Alternative Thinking 2024 Issue 1

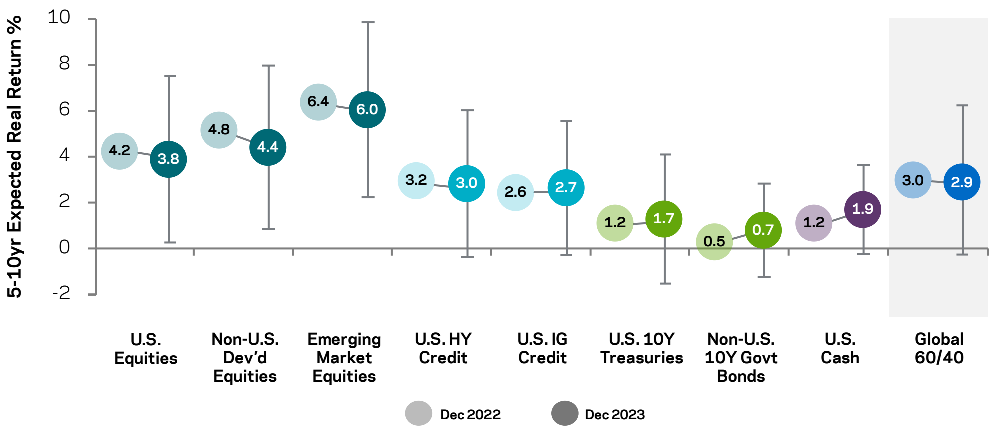
Capital Market Assumptions for Major Asset Classes

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 2023, expected returns fell for equities but increased further for bonds and cash, following larger increases in 2022. This implies slimmer equity risk premia. The expected real return of a global 60/40 portfolio held steady at 3%, near its decade high and near the historical average since 1990, but still well below the longer-term U.S. average of nearly 5% since 1900.[1]

The article also includes some thoughts on estimating expected returns and risk for private credit, the boom asset class of 2023 (spoiler: you need to haircut the yield, just as for listed credit). We conclude with a feature by Antti Ilmanen, Principal and Global Co-Head of the Portfolio Solutions Group, on the key decisions that underpin any capital market assumptions framework.

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



Source: Bloomberg, Consensus Economics and AQR; see **Exhibits 3-5** and **Exhibit 8** for details. Estimates as of December 31, 2023. "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. Global 60/40 is 60% global developed equities, 40% global developed government bonds. 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. 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.

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1 Historical comparisons based on a simpler methodology than main estimates due to data availability; methodology described in the Appendix.

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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, Pete Hecht, Antti Ilmanen, Thomas Maloney and Nick McQuinn for their work on this paper.

Introduction and Framework

For the past decade, we have published our capital market assumptions for major asset classes with a focus on medium-term expected returns (see the past 10 years' versions here). Each year, as well as the updated estimates, we provide additional analysis or other new material. This year's article includes a discussion of the drivers of risk and return for private credit and a feature on the *philosophy* of CMAs—the fundamental choices that underpin any framework for estimating expected returns.

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.

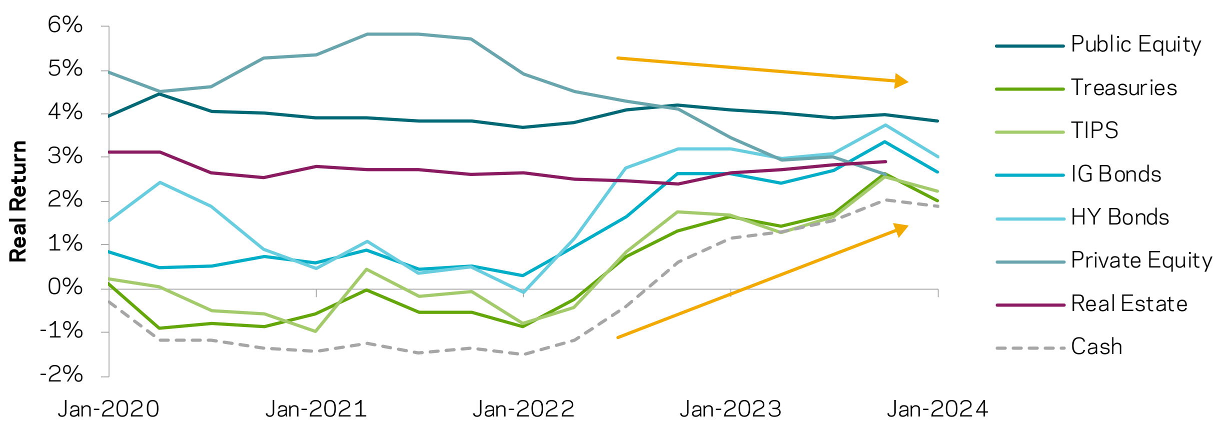
At shorter horizons, returns are largely unpredictable and any predictability has tended to mainly reflect momentum and the macro environment.

