Alternative Thinking | Q3 2022

New Rules of Diversification

How to Prep Your Portfolio for a Different Kind of Recession Risk

Executive Summary

During the first half of 2022, global equity markets tumbled around 20% from their January peak, with losses on typical stock/bond portfolios almost as large, as bonds offered little refuge.[1] More worryingly, this downturn has a vintage, disco-era look and feel that may be unfamiliar to many younger investors: with inflation still high, there is little prospect of central banks riding to the market's rescue as they did in 2008 and in 2020.

In this article we assess the prospects for stock and bond markets after the H1 sell-off, consider the impact of macroeconomic risks on a range of investments, and explore the use of diversifying investments to fortify portfolios.

Diversification away from traditional assets would have paid off in H1 2022 – finally – after many years of tailwinds for stock/bond portfolios. After a small rebound in July, some equity bulls might suggest it's time to 'buy the dip.' While a further recovery is one possible scenario, our analysis suggests that as of summer 2022, the strategic and tactical case for diversification remained strong. Investors cannot expect to time their reallocations perfectly, and it's not too late to diversify. We set out the practical considerations for investors (still) minded to batten down the hatches.

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1 The MSCI World Index returned -20.5% in H1 2022, the Barclays Global Aggregate Bond Index Hedged returned -9.1%, and a 60/40 portfolio of the two returned -16.0%.

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About the Portfolio Solutions Group

The Portfolio Solutions Group provides thought leadership to the broader investment community and custom analyses to help AQR clients achieve better portfolio outcomes.

We thank Alfie Brixton, Pete Hecht and Thomas Maloney for their work on this paper. We also thank Jonathan Fader, Roberto Giuffrida, Antti Ilmanen and Dan Villalon for helpful comments.

Introduction

The first half of 2022 brought sustained losses for both stocks and bonds, an outcome not seen for more than 40 years. Near-term inflation forecasts were still being revised up, even as growth forecasts were steadily revised down.[2] Economists are divided on the appropriate policy response, and central banks face tougher choices than they have for decades.

Last year, we published suggestions on managing heightened inflation risks in the white paper *When Stock/Bond Diversification Fails*, and summarized broader concerns and possible remedies in *Time to Diversify – But Into What?*. Here we update our analysis and refine our suggestions in response to recent market developments, addressing four crucial questions.

1. Have return prospects improved for stocks and bonds after the 2022 sell-off, and is it too late now to crystallize losses with a view to further diversifying portfolios? We show that yield-based expected returns for stocks and bonds remain low, even after some cheapening of both asset classes.

2. Now that 'peak inflation' is much discussed, are macroeconomic headwinds easing? We argue the macroeconomic environment remains unfavorable for traditional portfolios, with heightened risks from continuing inflation uncertainty, growth headwinds and tightening monetary policy.

3. Investors have flocked to private assets in recent years, seeking higher returns and diversification. How do private assets' risks differ from public, and how can they be mitigated? We discuss the implications of 'slow beta' and how to diversify private asset tail risks.

4. How should investors seeking true diversifiers and risk mitigators navigate the complex world of liquid alternatives? We set out the key attributes to look for, address common concerns and discuss funding and implementation choices.

Still a World of Low Expected Returns, Still 'Payback Time'

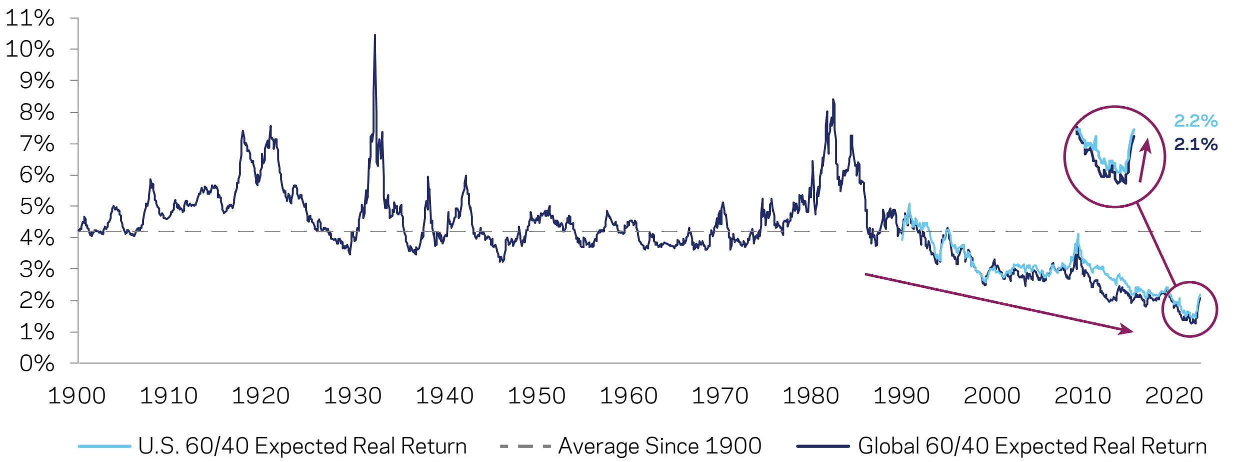
In his 2022 book *Investing Amid Low Expected Returns*, Antti Ilmanen suggests that a portion of the last few decades' stock and bond returns have been 'borrowed from the future' in the form of falling yields, i.e., rising valuations. Yields jumped in H1 2022, but those borrowed returns have not yet been fully paid back – not even close. **Exhibit 1** puts the recent yield rise into a (daunting) historical context. As of mid-year, traditional stock/bond portfolios were promising only around 2% real return over a 5- to 10-year horizon. Much more cheapening of stock and bond markets would be needed

