2020 | 24th ANNUAL EDITION

LONG-TERM CAPITAL MARKET ASSUMPTIONS

Time-tested projections to build stronger portfolios

PORTFOLIO INSIGHTS
FOR INSTITUTIONAL / WHOLESALE / PROFESSIONAL CLIENTS AND QUALIFIED INVESTORS ONLY – NOT FOR RETAIL USE OR DISTRIBUTION
“SCIENCE DOES NOT AIM AT ESTABLISHING IMMUTABLE TRUTHS AND ETERNAL DOGMAS; ITS AIM IS TO APPROACH THE TRUTH BY SUCCESSIVE APPROXIMATIONS, WITHOUT CLAIMING THAT AT ANY STAGE FINAL AND COMPLETE ACCURACY HAS BEEN ACHIEVED,” wrote British philosopher and mathematician Bertrand Russell. Investors will see parallels to this sentiment in trying to assess the long-term outlook for capital markets, given the barrage of new information we face each day.

Amid today’s demanding investing environment, we present the 2020 edition of J.P. Morgan Asset Management’s *Long-Term Capital Market Assumptions* (LTCMAs). In our 24th year of producing capital market estimates, we incorporate more than 50 asset and strategy classes; our return assumptions are available in 16 base currencies. Over the years, many investors and advisors have come to depend on our assumptions to inform their strategic asset allocation, build stronger portfolios and establish reasonable expectations for risks and returns over a 10- to 15-year time frame. Moreover, we seek, each year, to recalibrate our long-run approximations as we incorporate the new information presented by markets, policymakers and economic data alike.

We formulate our LTCMAs as part of a deeply researched proprietary process that draws on quantitative and qualitative inputs as well as insights from experts across J.P. Morgan Asset Management. Our own multi-asset investment approach relies heavily on our LTCMAs: The assumptions form a critical foundation of our framework for designing, building and analyzing solutions aligned with our clients’ specific investment needs.

This edition of our assumptions explores the trade-offs and complications of late-cycle investing, in particular the challenges to portfolio construction that zero or negative bond yields present. Over our investment horizon, we see modest global growth and somewhat constrained returns in many asset markets. And yet we are optimistic that with flexibility in portfolio strategy and precision in its execution, investors can access reasonable returns across a range of asset markets. Whatever approach investors take, a considered, long-term strategic perspective is essential.

So too is careful manager selection and attentiveness to the power of active asset allocation.

We look forward to working with you to make the best use of our assumptions in setting your own strategic perspective and pursuing your investment goals.

On behalf of J.P. Morgan Asset Management, thank you for your continued trust and confidence. As always, we welcome your feedback.

George Gatch
Chief Executive Officer,
Asset Management
EXECUTIVE SUMMARY

Reconfiguring 60/40: Investing in a world of ultra-low rates

John Bilton, CFA, Head of Global Multi-Asset Strategy, Multi-Asset Solutions
Karen Ward, Chief Market Strategist, EMEA, Global Market Insights Strategy
Tim Lintern, Global Strategist, Multi-Asset Solutions
Victoria Helvert, Associate, European Equity Group

IN BRIEF

This executive summary gives readers a broad overview of the 2020 edition of our Long-Term Capital Market Assumptions (LTCMAs) and provides a context for how we see important structural themes affecting economic outcomes and asset market returns over a 10- to 15-year investment horizon. Key takeaways from this year’s LTCMAs:

• Growth remains low by historical standards, with aging populations a key headwind, while a technology-driven boost to productivity presents the main upside risk. Inflation is set to fall short of central bank targets in most cases unless and until fiscal stimulus features more prominently in the policy toolkit.

• Sluggish nominal growth constrains equilibrium yields along the curve, but it is today’s low interest rates and lengthy path to normalization that drive down our fixed income forecasts. Credit remains a brighter spot, but even here forecasts are sharply lower.

• Equity forecasts, by contrast, improve a little as valuation headwinds recede. In relative terms, forecasts for equity returns are well ahead of those for bonds, but after a 10-year bull market they are at the low end of the historical range in absolute terms.

• Those seeking higher returns will continue to be drawn to private markets, where we expect alpha trends for financial alternatives to be steady and more concentrated exposure to the tech super-cycle is possible. Elsewhere in alternatives, real assets remain an attractive source of both returns and diversification.

• Expected returns for a 60/40 U.S. stock-bond portfolio fall 10 basis points to 5.4%, and the stock-bond frontier steepens. Sharpe ratios for bonds fall sharply but still sit in line with equities in USD, while in other currencies they are now negative in some cases, pointing to a bleak outlook for fixed income returns.

• Lower returns from bonds create a challenge for investors in navigating the late-cycle economy. Returns in equities, credit and alternative assets are available, but the days of simply insulating exposure to risky assets with an allocation to bonds are over; this calls for, in equal measure, greater flexibility in portfolio strategy and greater precision in executing that strategy.
INTRODUCING THE 2020 LONG-TERM CAPITAL MARKET ASSUMPTIONS

The 2020 edition of our Long-Term Capital Market Assumptions (LTCMAs) was written against a backdrop of trade tension between the world’s economic superpowers and a reversal in the trajectory of global monetary policy. While these both have far-reaching and complex implications, they effectively boil down to two interconnected issues: the contour of future economic growth, which is influenced significantly by trade, and the rate at which we discount that growth in asset markets. These issues can amount to a trade-off; for instance, something that lowers forward growth might also serve to lower discount rates, muting the impact on asset prices today, and vice versa.

At the risk of oversimplification, most factors – however nuanced or complex – that affect our long-term market outlook are relevant because of their influence on one side or the other of the growth vs. discounting trade-off. For an investor, recognizing whether an event or issue will mostly affect either growth or discounting is probably the easy bit. But figuring out over what time frame it might play out, and the scale of impact, is significantly more challenging.

Last year, we explored the dislocations that were forming in the late-cycle environment and argued that some of these might be structural. Factors including demographic trends and technology-led changes to the labor market were resetting inflation and policy rate equilibria such that assumptions of reversion to a historical mean might prove unreliable. We encouraged investors to manage outside the mean and to recognize which of our historical assumptions were permanently shifting.

One specific dislocation was very stark a year ago: The U.S. and other key regions were not at the same phase of the economic cycle. This manifested itself most clearly through the stock-bond frontiers: In USD, the frontier had flattened markedly, as is typical of a mature cycle, where higher rates improve bond returns at the same time that higher valuations weigh on ex-ante equity returns. Meanwhile, zero or negative rates elsewhere held down ex-ante bond returns in EUR and other key currencies, leading to steeper stock-bond frontiers and making relative equity returns look better than the growth outlook might have justified (Exhibits 1A and 1B).

We expected that this dislocation would correct itself through one of three unprecedented paths: an extreme extension – by years, not months – of the current cycle; a U.S. recession that didn’t take the rest of the world with it; or a reversal in the U.S. rate cycle before the rest of the world could even get started on raising rates. It appears that the third of these scenarios may be in play, and it could shape the long-term outlook meaningfully.

Nevertheless, we would also observe that this is not a normal late-cycle environment. Late-cycle exuberance that is typically evident in risky assets is notable by its absence, while bubbles appear to have formed in safe assets. Tight labor markets and flat yield curves are characteristic of late cycle, but other typical late-cycle phenomena, like excessive risk appetite, tightness in basic resources and constraints on capital availability, have not materialized. We therefore need to recalibrate our thinking about late-cycle investing, with some of the playbook followed during the prior two cycles seemingly not applicable this time around.

Cyclical forces continue to be a constraint on long-term returns, with U.S. stock markets looking particularly stretched. That said, the secular component of returns looks stable.

Last year, the stock-bond frontier for the U.S. stood out as particularly flat. This is typical of a late-cycle environment.

**EXHIBIT 1A: LAST YEAR’S STOCK-BOND FRONTIERS FOR USD AND EUR**

<table>
<thead>
<tr>
<th></th>
<th>Last year’s USD stock-bond frontier</th>
<th>60/40 portfolio (USD)</th>
<th>Last year’s EUR stock-bond frontier</th>
<th>60/40 portfolio (EUR)</th>
<th>Last year’s GBP stock-bond frontier</th>
<th>60/40 portfolio (GBP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. equity</td>
<td>-2%</td>
<td>0%</td>
<td>-2%</td>
<td>0%</td>
<td>-2%</td>
<td>0%</td>
</tr>
<tr>
<td>U.S. high yield</td>
<td>-4%</td>
<td>-4%</td>
<td>-4%</td>
<td>-4%</td>
<td>-4%</td>
<td>-4%</td>
</tr>
<tr>
<td>U.S. investment grade bonds</td>
<td>-6%</td>
<td>-6%</td>
<td>-6%</td>
<td>-6%</td>
<td>-6%</td>
<td>-6%</td>
</tr>
<tr>
<td>U.S. aggregate bonds</td>
<td>-8%</td>
<td>-8%</td>
<td>-8%</td>
<td>-8%</td>
<td>-8%</td>
<td>-8%</td>
</tr>
<tr>
<td>U.S. large cap</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>UK large cap</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>European large cap</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>U.S. aggregate bonds</td>
<td>14%</td>
<td>14%</td>
<td>14%</td>
<td>14%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>U.S. equity</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>UK large cap</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>UK Gilts</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Source:** J.P. Morgan Asset Management, estimates as of September 30, 2018, and September 30, 2019.

**EXHIBIT 1B: CYCLICAL AND STRUCTURAL RETURN ELEMENTS**

WHAT’S CHANGED OVER THE LAST YEAR?

Over the last year, central banks proved themselves willing to ease policy despite a healthy labor market, suggesting that the true real neutral rate (R*) is lower than previously thought. It also became clear that trade tensions are as much structural as transactional, and fears over long-run trade constraints contribute to the downward pressure on R*.

Debate about fiscal stimulus gained momentum; and although its widespread use is only likely to be triggered by an economic downturn, fiscal stimulus could deeply affect both the trajectory of inflation and the capital/labor share of income.

Issues such as climate change, income inequality and political populism extended from the political sphere into the economic sphere at an ever faster pace over the last year, further pushing environmental, social and governance (ESG) frameworks into the investing spotlight.

Finally, the cycle matured further still, becoming the longest U.S. expansion on record, and the yield curve inverted. Even accounting for the distorting effect of quantitative easing, that inversion proved a sobering milestone for investors and policymakers alike (Exhibit 2).

The past year saw the inversion of the U.S. yield curve, a key milestone for investors and policymakers. History shows that yield curves tend to steepen quite sharply before the first month of recession.

EXHIBIT 2: FLATTENING OF THE 3-MONTH/10-YEAR U.S. YIELD CURVE IN PRIOR AND CURRENT CYCLES, INCLUDING PERIOD FROM FLAT TO RECESSION

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Basis points</td>
<td>400</td>
<td>390</td>
<td>380</td>
<td>370</td>
<td>360</td>
</tr>
<tr>
<td>Months before first hike in subsequent hiking cycle</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>


All of these factors have meaningful long-term implications, but it is the sharp reversal in global monetary policy – led by the Federal Reserve (Fed) - from a seemingly monotonic tightening path to lowering rates and resuming asset purchases that has the most profound effect. This policy shift affects our near-term outlook, reinforcing our observation last year that the U.S. might be done with rate hikes and begin to ease before the rest of the world could get started.

In the short run, this may serve to extend the current cycle modestly. But in the longer run, it suggests central banks could enter the next downturn devoid of their usual monetary policy tools, their ammunition already spent trying to hold it off.

As a result, it seems ever more likely that a fiscal response will be necessary in the next recession. What form fiscal stimulus might take and what the effects might be are, as yet, undefined. But if fiscal stimulus were to result in higher inflation, then with monetary policy constraining long-term interest rates through quantitative easing (QE), this confluence of forces could set the scene for a period of financial repression.¹

RATES: LOWER FOR ... EVER?

As we explored last year, we are likely now past the high water mark of central bank independence; but equally, excessive criticism of central banks unfairly ignores the limitations of monetary policy, in isolation, to drive up inflation. Over the last decade, central banks sought to redeploy the tools and theories that successfully brought inflation down in the past and use them in reverse to try to drive inflation back up.

While it is reasonable to assume early deployment of ultra-easy policy by the Fed averted a descent into outright deflation, it is as likely to have been the shock of its deployment as much as the policy itself that led to this outcome. Yet in the extended period of easy policy that followed the financial crisis, inflation struggled to reach central bank targets even as unemployment fell to multi-decade lows.

One of our papers, “The failure of monetary stimulus,” explores how zero rate policy and quantitative easing may now be doing more harm than good. At best, in a world of low nominal growth, where liquidity traps are becoming more prevalent, central banks’ monetary toolkit may not be entirely up to the task.

But at worst, ultra-easy policy can effectively concentrate stimulus on capital owners, who typically have a lower propensity to spend. Thus, efforts to stimulate the economy as a whole may in fact serve simply to increase the savings glut, in turn slowing the velocity of money and weighing on inflation at the aggregate level. Monetary policy in isolation may not have led to this outcome. But in combination with government

¹ A persistent period of low or negative real returns that leads to an erosion of principal on certain investments.
austerity and adoption of technologies that are suppressing wage inflation, it may well have pushed the capital/labor share of income to a post-World War II low (Exhibit 3) and, in turn, served to increase inequality. The social and political ramifications of increased inequality are well documented, but the impact on growth, inflation and ultimately the asset markets is also significant.

Our real growth projections this year continue to be rather modest. We see global growth averaging 2.3% over the next 10 to 15 years, down 20 basis points (bps) from our projections last year, with developed market forecasts unchanged at 1.5% but emerging market (EM) forecasts trimmed 35bps to 3.9% (Exhibit 4). Population aging is broadly to blame for the low forecasts for global growth. In developed markets, the cyclical boost we attributed to the eurozone seems to have run its course, leading us to trim forecasts by 30bps, but these cuts are offset by a modest rise in forecasts for Australia and Canada, driven by more favorable demographics.

Over 70% of the sharp drop in the labor share of income has occurred in the last 20 years. This has likely increased inequality, which has implications for growth and inflation, as well as politics.

EXHIBIT 3: LABOR SHARE OF INCOME IN THE U.S. OVER THE LAST 70 YEARS

<table>
<thead>
<tr>
<th>Year</th>
<th>Nonfarm business: Labor share, SA, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949</td>
<td>64.8</td>
</tr>
<tr>
<td>1959</td>
<td>62.6</td>
</tr>
<tr>
<td>1969</td>
<td>57.1</td>
</tr>
<tr>
<td>1979</td>
<td>56%</td>
</tr>
<tr>
<td>1989</td>
<td>58%</td>
</tr>
<tr>
<td>1999</td>
<td>60%</td>
</tr>
<tr>
<td>2009</td>
<td>62%</td>
</tr>
<tr>
<td>2019</td>
<td>64%</td>
</tr>
</tbody>
</table>


Our 2020 assumptions anticipate slow real GDP growth globally; global growth assumptions are little changed from last year at the aggregate level, with most developed market projections stable

EXHIBIT 4: MACROECONOMIC ASSUMPTIONS (%)

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>2020</th>
<th>2019</th>
<th>Change (percentage points)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Real GDP</td>
<td>Inflation</td>
<td>Real GDP</td>
</tr>
<tr>
<td>DEVELOPED MARKETS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>1.50</td>
<td>1.60</td>
<td>1.50</td>
</tr>
<tr>
<td>Euro area</td>
<td>1.20</td>
<td>2.00</td>
<td>1.75</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.20</td>
<td>2.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Japan</td>
<td>0.60</td>
<td>0.80</td>
<td>0.50</td>
</tr>
<tr>
<td>Canada</td>
<td>1.60</td>
<td>1.80</td>
<td>1.50</td>
</tr>
<tr>
<td>Australia</td>
<td>2.20</td>
<td>2.30</td>
<td>2.00</td>
</tr>
<tr>
<td>Sweden</td>
<td>1.70</td>
<td>1.60</td>
<td>1.75</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.10</td>
<td>0.50</td>
<td>1.25</td>
</tr>
<tr>
<td>EMERGING MARKETS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>4.40</td>
<td>2.50</td>
<td>5.00</td>
</tr>
<tr>
<td>India</td>
<td>7.00</td>
<td>5.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.40</td>
<td>4.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Russia</td>
<td>1.20</td>
<td>5.50</td>
<td>1.25</td>
</tr>
<tr>
<td>Korea</td>
<td>2.20</td>
<td>2.00</td>
<td>2.25</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1.60</td>
<td>1.10</td>
<td>1.75</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.20</td>
<td>3.70</td>
<td>3.00</td>
</tr>
<tr>
<td>South Africa</td>
<td>2.20</td>
<td>5.30</td>
<td>2.75</td>
</tr>
<tr>
<td>Turkey</td>
<td>3.00</td>
<td>8.00</td>
<td>3.50</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>2.30</td>
<td>2.20</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; estimates as of September 30, 2019.

* Emerging markets aggregate derived from nine-country sample.

---

Downgrades to our growth outlook for China are a key factor in pulling down our EM growth forecasts. While the 60bps cut to Chinese growth forecasts to 4.4% may seem optically severe, it merely reflects the gradual maturing of the Chinese economy and the ongoing shift from investment and exports to consumption and services. In other EM economies, we are also seeing a drop in trend growth; notably, we trim forecasts for Brazil by 60bps, Mexico by 80bps and South Africa by 55bps. However, these reductions largely reflect a lowering of our productivity forecasts and, in particular, lower estimates for capex growth and total factor productivity improvements over our forecast horizon.

Our projections for global inflation are little changed from last year, with global CPI forecast at 2.2%. But it is worth reflecting that inflation in many countries is likely to remain stuck in first gear. The limitations of monetary stimulus seem unambiguous when we consider that the countries with the lowest forecasts of inflation (Japan and Switzerland) have had many years of extremely low nominal rates. Further, we project that central banks in many countries will fall short of reaching their stated inflation targets over our forecast horizon. Only in the event of significant fiscal stimulus – itself only likely to be deployed in response to an economic shock - might we see upside risks to our inflation forecasts start to build.

Given our questions about the effectiveness of monetary policy, we must concede that there is a certain circularity in linking cash rate projections to growth and inflation forecasts, but we believe policymakers may have boxed themselves into a low rate world. From this point forward, we would expect global monetary policy to remain extremely accommodative throughout this cycle and well into the next one. This leads us to build a significant delay in rate normalization into our forecasts. That, in combination with much lower starting yields and a modest cut to our equilibrium yield estimates, adds up to a sharp fall in projected fixed income returns - in some cases taking them negative over our forecast horizon (Exhibit 5).

Cash return forecasts in most major currencies are lower mainly because we have significantly extended our normalization assumptions and assume a lengthy period of zero rates. Further out on the curve, however, the impact of prevailing yield levels is profound. In aggregate, G4 10-year bond return assumptions are down 100bps, but in EUR and GBP long bond indices we now project negative returns over our forecast horizon. Clearly, fixed income investors face profound challenges: To achieve zero real return from 10-year German Bunds over a 10-year horizon, based on our inflation, curve and normalization assumptions, Bond yields would need to fall to around -2.5% over the next decade. Negative yields are now widespread, but such a level of negative yield would stretch credibility, particularly if fiscal stimulus eventually puts upward pressure on yields later in our forecast horizon.

In the wider fixed income complex, credit continues to offer a decent return uplift. Returns in investment grade credit have come down in sympathy with other longer-duration fixed income assets, whereas the shorter-duration high yield returns have held up better. For a long-term investor, credit may present an opportunity to enhance portfolio returns. Nevertheless, we would still caution that we are in a distinctly mature credit cycle and the risks of a drawdown early on are naturally higher. Riskless rates are low, and there is not much of a buffer embedded in the credit complex were spreads to widen sharply during a period of economic weakness.

Anticipating continued central bank dovishness, we shift our equilibrium interest rates lower across major G4 markets and extend the time horizon over which we expect rate normalization.

---

### Exhibit 5: Standard G4, IG, HY and EMD Fixed Income Return Projections

<table>
<thead>
<tr>
<th></th>
<th>USD (Equilibrium yield (%)</th>
<th>USD Return (%)</th>
<th>GBP (Equilibrium yield %)</th>
<th>GBP Return (%)</th>
<th>EUR (Equilibrium yield %)</th>
<th>EUR Return (%)</th>
<th>JPY (Equilibrium yield %)</th>
<th>JPY Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>2.0%</td>
<td></td>
<td>2.0%</td>
<td></td>
<td>1.3%</td>
<td></td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>1.9%</td>
<td>1.9%</td>
<td>2.0%</td>
<td>1.8%</td>
<td>1.0%</td>
<td>0.6%</td>
<td>0.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>10-year bond</td>
<td>3.2%</td>
<td>2.4%</td>
<td>2.7%</td>
<td>0.8%</td>
<td>2.2%</td>
<td>0.6%</td>
<td>1.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Long bond index</td>
<td>3.5%</td>
<td>1.6%</td>
<td>2.7%</td>
<td>-0.8%</td>
<td>2.8%</td>
<td>-0.8%</td>
<td>1.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Investment grade credit</td>
<td>4.7%</td>
<td>3.4%</td>
<td>4.4%</td>
<td>2.0%</td>
<td>3.4%</td>
<td>1.7%</td>
<td>1.3%</td>
<td>0.8%</td>
</tr>
<tr>
<td>High yield</td>
<td>7.6%</td>
<td>5.2%</td>
<td></td>
<td></td>
<td>5.8%</td>
<td>3.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emerging market debt*</td>
<td>6.6%</td>
<td>5.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; estimates as of September 30, 2019.

* EUR: 15y+ index, JPY: JGB Bond Index, GBP: 15y+ index, USD: 20y+ index; * EMD hard currency debt.
Our macroeconomic forecasts and our fixed income return estimates both send a somewhat downbeat message, but for subtly different reasons. After a decade long expansion, it follows that growth expectations might be somewhat muted. But equally, it might be more typical that after a prolonged period of growth, interest rates would be higher - and the return outlook for fixed income rather better. Persistent disinflation has been a feature of this cycle, with wage inflation, in particular, low compared with prior cycles, in turn reducing upward pressure on rates.

One factor that has contributed to lower inflation over this cycle - technology - also presents a potential upside risk to our base-case forecasts. Certainly, the frequently promised technology-driven productivity boon has proved rather elusive so far, but it could well fuel growth in the next cycle - particularly if, as we expect, investment spending in aggregate gets some support from fiscal stimulus.

TECHNOLOGY IS CHANGING PRODUCTIVITY AND HOW WE MEASURE IT

Our analysis of technology and productivity in the 2018 LTCAms concluded that by the end of the next decade automation and artificial intelligence (AI) had the potential to add 1 to 1.5 percentage points to global trend growth, with those countries facing the greatest demographic challenge standing to gain the most. This year, we have focused at a more granular level on e-commerce, exploring Robert Solow’s paradox that “you can see the computer age everywhere but in the productivity statistics.”

The extent of e-commerce adoption is substantially higher than official data suggest. It is probably boosting productivity, but this may not be fully evident until the next economic cycle - when willingness to invest might be rather higher than is the case at the tail end of a cycle. Without doubt, e-commerce acts as a disinflationary force, but it may also bring meaningful efficiency into firms’ internal supply chains, in turn reducing capital intensity and boosting margins over the longer term. At a time when equity returns are constrained simply as a result of the lengthy bull market, e-commerce offers an interesting upside risk for both public and private equity market returns.

Our long-term return outlook for equities is slightly better this year. Our average global equity return forecasts over the next 10 to 15 years rise 50bps to 6.5% in U.S. dollar terms. Our forecast for developed markets is up 20bps to 5.7%, and for emerging markets we also raise it 20bps to 8.7% - both in local currency terms, which serves to highlight the additional impact of currency translations in driving equity returns.

In developed markets, the lion’s share of this improvement is the result of better starting valuations, while in EM markets the boost is more evenly split between earnings and valuation. Across major markets, return forecasts are tightly packed just below the 6% level (Exhibit 6), but in risk-adjusted terms there is a far wider spread of projections. In either case, projected equity returns stand well above those available from fixed income, and stock-bond frontiers have accordingly steepened across the board.

Over the long run, we see scope for developed markets ex-U.S. to outperform U.S. markets – a change from the past decade

---


5 “Fat left tail” describes the deviation that actual returns in equity markets display relative to a normal distribution. In reality, equity markets suffer drawdowns more frequently and with a greater severity than a normal distribution of returns would imply.
We view metrics such as the equity risk premium (ERP) with similar caution. Having acknowledged that interest rates are unlikely to mean revert to pre-global financial crisis (GFC) levels, it strikes us as odd to compare prevailing ERP – for which riskless rates are a key input – with long-term historical means and thus argue that stocks are cheap. While long-term investors stand to harvest the ERP over the full 10- to 15-year investment horizon, the simple fact that ERP is currently elevated does not mean that, in the short run, it couldn’t move even higher if cyclical conditions were to deteriorate (Exhibit 8).

