others, we always want to improve our process. But improving something that you already believe is a long-term good strategy is fraught, especially when in reaction to a period of weak returns. Biases can come in. Grizzled veterans like tried-and-true strategies; newer market participants are biased toward the cool and new—and these are often at odds with each other (guess which one I am ☺).[13] And regardless of when you decide to add something new to the process, something to always worry about is data mining.[14]

But too often "innovation" is taken to mean "something totally new". It doesn't have to be; for strategies like managed futures, we think innovations can be—and ideally should be—firmly tied to the core thesis of the strategy itself (i.e., investors systematically under-react to information). This can help ensure changes don't come at the expense of Mandate #1 or Mandate #2.

At a very high level, here are two innovations that we think of as the "right" kind of improvements for managed futures. Both strategies have return characteristics that achieve the dual mandate on their own.[15]

- **"Alternative" Trends**: Admittedly, this one is pretty obvious. If you find trend-following to be a pretty persistent and pervasive strategy, then you would expect to find evidence for it even in places you didn't originally check. And not just in different asset classes, but even in factors themselves. Trend-following in these harder-to-access or harder-to-implement contexts is a natural extension of the core thesis of managed futures strategies, and as such not surprisingly has also shown the ability to meet the dual mandate.
- **Economic Trends**: This one is less obvious but I think is pretty cool. Managed futures is all about capturing the tendency of markets to gradually incorporate new information. This creates persistent price trends— but it also implies that positioning on the basis of recent news should also be profitable, which means trend-following based on economic fundamentals is worth taking a look at, too. The gist of this strategy is to go long assets for which fundamental macroeconomic trends are improving, and short assets for which fundamental macroeconomic trends are deteriorating.
- You might expect "price trend"- and "economic trend"-based strategies to be correlated but still complementary: sometimes markets can seem disconnected from fundamentals.[16] and sometimes they seem more driven by fundamentals[17]—so having both in a process makes intuitive sense. You'd be right.

Can these more novel approaches actually improve "tried-and-true" managed futures? Below I compare the two versions, with "Price Trends" being traditional managed futures and "Combined Trends" being one that—you guessed it—combines Price Trends with the two innovations described above (one essentially being more, and more esoteric, price trends, the other being economic trends). Since these are somewhat recent improvements, we've left the world of live returns and are looking at backtests below.

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[13] And even if the right investment answer for the client is "we're not changing a damn thing!", it's often not the right business answer if that same client wants to hear something else!

[14] And the "right" amount of worry to have for it.

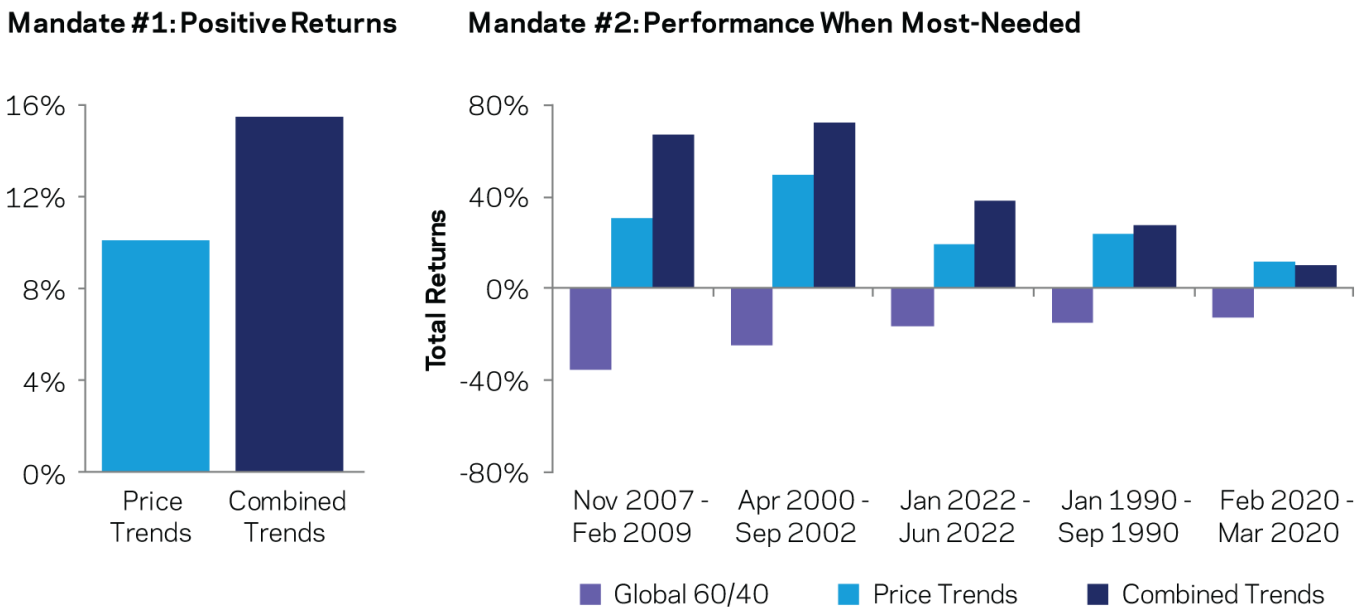
[15] Compared to conventional forms (i.e., price trend) of managed futures, these aren't as easy to implement efficiently, which is why I feel OK describing them here! Also, to nobody's shock I am touting innovations we have already implemented and are paying dividends.

