Thinking

Capital Market Assumptions for Major Asset Classes

This issue updates our multi-year expected returns for major asset classes. Compared to historical averages, we are still very much in a world of low expected returns. We have revised our method for estimating equity expected returns, incorporating estimates of net buyback yield and broadening our estimates of earnings growth to include additional inputs.
Executive Summary

- In this article we update our estimates of long-term expected returns for stocks, bonds and some other asset classes and factors.

- Our current estimate for the long-run real return of U.S. equities is 4.2%, somewhat lower than most other developed markets (average 4.6%) and emerging markets (5.4%). Our current estimate for U.S. 10-year government bonds’ long-run real return is 0.7%. For U.S. investment-grade and high-yield credit we estimate real returns of 1.4% and 2.1%, respectively. For a risk-weighted portfolio of commodities we estimate a long-run real return of around 3%.

- From a historical perspective almost all long-only investments have low expected returns today. In fact, the traditional US 60/40 portfolio has, in recent years, offered an expected real return of less than half its long-term average (since 1900) of roughly 5%.

- In this low return environment, one increasingly popular way to potentially enhance returns is diversification via uncorrelated, alternative risk premia like styles. We expect higher returns for smart beta than cap-weighted portfolios, and clearly higher expected risk-adjusted returns for long-short style premia compared to long-only portfolios.

- This year we revise our methodology for estimating expected equity market returns, to account for the growing use of buybacks. In principle, expected returns should not be affected by changes in payout policy. However, as described later, the classic dividend discount model (DDM) may underestimate equity returns. We make changes to both the earnings-based and payout-based estimates that we combine for our expected real returns.

Introduction and Framework

For the past three years, the first quarter’s Alternative Thinking has presented our capital market assumptions for major asset classes, with a focus on long-term expected returns¹ (see 2014, 2015 and 2016). 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. Further, while the low yields of bonds are the most evident, we stress that almost all long-only investments have low expected returns today. All long-only assets are priced as the sum of their expected cash flows discounted by the riskless yield plus myriad risk premia. Thus, the riskless yield is the common component of all assets’ discount rate and when it is near historical lows, it tends to make all assets expensive versus their own histories. For example, a U.S. 60/40 portfolio² averaged a 5.4% expected real return in the 1900s but has offered only 2-2.5% in recent years. For other countries and assets, we may not have as long histories, but the decline in expected returns is still evident.

As usual, we present expectations in terms of real (inflation-adjusted) annual compound rates of return for a horizon of 5-10 years. Over such intermediate horizons, initial market yields and valuations tend to be the most important inputs.³

For even longer (multi-decade) forecast horizons, the impact of starting yields is diluted, so theory and historical average returns matter more in judging

---

¹ Volatilities and correlations are relatively easier to forecast — both over short and long horizons — than returns because they are more persistent. ² The U.S. 60/40 is 60% U.S. stocks represented by the Standard&Poor’s 500 Index and 40% U.S. 10-year Treasuries. ³ Thus, we prefer to estimate expected returns based on current market yields, and we use them for stocks and bonds with some tweaks (adjusting for growth, rollover, default estimates). In other cases — commodities and style premia — yield measures are not available or as relevant, so our estimates are based more on historical returns. In no cases do we assume mean-reverting valuations (we discussed the evidence in the Alternative Thinking, 2015 Q1).
expected returns. For short horizons, returns are largely unpredictable but any predictability mainly reflects momentum and the macro environment.

Exhibit 1 summarizes our expected return estimates for long-only asset classes. They have not changed much from last year; the clearly biggest move is a 1% fall in the expected return of high-yield credits. Next up, we briefly describe the methodology used for each.

**Equity Markets**

In the classic DDM, the expected real return on equities is approximately the sum of dividend yield (DY), expected trend growth (g) in real dividends or earnings per share EPS, and expected change in valuations ($\Delta v$), that is: $E(r) = DY + g + \Delta v$. As in past years, we average estimates from two methods which include the first two terms — yield and growth proxies — but assume no mean reversion in valuations, i.e., $E(r) = DY + g$.