The equity risk premium is certainly extended, but it is unclear how informative this measure is in a world of such low rates

EXHIBIT 8: IMPLIED ERP FOR U.S. EQUITIES VS. PRE- AND POST-GFC MEANS

As public equity returns move a little higher this year, we see a parallel increase in private equity market returns. We raise our 10- to 15-year aggregate private equity return forecasts 55bps to 8.8%. Private equity continues to be attractive to those investors looking for return uplift, as well as those seeking more specific exposure to technology themes (see “The evolution of market structure,” 2019 Long-Term Capital Market Assumptions). Alpha trends in private markets are expected to be stable, at a level a little shy of their long-run averages. Nevertheless, the return outlook is encouraging and it will likely attract further inflows to private markets. At this time, we do not believe that the concerns over excessive dry powder⁶ are justified, given the huge investible opportunities arising from technological advancement, but even so, manager selection remains a critical driver of returns in private markets.

A CHANGING MIX OF GLOBAL GROWTH

Investors who seek to boost returns and also have greater risk tolerance likely will be drawn, once again, to emerging market assets. Our EM equity forecasts are 300bps over developed markets in local currency terms, while our EM bond return forecasts range from 5.9% for local currency sovereigns to 4.9% for EM corporate credit, compared with 2.4% for U.S. 10-year Treasuries (Exhibit 9).

⁶ Dry powder refers to the amount of cash committed to private equity funds but as yet undeployed.
⁷ Based on BEA trends, we expect technology to expand from representing 9% of the U.S. GDP footprint today to around one-fifth a decade from now.
While our return expectation for emerging market bond assets is lower than recent history, emerging market debt still offers a significant return uplift vs. core bonds.

EXHIBIT 9: HISTORICAL AND FORECAST RETURNS FOR KEY EMD CLASSES AND U.S. 10-YEAR

<table>
<thead>
<tr>
<th></th>
<th>Average return over the last 12 years</th>
<th>2020 LTCMA return assumption, USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMD hard</td>
<td>7.0</td>
<td>5.1</td>
</tr>
<tr>
<td>EMD local</td>
<td>8.1</td>
<td>6.3</td>
</tr>
<tr>
<td>EMD corp</td>
<td>5.9</td>
<td>4.9</td>
</tr>
<tr>
<td>U.S. 10-year</td>
<td>2.4</td>
<td>4.9</td>
</tr>
</tbody>
</table>


Over our forecast horizon, China is likely to overtake the U.S. as the world’s largest economy and, as such, exerts a powerful influence on our aggregate macro forecasts. In asset markets, China’s influence – while significant in some cases – still generally lags its economic might. Even in today’s terms, China accounts for one-sixth of global GDP and one-eighth of world equity market capitalization. However, international direct holdings of Chinese assets lag far behind global ownership trends apparent in other major equity and bond markets (Exhibit 10). Our paper “The next phase of China’s growth” explores how the nature of Chinese growth will change in the coming decade and how China’s influence in global equity, bond and currency markets will rapidly increase.

We expect China’s growth to slow from its present rate of a little above 6% to below 4% during the next decade, averaging 4.4% over our forecast horizon. This may seem a sharp decline, but it masks a meaningful rise in GDP per capita over that time frame and embeds our expectation that China will be broadly successful in navigating the middle income trap.8

Crucially, we expect China to move up the value chain and capture more of its growth from services, consumption and technology. This implies that some of the underlying structural disagreements in the current trade dispute with the U.S. are likely to remain in focus for some time to come. In any case, given China’s dominant role in the EM bloc, as the country’s pace of growth slows it presents a risk to EM aggregate growth forecasts and to assets correlated to Chinese growth, such as commodities.

International holdings of Chinese equities and bonds remain incredibly low when compared with developed markets.

EXHIBIT 10: INTERNATIONAL HOLDINGS – KEY EQUITY AND BOND MARKETS

<table>
<thead>
<tr>
<th></th>
<th>Government debt</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Germany</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>U.S.</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>UK</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>Japan</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>China*</td>
<td>10%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Source: Banque de France; Bruegel sovereign bond holdings database; Ministry of Finance, Japan; Nikkei Inc.; Office for National Statistics; People’s Bank of China; U.S. Department of the Treasury; J.P. Morgan Asset Management Multi-Asset Solutions; data as of September 30, 2019.

* China equities: Solid color block represents A shares; the full stack represents all China equity classes, including H shares and ADRs.

Clearly, trade issues have weighed heavily on EM assets and currencies in the last year, pushing prices down and reducing valuations. In equities, lower starting valuations, resulting in part from trade tensions, largely offset the impact of lower EM GDP growth this year, so that the wedge between EM and developed market equities is unchanged.

China already accounts for 32% of the EM equity complex, and this proportion is likely to increase in the near term as efforts to open up the Chinese stock market to international investors gather pace. In face value terms, the Chinese bond market is the second largest on the planet. It offers significant return pickup compared with other sovereign markets, even though we judge Chinese interest rates to be still some distance below their natural equilibrium (see “The future path of Chinese interest rates,” 2018 LTCMAs).

CHALLENGES TO PORTFOLIO MANAGEMENT LATE IN THE CYCLE

With global bond returns challenged over all forecast horizons, and investors forced further along the risk spectrum – to private markets and EM assets – to bolster returns, it becomes more difficult to build a robust portfolio that is not overly exposed to macro risks. In our final paper this year, we look at how investors are rethinking safe havens, recognizing that with yields now negative on around 25% of government bonds the...

---

8 The middle income trap refers to the phenomenon where rapidly growing economies stagnate at middle income levels and fail to transition into high income economies.

8 Developed in Silvia Merler and Jean Pisani-Ferry, “Who’s afraid of sovereign bonds?” Bruegel Policy Contribution 201202, February 2012.
ability to insulate a portfolio with bonds and clip a coupon is compromised. Conceptually, adding insurance to a portfolio - which was the role of the bond allocation - ought to come at a cost. Insurance simply isn't free. But we have now entered a world where the trade-off is no longer between forgone risky asset returns and reduced portfolio risk but is instead a zero or even negative return in exchange for that risk reduction. Little wonder that investors are re-examining the trade-offs they're willing to make.

Some currencies display safe haven characteristics – notably JPY, CHF and USD – but this is complicated by the negative real returns on offer in most defensive cash markets, and also by the persistent overvaluation of the U.S. dollar. As we did last year, we expect the dollar to decline over our forecast horizon in key crosses, with an equilibrium fair value for EURUSD of 1.38, for USDJPY of 88 and for GBPUSD of 1.48. Plainly, the dollar’s overvaluation could compromise some of the currency’s appeal as a potential safe haven asset; equally, we note that currencies don’t move to equilibrium in a straight line and crosses can remain at a good stretch from theoretical fair value for lengthy periods. Nevertheless, an overvalued USD remains a meaningful consideration when designing an optimal global asset allocation.

For investors with fewer liquidity concerns, our work on safe havens serves to highlight another bright spot in asset markets: real assets. Aversion to real estate in particular seems to stem from the central role overvalued property markets played in triggering the global financial crisis in 2008. But a longer-run analysis of through-cycle real estate returns suggests that the GFC was an anomaly and that real estate returns are generally robust through the cycle. This year, we forecast that core U.S. real estate returns will average 5.8% over the next 10 to 15 years, some way ahead of the returns available from a balanced 60/40 stock-bond portfolio. Casting the net more widely, forecast returns from global real assets and infrastructure have held up remarkably well, and given the resilience of their cash flows they may even act as a proxy for duration in portfolios with limited short-run liquidity demands.

CONCLUSIONS AND PORTFOLIO IMPLICATIONS

Overall, our 2020 LTCMAs forecast modest growth and contained inflation, and recognize the challenges to portfolio construction that zero or negative bond yields present. This environment is complicating the late-cycle playbook for those investors with an eye on tactical asset allocation. There are bright spots, but even then investors need to appreciate the trade-offs implicitly required to capture enhanced returns. Credit offers sizable return pickup over sovereign bonds, but with large drawdown risk when the economy turns; real estate returns are attractive, as are those in private equity, but liquidity is a consideration; and EM returns are well above developed market returns in most assets, but in the short run the gearing to trade uncertainty presents a headwind.

The long-term outlook for returns from government bonds is bleak compared with stocks (Exhibit 11). Ex-ante Sharpe ratios for U.S. Treasuries are not far from those for equities, but a quick comparison to historical average ex-post Sharpe ratios drives home just how scant the return in bonds is likely to be over the next decade. Last year, we judged that “bonds are back” as three years of gradually rising yields in U.S. Treasuries culminated in reasonable ex-ante risk-adjusted returns. That situation reversed in under a year, and it would take further cyclical weakness for bonds to offer the prospect of positive returns in the near term.

With core bond returns lower, this year risk premia look marginally more attractive in general

EXHIBIT 11: RETURNS AND RISK PREMIA, BASED ON 2020 VS. 2019 LTCMAS FOR RISK AND RETURN (%)

<table>
<thead>
<tr>
<th></th>
<th>2020 LTCMA</th>
<th>2019 LTCMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. small cap</td>
<td>6.50%</td>
<td>6.00%</td>
</tr>
<tr>
<td>U.S. large cap</td>
<td>5.60%</td>
<td>5.25%</td>
</tr>
<tr>
<td>U.S. high yield bonds</td>
<td>5.20%</td>
<td>5.50%</td>
</tr>
<tr>
<td>U.S. inv grade corporate</td>
<td>3.40%</td>
<td>4.50%</td>
</tr>
<tr>
<td>U.S. intermediate Treasuries</td>
<td>2.70%</td>
<td>3.25%</td>
</tr>
<tr>
<td>U.S. cash</td>
<td>1.90%</td>
<td>2.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RISK PREMIA</th>
<th>2020 LTCMA</th>
<th>2019 LTCMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>High yield premium</td>
<td>1.80%</td>
<td>1.00%</td>
</tr>
<tr>
<td>Investment grade premium</td>
<td>0.70%</td>
<td>1.25%</td>
</tr>
<tr>
<td>Private equity premium</td>
<td>3.20%</td>
<td>3.00%</td>
</tr>
<tr>
<td>Small cap premium</td>
<td>0.90%</td>
<td>0.75%</td>
</tr>
<tr>
<td>Equity risk premium</td>
<td>2.90%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Duration premium</td>
<td>0.80%</td>
<td>1.25%</td>
</tr>
</tbody>
</table>

Over the full forecast horizon, the resteepening of stock-bond frontiers (Exhibit 12) makes a clear relative case for equity over bonds. Nevertheless, it comes with the health warning that the absolute level of forecast returns for stocks today is still quite low relative to history – reflecting an asset market that has enjoyed a decade long bull market. Whether to pay more heed to the relative or absolute signal from the stock-bond frontier is ultimately a call on where we sit in the cycle today and how that signal might shift over the near term.

Despite our expectations of modest growth and modest returns, on average, over the next 10 to 15 years, we remain optimistic at heart. The late cycle presents a challenge for all investors, but if we take care to acknowledge that low rates today are less an indication of a Goldilocks scenario than they were earlier in the economic cycle, it will arm us to make better near-term decisions.

Over the longer run, we expect that technology will indeed boost productivity, even if care needs to be taken to manage its disinflationary side effects. We also believe that policy will evolve from monetary toward fiscal stimulus. Clearly, this comes with a warning sticker attached, but, used prudently, fiscal stimulus could strengthen economic growth and start to reverse some of the skew between capital and labor’s share in the rewards of that growth. That skew has widened considerably in recent years, further polarizing political debate.

It may be that the Goldilocks scenario in the next cycle is a little different - not so much unspectacular growth married to spectacularly easy policy but instead, perhaps, fiscal policy boosting inflation, allowing rates to eventually rise while technology adoption pushes up productivity.

Either way, the long-run outlook probably does favor stocks over bonds, but the cyclical environment suggests maybe a little more near-term caution. Keeping a view over the full cycle is always important; but in today’s challenging environment, where the buffer from market returns is simply thinner, disciplined execution of that strategy is likely to be a clear competitive advantage.

---

After flattening last year, the USD stock-bond frontier steepens again, led by lower bond returns. Expected 60/40 returns in EUR remain depressed.

**Exhibit 12A: USD Stock-Bond Frontiers and 60/40 Portfolios Based on 2020 vs. 2019 LTCMAS for Risk and Return (%)**

**Exhibit 12B: EUR Stock-Bond Frontiers and 60/40 Portfolios Based on 2020 vs. 2019 LTCMAS for Risk and Return (%)**

Modestly lower growth, stable inflation

Michael Hood, Global Strategist, Multi-Asset Solutions
Dr. David Kelly, CFA, Chief Global Strategist, Head of Global Market Insights Strategy
Benjamin Mandel, Ph.D., Global Strategist, Multi-Asset Solutions

IN BRIEF

• This year’s edition of our Long-Term Capital Market Assumptions makes only marginal changes to the forecasts for GDP growth and inflation that underlie each asset class outlook.

• Our modestly lower developed market (DM) growth projections stand below the average growth rate of the past 10 years in every region except the euro area. We expect weak labor force growth, though we could see a possible uplift in productivity.

• Emerging market (EM) economies will continue to outgrow their DM counterparts, though we are trimming several EM GDP forecasts this year, most notably China.

• We anticipate fairly steady inflation at the global level, with central banks likely falling short in lifting inflation back to official targets. We leave unchanged our U.S. CPI forecast.
In any annual update to a long-term forecasting project, the first question to ask is, “What has changed?” Almost inevitably, barring some major shock in the prior 12 months, the answer is, “Nothing dramatic,” and this response fairly describes the modifications to our economic forecasts in the 2020 edition of our Long-Term Capital Market Assumptions.

The incremental nature of the change in these forecasts, though, should not obscure the important underlying themes that have shaped the numbers in recent years. With regard to economic growth, slow expansion in the working-age population and moderate productivity gains lead to slower GDP gains in the forecast period than has generally been experienced in recent decades. These forecasts are experiencing further downward pressure from the convergence of major emerging market (EM) economies and continued reduction of cyclical slack across the developed world. With respect to inflation, our forecasts take into account some of the long-term structural changes that have depressed global inflation in recent years. We also acknowledge the determination of developed market (DM) central banks to boost inflation. As we argue elsewhere, however, central bank actions, while producing generally very low short-term interest rates, will likely fall short in lifting inflation all the way back to official targets. As a result, we expect the global economy to display low growth, low inflation and low interest rates in the coming 10 to 15 years (Exhibit 1).

We note, too, that the increasingly greater salience of environmental, social and governance (ESG) concerns partly reflects their likely influence over time on medium-term macro forecasts (see “The evolving role of ESG issues in macroeconomic analysis”).

DM GROWTH: WEAK LABOR INPUT, WARMING UP TO TFP

As has been the case for some years now, we project fairly low developed market real GDP growth by historical standards. Indeed, the numbers have changed only marginally from last year’s set, although this year our macroeconomic and asset class projections shift to increments of 0.1 percentage point (ppt.), compared with the prior 0.25ppt. steps (see “Our approach to forecasting”). Overall, we expect 1.5% real GDP growth in DM economies, the same as in 2019. In every region except the euro area, growth forecasts stand below the average growth rate of the past 10 years. The starting point a decade

Our 2020 assumptions anticipate slow real GDP growth globally; global growth assumptions are little changed from last year at the aggregate level, with most developed market projections stable

<table>
<thead>
<tr>
<th>EXHIBIT 1: MACROECONOMIC ASSUMPTIONS (%)</th>
<th>2020 assumptions</th>
<th>2019 assumptions</th>
<th>Change (percentage points)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Real GDP</td>
<td>Inflation</td>
<td>Real GDP</td>
</tr>
<tr>
<td>DEVELOPED MARKETS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>1.50</td>
<td>1.60</td>
<td>1.50</td>
</tr>
<tr>
<td>Euro area</td>
<td>1.20</td>
<td>1.30</td>
<td>1.50</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.20</td>
<td>2.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Japan</td>
<td>0.60</td>
<td>0.80</td>
<td>0.50</td>
</tr>
<tr>
<td>Canada</td>
<td>1.60</td>
<td>1.80</td>
<td>1.50</td>
</tr>
<tr>
<td>Australia</td>
<td>2.20</td>
<td>2.30</td>
<td>2.00</td>
</tr>
<tr>
<td>Sweden</td>
<td>1.70</td>
<td>1.60</td>
<td>1.75</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.10</td>
<td>0.50</td>
<td>1.25</td>
</tr>
<tr>
<td>EMERGING MARKETS</td>
<td>3.90</td>
<td>3.30</td>
<td>4.25</td>
</tr>
<tr>
<td>China</td>
<td>4.40</td>
<td>2.50</td>
<td>5.00</td>
</tr>
<tr>
<td>India</td>
<td>7.00</td>
<td>5.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.40</td>
<td>4.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Russia</td>
<td>1.20</td>
<td>5.50</td>
<td>1.25</td>
</tr>
<tr>
<td>Korea</td>
<td>2.20</td>
<td>2.00</td>
<td>2.25</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1.60</td>
<td>1.10</td>
<td>1.75</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.20</td>
<td>3.70</td>
<td>3.00</td>
</tr>
<tr>
<td>South Africa</td>
<td>2.20</td>
<td>5.30</td>
<td>2.75</td>
</tr>
<tr>
<td>Turkey</td>
<td>3.00</td>
<td>8.00</td>
<td>3.50</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>2.30</td>
<td>2.20</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; estimates as of September 30, 2019.
* Emerging markets aggregate derived from nine-country sample.
**Our Approach to Forecasting**

For real GDP, we use a production-function approach, focusing on each economy’s long-term trend or potential growth rate. We estimate the growth of the labor force, supplemented by changes in human capital and swings in hours worked per person; the pace at which the capital stock expands via investment spending; and the rate at which total factor productivity climbs. The labor force forecast itself comes from population projections combined with assumptions about participation rates. For the most part, we abstract from cyclical considerations. On occasion, we do adjust our growth estimates for economies that we believe are operating far above or below their current potential levels, sufficient to produce significant under- or outperformance in coming years. But given the high degree of uncertainty about output gap estimates, and unstable relationships between changes in, say, unemployment rates and GDP, we do not apply mechanical rules to this process.

We cannot build up inflation projections from components. Instead, we take the central bank inflation target, where it exists, as a significant starting point. That goal, however, does not serve as the sole anchor for the forecast. Many developed market central banks have struggled to meet their inflation targets from below in recent years, while emerging market (EM) monetary authorities more frequently face the opposite problem. We thus take into account each country’s inflation history, the shape of its distribution of inflation outcomes over time, revealed preferences of the central bank (such as its degree of willingness to use a broad range of tools in pursuit of its target) and likely long-term structural changes in the economy. In recent years, we have given increasing attention to common forces that may be driving inflation internationally, be they swings in the globalization process or information technology innovations. We take some comfort from inflation’s relative stability in the past few decades, particularly in developed markets and the relatively advanced EM economies.

This year brings a presentation change in the macroeconomic assumptions, similar to what is happening to the asset class projections, with a shift to increments of 0.1 percentage point (ppt.) compared with the prior 0.25ppt. steps. That previous quarter-point scale felt increasingly large against the backdrop of low-single digit forecasts for GDP growth and inflation in many economies, as well as for a significant portion of the asset class returns. The change does not imply a narrower confidence interval for the macroeconomic assumptions but instead an attempt to be slightly more precise about the center of the forecast distribution.

ago was near the bottom of the last recession, when unemployment rates were exceptionally high, and most countries’ expansions during the decade benefited from increases in labor force participation rates that we expect to prove partly cyclical in nature. While a secular uptrend in participation among senior citizens will likely continue, participation among prime-age individuals seems less likely to rise from currently elevated levels. Meanwhile, populations themselves are increasing sluggishly at best. As a result, we generally expect weak growth in labor forces from here, with no DM economy above 0.8ppt. per year and two (Japan and the euro area) likely to experience declining workforces.

By contrast, we are turning slightly more optimistic about the outlook for total factor productivity (TFP), a residual that captures phenomena like technological change. After a long period of mediocrity, some estimates of TFP growth in the U.S. have picked up recently. Business investment spending on intellectual property products – a category that captures much activity in the tech sector - has boomed. And the combination seen earlier this year of solid global corporate profit growth, accelerating wage growth and stable price inflation pointed to a possible uplift in productivity. We have yet to make wholesale positive revisions to our TFP expectations but see technological change as a source of upside risk to our forecasts.

As we consider the components of each country’s growth outlook, we assume that “balanced growth” prevails, as captured by a positive relationship between expansion of the capital stock, on one hand, and labor and TFP growth rates, on the other. The intuition that “every worker needs a machine” has generally been borne out empirically, with capital stocks broadly holding steady as a share of GDP over time. To be sure, income shares have not necessarily held steady in the same way, as workers have captured a smaller portion of national income in most DM economies during the past two decades or so. In terms of growth rates, though, we do expect the relationship to hold in an era of automation and artificial intelligence. In other words, we continue to believe that capital and labor will be complements rather than substitutes. We will maintain an open mind toward evidence that this pattern is changing but have yet to see convincing signs of such a shift.
With an expected 1.8% real GDP growth rate, the U.S. remains near the top of the DM growth ladder, behind only Australia, where we expect the labor force to benefit from ongoing immigration flows. The U.S. enjoys relatively favorable demographics (independent of its own current efforts to limit newcomers) and a track record of leadership in TFP growth, helped by its deep capital markets and world-class universities. This year, we revise downward our projection for the euro area, to 1.2% from a rounded 1.5% in 2019. In each of the previous two years, we included a cyclical bonus in the euro area forecast, reflecting the high unemployment rate, but joblessness has now returned to a more typical level. We also introduce individual forecasts for the euro area’s four largest economies, with Spain and France expected to grow a little more rapidly than the region as a whole, and with Germany (where demographics are poor) and especially Italy (with its weak TFP performance) lagging. The other DM projections have not changed, though we note ongoing uncertainty around the 1.2% UK projection. The Brexit process will very likely result in different long-term immigration and trade policies than in the past, and we struggle to estimate their effect ahead of the fact. We revised the UK projection downward two years ago as Brexit began to take shape, and thus far we have seen no reason to reverse that move.

**DM INFLATION: A POWERFUL ASYMMETRY**

While inflation has not, as an empirical matter, exhibited much cyclicality in recent decades, it is still remarkable that DM economies that are running relatively hot labor markets have not generated any meaningful upward pressure on consumer prices. This observation highlights a generic feature of the business cycle that we have described in recent iterations of our long-term forecasts: The increasingly flat nature of the cycle means that GDP growth, inflation and policy interest rates will all spend more time below levels considered “normal” than above them. The fact that central banks face challenges in stimulating the economy when policy rates are close to zero - a state of affairs known as a liquidity trap - is an integral part of a flatter business cycle. This asymmetry, in turn, was a key motivation last year for our downgrade of U.S. CPI inflation to 2% - a level that translates to something slightly below the Federal Reserve’s (Fed’s) core PCE inflation target.

Since then, a sequence of downward shocks to inflation has corroborated this line of reasoning and has also galvanized DM central banks to respond to varying degrees. The Fed, at the forefront of this effort, is currently conducting a review of its monetary policy tools and medium-term framework, with formal results of the review expected to be announced in the first half of 2020. Our best guess is that the review leads to the adoption of some variation of a “makeup” strategy, in which the Federal Open Market Committee (FOMC) gives consideration to compensating for past inflation misses as it contemplates appropriate policy settings over the cycle, in addition to targeting maximum employment and price stability. One specific strategy under consideration, average inflation targeting, would enshrine lower-for-longer strategies following recessions and, in effect, a higher inflation target during periods of expansion. For a more in-depth treatment of the challenges facing central banks and their likely responses, see “The failure of monetary stimulus,” 2020 Long-Term Capital Market Assumptions.