2 In June 2022 the Federal Reserve projected 5.2% PCE inflation for 2022 (vs. 4.3% in March) and 1.7% real GDP growth (vs. 2.8% in March). The ECB's June 2022 forecasts were 6.8% for inflation (vs. 5.1% in March), and 2.8% for real GDP growth (vs. 3.7% in March).

for yield-based expected returns to regain historical average levels. Investors with real or total return objectives are (still) starting from a difficult place.

Exhibit 1: Expected Real Return of U.S. and Global Stock/Bond Portfolios

January 1, 1900 – June 30, 2022



Source: AQR, Bloomberg, Robert Shiller Data Library, Ibbotson Associates (Morningstar), Kozicki-Tinsley (2006), Federal Reserve Bank of Philadelphia, Blue Chip Economic Indicators, Consensus Economics. U.S. 60/40 portfolio is 60% U.S. equities (S&P 500), 40% long-dated Treasuries. Global 60/40 is 60% cap-weighted developed equities and 40% GDP-weighted 10-year government bonds. Real equity yield is simple average of two measures: (0.5 * Shiller E/P * 1.075) + 1.5% and Dividend/Price + 1.5%. 1.5% term is assumed long term real earnings per share growth. 0.5 multiplier reflects long-term payout ratio; 1.075 multiplier accounts for EPS growth during 10-year earnings window. Real bond yield is yield minus long-term expected inflation.

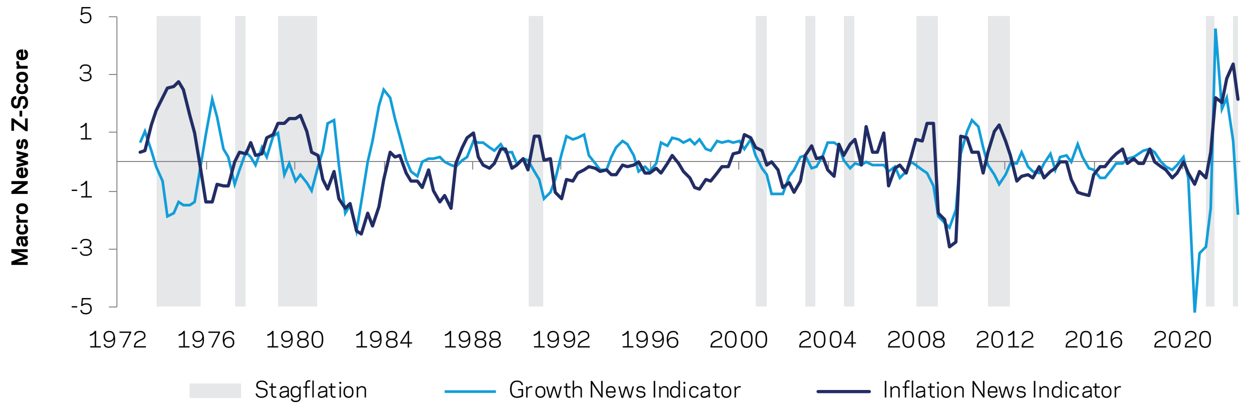
Inflation, Low Growth, Fed Hiking – or All Three?

Inflation expectations increased dramatically over the 18 months from late 2020 to early 2022. In Q2 2022 there were signs of stabilization and even some correction in medium-term expectations, but real rates soared as markets began to appreciate the full implications for monetary policy, and growth forecasts were revised down. Both equities and bonds continued to suffer. Even if the level of inflation has passed or is nearing its peak in many countries, there is still a risk of upside surprises if it fails to come down as quickly as the market and central banks currently expect. After a long sequence of upward forecast revisions, there may be more adjustments to come. Anchoring biases have tended to prolong the market impact of macroeconomic shocks, as their full consequences are only gradually appreciated and 'priced in' by investors.

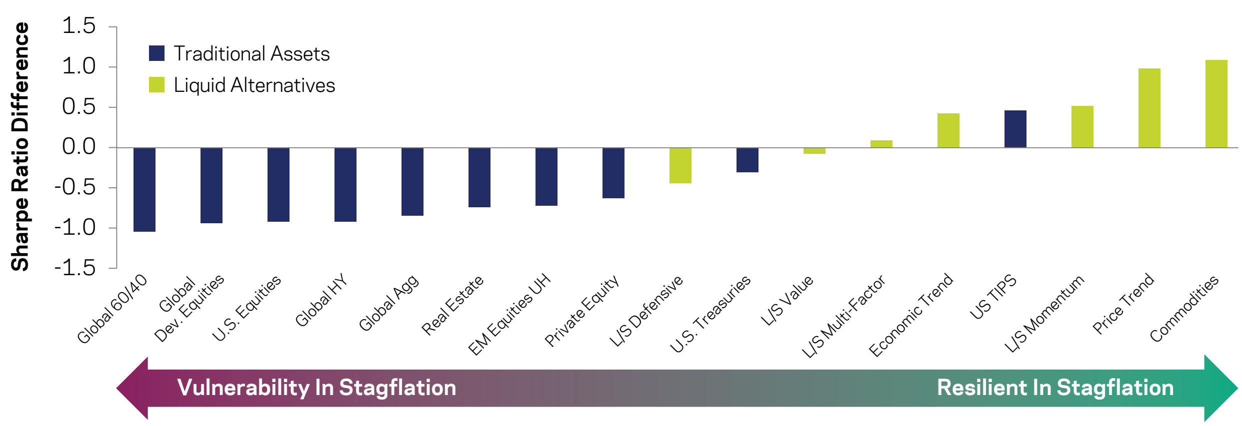
Exhibit 2 illustrates the historical sensitivities of asset classes and strategies to U.S. stagflation scenarios. These are defined as 12-month periods over which our inflation news indicator is positive and our growth news indicator negative, as shown in Panel A. The bars in Panel B show the difference in average performance in stagflation and non-stagflation regimes, ordered from left to right. Traditional assets are in blue – all except TIPS tended to underperform. Liquid alternatives, in green, have shown more resilience, with trend and momentum-related strategies and commodities even outperforming.

