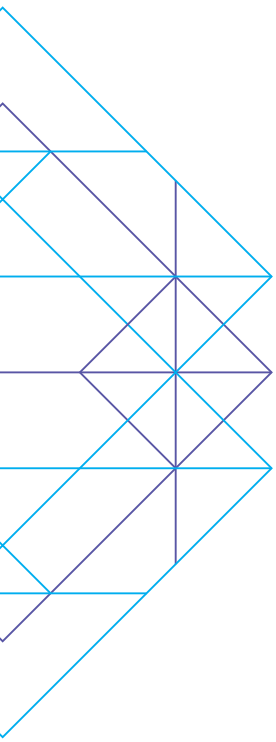


Alternative Thinking | Q1 2023

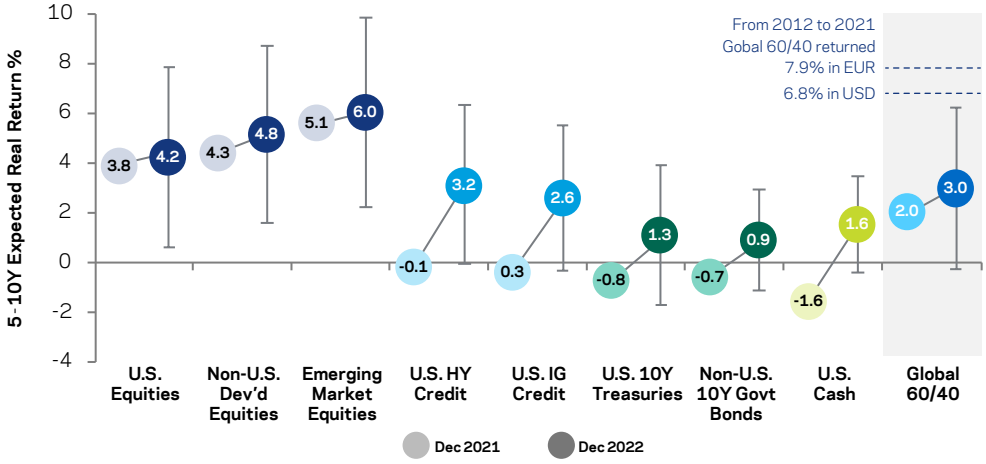
Capital Market Assumptions for Major Asset Classes

Executive Summary

This article updates our estimates of medium-term (5- to 10-year) expected returns for major asset classes. Selected estimates are summarized in **Exhibit 1**. In 2022 expected returns moved slightly higher for equities, and sharply higher for bonds and cash. The expected real return of a 60/40 portfolio increased to 3%, near its decade high but still well below the long-term average of nearly 5% (since 1900[1]), and even further below realized returns of the previous decade.

The article also includes two focus topics: one highlighting the case for emerging market equities, and the other assessing the impact of large interest rate rises on various risk premia—some of which appear compressed at the start of 2023.

Exhibit 1: Medium-Term Expected Real Returns for Liquid Asset Classes



Source: AQR; see Exhibits 3-5 for details. Estimates as of December 31, 2022. "Non-U.S. developed equities" is cap-weighted average of Euro-5, Japan, U.K., Australia, Canada. "Non-U.S. 10Y govt. bonds" is GDP-weighted average of Germany, Japan, U.K., Australia, Canada. Error bars cover 50% confidence range, based on historical analysis (see Appendix for details) and adjusted for current expected volatilities. These are intended to emphasize the uncertainty around any point estimates. Realized returns are for January 1, 2012 to December 31, 2021, based on 60% MSCI World and 40% Bloomberg Barclays Global Treasury Index. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

1 Historical comparison is based on a simpler methodology than main estimates, due to data availability; methodology described in Appendix.

PSG
Portfolio Solutions Group

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About the Portfolio Solutions Group

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

We thank Alfie Brixton, Thomas Maloney and Nick McQuinn for their work on this paper. We also thank Pete Hecht and Antti Ilmanen for helpful comments.

Introduction and Framework

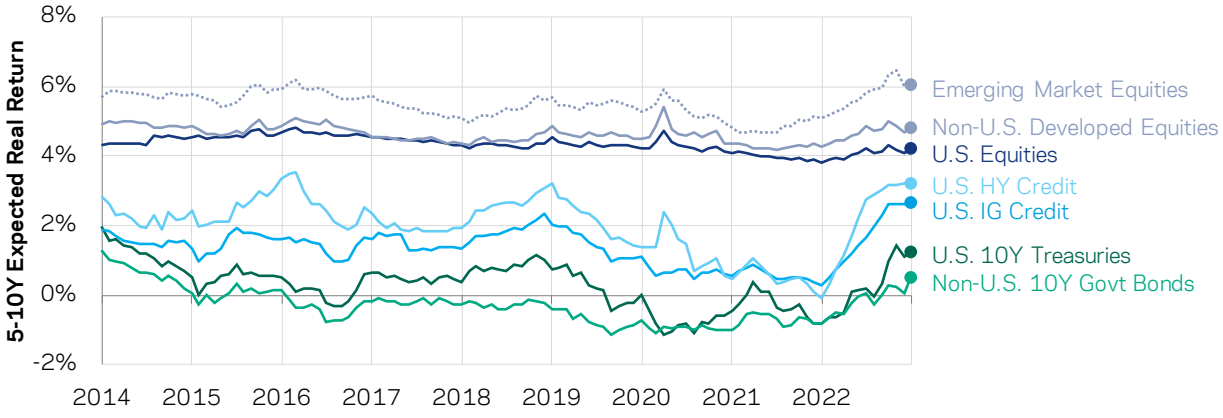
For the past nine years we have published our capital market assumptions for major asset classes, with a focus on medium-term expected returns (see 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022). Each year, in addition to the updated estimates, we provide additional analysis or other new material. This year's article includes a discussion of the strategic case for emerging markets and an assessment of the impact of large rises in interest rates on various risk premia.