This year, we revise our methodology to account for the structural change of firms replacing dividend payouts with share buybacks since the 1980s, which can influence both the yield and growth estimates. We provide a summary here with more color in the appendix.

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. To smooth the excessive cyclicalities in annual earnings, we use the inverse of the CAPE ratio (cyclically-adjusted P/E ratio, also called the Shiller P/E), which is the 10-year average of earnings, inflation-adjusted to today’s price levels, divided by today’s price.

Earnings yield is independent of payout ratio and changes in payout policy. However, as shown in Exhibit 2, it results in equity return estimates too volatile for long-run estimates that assume no mean-reversion. One simple way to remedy this is to proxy dividend yield with 50% of the Shiller E/P (roughly the long-run average dividend payout ratio in the U.S.), and plug this into the DDM with a real growth rate of 1.5% (the long-run run average real growth in EPS) to form a less volatile earnings-based estimate of expected real return that is still unaffected by changes in payout policy. Exhibit 2 plots expected returns from this modified earnings yield approach for the U.S. since 1900 (yellow line), alongside the simple earnings yield approach and the classic DDM method. We see that the revised method closely mirrors the classic DDM but has the advantage of being notably less volatile than the regular Shiller E/P. Exhibit 2 also shows that across all three methods, equity expected returns are far lower today than in the 1900s, as mentioned earlier.
To summarize, our revised earnings yield-based equity expected return is:

\[ E(r) = 0.5 \times \text{Adjusted Shiller E/P} + g \]

where \( g \) = long-run real earnings-per-share growth

We apply the U.S. long-run average payout ratio of 50% and real growth rate in EPS of 1.5% to all countries, except for emerging markets where we use a somewhat higher growth rate of 2%.

2. DDM yield

As per the classic DDM \( E(r) = DY + g \), our past approach was to estimate returns by summing country-specific current dividend yield \( DY \) and country-specific long-run real growth rates in EPS, proxied by forecast growth in GDP per capita.

To adjust the DDM for buybacks, we add smoothed net buyback yield (net buybacks equals buybacks minus issuance) to dividend yield, and correspondingly convert the per-share growth term to an aggregate growth term that includes net issuance. As shown in the technical appendix, assuming no repricing of valuation multiples, the Net Total Payout model defines expected real equity return approximately as

\[ E(r) = \text{NTY} + g_{TPagg} \]

where

- \( \text{NTY} = \) Net Total Payout Yield = \( DY + \) Net Buyback Yield
- \( g_{TPagg} = \) growth in real aggregate total payouts

Putting It All Together

Exhibit 3 summarizes our expected equity returns using both methods described above, as well as their average as our final estimate.

Exhibit 3 | Expected Equity Return Estimates

<table>
<thead>
<tr>
<th></th>
<th>Earnings-Yield Based</th>
<th>DDM Based</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 ( \times ) Adj. Shiller E/P + g (EPS)</td>
<td>DY + NBY + g_{TPagg}</td>
<td>Expected Real Equity Return</td>
</tr>
<tr>
<td>U.S.</td>
<td>3.7%</td>
<td>4.8%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Euro-5</td>
<td>4.4%</td>
<td>5.2%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Japan</td>
<td>3.7%</td>
<td>4.2%</td>
<td>3.9%</td>
</tr>
<tr>
<td>U.K.</td>
<td>4.6%</td>
<td>6.0%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Australia</td>
<td>4.5%</td>
<td>5.8%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Canada</td>
<td>4.0%</td>
<td>3.6%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Global Devlp.</td>
<td>3.8%</td>
<td>4.9%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Global Dev. ex US</td>
<td>4.2%</td>
<td>5.0%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Emerging Mkts</td>
<td>6.4%</td>
<td>4.5%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