Exhibit 2: Impact of Stagflation on Investment Performance

Panel A. U.S. Growth and Inflation Indicators and a Stagflation Regime Indicator, January 1972 – June 2022



Panel B. Hypothetical Relative Performance During U.S. Stagflation Periods, January 1972 – June 2022



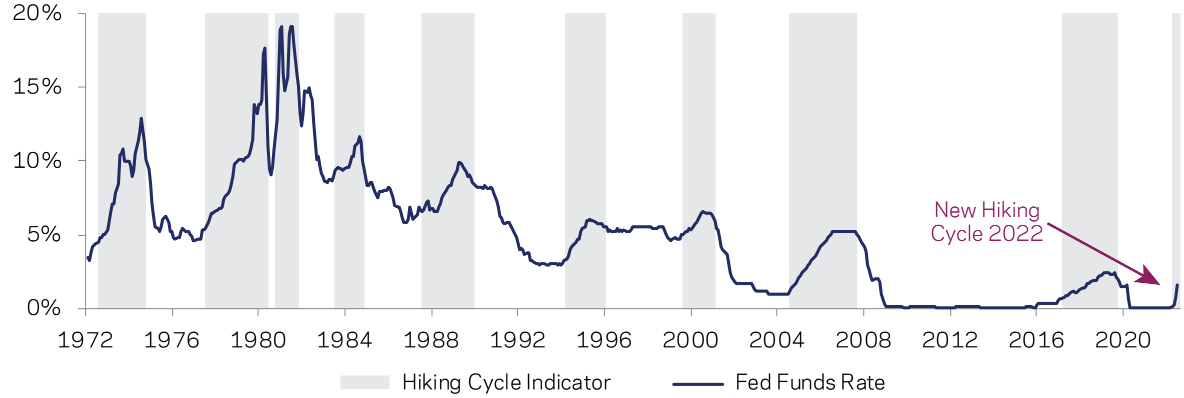
Sources: AQR, Federal Reserve, Bloomberg. Stagflation is defined as 12-month period for which growth news z-score < -0.2 and inflation news z-score > +0.2. Based on 12-month returns at quarterly frequency. Risk-free rate is 3-month T-Bills. See Appendix for details of macro news data, asset class proxies and hypothetical strategies. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the Appendix.

Of course, future macroeconomic shocks are difficult to predict. At the very least, it seems likely that we have entered a cycle of global policy tightening that – like previous hiking cycles – may be around for a while (though there is much debate regarding its likely duration and potential terminal rates in different markets). Worryingly for investors, most traditional assets have, on average, dramatically underperformed during previous Fed hiking periods, which are highlighted using a rules-based regime indicator in **Exhibit 3**, Panel A.

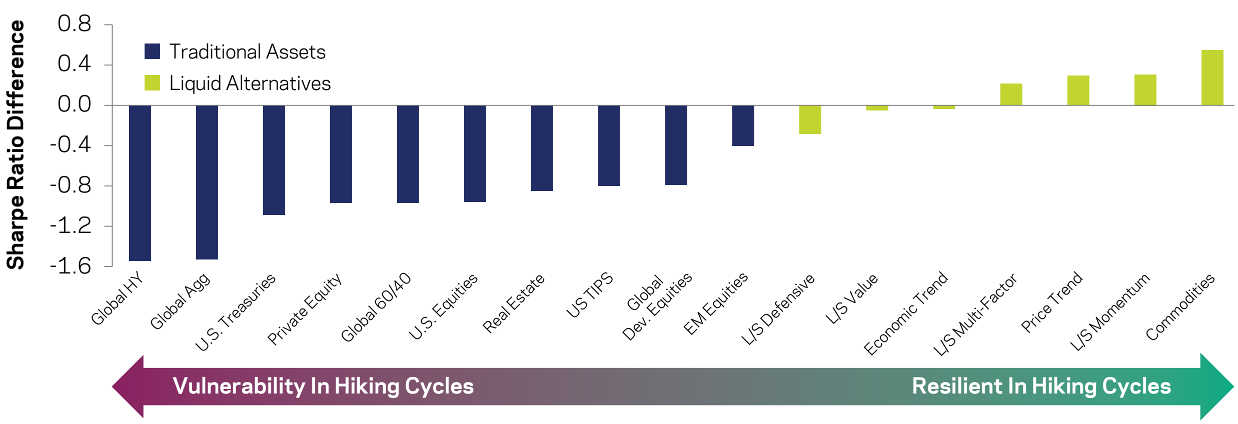
Panel B shows the difference in average performance in the two regimes as before, with traditional assets in blue, and liquid alternatives in green. As with stagflation, the hiking underperformers include equities, bonds, and most portfolios. Commodities and trend have outperformed, while equity style factors have mild exposures on average. These patterns cannot be fully relied on in the future, as there is plenty of variation across different hiking episodes, but they do illustrate the benefit of adding strategies that hedge traditional market exposures – like long/short liquid alternatives – or of holding assets with very different macroeconomic sensitivities, such as commodities.

