Alternative Thinking

Capital Market Assumptions for Major Asset Classes

This issue updates our multi-year expected return assumptions for major stock and bond markets, and also investigates methods for estimating expected returns for credits and commodities. Compared to historical averages, we are still very much in a world of low expected returns.

First Quarter 2016

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Executive Summary

- We first update our estimates of long-term expected returns for stocks and bonds. Our current estimate for U.S. stocks' long-run real return remains near 4%, lower than in European and emerging markets. In the U.S. and several other markets, modest increases in earnings and dividend yields over the past year have been offset by reductions in forecast earnings growth.
- Our current estimate for U.S. 10-year government bonds' long-run real return remains near 0.5%. From a century-long historical perspective, both equity and bond expected returns remain exceptionally low, especially when taken together.
- This year we also include long-run expected returns for credits and commodities, explaining our chosen methodology for each asset class. For U.S. investment-grade and high-yield credit we estimate real returns of around 1% and 3%, respectively. For a risk-weighted portfolio of commodities we estimate a long-run real return of around 3%.
- For completeness, we restate our long-run expectations for long-only smart beta (1%-2% active return) and diversified long/short style premia (0.7-1.0 Sharpe ratio) portfolios, as described more fully in the 2015 edition of this article, and we conclude by briefly discussing expected cash returns and the implications of the low return environment for investors.

Introduction and Framework

For the past two years, the first quarter's *Alternative Thinking* has presented our capital market assumptions for major asset classes, with a focus on the long-term expected returns[1] of major equity markets and government bonds (see *Alternative Thinking, First Quarter 2014* and *Alternative Thinking, First Quarter 2015*). We update these estimates annually, both because market conditions evolve and because our methodologies may evolve based on ongoing research. We also add additional asset classes where our research permits.

We remind readers that any point estimates for expected returns come with significant uncertainty and that the frameworks for making such estimates may be more useful than the numbers themselves — and more useful for planning than market timing, except perhaps at exceedingly rare extremes. To limit repetition, we defer to previous reports for some details but review the broad methodology and present some new analyses beyond data updates.

We opt to present expectations in terms of *real* (inflation-adjusted) annual compound rates of return for a horizon of 5- to 10-years. Over such intermediate horizons, initial market yields and valuations tend to be the most important inputs. For even longer (multi-decade) forecast horizons, the impact of starting yields is diluted, so theory and historical average returns matter more in judging expected returns. For short horizons, returns are largely unpredictable but any predictability mainly reflects market momentum and the macro environment.

Equity Markets

We estimate the prospective, or expected, real return on equity markets by averaging two common approaches:

1. **Earnings yield (E/P):** The inverse of a P/E ratio measures the ex-ante real return on equities, albeit under quite strict assumptions. We like multi-year averages of trailing as-reported earnings to smooth the excessive cyclicality in annual earnings. Thus, we use the Shiller E/P ratio which compares 10-year average (real) earnings with today's (real) equity prices.
2. **DDM yield:** According to the dividend discount model (DDM), the expected real return on equities is approximately the sum of dividend yield (DY), expected trend growth in real dividends or earnings per share (G), and expected

[1] Volatilities and correlations are relatively easier to forecast — both over short and long horizons — than returns because they are more persistent.

Exhibit 1 | *Building Expected Real Returns for Equity Markets*

	E/P	DY	G	DDM=DY+G	avg(E/P,DDM)
	Adjusted Shiller Earnings Yield	Dividend Yield	Earnings Growth Estimate	DDM Yield	Real Equity Yield
U.S.	4.6%	2.0%	1.5%	3.5%	**4.0%**
Euro-5	6.3%	2.8%	1.4%	4.2%	**5.2%**
Japan	4.1%	1.5%	1.3%	2.9%	**3.5%**
U.K.	7.5%	3.6%	1.5%	5.1%	**6.3%**
Australia	6.5%	4.5%	1.4%	5.9%	**6.2%**
Canada	5.8%	3.1%	1.2%	4.3%	**5.1%**
Emerging Mkts	8.7%	2.8%	2.0%	4.8%	**6.8%**