Source: AQR, Consensus Economics and Bloomberg. Return assumptions and methodology are subject to change and based on data as of December 30, 2016. The local real equity expected return is an average of two approaches: 1. The Shiller earnings yield (using 10-year earnings) scaled by 1.075 (embedding an annual real EPS growth of 1.5%), multiplied by 0.5 and added to a real growth rate in EPS of 1.5% for developed countries and 2% for emerging markets. 2. The sum of dividend yield (DY) plus estimates of net buyback yield (NBY) and long-term real growth of aggregate payouts \( g_{TPagg} \). For earnings yield, U.S. is based on the S&P 500; U.K. on the FTSE 100 Index; “Euro-5” is a cap-weighted average of large-cap indices in Germany, France, Italy, the Netherlands and Spain; Japan on the Topix Index; and “Emerging Markets” is based on the MSCI Emerging Markets Index. The period for NBY is 1988 through 2016. For DDM estimates, all countries are based on corresponding MSCI indices. “Global Developed” is a cap-weighted average of the developed market estimates. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back.
Exhibit 4 | Building Expected Real Returns for Government Bonds

<table>
<thead>
<tr>
<th></th>
<th>10-Year Nominal Bond Yield</th>
<th>Rolldown Return</th>
<th>10-Year Forecast Inflation</th>
<th>Y+RR-I Bond Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>2.4%</td>
<td>0.5%</td>
<td>2.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Japan</td>
<td>0.0%</td>
<td>0.3%</td>
<td>1.1%</td>
<td>-0.7%</td>
</tr>
<tr>
<td>Germany</td>
<td>0.2%</td>
<td>1.2%</td>
<td>1.7%</td>
<td>-0.3%</td>
</tr>
<tr>
<td>U.K.</td>
<td>1.2%</td>
<td>1.0%</td>
<td>2.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Australia</td>
<td>2.8%</td>
<td>0.6%</td>
<td>2.5%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Canada</td>
<td>1.7%</td>
<td>0.9%</td>
<td>2.0%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Global Developed</td>
<td>1.8%</td>
<td>0.6%</td>
<td>2.0%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 30, 2016. Return assumptions are subject to change. “Global Developed” is a GDP-weighted average of the country estimates.

Our final estimate of long-run expected real return for U.S. equities is 4.2% using our new method (just 0.2% higher than it would have been under the former method). As before, prospective real return estimates are clearly higher for European, Australian, and Emerging equity markets than for North America and Japan.

For emerging markets, we continue to use the classic DDM in place of the NTY model, due to data limitations described in the technical appendix. Exhibit A1 in the appendix provides a more detailed breakdown of Exhibit 3.

Government Bonds

Government bonds’ prospective nominal total returns, especially over long horizons, are strongly anchored by their yields. For bond portfolios with stable duration, so-called rolling yield is a better measure of expected long-run return, if an unchanged yield curve is a good base case. If the yield curve is upward-sloping, this implies rolldown gains when bonds age and their yields roll down the unchanged curve (say, from 2.43% 10-year yield to 2.37% 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 near 3% given the starting yield of 2.43%, augmented by the capital gains from a 6bp annual rolldown yield decline.

Exhibit 4 shows current local rolling yields for six countries, converted to local real return estimates by subtracting a survey-based forecast of long-term inflation. Real return estimates are in the range 0% to 1% for most markets, but are negative for Japan and Germany. Among major economies, expected U.S. equity returns remain relatively low while expected U.S. Treasury returns remain relatively high.

Any adjustment to these expected bond returns boils down to expectations on future changes in the yield curve level or shape. 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. We have argued that both views should be considered highly uncertain, and 2016 vindicated this skepticism again as yields fell in all countries, at least until the U.S. presidential election. Even after some sharp yield rises in the fourth quarter, a currency-hedged global government bond index outperformed cash over the year.

---

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 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).
Expectations of looser fiscal policy and tighter monetary policy have raised U.S. Treasury yields in recent months. Our expected return estimates in Exhibit 4 do not embed future shifts in the yield curve, but the steepness does give some cushion against further yield rises, and provide rolldown gains if the yield curve remains unchanged.