Exhibit 3: Impact of Monetary Policy Cycles on Investment Performance

Panel A. Fed Funds Rate and a Regime Indicator Based on Fed Hiking Cycles, January 1972 – June 2022



Panel B. Hypothetical Relative Performance During Hiking and Non-Hiking Periods, January 1972 – June 2022



Sources: AQR, Federal Reserve, Bloomberg. Hiking Cycle Indicator is triggered when current Fed Funds and T-Bill rates over- or undershoot their 12-month averages by a given margin (full methodology in appendix). Based on monthly returns. Risk-free rate is 3-month T-Bills. See appendix for details of asset class proxies and hypothetical strategies. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the Appendix.

To add to investors' woes, bond allocations have tended to be less diversifying to stocks when inflation uncertainty is heightened, and during tightening monetary policy.[3] We do not advocate aggressive deallocation from bonds, which could still offer valuable protection in some of the worst recession scenarios. But prevailing macroeconomic conditions suggest investors may have to look to their alternatives allocation if they want to maintain diversification and manage risk, and to provide refuge from portfolio losses. This leads us to the topic of private assets.

3 For further discussion and analysis, see AQR Alternative Thinking Q2 2022, *The Stock/Bond Correlation: Drivers and Implications*.

Diversify Those Diversifiers (Private Assets, We're Looking at You)

Investors have flocked to private assets over the past decade,[4] for a variety of reasons. Chief among these is an expectation of higher returns from these strategies: some investors are confident they can identify top-quartile managers delivering alpha through operational transformation, others value the access to embedded leverage, and many expect an illiquidity premium for locking away their money. Additional perceived benefits include the stable cash flows from real estate and infrastructure, and, importantly, the cushioning effect of investments that are infrequently marked to market. Two of the expectations are probably offsetting – demand for return smoothing offsets any fair illiquidity premium. But investors have voted with their wallets in favor of private assets.

Private assets may indeed help to cushion portfolio gyrations in a period of heightened uncertainty. But many of the headwinds faced by public assets apply also to their private counterparts. Valuations are more difficult to measure but are likely high, depressing expected returns. And macroeconomic factors such as inflation uncertainty and monetary policy tightening are likely to take their toll on private assets' returns eventually, even if it comes later than the impact on liquid public markets. One key tail risk for private assets is a *sustained period of low growth and poor market performance*, where smoothing does not help and underlying economic exposures ('slow beta') materialize. Such episodes have been rare in recent history (even the Financial Crisis was followed by a strong market recovery in 2009, partly driven by monetary stimulus – a pattern repeated at smaller scale and faster pace in 2020).

For investors with substantial allocations to private assets, the most valuable diversifier is a strategy expected to outperform specifically during these prolonged bear market scenarios. Historically, trend following strategies have exhibited this pattern, as shown in **Exhibit 4**. *Price trend* strategies go long or short assets based on recent performance, while *economic trend* strategies exploit assets' tendency to underreact to fundamental drivers such as growth news, inflation and monetary policy.[5] Both strategies consistently delivered positive returns when private equity suffered, and the intuition is clear. These are dynamic strategies that are not always positioned correctly if a sudden crash occurs – they are imperfect tail hedges. But during prolonged episodes – typically most harmful to private assets – they have been able to position defensively and deliver positive returns as trends play out.[6] Defensive equity strategies also outperformed during these prolonged drawdown episodes, while other equity factors like value and momentum show mixed results consistent with low long-term correlations.

4 The 2021 Blackrock Global Institutional Rebalancing Survey identified investor intentions to increase allocations to private equity and real estate, while deallocating from traditional assets and hedge funds, in line with previous years' surveys.
5 For more details on economic trend, also called macro momentum, see Brooks (2017).
6 There are also benefits to diversifying across trend strategies, since economic trends can often be identified before market trends emerge. For example, in Q3 2008, economic trend was already positioned for an equity market sell-off and so delivered positive returns, whereas price trend 'caught up' in Q4 of that year.