[16] The value premium today is probably the most glaring example of how markets can become disconnected from fundamentals for an extended period.

[17] Take this year as an example: There are times when the economy zigs and markets zag; the two seem disconnected. 2022 has decidedly not been one of those periods. If you stopped paying attention to markets at the end of last year, but I told you today the macro developments we're seen so far in 2022, you'd probably be able to correctly guess the direction of all major markets.

Exhibit 3: Hypothetical Performance for Each Mandate

January 1, 1990 – June 30, 2022



Source: AQR, Bloomberg. Hypothetical Price Trends, Economic Trends, Alternative Trends and Combined Trends are described in more detail at the end of this piece. Hypothetical Combined Trends is 40% Price-Based Trend Following, 40% Economic Trend Following and 20% Alternative Trend Following. For comparability, both the Hypothetical Price Trends and Hypothetical Combined Trends series here target the same volatility. The returns are gross of fees and net of estimated transaction costs. Global 60/40 is 60% MSCI World and 40% Barclays Global Aggregate Hedged USD. For illustrative purposes only. Hypothetical data has inherent limitations, some of which are disclosed at the end of this piece.

What the Managed Futures Industry Can Teach All Investors

The managed futures story is a microcosm of the alternatives industry in the post-GFC era—a decade-or-so stretch in which traditional assets were enough to reach many investors' return objectives. Arguably, with these same traditional assets now even richer than they were a decade ago, investors need to be careful to take away the right lessons.[18]

The first is that when it comes to alternatives, "above-average returns" doesn't always mean "better for your portfolio." Going back to the regression tables earlier, investors need to look beyond raw average returns to evaluate how much value a strategy is actually adding. This is especially true amid a bull market, where "beta" can easily be sold as "alpha," leading investors to add to risks they already have.[19]

Similarly, even an investor who wants to stick with the strategy, whose heart and brain are in the right place, often implicitly ends up sorting on and choosing the versions of the strategies that aren't really doing what they're supposed to. To be even more explicit, say you are disappointed with your existing managed futures manager because he or she has underperformed the peer group, but you're worried about the market environment going forward, so you want to stick with the strategy. If you search among all managed futures managers and switch to the one that has performed the best over the last five or ten years, you will very likely choose one that has traded off mandate #2 for mandate #1.[20] This is like the alternatives equivalent of selling at the bottom.

The second, and more general takeaway, is that good strategies have bad times. Maybe paradoxically, if they didn't have bad times, they probably shouldn't be expected to work going forward. Prolonged good times attract large flows and eventually strategies become over-capitalized, and whatever expected return advantage they had

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[18] Kudos to Antti for a near-perfect timing on that second book. Though even the Oracle of Helsinki would admit he's been sounding the low-expected-return alarm for a while now :)

[19] Don't get me wrong, beta isn't a bad thing—you just need to know how much you're getting (and at what fee!).