What about Europe and Japan: can investments in negative-yielding bonds ever be justified? We believe the answer is yes, for several reasons. Firstly, the purpose of investing (rather than holding cash) is to earn returns in excess of the risk-free rate. Long-horizon expected cash returns are difficult to estimate (see later section) but low bond yields should be considered in the context of exceptionally low cash rates. Secondly, as we discovered in 2016, yields can turn negative — in other words, there are conceivable outcomes where yields fall even further. This may not be the central case but it warrants humility in tactical allocation. Thirdly, bonds remain useful diversifiers for equity-dominated portfolios. Even in rising rates environments they have exhibited low correlations to other asset classes. Reducing to zero a major allocation such as German or Japanese bonds represents a very aggressive tilt ill-matched to the low conviction in return forecasts.

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 \((R\text{, if hedged})\) or the expected exchange rate return from spot rate changes \((E_{currency}\text{, if unhedged})\). The adjustment for currency-hedged positions reflects the expected real cash rate differential.

\[
E_{int \text{ hedged}} = E_{local} + (I_{local} - I_{home}) + (R_{home} - R_{local})
\]

\[
E_{int \text{ unhedged}} = E_{local} + (I_{local} - I_{home}) + E_{currency}
\]

The significance of these corrections has increased somewhat over the past year. For example, expected U.S. inflation is approximately 0.5% higher than in Germany and 1% higher than in Japan, while U.S. cash rate differentials are now near 1% for both. If those differentials were to persist, a hedged U.S. investor would expect real returns about 0.5% higher than local estimates for Germany, and similar to local estimates for Japan.\(^5\)

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 for simplicity we assume real cash rates to average zero over the coming decade, expected excess returns for all markets would equal their expected real returns.

Credit Indices

In last year’s article we discussed possible methodologies for estimating expected returns for credit indices, and settled on the following simple approach. We apply a haircut of 50%\(^6\) to both IG and HY spreads to represent the combined effects of expected default losses, downgrading bias and bad selling practices. We assume no change in the spread curve, say, through mean-reversion.

Exhibit 5 applies our preferred approach to U.S. IG and HY credit indices. Halving the 2016 year-end OAS gives an expected excess return over duration-matched Treasuries of 0.6% (2.0%) for IG (HY).\(^7\) To this we add the expected real yield of a duration-matched Treasury (currently negative for the lower duration high yield index). Finally, we add rolldown

\(^5\) This hedging adjustment assumes that covered interest rate parity (CIP) holds. In recent years, the failure of CIP has tended to make hedging more attractive than implied by local cash rates for U.S. investors holding euro- and yen-denominated assets, and vice versa (BIS Annual Report 2016).

\(^6\) Consistent with Giesecke et al (2011), who find that over the very long term, the average credit risk premium is roughly half the average spread. We find similar results using a shorter data set. We may try to improve on this estimate in future editions, but note that improved forecasts of default losses are typically made for shorter horizons, not for 5-10 years.

\(^7\) Exhibit 5 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 bonds. The so-called basis between cash and synthetic bonds narrowed during 2016, with the CDX trading near 3.6% at year-end compared to cash bonds’ 4.1%.
return — both Treasury rolldown and the additional spread curve rolldown as bonds age and roll down the OAS curve. Thanks to the credit spreads (and additional rolldown for IG bonds), the expected real return for credits is clearly higher than for Treasuries.

Commodities

In last year’s article, we tested for predictable time variation in the commodity risk premium using a uniquely long data set of commodity futures returns, dating back to 1877. While we did find statistically significant predictability in short-term returns, this did not extend to predicting multi-year returns. Lack of useful yield measures and lack of long-horizon predictability suggest that our best estimate of 5-10-year expected return for commodity futures is simply the long-run average return.

A diversified portfolio of commodity futures has earned about 3% geometric average excess return over cash. Exhibit 6 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 geometric average return over cash was 3.2% since 1877 and 3.4% since 1951. If we assume near-zero real return for cash, the expected real return would be 3%.

Exhibit 5 | Expected Real Return on U.S. Credit Indices

<table>
<thead>
<tr>
<th></th>
<th>A. Spread Return</th>
<th>B. Treasury Real Yield</th>
<th>C. Rolldown Return</th>
<th>A+B+C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Option-Adjusted</td>
<td>OAS Haircut</td>
<td>Expected Excess Return</td>
<td>Duration Matched Tsy Yield</td>
</tr>
<tr>
<td>U.S. IG</td>
<td>1.2%</td>
<td>50%</td>
<td>0.6%</td>
<td>2.3%</td>
</tr>
<tr>
<td>U.S. HY</td>
<td>4.1%</td>
<td>50%</td>
<td>2.0%</td>
<td>1.6%</td>
</tr>
</tbody>
</table>

Source: 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. Duration for the Barclays Investment Grade index is 7.3 years while that for the Barclays High Yield index is 4.1 years.