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 real returns for bonds and cash rose sharply in 2022 and 2023 from all-time lows in 2021 (see **Exhibit 2**). By contrast, expected returns for equities have remained fairly constant.[3]

Exhibit 2: Expected Real Returns for U.S. Asset Classes

December 31, 2019 - December 31, 2023



Source: AQR; see **Exhibits 3-8** for details. 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 In the tables we show real and excess-of-cash returns. The latter are calculated by subtracting estimates of real cash return, and are effectively the returns 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: $E(r) \approx DY+g+\Delta v$. We take the average of two approaches,[4] described below. We assume no mean reversion in valuations, i.e., $\Delta v=0$.[5]

1. **Earnings-based:** The inverse of the CAPE ratio (cyclically-adjusted P/E) is 10-year average inflation-adjusted earnings divided by today's price. We multiply this by 0.5 (roughly the U.S. long-run dividend payout ratio) and add real earnings growth of 1.5% (roughly the U.S. average since 1900). So the earnings-based expected return[6] is: $E(r) \approx 0.5^{*} \textit{Adjusted Shiller E/P} + g_{EPS}$

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 $NTY = DY + NBY$

This year we add U.S. small cap to our line-up and split out China from the emerging markets region. Most real return estimates fell in 2023 due to rising valuations (see **Exhibit 3**). Excess returns have shrunk for a second year due to further rises in cash estimates.

Exhibit 3: Expected Local Returns for Equities

As of December 31, 2023

	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. Large	3.5%	3.2%	1.4%	0.5%	2.5%	4.5%	**3.8%**	*-0.5%*	**1.9%**
U.S. Small	5.7%	4.6%	1.6%	-0.8%	3.0%	3.7%	**4.2%**	*0.0%*	**2.3%**
Eurozone	4.9%	3.9%	3.1%	-0.6%	2.2%	4.8%	**4.3%**	*-0.3%*	**3.5%**
Japan	4.9%	3.9%	2.2%	0.3%	2.1%	4.7%	**4.3%**	*-0.6%*	**5.6%**
U.K.	6.3%	4.6%	3.6%	-0.9%	2.1%	4.8%	**4.7%**	*+0.2%*	**2.9%**
Glob. Dev. ex US	5.2%	4.1%	3.1%	-0.5%	2.3%	4.8%	**4.4%**	*-0.2%*	**3.9%**
Global Developed	3.9%	3.4%	1.8%	0.3%	2.4%	4.5%	**4.0%**	*-0.4%*	**2.5%**
EM ex China	7.2%	5.6%	3.0%	--	3.0%	6.0%	**5.8%**	*-0.6%*	**3.5%**
China	9.4%	6.7%	2.5%	--	3.5%	6.0%	**6.4%**	*0.0%*	**5.4%**
All Emerging Mkts	7.9%	5.9%	2.9%	--	3.2%	6.1%	**6.0%**	*-0.4%*	**4.2%**
Global All Country	4.4%	3.7%	2.0%	0.3%	2.4%	4.6%	**4.2%**	*-0.4%*	**2.7%**

Source: AQR, Consensus Economics and Bloomberg. Estimates and methodology subject to change and based on data as of December 31, 2023. See main text for methodology. For earnings yield, U.S. is based on S&P 500; U.K. on FTSE 100; Eurozone is a cap-weighted average of large-cap indices in Germany, France, Italy, Netherlands and Spain; Japan is Topix; 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. Estimates are for illustrative purposes only, are not a guarantee of performance and are 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. Briefly, the timing of any mean reversion is difficult to forecast, and there are plausible arguments for yields not returning to historical levels.

6 For our earnings-based estimate, we apply 50% payout ratio to all countries, and use g = 1.5% for all developed large cap markets, 1.8% for U.S. small cap and 2% for all emerging markets. *Adjusted Shiller EP* applies a multiple of 1+(g*5) to account for earnings growth during the 10-year earnings window.