[20] This is ubiquitous, and we've seen it in value investing, too. Picking a value strategy that didn't lose in 2018-2020 (or just lost less) *may* be choosing skill, but it's often far more likely choosing the version that doesn't actually really do the strategy you want to stick with!

is driven down.[21] In contrast, bad times drive flows away from strategies and leave them less capitalized but with better expected returns going forward.[22] This cycle of good times and bad times is precisely what allows positively-rewarded strategies to persist over very long periods of time.

It's always a noble (if fraught) effort to improve a good strategy. Doing so *without* harming the strategy's reason for living is even harder. We believe adding market beta and carry is the wrong way to do it for managed futures. Instead, we think adding strategies like Alternative Trends and Economic Trends that preserve (and improve upon) the dual mandate is the better way to innovate.

The bottom line is we think the long-term evidence is that trend-following delivers on the "dual mandate." It can have tough times, sometimes for years, if markets don't need their diversification and if trends reverse more often than normal. But these few years are a drop in the bucket versus the longer-term evidence and logic. Even over one of the tougher decades you'll see for managed futures, it did what it's supposed to do. It delivered non-trivial positive returns and excelled when it was supposed to and was most needed.

[21] You could argue that's what we've seen in bullish strategies and markets themselves. Also, this might be too defensive of me, but we do not believe this is what happened to managed futures (as some assert). While they grew a lot after the GFC they always traded very liquid, deep markets and they never got to a size where they could plausibly arbitrage themselves away.

[22] Sometimes a weak period can be hard to explain. That can happen with truly alternative strategies (paradoxically the most truly uncorrelated strategies are often the hardest to explain, precisely because they're doing something so different—which is what you often want!). On the other hand, sometimes—as with managed futures until recently—a weak period can be very easy to explain (less trending, no need for investors to be saved from a long bear market). It's hard to see how it's a good idea to abandon a strategy in this latter case.

Data Information

The Managed Futures Full Volatility Private Composite

The Managed Futures Full Volatility Private Composite (the "Composite") was created in September 2009. The investment objective of the Composite strategy (the "Strategy") is to achieve attractive risk-adjusted returns through a trend-following strategy that is uncorrelated to traditional investments over the long term. The Strategy invests in a diversified portfolio of equity, fixed income, currency and commodity-linked instruments, both long and short, based on trends relevant to each asset using a systematic, quantitative investment process. The Strategy invests primarily in financial futures, commodity futures and currency forwards, but it may also invest in option and swap contracts, fixed income securities, pooled investment vehicles (largely money market funds), and other investments intended to serve as margin or collateral for the accounts' derivative positions. Accounts included pursue an ex-ante target volatility of 17% per annum, which is subject to change on a near term basis to best accommodate changing market conditions. Since inception, accounts included have at certain times adjusted their target volatility level.

The Strategy uses derivatives, such as futures, forwards, and swaps, primarily to obtain exposure to markets, both long and short. The derivatives employed in the Strategy contain embedded economic leverage as the margin required to hold the contract is less than the notional economic exposure of the underlier. Leverage is employed to increase the overall volatility of the Strategy to the desired level. Leverage will vary over time based on market conditions, risk environment, assets traded, and opportunity set. Additionally, the Strategy may use shorting and derivatives to hedge unwanted market exposure gained from portfolio holdings, such as exchange rate risk embedded into security holdings.

Historical Performance
September 1, 2009 – June 30, 2022

Portfolio	Annualized Net Returns	Annualized Volatility	Sharpe Ratio
Managed Futures Full Volatility	5.1%	16.7%	0.27
SG Trend Index	5.2%	11.3%	0.42

Source: AQR, Bloomberg. Actual performance figures contained below are denominated in USD, reflect the reinvestment of dividends and all other earnings, and represent unaudited estimates of realized and unrealized gains and losses prepared by AQR and are subject to review and revision. Past performance is not a guarantee of future performance. Net returns of the Managed Futures Full Volatility Composite are net of a 1.36% management fee per annum. Past performance is not a reliable indicator of future performance.

Limitations of Backtested Performance. The returns presented reflect hypothetical performance an investor would have obtained had it invested in the manner shown and does not represents returns that any investor actually attained. The information presented is based upon the following hypothetical assumptions.