Exhibit 6 | Historical Performance of an Equal-Volatility-Weighted Portfolio of Commodity Futures (Estimating a Constant Commodity Risk Premium)

<table>
<thead>
<tr>
<th></th>
<th>1877-2016</th>
<th>1951-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess Return (AM)</td>
<td>4.5%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Excess Return (GM)</td>
<td>3.2%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Annualized Volatility</td>
<td>16.8%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>0.27</td>
<td>0.33</td>
</tr>
</tbody>
</table>

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.

Smart Beta and Style Premia

“Smart Beta” (Style-Tilted Long-Only) Portfolios

In this low return environment for traditional long-only asset classes, investors have been increasingly trying to boost returns by adding diversifying alternative risk premia like styles to their portfolios. We therefore provide our long-run expectations for long-only smart beta and diversified long/short style premia portfolios, as described more fully in the 2015 edition of this article.

In our 2015 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. A

---

8 For more details, see Levine, Ooi and Richardson (2016).

9 Refer to AQR alternative Thinking, Q2 2015, “Strategic Portfolio Construction: How to Put It All Together”

10 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
multi-style strategy — which we assume to include three highly complementary, “tried and true” strategy styles, notably value, momentum and quality — can be designed to convert its 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). Very few long-only portfolios may realistically reach ex-ante Sharpe ratios of 0.5-0.6. Yet, for a diversified composite of alternative risk premia we believe an ex-ante Sharpe ratio of 0.7-0.8, net of trading costs and fees, can be feasible when multiple styles 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. We stress that this requires careful craftsmanship in portfolio construction as well as great efficiency in controlling trading, financing and shorting costs.

**What About Current Style Valuations?**

The above estimates are mainly based on historical average returns, adjusted for trading costs and fees and some discounting. There has been active debate on whether smart beta or style premia valuations are currently exceptionally expensive and on whether such valuations can be used for contrarian factor timing or rotation. We have studied these topics closely and expect to publish more on them in 2017, but our short answers are:

- First, viewed as a group, the main factors are hardly expensive. Indeed, today’s valuations are, on average, surprisingly close to 25-year norms. Some factors are rich (notably, defensive stock strategies) but not off-the-chart, while others are on the cheap side.
- Second, contrarian factor timing or rotation using such valuation signals has been surprisingly ineffective in the past. At least three reasons contribute: (i) factor portfolios have evolving constituents, and timing a “moving target” is harder; (ii) contrarian factor timing strategy is itself correlated with static value; and (iii) it is especially hard to improve on the performance of a strategically diversified multifactor portfolio that already includes value (diversification trumps timing).

**Cash**

The prospects for cash returns depend on the expected path of inflation and of real cash rates. Long-term U.S. inflation expectations have remained well-anchored just above 2%, though rising slightly and becoming more uncertain following the result of the presidential election. Even though the Federal Reserve is the only major central bank in a policy tightening mode, it expects
to act slowly and keep real policy rates negative still at the end of 2017. The European Central Bank and the Bank of Japan intend to continue quantitative easing amid very low inflation and negative nominal and real short-term rates. In Europe and Japan it is conceivable that real policy rates stay negative over our forecast horizon.

Conclusion

This report details improvements to our return estimates for equities, and updates estimates for several other asset classes and sources of return.

By adopting a net total payout model for equity returns, we use a model that is independent of payout policy, and thus more comparable across countries. The net payout model is better suited to the growing use of share repurchases in place of dividends, unlike the traditional DDM which underestimates returns if dividend yields are used with historical per-share growth rates.

The investment environment remains challenging. Most asset classes do have positive expected real returns, which is more than can be said for cash. However, for the two asset classes 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 2.7% for U.S. Treasuries)15.