In setting our projections for future inflation in DM economies, we thus consider both lived experience with respect to inflation outcomes as well as the willingness and ability of central banks to offset the powerful asymmetry that low levels of rates have created. In the case of the U.S., we feel comfortable with 2% as a central case and reserve judgment on the FOMC’s strategy changes pending additional information. To the extent that the changes are more revolutionary than evolutionary, and credibly aggressive in staving off the recent downward drift in inflation expectations, it could warrant an upgrade to inflation at some point in the future. The prospect of coordination between expansionary fiscal and monetary policy would push in this same direction. Headed the opposite way are our inflation forecasts for Europe and Japan, both of which we downgrade by 20 basis points (bps) this year. In the case of the euro area, we anticipate an unhelpful interaction between persistent inflation shortfalls, a high probability of being in a liquidity trap over our forecast horizon and a European Central Bank that has relatively little willingness to indulge inflation above its stated target. In Japan, where central bankers have arguably been grappling with liquidity trap dynamics for some time as even larger inflation misses relative to their 2% target are commonplace, a more aggressive approach to bolstering inflation along the lines of what the Fed is doing does not seem either credible or feasible. Finally, we note a small downgrade to our Australia inflation assumption, reversing an upgrade from last year, as the post-crisis nominal shock to the economy lingers.

**EM GROWTH: SLOWER CONVERGENCE**

We are trimming several EM GDP forecasts this year, most notably for China but also for Brazil, Mexico, South Africa and Turkey, with marginal reductions to Russia and Taiwan. The China projection has fallen gradually over the past several years as the country’s remarkable convergence to higher income living standards has unfolded. With China now reaching the USD 10,000 GDP per capita milestone against a less favorable global backdrop, a separate article examines its

The EM forecasts reflect the same components as their DM counterparts - labor, capital stock and TFP - with nuanced differences. Some EM economies appear undercapitalized and will likely experience capital stock growth that exceeds that of the labor force and TFP as part of a catch-up process. And whereas TFP growth in DM economies should move at broadly the same pace, as that group of countries all operate at or close to the global technology frontier, in EM economies TFP partly captures convergence, or movement toward that standard. This year’s set of EM downgrades partly reflects a revised historical dataset showing less impressive TFP performance in some countries than previously appeared to be the case.

We have left our India forecast unchanged at 7.0%, making it the fastest-growing economy in our dataset, as has been the case for several years. To some extent, this reflects the low starting level of per capita income, but India should also benefit from strong demographics (the fastest-growing labor force in our global sample), a gradually capitalizing economy and solid gains in TFP. We believe India has liberalized its economy sufficiently to enjoy growth driven by improved allocative efficiency and business practices for the next decade or so.

By contrast, cuts to forecasts for Mexico, Brazil, Turkey and South Africa all reflect policy disappointments of one kind or another. In Mexico’s case, we expect a tilt toward populist policies under the current administration to worsen the growth/inflation trade-off, a pattern observed many times before in Latin America. As an example, the government’s distaste for the previously approved energy sector reforms and its desire to use the state-owned oil company as a national champion seem likely to lower productivity and encourage rent-seeking behavior in that sector. Brazil is struggling to emerge from an extended recession and in theory is operating with a large output gap, but business confidence has displayed persistent weakness amid large public sector imbalances. Turkey is pursuing a policy mix somewhat similar to Mexico’s, with the government attempting to enlist the central bank in a pro-growth campaign that instead seems likely to entrench high inflation. And South Africa is wrestling with a range of problems that include rent-seeking, somewhat offset by well-developed capital markets and ongoing improvements in human capital. While lower than before, our projections for these economies do not seem unduly pessimistic; indeed, those for Brazil and South Africa stand above their own 10-year averages, and Mexico is close to its own, while Turkey is the third-highest EM projection after India and China.

Korea and Taiwan represent special cases in the EM universe, given their relatively high income status. Their growth projections, 2.2% and 1.6%, respectively, look like DM forecasts, but their structure is different. Both suffer from rapidly aging populations, and their workforces are expected to shrink fairly rapidly in coming years. But each specializes in high tech manufacturing, where productivity gains can be sustained at a high level, and both have consistently generated solid TFP growth. Korea and Taiwan therefore will likely continue to experience steady increases in per capita income as their successful convergence to DM status continues.

EM INFLATION: LOOSE ANCHORS

We cast a wider net in assessing the underlying drivers of EM inflation relative to their DM counterparts, a reflection of the fact that EM inflation anchors are generally looser and more prone to influence by political shocks, currency volatility and trends in global goods prices. This diverse set of drivers leads to various revisions in our EM inflation forecasts. As a complement to the policy disappointments in Mexico and Turkey and their corresponding growth downgrades, we revise up our inflation projections by 20bps and 50bps, respectively. While this pattern of revisions indicates a much less favorable balance of growth and inflation in those economies and, to be sure, a somewhat downbeat view, our inflation outlook is actually on the optimistic end of the spectrum of lived experience. Average inflation in Mexico and Turkey over the past one-, five-, 10- and 20-year periods is higher than what we have penciled in.

For China, recent inflation dynamics have also influenced our expectations for the future, and we take aboard the persistent tendency to undershoot the People’s Bank of China’s 3% inflation target. Pockets of domestic excess capacity in combination with weak global goods pricing and an expectation that the yuan will appreciate over the long term suggest that inflation will remain modest, and thus we cut our forecast by 25bps. While proximity to China might suggest similar downdrafts for Korea and Taiwan, given that we cut our Korea projection last year we are comfortable with the low levels of inflation already embedded in our outlook. One intriguing possibility is that the recent deceleration of globalization, in particular the U.S. pushback against China’s integration, mitigates China’s future ability to export its excess capacity, weakening the associated headwinds to global inflation. We note one success story vis-à-vis inflation: Brazil. While political change has created its share of obstacles to real growth, central bank credibility has kept inflation expectations in check. We now expect inflation to average 4.5% over our forecast horizon, well within the tolerance range set by policymakers.
THE EVOLVING ROLE OF ESG ISSUES IN MACROECONOMIC ANALYSIS

Author
Jennifer Wu, Global Head of Sustainable Investing

Considering environmental, social and governance (ESG) issues in macroeconomic analysis is nothing new. For example, ESG analysis is used in estimating the variables that impact capital input, hours worked per person, the growth of a labor force and total factor productivity (TFP). The degree of a country’s reliance on energy imports and how well it manages its own natural resources, workers’ education and health, the openness and accountability of governmental agencies, political stability – all these are ESG factors that macroeconomic forecasts already take into account.

So what is new about ESG? Two emerging trends in ESG analysis will, we believe, shape the way we analyze and predict real economic activity over the next decade. First, a growing body of research is exploring the impact of ESG issues on economic and financial returns. The assumption or perception that ESG considerations come at a cost is no longer a valid argument – this research provides evidence that information on ESG issues should be understood not as good or bad but merely as a reflection of facts and context. We note, too, that ESG should not be treated as a single category, given that E, S and G issues can be quite distinct from one another – although it is important to understand the relationships among them. Because of these distinctions, we don’t believe there is a one-size-fits-all solution, even as many attempts exist to create country-level definitions of ESG. We think the opportunity lies in identifying a country’s exposure and management of different E, S and G issues at the sectoral level and in estimating the impact on real economic activity.

Second, we believe that a more systematic and explicit consideration of the E, S and G risks and opportunities will play a much more significant role in macroeconomic analysis over our 10- to 15-year forecast horizon. Themes such as climate change, data privacy, technology disruption, social inequality and the circular economy (an economy that aims to eliminate waste and regenerate resources) are not stand-alone E, S or G issues. Rather, they are interconnected forces that affect the pace and variability of economic growth through their impacts on labor supply, productivity growth and production output. Each of these themes presents specific environmental, social or governance effects on different sectors and regions. Climate change, for example, impacts societies and economies through two main channels: the physical aspects of climate change as well as the implications of the ongoing transition to a low carbon economy. They each present E, S and G risks and opportunities.

Changes in the physical climate system have contributed to an estimated USD 4.2 trillion of global economic losses by natural disasters since 2000, of which the uninsured losses have been increasing at a faster rate than the insured portion in recent years. Faced with rising atmospheric and ocean temperatures, increasing and irregular precipitation levels, local sea-level rise and the collapse of ecosystems, policymakers and market participants are engaged in a broad discussion about the impacts of climate change on public health and labor productivity. In effect, these seeming “environmental” problems have become new “social” issues. For example, agriculture is expected to be the sector most affected by climate change, as water stresses render certain regions infertile, leading to population migration and worker displacement.

Transition impacts occur when countries and companies begin moving toward a less polluting, greener, low carbon economy. Such transitions may well trigger shifts in asset values for some industries or raise the cost of doing business while they reduce greenhouse gas (GHG) emissions and improve energy efficiency. Among the forces spurring these changes, some of which are already in effect: new regulatory policies; the introduction of carbon taxes or other market incentives, such as subsidies; advances in technological solutions; and shifts in market demand. Determining how E, S and G risks and opportunities might impact real economic activity will not be a simple exercise, but we believe that these impacts will be unavoidable, especially over the next five years.

One challenge of performing ESG analysis is clear: a persistently high level of uncertainty about the timing and potential magnitude of the ESG issues’ impacts - many of which are unprecedented. Because these issues are multi-faceted and interconnected, they are unlikely to be captured by a single equation or econometric estimate. We see an opportunity to start building new economic models as more data becomes available and we gain a better understanding of how environmental, social and governance factors might shape the global economy over time.

---

1 Weather, Climate & Catastrophe Insights, AON, 2018.
I Thematic articles
The failure of monetary stimulus

Dr. David Kelly, CFA, Chief Global Strategist, Head of Global Market Insights Strategy
Yoshinori Shigemi, Global Market Strategist, Global Market Insights Strategy
Vincent Juvyns, Global Market Strategist, Global Market Insights Strategy
Michael Albrecht, CFA, Global Strategist, Multi-Asset Solutions
Meera Pandit, CFA, Market Analyst, Global Market Insights Strategy
Jason Davis, CFA, Portfolio Manager, Global Fixed Income, Currency & Commodities

**IN BRIEF**

- Global central banks implemented conventional and unconventional monetary easing after the financial crisis. We assess its effectiveness in stimulating aggregate demand through six transmission mechanisms.

- Of these six mechanisms of transmission, the price effect reduces interest costs, encouraging borrowing and investment; the wealth effect boosts asset prices to create wealth and promote consumption; the currency effect reduces a currency’s value, boosting exports and reducing imports; the income effect lowers income for savers and expenses for borrowers; the confidence effect impacts confidence in economic prospects; and the expectations effect discourages borrowing in anticipation of lower rates.

- We conclude that the price, wealth and currency effects of monetary stimulus are mostly positive and the income, confidence and expectations effects are mostly negative. In addition, the evolution of economies over time and a starting point of very low interest rates both tend to reduce the positive impacts of monetary stimulus and increase the negative impacts. These impacts also vary across regions, but generally we conclude that the net economic impact of monetary stimulus in today’s global economy is, at best, low and, at worst, negative.

- We expect central bankers to take a different view, and believe they will consequently respond to future economic weakness with similar monetary stimulus tools. This is an important rationale for our developed economies forecast of slow growth, low inflation and low interest rates over the next 10 to 15 years.
The failure of monetary stimulus is a deliberately provocative title, highlighting both a dominant theme of recent economic history and a key driver of our long-term views. We should stress at the outset that we do not question the good intentions of central banks or their effectiveness as lenders of last resort in times of financial turbulence.

However, particularly since the financial crisis of 2008–09, most major central banks in developed countries have failed to raise inflation to their stated targets. In addition, while the global economy has expanded steadily, it has generally grown more slowly than in periods with less dramatic monetary stimulus. Finally, it appears that easy money has done a better job of boosting financial assets than the real economy—a benefit to investors but potentially at the cost of aggravating income inequality today and risking financial turmoil in the future.

To assess the efficacy of monetary stimulus, we review the recent conventional and extreme steps taken by the Federal Reserve (Fed), the European Central Bank (ECB), the Bank of Japan (BoJ) and the Bank of England (BoE), and analyze their effects through a framework of six transmission mechanisms.

We recognize that the view we espouse here is not widely accepted by central bankers. Consequently, we believe they will respond to future economic weakness with a similar array of monetary stimulus tools, which we expect to be no more effective than they have been in recent years. This is an important rationale for our developed economies forecast of slow growth, low inflation and low interest rates over the next 10 to 15 years.

POST-GLOBAL FINANCIAL CRISIS STIMULUS EFFORTS

Since the onset of the financial crisis, central banks have been more aggressive and imaginative in their attempts to stimulate economies than at any time in their histories. Each central bank cut rates effectively to zero, and in the case of the ECB and the BoJ, to negative levels (Exhibit 1A). As the scope for further rate cuts diminished, global central banks resorted to quantitative easing (QE), expanding their balance sheets by USD 11.7 trillion (Exhibit 1B). To support bank lending and liquidity, targeted longer-term refinancing operations (TLTROs) became a critical tool for the ECB starting in 2014, aiming to boost lending by extending cheap long-term credit to banks. The BoE introduced a similar scheme for the UK. Global central banks also employed “forward guidance,” an indication that they would not raise rates in the near term and in some cases until certain conditions were met. In each case, central banks hoped that a promise to maintain low short-term interest rates would result in lower long-term rates.

1 Increase in assets at the Fed, ECB, BoE and BoJ from January 4, 2008, to June 30, 2019, using exchange rates on June 30, 2019.
A TRANSMISSION MECHANISM APPROACH TO ASSESSING THE IMPACT OF MONETARY STIMULUS

How successful have these measures been?

One approach to assessing success would examine real economic growth, unemployment and inflation in the wake of the global financial crisis. Historically, a severe recession has typically been followed by a strong bounce back in economic activity. However, across the developed world post-crisis growth has been mediocre and inflation has been surprisingly low, despite a relatively normal decline in unemployment. Yet this approach cannot clarify the effectiveness of monetary stimulus because other forces could have contributed to lackluster economic performance, including tepid fiscal stimulus and austerity in Europe and the UK, slower growth in the working-age population, regulatory tightening and the structural evolution of the economy itself. In addition, it is difficult to assess whether these forces simply slowed the economy, increasing the need for monetary stimulus, or actually undermined the effectiveness of the stimulus itself.

Another approach would be to use conventional, “black box” time-series econometric models. However, changes in interest rates impact economic agents through multiple transmission mechanisms that take time to play out, making their effects almost impossible to isolate, particularly when assessing both conventional and unconventional measures. Bluntly, we know of no way of torturing time-series data to get them to provide an accurate assessment of the impact of monetary stimulus on key economic variables.

However, an alternative approach opens up the black box and looks separately at each of the transmission mechanisms by which easy money should impact the economy, in either a positive or a negative way. Broadly speaking, these transmission mechanisms can be separated into six different channels:

- **THE PRICE EFFECT**: Lower long-term interest rates reduce the expected interest cost of servicing investment spending, inventory stockpiling, homebuying and consumer durable purchases. In theory, this should boost these areas of demand.

- **THE WEALTH EFFECT**: Lower interest rates should make income-producing assets more valuable, thus boosting asset prices and household wealth. Wealthier households should be more willing to spend more at any given level of income.

- **THE CURRENCY EFFECT**: Lower interest rates could make it less attractive for global investors to hold a national or regional currency, thus triggering a devaluation. This could increase exports and reduce imports, thereby boosting GDP.

- **THE INCOME EFFECT**: Households are generally net creditors, while corporations and governments are generally net debtors. Lower interest rates should thus reduce net interest income for households while increasing it for corporations and governments. To the extent that household spending responds more directly to net interest income than does corporate or government spending, lower interest rates may reduce aggregate demand.

- **THE CONFIDENCE EFFECT**: Central bank actions to stimulate the economy could be interpreted as a sign that the economy is in trouble, which could reduce confidence and thus spending among both households and businesses. On the other hand, if central banks are able to portray their actions as appropriate and preemptive, they could boost confidence.

- **THE EXPECTATIONS EFFECT**: In recent times, monetary stimulus has been doled out in a series of discrete moves. A move to cut rates will often foster speculation about further cuts. While this could lower long-term interest rates, it may also give economic agents a reason to hesitate to borrow money until rates have fallen further.

TRANSMISSION MECHANISMS IN PRACTICE

How have these effects played out across the U.S., eurozone, UK and Japan?

- **THE PRICE EFFECT**: All else equal, lower interest rates should stimulate investment spending, homebuilding and consumer durable purchases by reducing the interest payments on these purchases. While this is generally true, the impact of the price effect on the economy can vary: first, over time; second, across economies; and third, at different levels of interest rates.

On the first issue, the importance of interest rate-sensitive sectors has diminished in recent years. This can be seen, for example, in the declining employment share of the interest rate-sensitive manufacturing and construction sectors across the developed world (Exhibit 2). This, on its own, should have reduced the positive price impacts of lower interest rates on aggregate demand.
The declining employment share of manufacturing and construction reflects the diminished importance of interest rate-sensitive sectors.

EXHIBIT 2: MANUFACTURING AND CONSTRUCTION, % OF TOTAL EMPLOYMENT


On the second issue, those economies with relatively high exposure to interest rate-sensitive sectors should benefit more from lower interest rates. In addition, other factors can limit the ability of low interest rates to incentivize capital spending. For example, in Europe up to two-thirds of corporate financing comes from bank lending, which can be constrained by stressed bank balance sheets. Combating this issue in the UK, the Bank of England introduced a Special Liquidity Scheme, which helped remove illiquid assets from bank balance sheets, allowing for a more effective transmission of rate cuts to consumers. Meanwhile, a recent Bank of Japan report revealed that 41% of Japanese small- to medium-sized enterprises either don’t borrow or have cash holdings that exceed borrowing, rendering lower rates less relevant.

On the third issue, the initial level of interest rates is important because of the multiple constraints on investment and spending decisions that involve financing. For example, in the housing market a borrower must be able to make the mortgage payment but also accumulate a down payment and have an acceptable credit score. When rates are high, the mortgage payment is the biggest constraint. However, a long period of low interest rates can boost home prices, making the down payment more problematic. Further, in the wake of the financial crisis banks have demanded higher credit scores. As a result, when rates are low, interest payments are less of a binding constraint on homebuying, reducing the potential for rate cuts to boost demand.

THE WEALTH EFFECT: Lower interest rates boost asset prices by increasing the value of any asset that pays a steady stream of income. That would tend to have a positive impact on aggregate demand, but the concentration of wealth among the very richest in society, whose spending is relatively unaffected by changes in their net worth, can dilute that impact (Exhibit 3). The wealth effect may also be diminished when counteracted by a belief that in a low rate environment you need a bigger stock of assets to finance retirement, particularly if you are averse to selling "principal."

The wealth effect of monetary stimulus has also likely varied significantly across different regions in recent years.

Since the onset of the financial crisis, the gain in net worth has clearly been strongest in the U.S. due to a booming stock market. However, only some of this is the result of easy money; much of the rest of the story reflects better corporate earnings growth and a substantial cut in the corporate tax rate.

Smaller wealth effects in Europe may also partly reflect the relatively defensive asset allocation of European households, who, on average, hold 39% of their assets in currency and deposits and just 22% in equities. They thus benefited less from the asset reflation that followed the implementation of the ECB’s unconventional monetary policy measures.

The BoJ has very directly tried to engineer a wealth effect by buying riskier assets, such as equity ETFs and REITs, as part of its QE program.

Asset appreciation tends to boost aggregate demand, but wealth concentration can dilute that impact.

EXHIBIT 3: CONCENTRATION OF WEALTH ACROSS DEVELOPED COUNTRIES


---

2 “Funding the EU economy: The role of banks and financial markets,” Association for Financial Markets in Europe (2014), using International Monetary Fund data from 2012.

3 Bank of Japan, April 2019.

4 OECD (2019), household financial assets (indicator) as of 2016. Eurozone aggregate is based on a simple average of underlying constituents.
However, even though gains in wealth since the onset of the financial crisis have been more muted outside of the U.S., the impacts of improved wealth may be more similar, as wealth is much better spread across society in Europe, the UK and Japan than it is in the U.S., potentially boosting the impact on aggregate demand from an increase in wealth.

It should finally be recognized that the positive wealth effect of monetary easing has likely fallen in all countries over time because of an increasing concentration of income and wealth among the very richest households, who are less likely to spend their gains in either income or wealth.

**THE CURRENCY EFFECT:** In theory, lower interest rates can reduce exchange rates by making domestic currencies less attractive to global investors. This can, in turn, boost exports and reduce imports, thus increasing domestic demand. Over the past 20 years, however, the evidence for this is mixed. In particular, while lower relative short-term interest rates do appear to have resulted in weaker currencies, the effects seem to be relatively weak and have varied across countries, with sterling and the yen the most sensitive to rates and the dollar and the euro less so.

In addition, the potential for lower exchange rates to boost domestic demand depends on the size of the trade sector. In particular, the UK has a substantially larger trade sector as a share of GDP than the eurozone (counted as a single region), Japan or the U.S. (Exhibit 4). Finally, it should be noted that any positive effect on demand from lower exchange rates is, of course, a zero-sum game across nations.

In an economy with a larger trade sector, lower exchange rates have a greater potential to boost domestic demand

<table>
<thead>
<tr>
<th></th>
<th>Imports</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>29.8%</td>
<td>28.3%</td>
</tr>
<tr>
<td>Eurozone</td>
<td>16.5%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Japan</td>
<td>15.3%</td>
<td>16.3%</td>
</tr>
<tr>
<td>U.S.</td>
<td>14.6%</td>
<td>11.9%</td>
</tr>
</tbody>
</table>


**THE INCOME EFFECT:** Since households are generally net creditors while corporations and governments are generally net debtors, lower interest rates should reduce net interest income for households while increasing it for corporations and governments. As a result, the income effect of monetary stimulus is negative, counteracting the positive price effect. Throughout the developed world, households have more interest-bearing assets than interest-bearing liabilities, while corporations and governments tend to be net borrowers.

In addition, most U.S. household liabilities are in the form of fixed rate mortgages, while their interest income tends to be impacted by interest rate changes far more quickly. Consequently, lower interest rates, on net, reduce household discretionary income. Moreover, in recent decades the gap between interest-bearing assets and nonmortgage interest-bearing liabilities has risen sharply relative to GDP, increasing the negative income effect of rising rates.

While the eurozone has a greater exposure to adjustable rate mortgages than the U.S., household debt accounts for only 58% of GDP vs. 76% in the U.S., while European households hold 39% of their financial assets in currency and deposits compared with 13% in the U.S. As a consequence, European household income has also been negatively affected by the ECB’s monetary policy.

Interest rates on savings accounts in Japan have been almost zero throughout this century, highlighting the drag of low interest rates on a nation with traditionally high personal savings. The UK may have less exposure to negative income effects than other developed nations due to very high housing debt, most of which is financed through adjustable rate mortgages.

Across economies, distributional issues should reduce the negative income effect. Interest-bearing assets tend to be concentrated among the rich, while debt is more aligned with the overall income distribution. Just as in the case of the wealth effect, changes that impact the finances of the richest households are less likely to have knock-on effects on the rest of the economy due to these households’ lower average propensity to consume (Exhibit 5).

In an economy with a larger trade sector, lower exchange rates have a greater potential to boost domestic demand

---

5 Bank for International Settlements (2018); OECD (2019), household financial assets (indicator) as of 2016. Eurozone aggregate is based on a simple average of underlying constituents.
THE CONFIDENCE EFFECT: Monetary stimulus could boost confidence if it were seen as a clear answer to an economic problem that was already widely perceived. But because monetary stimulus is often viewed as an admission by monetary authorities that things are worse than they thought, it tends to diminish consumer and business confidence.

As evidence of this, in recent decades in the U.S. interest rate cuts have generally been accompanied by declines in consumer confidence (Exhibit 6).

Immediately following the financial crisis, the ECB failed to boost consumer and business confidence in the eurozone. The fact that the European economy endured a double-dip recession didn’t help, of course. In Europe, too, policy rate cuts have usually been associated with diminished consumer confidence. In the wake of the financial crisis, the ECB failed to boost consumer and business confidence. However, during the sovereign debt crisis in 2012, when the fate of the euro was in question, the ECB deployed a range of unconventional policy measures and ECB president Mario Draghi delivered a crucial speech promising to do “whatever it takes” to save the euro. These actions seemed to have a positive impact on business and consumer confidence.

Similarly, the appointment of Haruhiko Kuroda as head of the BoJ, reflecting a new determination from both the government and the BoJ to achieve higher inflation, delivered an initial boost to consumer confidence. However, successive failures to stimulate inflation have eroded public confidence. At this stage, further monetary easing might well trigger a decline rather than an increase in consumer sentiment.