Hypothetical AQR Multi-asset Carry Backtest

The AQR backtest of the Carry theoretical long/short style is a component of the Hypothetical AQR Style Premia Backtest. It is based on monthly returns, undiscounted, gross of fees and net of transaction costs, excess of a cash rate proxied by the ICE BofAML U.S. 3 Mo. T-bill, and scaled to 12% annualized volatility. Each strategy is designed to take long positions in the assets with the strongest style attributes and short positions in the assets with the weakest style attributes, while seeking to ensure the portfolio is market-neutral. Carry strategies seek to profit off the tendency of higher-yielding assets to provide higher returns than lower-yielding assets. Please see below for a description of the Universe selection.
Stock & Industry Selection: approximately 2,000 stocks across Europe, Japan, and U.S. **Country Equity Indices:** Developed Markets: Australia, Canada, Eurozone, Hong Kong, Japan, Sweden, Switzerland, U.K., U.S. Within Europe: Italy, France, Germany, Netherlands, Spain. Emerging Markets: Brazil, China, India, Israel, Malaysia, Mexico, Poland, Singapore, South Africa, South Korea, Taiwan, Thailand, Turkey. **Bond Futures:** Australia, Canada, Germany, Japan, U.K., U.S. **Yield Curve:** Australia Germany, United States. **Interest Rate Futures:** Australia, Canada, Europe (Euribor), U.K. and U.S. (Eurodollar). **Currencies:** Developed Markets: Australia, Canada, Euro, Japan, New Zealand, Norway, Sweden, Switzerland, U.K., U.S. Emerging Markets:

Brazil, Hungary, India, Israel, Mexico, Poland, Singapore, South Africa, South Korea, Taiwan, Turkey.
Commodity Selection: Silver, copper, gold, crude, Brent oil, natural gas, corn, soybeans.

Hypothetical AQR Trend Following Strategy

The Hypothetical AQR Trend Following Strategy utilizes performance from the managed futures sleeve of the DELTA Composite from October 1, 2008 to August 31, 2009. Managed futures performance carved out from the DELTA composite includes returns to four classes; equities, fixed income, currencies and commodities. From September 1, 2009 onwards, returns are used for the Managed Futures Full Volatility Private Strategy run at 17 volatility. The aggregated managed futures strategy is scaled to a 15% volatility target at each point in time. Hypothetical AQR Trend Following is net of a 1.2% annual management fee.

Carve-out performance results are based upon a segment of the strategy and were not managed separately but as part of a larger strategy. Volatility adjusted performance has been scaled to match a different volatility target and is not the actual performance of the respective portfolio(s). All carve-out and volatility scaled performance are hypothetical and for illustrative purposes only.

Historical Performance
October 1, 2008 – June 30, 2022

Portfolio	Annualized Net Returns	Annualized Volatility	Sharpe Ratio
DELTA	4.1%	9.3%	0.39

Source: AQR. Actual performance figures contained below are denominated in USD, reflect the reinvestment of dividends and all other earnings, and represent unaudited estimates of realized and unrealized gains and losses prepared by AQR and are subject to review and revision. Past performance is not a guarantee of future performance The AQR DELTA Composite returns are net of a 2.0% management fee per annum.

Composite Description: The DELTA Composite (the “Composite”) was created in October 2008. The investment objective of the Composite strategy (the “Strategy”) is to provide positive absolute returns. The Strategy targets 10% annualized volatility. The Strategy seeks to efficiently capture a diversified set of classic hedge fund strategies and deliver them to investors in a transparent and liquid vehicle with little or no correlation to traditional asset classes. Using a bottom-up, clearly defined investment process, the Strategy provides exposure to more than sixty hedge fund risk premia across seven broad strategy groups with a dynamic and disciplined investment process that aims to provide risk-balanced, long-term exposure to the underlying strategies. The result is a high risk-adjusted expected return with low correlation to traditional asset classes. The Composite is denominated in USD.