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2015. "Euro-5" is a GDP-weighted average of Germany, France, Italy, the Netherlands and Spain. "Emerging Mkts" is based on the MSCI Emerging Markets index. Our adjusted Shiller E/P scales up the normal Shiller E/P by 1.075 to correct for the fact that the 10-year average of a series that grows over time will systematically underestimate its current value (the scalar reflects assumed real trend growth of 1.5% and 5-year average staleness). Return assumptions are subject to change. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back

change in valuations (ΔV), that is: DY+G+ΔV. We use the first two terms — country-specific dividend yield and country-specific real growth rate — but assume no mean reversion in valuations.

Academics and practitioners continue to debate the validity of these approaches, and to suggest improvements.[2] We choose to maintain our current framework, pending further research. The average of the two approaches currently points to an expected real return near 4% in the U.S. and Japan, 5% in the Eurozone and Canada, and above 6% in the U.K., Australia and emerging markets, as shown in **Exhibit 1**. These estimates are little changed from last year and remain low from a historical perspective. Still, as we'll soon see, the equity premium over bonds is significant.

One pattern worth noting is that while earnings yields and dividend yields rose in several major markets during 2015 (implying a cheapening of equity markets), our forecasts for future real earnings growth[3] also fell by 0.1%-0.5% across the board. These two developments have tended to cancel out, leaving our return estimates almost unchanged.

Government Bonds

Government bonds' prospective nominal returns, especially over long horizons, are strongly anchored by their yields. To assess prospective *real* returns, we can subtract a (say, survey-based) measure of expected inflation from nominal bond yields.

However, for bond portfolios with stable duration, so-called *rolling yield* is a better measure of expected long-run return than yield, if an unchanged yield curve is a good base case. If the yield curve is upward-sloping, this implies rolldown gains when bond yields age and roll down the unchanged curve (say, from 2.27% 10-year yield to 2.21% 9-year yield). Expected returns then exceed the yield. For example, a strategy of holding constant-maturity 10-year Treasuries has an expected annual (nominal) return of 2.75% given the starting yield of 2.27%, augmented by the capital gains from a 6bp annual rolldown yield drop.[4]

[2] Most recently and relevantly, Straehl and Ibbotson (2015) address the structural change caused by the growing use of buybacks. We hope to explore the implications of this research for our capital market assumptions, though data limitations outside the U.S. present a constraint. Separately, Professor Jeremy Siegel has challenged the use of the Shiller E/P due to changing accounting practices.

[3] Our proxy for G, the trend real growth in dividends per share or earnings per share, is based on long-term forecast real GDP growth per capita. We start with a survey forecast of next-decade average real GDP growth (published by Consensus Economics), subtract a slow-moving measure of the population growth rate in each country, and then "shrink" each country's estimate halfway toward a cross-country average (near 2%).

[4] The estimate starts with the yield of a constant-maturity bond portfolio (Y), adds on the one-year rolldown gains in an unchanged yield curve

Exhibit 2 | *Building Expected Real Returns for Government Bonds*

	Y	RR	I	Y+RR-I
	10-Year Nominal Bond Yield	Rolldown Return	10-Year Forecast Inflation	Expected Real 10Y Bond Return
U.S.	2.3%	0.5%	2.2%	**0.5%**
Japan	0.3%	0.6%	1.4%	**-0.5%**
Germany	0.6%	1.4%	1.7%	**0.3%**
U.K.	2.0%	0.8%	1.9%	**0.9%**
Australia	2.9%	0.7%	2.5%	**1.0%**
Canada	1.4%	1.0%	2.0%	**0.4%**

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2015. Return assumptions are subject to change.

Exhibit 2 shows current rolling yields for six countries, converted to real-return estimates by subtracting a forecast of long-term inflation.[5] Real return estimates are highest for Australian, U.K. and U.S. bonds (but at best 1%) and lowest in Japan (below zero). Among major developed economies, expected U.S. equity returns remain relatively low while expected U.S. Treasury returns remain relatively high — though in both asset classes our spread of estimates has converged somewhat over the past year.