Interest rate-bearing assets tend to be concentrated among the rich, who have a lower average propensity to consume

EXHIBIT 5: U.S. PRETAX INCOME, INTEREST EARNED AND PAID IN HIGHEST INCOME DECILE AND AVERAGE PROPENSITY TO CONSUME FOR HIGHEST DECILE AND LOWEST 90%

<table>
<thead>
<tr>
<th>Pretax income</th>
<th>Interest earned</th>
<th>Interest paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>34%</td>
<td>55%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Top 10% share of pretax income, interest paid/earned

<table>
<thead>
<tr>
<th>Spending as a share of income after tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>76%</td>
</tr>
<tr>
<td>102%</td>
</tr>
</tbody>
</table>

Bottom 90%


U.S. interest rate cuts have generally been accompanied by declines in consumer confidence

EXHIBIT 6: U.S. CONSUMER SENTIMENT AND FED EASING CYCLES

**THE EXPECTATIONS EFFECT:** Finally, there is the expectations effect. In recent decades, all major central banks appear to have adopted an incremental approach to changes in policy rates, with tightening and easing cycles stretching into years rather than months. Rate adjustments in one direction are often followed by further rate adjustments in the same direction, so a move to cut rates will often foster speculation about further cuts. Policy rate cuts thus tend to result in lower long-term rates as investors build in some expectation of lower rates ahead (Exhibit 7).

Policy rate cuts often foster speculation about further rate cuts

**EXHIBIT 7: PERCENTAGE OF RATE ADJUSTMENTS (CUTS OR HIKES) FOLLOWED BY A FURTHER MOVE IN THE SAME DIRECTION WITHIN THE NEXT SIX MONTHS**

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>UK</th>
<th>Eurozone</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last 35 years</td>
<td>81%</td>
<td>74%</td>
<td>68%</td>
<td>44%</td>
</tr>
</tbody>
</table>


However, the expectation of even easier monetary policy ahead probably has the impact of causing borrowers to delay borrowing and investing activity as they wait for even lower rates. This should partly offset the stimulus impact of lower rates on their own.

**SUMMING UP THE TRANSMISSION EFFECTS**

Exhibit 8 provides a qualitative summary of the six transmission mechanisms across regions. In broad terms, we continue to believe that the price, wealth and currency effects of monetary stimulus are positive and the income, confidence and expectations effects are negative.

Price effects from lower interest rates are probably pretty similar across developed nations, as the most interest rate-sensitive sectors of the economy account for similar shares of regional employment today. However, they are likely far less potent than in the past, both because of a declining share of interest rate-sensitive sectors over time and the very low levels of interest rates that have prevailed in these regions since the financial crisis. The wealth effect should also be positive across all regions and most potent in the U.S., given the generally higher levels of financial wealth in the U.S. However, that advantage should be somewhat reduced by the more unequal wealth distribution in the U.S. and the tendency of the wealthy to save rather than spend. The UK has the greatest potential to experience a positive currency effect from easy money due to its large trade sector. We note, however, that the sharp fall in sterling and the euro relative to the U.S. dollar since 2008 probably reflects differences in economic performance rather than monetary policy. Japan, which has implemented the most aggressive monetary stimulus, has seen little change in its exchange rate relative to the U.S.

Countering the positive effects of price, wealth and currency are the negative impacts on aggregate demand of the income, confidence and expectations effects. With holdings in interest-bearing assets outstripping holdings in interest-bearing liabilities, the income effect should have been significantly negative in the U.S., although less so in the UK, the eurozone

The price, wealth and currency effects of monetary stimulus are mostly positive, and the income, confidence and expectations effects are mostly negative

**EXHIBIT 8: QUALITATIVE SUMMARY OF ALL SIX EFFECTS ACROSS FOUR REGIONS**

<table>
<thead>
<tr>
<th>EFFECT</th>
<th>DESCRIPTION</th>
<th>U.S.</th>
<th>JAPAN</th>
<th>EUROPE</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Reduce interest costs to encourage spending/investment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Wealth</td>
<td>Boost asset prices, create wealth, promote consumption</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Currency</td>
<td>Reduce currency, boosting exports and reducing imports</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Income</td>
<td>Reduce expense for borrowers and income for savers</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>–</td>
</tr>
<tr>
<td>Confidence</td>
<td>Boost confidence in economic prospects</td>
<td>✗</td>
<td>–</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Expectations</td>
<td>Discourage borrowing today in anticipation of lower future rates</td>
<td>✗ ✗</td>
<td>✗</td>
<td>✗ ✗</td>
<td>✗ ✗</td>
</tr>
</tbody>
</table>

and Japan due to their higher use of adjustable rate mortgages. Finally, rate cuts and QE have tended to undermine consumer confidence and delay investment decisions across regions, by sending a negative signal on central bank economic expectations and a clear signal that borrowers will be rewarded for waiting.

On balance, it would appear that monetary stimulus has its greatest chance of having a positive impact in the UK and its greatest chance of actually dragging on growth in the U.S. Crucially, however, across regions the net economic impact of monetary stimulus appears to be very low and potentially negative.

## The Future of Monetary Stimulus

As we suggested in our 2016 article, “The future of monetary policy,” we believe that central banks in the future will return to the policies first employed in this cycle, including quantitative easing. Simply put, what was once extraordinary and unconventional will likely become ordinary and conventional.

Policymakers will have learned from the experience of the last decade, and this should result in a greater emphasis on those policies that appear to have had the greatest positive impact. These could include more targeted lending schemes that directly incentivize banks to finance capital spending or homebuying.

Greater coordination with fiscal authorities would likely help as well, as would a commitment to avoid allowing too-tight lending standards to negate the impact of lower interest rates. Central banks could also adopt shock-and-awe tactics in place of incrementalism, by reducing interest rates very sharply at the outset of any bout of economic weakness.

However, policymakers will also face some greater challenges in the years ahead. While coordination with fiscal authorities is essential, years of low interest rates and low inflation have eroded public support for fiscal discipline. Although Modern Monetary Theory (MMT) seems unlikely to be adopted formally, central governments will be increasingly tempted, by low interest rates and a lack of negative near-term consequences, to expand deficits and dismantle central bank independence. At an extreme, of course, this could lead to hyperinflation. However, even when employed to a lesser degree, increased central government control of the economy would likely diminish productivity and potentially, by favoring political allies, erode democracy.

Assuming, however, that fiscal policy does not precipitate a crisis, the greatest challenge for monetary authorities in the 2020s will be the starting point. In an environment already characterized by low inflation and low interest rates, monetary stimulus will likely continue to be relatively ineffective. To the extent that it is, and to the extent that central banks do not fully recognize this, both the evolution of the global economy and the behavior of central banks could contribute to an era of continued slow growth, low inflation and low interest rates throughout our 10- to 15-year investment time frame.

---

The next phase of China’s growth

Michael Hood, Global Strategist, Multi-Asset Solutions
Hannah Anderson, Global Market Strategist, Global Market Insights Strategy
Patrik Schöwitz, CFA, Global Strategist, Multi-Asset Solutions
Sylvia Sheng, Ph.D., Global Strategist, Multi-Asset Solutions
Jasslyn Yeo, Ph.D., CFA, Global Market Strategist, Global Market Insights Strategy

IN BRIEF

• China’s GDP has reached a milestone that puts it on the cusp of middle income status, a point after which other developing economies have lost growth momentum, falling into the “middle income trap.”

• Exceptions were South Korea and Taiwan, which saw living standards continue to rise rapidly after reaching middle income; China faces a different set of challenges, however, including weaker global tailwinds and demographics, and greater reliance on an inefficient state sector.

• We project China’s real GDP growth will average 4.4% annually over the next 10 to 15 years, which would put China into the high income group of countries, although the range of possible growth outcomes has widened.

• While China’s equity and bond markets are the world’s second largest, the investment opportunity set does not match China’s economic heft, and significant changes to its financial markets likely lie ahead – posing opportunities and risks for investors.

• Investors able to carry out the requisite analysis may find opportunities, including in China’s rising services and consumer sectors, and elsewhere in Asia as China’s development effects reach beyond its borders.
WILL CHINA GROW RAPIDLY FROM HERE OR FALL INTO THE “MIDDLE INCOME TRAP”?

During 2019, China will likely pass a milestone in its development: Per capita GDP, measured using market exchange rates, will reach USD 10,000 (10K). This comes after China’s per capita GDP doubling since 2011 and increasing 10-fold since 2000. This massive improvement in the living standards of a population that exceeds 1 billion represents one of the greatest and fastest economic success stories in history.

In recent years, China’s growth has slowed from its double-digit pace, and the economy is now at an important juncture. Very few developing economies have maintained strong momentum in convergence toward the world’s richest economies much past the point when they reached the USD 10K per capita GDP mark—a phenomenon known as the middle income trap. In our judgment, China will likely escape this trap. We expect its economy to continue growing rapidly during the next 15 years, nearing high income status by the end of that period.

South Korea and Taiwan provide encouraging precedents, having grown steadily after crossing the 10K line in the 1990s, and their convergence with developed economy income levels is nearly complete. Both managed 5% annual average real GDP growth in the 15 years after hitting the 10K mark, and at present their convergence with developed economy income levels is nearly complete. We believe China will expand a bit more slowly than 5% from here, for a variety of reasons. This year’s Long-Term Capital Market Assumptions (LTCMAs) project 4.4% Chinese real GDP growth. Potential upside could come from aggressive pursuit of the authorities’ reform program (see box, “Structural reform could shift China’s growth path upward”); downside risk comes primarily from elevated leverage.

IN GOOD COMPANY: COMPARING CHINA’S TRACK RECORD WITH EAST ASIA’S

Chinese per capita GDP has taken a similar path to those of South Korea and Taiwan as they approached USD 10K (Exhibit 1). Taiwan hit that level in 1992, South Korea in 1994. Encouragingly, both saw living standards improve for decades thereafter. A look at aggregate real GDP growth before and after the 10K level (Exhibit 2) suggests two points. First, growth in China has already slowed more than in South Korea and Taiwan at corresponding levels of development. Second, South Korea and Taiwan cooled noticeably once they hit the 10K mark, to an annual average of about 6% in the subsequent five years—roughly the clip at which China is expanding today.

CHALLENGES AND OPPORTUNITIES ALONG CHINA’S LIKELY FUTURE GROWTH TRAJECTORY

China faces several challenges in seeking to maintain rapid growth and avoid the middle income trap. Some relate to the international environment. First, global tailwinds are blowing more weakly than before. Global trade volumes are rising much more slowly today than in the early 1990s, when South Korea and Taiwan were on this same path. Trade growth ran at roughly a 7% per annum pace in volume terms during the
decade after those economies reached the 10K level, vs. 3% to 4% in the past few years (Exhibit 3). Growth in global trade appears to have come to a halt in recent quarters amid persistent U.S.-China trade tensions. The countries that rode an earlier globalization wave also benefited from improving export prices, another phenomenon that has faded. Both volume and price dynamics will make it more difficult for China to achieve rapid, trade-driven GDP growth from here.

Global trade volumes are rising 3%–4% annually today vs. 7% during the years South Korea and Taiwan were moving from middle to high income

EXHIBIT 3: CHANGE IN GLOBAL TRADE VOLUMES (% y/y)


DOMESTIC HEADWINDS TO GROWTH

In addition to external challenges, three main domestic factors are likely to contribute to gradual deceleration in Chinese growth. First, China's demographics look appreciably worse than South Korea's and Taiwan's did at the 10K mark. During the next 15 years, China's prime working-age population—15 to 64—is projected to shrink by a drastic 0.5% a year. By comparison, in the 15 years after they crossed the 10K line, South Korea's prime-age population expanded 0.8% annually and Taiwan's grew by 1.1%. The shrinking of China's workforce may be partially offset by rising labor force participation among a rapidly expanding population of older adults. China's senior participation rate, though, already appears to be above the emerging market (EM) average. In our view, continued urbanization will provide a more significant boost. China remains relatively rural, even for a country at its current level of development, and the urbanization process has been underway steadily for many years, with no obvious recent signs of a slowdown.

Second, China's debt situation poses significant challenges to the growth outlook, as the authorities have acknowledged for several years. The previous development strategy leaned heavily on bank credit to favored sectors and enterprises to spur investment spending. Over the past decade, the shadow banking sector has grown enormously and, more recently, a bond market has flourished. Credit to the nonfinancial sector now stands at roughly 250% of GDP, more than 100 percentage points (ppt.) higher than was the case for South Korea at a similar income level. International experience suggests that rapid debt accumulation is associated with an elevated likelihood of a financial crisis.¹

Even if that does not occur, China's breakneck pace of capital deepening has probably resulted in resource misallocation that will persistently reduce productivity growth. The Chinese government itself has signaled discomfort with further leverage and has cracked down especially on the shadow banking system. The government's orientation will likely lead to consistently tighter policy settings, particularly monetary, than would otherwise be the case.

Third, the structure of China's economy may inhibit future productivity growth. In particular, the prevalence of large state-owned enterprises (SOEs) looked more appropriate at an earlier stage of development, when the authorities needed to encourage rapid expansion of the capital stock. From here, however, convergence with high income economies will need to come more from total factor productivity (TFP) growth,² which international experience suggests thrives within more decentralized, innovation-based structures. Indeed, some calculations point to increasingly negative TFP growth in China during recent years. In this respect, the authorities' mooted reform plans represent an opportunity to achieve faster growth than envisioned in our baseline forecast (see box). At the same time, the likely rebalancing toward services that the economy will undergo in coming years (in cross-country analysis, a standard accompaniment to higher income levels) may not be an unambiguous positive for total growth, given that productivity is typically lower in services than in manufacturing.³

² Productivity growth not explained by capital stock accumulation or increased hours worked, capturing the efficiency or intensity with which inputs are utilized; a residual that likely reflects technological change.
STRUCTURAL REFORM COULD SHIFT CHINA’S GROWTH PATH UPWARD

While China’s economy appears less well positioned than its Asian neighbors were at a similar stage of development, economic efficiency, and thus growth, could potentially be improved through structural reforms. Reforms to state-owned enterprises (SOEs) and the financial and services sectors could lead to better resource allocation and boost productivity.

Although their share of the economy has steadily declined over the past two decades, SOEs still play a major role, accounting for around 20% of industrial output and 15% of urban employment (down from above 40% in 2000). During a 1990s phase of SOE reforms, the government restructured excessive debt and reduced overlaps, resulting in notable efficiency gains in the state sector over the subsequent decade. These dividends have waned somewhat as SOE efficiency has deteriorated since approximately 2010 (Exhibit A).

Despite subsidized inputs, the RoA of China’s state sector underperforms those of the Chinese private sector and SOEs in other EM economies.

EXHIBIT A: RETURN ON ASSETS OF CHINA’S SOE AND NON-SOE

<table>
<thead>
<tr>
<th>Year</th>
<th>Industrial enterprises</th>
<th>SOEs</th>
<th>Non-SOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>14%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>03</td>
<td>12%</td>
<td>7%</td>
<td>10%</td>
</tr>
<tr>
<td>06</td>
<td>10%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>09</td>
<td>8%</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>12</td>
<td>6%</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>15</td>
<td>4%</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>18</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
</tr>
</tbody>
</table>


Chinese SOEs appear inefficient by both domestic and international standards; their return on assets (RoA) lags both private sector counterparts and the SOEs of other emerging markets. China’s SOE returns would likely be even lower after adjusting for the favorable terms on which these firms can access land and credit. Productivity in the state sector is, on average, about 25% below private firms’, even after controlling for differences in their industry mixes, according to International Monetary Fund estimates.1 SOEs are also more indebted than private enterprises, with lower debt-servicing capacity (Exhibit B).

Facing these issues, the government has identified SOE reform as a priority. The current focus is on initiating mixed ownership – that is, introducing private capital into SOEs. Progress in early pilot programs has been slow, yet we see potential dividends from a shift to mixed ownership. Reforms might create board seats for private investors, which could help modernize corporate governance. The launch of an employee share ownership program could provide stronger long-term incentives for core staff by aligning their interests with their companies’.


China’s state sector is more leveraged than the private sector, likely reflecting better access to credit.

EXHIBIT B: LIABILITY-TO-ASSET RATIO OF CHINA’S SOE AND NON-SOE

<table>
<thead>
<tr>
<th>Year</th>
<th>Industrial enterprises</th>
<th>SOEs</th>
<th>Non-SOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>50%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>03</td>
<td>52%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>06</td>
<td>54%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>09</td>
<td>56%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>12</td>
<td>58%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>15</td>
<td>60%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>18</td>
<td>62%</td>
<td>64%</td>
<td>50%</td>
</tr>
</tbody>
</table>


Leveling the playing field may narrow the productivity gap between SOEs and private enterprises. Deregulating state-dominated services sectors, including financials, telecoms and health care, would help foster competition, and lowering barriers to entry could promote efficiency gains. Removing implicit guarantees for SOEs and liquidating nonviable ones would also help address the debt burden problem and improve credit allocation. We estimate that an optimal reallocation of capital between SOEs and private enterprises could by itself boost China’s GDP by around 20 basis points (bps) per year if spread across a decade. Other empirical estimates are higher, suggesting a potential boost to GDP of 20bps-100bps per year.7

Also high on China’s agenda are financial sector reforms. China is transitioning from a quantity-based to a price-based monetary policy framework – that is, switching from controlling the amount of money in the economy to managing the price of that money, with interest rates as the primary instrument. To work, this system requires effective transmission of the policy rate to market rates. The central bank has already established an interest rate corridor, centered on the seven-day repo rate, to limit volatility in short-term interbank rates. Transmission could be further enhanced if institutional constraints on banks – such as high reserve requirements on deposits, and loan quotas – were removed.

Another important step to reduce the misallocation of capital would involve China’s capital markets, which could benefit from further reforms, including lessening restrictions on foreigners’ access to China’s equity and bond markets, encouraging fundamentals-based pricing of assets, lengthening the maturities of traded corporate bonds and strengthening the interest rate derivatives market.

PUTTING IT ALL TOGETHER: ADDING UP CHINA’S GROWTH PROSPECTS

As discussed in the Macroeconomic Assumptions article, we estimate long-term potential growth by making projections for each economy’s labor input (the workforce, human capital and average hours worked per person), capital stock and TFP. We expect a marginally positive growth rate in China’s labor input (thanks to urbanization). With China reaching the 10K GDP per capita mark, and bearing in mind the various challenges the country faces, we are lowering our sights for its future capital stock growth and for TFP. Our LTCMA forecast for Chinese growth over the next 15 years correspondingly shifts down, from 5.0% last year to 4.4% this year—still the second highest in our global sample (behind only India, which has a much lower current level of per capita income). Successful pursuit of structural reforms could steer China onto a somewhat faster growth trajectory.

Given the pervasiveness of the middle income trap, 4.4% per annum real growth for China over the next 15 years would constitute a remarkable and highly unusual success story, especially in a somewhat unforgiving international climate. It would result in substantial further gains in living standards, with per capita GDP in U.S. dollar terms rising (using our LTCMA exchange rate projections) into the upper USD 20,000 range by 2034. By these projections, China would reach high income status, as defined by the World Bank, by the mid-2020s at the latest. That achievement would likely result in another kind of rebalancing, with consumption representing a much higher share of GDP than it does today, along with a declining investment component. Moreover, the aggregate size of China’s economy in U.S. dollars would roughly match, or perhaps exceed, that of the U.S. by the end of our forecast period. Such outcomes might have seemed implausible not very long ago, but they now constitute our base-case LTCMA expectation.

TRANSLATING DEVELOPMENT INTO INVESTOR OPPORTUNITIES: CHINA’S ASSET MARKETS

As China’s economic heft continues to grow, its asset markets are also entering a new phase. Slowing growth, reforms—to both the structure of the economy and the function of the country’s financial industry—and continued economic development will each, in different ways, affect the investment opportunities available in China.

In the fixed income market, the low cost at which firms can borrow, enforced by government influence in the banking system, depresses the base borrowing rate against which investors price instruments across the bond universe. Additionally, low borrowing costs have constrained the development of an onshore bond market—why would a company want to deal with the vagaries of the market when it could access a fixed-term loan at an attractive rate? Bond financing in China may remain more expensive than it would be in a purely market-driven financial system, but that dynamic will likely support elevated yields onshore over our forecast horizon, attracting yield-seeking investors. Financial liberalization will likely allow the base interest rate to rise from its currently depressed level, but China’s slowing nominal growth will put downward pressure on yields, a force we have long highlighted in our LTCMAs.

Policymakers’ emphasis on market-driven pricing, as well as greater reliance on public markets overall, will likely support the growth of China’s bond markets. China’s debt-to-GDP ratio is famously high, but its bond market lags many other countries’. Market-driven pricing requires putting more of China’s debt on the market, supporting bond market growth. New issuance, combined with the yield dynamics and systemic reforms discussed here, will likely draw a steady stream of offshore investors, pushing their ownership of the CNY bond market above its current measly 2%. At the same time, local investors will watch the development of the bond market carefully to see if government issues, in particular, take on “safe haven” status. Persistently negative correlation between stocks and bonds could allow for more stable, internally hedged onshore investment portfolios.

We don’t mean to say that China’s banking system won’t continue to play an outsize role in economy-wide financing—banks are often the largest purchasers of bonds—but banks’ role in intermediation may evolve from issuing loans to also underwriting securitized debt. Official promotion of market pricing of debt, and the shifting of risks from bank balance sheets to market participants, should also help improve liquidity onshore, which, in turn, could lead to less volatility in China’s debt markets.

MARKETS: STILL AMPLE POTENTIAL ROOM TO GROW

It is instructive for investors to consider the examples of the asset markets of other EM economies that accelerated through the middle income trap to understand the likely trajectory ahead for China’s financial markets. One useful metric is the equity market cap-to-GDP ratio, which tends to...

---

rise as economies develop. China’s, currently about 70%, is already fairly high compared with some other economies at an equivalent stage (Exhibit 4). However, many developed market (DM) economies, including Taiwan, have market cap-to-GDP ratios exceeding 100%, implying potential room for growth in the Chinese equity market. Similar dynamics are likely to play out in bond markets. The Chinese bond market today is worth USD 13.2 trillion, or 100% of GDP, vs. 130% of GDP for the value of the U.S. bond market.

Economic growth is not the sole determinant of equity investor returns in China. One big reason for this, which we account for in our returns framework, is dilution: While corporate revenues usually grow in excess of an emerging market’s GDP, share counts also tend to grow as financial markets develop, diluting returns to existing holders. This effect tends to diminish as markets develop, which can be seen in China in recent years.

POTENTIAL INVESTMENT INFLOWS AND THE EVOLUTION OF EQUITY SECTORS

The inclusion of Chinese securities in global benchmark bond and stock indices, and the emergence of vehicles allowing offshore investors access to China’s onshore stock market, have prompted large increases in foreign investor holdings. Yet foreign ownership still remains low by international standards, at 3% of A-share equities, an estimated 15% across all Chinese equity classes and just 2% of bonds (Exhibit 5).

For comparison, foreign investors own around 23% and 24% of the U.S. equity and bond markets, respectively.6 As foreign owners take advantage of recently expanded access to China, we would expect their ownership share to rise closer to the country’s overall percentage of global markets—Chinese securities make up, by market capitalization, roughly 8% of global equity markets and 13% of global bond markets.7

Such ownership shifts, along with the further development of an onshore asset management industry to help Chinese citizens invest their growing incomes, will drive structural change in China’s markets. Chinese equity markets, in particular, are still overwhelmingly held by retail investors, at 82%, while institutional ownership remains relatively low at 18%. This compares with 67% institutional ownership in the U.S. and 60% in the UK.8

This change to the investor base may exert a stabilizing influence on China’s equity prices—now among the EM world’s most volatile, largely due to retail investors’ primacy in the market. China’s increasing integration into the global financial system should also lead its asset market returns to become more correlated with global markets—something that is already happening.

While China’s market cap-to-GDP is fairly high (70%) for the country’s development stage, this ratio in developed market economies can exceed 100%, suggesting room to grow

EXHIBIT 4: EQUITY MARKET CAPITALIZATION-TO-GDP, SELECTED MARKETS

---

5 Because China would eventually dominate benchmark equity indices if its shares’ weighting were commensurate with its market size, it seems likely that over time Chinese listed securities will be spun off into stand-alone indices and/or that a new EM ex-China benchmark index will be established.


LONG-TERM CAPITAL MARKET ASSUMPTIONS

Chinese assets as a share of foreign ownership

Changes in China’s economic structure will also drive shifts in the equity market’s composition. Services- and consumer-focused equity sectors will likely rise in importance at the expense of the energy, materials and industrial sectors that often dominate EM equity markets, in number of listings and market weight, during earlier stages of development. (Taiwan and South Korea exhibited this pattern in recent decades.)