Exhibit 4: Hypothetical Performance in Ten Worst Quarters for Private Equity, 1986-2021

	Private Equity	Price Trend	Economic Trend	Global Defensive vs. Market	Global L/S Value	Global L/S Momentum
4Q 2008	-18.1%	20.3%	9.2%	9.3%	-0.4%	-1.9%
1Q 2020	-10.3%	5.4%	4.3%	5.7%	-13.2%	5.4%
3Q 2008	-9.6%	-1.6%	7.8%	10.5%	5.1%	-9.1%
1Q 2001	-6.7%	5.8%	1.5%	2.9%	12.2%	-4.0%
3Q 2001	-5.9%	6.6%	10.4%	8.6%	2.1%	3.9%
3Q 2011	-5.7%	7.6%	5.0%	12.2%	-2.4%	-0.4%
1Q 2009	-4.9%	-0.4%	-0.6%	0.2%	2.9%	-1.9%
3Q 2002	-4.1%	11.2%	5.4%	7.1%	-0.5%	5.8%
3Q 1998	-3.6%	8.0%	8.0%	6.0%	-2.5%	3.5%
4Q 2000	-2.7%	9.2%	3.3%	9.3%	8.8%	-3.2%
Average	**-7.1%**	**7.2%**	**5.4%**	**7.2%**	**1.2%**	**-0.2%**

Risk Mitigators: Price Trend, Economic Trend, Global Defensive vs. Market

Diversifiers: Global L/S Value, Global L/S Momentum

Sources: AQR, Cambridge Associates. Private equity is a 70/30 combination of the Cambridge Associates U.S. Private Equity Index and the Cambridge Associates Global Ex-U.S. Developed Markets Private Equity Index. Price Trend, Economic Trend, Global Defensive, Global L/S Value and Global L/S Momentum are hypothetical strategies as described in the appendix. Value and Momentum strategies are scaled to 7% volatility. Hypothetical data has inherent limitations, some of which are disclosed in the appendix.

Liquid Alternatives – What to Look for (And What to Avoid)

Here we take 'liquid alternatives' to mean any allocation with the potential to deliver returns lowly correlated to stock and bond markets, using liquid assets. This broad category mainly comprises active strategies that use financial tools such as shorting and leverage to hedge market exposures and amplify diversifying sources of risk and return. It also includes commodities, which have delivered low long-term correlations to stocks and bonds thanks to their very different macroeconomic exposures.

Facing up to the challenges: Many investors are cautious about liquid alternatives. Some cite the 'negative sum game' of active management; others point to so-called diversifying strategies that suffered losses at unhelpful times; yet others are put off by complexity and fees in the liquid alts space. These are all reasonable concerns. However, they must be balanced against challenges elsewhere in the portfolio, and for many investors the formidable headwinds for traditional assets – low expected returns and heightened macro risks – may tip the balance in favor of a liquid alts allocation.

Skepticism towards active management can be addressed by focusing on strategies with strong evidence of a long-term premium, supported by economic intuition for why it is likely to persist. This can also help address transparency and complexity concerns. Investors should accept that a range of imperfect diversifiers is better than none at all. For example, a value tilt was not helpful in early 2020 – in fact, it made losses worse – but during the long bear market that followed the Dotcom Bubble it was extremely valuable, as it has been during the 2022 sell-off. Similarly, an allocation to commodities didn't help in the Financial Crisis but was a strong diversifier during 1970s stagflation, and made sizable gains during the recent inflation shock.

Which strategies? In the late 2021 paper *Time to Diversify*, we singled out long/short value and trend-following as looking particularly attractive in the prevailing environment. Both went on to perform strongly in H1 2022, and both still looked attractive at mid-year: value spreads remained wide,[7] and macroeconomic turmoil continued to favor trend and macro strategies. There are also more strategic considerations when selecting strategies: long/short equity and arbitrage strategies may help with expected return challenges; trend and macro are best-suited to tail risk mitigation (while also earning positive returns over the long term, unlike option-based tail hedges[8]); alternative risk premia can provide broad diversification; and commodities[9] can help to offset inflation exposure in stock-bond portfolios.

Evaluation: In **Exhibit 5** we summarize key questions investors should ask of any candidate liquid alternative investment. Those selecting strategies with the highest past returns – without sufficient regard for diversifying capabilities – may be disappointed

7 As of June 30, 2022, AQR's measure of the global value spread was at the 97th percentile compared to its history. See appendix for details. Also see Cliff's Perspective blog, *Still Crazy After All This YTD*, May 2022.
8 See Ilmanen, Thapar, Tummala and Villalon (2021) for a comparison of put-buying and trend strategies.
9 For discussion of best practices in commodities investing, see Ooi, Maloney and Brixton (2022).

in tough market environments. Any tendency to bundle diversifying returns with passive market beta will flatter past performance during the bull market, while reducing prospective benefits.

Exhibit 5: Questions to Ask of Diversifying Strategies

L/S Equity and Arbitrage	Multi-Strategy / Alt. Risk Premia	Trend & Macro Strategies	Commodities
Beta: Has it delivered the expected amount?	**Market Neutrality:** Has it delivered diversifying returns over long term?	**Tail Risk Mitigation:** Has it delivered returns when most needed?	**Risk Balance:** Does it take full advantage of low correlations across sectors, and avoid large positions in single commodities?
Alpha: Has it delivered long-term? Is active risk complementary to existing exposures?	**Capital Efficiency:** 'Is it managed with enough active risk to deliver 'bang for the buck'?	**Innovation:** Do 'bells and whistles' dilute or enhance tail hedging?	**Active:** Can it adjust commodity mix and avoid passive roll headwinds?
Style Trends: Is the track record skewed by the late 2010s growth bubble?	**Style Exposures:** Is it positioned to benefit from opportunities?	**Complementarity:** Evaluate alpha to existing portfolio, not just standalone performance	

Source: AQR. For illustrative purposes.