Any adjustment to these expected bond returns boils down to expectations on future yield curve shifts. Capital gains/losses due to falling/rising yields dominate bond returns over short horizons but matter less over long horizons. Over the past few years, many investors have held strong views that (1) bond yields will rise soon, and (2) this outcome will be very bad news for bond investors. In last year's article, we argued that both views should be considered highly uncertain, and 2015 again vindicated this skepticism: 10-year yields rose only 0.1% and bonds earned a small positive return from carry and rolldown.

We again note that low prospective returns may materialize in several different ways, which may be broadly characterized as either "fast pain" (real yields move sharply higher, inflicting capital losses on both stock and bond investments) or "slow pain" (low yields persist for years to come).

Currency and Cash Considerations

We present real returns in local-currency terms, which are not directly comparable across countries for an investor in one country. To convert these to expected real returns seen by a foreign investor (E_{int}), we must first correct for any difference in expected inflation (I) in the two countries, and then correct for the expected cash rate differential (R, if hedged) or the expected exchange rate return from spot rate changes ($E_{currency}$, if unhedged). The adjustment for currency-hedged positions reflects the expected real cash rate differential.

$$E_{int\ hedged} = E_{local} + (I_{local} - I_{home}) + (R_{home} - R_{local})$$

$$E_{int\ unhedged} = E_{local} + (I_{local} - I_{home}) + E_{currency}$$

These corrections are currently small for most developed markets.

Likewise, to present results in terms of excess returns over cash, we would need to subtract the expected real return of cash from the expected real market returns we report. Thus, if we assume real cash rates to average zero over the coming decade, expected excess returns for all markets equal their expected real returns.

scenario (RR), and then subtracts expected long-term inflation (I) to get expected real return. One could add to this the annual capital loss of any expected yield rise (roughly, duration times yield rise, pro-rated to the number of years).

[5] If we used the 10-year break-even inflation rate (difference between nominal and index-linked Treasury yields), which was 1.6% at end-2015, instead of economists' consensus forecast, our expected real return estimate for U.S. would be 1.1% instead of 0.5%.

Credit Indices

A natural starting point for the expected return of credits, in excess of duration-matched Treasuries, is the prevailing option-adjusted yield spread (OAS) for the credit index (or any other credit portfolio).[6] However, the OAS tends to be an upward-biased estimate of prospective returns for at least three reasons.

- Most obviously, any future default losses will reduce prospective returns. This term can be estimated by assessing the expected default probability and the expected recovery rate if a default happens. The impact tends to be tiny for top-rated bonds (<<0.1%) while it can amount to half of the spread, or more, for high-yield bonds. Default losses tend to be highly cyclical — negligible in good times and sharply higher in bad times (often recessions).
- Investment-grade (IG) bonds face an empirical downgrading bias. This asymmetry is caused by two features: especially top-rated bonds are more likely to be downgraded than upgraded, and the spread impact of downgrades tends to be larger than that of upgrades. The expected net loss may be 0.1-0.3%.
- IG indices, and investors following them, employ bad selling practices.[7] Notably, they are forced to sell "fallen angels" that drop out of the index following a rating downgrade to speculative (high-yield) status. The related selling pressure tends to cause temporary price declines. The impact of such ill-timed forced selling has been estimated to reduce the long-run return for IG indices by 0.3%-0.4% — a meaningful fraction of their long-run average spread near 1.4%.

Another way to think about prospective credit returns involves assumptions about future spread changes. The expected excess return on credits may be approximated by the sum of the spread income and the capital gain/loss from changing credit spread (whose return impact is proportional to duration). Changing spreads may reflect expected changes in the level of the spread curve as well as rolling along an unchanged spread curve. In good times, credit spreads have tended to be narrow and spread curves upward-sloping; any mean reversion pressures toward normal, wider spreads (which would cause capital losses) tend to be balanced by spread rolldown gains as well as by cyclically low near-term default probabilities. Conversely, in bad times, credit spreads have tended to be wide and spread curves downward-sloping; any mean reversion pressures toward normal, narrower spreads (which would cause capital gains) tend to be balanced by spread roll-up losses as well as by cyclically high near-term default probabilities.