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.[7] For example, a strategy of holding constant-maturity 10-year German government bonds has an expected annual (nominal) return of 2.3%, given the starting yield of 2.0% and expected capital gains of 0.3% 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 next 10-year 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 2023 most estimates increased, adding to the previous year's larger increases. Improved rolldown and modest declines in expected long-term inflation were the main contributors. Most markets now have a positive expected local real return, with some major markets offering almost 2% above expected inflation. Estimates of bond risk premia or excess-of-cash returns depend on cash assumptions, where uncertainty is exceptionally high.

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

As of December 31, 2023

	Y	RR	I	Y + RR - I		
	10yr Nominal Bond Yield	Rolldown Return	10yr Forecast Inflation	Real Return	*1yr Change*	Excess-of-Cash Return
U.S.	3.9%	0.0%	2.3%	**1.7%**	*+0.4%*	**-0.2%**
Japan	0.6%	0.8%	1.6%	**-0.1%**	*+0.2%*	**1.2%**
Germany	2.0%	0.3%	2.2%	**0.2%**	*+0.2%*	**-0.4%**
U.K.	3.5%	0.5%	2.4%	**1.7%**	*+0.7%*	**-0.2%**
Australia	4.0%	0.4%	2.6%	**1.8%**	*-0.2%*	**0.5%**
Global Developed	3.3%	0.2%	2.2%	**1.4%**	*+0.3%*	**-0.1%**
Global Dev. ex U.S.	2.4%	0.5%	2.1%	**0.7%**	*+0.2%*	**0.1%**

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2023. "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.

7 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 9). 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 public credit indices, we first apply a haircut of 50% to both IG and HY spreads to represent the combined effects of expected default losses (the main driver for HY), and downgrading bias and bad selling practices (the main drivers for IG).[8] 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.[9]

Exhibit 5 shows our updated estimates for U.S. credit indices and hard-currency emerging market sovereign debt. Narrower spreads were offset by higher Treasury yields in 2023, and the HY-IG spread narrowed after widening in 2022.

Exhibit 5: Expected Returns for Credit Indices

As of December 31, 2023

	A. Spread Return	B. Treasury Real Yield	C. Rolldown Return	D. Convexity & Variance	Real Return	*1yr*	Excess-of-
	OAS * 0.5	Y - I	R_T+R_C	Con - Var	A+B+C+D	*Change*	Cash Return
U.S. IG	0.5%	1.8%	0.1%	0.2%	**2.7%**	*+0.1%*	**0.8%**
U.S. HY	1.6%	2.1%	-0.2%	-0.5%	**3.0%**	*-0.2%*	**1.2%**
EM HC Debt	1.8%	1.8%	0.2%	0.0%	**3.8%**	*+0.3%*	**1.9%**

Source: Bloomberg, AQR. Estimates as of December 31, 2023. 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 7.3 years, 3.8 years and 7.4 years respectively. For EM debt we use US HY OAS rolldown due to data limitations. 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.[10] We add the U.S. real cash return to give an expected real return of 4.9%.

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.[11]

8 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.

9 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.

10 For more details see the 2016 edition, Levine, Ooi, Richardson and Sasseville (2018), and the AQR data library.

11 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.[12]

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.[13] These are long-term estimates—we discuss tactical considerations below.

Long/Short Factor Premia and the Benefits of 'Cash-Plus' Returns

Alternative risk premia strategies are typically implemented as a long/short market-neutral portfolio across multiple asset classes. They can be scaled to different risk levels, so we focus on expected Sharpe ratio (SR). The degree of diversification is critical. A single theme applied in a single asset class might have an expected SR of 0.2-0.3. For a diversified combination, we believe an expected SR 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.[14, 15]

With cash rates having increased 4-5% in most major markets during the last two years, it follows that expected total returns for alternative risk premia and other liquid alternatives—which have large cash holdings—have increased by a similar amount. This fact is probably underappreciated by investors.[16]

Current Valuations

Aggregate valuations across multiple styles are near long-term averages. Among individual styles, the equity value style continues to look cheap, despite several years of value recovery. Indeed, spreads between value and growth stocks remain comparable to their previous peak during the Dotcom Bubble. Our research suggests there is quite a tenuous link between the value spreads of style factors and their immediate future returns, making it difficult to use tactical timing based on valuations to outperform a strategic multi-style portfolio.[17] However, we believe the ongoing cheapness of value warrants a continued overweight to that style in multi-factor strategies.