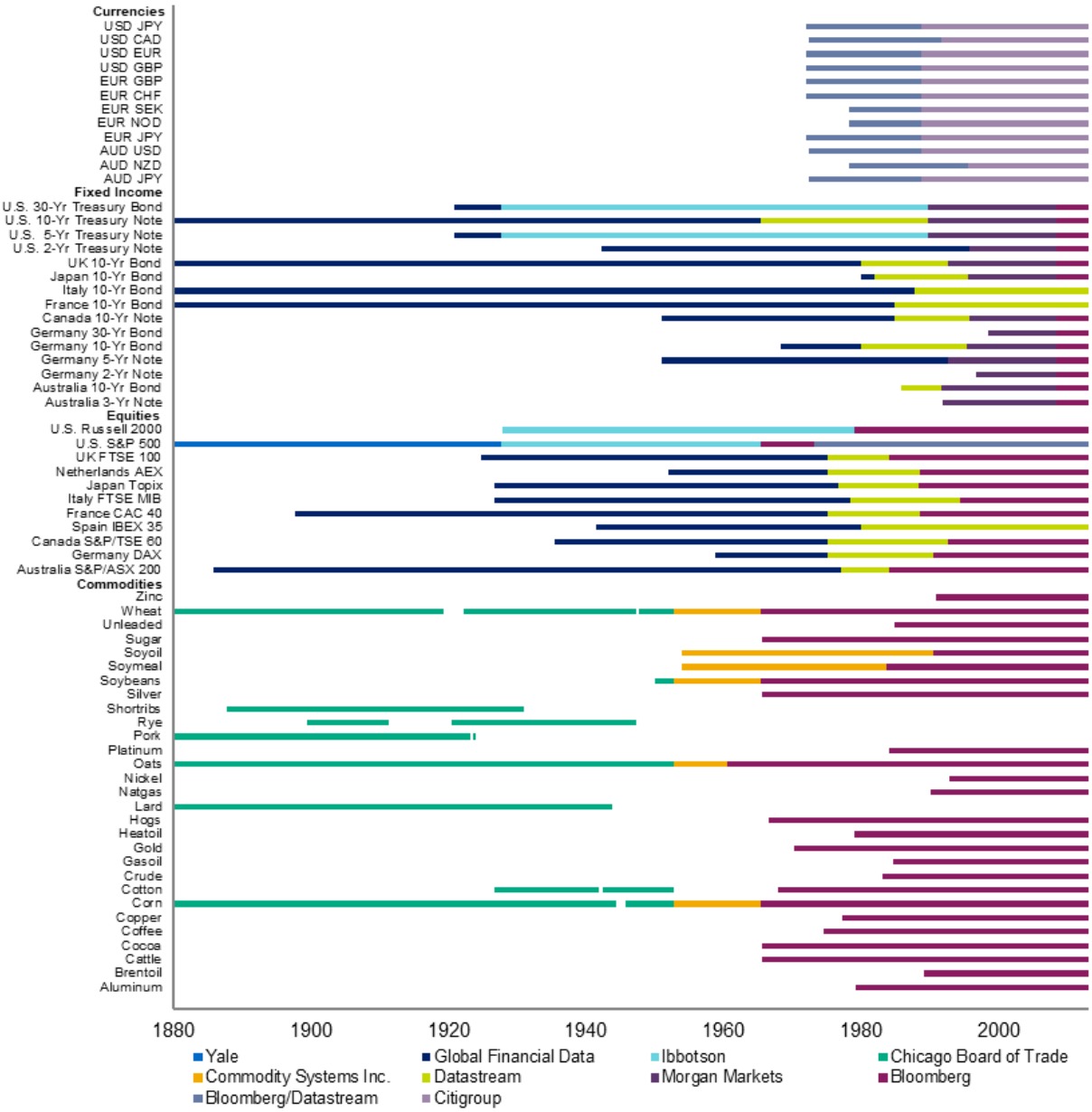
Hypothetical Price-Based Trend-Following Strategy

The Hypothetical Price-Based Trend-Following Strategy model uses data from January 1880 onward. The investment strategy is based on trend-following investing which involves going long markets that have been rising and going short markets that have been falling, betting that those trends over the examined look-back periods will continue. The strategy was constructed with an equal-weighted combination of 1-month, 3-month, and 12-month trend-following strategies for 67 markets across 4 major asset classes: 29 commodities, 11 equity indices, 15 bond markets, and 12 currency pairs. Since not all markets have return data going back to 1880, we construct the strategies using the largest number of assets for which return data exist at each point in time. We use futures returns when they are available. Prior to the availability of futures data, we rely on cash index returns financed at local short rates for each country. Please see Figure 2 for additional details. The strategy targets a long-term volatility target of 10% but does not limit volatility during periods where realized volatility may be higher or lower than this number.