Overall, these balancing forces mitigate the cyclical variation in actual credit returns. They also anchor forward-looking credit returns better to starting spreads because predicting the net impact of these forces is hard — and accurately predicting the cyclical environment is even harder. Moreover, our focus is on multi-year expected returns, and any cyclical effects tend to wash out or at least get diluted over 5-10 years. Thus, in this report we choose to anchor the expected excess return strongly on the starting OAS and only ask which fraction of it we should expect to realize in long-run future returns.

Exhibit 3 applies our preferred simple approach to U.S. IG and HY credit indices. We assume no change in spread either through rolldown or mean-reversion effects, though we note that current spreads are mildly above average.[8] We apply a simple haircut of 50%[9] to both IG and HY spreads to

[6] Option-adjusted spreads take into account the embedded options in bonds given to the issuer. Before this adjustment, the raw yield spreads are somewhat wider. For in-depth studies of the credit risk premium, see Ilmanen (2011) chapter 10 and Asvanunt-Richardson (2015).

[7] Index rules imply that bonds downgraded below investment grade are sold out of the index at the prevailing market prices at a month end after the downgrade. Many index-oriented investors sell their bonds exactly at that time, for regulatory reasons or to reduce tracking error, causing synchronous selling pressure. Some investors have tried to correct any bad selling practices in recent years and become more patient with their "fallen-angel" holdings. See Ng and Phelps (2011).

[8] The differences between current and average spreads are less than one standard deviation, so mean reversion pressures may be mild.

[9] Consistent with Giesecke et al (2011), who find that over the very long

represent the combined effects of the three bullets above — expected default losses, downgrading bias and bad selling practices. This haircut reflects expected default losses for HY bonds but mainly the downgrading bias and bad selling practices for IG bonds. Halving the 2015 year-end OAS gives an expected excess return over duration-matched Treasuries of 0.8% (3.3%) for IG (HY).[10]

Finally, to get the expected real return for credits, we add the expected real return of a duration-matched Treasury. This added term is small (smaller than the 0.5% for 10-year Treasuries in Exhibit 2 because credit indices have a somewhat shorter duration and the yield curve is upward-sloping).

Exhibit 3 | *Expected Real Return on U.S. Credits: A Simple Approach*

	U.S. IG	U.S. HY
Option-Adjusted Spread (OAS)	1.7%	6.6%
Average OAS 1994-2015	1.4%	5.2%
Duration	7.0	4.3
Expected Excess Return Over Duration-Matched Treasury	0.8%	3.3%
Expected Real Return	1.1%	3.3%

Sources: Barclays, Bloomberg and AQR. OAS and duration data is for Barclays U.S. Corporate Investment Grade Index and Barclays U.S. Corporate High Yield Index.

Our future research may lead to better estimates than the above if we can assess the combined *multi-year* impact of mean-reverting spread changes, spread rolldown, and expected default losses. Although our current forecasts are not directly based on our default probability estimates, we note that these have been increasing through 2015. Moody's realized default probability rates for HY recently rose to 3%, above the median of 2.7% since 1971.[11] Our models for near-term expected default probability rates reflect a similar pattern and estimate somewhat higher rates for 2016.[12]

Commodities

Our commodity research team has created a uniquely long data set of commodity futures returns, dating back to 1877.[13] This data set can help us address questions about the long-run returns we can expect for a diversified portfolio of commodity futures. Of course the further back we go historically, the narrower the commodity universe tends to be and the lower the data quality. Thus we will also show evidence starting from 1951 (when we have a broader commodity universe).