12 See for example Ilmanen et al. (2021), "How do Factor Premia Vary Over Time? A Century of Evidence".
13 Factor-tilted strategies exhibit many design variations. Our estimates are purely illustrative and do not represent any AQR product or strategy.
14 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.
15 We stress that this requires careful craftsmanship in portfolio construction as well as great efficiency in controlling trading, financing and shorting costs. Strategies that are less well-designed or poorly implemented may have much lower expected returns. See Israel, Jiang and Ross (2017), "Craftsmanship Alpha: An Application to Style Investing".
16 For further analysis see AQR Alternative Thinking 2023 Issue 3: "Honey, the Fed Shrunk the Equity Premium".
17 See Asness, Chandra, Ilmanen and Israel (2017), "Contrarian Factor Timing Is Deceptively Difficult".

Private Equity, Real Estate and Private Credit

Illiquid assets are inherently harder to model than public markets, and data are less plentiful. Nevertheless, we attempt to apply our discounted-cashflow approach to the illiquid realm. For private equity we estimate an expected net-of-fee return for U.S. buyout funds. Each of our inputs is debatable, as data limitations necessitate lots of simplifying assumptions, and each input can substantially affect the final estimate. We estimate unlevered return 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 apply leverage and the cost of debt, and finally we add expected multiple expansion and subtract fees (see **Exhibit 6**).[18]

Our yield-based real return estimate is now just 1.4% net of fees, sharply lower than last year mainly due to lower leverage and a further substantial increase in the cost of debt. An alternative approach, which applies simple size and leverage adjustments to a public proxy, assuming zero net alpha, generates a higher estimate of 3.9%.[19] Taking a simple average of the two approaches gives a final estimate of **2.6%**, around 1% *lower* than our U.S. large cap equity estimate.

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

As of September 30, 2023

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 Real Return	*1yr Change*
2.2%	3.0%	5.2%	78%	4.7%	5.7%	0.7%	6.4%	5.0%	**1.4%**	*-1.8%*

Source: AQR, Pitchbook, Bloomberg, CEM Benchmarking. Estimates as of September 30, 2023. Real cost of debt is expected real inter-bank rate plus a spread based on bank loan data, averaged over 12 months. Strictly speaking, our inputs are log returns and should be converted to simple returns before leverage is applied, then converted back to log returns, but we omit this minor adjustment. 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.[20] **Exhibit 7** shows a 0.5% rise in our expected real return for unlevered RE to 2.9%.

18 See Ilmanen, Chandra and McQuinn (2020) for a detailed discussion of the original version of this framework and other ways to assess expected PE returns. Strictly speaking, our estimate applies to the current vintage rather than the entire PE market.
19 See the 2019 edition for details of this alternative method.
20 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

As of September 30, 2023

	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	4.3%	1.4%	2.9%	0.0%	**2.9%**	*+0.5%*

Source: AQR, NCREIF Webinar Q3 2023. Estimates as of September 30, 2023. 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.

Private Credit: Estimating Expected Returns and Risk

Private credit was the hot asset class of 2023, but many allocators remain unsure of how to estimate its expected return and risk. We approach this question by using public credit as an anchor, and then asking how private credit might differ (similar to our approach for private equity, where we consider differences versus public equity).

Of course, individual managers may deliver alpha by avoiding losses via informed security selection, loan structuring, and otherwise maximizing recoveries. But here we are interested only in industry-wide differences. Why might private credit's long-term risk-adjusted return be…

Higher?

- Illiquidity premium
- Borrower pays premium for flexibility and certainty of execution
- Disintermediation of banks
- Lower defaults / more efficient workouts when problems arise

Lower?

- Higher and opaque fees
- Overpaying for price smoothing and/or embedded leverage
- Possible latent deterioration in credit quality

Ideally we would test these drivers empirically over long periods, but private credit data are limited. Munday et al. (2018, results updated 2020) find private credit funds in aggregate have matched the performance of leveraged loan or high yield index benchmarks, with beta of 1 to 1.2 and alpha near zero. In other words, higher fees and investor price smoothing preferences appear to have fully offset any illiquidity premium. For these theoretical and empirical reasons, our proposed CMA framework for private credit (see table below) mirrors public high yield credit with two modifications:

1. We model floating-rate debt by subtracting the duration component of the expected return and risk, reflecting a common characteristic of the private credit marketplace.
2. We adjust for a survey-based estimate of average industry leverage, which magnifies both excess return and volatility projections.

Industry-wide private debt modification rates are similar to average default rates for single-B listed credit, hence the choice of a high yield proxy (see table footnote). Investors can apply their own estimates of leverage and credit quality, which will impact both risk and return estimates.