Hypothetical performance is gross of advisory fees and net of transaction costs, unless stated otherwise. In order to calculate net-of-fee returns, we subtracted a 2% annual management fee and a 20% performance fee from the gross-of-fee, net-of-transaction-cost returns to the strategy. The transactions costs used in the strategy are based on AQR’s estimates of average transaction costs for each of the four asset classes, including market impact and commissions. The transaction costs are assumed to be twice as high from 1993 to 2002 and six times as high from 1880–1992. The transaction costs used are shown in Figure 1.

The benchmark and relevant cash rate is assumed to be ICE BofAML 3-Month T-Bill. Prior to 1929 when 3-month Treasury bills became available, the benchmark and relevant cash rate is assumed to be the NYSE call money rates (the rates for collateralized loans) through 1920, and returns on short-term government debt (certificates of indebtedness) from 1920 until 1929.

Figure 2



Hypothetical Economic Trend-Following Strategy Backtest Construction

The Hypothetical Economic Trend-Following Strategy uses data from February 1970 onward. The investment strategy is based on trend-following which for each theme (Growth, Inflation, International Trade, Monetary Policy, Risk Aversion) and within each asset class, takes a long position in assets in which economic trends are improving and a short position in assets in which economic trends are deteriorating. Each individual position is sized to target the same amount of volatility, both to provide diversification and to limit the portfolio risk from any individual market. The theme portfolio across all assets is scaled to target 10% forecasted annual volatility.

Not all markets and assets have returns going back to 1970; details outlined below.

Hypothetical Economic Trend-Following Strategy Universe:
Equity index return data is from Bloomberg. Start dates are the earliest available date of the series:
- 1970: Australia, Germany, Canada, Spain, France, Italy, Japan, Netherlands, U.K., U.S.
- 1975: Switzerland
- 1980: Denmark, Hong Kong, Sweden
- 1988: New Zealand

Government bond return data is from Bloomberg and DataStream. Start dates are
- 1970: Germany, Canada, U.K., U.S.
- 1980: Japan
- 1981: Switzerland
- 1985: Denmark
- 1986: Australia
- 1987: Sweden

Currency return data is from Citi and Reuters. Start dates are
- 1971: Germany, Japan, Switzerland, U.K.
- 1972: Australia, Canada
- 1978: New Zealand, Sweden

Interest rate futures return data is from IFS. Start dates are
- 1987: U.S.
- 1988: U.K.
- 1989: Australia, Europe (Euribor)
- 1991: Canada, New Zealand, Switzerland

Commodity futures return data is from Bloomberg. Start dates are
- 1970: Cattle, Corm Cotton, Hogs, Soybeans, Soymeal, Soyoil, Sugar, Wheat
- 1974: Coffee
- 1979: Heat Oil
- 1983: Crude Oil
- 1984: Gas Oil
- 1985: Unleaded
- 1989: Brent Oil
- 1990: Natural Gas
- 1991: Zinc
- 1993: Nickel

Growth: Growth trends are captured using one-year changes in forecasts of real GDP growth. From 1990 onward forecast data is from Consensus Economics. Prior to 1990, we use one-year changes in realized year-on-year real GDP growth, lagged one quarter (this definition is equivalent to changes in forecasts assuming that real GDP growth follows a random walk). The series is from the OECD. Increasing growth is assumed to be bullish for equities (cash-flow impact), commodities (increasing demand), and currencies (Balassa-Samuelson hypothesis), and bearish for fixed income (both government bonds and interest rates) via both inflationary pressures and upward pressure on real interest rates.

Inflation: Inflation trends are captured using one-year changes in forecasts of CPI inflation. From 1990 onward forecast data is from Consensus Economics. Prior to 1990, we use one-year changes in realized year-on-year CPI inflation, lagged one quarter (this definition is equivalent to changes in forecasts assuming that CPI inflation follows a random walk). The series is from the OECD. Increasing inflation is assumed to be bearish for equities (see Katz and Lustig (2017)), bullish for currencies (see Clarida and Waldman (2008)), and bearish for fixed income.