As usual, we present local real (inflation-adjusted) annual compound rates of return[2] for a horizon of 5 to 10 years. Over such intermediate horizons, starting valuations tend to be useful inputs. For multi-decade forecast horizons their impact is diluted, so theory and long-term historical averages may matter more in judging expected returns. At shorter horizons, returns are largely unpredictable and any predictability has tended to mainly reflect momentum and the macro environment.

Our estimates are intended to assist investors with setting medium-term expectations. They are highly uncertain, and not intended for market timing. The frameworks we present may be more informative than the numbers themselves. As one cautionary example, the error ranges shown in **Exhibit 1**, based on historical analysis, suggest there is a 50% chance that realized equity market returns over the next 10 years will under- or overshoot our estimates by more than 3% *per annum*.

Expected returns for stocks and (especially) bonds rose in 2022 from all-time lows in 2021. Generally, they rebounded to around the levels of the early 2010s, when we started publishing our CMAs (see **Exhibit 2**). Changes in expected premia over risk-free returns (which also increased sharply) have been more mixed, as we discuss later in this article.[3]

Exhibit 2: Expected Real Returns for Liquid Asset Classes
December 2013 to December 2022



Source: AQR; see Exhibits 3-5 for details. "Non-U.S. developed equities" is cap-weighted average of Euro-5, Japan, U.K., Australia, Canada. "Non-U.S. 10Y govt. bonds" is GDP-weighted average of Germany, Japan, U.K., Australia, Canada. Estimates are based on current methodologies, are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

2 For a discussion of expected arithmetic (or simple) vs. geometric (or logarithmic, or compound) rates of return, see the 2018 edition.
3 We calculate the excess-of-cash return by subtracting an estimate of real cash return; this is effectively the return accessed by hedged investors irrespective of their base currency (ignoring cross currency basis). Unhedged USD estimates are shown in the Appendix; other currencies available on request.

Equity Markets

Our starting point for equities is the dividend discount model, under which expected real return is approximately the sum of dividend yield (DY), expected trend growth (g) in real dividends or earnings per share (EPS), and expected change in valuation (Δv), that is: E(r) ≈ DY+g+Δv. We take the average of two approaches,[4] described below. We assume no mean reversion in valuations.[5]

1. Earnings-based: We start from the inverse of the CAPE ratio (cyclically-adjusted P/E), which is 10-year average inflation-adjusted earnings divided by today's price. We multiply by 0.5 (roughly the U.S. long-run dividend payout ratio), and add real earnings growth of 1.5% (roughly the U.S. long-run average). So earnings-based expected return[6] is: $E(r) \approx 0.5^{*}$ *Adjusted Shiller E/P* $+ g_{EPS}$

2. Payout-based: We estimate net total payout yield (NTY) as the sum of current dividend yield and smoothed net buyback yield (NBY). To this we add an estimate of long-term real growth of aggregate payouts that includes net issuance. This growth estimate, g_{TPagg}, is an average of smoothed historical aggregate earnings growth and forecast GDP growth. So our payout-based expected return is: $E(r) \approx NTY + g_{TPagg}$, *where* $NTY = DY + NBY$

All estimates increased in 2022 (see **Exhibit 3**), due to cheapening which was partly offset by lower growth forecasts.[7] Emerging markets saw the biggest rise (see special topic).

Exhibit 3: Expected Local Returns for Equities

December 2022

	1. Earnings-Based		2. Payout-Based				Combined		Excess-of-Cash Return
	Adjusted Shiller EP	0.5 * EP + g_{EPS}	Dividend Yield	NBY	g_{TPagg}	DY+NBY + g_{TPagg}	Real Return	*1yr Change*	
U.S.	4.0%	3.5%	1.7%	0.7%	2.5%	4.9%	**4.2%**	*+0.4%*	**2.7%**
Eurozone	5.1%	4.1%	3.3%	-0.2%	2.3%	5.3%	**4.7%**	*+0.8%*	**4.8%**
Japan	5.5%	4.3%	2.6%	0.2%	2.1%	5.0%	**4.6%**	*+0.4%*	**5.4%**
U.K.	6.0%	4.5%	3.8%	-0.5%	2.1%	5.4%	**5.0%**	*+0.1%*	**4.2%**
Australia	5.1%	4.1%	5.0%	-1.0%	2.5%	6.5%	**5.3%**	*+0.4%*	**4.2%**
Canada	5.1%	4.0%	3.3%	-0.8%	2.5%	5.0%	**4.5%**	*+0.5%*	**3.2%**
Global Dev.	4.4%	3.7%	2.1%	0.4%	2.4%	4.9%	**4.3%**	*+0.4%*	**3.2%**
Global Dev. ex U.S.	5.4%	4.2%	3.4%	-0.2%	2.3%	5.4%	**4.8%**	*+0.5%*	**4.6%**
Emerging Markets	8.1%	6.0%	3.4%	--	2.6%	6.0%	**6.0%**	*+0.9%*	**4.4%**

Source: AQR, Consensus Economics and Bloomberg. Estimates and methodology subject to change and based on data as of December 31, 2022. See main text above for methodology. For earnings yield, U.S. is based on S&P 500; U.K. on FTSE 100 Index; Eurozone is a cap-weighted average of large-cap indices in Germany, France, Italy, Netherlands and Spain; Japan is Topix Index; and "Emerging Markets" is MSCI Emerging Markets Index. For payout-based estimates, all countries are based on corresponding MSCI indices. "Global Developed" is a cap-weighted average. For emerging markets, payout-based estimate is dividend yield + forecast GDP per capita growth. Excess-of-cash return is calculated by subtracting real cash return estimates described later in the article. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

4 See the 2017 edition and its online appendix for details and discussion of the methodology.

5 See the 2015 edition for a discussion of mean reversion in stock and bond valuations, and our decision to exclude it. Our analysis suggests the timing of any mean reversion is difficult to forecast, and there are plausible arguments for yields remaining below historical levels.