Modeling Private Credit as Floating-Rate Levered High Yield Corporate Bonds

	U.S. HY Credit Excess	Leverage Multiplier	Private Credit
Excess Return (spread * haircut + roll)	1.8%	x 1.2	2.2%
Volatility	8.4%	x 1.2	10.1%
Sharpe Ratio	0.22		0.22
Total Nominal Return (AM)	6.0%		6.3%
Total Nominal Return (GM)	5.6%		5.8%
Real Return (GM)	3.4%		3.6%

Source: Bloomberg, Block et al. (2023), AQR. Estimates as of December 31, 2023. Public proxy is based on Bloomberg Barclays U.S. Corporate High Yield (HY) Index in excess of duration-matched U.S. Treasury. Leverage estimate from Block et al. (2023). Cambridge Associates Private Credit modification rate from 2002 to 2017 was 10% compared to 11% default rate for Moody's single-B listed credit.

Cash

This year we make a small but important change to our methodology for estimating cash returns, adding survey forecasts for short-term yields alongside our existing inputs of current short-term and long-term yields (reflecting pure risk premium and pure expectations hypotheses, respectively). Economist surveys have not been very accurate historically,[21] and can be slow to respond to new information, but we believe including them as one input helps to give more stable, robust cash assumptions when the yield curve reflects expectations for large changes in interest rates, as in 2023.

For simplicity we take a simple average of our three inputs, as shown in **Exhibit 8**. Real cash return estimates saw a second consecutive year of increases (excluding Japan) from the all-time lows of 2020-21, reaching near 2% in the U.S. and near 1% in the eurozone. These substantial increases imply slimmer risk premia for some other asset classes, notably equities and private assets.

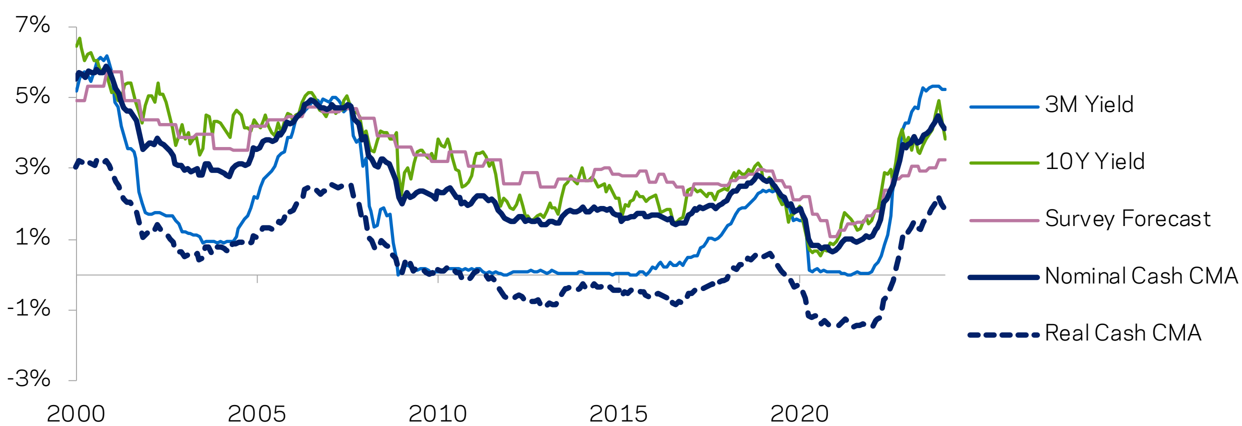
Exhibit 8:
A. Expected Local Real Returns for Cash

As of December 31, 2023

	S	L	E	I	Avg (S,L,E) - I	
	3-Month Yield	10yr Yield	Next 10yr Avg. Forecast Short Rate	10yr Forecast Inflation	Real Cash Return	*1yr Change*
U.S.	5.3%	3.9%	3.2%	2.3%	**1.9%**	*+0.7%*
Eurozone	3.6%	2.5%	2.5%	2.0%	**0.8%**	*+0.9%*
U.K.	5.3%	3.5%	3.9%	2.4%	**1.8%**	*+1.2%*
Japan	-0.2%	0.6%	0.4%	1.2%	**-1.3%**	*-0.5%*
Australia	4.3%	4.0%	3.3%	2.7%	**1.3%**	*+0.6%*

B. Evolution of Components for U.S. Cash Estimate

January 1, 2000 – December 31, 2023



Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2023. Eurozone is cap-weighted average of Germany, France, Italy, Netherlands and Spain. 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.