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 stressing that the message we take away from all the above is not to time the market aggressively16 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.

16 See Asness, Ilmanen, and Maloney (2016).
Appendix: Revisions to Our Methodology for Equity Expected Returns

In this section, we provide more specific details on our methodology. For the subset of readers who would like to peruse the topic in even greater depth, we also provide an expanded technical appendix available online that presents the underlying theory and practical guidance on building such estimates.

First we explain our motivation for revising our equity expected returns methodology. There is clear evidence that many U.S. firms have replaced dividend payouts with share buybacks, following the SEC rule 10b-18 in 1982 that paved the way for companies to conduct share buybacks without suspicions of price manipulation. Other reasons for the growing use of buybacks include tax advantages and corporate signaling benefits. We have seen a clear decline in dividend yield and an increase in buyback yield since the 1980s. Thus, unless a model is inherently independent of payout policy, failure to account for these structural changes may make it less comparable across regimes and countries. Next, we describe the modifications to each of our methods.

1. Earnings yield (E/P)

To recap our former methodology, we use the Shiller E/P ratio which compares a 10-year average of earnings (each year’s earnings scaled to today’s prices using the CPI), with today’s equity prices. While this variant is smoother, it leaves us with the problem that the “Shiller earnings” are, on average, 5 years stale compared to current earnings. The long-run real growth rate of earnings in the U.S. has been 1.5%. Hence, we scale up the Shiller earnings yield for each country by 1.075 to account for the fact that for a series that grows at 1.5% annually, the 10-year average will be understated by 7.5% (5 years with a 1.5% growth rate).

The E/P ratio embeds some implicit mix of dividend payouts and the growth rate of retained earnings (as explained in the technical appendix). Our revised method makes this mix explicit by assuming a constant dividend payout ratio and a constant earnings growth rate. In our new method, dividend yield is approximated by 50% of the Shiller E/P, and plugged into the DDM with a real growth rate of 1.5%. The new method applies the U.S. long-run average payout ratio of 50% to all developed countries as well as the U.S. long-run EPS growth rate of 1.5% (except for emerging markets where we assume 2%).

2. DDM yield

Our former approach was the classic DDM, \( E(r) = DY + g \), where we use country-specific estimates of DY and g. The DDM may underestimate equity returns if current low dividend yields (that do not capture the total payout to shareholders) are used together with historical realized per-share growth rates (that underestimate forward-looking per-share growth by missing the impact of lower share count due to buybacks). We adopt the Net Total Payout model of stock returns as presented in Ibbotson-Straehl (2016) and used by Grinold, Kroner and Siegel (2011) to forecast equity market returns.

Net Total Payout Model Methodology

As explained in the technical appendix, assuming no repricing of valuation multiples, the Net Total Payout model defines expected real equity return approximately as

\[ E(r) = NTY + g_{TPagg} \]

where NTY = net total payout yield and \( g_{TPagg} \) = growth in real aggregate total payouts

Net Total Payout Yield

We construct NTY on the lines of Boudukh et al (2007) and Ibbotson-Straehl (2016), as a sum of the dividend yield and the net buyback yield. We define net buyback yield for a stock as the (negated) monthly change in shares outstanding times the share price, divided by the monthly market capitalization, and aggregate this to
the equity index level using index constituent weights. Just as with the Shiller CAPE, we smooth cyclical variations in buybacks and issuance, by normalizing 10-year averages of net buybacks (scaled by the CPI to current price levels) by current prices. We add this to current dividend yield to get NTY.

**Growth in Aggregate Total Payouts (g_{Tragi})**

The NTY approach involves the use of aggregate earnings growth, while the classic DDM approach involves the use of per-share earnings growth. We estimate growth in aggregate total payouts for each developed country using the average of two approaches. The first is a top-down, forward-looking approach: we use consensus forecast long-term growth in real aggregate GDP as a proxy for the long-term growth in real total payouts. The second is a bottom-up, historical-based approach that starts with the realized long-term growth in real EPS of the equity indices since 1970. Assuming a constant payout ratio, per-share growth in EPS equals per-share growth in payouts. To convert this per-share growth in payouts to aggregate growth in payouts, we add an estimate of dilution, proxied by U.S. long-term realized equity dilution (1.6%). We shrink both the aggregate GDP growth and the EPS growth estimates towards cross-country averages.