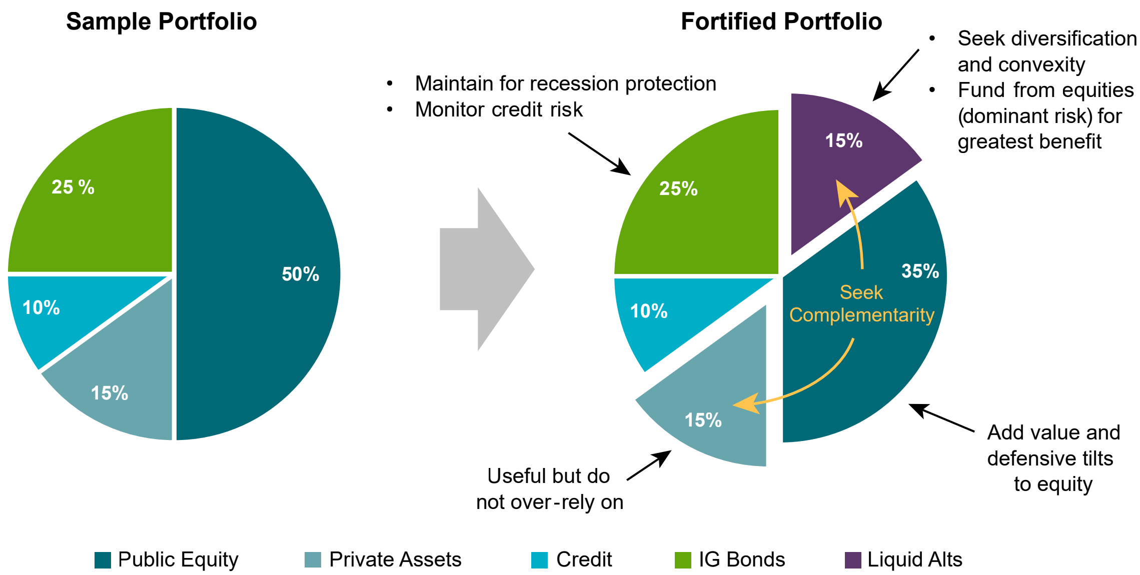
Funding choices and implementation: For the greatest benefit to portfolio diversification, investors should fund from dominant risk allocations such as public equity. This has been unpalatable for some investors in the past due to equities' perceived higher expected return. In the current environment, the expected return balance may have shifted. A higher risk, higher expected return option is to fund partly or fully from bonds. Another option popular with some institutions is to add unfunded exposure via swap arrangements with managers or banks. Finally, liquid alternatives may be attached to synthetic market exposure in a portable alpha structure, for investors who wish to allocate to new sources of return while maintaining portfolio market exposure.

Regarding implementation, some investors will want to focus on a specific single strategy to complement existing exposures. Others will prefer a flexible building-block approach, while still others may benefit from an integrated, multi-strategy approach to reduce 'line-item risk' and make the allocation easier to hold for the long term. As Antti Ilmanen stresses in *Investing Amid Low Expected Returns*, diversification requires patience, and this is a formidable challenge for many investors especially when it comes to less conventional strategies.

A Fortification Case Study

In this final section, we illustrate simple steps to prepare for the risk of a sustained unfavorable environment for traditional assets. **Exhibit 6** shows on the left a sample risk-seeking portfolio with allocations to public equity, investment grade and high-yield bonds, and private assets, and on the right a 'fortified portfolio' with a new allocation to diversifying liquid alternatives funded from public equity. In this example, we have modelled the liquid alts allocation as a blend of three components: alternative risk premia to deliver long-term uncorrelated returns, trend following to mitigate tail risks and complement the private assets, and commodities to offset the disinflationary bias in the rest of the portfolio. All three delivered positive returns in H1 2022. The fortified portfolio also applies factor tilts to the remaining equity allocation – a value tilt to take advantage of wide spreads and boost expected returns, and a defensive tilt to reduce risk.

Exhibit 6: A Fortification Case Study



Source: AQR. For illustrative purposes.

According to a set of assumptions listed in the appendix, these reallocations could maintain expected returns while substantially reducing portfolio risk and the likely scale of losses in a prolonged bear market. Specifically, our assumptions imply a slight increase in expected excess return from 2.6% to 2.8%, with a reduction in volatility of about a quarter from 11.3% to 8.3%. Alternatively, investors with higher risk tolerance could fund the liquid alts allocation partly or fully from fixed income for higher expected returns and risk (3.2% and 9.8% respectively, with our assumptions). These reallocations are also likely to reduce the portfolio's sensitivity to macroeconomic risks such as monetary policy tightening and stagflation – although to really transform macro exposures, a larger reallocation would be needed.

Existing allocations, investment objectives, constraints and beliefs all differ widely across investors, and the exact prescription for each will vary accordingly. Some investors may be more aggressive with their portfolio tilts, some less so. The diversifying allocation should be designed to complement existing exposures, including to private assets. But investors should not seek perfection – the most important thing is to take decisive steps towards investments that are exposed to fundamentally different risks from the dominant risks in the portfolio. Call it strategic or call it tactical: just diversify.