If there is a constant "commodity risk premium" over time, we can best estimate it by studying the long-run average return (in excess of cash). However, if the commodity risk premium varies predictably over time, then a fitted value from a predictive regression will give us a better estimate. We will show below that over the long run, a diversified portfolio of commodity futures has earned about 4% (3%) arithmetic (geometric) average excess return over cash. This turns out to also be our best forward-looking estimate because our regression analysis does not uncover statistically significant predictable time-variation in multi-year commodity returns.[14]

Now to the data. **Exhibit 4** shows evidence on the performance of an equal-volatility-weighted portfolio of commodity futures, in early decades holding only 3-6 grains but the universe growing to 15 by 1970 and 24 by 1990. The arithmetic (geometric) average return over cash was 4.2%

term, the average credit risk premium is roughly half the average spread. We find similar results using a shorter data set.

[10] Exhibit 3 shows spreads for cash bonds in the popular Barclays indices. Actively traded synthetic indices (Markit North America CDX) tend to have 50-100bps narrower spreads for HY bond. The so-called basis between cash and synthetic bonds was wide at end-2015 as the CDX traded near 5% compared to cash bonds' 6.6%.

[11] Source: Moody's press release "Moody's: Global Spec-Grade Corporate Default Rate Rose in November," December 2015.

[12] We are bearish on HY near term. Although HY spreads widened in 2015 our fair value anchors rose even more, making HY appear unattractive. However, we repeat that our capital market assumptions are made for long horizons over which such near-term cyclical predictions get diluted.

[13] Much of this data, especially pre-1950, has never been used in publication before, and was manually entered from Annual Reports of the Chicago Board of Trade.

[14] This *Alternative Thinking* focuses on long-run expected returns. We will discuss elsewhere more short-term behavior of commodities as an asset class as well as single commodities, such as oil, whose recent gyrations have been exceptional.

(2.9%) since 1877 and 4.1% (3.4%) since 1951.[15] Volatility was comparable to a broad equity index: 17% since 1877 and 12% since 1951 (though it would have been higher for a less well diversified commodity portfolio), Sharpe ratios were around 0.3. The last two rows show that, on average, the gains came from spot price appreciation, while rolling the futures detracted mildly. Thus, the negative roll yields of the past decade are nothing new. We also studied the performance of a nominally equal-weighted portfolio; all key results were similar, though it had slightly higher average returns and volatilities (results available on request).

Exhibit 4 | *Historical Performance of an Equal-Volatility-Weighted Portfolio of Commodity Futures (Estimating a Constant Commodity Risk Premium)*

	1877-2015	1951-2015
Total Return (AM)	7.8%	8.4%
Excess Return (AM)	4.2%	4.1%
Excess Return (GM)	2.9%	3.5%
Annualized Volatility	16.8%	12.3%
Sharpe Ratio	0.25	0.34
Spot return (GM)	4.4%	4.8%
Roll return/yield (GM)	-0.6%	-0.7%

Sources: AQR, Bloomberg, Chicago Board of Trade, Commodity Systems Inc. The portfolio consists of 2 to 25 of the most actively traded commodity futures, with the universe generally increasing over time as new data becomes available. Equal-volatility-weighting is based on rolling 12-month volatilities. AM = arithmetic mean. GM = geometric mean. Data presented is based on hypothetical portfolios and are not representative of any AQR product or investment Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back

What about time-varying expected returns? The yield-based estimates we use for stocks and bonds are not available for commodities, but we can study the predictive ability of carry/roll (shape of the commodity term structure) as well as momentum (proxied by past-year return) and multi-year reversal (proxied by the negative of four-year return one year ago). Because such indicators are known to predict cross-sectional returns between commodities, we might expect them to also predict commodity portfolio returns over time. Indeed, **Exhibit 5** (upper panel) shows that when predicting next-month portfolio returns, over the full sample since 1877 all regression coefficients are statistically significant (by far the largest *t*-statistic of 3.9 is for momentum; over the shorter sample momentum is the only predictor with a *t*-statistic over 2).