6 For our earnings-based estimate, we apply a 50% payout ratio to all countries, and use g = 1.5% for all countries except for emerging markets, where we use g = 2%. *Adjusted Shiller EP* is Shiller EP * 1.075 where the scalar accounts for average earnings growth during the 10-year earnings window.

7 This year we adjusted our (10-year smoothed) NBY calculation to better account for mergers and buyouts; this has boosted our U.S. equity CMA by 0.2% compared to our old method, and reduced our Australia estimate by 0.3%, with smaller changes for other countries.

Government Bonds

Government bonds' prospective medium-term nominal total returns are strongly anchored by their yields. The so-called *rolling yield* measures the expected return of a constant-maturity bond allocation assuming an unchanged yield curve.[8] For example, a strategy of holding constant-maturity 10-year Treasuries has an expected annual (nominal) return of 3.7%, given the starting yield of 3.8% and expected capital gains of -0.1% from rolldown as the bonds age. **Exhibit 4** shows current local rolling yields for six countries, converted to local real returns by subtracting a survey-based forecast of long-term inflation.

We also show expected excess-of-cash returns, which are effectively the returns accessed by hedged investors irrespective of their base currency (assuming zero cross currency basis). While real returns are often the appropriate unit for assessing expectations versus investment objectives, excess-of-cash returns are more relevant for making international allocation decisions, and for investors with access to leverage.

During 2022, all estimates increased sharply, except for Japan. Large yield rises outweighed reduced rolldown from flatter or inverted curves and modest rises in expected long-term inflation. All markets except Japan now have a positive expected local real return. Most excess-of-cash returns are positive—see the related special topic section for more discussion on bond risk premia.

Any adjustment to these expected returns boils down to expected changes in the yield curve level or shape. Capital gains/losses due to falling/rising yields dominate returns over short horizons but are highly uncertain, and matter less over longer horizons.

Exhibit 4: Expected Local Returns for Government Bonds
December 2022

	Y	RR	I	Y + RR - I		Excess-of-Cash Return
	10-Year Nominal Bond Yield	Rolldown Return	10-Year Forecast Inflation	Expected Real Return	*1yr Change*	
U.S.	3.8%	-0.1%	2.5%	**1.2%**	*+2.0%*	**-0.3%**
Japan	0.4%	0.3%	1.0%	**-0.3%**	*0.0%*	**0.5%**
Germany	2.6%	0.1%	2.7%	**0.0%**	*+1.7%*	**0.4%**
U.K.	3.7%	0.2%	2.9%	**1.0%**	*+2.2%*	**0.3%**
Canada	3.3%	0.1%	2.3%	**1.2%**	*+1.6%*	**-0.2%**
Australia	4.1%	0.6%	2.7%	**1.9%**	*+1.9%*	**0.9%**
Global Developed	3.4%	0.1%	2.4%	**1.1%**	*+1.8%*	**0.0%**
Global Developed ex U.S.	2.5%	0.2%	2.2%	**0.5%**	*+1.3%*	**0.3%**

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2022. "Global Developed" and "Global Developed ex US" are GDP-weighted averages. Rolldown return is estimated from fitted yield curves and based on annual rebalance. Excess-of-cash return is calculated by subtracting real cash return estimates described later in the article. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

8 If we assumed a more realistic random-walk (rather than unchanged) yield curve, our estimate would theoretically need to include convexity and variance drag components (see footnote 10). However, since these terms are small and mostly offsetting for concentrated bond portfolios, we ignore them here.

Credit Indices

To estimate expected real returns for credit indices, we first apply a haircut of 50% to both IG and HY spreads to represent the combined effects of expected default losses, downgrading bias and bad selling practices.[9] We assume no change in the spread curve, say, through mean reversion. We add the expected real yield of a duration-matched Treasury, and rolldown from both Treasury and spread curves. Finally, we include corrections for convexity and variance drag.[10] **Exhibit 5** shows our updated estimates for U.S. credit indices[11] and hard-currency emerging market sovereign debt. Estimates rose sharply in 2022, with wider spreads adding to higher Treasury yields. The HY-IG spread increased from previous narrow levels (HY's spread advantage over IG now outweighs its lower rolldown and convexity).

Exhibit 5: Expected Returns for Credit Indices
December 2022

	A. Spread Return	B. Treasury Real Yield	C. Rolldown Return	D. Convexity & Variance			
	OAS * 0.5	Y - I	R_T+R_C	C - V	Expected Real Return A+B+C+D	*1yr Change*	Excess-of-Cash Return
U.S. IG	0.7%	1.6%	0.1%	0.2%	**2.6%**	*+2.3%*	**1.1%**
U.S. HY	2.3%	1.8%	-0.5%	-0.4%	**3.2%**	*+3.3%*	**1.7%**
EM HC Debt	2.0%	1.6%	0.0%	0.0%	**3.5%**	*+2.4%*	**2.0%**

Source: Bloomberg, AQR. Estimates as of December 31, 2022. OAS and duration data are for Bloomberg Barclays U.S. Corporate Investment Grade (IG), U.S. Corporate High Yield (HY) and Emerging USD Sovereign (EM HC Debt) Indices. Index durations are 7.4 years, 4.4 years and 7.6 years respectively. Excess-of-cash return is calculated by subtracting real cash return estimates described later in the article. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

Commodities

Commodities do not have obvious yield measures, and we find no statistically significant predictability in medium-term returns (see the 2016 edition). Our estimate of 5- to 10-year expected return is therefore simply the long-run average return of an equal-weighted portfolio of commodity futures. This portfolio has earned about 3% geometric average excess return over cash since 1877, and a similar return if measured since 1951.[12] We add the U.S. real cash return to give our expected real return of 4.6%.