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Appendix

Assumptions for Case Study

Typically, our unconditional Sharpe ratio assumption for global equities and global fixed income is 0.3, based on very long-term historical data. Here we assume a lower figure of 0.2 for both asset classes to reflect unfavorable macroeconomic conditions.[10] We assume private equity earns 1% higher return than public, with proportionally higher risk. We assume value and defensive equity tilts deliver higher risk-adjusted returns (Sharpe ratio 0.3) with beta 0.8. Finally, we model a liquid alts allocation as 40% trend following, 40% alternative risk premia and 20% to a diversified basket of commodities. Conservative assumptions for these components imply a combined Sharpe ratio of 0.4 at about 8% volatility.[11]

Assumptions for Asset Classes

	Excess Return	Volatility	Sharpe Ratio	Sample Portfolio	Fortified Portfolio	Notes
Public Equity	3.0%	15.0%	0.20	50%	0%	Assumption reflects macro headwinds
Tilted Equity	3.6%	12.0%	0.30	0%	35%	Value and defensive tilts
Private Assets	4.0%	20.0%	0.20	15%	15%	Assumption reflects macro headwinds
Credit	2.0%	10.0%	0.20	10%	10%	Assumption reflects macro headwinds
IG Bonds	1.0%	5.0%	0.20	25%	25%	Assumption reflects macro headwinds
Liquid Alts	3.2%	8.0%	0.40	0%	15%	See separate tables below
			Excess Return	**2.6%**	**2.8%**	
			Volatility	**11.3%**	**8.3%**	
			Sharpe Ratio	**0.23**	**0.34**	

Correlations	Public Equity	Tilted Equity	Private Assets	Credit	IG Bonds
Tilted Equity	1.0				
Private Assets	0.9	0.9			
Credit	0.6	0.6	0.6		
IG Bonds	0.2	0.2	0.2	0.4	
Liquid Alts	0.1	0.1	0.1	0.1	0.1

10 This is still considerably higher than either asset class has delivered on average during Fed hiking periods or stagflation episodes, reflecting high uncertainty around macroeconomic outcomes.
11 Note that these assumptions are net of any fees which are more significant for active strategies and particularly private assets.

Assumptions for Liquid Alternatives Sub-Strategies

	Excess Return	Volatility	Sharpe Ratio	Liquid Alts
Trend	2.5%	10.0%	0.25	40%
Alt Risk Premia	3.5%	10.0%	0.35	40%
Commodities	3.8%	15.0%	0.25	20%
			Excess Return	**3.2%**
			Volatility	**7.9%**
			Sharpe Ratio	**0.40**

Correlations	Trend	ARP
Alt Risk Premia	0.3	
Commodities	0.3	0.2

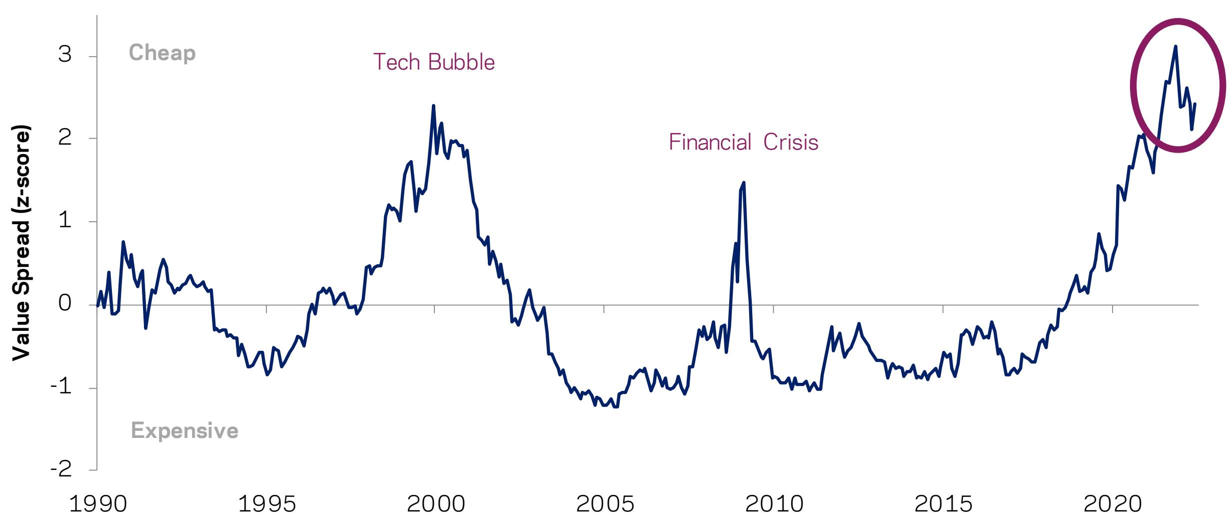
Methodology for Macroeconomic Regime Indicators

Growth and Inflation News Indicators: Each metric is an equal-weighted combination of 12-month changes and 12-month surprises. Changes are calculated as simple difference between year-on-year inflation or growth and year-on-year inflation or growth 12 months earlier. Surprises are calculated as simple difference between year-on-year inflation or growth and 1-year forecast 12 months earlier. Based on 12-month returns at quarterly frequency.