Exhibit 5 | *Regressing an Equal-Volatility-Weighted Portfolio of Commodity Futures on Three Predictors: Carry, Momentum, Reversal (Analyzing Time-Variation in Commodity Risk Premia)*

	1877-2015	1951-2015
One-Month Horizon	**Coeff. (t-stat)**	**Coeff. (t-stat)**
Intercept (monthly)	0.37% (3.0)	0.31% (2.3)
Carry Predictor	0.31 (2.3)	0.31 (1.8)
Momentum Predictor	0.03 (3.9)	0.03 (3.0)
Reversal Predictor	0.01 (2.0)	-0.00 (-0.4)
R-Squared	2%	2%
5-Year Horizon	**Coeff. (t-stat)**	**Coeff. (t-stat)**
Intercept (annualized)	4.02% (1.9)	4.79% (1.6)
Carry Predictor	0.42 (1.6)	0.44 (0.9)
Momentum Predictor	0.13 (1.2)	-0.16 (-0.6)
Reversal Predictor	0.00 (0.0)	0.01 (0.1)
R-Squared	17%	9%

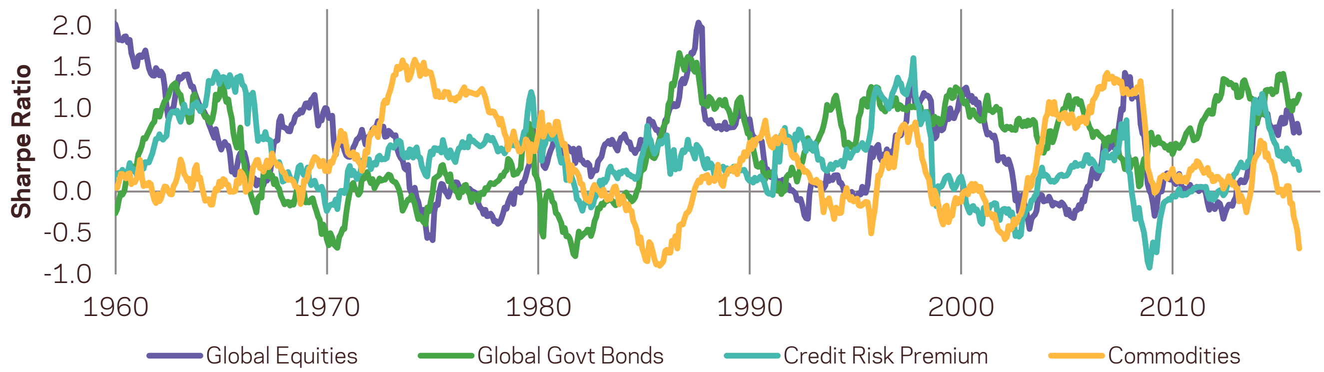
Sources: AQR, Bloomberg, Chicago Board of Trade, Commodity Systems Inc. The portfolio consists of 2 to 25 of the most actively traded commodity futures, with the universe generally increasing over time as new data becomes available. Equal-volatility-weighting is based on rolling 12-month volatilities. Every predictor is measured at the individual commodity level and then aggregated to the basket level. Carry measures the difference between the front month and second month contracts for each commodity. Momentum measures the last 12 month returns of each commodity. Reversal measures the negated four-year spot move, starting one year ago.[16] Data presented is based on hypothetical portfolios and are not representative of any AQR product or investment Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back

However, when we predict returns over a one-year horizon (not shown) or a five-year horizon (lower

[15] The difference between total and excess returns shows that cash return averaged 3.6% (4.3%) since 1877 (1951). Since cash (proxied by Treasury bills or other money market instruments) earned a modest positive real return, the real return of commodities would have been about 1% higher than their excess return. However, we assume zero real returns for cash over the next 5-10 years, so we expect about 3% geometric mean excess and real return for a diversified commodity portfolio. Note that the geometric mean for single commodities has been lower than that for a diversified portfolio, near zero on average, because the "variance drag" (half the volatility squared) between arithmetic and geometric means is much larger for single commodities (whose volatility averages near 30%) than for a diversified portfolio.

[16] See forthcoming whitepaper Levine, Ooi and Richardson (2016).