We do not have medium-term return estimates for individual commodities, but would expect them to deliver a substantially lower risk-adjusted return than a diversified basket over the long term. A gold investment, for example, has exhibited useful tail-hedging properties historically, but it forgoes the considerable diversification found within the broader asset class (as 2022 demonstrated).[13]

9 Consistent with Giesecke et al. (2011) and Ben Dor et al. (2021), who find that over the long term, the average credit risk premium is roughly half the spread. 'Bad selling' refers to the practice of selling bonds that no longer meet the rating or maturity criteria of the index.
10 These terms, both related to volatility, are not as closely offsetting for broad indices as they are for single bonds, due to diversification effects. Briefly, the convexity term estimates the impact of non-linearities assuming yields will change, while the variance drag term estimates the impact of compounding effects assuming return volatility will be non-zero.
11 **Exhibit 5** shows spreads for Bloomberg Barclays cash bond indices. Synthetic indices (Markit North America CDX) have tended to have somewhat tighter spreads (but during 2021 this basis was near zero). For EM debt we use U.S. HY OAS rolldown due to data limitations.
12 For more details see the 2016 edition, Levine, Ooi, Richardson and Sasseville (2018), and the AQR data library.
13 From February 1975 to December 2022, an investment in gold futures delivered around 1% real return, approximately the same as cash.

Alternative Risk Premia

It is difficult to apply a yield-based approach to dynamic strategies where holdings are constantly evolving. Below we state long-term assumptions for what we believe to be sustainable long-term premia, backed by a broad range of empirical evidence.[14]

Factor-Tilted Long-Only Portfolios

We believe a hypothetical value-tilted, diversified long-only equity portfolio that is carefully implemented and reasonably priced may be assumed to have an expected real return 0.5% higher than the cap-weighted index, after fees, with 2-3% tracking error. For an integrated multi-factor strategy—which we assume to include balanced allocations to value, momentum and defensive themes—we assume an expected net active return of around 1% at a similar tracking error. Finally, we think a defensive equity portfolio may be assumed to have an expected return similar to that of the relevant cap-weighted index, but may achieve this with lower volatility.[15] These are long-term estimates—we discuss tactical considerations below.

Long/Short Factor Premia

Alternative risk premia strategies apply similar tilts as long-only smart beta strategies, but in a market-neutral fashion and often in multiple asset classes. Because long/short strategies can be scaled to different risk levels, we focus on expected Sharpe ratios. The degree of diversification is critical. A single theme applied long/short in a single asset class might have an expected Sharpe ratio of only 0.2-0.3. For a diversified combination, we believe an expected Sharpe ratio of 0.7-0.8, net of trading costs and fees, can be feasible when multiple factor themes are applied in multiple asset classes. At a target volatility of 10%, such a hypothetical portfolio would have an expected return of 7-8% over cash.[16] We stress that this requires careful craftsmanship in portfolio construction as well as great efficiency in controlling trading, financing and shorting costs.[17] Strategies that are less well-designed or poorly implemented may have much lower expected returns.

Current valuations

Aggregate valuations across multiple styles are near long-term averages. Among individual styles, the equity value style continues to look extremely cheap, despite a second consecutive year of value outperformance. Indeed, spreads between value and growth stocks remain comparable to their previous peak during the Dotcom Bubble. Our research suggests there is quite a weak link between the value spreads of style factors and their future returns, making it difficult to use tactical timing based on valuations to outperform a strategic multi-style portfolio.[18] However, we believe the current extreme cheapness of value warrants a continued overweight to that style in multi-factor strategies.[19]

14 See for example Ilmanen et al. (2021), "How do Factor Premia Vary Over Time? A Century of Evidence".
15 Factor-tilted strategies exhibit many design variations. Our estimates are purely illustrative and do not represent any AQR product or strategy.
16 Consistent with historical data, we assume low correlations between the factors to produce our Sharpe ratio range for a diversified combination of long/short factors. As transaction costs depend on implementation and both transaction costs and fees vary with target volatility, our estimates are based on a transaction-cost-optimized strategy targeting 10% volatility with fees of 1 to 1.5%. Refer to the 2015 edition for discussion of factor premia assumptions. All assumptions are purely illustrative and do not represent any AQR product or strategy.
17 See Israel, Jiang and Ross (2017), "Craftsmanship Alpha: An Application to Style Investing".
18 See Asness, Chandra, Ilmanen and Israel (2017), "Contrarian Factor Timing Is Deceptively Difficult".
19 See *Cliff's Perspective* blog, The Bubble Has Not Popped, January 2023.

Private Equity and Real Estate

Illiquid assets are inherently harder to model than public markets, and this is exacerbated by a lack of good quality data. Nevertheless, in recent years we extended our discounted-cashflow-based approach into the illiquid realm, and we update these estimates below. For private equity (PE) our estimate is for U.S. buyout funds. We present net-of-fee expected returns, as fees are a substantial component of returns for illiquid assets. Each of our inputs is debatable, as data limitations necessitate lots of simplifying assumptions, and each input can substantially affect the final estimate. **Exhibit 6** illustrates our framework and current inputs.[20] First, we estimate unlevered ER using the DDM: $E(r) \approx y_U + g_U$, where y_U = unlevered payout yield and g_U = real earnings-per-share growth rate. Then, we estimate the levered return by applying leverage and the cost of debt, and finally we add expected multiple expansion and subtract fees.