21 See the 2020 edition for some analysis and discussion of possible inputs to cash assumptions.

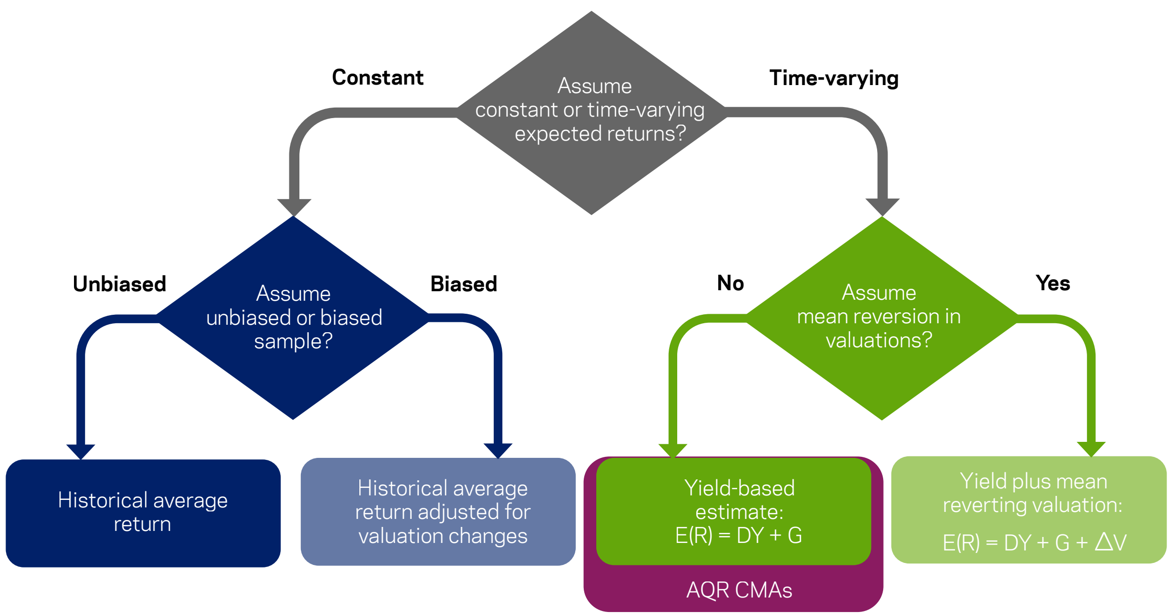
Special Topic: The Philosophy of CMAs

Capital market assumptions (CMAs) primarily consist of longer-term expected returns for major asset classes. In the 1900s, they were usually based on historical average total or excess-of-cash returns, implicitly assuming that risk premia are constant over time. In the 2000s, academics and practitioners increasingly proposed that expected asset returns vary over time and are best estimated from forward-looking metrics like yields and market valuations.[22]

Forward-looking approaches are often related to supply-based models which describe how asset returns are generated over time—for example, decomposing stock returns into dividend income, growth, and valuation changes. This contrasts with a demand-based approach that describes why investors require certain returns, say, by adding a historical average risk premium to the current riskless rate. This building-block approach is appealing but fails if risk premia themselves depend on the risk-free rate.[23]

Exhibit 9 illustrates the key choices in developing CMAs, resulting in four alternative methods. The most important choice is whether to assume constant or time-varying expected returns, and thus whether to rely on historical average returns or current market yields. Each branch then requires a second choice—whether to adjust for (past or expected future) valuation changes. There are, of course, many other more granular decisions—for example, how to estimate yield and growth terms for equities—and we have discussed those in previous editions.

Exhibit 9: Key Decisions Underlying Any CMA Framework



Source: AQR.

22 The visible time variation in market yields and valuations seems at first like obvious evidence of time-varying risk premia. However, high earnings yields might reflect market's expectations of low earnings growth rates, steep yield curves might reflect expectations of rising short rates, wide credit spreads might reflect expectations of widespread defaults—all in the context of constant equity, term, and credit premia. In practice, these yield measures have some empirical ability to predict both future growth, short-rate and default evolution and future excess returns on equities, bonds and credit, so they reflect some (debatable) blend of market expectations and time-varying risk premia. See Ilmanen (2011, 2022).