Exhibit 6 | *Historical Rolling 5-Year Sharpe Ratios for Four Asset Classes 1960-2015*



Sources: AQR, Bloomberg, Barclays, Ibbotson. Global equities, bonds and commodities are equal-weighted composites of several markets, as constructed in Hurst-Ooi-Pedersen (2014). Credit risk premium is constructed as the excess return of U.S. corporate bonds over empirical-duration-matched Treasuries as in Asvanunt-Richardson (2015).

panel), no predictors have statistically significant coefficients over the full or the shorter sample; only the intercept has a *t*-statistic near 2.[17] The regression results are broadly similar for the equal-dollar-weighted portfolio: no evidence of time-varying expected returns over one-year or five-year horizons.

Bottom line: Since our capital market assumptions focus on long-run expected returns and we find no statistically significant predictability in multi-year returns in Exhibit 5, our best estimate of a future long-run commodity risk premium is about 4% (3%) arithmetic (geometric), based on Exhibit 4. Our use of a constant risk premium for commodities differs from our use of yield-based estimates for other markets above for the simple reason that equity and bond markets exhibit statistically significant time-variation in multi-year expected returns whereas commodities do not.[18]

We suspect that if we had better value anchors for commodities we would uncover more significant long-run reversal patterns; this would be particularly relevant today, after many years of poor returns. Even though our capital market assumptions do not incorporate an assumption of mean reversion for any asset class, it is worth showing rolling 5-year Sharpe ratios in **Exhibit 6**. A contrarian-minded investor likely will find interesting the recent multi-year underperformance of commodities both in absolute and relative to other asset classes, despite the lack of statistically significant evidence of long-run predictability. The most recent 5-year Sharpe ratio for commodities is about as low as we have seen for any asset class in the past.

Smart Beta and Style Premia

"Smart Beta" (Style-Tilted Long-Only) Portfolios

In last year's article we assumed that a hypothetical value-tilted (but still diversified long-only equity) portfolio has an expected real return of around 1% higher than the cap-weighted index, after fees.[19] A multi-style strategy — which we assume to include three highly complementary, "tried and true" strategy styles, notably value, momentum and profitability — can be designed to convert its

[17] Despite the lack of statistically significant relations, we note that current predictor signals are strongly negative from past-year momentum, positive from multi-year reversal, and mildly negative from carry/roll. Using the statistically insignificant point estimates of regression coefficients gives a net prediction that is mildly positive or negative depending on the horizon.

[18] Unlike these long-horizon capital market assumptions, our short-term trading strategies may use the short-horizon predictability documented in Exhibit 5. However, most of our trading strategies — including those for commodities — tend to focus more on cross-sectional opportunities than directional market timing.

[19] Smart beta strategies exhibit so many design variations that it is difficult to generalize. To list just a few, style tilts may be industry-neutral or may permit industry bets, they may or may not be beta-neutral, and they may have different levels of tracking error. Beyond the strategy design, implementation efficiency and fees affect net expected returns. See Alternative Thinking 1Q2015 for details of our assumptions, which we believe are plausible and conservative. All assumptions are purely illustrative and do not represent any AQR product or strategy.

superior expected diversification into a higher expected active return of around 2% net. Finally, a defensive or low-risk 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.

Style Premia (Long/Short Alternative Risk Premia)

Style 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 invested at any volatility level, it makes sense to focus on Sharpe ratios and then scale them by the chosen volatility target to get ex-ante estimates of excess return over cash.

The degree of diversification is essential. Individual alternative risk premia (a single long/short style in a single asset class) might have similar forward-looking Sharpe ratios as market risk premia in asset classes (0.2-0.3), but for a diversified composite of alternative risk premia (multiple styles applied across multiple asset classes) we assume an ex-ante Sharpe ratio of 0.7-1.0, net of trading costs and fees. In contrast, few long-only portfolios may reach realistic ex-ante Sharpe ratios of 0.5-0.6.[20]

Cash

The prospects for cash returns depend on the expected path of inflation and of real cash rates. While long-term inflation expectations have been well anchored near 2%, there is less consensus on the pace at which real cash rates normalize from their exceptional negative levels (still below -1% in the U.S.). The Fed was the first G-3 central bank to hike policy rates but even it intends to act "patiently," while the European Central Bank and the Bank of Japan will likely continue quantitative easing. We maintain our view that world economies and financial institutions are not ready for steeply rising real yields, suggesting that a low expected return environment may remain with us for several years. The consensus view in economist surveys (such as Blue Chip Economic Indicators) as well as the Federal Reserve "dot points" predict that real U.S. cash rates will turn clearly positive by 2018, whereas the "new neutral" argument points to a slower normalization and real policy rates near zero for longer. We do not make direct forecasts of policy rates but sympathize with the latter view. In Europe and Japan it is quite conceivable that real policy rates stay negative over our forecast horizon.