Our yield-based real return estimate is 3.5% net of fees, lower than last year mainly due to a higher cost of debt[21] and a lack of cheapening in reported valuations (so far). An alternative approach, which applies simple size and leverage adjustments to a public proxy and assuming zero net alpha, generates a higher estimate of 4.3%.[22] Taking a simple average of the two approaches gives a final estimate of **3.9%**, slightly *lower* than our U.S. public large cap equity estimate.

Exhibit 6: Expected Real Returns for U.S. Private Equity

	Unlevered				Leverage		Levered						
	y_u	g_u	$r_u = y_u + g_u$		D	k_D	$r_L = r_u + D^*(r_u - k_D)$	m	$r_G = r_L + m$	f	$r_N = r_G - f$	
	Income Yield	Real Growth Rate	Real Return		Debt to Equity	Real Cost of Debt	Levered Real Return	Multiple Expansion	Gross Real ER	Fees	Net Exp. Real Return	*1yr Change*
U.S. PE	2.2%	+ 3.0%	= 5.2%		105%	2.3%	8.2%	+ 0.3%	= 8.5%	5.0%	= **3.5%**	*-2.1%*

Source: AQR, Pitchbook, Bloomberg, CEM Benchmarking. Estimates as of September 30, 2022. Strictly speaking, our inputs are log returns and should be converted to simple returns before leverage is applied, then converted back to log returns. This 'round-trip' has only a small impact, so we omit it here. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any AQR product or strategy.

We estimate expected returns for unlevered U.S. direct real estate (RE) as represented by the NCREIF indices. We caveat that returns for individual RE funds can vary vastly from the industry average (this is also true of PE). As with our DDM-based approach for equities, we sum payout yield and expected long-term growth rate.[23] **Exhibit 7** shows a slight fall in our expected real return for unlevered RE to 2.4%. The lack of cheapening for private RE (so far) constrasts sharply with the large losses for public REITs in 2022.

20 See Ilmanen, Chandra and McQuinn (2020) for a detailed discussion of the framework, our input choices, and the sources, as well as a literature review. Strictly speaking, the framework applies to the current vintage rather than the entire PE market. This paper also discusses the theoretical rationales and historical average returns to assess expected PE returns.

21 We have revised our method for estimating real cost of debt, now using bank loan spread data to reflect typical sources of PE financing. This revision raises our cost of debt estimate somewhat. Any reasonable method would show a substantial increase in cost of debt during 2022, due to higher real rates and wider spreads – and hence a reduction in PE expected return.

22 See the 2019 edition for details of this alternative method.

23 See Ilmanen, Chandra and McQuinn (2019) for full details of our methodology and assumptions.

Exhibit 7: Expected Real Returns for U.S. Private Real Estate

	NOI	C ≈ NOI / 3	CF ≈ NOI - C	g	ER = CF + g	
	NOI Yield	Capital Expenditure	Cashflow Yield	Real Growth	Unlevered Real Return	*1yr Change*
U.S. Real Estate	3.6%	1.2%	2.4%	0.0%	**2.4%**	*-0.2%*

Source: AQR, NCREIF Webinar Q3 2022. Estimates as of September 30, 2022. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any AQR product or strategy.

Cash

As discussed in the 2020 edition, our yield-based cash return assumption is a weighted average of current short-term and long-term yields. We are effectively averaging between the pure expectations and pure risk premium hypotheses. Giving a larger weight to the 10-year yield implies market rate expectations explain a larger portion of the yield curve slope than the required term premium, a conjecture arguably justified by the role of forward guidance from credible central banks.

Exhibit 8 shows real cash return estimates rose sharply in 2022 from all-time lows in 2020-21, turning positive in the U.S. and several other markets.[24] This implies lower risk premia for other asset classes, as discussed in this article's second special topic.

Exhibit 8: Expected Local Real Returns for Cash

December 2022

	S	L	I	(L*2/3 + S*1/3) - I	
	3-Month Yield	10-Year Yield	10Y Forecast Inflation	Expected Real Cash Return	*1yr Change*
U.S.	4.3%	3.9%	2.5%	**1.6%**	*+3.1%*
Japan	-0.2%	0.4%	1.0%	**-0.8%**	*0.0%*
Germany	1.8%	2.6%	2.7%	**-0.4%**	*+2.0%*
U.K.	3.5%	3.7%	2.9%	**0.7%**	*+2.6%*
Australia	3.1%	4.1%	2.7%	**1.1%**	*+2.3%*
Canada	4.3%	3.3%	2.3%	**1.4%**	*+2.6%*

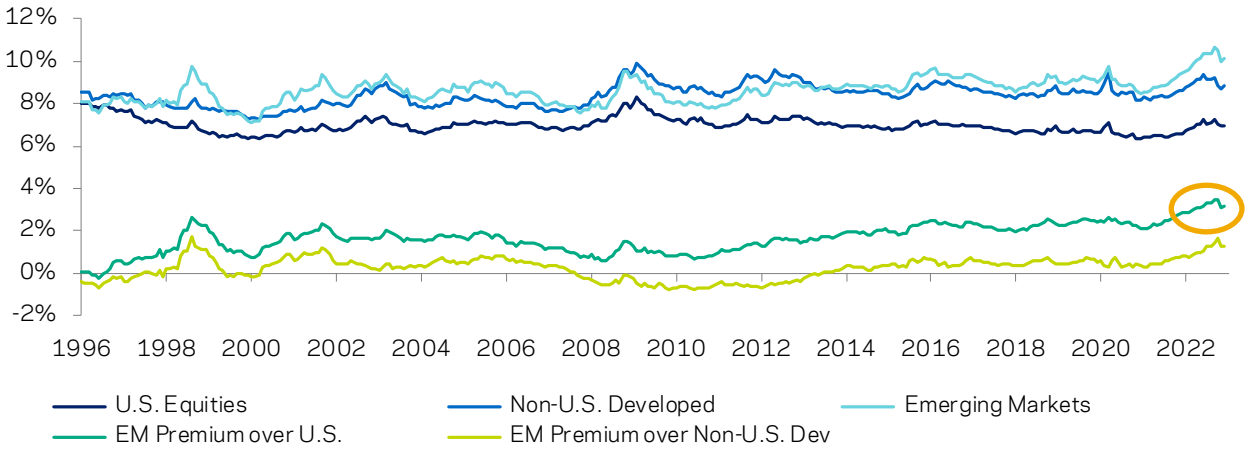
Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2022. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

24 Survey-based forecasts from Consensus Economics are broadly consistent with these market-based estimates, except for the U.S. where the survey forecast is around 100bps lower (real cash rate near zero). We find no evidence that estimates based on survey data have been more accurate than our market-based assumptions, but they can provide useful insights (see Special Topic 2).