International Trade: International trade trends are captured using one-year changes in spot exchange rates against an export-weighted basket. Data is from DataStream. A depreciating currency is bullish for equities (exports become more competitive), bearish for currencies (very similar to price momentum), bearish for fixed income (other things equal, a depreciating currency reduces the pressure on a central bank to reduce interest rates), and bearish for commodities (depreciation of the currencies of commodity consumers means commodities, which are generally priced in USD, are effectively more expensive).

Monetary Policy: Monetary policy trends are captured using one-year changes in the front end of the yield curve. From 1992 onwards, I use two-year yields, while prior to 1992 I use Libor and its international equivalents. Both data series are from Bloomberg. Expansionary monetary policy is bullish for equities (see Bernanke and Kuttner (2005)), bullish for currencies (see Eichenbaum and Evans (1995)), bullish for commodities, and bearish for fixed income.

Risk Sentiment: Changes in risk sentiment are captured using one-year equity market excess returns. Data is from DataStream. Increasing risk sentiment — i.e., strong equity market returns — is bullish for equities, commodities, and currencies, and bearish for fixed income.

The model employs relatively simple measures as they afford long data availability and are less susceptible to concerns about data mining. The strategy is therefore intended as a proof of concept, and can potentially be enhanced by employing additional and improved measures of economic trends.

Backtest returns are hypothetical gross of transaction costs and fees. Even after adjusting for transaction costs and fees, backtest returns are likely overstated, despite best effort to employ simple and transparent signals, due to unavoidable hindsight bias. Hypothetical data has inherent limitations, some of which are disclosed herein.

As the backtest is constructed to take a long position in assets in which economic trends are improving and a short position in assets in which economic trends are deteriorating, the strategy would likely underperform in a period of sharp reversals across asset classes and investment themes or in an environment in which price trends and economic trends diverge. However, due in part to the diversification benefits of the four asset classes and four investment themes, the performance of the backtest has been consistent over a wide variety of macroeconomic and financial environments over the last 50 years.

Hypothetical Alternative Trend-Following Strategy

The Hypothetical Alternative Trend-Following Strategy was constructed with an equal-weighted combination of 1-month, 3-month, and 12-month trend-following strategies for markets across 6 major asset groups – equity factor portfolios, credit indices, interest rate swaps, emerging currencies, alternative commodities, and volatility futures – from January 1990 onward. Since not all markets have the same length of historic return data available, we construct the strategies using the largest number of assets for which return data exist at each point in time. We use futures returns when they are available. The strategy targets long-term volatility target of 10% but does not limit volatility during periods where realized volatility may be higher or lower than this number.

In order to calculate net-of-fee returns for the time series momentum strategy, we subtracted a 2% annual management fee and a 20% performance fee per annum from the gross-of-fee returns to the strategy. The performance fee is calculated and accrued on a monthly basis, but is subject to an annual high-water mark. In other words, a performance fee is subtracted from the gross returns in a given year only if the returns in the fund are large enough that the fund's NAV at the end of the year exceeds every previous end of year NAV. The transactions costs used in the strategy are based on AQR's proprietary estimates of transaction costs for each market traded, including market impact and commissions.

This model is not based on an actual portfolio AQR manages. The performance of the AQR Alternative Trends Strategy may be greater or less than the performance of the Alternative Trend-Following Strategy due to, among other things, differences in the investment strategy pursued by the AQR Alternative Trends Strategy and the number of holdings in and composition of the AQR Alternative Trends Strategy's portfolio.

The benchmark and relevant cash rate is assumed to be 3-month Treasury bills.

The Hypothetical Diversified Trend-Following Strategy ("Combined Trends") has a 40% allocation to the Hypothetical Price-Based Trend-Following Strategy, a 40% allocation to the Hypothetical Economic Trend-Following Strategy and a 20% allocation to the Hypothetical Alternative Trend-Following Strategy.

Broad-based securities indices are unmanaged and are not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index.

The SG Trend Index is designed to track the largest 10 (by AUM) CTAs and be representative of the managed futures trend-following space.

The MSCI World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets.

The Bloomberg Barclays Global Aggregate Bond Index is a market-weighted index of global government, government-related agencies, corporate and securitized fixed-income investments.

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