Investors should also keep in mind that many of China’s champion technology and internet companies are not listed on the domestic A-share market, lowering the weight of consumer-focused sectors. The weight of China’s financial sector will likely decline from its current 39%, but it still looks likely to continue to have an elevated weight in the A-share market, reflecting the banking system’s size and outsized role. It should be noted that a dominating financial sector is not uncommon, even among developed markets such as Australia and Canada.

The migration in equity weights in China’s market is already fairly advanced, with energy and materials accounting for just 12% of A-shares.

China’s growth trajectory and the progress of its asset markets are likely to generate spillover effects for other Asian financial markets. We expect revenue growth for the MSCI All Country Asia ex Japan (MXASJ) Index, excluding China, to decelerate in accordance with China’s slower pace of nominal GDP growth. This should especially be the case for Hong Kong, Taiwan, Korea and Singapore, partly because of China’s central role in regional supply chains (Exhibit 6). China’s internal shift to greater economic reliance on consumers and services does not bode well for Asian ex-China industrial firms but could be a boon for consumer-linked firms, especially as Chinese consumers continue to upgrade their purchases.

Within the financial industry, revenue growth opportunities resulting from China’s financial market reform are unlikely to benefit Asia ex-Japan at the level of the MSCI index, given the constituent companies’ limited direct financial exposure to China. Hong Kong’s and Singapore’s financial firms may be an exception, as they will likely gain wider access to China’s banking, brokerage, asset management and insurance markets. As shown in Exhibit 7, China’s households are still relatively underdiversified in their investments, creating a large opportunity for financial services providers.

China is an important source of revenue for Asian companies

Exhibit 6: Revenue Exposure to China of MXASJ Ex-China Markets


The migration in equity weights in China’s market is already fairly advanced, with energy and materials accounting for just 12% of A-shares.
Chinese households have relatively few financial assets

**EXHIBIT 7: HOUSEHOLD BALANCE SHEETS**

<table>
<thead>
<tr>
<th>Currency</th>
<th>Property</th>
<th>Equity</th>
<th>Mutual fund</th>
<th>Insurance &amp; pension</th>
<th>Other securities</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


CHINA STANDS OUT IN INVESTMENT OPPORTUNITIES, EVEN WITH SLOWER GROWTH

China’s rise during the past two decades has exerted enormous influence on the global economy, reshaping supply chains, generating large-scale demand for commodities and creating hundreds of millions of middle class consumers. We expect China to remain a focal point for the global outlook over the next 15 years thanks to its sheer size, even though we forecast somewhat slower growth from here as the country moves from middle income toward high income status.

In some ways, we expect financial market trends to take center stage in China in coming years. Capital markets will likely grow in excess of the rate of GDP growth, deepening opportunities for foreign investors in particular. Foreign participation is rising but remains low by international standards and will likely step up significantly. At the same time, domestic institutional investors, both official and private, will likely gain greater prominence. Sector shifts will occur within markets, with the composition of listed equities likely to change significantly (though banks may well remain more prominent than elsewhere). Investors capable of carrying out deep analysis may thus find ample room for alpha generation. Bond yields will face competing influences from liberalization and slowing growth; a crucial question will be whether government bonds become a true safe haven asset for local investors.

The increasing size and importance of Chinese capital markets will also strongly influence other markets in Asia, and not in a uniformly positive way. Revenue growth elsewhere in Asia may slow, and China’s shift away from manufacturing toward consumer- and service-oriented businesses may well pose a problem for the current set of listed companies in the region. Financial market liberalization in China seems unlikely to carry much benefit for the country’s neighbors, with the exception of financial firms in Hong Kong and Singapore.
New economy, same old returns?

Benjamin Mandel, Ph.D., Global Strategist, Multi-Asset Solutions
David Lebovitz, Global Market Strategist, Global Market Insights Strategy
Christopher M. Sediqzad, CFA, Research Analyst, Multi-Asset Solutions Manager Research
Anthony Werley, Chief Investment Officer, Endowments & Foundations Group
Boqiu Lu, Quantitative Analyst, Multi-Asset Solutions
Emily Overton, Research Analyst, Multi-Asset Solutions Manager Research

IN BRIEF

We use three novel data sources to document the intensity and proliferation of e-commerce in the U.S. economy, its effect on corporations and its investibility through public and private markets. We find that:

• The extent of e-commerce adoption is substantially higher than official statistics suggest.
• E-commerce intensity tends to be positively correlated with corporate performance.
• There are regional and sectoral pockets in public markets that are e-commerce intensive.
• Private companies account for a nontrivial share of e-commerce activity.

For our long-term economic and market projections, these findings give us a higher level of confidence that technology adoption will raise productivity growth from current low levels, with greater benefits to firms levered to this trend. We also see private markets as an important channel by which investors can access technology-related growth.
Technology is a perennial theme in our long-term economic and market outlook. Relatively low rates of productivity growth over the past decade appear to imply either that the technological frontier is expanding at a less rapid clip or that firms have been slower to adopt tech innovations in their business practices. It has also led to speculation of a return to the productivity paradox of the 1970s and ‘80s - often linked to Robert Solow’s quip “You can see the computer age everywhere but in the productivity statistics.” We lean toward a more optimistic interpretation: Our economic projections implicitly assume that any fallow period in innovation and adoption, whether real or a figment of measurement, will prove transient. Moreover, we keep an open mind about upside risk to the outlook as productivity accelerates from its post-crisis lows.¹

Given the difficulty of forecasting productivity, how confident can we be in this sanguine view? And what are its implications for corporate performance and global asset classes? In this paper, we assess recent trends in technology proliferation from the perspective of the economy, firms and investors, using e-commerce as a case study. E-commerce, defined here as the absence of the consumer’s physical presence in the negotiation of terms, placement of orders or payment for purchases, is by no means a comprehensive measure of technology innovation or adoption in the modern economy. However, it is a fairly broad aspect of the “new” economy and, crucially, it is something we are able to measure. We present three empirical proxies for e-commerce and use them to measure the extent and rate of e-commerce proliferation in the U.S. economy, gauge the effects it has on firms and describe how investors can access e-commerce in global markets.

E-COMMERCE IN CONSUMPTION: MORE PREVALENT THAN OFFICIAL STATISTICS SHOW

The first piece of supporting evidence for our view that e-commerce proliferation has been rapid and broad comes from a proprietary measure using Chase consumer card transactions data² (see “Three measures of e-commerce”). We compute e-commerce transaction and expenditure shares at the national and industry level over the past five years (Exhibit 1) by adding up the Chase card transactions flagged as “card not present.” For the subset of consumption classified as retail sales, e-commerce activities account for 16% of expenditure value and 13% of transactions. The disparity between these shares reflects the fact that e-commerce transaction size tends to be larger than average. These series have been rising rapidly over the course of the past five years, with each increasing roughly 7 percentage points.

### E-commerce spending shares are much higher using card data vs. official measures

**EXHIBIT 1: E-COMMERCE TRENDS FOR RETAIL TRADE INDUSTRIES**

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 13</td>
</tr>
<tr>
<td>E-commerce share, retail sales (Census, value)</td>
</tr>
<tr>
<td>E-commerce share, retail sales (Chase, value)</td>
</tr>
<tr>
<td>E-commerce share, retail sales (Chase, transactions)</td>
</tr>
</tbody>
</table>

Both measures are substantially higher than the corresponding estimates from the Census Bureau’s Monthly Retail Trade Survey (MRTS). For the industries classified as retail trade, the average e-commerce value share was 8% over that five-year period. What is striking, beyond the fact that the Chase measures are almost twice as large, is that the two sets of estimates are actually quite similar in both trend and seasonal fluctuation (i.e., to a first approximation, they are off by a constant). We do not believe that the difference in level is a simple artifact of the Chase banking population being different from the overall U.S. population. One piece of evidence that suggests deeper underlying differences between the Census and Chase card measures is the distribution of their shares across industries. High Chase estimates of e-commerce are more or less ubiquitous across the industries shown (Exhibit 2).³ For retail trade industries, the e-commerce value share is above 10% for all industries except two – Food and Beverage Stores and Gasoline Stations – and hence there is no significant skew across industries. In contrast, for the Census measures all industries have a value share of 3% or less, with the exception of Nonstore Retailers at 60%. The fact that virtually all of the Census Bureau’s overall e-commerce share in retail trade industries is driven by Nonstore Retailers suggests

---

¹ For instance, see “Technology, productivity and the labor force: The impact of technology on long-term potential economic growth,” in 2018 Long-Term Capital Market Assumptions, J.P. Morgan Asset Management.

² The Chase dataset excludes some co-branded cards.

³ Industries are as defined by the North American Industry Classification System (NAICS).
that aggregate differences in e-commerce share are not a simple function of Chase customers being generically more intensive e-commerce users.

The discrepancy between Chase and official measures is starker for services industries, as illustrated relative to the Census Bureau’s Service Annual Survey (SAS) in Exhibit 2. The sheer magnitude of the differences, even for sectors where revenues consist primarily of final demand by households (which are most comparable to our perspective in the Chase data), appears to indicate considerable underlying disparities.4

While the MRTS measures sales to final consumers exclusively, the SAS sales figures include transactions with other businesses and, as such, capture some activity that is not strictly comparable to the Chase measures.

Personal and Laundry Services, for example, an industry that caters primarily to individuals and households rather than businesses, has a 21% e-commerce share in the Chase data vs. 4% in the SAS.

We suggest two possible explanations for what is driving the higher e-commerce intensity in Chase’s measure. First, we employ a broader definition, including payments, as opposed to the Census definition, which focuses on orders. To the extent that e-commerce circumscribes the set of payment technologies for things like automatic recurring payments – paying utility bills by direct debit, for instance – we would argue that our measure is actually a better reflection of e-commerce in consumption than the Census measure, in which those transactions would not count as e-commerce.

Large differences exist between Chase and official measures of e-commerce intensity, particularly for services industries

EXHIBIT 2: COMPARISON OF CHASE VS. OFFICIAL MEASURES, BY NAICS INDUSTRY

- E-commerce value share, Chase (2016)
- E-commerce value share, Census (2016)

E-commerce share (%)

The second possibility is that there are inherent measurement biases between estimates based on surveys of firms vs. data collected directly from consumers. So whereas the e-commerce measure of retail trade based on the MRTS is designed to be representative of the universe of 2 million U.S. retail firms, one sampled from the Chase data might be more closely aligned with overall consumer spending. Since these two perspectives are just opposite sides of the same transactions, in principle they should not be that different. But we have more confidence in the direct measures from consumers.

E-COMMERCE AND FIRMS: A POSITIVE PRODUCTIVITY SHOCK, BUT NOT FOR EVERYONE

What does the proliferation of e-commerce mean for corporate performance? Is it a positive innovation for firms’ productivity and cost structures or, rather, an inherent challenge to a subset of firms and sectors now facing greater competition? To some extent, it is both. Our first pass at addressing these questions is to link our Chase card e-commerce measures to economic statistics at the industry level. One striking relationship is that retail trade industries that are more intensive in e-commerce tend to have flatter trends in output price inflation (Exhibit 3). This finding could be consistent with e-commerce as an opportunity or a threat to firms, by lowering marginal costs and prices or putting downward pressure on their margins, respectively.

While the Chase measures are useful for comparison to national statistics and industry macro phenomena, they ultimately fall short of creating tight links with measures of corporate performance. For one, they are not specific to firms, where more detailed information on corporate health is available. We also need a more holistic view of firms’ use of e-commerce. Whereas the card data captures the specific interface between retailers and consumers, it would also be desirable to capture the e-commerce activity of firms providing technology and ancillary services to those retailers. Our solution is to use ThemeBot, a natural language processing algorithm that sifts through hundreds of millions of news articles, regulatory filings, company profiles and research publications to find key phrases associated with e-commerce, and then to score publicly listed firms’ e-commerce intensity (see “Three measures of e-commerce”).

Using this definition, we find that sectors with higher e-commerce scores tend to have had faster revenue growth and greater margin expansion since 2010 (Exhibits 4A and 4B). They also have come to account for a larger share of MSCI All-Country World Index (ACWI) earnings over that period and have had a higher return on equity. This business cycle has highlighted that in periods characterized by sluggish economic growth, markets afford a premium to companies able to generate solid revenue and earnings growth. Interestingly, it is those companies that also tend to have embraced e-commerce. The Information Technology, Consumer Discretionary and Communication Services sectors – some of the best-performing sectors over the course of this cycle – fall into this camp.
It may appear intuitive that higher e-commerce scores are associated with service-oriented businesses and more robust profitability, but are these trends informative about the underlying business model that these companies employ? Drilling down to the industry level yields some interesting insights. One thing to note is that there is far more differentiation at the industry level, and hence a more diffuse relationship, between e-commerce intensity and corporate performance. On average, industries with higher e-commerce scores tend to have higher asset turnover, less leverage and lower capital expenditures as a share of sales (Exhibit 5). This suggests that industries with higher e-commerce scores are employing a more efficient, capital-lite business model. Beneath the averages, we note the possibility that e-commerce's influence on firms has been highly differentiated. For example, Retailing, which has the highest e-commerce score, includes firms that have arguably been hit the hardest by the growth in e-commerce.

### Exhibit 4A: E-commerce Intensity and Revenue Growth

*Annualized revenue growth, 2010-18 (%)*

<table>
<thead>
<tr>
<th>E-commerce score (%)</th>
<th>Energy</th>
<th>Materials</th>
<th>Industrials</th>
<th>Consumer Discretionary</th>
<th>Consumer Staples</th>
<th>Health Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Exhibit 4B: E-commerce Intensity and Margin Growth

*Change in margins, 2010-18 (%)*

<table>
<thead>
<tr>
<th>E-commerce score (%)</th>
<th>Energy</th>
<th>Materials</th>
<th>Industrials</th>
<th>Consumer Discretionary</th>
<th>Consumer Staples</th>
<th>Health Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


While not a tight relationship, companies with higher e-commerce intensity have lower capital expenditures-to-sales ratios

### Exhibit 5: E-commerce Intensity and Capital Expenditures

*Capital expenditures % of sales*

<table>
<thead>
<tr>
<th>E-commerce score (%)</th>
<th>Utilities</th>
<th>Semiconductors &amp; Semiconductor Equipment</th>
<th>Telecommunication Services</th>
<th>Media &amp; Entertainment</th>
<th>Pharmaceuticals, Biotechnology &amp; Life Sciences</th>
<th>Household &amp; Personal Products</th>
<th>Consumer Durables &amp; Apparel</th>
<th>Food &amp; Staples Retailing</th>
<th>Retailing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Public market e-commerce opportunities are concentrated in a few economies and sectors, with smaller pockets elsewhere.

EXHIBIT 6: E-COMMERCE INTENSITY SCORES FOR ECONOMY/SECTOR PAIRS, %

<table>
<thead>
<tr>
<th>Country</th>
<th>Energy</th>
<th>Utilities</th>
<th>Real Estate</th>
<th>Materials</th>
<th>Financials</th>
<th>Consumer Staples</th>
<th>Health Care</th>
<th>Communication Services</th>
<th>Industries</th>
<th>Information Technology</th>
<th>Consumer Discretionary</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israel</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Italy</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Spain</td>
<td>0.0</td>
<td>0.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Mexico</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>0.4</td>
<td>0.1</td>
<td>0.0</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.0</td>
<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Germany</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td>2.6</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.8</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>1.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Canada</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
<td>0.5</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.4</td>
<td>0.5</td>
<td>3.4</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
<td>0.5</td>
<td>0.2</td>
<td>0.5</td>
<td>0.3</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>India</td>
<td>0.4</td>
<td>0.2</td>
<td>0.0</td>
<td>0.4</td>
<td>0.1</td>
<td>0.7</td>
<td>0.8</td>
<td>0.3</td>
<td>0.2</td>
<td>0.4</td>
<td>0.5</td>
<td>3.9</td>
</tr>
<tr>
<td>France</td>
<td>0.1</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.8</td>
<td>0.3</td>
<td>0.2</td>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
<td>0.0</td>
<td>0.4</td>
<td>0.5</td>
<td>1.0</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>0.6</td>
<td>4.3</td>
</tr>
<tr>
<td>South Korea</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.6</td>
<td>0.7</td>
<td>1.1</td>
<td>0.3</td>
<td>1.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Japan</td>
<td>0.0</td>
<td>0.1</td>
<td>0.5</td>
<td>0.8</td>
<td>1.0</td>
<td>1.8</td>
<td>1.4</td>
<td>1.7</td>
<td>3.1</td>
<td>2.2</td>
<td>2.3</td>
<td>15.0</td>
</tr>
<tr>
<td>China</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td>1.2</td>
<td>2.9</td>
<td>0.9</td>
<td>2.8</td>
<td>2.9</td>
<td>2.7</td>
<td>2.8</td>
<td>4.9</td>
<td>22.5</td>
</tr>
<tr>
<td>United States</td>
<td>0.9</td>
<td>1.0</td>
<td>1.6</td>
<td>0.7</td>
<td>3.0</td>
<td>1.9</td>
<td>1.7</td>
<td>2.1</td>
<td>2.3</td>
<td>4.9</td>
<td>5.6</td>
<td>25.7</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3.4</td>
<td>3.5</td>
<td>3.9</td>
<td>4.7</td>
<td>9.7</td>
<td>9.8</td>
<td>9.9</td>
<td>11.2</td>
<td>12.1</td>
<td>12.3</td>
<td>19.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>


E-COMMERCE AND INVESTORS: POCKETS OF CONCENTRATION IN PUBLIC AND PRIVATE MARKETS

Having identified the macro trends and some of the relationships between e-commerce intensity and corporate performance, the final question for investors is how to gain exposure to e-commerce as a theme. Within public markets, there are important geographic and sectoral concentrations of e-commerce exposure that investors should keep in mind. For example, roughly 60% of the e-commerce intensity in the ACWI universe is in the U.S., China and Japan, and skews toward Information Technology, Consumer Discretionary and Industrials (Exhibit 6). Looking at this cross section, the nine combinations of these top economies and sectors account for roughly 31% of e-commerce intensity within the MSCI ACWI universe.

An important alternative access point for building exposure to e-commerce trends is through private markets, as the sector mix of these markets suggests. Information Technology and Consumer Discretionary are relatively large shares of the U.S. private equity benchmark, whereas sectors with lower e-commerce scores, like Financials, tend to skew toward public markets (Exhibit 7). Deal trends in the private equity world are consistent with these sectoral patterns. Software transactions as a share of total private equity deals have trended higher as companies have embraced capital-lite business models and spent less on traditional property, plant and equipment. Additionally, the technology sector remains a key focus across both buyout and add-on strategies, a trend showing little sign of abating imminently. In sum, with return expectations in public markets depressed relative to history, investors seeking growth have been migrating toward private markets and, directly or indirectly, the pockets of technology exposure therein.
 Private equity markets can be a gateway to sectors with high e-commerce intensity

EXHIBIT 7: SECTOR WEIGHTS – PRIVATE VS. PUBLIC MARKETS
Difference between U.S. private equity and Russell 2000 sector weights (%)


Focusing on millennial/post-millennial consumers

We bring one more piece of evidence to bear on the question of where e-commerce exposure resides in global markets: a proprietary survey of 183 analysts and interns at J.P. Morgan Asset and Wealth Management (see “Three measures of e-commerce”). The survey results corroborate several findings from the Chase data. Namely, e-commerce accounts for a material amount of consumer spending across a wide swath of sectors, goods and services; for more than 80% of the sample, online expenditures represent over 20% of total consumption. Unsurprisingly, the majority of respondents reference nonstore retailers and air travel as significant beneficiaries of the trend, with more than 60% of the wallet-share as e-commerce in their respective categories. However, traditional retailers also seem to be making significant inroads with their e-commerce presence, muddying the common perception that there are few winners in that space. Respondents are also looking for more from traditional staples-oriented retailers. For example, the top responses to the question “Where would you like to see more of an e-commerce presence?” were grocery stores, food/beverages, health care, drugstores and pharmacies (Exhibit 8). This suggests additional opportunities or potentially fewer threats for businesses willing to evolve their operating models.

Interestingly, when our interns and analysts were asked what individual firms they spend the most with online, relatively new firms focused on e-commerce with direct-to-consumer business models (e.g., personal shopping apps, monthly subscription services and travel companies) were prominent among their responses. This suggests to us that they are comfortable with trying newer brands. The relative frequency of their interaction with these (generally) capital-lite business models lends additional support to our findings on the relationship between e-commerce intensity and operating fundamentals. Separately, a significant amount of money is spent on housing, utilities and financial services, further illustrating the breadth of e-commerce. We also found that the e-commerce share of total consumption is greater and encompasses a broader range of industries among older, fully employed analysts vs. younger summer interns. This suggests that e-commerce spending and its breadth may vary positively with income.

One potential headwind for the e-commerce trend is the perception around data security and privacy. When asked about concerns related to e-commerce, 60% took issue with cybersecurity, although their concern was not reason enough to dissuade them from relying on e-commerce on a regular basis.
Finally, the firms reported as receiving top shares of respondents’ e-commerce spend included a mix of both public and private entities. While the total spend is currently skewed toward public companies, the tail of the opportunity set skews private, suggesting diversity in how investors may access the opportunities leveraging these powerful trends (Exhibit 9).

CONCLUDING THOUGHTS

Our findings for e-commerce have broad implications. For our long-term economic and market projections, these findings give us a higher level of confidence that technology adoption will raise productivity growth from current low levels and provide support for potential GDP growth and equilibrium rates of interest. As such, it would be a mistake to extrapolate the low growth post-crisis experience ad infinitum. These benefits of e-commerce are not for free, though, and there is a voluminous academic literature linking rising wage inequality to, among other factors, the “skill bias” embedded in new technologies. For an early survey, see Daron Acemoglu, “Technical change, inequality, and the labor market,” Journal of Economic Literature 40, no. 1 (2002): 7-72.

THREE MEASURES OF E-COMMERCE

1 Chase credit and debit card data: Our first measure of e-commerce is computed using a confidential administrative dataset of credit and debit card spending from the Consumer & Community Banking division of JPMorgan Chase & Co. The dataset contains monthly card purchase information for 39 million anonymized households that have a banking relationship with Chase, segmented by the roughly 1,000 merchant classification codes (MCC) for the period July 2013–September 2018. The 43.5 billion underlying transactions aggregate to USD 1.8 trillion in spending over that period, representing 3% of total personal consumption expenditures. Spending transactions where the card was not physically present are designated e-commerce. The defining characteristic of e-commerce is thus a lack of physical presence at the point of sale or, to be more precise, the point of payment. This is a broad definition insofar as it includes a much wider set of expenditures than just online purchases of merchandise, but it is similar to definitions used in related research.**

2 ThemeBot: ThemeBot is a J.P. Morgan proprietary portfolio construction engine developed by our Quantitative Beta Strategies group in collaboration with our Intelligent Digital Solutions data science team. It utilizes machine learning techniques to facilitate the building of thematic portfolios. Data is accessed by ThemeBot from a variety of sources, including both primary sources (such as broker reports, company filings, etc.) and secondary sources such as news articles. ThemeBot generates an e-commerce score for each constituent of the MSCI All-Country World Index (ACWI). This e-commerce score has two parts: a textual relevance score, which quantifies how frequently a company is covered in documents that mention theme-related concepts, and a revenue score, a probabilistic metric indicating the likelihood of a company having exposure to business segments related to a theme. Averaging these metrics together produces the e-commerce score, which we use to create market capitalization-weighted aggregates by sector, industry and economy.

3 J.P. Morgan Global E-Commerce Survey of Analysts and Interns:† For a third lens into e-commerce trends, we leveraged insights from a “captive” population of consumers, consisting of over 180 university and graduate-level members of our Global Analyst and Summer Intern classes at J.P. Morgan Asset and Wealth Management, representing a specific cohort of spenders that have internet-based commerce as a staple of their consumption opportunity set. They also provide some relevant, global context as to how the next generation is likely to spend. What we heard was consistent with the insights gleaned from conversations with leading venture capital firms that represented a specific cohort of spenders that have internet-based commerce as a staple of their consumption opportunity set. They also provide some relevant, global context as to how the next generation is likely to spend. What we heard was consistent with the insights gleaned from conversations with leading venture capital firms that

---

** We have a number of security protocols in place that are designed to ensure all customer data is kept confidential and secure. We use reasonable physical, electronic and procedural safeguards that are designed to comply with federal standards to protect and limit access to personal information. There are several key controls and policies in place designed to ensure customer data are safe, secure and anonymous:
• Before J.P. Morgan Asset Management receives the data, all unique identifiable information, including names, account numbers, addresses, dates of birth and Social Security numbers, is removed.
• J.P. Morgan Asset Management has put privacy protocols for its researchers in place. Researchers are obligated to use the data solely for approved research and are obligated not to re-identify any individual represented in the data.
• J.P. Morgan Asset Management does not allow the publication of any information about an individual or entity. Any data point included in any publication based on customer data may only reflect aggregate information.
• The data are stored on a secure server and can be accessed only under strict security procedures. Researchers are not permitted to export the data outside of J.P. Morgan Chase’s systems. The system complies with all J.P. Morgan Chase Information Technology Risk Management requirements for the monitoring and security of data.
• J.P. Morgan Asset Management provides valuable insights to policymakers, businesses and financial advisors, but these insights cannot come at the expense of consumer privacy. We take every precaution to ensure the confidence and security of our account holders’ private information. © 2019 JPMorgan Chase & Co. All rights reserved.