**Putting It All Together**

Exhibit A1 provides more detail on the building blocks behind the expected return estimates in Exhibit 3.

**Exhibit A1 | Building Expected Real Returns for Equity Markets**

<table>
<thead>
<tr>
<th>Earnings-Yield Based</th>
<th>Dividend Discount Model Based</th>
<th>Combined</th>
<th>Expected Real Equity Return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E/P</td>
<td>Div. Yield</td>
<td>10y Cycl. Adj. Net Buyback Yield</td>
</tr>
<tr>
<td>U.S.</td>
<td>4.3%</td>
<td>1.5%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Euro-5</td>
<td>5.8%</td>
<td>1.5%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Japan</td>
<td>4.3%</td>
<td>1.5%</td>
<td>3.7%</td>
</tr>
<tr>
<td>U.K.</td>
<td>6.2%</td>
<td>1.5%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Australia</td>
<td>5.9%</td>
<td>1.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Canada</td>
<td>5.0%</td>
<td>1.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Global Devlpd.</td>
<td>4.7%</td>
<td>1.5%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Global Dev. ex US</td>
<td>5.4%</td>
<td>1.5%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Emerging Mkts</td>
<td>8.7%</td>
<td>2.0%</td>
<td>6.4%</td>
</tr>
</tbody>
</table>

* For emerging markets, our DDM estimate is dividend yield plus forecast GDP growth per capita. The growth estimate 2% is thus not comparable to other markets.

Source: AQR, Consensus Economics and Bloomberg. Return assumptions and methodology are subject to change and based on data as of December 31, 2016. The local real equity expected return is an average of two approaches: 1. The Shiller earnings yield (using 10-year earnings) scaled by 1.075 (embedding an annual real EPS growth of 1.5%), multiplied by 0.5 and added to a real growth rate in EPS of 1.5% for developed countries and 2% for emerging markets. 2. The sum of dividend yield plus estimates of net buyback yield (NBY) and long-term real growth of aggregate payouts g\text{Tragi}. G is the average of two measures: (i) long-term historical real earnings growth (since 1970) adjusted for dilution (GP), and (ii) long-term forecast real GDP growth based on Consensus Economics data (GG). GP and GG are both shrunk halfway towards a cross-country average. For earnings yield, U.S. is based on the S&P 500; U.K. on the FTSE 100 Index; “Euro-5” is a cap-weighted average of large-cap indices in Germany, France, Italy, the Netherlands and Spain; Japan on the Topix Index; and “Emerging Markets” is based on the MSCI Emerging Markets Index. For DDM estimates, all countries are based on corresponding MSCI indices. “Global Developed” is a cap-weighted average of the developed market estimates. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back.
References

AQR Alternative Thinking, First Quarter 2014, “Capital Market Assumptions for Major Asset Classes.”

AQR Alternative Thinking, First Quarter 2015, “Capital Market Assumptions for Major Asset Classes.”

AQR Alternative Thinking, First Quarter 2016, “Capital Market Assumptions for Major Asset Classes.”


Disclosures

This document has been provided to you solely for information purposes and does not constitute an offer or solicitation of an offer or any advice or recommendation to purchase any securities or other financial instruments and may not be construed as such. The factual information set forth herein has been obtained or derived from sources believed by the author and AQR Capital Management, LLC ("AQR") to be reliable but it is not necessarily all-inclusive and is not guaranteed as to its accuracy and is not to be regarded as a representation or warranty, express or implied, as to the information's accuracy or completeness, nor should the attached information serve as the basis of any investment decision. This document is intended exclusively for the use of the person to whom it has been delivered by AQR, and it is not to be reproduced or redistributed to any other person. The information set forth herein has been provided to you as secondary information and should not be the primary source for any investment or allocation decision.