23 See AQR *Alternative Thinking* 2023 Issue 3: "Honey, the Fed Shrunk the Equity Premium."

Assuming constant expected returns: Historical average premium is indeed the best estimate of future premium assuming (i) such premia are constant over time *and* (ii) the historical sample period used is not biased, say, by sample-specific richening or cheapening of the asset class. Very long historical samples are more likely to be unbiased, unless there have been structural changes.[24] This is relevant because recent decades since the 1980s saw persistent richening of most asset classes, resulting in unexpected windfall gains. Extrapolating their past performance ignores the one-off nature of such gains, and presumes the boost will continue even when starting from historically extreme yield or valuation levels. Fortunately, it is possible to adjust historical average returns for net valuation changes. These adjusted returns are likely more representative of what investors required from assets during the past and are better measures of expected returns.[25]

Assuming time-varying expected returns: Estimates are often based on the discounted cash flow framework, where an asset's price reflects expected future cash flows discounted by the sum of the riskless rate and some asset-specific risk premia. For equities, this implies expected return is the dividend yield plus expected growth, as well as any expected change in valuation. We and many other CMA providers assume the expected change in yields or valuation is zero. Some CMA providers assume valuations revert towards a historical average.[26]

The U.S. equity market as a case study: The four solid lines in **Exhibit 10** correspond to the four options in **Exhibit 9**—with the same colors—applied to U.S. large-cap equities. Yield-based estimates (green lines) have been lower than historical estimates (blue lines) for most of the past 30 years, due to a multi-decade upward trend in valuations. The bias-adjusted historical return delivers the most stable or static estimate, while 'yield plus mean reversion' gives the most volatile estimate with the widest range.

During periods of multiple expansion like the late 1990s and the 2010s, the naïve historical average increases even as the yield-based estimates decline. For 'rearview mirror' investors basing their expectations (explicitly or implicitly) on shorter historical periods, this conflict is even more dramatic. This highlights the need for historical estimates to be adjusted for valuation changes.

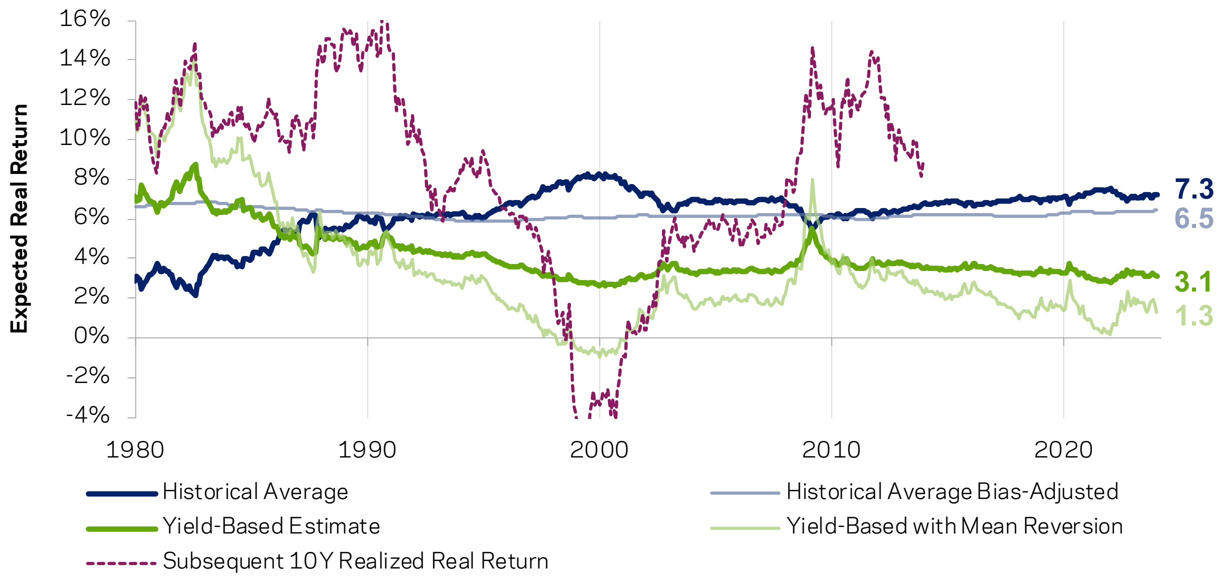
Over this sample, the simple historical average was the worst performing forecast (4.1% p.a. mean absolute error), while the bias-adjusted historical average recorded the smallest errors (3.3%). 'Yield with mean reversion' suffered the largest forecast error over the last 10 years, as it predicted cheapening and the market richened instead. We continue to favor a yield-based approach without mean reversion as a robust and humble choice for generating capital market assumptions for a 5- to 10-year horizon.

24 For details, see *Cliff's Perspective* blog, The Long Run is Lying to You (2021) and Ilmanen (2022). Farmer-Nakamura-Steinsson (2023) highlight the pernicious impact of gradual structural changes because we learn about them so slowly. These include gradually drifting asset yields and lower trading costs.