** See, for example, Paul Dolfen, Liran Einav, Peter J. Klenow, Benjamin Klopack, Jonathan D. Levin, Laurence Levin and Wayne Best, “Assessing the gains from e-commerce,” (February 2019), NBER Working Paper No. w25610. Available at SSRN: https://ssrn.com/abstract=3346257. The authors use Visa card data to measure e-commerce activity.

† A total of 183 first- through third-year part-time and full-time analysts from J.P. Morgan Asset and Wealth Management’s Global Analyst and Summer Intern classes participated in this survey in June and July 2019. We are grateful to Gabriel Castro and Neil Desai, who designed and administered the survey.
BUILDING RESILIENT PORTFOLIOS

Rethinking safe haven assets

Thushka Maharaj, DPhil, CFA, Global Strategist, Multi-Asset Solutions
Sorca Kelly-Scholte, FIA, Global Strategist, Global Pension Solutions
Nicolas Aguirre, CFA, Portfolio Strategist, Endowments & Foundations Group

IN BRIEF

• Holding safe haven assets has always involved a trade-off. Over the last 30 years, bonds have served well as diversifiers, providing both income and capital appreciation – hence, masking this trade-off. Basically, investors have been compensated for using positive-yielding bonds to protect their portfolios.

• This is changing. A large proportion of developed market sovereign bonds now yield zero or less, making the opportunity costs of holding bonds painfully apparent. Investors need to challenge the concept of a “risk-free return,” as they are now required to pay for the portfolio protection bonds provide.

• We discuss the role of traditional safe haven assets – namely, high quality sovereign bonds, reserve currencies and gold – in portfolio protection. We also look at alternative assets, such as private core real estate and infrastructure, and investigate their roles in the safe part of portfolios.

• Bonds still have a significant role to play in portfolio protection – despite low yields. In contrast, the outlook for the USD as a safe haven is unclear. Gold-related assets are gaining in importance as safe havens due to the deployment of unprecedented policy measures.

• Stable and high quality income streams from core real estate and infrastructure investments provide a strong offset against their lack of liquidity. For investors who are able to hold these assets through the cycle, select alternative assets bring diversifying properties to portfolio construction.

• In our view, there is no solitary safe haven asset, and the current environment demands a more thorough analysis of the optimal trade-offs that suit individual portfolios. The importance of effectively embedding safe haven assets in portfolios argues for devoting as much attention to efficiently building portfolio ballast as to optimizing returns.
INTRODUCTION

Portfolio protection is at the forefront of investors’ minds in the current late-cycle environment – and with good reason. Equity markets are near all-time highs, bond yields are at cyclical lows, and geopolitical risks are increasing. Investors are asking how their assets will fare in the next downturn and what they can do to build more resilient portfolios.

Diversification across assets is central to the construction of resilient portfolios. Classic portfolio theory states that allocating to safe haven assets (such as high quality sovereign bonds) in a balanced portfolio builds a nonlinear expected return payoff profile and an effective floor under returns. Does that principle still hold? And if it doesn’t - or if its meaning has shifted in subtle but important ways - what are the ramifications for portfolio construction?

For many multi-asset investors, sovereign bonds have been the traditional safe haven assets in balanced portfolios. The accepted trade-off for adding a safe haven asset has been that investors would forgo some of the higher expected returns from risky assets like stocks in return for a lower expected “risk free” return from bonds. Until recently, this assumption held: Bonds provided both income and capital return, so that investors were effectively being paid for adding portfolio insurance.

All of this has changed with the implementation of unprecedented monetary policies following the global financial crisis. Today a substantial proportion of developed market government bonds now have negative or near-negative yields. So for the first time in modern financial history, some investors effectively have to pay to add bonds to a portfolio. One might well ask whether the concept of a “risk-free return” has been exhausted.

The opportunity cost of holding bonds is plainly rising and their effectiveness in protecting portfolios is coming under scrutiny. This represents a challenge for investors in designing well-balanced portfolios. In our view, it demands a more careful analysis of safe haven assets and their trade-offs from a specific investor’s perspective. Most importantly, it necessitates devoting as much attention to efficiently building portfolio ballast as to optimizing returns.

In the following pages, we investigate the role of safe haven assets in balanced portfolios, including:

- **traditional assets**: high quality bonds, foreign exchange (FX) reserve currencies and gold

We conclude that both traditional and alternative assets may exhibit safe haven properties that can be mapped to particular types of portfolios. Crucially, our research demonstrates that there is no single safe haven asset; rather, different assets protect against different risks, and their relative effectiveness and opportunity costs vary. Investors, too, vary - in the relative importance of the risks they need to protect against.

THE NEED FOR A BROADER DEFINITION OF SAFE HAVEN ASSETS

In the traditional sense, an asset is considered “safe” if: it serves as a store of value - i.e., generally maintains or even increases in value through market cycles; can be readily converted to cash without significant loss of value; and exhibits low volatility. Importantly, safe haven assets have a low or negative correlation to the general market and can protect portfolios during times of stress.

By definition, a safe haven asset will have an opportunity cost - either the direct cost of buying it, as in purchasing a stock option, or the potential returns forgone by holding it rather than another asset. The bull market in sovereign bonds of the last 30 years has somewhat obfuscated this trade-off, given that bond returns have been so strong. But now that yields are so low, these trade-offs are becoming brutally apparent.

Determining the most appropriate safe haven asset for a portfolio requires a thorough examination of what investors want to achieve and which trade-offs are least damaging. Nevertheless, the starting philosophy in adding a safe haven asset to a portfolio is common for all investors. Namely, in a downturn or period of market volatility, investors seek to:

1. stay solvent
2. keep cash flows stable to meet required outflows
3. have a little “dry powder” to capitalize on opportunities from market dislocations

Even allowing for negative yields, for some portfolios traditional high quality bonds may still be the most appropriate safe haven asset. But for others, a wide definition of what constitutes a safe haven asset, and an understanding of how well other safe haven assets might map to portfolio objectives, are essential to optimal portfolio design. We examine both traditional and alternative assets, assessing their ability to address these survival needs, balanced against the opportunity cost of their protective benefits.
CORE FIXED INCOME

High quality sovereign bonds (referred to here as simply “bonds”) are traditionally seen as ballast in balanced portfolios. Stock and bond returns, however, have not always exhibited their expected negative correlation (Exhibit 1). This was particularly true in the 1970s and early ‘80s, when negative oil supply shocks pushed inflation and yields higher and equity prices lower. It was not until inflation was brought under control during the tenure of Federal Reserve Chair Paul Volcker (1979–87) that the stock-bond correlation began its downward trend, eventually moving into negative territory.

Since the 1990–91 recession, negative growth shocks have consistently been accompanied by a reassertion of lower stock-bond correlations. This is seen most clearly in the stabilizing role of bonds in the wake of the global financial crisis. Exhibit 2 shows the impact of inflation on the stock-bond relationship, focusing on periods of equity market drawdowns in the U.S. from 1953 to April 2019. Our analysis shows that bonds have been more effective portfolio diversifiers (i.e., yields have fallen more consistently during equity market declines) in periods characterized by low to moderate inflation. An analysis of 10-year yields and stock market performance in the UK and Germany since the 1950s echoes these findings.

Until now, investors have been unusually compensated for protecting balanced portfolios by the positive coupons on bonds. In our view, high quality bonds will remain viable safe haven assets during the next 10 to 15 years, given our expectation for muted inflation over our Long-Term Capital Market Assumptions (LTCMA) investment time frame. Bonds are likely to provide a return of capital – even if they don’t provide return on capital. They also offer protection in a market downturn and the liquidity required to take advantage of dislocations. Crucially, however, we do not see bonds as a major source of income or return on capital, and there are opportunity costs associated with holding bonds, especially at current low, and sometimes negative, real yields. Said another way, low yields and negative real yields can now be seen as an option premium to protect the return of capital in the future and as the cost of the liquidity that bonds offer.

Bonds have been a traditional liquid store of value and have offered protection against growth shocks. But low starting yields diminish the protective power of bonds. At best, bonds now provide only a modest cushion against inflation. At worst, investors may lock in a capital loss in the case of negative-yielding debt – a new trade-off that investors will need to weigh that is much more tangible than the concept of opportunity cost.

In equity drawdowns accompanied by high (>3%) inflation, bond yields have tended to rise, offering little protection


Stocks and bonds have not always exhibited their diversifying negative correlation, especially during periods of high inflation

In equity drawdowns accompanied by high (>3%) inflation, bond yields have tended to rise, offering little protection

EXHIBIT 1: S&P 500 AND BOND PRICE 5-YEAR ROLLING CORRELATION VS. INFLATION (U.S. CPI, %, Y/Y)

Stock-bond correlation

Inflation (%)

Source: Bloomberg, Robert Shiller, Yale University Department of Economics Online Data; data as of June 30, 2019.
Given that we expect the current low rate environment to persist for some time, it is important to consider other traditional safe haven assets, such as currencies and gold.

**U.S. DOLLAR: FX RESERVE CURRENCY**

Reserve currencies, by their very nature, are highly liquid, high quality instruments that typically exhibit negative correlation to risk assets in times of stress.

**Demand for the world’s reserve currency**

Currency has three traditional functions: as a medium of exchange, a store of value and a unit of account. By almost any measure, the U.S. dollar (USD) can be viewed as the world’s main reserve currency (Exhibit 3). Over 60% of international foreign exchange reserves held by central banks are held in USD. Most commodities are denominated in USD, contributing to its high usage in trade invoicing. On the funding side, the USD is the main currency for cross-border trade and funding. In fulfilling most of these functions, the USD has a usage more than double that of the euro or the Japanese yen.

The U.S. dollar is a dominant currency for international transactions

**EXHIBIT 3: USE OF USD VS. EURO AND YEN IN VARIOUS ECONOMIC FUNCTIONS (SHARE, %)**

<table>
<thead>
<tr>
<th>Function</th>
<th>USD</th>
<th>EUR</th>
<th>JPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign exchange reserves</td>
<td>60</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>International debt</td>
<td>61</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>International loans</td>
<td>56</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>Forex turnover</td>
<td>43</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Global payments ccy (SWIFT)</td>
<td>40</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Global trade invoicing</td>
<td>40</td>
<td>40</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Bank for International Settlements (BIS), European Central Bank (ECB), International Monetary Fund (IMF), Society for Worldwide Interbank Financial Telecommunications (SWIFT); data as of Q4 2017.

Another way to view demand for the USD is to look at the cross-currency basis swap, which shows the premium investors are willing to pay to access USD funding relative to other currencies. A more negative number implies a higher demand for U.S. dollars. In times of stress, demand for the USD picks up (Exhibit 4).

**Demand for the USD rises (swap premia turn very negative) during periods of market uncertainty**

**EXHIBIT 4: USD 1-YEAR CROSS-CURRENCY BASIS SWAP PREMIA**

Source: Bloomberg; data as of August 31, 2019.

Our analysis of the U.S. dollar during episodes of market stress shows that USD performance has been mixed: The USD strengthened in the 1980–82 and 2007–09 crises but not in the 1973–74, 1990 or 2001 recessions (Exhibit 5).

**U.S. dollar performance has been mixed across recessions and episodes of equity market weakness**


Looking ahead, we question the extent to which the USD will provide safe haven characteristics. Clearly, its performance will depend on the form and degree of the economic shock. The USD may not be a clear winner in the next downturn because:

- Demand from global FX reserve managers is falling: Over the last few years, the total stock of FX reserves stopped growing as emerging market (EM) current account balances deteriorated. Moreover, reserve managers are diversifying out of the USD and into other currencies and gold.
• U.S. rate spreads to other markets are wide (Exhibit 6): In previous recessions, the spreads between U.S. front-end yields and those of other G4 markets were tight; other central banks had more room to ease during a crisis. Today, with other central banks already at the zero lower bound, the U.S. Federal Reserve (Fed) has relatively more room to cut rates, which would reduce the rate support for the USD.

• The USD’s valuation is high (Exhibit 6): As of August 2019, the U.S. Dollar Index (DXY) starting valuation was 1.1 standard deviations above its 10-year average.

• Interventionist policies are gaining support: It is possible that we will see foreign exchange policy move toward active currency depreciation. While it may be a low likelihood event, the impact of such intervention may be large enough to warrant a risk premium.

Looking beyond the U.S. dollar, we would expect a basket of classic safe haven currencies to do well in periods of stress. As a result, diversifying the currency hedge to include the Japanese yen and Swiss franc should provide protection across a wider range of downturn scenarios. In our previous work, we found that certain currency pairs, like AUDJPY, have provided a nonlinear payoff in times of stress and are a consideration for optimizing the safe haven currency component of portfolios.

GOLD

One benefit of gold is its ability to protect against very different tail events. Bonds were favored as a safe haven asset vs. gold during the last 25 years because inflation was subdued and quantitative easing distorted bond markets (Exhibit 7). But is that set to change, given extremely low yields?

Is gold becoming a more cost-effective safe asset as real yields hover around zero?

EXHIBIT 7: U.S. TREASURY 10-YEAR REAL YIELD VS. GOLD PRICE

Gold: A diversifying store of value

Historically, gold has exhibited strong negative correlation to equity markets, particularly during the high inflation regime of the 1970s. Even during coordinated FX intervention under the Plaza and Louvre Accords, the role of gold as a stabilizer strengthened (Exhibit 8). With more talk of currency intervention, this relationship between the USD and gold is of increasing relevance.

1 The Plaza Accord (September 1985) saw a substantial depreciation of the U.S. dollar relative to the yen and Deutsche mark; the subsequent Louvre Accord (February 1987) served to halt the USD’s decline.
Gold has been a stabilizing asset across a variety of economic, market and policy environments.

**EXHIBIT 8: GOLD VS. S&P 500 RETURNS – 5-YEAR ROLLING CORRELATION**

<table>
<thead>
<tr>
<th>Recession</th>
<th>5-yr rolling correlation, gold vs. S&amp;P 500</th>
</tr>
</thead>
</table>

-0.6 -0.4 -0.2 0.0 0.2 0.4 0.6

-65 '71 '77 '83 '89 '95 '01 '07 '13 '19

**Bretton Woods**

**Plaza / Louvre / 1987 crash**

Source: Bloomberg; data as of August 31, 2019.

Gold has provided positive returns during periods of negative growth shocks as well as positive inflation shocks. However, in terms of inflation regimes, average returns have generally been most pronounced during extremely low (less than 1%) or high (greater than 3%) inflation. In the episodes in between, however, gold returns were lackluster (Exhibit 9A).

At the same time, gold has delivered positive returns in both rising and falling equity markets (Exhibit 9B). For example, in monthly periods when the S&P 500 experienced a 1-standard deviation (std) decline (-1std, or -4.4%), the average monthly return for gold was +1.3%. When the S&P 500 experienced a +1std monthly increase (+4.4%), the average monthly return for gold was a slightly lower +1.0%.

The ability of gold to provide stability under a range of economic and market environments is due to the diversity of its demand drivers:

- Investors’ need for a store of value: Gold appreciates in line with inflation, maintaining its real value.
- Reserve asset demand: Central banks have been buying gold as a strategic investment and a way to diversify their reserves out of the U.S. dollar. According to a World Gold Council survey, in 2019, 11% of emerging market central banks signaled an intention to increase gold holdings. China, in particular, has been steadily increasing gold reserves, from 1% of total reserves in Q1 2014 to 2.5% in Q1 2019.3
- Personal wealth: Prices rise/fall with net worth and the demand for luxury goods, particularly in expanding emerging market economies. China and India account for 50% of current consumer demand for gold.4
- Opportunity cost: Prices rise/fall as the relative return for holding other assets, such as bonds, decreases/increases (Exhibit 7).

In the coming years, gold may gain appeal as a diversifier if monetary policy becomes less potent and low to negative rates reduce the opportunity cost of holding gold. Moreover, in a politicized environment in which authorities may favor currency debasement, gold as an alternative diversifying safe haven asset is gaining traction among investors.

Traditional safe haven assets all involve an implicit trade-off in terms of market risk and return. While this trade-off may be appropriate for many portfolios, there are some for which different trade-offs may be optimal. In our final section, we look at less traditional safe haven assets within alternative strategy classes. To be clear, these investments are suitable for a specific group of investors who are able and willing to forgo liquidity for a steady income stream.

---

3 World Gold Council.
4 Ibid.
REAL ASSETS: CORE REAL ESTATE AND INFRASTRUCTURE

Real assets do not fit neatly into our definition of traditional safe haven assets. These assets (real estate in particular) have experienced significant drawdowns during recessions and are not highly liquid or readily converted to cash. However, real assets can help provide investors with a key survival skill: keeping cash flows stable to meet required outflows—something many sovereign bonds can no longer do.

While real estate (and other alternative assets) exhibit significant economic volatility (actual realized volatility), their accounting volatility can be lower, mostly due to their quarterly reporting frequency (Exhibit 10). The lag in appraisals does help to smooth returns. However, for real estate these lags have been reduced since the 1990s, and an increasing number of open-end diversified core equity (ODCE) funds have introduced more third-party oversight procedures to ensure valuations are credible and timely.

While alternative assets can be volatile, reporting frequencies can dampen accounting volatility

EXHIBIT 10: ECONOMIC VS. ACCOUNTING VOLATILITY FOR SELECTED ALTERNATIVE ASSETS

<table>
<thead>
<tr>
<th></th>
<th>Economic volatility</th>
<th>Accounting volatility</th>
<th>Volatility difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. direct core real estate</td>
<td>12.25</td>
<td>7.70</td>
<td>4.55</td>
</tr>
<tr>
<td>Global infrastructure levered</td>
<td>11.75</td>
<td>9.50</td>
<td>2.25</td>
</tr>
</tbody>
</table>

Source: Bloomberg, MSCI, J.P. Morgan Asset Management; estimates as of September 30, 2018; historical data as of December 31, 2018.

Looking at the performance of the NFI-ODCE Fund Index (National Council of Real Estate Investment Fiduciaries [NCREIF] Fund Index-Open End Diversified Core Equity) around previous recessions, the 2007-08 crisis appears to be the outlier (Exhibit 11). As the Great Recession had its roots in a housing crisis, the performance of real estate assets was disproportionately affected.

The severity of the real estate drawdown during the housing-led 2007-08 crisis was exceptional

EXHIBIT 11: TOTAL RETURN OF NFI-ODCE FUND INDEX*

Looking at the performance of the NFI-ODCE Fund Index (National Council of Real Estate Investment Fiduciaries [NCREIF] Fund Index-Open End Diversified Core Equity) around previous recessions, the 2007-08 crisis appears to be the outlier (Exhibit 11). As the Great Recession had its roots in a housing crisis, the performance of real estate assets was disproportionately affected.

The average real estate drawdown during the four recessions prior to 2008 gives an indication of the expected drawdown in a non-housing market related financial crisis—a roughly 4% quarter-over-quarter (q/q) decline about six quarters after the start dates of those recessions. These numbers are, of course, biased favorably due to smoothing around quarterly data.

Another safe haven characteristic of real estate is its positive but low correlation to other assets, including equities. Core real estate has high quality, relatively transparent income streams, which in the current environment are well above core government bond yields. The income generated can smooth out the total return performance, providing a buffer against capital depreciation and needed cash flow during times of stress (Exhibit 12A).

Increased demand for green projects supports infrastructure investment

We see similar safe haven properties in infrastructure-related assets (Exhibit 12B). Core infrastructure investment is likely to remain in demand in the coming years, especially with the growing interest in “green” projects. The European Investment Bank, for example, has signaled its intent to increase green investment following strong political support. The heightened popularity of green parties and intensified focus on environmental, social and governance (ESG) scores in evaluating investment mandates support strong demand for green infrastructure investments. Moreover, most green investments are likely to carry government guarantees, backed by tax receipts, that can improve the quality of the cash flows and reduce the credit risks underlying these long-term projects.

Due to lack of data, we do not evaluate the performance of infrastructure assets during recessions prior to 2008.

* National Council of Real Estate Investment Fiduciaries (NCREIF) Fund Index-Open End Diversified Core Equity.

BUILDING RESILIENT PORTFOLIOS
Real assets can provide reliable income streams to meet cash flow requirements and help buffer capital losses in a crisis.

**EXHIBIT 12A: NFI-ODCE* CAPITAL APPRECIATION AND INCOME RETURNS**
(Q1 1979–Q2 2019, Y/Y, %)

- Income return
- Capital appreciation


* National Council of Real Estate Investment Fiduciaries (NCREIF) Fund Index-Open End Diversified Core Equity.

**EXHIBIT 12B: MSCI GLOBAL INFRASTRUCTURE* CAPITAL APPRECIATION AND INCOME RETURNS**
(Q1 2008–Q1 2019, Y/Y, %)

- Income return
- Capital appreciation

Source: MSCI Global Quarterly Infrastructure Asset Index; data as of Q1 2019.

* MSCI Global Quarterly Infrastructure Asset Index; returns from start of index history.

Infrastructure investment projects, while not liquid, could be suitable diversifying safe assets for specific long-term investors who can hold them through the cycle and harvest the illiquidity premium embedded in their pricing (see “How should long-term investors manage exposure to negative yields?”).

Similar to real estate (Exhibit 10), they also have the benefit of lower accounting vs. economic volatility due to reporting frequency.

**HOW SHOULD LONG-TERM INVESTORS MANAGE EXPOSURE TO NEGATIVE YIELDS?**

Many liability-aware investors aspire to hedge their exposure to falling interest rates strategically in the long term and can limit the opportunity cost of doing so by using overlay strategies that allow them to continue holding riskier assets for long-term growth. However, many have deferred fully hedging their liabilities against the expectation that interest rates are likely to normalize, allowing them to hedge at higher levels of rates and after liability valuations have fallen.

We believe it is unlikely that yields will normalize until after a recession or period of market stress occurs; as a consequence, this strategy of deferral is likely to result in further short-term pain and funding level stress. Given our muted expectations for the levels of yields at normalization, and how long normalization might take, it is unclear that the long-term benefit of waiting will be material in terms of funding outcomes. However, increasing allocations to physical bonds does have a long-term potential opportunity cost. Accessing duration through the derivatives markets or by reshaping existing bond portfolios into liability-aware formats may be preferable for most investors. These approaches allow investors to increase duration hedging while retaining exposure to long-term growth assets. At this point, the safe haven discussion becomes relevant to liability-aware investors as they seek to preserve and grow their risky asset portfolio. See Pension Pulse – Summer 2019, J.P. Morgan Asset Management, July 2019, for more details.
CONCLUSION

Holding a safe haven asset has always involved a trade-off - traditionally assumed to be a lower expected return for greater portfolio protection. But with yields now negative in real and often nominal terms, many investors are paying an actual price for holding bonds as insurance. The modest growth, muted inflation and lower-for-still-longer rate environment projected in our 2020 Long-Term Capital Market Assumptions suggest that bonds can still help protect portfolios, but at an outright cost.

The good news is, investors may have more choices for building protection and resiliency into their portfolios than they think. Expanding the concept of safe haven assets to include not only bonds, reserve currencies and gold but also selected alternative assets is a good starting point (Exhibit 13). Investors should then consider what they really need to successfully navigate periods of market stress (in our view: staying solvent, meeting cash flow obligations, being nimble enough to seize investment opportunities) and what trade-offs they are more or less willing to make to achieve their investment objectives.