Past performance is not a guarantee of future performance

This presentation is not research and should not be treated as research. This presentation does not represent valuation judgments with respect to any financial instrument, issuer, security or sector that may be described or referenced herein and does not represent a formal or official view of AQR.

The views expressed reflect the current views as of the date hereof and neither the author nor AQR undertakes to advise you of any changes in the views expressed herein. It should not be assumed that the author or AQR will make investment recommendations in the future that are consistent with the views expressed herein, or use any or all of the techniques or methods of analysis described herein in managing client accounts. AQR and its affiliates may have positions (long or short) or engage in securities transactions that are not consistent with the information and views expressed in this presentation.

The information contained herein is only as current as of the date indicated, and may be superseded by subsequent market events or for other reasons. Charts and graphs provided herein are for illustrative purposes only. The information in this presentation has been developed internally and/or obtained from sources believed to be reliable; however, neither AQR nor the author guarantees the accuracy, adequacy or completeness of such information. Nothing contained herein constitutes investment, legal, tax or other advice nor is it to be relied on in making an investment or other decision.

There can be no assurance that an investment strategy will be successful. Historic market trends are not reliable indicators of actual future market behavior or future performance of any particular investment which may differ materially, and should not be relied upon as such. Target allocations contained herein are subject to change. There is no assurance that the target allocations will be achieved, and actual allocations may be significantly different than that shown here. This presentation should not be viewed as a current or past recommendation or a solicitation of an offer to buy or sell any securities or to adopt any investment strategy.

The information in this presentation may contain projections or other forward-looking statements regarding future events, targets, forecasts or expectations regarding the strategies described herein, and is only current as of the date indicated. There is no assurance that such events or targets will be achieved, and may be significantly different from that shown here. The information in this presentation, including statements concerning financial market trends, is based on current market conditions, which will fluctuate and may be superseded by subsequent market events or for other reasons.

Performance of all cited indices is calculated on a total return basis with dividends reinvested.

Diversification does not eliminate the risk of experiencing investment losses. Broad-based securities indices are unmanaged and are not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index.

The investment strategy and themes discussed herein may be unsuitable for investors depending on their specific investment objectives and financial situation. Please note that changes in the rate of exchange of a currency may affect the value, price or income of an investment adversely.

Neither AQR nor the author assumes any duty to, nor undertakes to update forward looking statements. No representation or warranty, express or implied, is made or given by or on behalf of AQR, the author or any other person as to the accuracy and completeness or fairness of the information contained in this presentation, and no responsibility or liability is accepted for any such information. By accepting this presentation in its entirety, the recipient acknowledges its understanding and acceptance of the foregoing statement.

The data and analysis contained herein are based on theoretical and model portfolios and are not representative of the performance of funds or portfolios that AQR currently manages. Volatility targeted investing described herein will not always be successful at controlling a portfolio’s risk or limiting portfolio losses. This process may be subject to revision over time.

Hypothetical performance results (e.g., quantitative backtests) have many inherent limitations, some of which, but not all, are described herein. No representation is being made that any fund or account will or is likely to achieve profits or losses similar to those shown herein. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently realized by any particular trading program. One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or adhere to a particular trading program in spite of trading losses are material points which can adversely affect actual trading results. The hypothetical performance results contained herein represent the application of the quantitative models as currently in effect on the date first written above and there can be no assurance that the models will remain the same in the future or that an application of the current models in the future will produce similar results because the relevant market and economic conditions that prevailed during the hypothetical performance period will not necessarily recur. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results, all of which can adversely affect actual trading results. Discounting factors may be applied to reduce suspected anomalies. This backtest’s return, for this period, may vary depending on the date it is run. Hypothetical performance results are presented for illustrative purposes only.

There is a risk of substantial loss associated with trading commodities, futures, options, derivatives and other financial instruments. Before trading, investors should carefully consider their financial position and risk tolerance to determine if the proposed trading style is appropriate. Investors should realize that when trading futures, commodities, options, derivatives and other financial instruments one could lose the full balance of their account. It is also possible to lose more than the initial deposit when trading derivatives or using leverage. All funds committed to such a trading strategy should be purely risk capital.