25 Note that this approach still assumes constant premia—it just corrects historical average returns for a biased sample with measurable "unexpected returns". Even after adjusting for a secular decline in yields, this approach gives a higher estimate than a yield-based approach anchored to the lower yield at the end of the sample (see **Exhibit 10**).

26 The zero valuation change or 'random walk' assumption implies current valuations are sustainable, and that any deviation from historical averages reflects structural change. This approach still assigns low expected returns to expensive markets via the carry channel (low starting yields), but it does not apply a further penalty by assuming yields normalize over the CMA horizon. It is true that historical evidence supports slow mean reversion over multi-year horizons, but the effect is weak, possibly offset by gradual structural changes, and it is highly debatable which historical mean is relevant (say, the past 20 years or a century?). Note that one could also assume the opposite of mean reversion, momentum, but empirical evidence supports this assumption only at short horizons up to a year.

Exhibit 10: Point-in-Time Expected Real Return Estimates for U.S. Equities
January 1, 1980 – December 31, 2023, based on expanding data since January 1960



Sources: Bloomberg, Robert Shiller data library, Consensus Economics, AQR. Historical estimates based on expanding window since January 1960. Bias-adjusted estimate subtracts annualized change in CAPE ratio. Yield-based with mean reversion assumes CAPE moves halfway to expanding mean over next 10 years.

Assumptions for longer horizons: While starting yields and mean-reverting valuations matter most over 5- to 10-year horizons, their impact gets diluted over multi-decade horizons.[27] This leaves us with historical average returns and economic theories—but theories are too many and too imprecise to guide us closely on expected returns. We begin by deciding which risks are compensated in the long run.[28] When assessing the size of any long-run premium, one useful anchor is that several major asset classes have delivered very long-run Sharpe ratios near 0.3.

Summary: Our CMAs are primarily based on branching first right and then left in **Exhibit 9**. Sometimes the yield-based approach does not makes sense: we have little idea of long-run future cash flows for commodities, hedge funds, or alternative risk premia strategies with high turnover. For these we rely on some mix of historical experience—appropriately discounted—and economic rationale.

Finally, we stress that CMA providers and consumers should be clear on what quantity is being estimated. CMAs can be expressed as real or nominal, total or excess of cash, simple or log, local or in a given currency, and at various horizons. And we stress that while we present CMAs as point estimates of future expected returns (typically real, local, geometric, over the next 5-10 years), these come with wide forecast uncertainty even at long horizons.

27 Strictly speaking, with a random-walk assumption, starting yields serve as anchors forever. Unexpected future changes in asset yields tend to have two offsetting effects: capital gains/losses and reinvestment rate changes.

28 Even the basic risk-reward tradeoff has been challenged by empirical evidence that strategies like trend following or quality-minus-junk stock selection have offered positive long-run rewards and risk reduction, likely due to behavioral biases.

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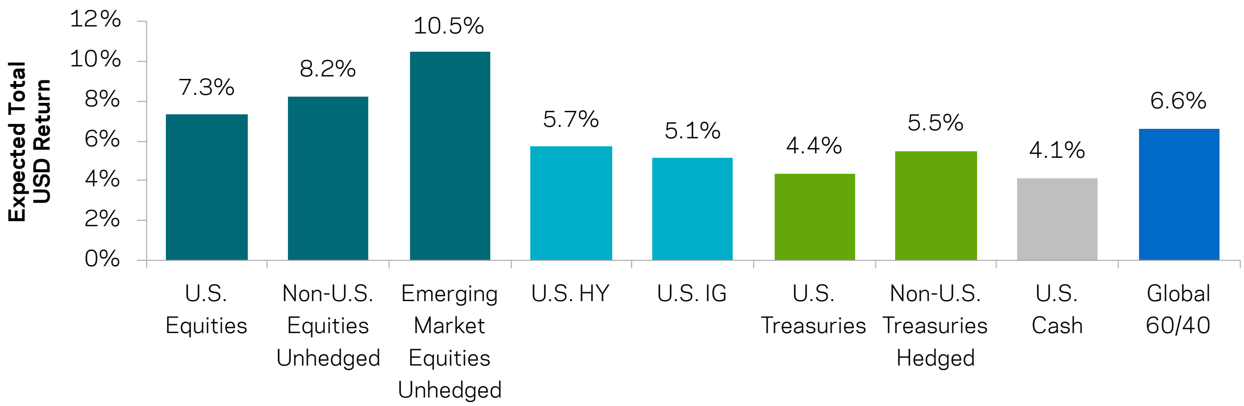
Appendix

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

As of December 31, 2023



Source: AQR. Estimates as of December 31, 2023 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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