Special Topic 1: Emerging Market Equities—Assessing the Strategic Case

Emerging markets are a heterogeneous category presenting a wealth of investment opportunities. An allocation to emerging market equities should be expected to deliver higher returns, higher risk and useful diversification over the long term. But the region's relative performance has experienced multi-year cycles, with the past decade being particularly disappointing. According to our capital market assumptions, this period of underperformance has driven the region's forward-looking expected return advantage over the U.S. market to more than 3%, its highest for decades (see **Exhibit 9**).

Exhibit 9: Expected Total USD Returns for Equity Regions
January 1996 – December 2022



Sources: Bloomberg, Consensus Economics and AQR. Chart shows nominal total arithmetic USD returns. Local real equity yield is calculated as expected payout + expected real growth, where expected payout is the simple average of two measures: 0.5 * Shiller E/P * 1.075 and Dividend/Price. The 0.5 multiplier reflects the long-term payout ratio; the 1.075 multiplier accounts for EPS growth during the 10-year earnings window. Long term real EPS growth is assumed to be 1.5% for developed markets and 2% for emerging markets. Local real returns are converted to USD nominal returns by adding expected FX return (derived from long-term expected inflation differentials) and adding long-term expected U.S. inflation, and then converted to arithmetic returns by adding a variance drag term.

Other strategic considerations

There are many other considerations besides relative valuations. Emerging markets are associated with higher growth expectations, but GDP growth does not always translate to higher equity returns. Insiders may be able to exploit less-informed foreign investors. And investors may overpay for expected growth, and for the bang-for-the-buck of a high-risk, high-return asset class.

On the other hand, greater frictions and less market efficiency may create attractive opportunities for active managers. One example is the current 'value spread' between cheap and expensive companies, which is even more extreme in emerging than developed markets.[25] Historical evidence suggests that both discretionary and systematic active managers have performed better in emerging

25 Value spread as of December 31, 2022 was at 97th percentile for emerging markets, compared to 92nd percentile for global developed.

than developed markets.[26] And finally, the potential for ESG-conscious investors to make an impact may be greater in emerging markets, where carbon footprints tend to be larger and ESG scores lower.

The role of emerging markets currency risk

An emerging markets allocation is a combination of equity and currency risk. Historically, spot currency moves have added substantial volatility that has been moderately positively correlated to the equity markets themselves. But this additional risk has been compensated with positive average returns from the interest rate differential or carry (put differently, it has been costly to hedge the exposure). There is also some evidence that currency risk has enhanced the inflation resilience of an emerging market equity allocation by adding more commodity-like exposure.

Special Topic 2: Waiting for the Axe to Fall? Rising Cash Rates and Market Risk Premia

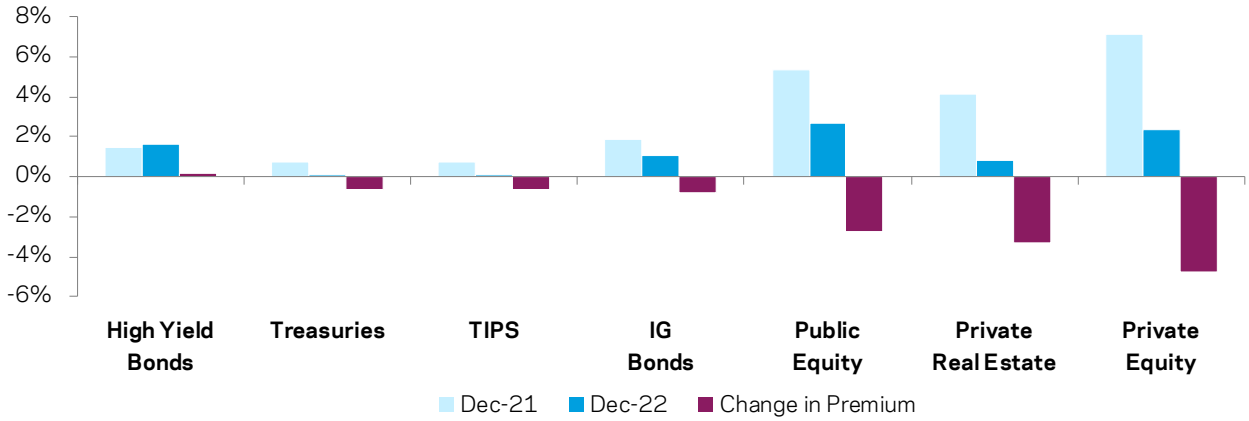
On which asset classes has the 'real rates axe' yet to fall?

Over the past year, our expected return estimates for cash generally increased by more than our estimates for other asset classes, implying lower excess-of-cash returns or risk premia. But the impact varies widely by asset class. **Exhibit 10** shows expected excess-of-cash returns for U.S. asset classes, ordered by the change in 2022. Fixed income premia appear relatively stable, reflecting a near-full repricing in reponse to the rise in rates (see below for further discussion), but equities and—especially—private assets have not (yet) repriced nearly as much. This may be a warning flag for their near-term prospects.