Conclusion

This report expands our menu of capital market assumptions for additional sources of return that may help in the current challenging environment. Empirical evidence suggests that the credit risk premium deserves a place alongside equity and term premia. Commodities, while inflicting considerable pain on investors during the past year, have earned a positive and lowly correlated premium over a long period and can protect against unforeseen inflation.

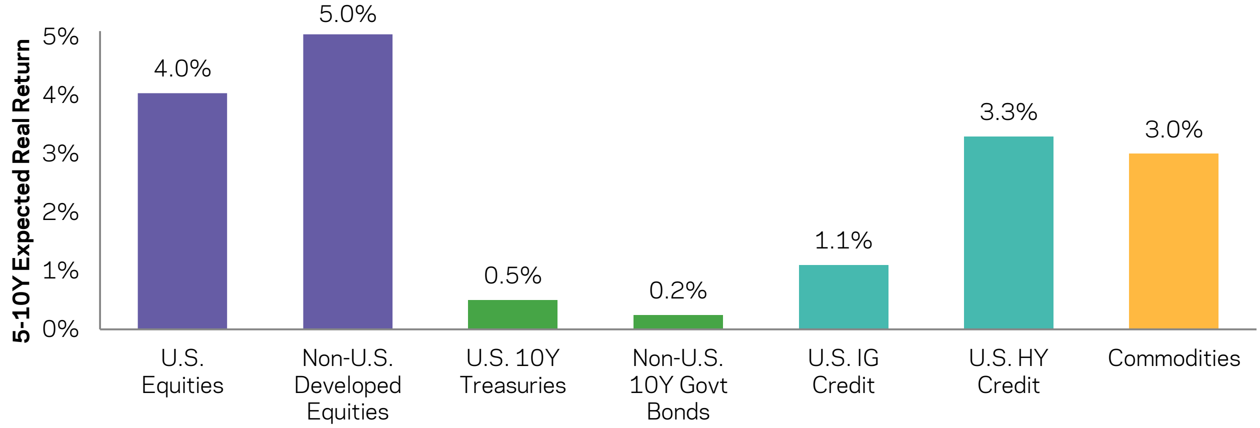
Our estimates are summarized in Exhibit 7. All asset classes do have positive expected real returns, which is more than can be said for cash. However, we clearly are in a world of low expected returns. For the two assets where we have century-long histories, current expected real returns are well below the median level since 1900 (which was 6.2% for U.S. equities and 3.1% for U.S. Treasuries).

Long/short style premia offer the advantage of being relatively insensitive to the riskless real yields which serve as (part of) discount rates for all long-only assets. The richness of long-only assets need not carry over to long/short strategies and the latter may be less vulnerable to any increases in real yields.

It bears repeating that the message we take away from all the above is not to time the market aggressively but to make sure to use reasonable (i.e., lower) expectations for asset class returns, and diversify as much as constraints permit across many sources of expected returns.

[20] We assume low correlations between the styles to produce our assumed Sharpe ratio range for a diversified composite of long/short styles. All assumptions are purely illustrative and do not represent any AQR product or strategy.

Exhibit 7 | *Summary of Expected Long-Run Real Return Estimates for Major Asset Classes*



Source: AQR; see Exhibits 1-4 for details. "Non-U.S. developed equities" is a cap-weighted average of Euro-5, Japan, U.K., Australia and Canada. "Non-U.S. 10Y government bonds" is a GDP-weighted average of Germany, Japan, U.K., Australia and Canada.

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