Hiking Cycle Indicator: The indicator combines two inputs for robustness, signaling a hiking cycle when there is a large increase in the 3-month T-Bill rate, or a smaller increase combined with an increase in the Fed Funds Rate. Specifically, a new hiking cycle is triggered when the following conditions are met: 3-month T-Bill rate exceeds prior 12-month average by 0.4% AND Fed Funds Rate is higher than prior 12-month average, OR 3-month T-Bill rate exceeds prior 12-month average by 0.8%. The hiking cycle then continues until the following opposite conditions are met to trigger its end: 3-month T-Bill rate is less than prior 12-month average by 0.4% AND Fed Funds Rate is lower than prior 12-month average OR 3-month T-Bill rate is less than prior 12-month average by 0.8%.

Value Spread for Hypothetical Global Value Portfolio

January 1, 1990 – June 30, 2022



Source: AQR. Hypothetical value composite includes four value measures: book-to-price, earnings-to-price, forecast earnings-to-price, and sales-to-enterprise value; spreads are measured based on ratios. Spreads are constructed to be industry-neutral by comparing value measures within each industry, then aggregating to represent an entire portfolio. Universe is 70% developed large cap, 30% emerging large cap.

Asset Class Proxies for Sensitivity Analyses

Investment	Proxy	Source
U.S. Equities	MSCI U.S. Net TR Index	Bloomberg
Global Developed Equities	MSCI World Net TR Unhedged Index	Bloomberg
Emerging Equities	From 1988, MSCI Emerging Markets Net TR Index. Before 1988, MSCI EAFE Net TR Index.	
U.S. Treasuries	10-year U.S. Treasury	GFD
Global IG Bonds	From 1990, Bloomberg Barclays Global Agg Bond Hedged. Before 1990, AQR global bond series.	Bloomberg, AQR
Global HY Bonds	From 1990, Bloomberg Barclays Global High Yield. Before 1990, Bloomberg Barclays U.S. High Yield and Corporate Bond indices.	Bloomberg
U.S. TIPS	From 1997, U.S. 10-year TIPS. Before 1997, synthetic returns based on nominal Treasury yields and survey-based expected inflation.	
Private Equity	50% Russell 2000 x 1.2, 50% Cambridge U.S. Buyout index	
Real Estate	50% FTSE Nareit All REITs Index (listed), 50% NCREIF Property Index (unlisted)	Bloomberg
Global 60/40	60% Global Equities, 40% Global IG Bonds as defined above	Bloomberg, AQR
Commodities	Bloomberg Commodity Index	Bloomberg
Long/Short Equity Style Factors	Value is U.S. HML Devil factor based on B/P (Asness and Frazzini, 2013). Momentum is U.S. 'Up Minus Down' factor based on 12M return excluding most recent month. Defensive is 50% U.S. 'Betting Against Beta' factor (Frazzini and Pedersen, 2014) and 50% U.S. 'Quality Minus Junk' factor (Asness, Frazzini and Pedersen, 2014). All factors are cap-weighted long the 1/3 best stocks and short the 1/3 worst stocks following the methodology of Fama and French (1993), rebalanced annually every January. All factors except Low Beta are dollar long and short. For Low Beta the long side is levered to make the portfolio ex-ante beta-neutral as described in Frazzini and Pedersen (2014). Multi-factor Portfolio is equal-weighted combination of Value, Momentum and Defensive.	AQR Data Library
Long-Only Defensive	Hypothetical strategy that aims to earn a long term rate of return comparable to that of a cap-weighted benchmark while maintaining lower risk, by holding low risk, high quality securities. The universe is the MSCI World Index and the rebalancing frequency is quarterly.	AQR
Price Trend	Hypothetical trend following strategy as described in A Century of Evidence on Trend-Following Investing by Hurst, Ooi and Pedersen (2017). The strategy goes 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. Returns are net of estimated transaction costs and 2 & 20 fees.	AQR
Economic Trend	Hypothetical long/short and directional strategies applied to 15 equity indices, 9 government bond markets, and 9 currencies, with signals based on the following macro momentum themes as described in *A Half Century of Macro Momentum* by Brooks (2017): Business Cycle, International Trade, Monetary Policy, Risk Sentiment. The strategy goes long assets for which fundamental momentum is favorable and short assets for which it is unfavorable. Returns are net of estimated transaction costs and 2 & 20 fees.	AQR

Note: All asset class proxies, 60/40, long-short style factors and defensive equity are presented gross of transaction costs and fees.

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The **S&P 500 Index** is the Standard & Poor's composite index of 500 stocks, a widely recognized, unmanaged index of common stock prices.

The **MSCI Emerging Markets Index** is a free float-adjusted market capitalization index that is designed to measure equity market performance of emerging markets.

The **MSCI U.S. Index** is a free float-adjusted market capitalization index that is designed to measure the performance large and mid cap equities in the United States.

The **Bloomberg Barclays Global Aggregate Index** is an unmanaged index that is comprised of several other Bloomberg Barclays indexes that measure fixed income performance of regions around the world.

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The **Cambridge Associates Private Equity U.S. Buyout Index** is a pooled horizon internal rate of return (IRR)-based index compiled from the Cambridge Associates database of U.S. private equity buyout funds.

The **Cambridge Associates U.S. Private Equity Index** and the **Cambridge Associates Global Ex-U.S. Developed Markets Private Equity Index** are from the Cambridge Associates LLC Database.

The **Russell 2000 Index** is a market capitalization weighted index representing the 2,000 smallest companies in the Russell 3000 Index.

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