Different safe haven assets are attractive for different reasons

<table>
<thead>
<tr>
<th>ASSET CLASS</th>
<th>LIQUID / HIGH CONVERTIBILITY TO CASH</th>
<th>NEGATIVE CORRELATION TO RISK ASSETS</th>
<th>STABLE INCOME STREAM</th>
<th>STORE OF REAL VALUE</th>
<th>LOW ACCOUNTING VOLATILITY</th>
<th>MOST STRONGLY PROTECTS AGAINST ...</th>
<th>PRINCIPAL OPPORTUNITY COST / TRADE-OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash/money market funds</td>
<td>Significant benefit</td>
<td>Some benefit</td>
<td>No benefit</td>
<td>Volatility, recession</td>
<td>Negative yield</td>
<td>Growth shocks</td>
<td>Low yield, inflation risk</td>
</tr>
<tr>
<td>Core government bonds</td>
<td>Significant benefit</td>
<td>Some benefit</td>
<td>No benefit</td>
<td>Inflation</td>
<td>Negative yield, liquidity</td>
<td>International shock (EM)</td>
<td>Not reliable, interventionist policy</td>
</tr>
<tr>
<td>Inflation-linked bonds</td>
<td>Significant benefit</td>
<td>Some benefit</td>
<td>No benefit</td>
<td></td>
<td></td>
<td>Extreme negative growth or positive inflation shock</td>
<td>No return, does poorly outside stress</td>
</tr>
<tr>
<td>U.S. dollar</td>
<td>Significant benefit</td>
<td>Significant benefit</td>
<td>Significant benefit</td>
<td></td>
<td></td>
<td>Shallow recession, predictable cash flow</td>
<td>Illiquid, housing market crisis</td>
</tr>
<tr>
<td>Gold</td>
<td>Significant benefit</td>
<td>Significant benefit</td>
<td>Significant benefit</td>
<td></td>
<td></td>
<td>Shallow recession, predictable cash flow</td>
<td>Illiquid</td>
</tr>
</tbody>
</table>

Investors should spend as much time optimizing the risk parameters of their portfolios as they do seeking return

**EXHIBIT 14: A FRAMEWORK FOR SELECTING SAFE HAVEN ASSETS**

The solutions may be surprising, and the most appropriate trade-offs will vary across investors. As an example of some of the trade-offs, **Exhibit 14** shows which safe haven assets are favored based on income needs and capital liquidity needs. Long-term investors who can warehouse volatility without being forced to sell can harvest income returns from core real assets that exhibit low beta to equity markets. In contrast, for investors who are more focused on mark-to-market performance and face capital outflows but have low cash flow obligations, more liquid safe haven assets such as gold, cash and bonds may be more attractive.

There is simply no single, perfect safe haven asset. Markets and economies are dynamic and present multiple and changing risks. Investors have different risk exposures and protection priorities. But one thing is clear: In this world of persistently low rates and a mature economic cycle, investors should spend as much time optimizing the risk parameters of their portfolios as they do fortifying portfolio return generation.

---

Source: J.P. Morgan Asset Management; views as of September 30, 2019.
Assumptions
Lower rates for even longer

Thushka Maharaj, DPhil, CFA, Global Strategist, Multi-Asset Solutions
Michael Feser, CFA, Portfolio Manager, Multi-Asset Solutions
Diego Gilsanz, Global Strategist, Multi-Asset Solutions
Michael Albrecht, CFA, Global Strategist, Multi-Asset Solutions
Jason Davis, CFA, Portfolio Manager, Global Fixed Income, Currency & Commodities

IN BRIEF

• Anticipating continued central bank dovishness, we shift our equilibrium interest rates lower across major G4 markets and extend the time horizon over which we expect rate normalization.

• Cash rates are still far below equilibrium in markets outside the U.S. and are only expected to converge very gradually to equilibrium. This extended normalization creates a significant drag to expected returns in the eurozone and the UK.

• Long core duration assets across all major markets see poor returns in absolute terms and relative to cash, as starting yield curves are very flat.

• In the corporate bond market, duration has risen and quality has deteriorated. Expected investment grade returns are lower, primarily due to a renewed drag from interest rate normalization.

• Inclusion of the Gulf Cooperation Council in the J.P. Morgan EMBI Global Diversified Index has increased the quality and duration of the emerging market debt index, but expected total returns have come down due to lower rates and tighter starting spreads.
OVERVIEW

Central bank dovishness was a defining feature of G4 government bond markets over the last year. Growing trade uncertainty and the Federal Reserve’s (Fed’s) dovish pivot earlier in 2019 pushed yields lower, with 10-year U.S. Treasury yields falling from a high of 3.25% to an early September low of 1.45%. Outside the U.S., central banks adopted dovish policies across major developed markets as manufacturing sector weakness persisted and inflation remained dormant. The average yield on G4 10-year government bonds fell 140 basis points (bps) over the last year. Consistent with the relentless flattening that started last year, the yield curve continued to flatten this year. This phenomenon was especially felt in Europe, where 10-year Bund yields fell below the deposit rate for the first time in this cycle.

Relative to the numbers in last year’s Long-Term Capital Market Assumptions (LTCMAs), we shift our equilibrium interest rates lower across major G4 markets. We also extend the time horizon over which we anticipate normalization of interest rates to play out, especially in Europe. We make these forecast changes in light of continued weak inflation and one more year of data signaling the limited power of labor market tightening to spark inflationary pressure, despite a recent pickup in wages.

As we discuss in “The failure of monetary stimulus,” 2020 Long-Term Capital Market Assumptions, in coming years central banks are likely to return to using monetary stimulus tools, including quantitative easing (QE), and interest rate policy is likely to be easier for longer as inflation remains subdued. As a result, our forecast calls for lower yields in markets outside the U.S.; we also push out the normalization pathways across all markets to acknowledge that monetary policy may be less effective in the next downturn. Real rates are likely to be suppressed over our forecast horizon relative to GDP, as there is less room for nominal policy rate cuts (Exhibit 1) - especially after the recent Fed rate cuts and easing measures from the European Central Bank (ECB). Lower starting bond yields across major markets, coupled with a longer period of normalization, compound the fall in expected returns (Exhibit 2).

This year, we introduce an explicit ranking of real cash rates across major markets (Exhibit 3). The U.S., Canada and Australia are ranked at the top, while Japan and Switzerland have the most negative real cash rates. Essentially, we assign a higher likelihood that U.S. policymakers will achieve their inflation mandate than policymakers in Switzerland or Japan. Cash rates are still far below equilibrium in markets outside the U.S. and are only expected to converge very gradually to equilibrium. This implies negative real cash returns in most markets outside the U.S.

Real rates follow long-term cycles

EXHIBIT 1: REAL CASH RATES, 5-YEAR AVERAGE, ACROSS DEVELOPED MARKETS

Source: Bloomberg, J.P. Morgan Asset Management; data as of December 2018.
Anticipating continued central bank dovishness, we shift our equilibrium interest rates lower across major G4 markets and extend the time horizon over which we expect rate normalization.

**EXHIBIT 2: STANDARD G4, IG, HY AND EMD FIXED INCOME RETURN PROJECTIONS**

<table>
<thead>
<tr>
<th>USD</th>
<th>GBP</th>
<th>EUR</th>
<th>JPY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equilibrium yield (%)</strong></td>
<td><strong>Return</strong></td>
<td><strong>Equilibrium yield (%)</strong></td>
<td><strong>Return</strong></td>
</tr>
<tr>
<td>Inflation</td>
<td>2.0%</td>
<td>2.0%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Cash</td>
<td>1.9%</td>
<td>2.0%</td>
<td>1.8%</td>
</tr>
<tr>
<td>10-year bond</td>
<td>3.2%</td>
<td>2.4%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Long bond index*</td>
<td>3.5%</td>
<td>1.6%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Investment grade credit</td>
<td>4.7%</td>
<td>3.4%</td>
<td>4.4%</td>
</tr>
<tr>
<td>High yield</td>
<td>7.6%</td>
<td>5.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Emerging market debt*</td>
<td>6.6%</td>
<td>5.1%</td>
<td></td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; estimates as of September 30, 2019.

* EUR: 15y+ index, JPY: JGB Bond Index, GBP: 15y+ index, USD: 20y+ index; * EMD hard currency debt

Cash rates are still far below equilibrium in markets outside the U.S. and are only expected to converge very gradually to equilibrium.

**EXHIBIT 3: RANKING OF REAL CASH RATE ASSUMPTIONS ACROSS MARKETS**

Our framework for long-end yield assumptions is unchanged. We anticipate a significant degree of correlation across markets, which will make it difficult for the U.S. to decouple totally from the rest of the G4. Quantitative easing, strong forward guidance, dormant inflation and unfavorable demographics all support the ongoing demand for duration. This keeps term premia depressed and curves flatter in equilibrium than was the case historically. If inflation were to rise meaningfully over the next decade (possibly due to fiscal stimulus), curves could steepen. The same could occur if policymakers focused on boosting the labor share of income as a way to address increased income inequality.

The most significant change we make this year is a downgrade to European yields across the entire yield curve as growth and inflation forecasts come down substantially. Relative to other regions, Europe sees the biggest downgrade to expected returns relative to last year.

History shows that monetary policy can keep rates lower than what would be implied by nominal GDP forecasts.

**EXHIBIT 4: 10-YEAR U.S. TREASURY YIELDS RELATIVE TO NOMINAL GDP GROWTH, 1910–2019**

For the 2020 LTCMAs, we explored to what extent policy can distort yields relative to nominal GDP. In the 1940s, for example, long-term yields were artificially suppressed to fund the Marshall Plan and post-war spending (Exhibit 4). Similarly, over the coming decade, coordinated monetary and fiscal policies could keep rates lower than what is implied by our long-term nominal GDP forecasts. Moreover, the Fed’s review of its framework for assessing inflation may push up inflation expectations and could lead to a similar distortion through financial repression, at least in direction if not magnitude. This would artificially depress real yields, but we would expect that to be reflected mostly through steeper curves.

U.S. RATES

We make only modest changes to our cash and 10-year yield assumptions. We reduce the U.S. cash rate by 10bps to 1.9% to reflect our view that the diminished effectiveness of monetary policy will depress real rates for a longer time frame than we thought last year. Insurance rate cuts from the Fed have brought the spot cash rate in line with our long-term equilibrium level.

Based on our new rounding methodology, we lower our U.S. 10-year yield assumption by 5bps to 3.2%. Ten-year nominal yields are expected to equilibrate to 60bps below our LTCMA forecast for nominal U.S. GDP. We extend the normalization window from three years to four years due to low inflation expectations and our view that ex-U.S. 10-year yields will take longer to normalize.

This year, we introduce an explicit framework and assumption for 10-year breakeven inflation rates. It allows us to signal a 10-year real yield assumption. Our implied 10-year real yield is 0.9%. That may look high relative to today’s level of around 0%, but we note that it is half the average level experienced since the 1960s.

EUROZONE RATES

We continue to expect that the European Central Bank (ECB) will undershoot its inflation target over the forecast horizon amid a difficult economic outlook. As a result, Europe sees the largest cuts to our growth and inflation assumptions. This translates directly to a reduction in our cash yield assumption, which falls 50bps in nominal terms to 1% and 30bps in real terms to -0.3%. The yield curve slope is unchanged vs. last year at 120bps, which is 50bps flatter than the post-financial crisis average and in line with its 30-year average.

We extend the normalization window for cash rates due to the low inflation environment. Cash rates are expected to start normalizing in one year, reaching equilibrium in five years. The normalization window for 10-year yields was also extended to five years to reflect increased uncertainty that the ECB will meet its inflation target. Sweden and Denmark broadly follow the path mapped out for eurozone rates.

JAPANESE RATES

Expecting that the Bank of Japan, like the ECB, will persistently undershoot its inflation target, we cut our inflation assumption, which translates directly into a lower cash rate. Our nominal cash yield assumption falls from 0.5% to 0.3%, taking the real cash rate to -0.5%, the lowest across the major developed markets in our assumptions set.

This is also manifested in a 25bps reduction in our 10-year Japanese government bond (JGB) assumption to 1% in nominal terms and a 3m10y yield curve slope assumption unchanged at 70bps. Japan still has the steepest 10y30y curve at 50bps, reflecting yield curve control anchoring rates out to 10 years as well as the high debt-to-GDP that the Japanese government is expected to carry over the next decade. The normalization window has been pushed out to six years to reflect lower inflation expectations and the need for financial repression to support Japan’s high debt stock.

UK RATES

The UK outlook remains very uncertain. Last year, we thought that the most likely outcome would be an orderly Brexit with a long transition period. At the time of writing, a general election has been agreed for mid-December and the Brexit deadline has been pushed out to early 2020. Essentially, the shape and form of Brexit will be decided indirectly through the general election. It is quite difficult to call the result of this election, given the emergence of new Brexit-related parties and their potential impact on the performance of mainstream parties. The risk of a no-deal Brexit has fallen in the short term, but it cannot be ruled out entirely. This keeps the outlook for the UK economy beholden to political outcomes and the ways they shape the future trade relationship between the UK and the euro area.

Without knowing the full details of an agreement, we focus on the medium-term outlook for the UK economy, which has a significant impact on the outlook for Gilts. Together with lower expectations for eurozone bond yields, we have also lowered our yield assumptions for the UK. We reduced our 10-year yield assumption to 2.7% from 2.75% last year. We keep the 10y30y curve flat at 0.
LONG-TERM CAPITAL MARKET ASSUMPTIONS

OTHER DEVELOPED MARKETS

In Australia, we make a modest downgrade to our inflation outlook, which nudges our cash rate assumption 20bps lower to 2.8%. Australia is still the highest yielding front end of major markets in both real and nominal terms. We steepen the yield curve slope by 20bps to bring it more in line with global yield curves. Raising the steepness to 120bps keeps the Australian 10-year yield assumption unchanged at 4%.

In Canada, we make minimal forecast adjustments amid unchanged macro assumptions. The real cash rate is modestly positive at 10bps, and the 10-year yield is reduced from 3.25% to 3.1%, slightly below the U.S., as the Canadian economy rebalances away from commodity markets.

Finally, in Switzerland we cut our growth expectations, which pushes all rate assumptions lower. We reduce our equilibrium cash rate assumption to 0.1%, the lowest in nominal terms. This translates to a -0.4% real cash rate – only Japan has a lower rate. We keep the 3m10y yield curve slope unchanged at 100bps, which is flatter than the slopes in Europe and the U.S.

INFLATION-LINKED BONDS

For the first time, we have included explicit cycle-neutral breakeven forecasts (see “Building blocks: Anatomy of breakeven and real yields”). These inform our expectations for equilibrium implied real yields, as we explain below.

The methodology starts by forecasting 10-year inflation breakevens, of which the most important component is inflation expectations (Exhibit 5). Using the simplifying assumption that expectations are based on realized inflation in the recent past, we rely on our inflation forecasts for this first building block. On top of this, we add an inflation risk premium (IRP).

The IRP reflects the additional compensation based on the distribution of risks around the market’s base case for inflation. In reality, outside of recessionary periods, 10-year breakevens have remained very close to historical realized inflation. Across developed markets, nonrecessionary IRPs have tended to be close to or even below zero.

Over our investment horizon, however, we forecast IRPs to be a small but positive number, given a higher probability of upside risks to inflation going forward. This reflects two important factors: an expectation that fiscal policy may play a bigger role in generating inflation, and a belief that central banks may attempt to boost inflation expectations by trying to overshoot their targets outside of recessions. This combination of easier and potentially coordinated fiscal and monetary policy suggests IRPs may be marginally higher than we have seen in the post-crisis period. Across countries, we have forecast higher IRPs where inflation expectations still remain close to target, central banks have more credible toolkits and fiscal policy seems more feasible.

BUILDING BLOCKS: ANATOMY OF BREAKEVEN AND REAL YIELDS

CYCLE NEUTRAL FORECASTS

10-YR BREAKEVEN =

Average inflation expectations

We assume inflation expectations are backward looking and determined by historical realized inflation. Given our long horizon, expectations are set equal to our inflation forecasts.

+ Inflation risk premium

The additional yield on top of inflation expectations to reflect the distribution of inflation risks around the base case

+ CPI vs. RPI wedge (UK only)

10-yr implied real yield = 10-yr nominal yield – 10-yr breakeven

INFLATION-LINKED BOND RETURNS

INFLATION CARRY

Average expected inflation

+ Real yield carry

Average real yields

 +/- Duration normalization

Annualized impact of normalization from current real yields to forecasted real yields

+ Roll-down

Annualized roll-down return

INFLATION-LINKED BOND RETURNS

INFLATION CARRY

Average expected inflation

+ Real yield carry

Average real yields

 +/- Duration normalization

Annualized impact of normalization from current real yields to forecasted real yields

+ Roll-down

Annualized roll-down return
With a forecast for 10-year breakevens, we can now back out our 10-year implied real yields. Most of the normalization in 10-year nominal rates is coming from the real yield component. These forecasts are consistent with a slow and gentle trend higher in real rates both during and after our investment horizon. UK real rates are still expected to remain negative due to distortions from pension fund demand for inflation-linked assets. Of course, many factors, including demographics and debt burdens, will continue to weigh on real yields. That said, potentially easier fiscal policy and our structurally optimistic view on long-term growth and productivity (relative to the post-crisis period) suggest real cash expectations can rise gradually, while real rate term premia may increase from their currently very depressed (and negative) levels.

An explicit assumption for 10-year breakeven inflation rates allows us to signal a 10-year real yield assumption.

### EXHIBIT 5: BACKING OUT IMPLIED REAL YIELD FORECASTS

<table>
<thead>
<tr>
<th>10-yr breakeven</th>
<th>10-yr real implied</th>
<th>10-yr nominal</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>3.2</td>
<td>2.7</td>
</tr>
<tr>
<td>GBP</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>EUR</td>
<td>2.2</td>
<td>1.4</td>
</tr>
<tr>
<td>JPY</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>AUD</td>
<td>1.6</td>
<td>2.4</td>
</tr>
<tr>
<td>CAD</td>
<td>3.1</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; data as of September 2019.

CREDIT

Quantitative easing, and the lower interest rates associated with this unprecedented policy tool, fundamentally changed credit markets. Throughout this cycle, companies have moved away from more costly equity financing toward debt issuance. Duration has meaningfully extended for quality bonds as companies have sought to lock in favorable rates. Unsurprisingly, total corporate leverage has increased markedly.

U.S. investment grade (IG) net corporate leverage metrics have never been higher, and average quality within the IG index has deteriorated to some extent. The BBB market size has increased consistently over the expansion and now makes up roughly half of the overall index by market capitalization, well above its 30%-35% share at the time of the 2008 financial crisis (Exhibit 6). Duration extension has been particularly pronounced among the higher quality issuers (Exhibit 7). These changes in duration and quality affect our views of fair value spreads, which assume a 165bps spread for the overall index, higher than the historical average since 1988 of 135bps.

BBBs now make up roughly half of the U.S. investment grade market

### EXHIBIT 6: INCREASING SHARE OF BBBS IN THE IG MARKET

<table>
<thead>
<tr>
<th></th>
<th>'88</th>
<th>'93</th>
<th>'98</th>
<th>'03</th>
<th>'08</th>
<th>'13</th>
<th>'18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baa corporate</td>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>A corporate</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>Aa corporate</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Aaa corporate</td>
<td>60%</td>
<td>50%</td>
<td>40%</td>
<td>30%</td>
<td>20%</td>
<td>10%</td>
<td>0%</td>
</tr>
</tbody>
</table>


Duration extension has been prevalent across U.S. investment grade bonds of all ratings

### EXHIBIT 7: AVERAGE DURATION BY CREDIT RATING

<table>
<thead>
<tr>
<th></th>
<th>'90</th>
<th>'94</th>
<th>'98</th>
<th>'02</th>
<th>'06</th>
<th>'10</th>
<th>'14</th>
<th>'18</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>4%</td>
<td>6%</td>
<td>8%</td>
<td>10%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
</tr>
<tr>
<td>AA</td>
<td>6%</td>
<td>8%</td>
<td>10%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
<td>20%</td>
</tr>
<tr>
<td>A</td>
<td>8%</td>
<td>10%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>BBB</td>
<td>10%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
<td>20%</td>
<td>22%</td>
<td>24%</td>
</tr>
<tr>
<td>Index</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
<td>20%</td>
<td>22%</td>
<td>24%</td>
<td>26%</td>
</tr>
</tbody>
</table>


This year, we have also built out IG maturity curves by rating, with spread assumptions for each maturity and quality segment (Exhibit 8). In general, our spread assumptions deviate more from historical averages further out on the maturity curve. We assume higher spreads at the longer end of the curve, which has driven the majority of the index’s duration extension amid higher supply.
Projected spread curves are a little steeper than historical averages

**EXHIBIT 8: PROJECTED SPREAD CURVES BY BOND RATING**

Source: J.P. Morgan Asset Management; data as of September 30, 2019.
Note: Dots are point estimates of specific maturity buckets (1- to 5-yr, 5- to 10-yr, 10-yr+). Dotted lines are linear trend lines.

We lower the IG total return assumption by 110bps to 3.40%, due to a renewed drag from interest rate normalization following this year’s marked rally in Treasuries. We maintain a 25bps haircut stemming from losses due to fallen angels; the high concentration of BBB issuers in the IG market makes it likely that the next downturn will cause a significant number of bonds to downgrade into high yield (HY).

In the U.S. HY market, duration has fallen very slightly during this cycle and quality has not deteriorated as it has in the IG market. The CCC market share was initially elevated relative to past cycles but has been coming down in recent years, and the BB share has actually increased its weight over the course of the expansion (**Exhibit 9**). Overall, we assume HY spreads will be close to their historical average at 500bps, unchanged year-over-year.

We maintain a high yield total return loss rate of 200bps from defaults, unchanged from last year - we assume the historical average for default rates and recovery rates in a cycle. Overall, the total return estimate drops by 30bps to 5.2%. The drag from interest rate normalization is partially offset by a better spread valuation starting point.

Our fair value spread for emerging market hard currency debt moves up by 25bps to 350. The inclusion of the Gulf Cooperation Council in the J.P. Morgan EMBI Global Diversified Index has increased noticeably both the quality and duration of the index (see “Accounting for changes in index constituencies”). Moreover, we have assumed some of the deterioration in the quality that the index has experienced over this expansion has been cyclical and will reverse over the next 15 years. However, much like in the U.S. corporate credit markets, we assume spreads per rating will be modestly higher than their historical averages. The duration extension motivates our higher spread assumption in the higher quality space, whereas the prevalence of relatively less liquid first-time issuers leads us to widen our spread assumptions in the high yield segment. Given starting valuations for interest rates and spreads, our projected return drops to 5.10%. Due to the structural index composition changes, we increase the expected loss due to downgrades and defaults to 75bps.

Local emerging market debt (EMD) return assumptions are unchanged from last year, with slightly lower but broadly similar starting yields and an expectation for an offsetting increase in translation gains as the U.S. dollar declines over the assumptions horizon. Given the 10% maximum limit on the exposure of a single country in the local EMD index, Chinese debt reached this upper limit shortly after it joined the local EMD index. This had a small adverse impact on the return assumptions, given the lower yields on Chinese debt compared with the current index average, but an above-average FX translation gain mitigated the impact on the expected return in USD.

This year’s EM corporate debt spread assumptions remain unchanged from last year. In recent years, the trend toward a lower average index credit quality has come to an end, while at the same time the duration profile of the index has remained well below its long-term average.

This year, we introduce explicit assumptions for the index of U.S. agency mortgage-backed securities (MBS). Historically, over long horizons agency MBS performance closely tracked historical averages.
We accounted for two changes in index constituencies in 2019: the inclusion of Gulf Cooperation Council (GCC) countries’ bonds in the J.P. Morgan EMBI Global Diversified Index (EMBIG D) and the introduction of Chinese government bonds (CGBs) in the Bloomberg Barclays Global Aggregate Bond Index (Global Agg).

The five GCC countries (United Arab Emirates, Bahrain, Kuwait, Qatar and Saudi Arabia) now constitute just under 13% of the overall index’s market value. In tandem with Venezuela’s exit from the index – it was the issuer with the highest yielding bonds – the inclusion of GCC country bonds structurally improved the index’s quality over the year. The higher quality bias of the index – of which more than half is now investment grade – has lowered the outlook for spreads, returns (through carry) and volatility for the asset class.

With duration averaging around nine years, GCC country bonds have meaningfully longer duration than the index (about seven years). Cyclically, this higher duration has the effect of lowering returns for this year’s assumption – the assumed normalization of Treasury rates in our process will impose a marginally larger drag on the performance of the EMBIG Diversified Index.