Put differently, at the start of 2022, all major classes were expensive, reflecting historically low real riskless discount rates but fairly normal forward-looking risk premia. Now, at the start of 2023, real riskless discount rates have largely normalized, while forward-looking risk premia on non-bond asset classes appear compressed (especially U.S equities and illiquid assets).

26 In the ten years ending June 30, 2022, mean IRs across systematic and discretionary institutional managers were 0.06 and 0.03 respectively for U.S. large cap, but 0.45 and 0.19 for emerging markets large cap, based on eVestment data (gross of fees).

Exhibit 10: Which Premia Have Shrunk? Expected Excess-of-Cash Returns for U.S. Asset Classes



Source: AQR. Estimates as of December 31, 2022 except for real estate and private equity, which are as of September 30, 2022 (the latest available). Annual geometric excess-of-cash rates of return. Fixed income estimates relate to corresponding Bloomberg Barclays indices rather than single bonds. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages..

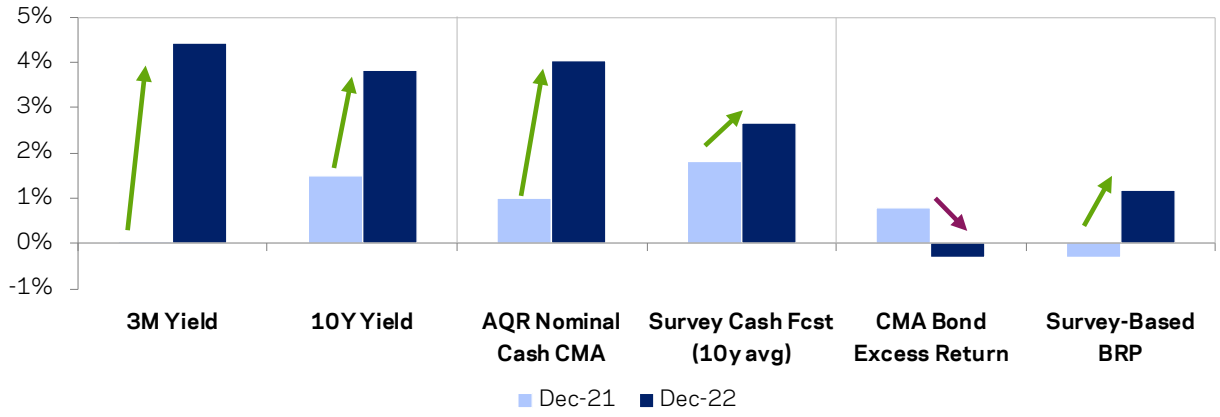
Estimating bond risk premia amid volatile markets

For bonds we must look a little more carefully. Our cash CMA methodology effectively assumes that two thirds of the yield curve slope can be attributed to expected changes in short rates, and one third can be attributed to the bond risk premium (BRP). This may be a reasonable assumption on average, but in some years something very different may be happening.

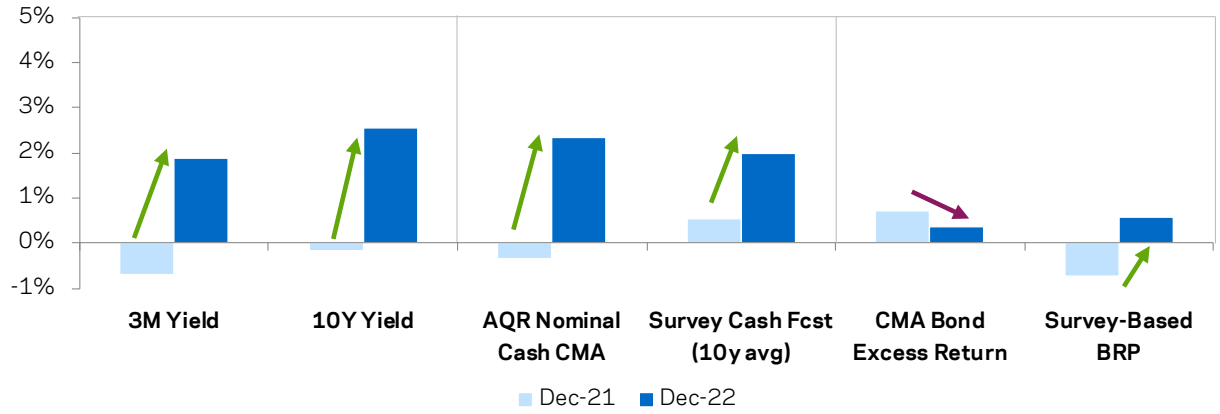
In 2022, the U.S. Treasury curve flattened (in fact inverted), implying a loss of carry and rolldown for Treasuries, and hence a slightly negative premium according to our CMAs (see **Exhibit 11**, panel A, red arrow). But survey data suggests the two components of the slope may be large but offsetting: a *negative* expected change in short rate and a resurgent *positive* bond risk premium (rightmost green arrow in chart). For European bonds (panel B), surveys imply the slope is now attributable to a combination of an expected (further) rise in short rate and a positive premium. In both markets, our assumptions show a reduction in bond risk premium during 2022, while surveys imply an increase.

Exhibit 11: Did Bond Risk Premia Grow or Shrink in 2022?

A. U.S. Treasuries



B. German Government Bonds



Source: AQR, Consensus Economics. Estimates as of December 31, 2022. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

So which is correct? It seems plausible that bond risk premia did increase in 2022, as inflation and monetary policy uncertainty raised perceptions of bonds as risky (and perhaps less diversifying[27]) assets.[28] We continue to evaluate market- and survey-based approaches to estimating market risk premia, and may incorporate survey data in our CMAs in the future. Humility is warranted: all methods for estimating time-varying expected returns and risk premia involve debatable assumptions and wide bands of uncertainty. For strategic investors, the positive long-term average premium is the prize.

27 See Brixton et al. (2023), "A Changing Stock-Bond Correlation: Drivers and Implications."
28 Other estimates of bond risk premia show fluctuations but little net change during 2022; see the term structure models of Kim and Wright, and Adrian et al.

Concluding thoughts (and a word on liquidity)

To invest is to accept the risk of losses in pursuit of returns above the risk-free rate. A rise in the risk-free rate could eventually make the investor's task easier, by allowing them to attain a given real or nominal return goal with less risk. But *we are not there yet*, because valuations of some risky assets (and especially illiquid assets) have not adjusted to higher discount rates, so their premia appear compressed.

Liquidity risk has been in the spotlight in recent months, with the gating of a large real estate fund in the U.S. and LDI stress triggering a dash for cash for some U.K. pension funds. Over the past decade, many investors responded to low expected returns by accepting less liquidity in their portfolios. Illiquidity has conferred cosmetic benefits of price-smoothing and lagged reporting,[29] which are conspicuously lacking in public markets and liquid alternatives where mark-to-market volatility has been high. But there can be costs to illiquidity too. These have materialized in the past (recall private asset firesales during the Global Financial Crisis), and the current compressed premia are a hint that they may do so again. Allocations that are *both diversifying and liquid* are likely to be particularly valuable for enhancing portfolio resilience in uncertain times.

29 Investor preference for smooth returns may even offset any required illiquidity premia in private assets; see Ilmanen (2022).

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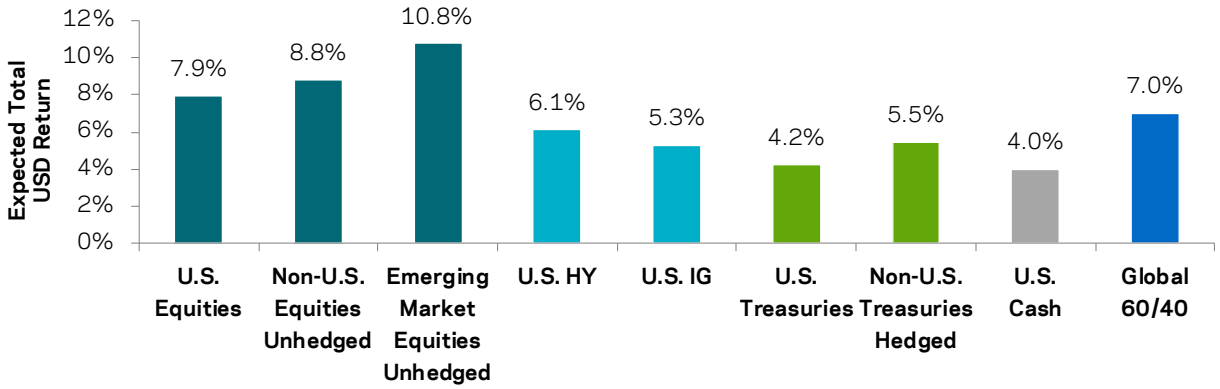
Appendix

Translating Local Real Returns to Expected Total Returns for a Given Base Currency

In the rest of this paper we report local real and excess-of-cash returns. In **Exhibit A1** we translate these into *nominal arithmetic* returns by adding local expected inflation and variance drag terms. We also quote *unhedged* U.S dollar estimates for non-U.S. equities, in line with common investing practice. Currency return assumptions are based on expected inflation differentials. Expected returns for other base currencies are available on request.

Exhibit A1: Expected Total Nominal Arithmetic Returns for a U.S. Dollar Investor



Source: AQR. Estimates as of December 31, 2022 are USD-denominated total nominal annual arithmetic rates of return. "Non-U.S. developed equities" is cap-weighted average of Euro-5, Japan, U.K., Australia and Canada, unhedged. U.S. and Non-U.S. Treasuries are respective Bloomberg Barclays indices rather than single bonds. Global 60/40 is a 60%/40% weighted average of the developed equities listed above and developed government bonds listed above, respectively. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

Sources and Methodology for Long-Term Historical Expected Returns

Sources for historical equity and bond expected returns are AQR, Robert Shiller's data library, Kozicki-Tinsley (2006), Federal Reserve Bank of Philadelphia, Blue Chip Economic Indicators, Consensus Economics and Morningstar. Prior to 1926, stocks are represented by a reconstruction of the S&P 500 available on Robert Shiller's website which uses dividends and earnings data from Cowles and associates, interpolated from annual data. After that, stocks are the S&P 500. Bonds are represented by long-dated Treasuries. The equity yield is a 50/50 mix of two measures: 50% Shiller E/P * 1.075 and 50% Dividend/Price + 1.5%. Scalars are used to account for long term real Earnings Per Share (EPS) Growth. Bond yield is 10-year real Treasury yield minus 10-year inflation forecast as in *Expected Returns* (Ilmanen, 2011), with no rolldown added.

Methodology for Forecast Error Analysis (Exhibit 1)

Not only are the return forecasts uncertain, but also any measures of forecast uncertainty are debatable. Forecasting requires humility at many levels. We first produce historical time series of yield-based estimates for U.S. equities and U.S. Treasuries using the method described in the previous paragraph (analysis starts in 1900, but we use data from 1870s onwards). We test their predictive power using quarterly overlapping 10-year periods since 1900 and measure the distribution of errors. See the 2018 edition for more details. Error ranges in **Exhibit 1** are based on interquartile ranges of these distributions, adjusted for current volatility estimates.

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The **Bloomberg Barclays U.S. Corporate Bond Index** measures the USD-denominated, investment-grade, fixed-rate, taxable corporate bond market.

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