Turning to the other major change in the global debt index landscape, Chinese government bonds have a new profile after the J.P. Morgan Government Bond Index – Emerging Markets Global Diversified (GBI-EM GD) and the Bloomberg Barclays Global Aggregate Bond Index (Global Agg) decided to incorporate CGBs. FTSE Russell refrained from adding CGBs to its World Government Bond Index this year. CGBs will be gradually incorporated into the GBI-EM GD through 2020 and are expected to reach the 10% country issuer limit. This has served to slightly lower our assumed overall yields in the relatively riskier EM index, but the adverse impact on projected returns is modest. CGBs will also represent roughly 6% of the Global Agg Index’s market capitalization by the end of 2020. CGBs are putting modest upward pressure on the investment grade index’s aggregate yields, but we don’t anticipate any meaningful changes in the return outlook. The CNY is the only major currency in the Global Agg that causes USD investors to incur hedging losses. As a result, while the forecasted Global Agg yield has been pushed a little higher by the inclusion of CGBs, the impact on our hedged dollar return forecast isn’t as positive.

This year, we introduce explicit assumptions for U.S. agency MBS

EXHIBIT 10: U.S. AGENCY MBS SPREADS RELATIVE TO CORPORATE BONDS, 1988–2019

Better starting point, higher returns

Christopher Sediqzad, CFA, Manager Research, Multi-Asset Solutions
Patrik Schöwitz, CFA, Global Strategist, Multi-Asset Solutions
Pete Klingelhofer, CFA, Portfolio Manager, Multi-Asset Solutions
Tim Lintern, Global Strategist, Multi-Asset Solutions
Stephen Macklow-Smith, Portfolio Manager, European Equity Group
Sylvia Sheng, Ph.D., Global Strategist, Multi-Asset Solutions

IN BRIEF

• We raise our long-term (10- to 15-year) equity return assumptions across most regions, with developed markets and emerging markets both up. The expected dispersion in returns between emerging and developed equities is roughly unchanged in local currency terms at 3.00%, while marginally expanding in U.S. dollar terms, from 2.75% to 2.90%.

• In the U.S., our expected return increases to 5.60% from 5.25%, primarily due to the reduction in the drag from valuation normalization; in the euro area, our equity return estimates are slightly lower due to a modest cut to euro area GDP expectations. We upgrade our expected UK equity returns, with attractive valuations offsetting lower margins and a stronger pound sterling vs. the U.S. dollar.

• Japanese equities posted the largest upgrade among developed markets, increasing from 5.00% to 5.50% in local terms. We continue to expect governance-led reforms to drive a sustainable increase in return on equity along with capital return to shareholders.

• We project modestly higher emerging market equity returns, with a diminished drag from margin normalization offsetting the negative impact from several GDP growth downgrades.

• We expect the USD to weaken over our forecast horizon, providing a tailwind to the attractiveness of international equity markets to U.S. dollar-based investors.
MODEST RISE

Our expected equity returns are generally higher across most markets this year. In local currency terms, our expectation for long-term developed market (DM) equity returns increases from 5.50% to 5.70%, while our expectation for emerging market (EM) equity returns increases from 8.50% to 8.70%. The projected dispersion in returns between emerging and developed equities is roughly unchanged in local currency terms at 3.00%, while marginally expanding from 2.75% to 2.90% in U.S. dollar terms. Increased developed market return assumptions reflect an upgrade to Japanese equities, in part the result of some margin normalization over the year, and more attractive valuations in the UK and the U.S. In emerging markets, returns are modestly higher, with higher forecasts in emerging Asia partly offset by lower Latin America returns.

The return of capital to shareholders in the form of dividends and buybacks continues to be a crucial component of the outlook. Additionally, our currency forecasts have a material effect on our unhedged equity market assumptions. In a world of mid-single digit equity market returns, currency will likely have a significant impact on returns. We expect the USD to weaken relative to key developed market currencies, providing a tailwind for the attractiveness of markets outside the U.S. to U.S. dollar-based investors.

Those ex-U.S. markets look promising relative to our assumptions for U.S. large cap stocks, even before converting returns into USD terms. We remain structurally optimistic about the U.S. market, as the region's earnings growth, sustainable margin, earnings multiple and return on equity (ROE) are notably higher than its developed market peers. Nonetheless, the U.S. large cap market looks expensive, trading appreciably above its equilibrium multiple, while other key markets, like Japan and the UK, trade at or below their “fair value” multiples (Exhibit 1).

While the U.S. large cap market trades above its equilibrium multiple, Japan and the UK trade at or below their “fair value” multiples

EXHIBIT 1: EQUILIBRIUM VS. CURRENT P/E RATIO, U.S., JAPAN, EUROZONE, UK

Additionally, the higher dividend yield offered by ex-U.S. markets provides a meaningful contribution to returns, one not captured by headline stock market indices. Put another way, while we expect U.S. companies to remain conspicuously high quality relative to their foreign counterparts, on a relative basis we do not expect U.S. stock returns to match foreign countries’ strength. This is particularly notable given the outperformance of U.S. markets over the past decade. While it might be difficult to imagine a sustained period of U.S. equity underperformance, since 1983 10-year returns in Japan and Europe have exceeded U.S. returns 37% and 45% of the time, respectively (Exhibit 2).

Since 1983, 10-year returns in Europe have exceeded U.S. returns 45% of the time

EXHIBIT 2: 10-YEAR ROLLING RETURNS, USD, %
BUILDING OUR FORECASTS

We continue to rely on the equity return assumptions methodology we introduced in our 2015 assumptions (see box). Similar to DuPont analysis, this methodology allows us to decompose total returns structurally into easy-to-forecast ratios as drivers of returns. It enables us to account explicitly for the global composition of corporate revenues — and how fast different regions are growing — as well as the normalization of profit margins and valuations, and the impact of share buybacks and dilution. Perhaps most importantly, it ties together complex interrelationships among these factors to ensure that retained earnings and gross dilution imply a future book value that is consistent with projected return on equity and future earnings. This framework — analogous to Robert Higgins’ sustainable growth rate (SGR) concept — ensures that higher shareholder payouts, for instance, would come at the expense of slower earnings growth, all else the same. Our methodology uses trailing, not forward, earnings, which tend to be more stable.

Our equity assumptions methodology breaks equity returns into easy-to-forecast return drivers

BUILDING BLOCKS – ANATOMY OF EQUITY TOTAL RETURNS

1. Aggregate revenue growth
2. × Aggregate earnings growth / revenue growth (margins) = Aggregate earnings growth
3. × Earnings per share (EPS) growth / aggregate earnings growth (net dilution) = EPS growth
4. × Price return / EPS growth (valuations) = Price return
5. + Dividends (carry) = Total return

DEVELOPED MARKETS EQUITY RETURN ASSUMPTIONS

In the U.S., our expected return increases to 5.60% from 5.25%, primarily due to the reduction in the drag from valuation normalization over the forecast horizon. Earnings growth is expected to be solid relative to other developed markets, driven by the healthy domestic growth outlook, but margins will continue to be a drag on return expectations going forward.

Overall, U.S. large cap margins tell an impressive tale of dynamism and resilience. The market’s sector shift toward technology, and away from energy, industrial cyclicals and financials, has had a major positive impact on margin level and sustainability. An increasing number of technology companies have transitioned toward a service-oriented model and away from a hardware-intense, unit-based sales model. Technology margins have risen over 10 percentage points during the last 10 to 15 years, from below 13% to over 23%, and the combined capitalization share of technology and communication services sectors has also risen by more than 10 percentage points, from below 20% to over 30%, as a share of the S&P 500 index. In sum: Given their strong starting point, U.S. large cap margins will continue to be a drag on return expectations going forward. But instead of reverting to their long-term average, we project that they will revert to a “rising” equilibrium.

This transition in the index mix has also had a profound impact on the nature of returns from growth and value stocks. Value sectors have seen their portion of U.S. large cap market capitalization shrink, and their margins have generally fallen. Conversely, growth sectors have witnessed rising margins and an increased capitalization share. The trend toward technology and growth looks set to continue, as capex tends to follow these successes, while investment in technology supports efficiency gains and innovative improvements.

The current environment stands in contrast to the early 2000s. Then, value stocks were poised to benefit from a coming economic recovery, and growth stocks reset to lower levels after the dot-com bubble burst. Today the economic outlook is more moderate, and cash flows now support technology investments. That said, some elements of the technology complex, notably software and internet names, trade at very expensive multiples, which might reflect overconfidence in the stability of those sectors’ revenue streams. To see a sustained move in value over growth, we’d need to have conviction that interest rates were on the rise, and that is not our base case until well into our forecast horizon.
Our Japanese equities return assumption posted the largest upgrade among developed markets, increasing from 5.00% to 5.50% in local terms. The move reflects a decline in Japanese corporate margins over the past year, leading to a reduction in the drag from margin normalization. All else equal, the material 1.70% appreciation of the Japanese yen over our forecast horizon will present a headwind to the large exporting sectors within the Japanese market. However, the currency is not the only driver of margins, and this dynamic may be offset by gains elsewhere as Japanese return on equity converges with that of other developed markets. As we have mentioned in recent years, we expect governance-led reforms to drive a sustainable increase in ROE in addition to capital returns to shareholders. Yet even as Japanese companies have bought back more stock, there has also been a significant pickup in equity issuance.

In the euro area, our expectations of future returns move down slightly to 5.80% in local terms. A reduction in earnings growth driven by downward adjustments to both real GDP and inflation within the region is offset by a reduced drag from margin normalization. We remain optimistic about the long-term prospects for European equities but acknowledge that uncertainty surrounding the future of the European project suggests a wide distribution of economic and investment outcomes for the region. Over the past decade, many of Europe’s political troubles were exacerbated by a double-dip recession, and we do not expect another double-dip recession over our forecast horizon.

In prior years, we have discussed the implications of structural changes to the euro area equity market driven by increasing regulation of eurozone banks, which is often raised as an argument against expecting any significant improvement in the profitability of eurozone corporations. The erosion of bank profitability, though, has already happened. Bank profitability peaked just before the global financial crisis, and bank valuations have adjusted accordingly (Exhibit 3). Banks’ current return on equity is mid to high single digit and less than the cost of equity for the sector. The European Central Bank has already procured an increase in Tier 1 equity for eurozone banks, leaving them with sufficient capital protection to withstand the next economic downturn. It has also signaled its intention to encourage more consolidation within the banking sector. Given that the sector trades at a 50% discount to book value, we do not expect valuations to deteriorate much from here, and after 10 years of underperformance the sector’s weight, at 7% of the market, is a lot less significant than it was.

We upgrade our UK equity return assumption to 6.10% in local currency terms vs. 5.75% last year. Forward-looking UK returns are flattered by the market’s very high dividend yield and its relative cheapness as an underloved market. This year, we reduce the UK’s equilibrium margin from 6.50% to 6.25%, reflecting ongoing pressures on the materials sector and the increase in our forecast for sterling appreciation from 0.75% to 1.50% per year vs. the U.S. dollar. Given the unknowns surrounding Brexit, the future of Britain’s trading relationship with the European Union is difficult to predict. But because the revenue exposure of the wider UK market is so globally diversified — just 15% is from the euro area — UK stocks are somewhat protected from Brexit fallout.

We present selected developed market equity assumptions in Exhibit 4A.

**EMERGING MARKETS EQUITY RETURN ASSUMPTIONS**

Emerging market equities have had a difficult year, with returns buffeted by the global growth slowdown and trade tensions. Yet valuations are little changed, as earnings and margins have declined alongside prices. As a result, the drag expected from margin normalization in last year’s numbers has disappeared, leaving us to assume roughly flat margins over our forecast horizon. This more than offsets the negative impact from a number of GDP growth downgrades, leaving the EM equity return expectation modestly higher at 8.70% (from 8.50%) in local currency terms. In USD terms, the EM return assumption rises to 9.20% from 8.50% as a result of several EM FX forecast upgrades, mostly in Asia (Exhibit 4B). The return premium is unchanged in local terms at 3.00%, while marginally expanding in U.S. dollar terms, from 2.75% to 2.90%.
From a structural perspective, our views are largely unchanged. While our overall economic growth forecasts for emerging markets have dropped a little, relative to developed economies we see higher growth potential from a range of forces: still-high productivity growth, the potential for the EM technology sector to catch up to its DM counterpart and more favorable demographics (although admittedly also worsening). If the U.S. dollar weakens, as we expect, funding pressures for emerging market sovereign borrowers should not be a major constraint. Translating strong economic growth into returns is a nuanced process in emerging markets, which investors need to consider as they determine their allocations. As we did last year, we note the dispersion among returns in individual emerging markets within the broader complex. Variations in market structure, sectoral composition, corporate governance and external exposure all contribute to the spread among individual EM market returns.

As highlighted in prior editions of our Long-Term Capital Market Assumptions (LTCMAs), earnings per share are more complicated to forecast for emerging markets. As the market capitalization of a relatively nascent stock market grows through new issuance, the number of listed shares increases, diluting the portion of the pie owned by existing shareholders. Thus, faster economic growth does not necessarily result in faster earnings per share growth. Within our assumptions framework, this tends to lead to a higher dilution for emerging markets than for developed ones. While this factor has admittedly diminished substantially over the last decade, we still see it as being a roughly 2% drag for EM equity returns relative to their DM counterparts. We derive our aggregate EM equity assumption by applying the same methodology we use for DM equity assumptions to nine large emerging markets and aggregating by market capitalization weight. The countries we include account for more than 80% of the market capitalization in the MSCI Emerging Markets Index. We once again caution that data history in emerging economies is generally shorter and data quality less robust, so our confidence in the resulting assumptions is by nature somewhat lower than for developed markets. Despite this reservation and the variety of cyclical and structural crosscurrents moving through the emerging market universe, we identify a few common themes.

Given widely diverging performance among individual EM equity markets over the past year, many of the more notable changes in return assumptions have been driven by changes in starting valuations. The EMEA region sees a substantial upgrade in local FX return to 9.60% — the highest of any EM region — from 8.75%, after a year of lukewarm returns (although returns are lower in USD terms, at 8.50%). The same effect is at work in Mexico, which sees its return assumption rise to 9.70% in local currency terms. The overall Latin America return assumption drops to 7.30% from 8.75% a year ago, with Brazil equities looking much more expensive after rising substantially over the past year. Changes in Asia are more modest, with the overall EM Asia return assumption rising by 30 basis points (bps) to 8.80%. Much of this is fueled by a higher assumption for India as a result of a review of our underlying assumption drivers. In contrast, return numbers for the larger Korean and Taiwanese markets have moved down by 60bps and 50bps, respectively. As for China, the biggest emerging equity market, our return assumption for the MSCI China Index rises to 9.10%, while our return assumption for the domestic A-share market drops by 65bps to 8.10%, mostly due to higher starting valuations.

**Convertible Bonds**

Convertible bonds — corporate debt securities that provide the holder with an option to convert into the issuer’s stock at a predetermined price — have historically offered investors equity-like returns with lower volatility and downside protection through a fixed income floor. Convertibles generally provide a more attractive income component than stocks alone while still allowing participation in the stock’s price movement. They can improve the risk-adjusted returns of balanced stock-bond portfolios due to their asymmetric return profile and diversification benefits.

As an equity alternative, convertibles allow investors to stay invested while lowering the risk of large drawdowns. Moreover, convertible valuations benefit from increased volatility, as they are implicitly long volatility via the optionality embedded within them.

As a credit alternative, convertibles have structurally lower duration than credit broadly and thus offer a route to positive returns even as the environment for duration and credit spreads deteriorates. Convertibles will generally be more positively affected by rising stock values than negatively affected by rising interest rates due to their low duration. However, like high yield bonds, convertibles have been susceptible to liquidity constraints during periods of market stress.
Our methodology for calculating convertible bond returns accounts for convertibles’ similarities to and differences from traditional equity and fixed income, as well as the composition of convertible indices. We incorporate into our convertible bond assumptions our existing LTCMA numbers for equity and fixed income, along with convertibles’ equity sensitivity, credit quality, option premium and the underlying stocks’ unique characteristics. While the geographic composition of the global convertibles universe is similar to that of the MSCI World Index, it has historically been biased toward smaller companies and cyclical sectors. Thus, our convertible bond assumptions estimate regional betas based on a historical regression and apply that to our regional weight and delta assumptions and the existing regional equity return LTCMA numbers.

EXHIBIT 4A: SELECTED DEVELOPED MARKET EQUITY LONG-TERM RETURN ASSUMPTIONS AND BUILDING BLOCKS

<table>
<thead>
<tr>
<th>Equity assumptions</th>
<th>U.S. large cap</th>
<th>Euro area</th>
<th>UK</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue growth</td>
<td>5.1</td>
<td>4.0</td>
<td>4.5</td>
<td>3.2</td>
</tr>
<tr>
<td>+ Margins impact</td>
<td>-1.1</td>
<td>-0.5</td>
<td>-1.0</td>
<td>-0.6</td>
</tr>
<tr>
<td>Earnings growth</td>
<td>4.0</td>
<td>3.6</td>
<td>3.4</td>
<td>2.6</td>
</tr>
<tr>
<td>+ Gross dilution</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>+ Buybacks</td>
<td>2.5</td>
<td>1.8</td>
<td>1.0</td>
<td>1.6</td>
</tr>
<tr>
<td>EPS growth</td>
<td>4.5</td>
<td>3.3</td>
<td>2.4</td>
<td>2.2</td>
</tr>
<tr>
<td>+ Valuation impact</td>
<td>-0.9</td>
<td>-0.6</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Price return</td>
<td>3.6</td>
<td>2.8</td>
<td>2.6</td>
<td>2.9</td>
</tr>
<tr>
<td>+ Dividend yield (DY)</td>
<td>2.0</td>
<td>3.0</td>
<td>3.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Total return, local currency</td>
<td>5.6%</td>
<td>5.8%</td>
<td>6.1%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Change vs. 2019 LTCMAs</td>
<td>+35bps</td>
<td>-20bps</td>
<td>+35bps</td>
<td>+50bps</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; estimates as of September 30, 2018, and September 30, 2019. Components may not add up to totals due to rounding.

EXHIBIT 4B: SELECTED EMERGING MARKET EQUITY LONG-TERM RETURN ASSUMPTIONS AND BUILDING BLOCKS

<table>
<thead>
<tr>
<th>Equity assumptions</th>
<th>China*</th>
<th>Korea</th>
<th>Taiwan</th>
<th>India</th>
<th>South Africa</th>
<th>Brazil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue growth</td>
<td>9.3</td>
<td>5.2</td>
<td>4.3</td>
<td>13.7</td>
<td>9.1</td>
<td>8.5</td>
</tr>
<tr>
<td>+ Margins impact</td>
<td>0.2</td>
<td>0.3</td>
<td>1.3</td>
<td>0.6</td>
<td>-1.3</td>
<td>-3.0</td>
</tr>
<tr>
<td>Earnings growth</td>
<td>9.5</td>
<td>5.5</td>
<td>5.6</td>
<td>14.4</td>
<td>7.7</td>
<td>5.2</td>
</tr>
<tr>
<td>+ Gross dilution</td>
<td>-3.8</td>
<td>-1.5</td>
<td>-1.8</td>
<td>-3.1</td>
<td>-1.1</td>
<td>-2.0</td>
</tr>
<tr>
<td>+ Buybacks</td>
<td>0.3</td>
<td>1.3</td>
<td>0.5</td>
<td>0.3</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>EPS growth</td>
<td>5.9</td>
<td>5.3</td>
<td>4.2</td>
<td>11.1</td>
<td>7.0</td>
<td>4.0</td>
</tr>
<tr>
<td>+ Valuation impact</td>
<td>0.8</td>
<td>0.7</td>
<td>-0.7</td>
<td>-2.2</td>
<td>-0.3</td>
<td>-1.0</td>
</tr>
<tr>
<td>Price return</td>
<td>6.7</td>
<td>6.0</td>
<td>4.2</td>
<td>8.8</td>
<td>6.7</td>
<td>3.0</td>
</tr>
<tr>
<td>+ Dividend yield (DY)</td>
<td>2.8</td>
<td>1.75</td>
<td>3.75</td>
<td>1.5</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Total return, local currency</td>
<td>9.1%</td>
<td>7.9%</td>
<td>7.5%</td>
<td>10.3%</td>
<td>9.9%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Change vs. 2019 LTCMAs</td>
<td>+35bps</td>
<td>-60bps</td>
<td>-50bps</td>
<td>+155bps</td>
<td>+115bps</td>
<td>-215bps</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; estimates as of September 30, 2018, and September 30, 2019. Components may not add up to totals due to rounding.

* China refers to MSCI China Index.

For the fixed income component of convertible bonds, we make an assumption of future investment grade vs. high yield issuance and use our LTCMA regional return assumptions, including the opportunity costs and currency differentials.

This year, our global convertible bond and global credit-sensitive convertible bond assumptions (hedged into USD) are 4.80% and 4.40%, respectively. Credit-sensitive convertibles are securities whose underlying stock trades significantly below the conversion price, causing them to behave more like debt than equity. For context, we forecast 6.50% for the MSCI AC (All Country) World Index (in USD terms) and 3.20% for global credit returns (hedged into USD).
EQUITY FACTOR ASSUMPTIONS

Authors
Joe Staines, Portfolio Manager and Research Analyst, Quantitative Beta Strategies
Garrett Norman, Investment Specialist, Beta Strategies

Our long-term assumptions include return estimates for factor exposures. We cover five individual factors (value, quality, momentum, minimum volatility and dividend yield) and diversified approaches across five geographies (U.S., global developed, international developed, Europe and emerging markets).

Methodology

We determine our long-term assumptions by examining the properties of two index suites, designed by J.P. Morgan Asset Management and calculated by FTSE Russell. The J.P. Morgan Diversified Factor Suite describes the performance of stocks chosen for their diversified factor characteristics; the J.P. Morgan US Single Factor Suite describes the performance of large U.S. companies chosen to target a single characteristic. While there is no unambiguous, natural choice of a representative index, we hope that these long-term assumptions will help inform how investors think about asset allocation with respect to factors.

To reach a return assumption, we first make assumptions about the relative performance of the best and worst stocks according to a factor. We calculate the historical return difference between the best and worst quartile of stocks for each factor; significantly, we measure stocks relative to their sector and geographical region peers. Relative returns are adjusted to remove the impact of market beta, allowing for an isolated view of factor performance. The quartile portfolios are rebalanced monthly and incorporate conservative estimates for the cost of trading. We then apply a haircut to these returns to account for potential selection bias effects and market adaptation. These steps form a baseline for our long-term factor return assumptions.

Next, we adjust for the richness/cheapness of factors under the assumption that factor returns are persistent but cyclical. Mechanically, we assume that the forward earnings yield differential between top quartile stocks and bottom quartile stocks will revert to its long-term average, and adjust the return assumption accordingly. The impact of this adjustment can be meaningful when factors reach extreme valuation levels. For example, as the value factor has cheapened over the past year and reached levels that have only been surpassed during the dot-com bubble, our return expectation has risen from 6.0% to 7.2%.

Finally, we estimate the exposure of each index in the aforementioned diversified and single factor suites to the market risk premium, as well as the factors, using regression analysis. Multiplying each exposure by the appropriate return assumption gives us our final return assumptions. We base expectations for volatility and correlation on their historical values for the J.P. Morgan Asset Management index series.

We cover five individual factors and multi-factor approaches across five geographies

RETURN ESTIMATES (ROUNDED TO THE NEAREST 10BPS FOR 2020 NUMBERS AND THE NEAREST 25BPS FOR 2019 NUMBERS)

<table>
<thead>
<tr>
<th>Factor</th>
<th>2020 return assumptions, USD</th>
<th>2019 return assumption, USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. diversified</td>
<td>6.30%</td>
<td>5.50%</td>
</tr>
<tr>
<td>U.S. value</td>
<td>7.20%</td>
<td>6.00%</td>
</tr>
<tr>
<td>U.S. momentum</td>
<td>5.40%</td>
<td>5.50%</td>
</tr>
<tr>
<td>U.S. quality</td>
<td>5.60%</td>
<td>5.25%</td>
</tr>
<tr>
<td>U.S. dividend</td>
<td>6.90%</td>
<td>6.00%</td>
</tr>
<tr>
<td>U.S. min vol</td>
<td>5.80%</td>
<td>5.50%</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; data as of September 30, 2019.
Alternatives Strategy Assumptions

Attractive outlooks relative to public market options

Anthony Werley, Chief Investment Officer, Endowments & Foundations Group
Nicolas Aguirre, CFA, Portfolio Strategist, Endowments & Foundations Group
Pulkit Sharma, CFA, CAIA, Head of Alternatives Investment Strategy and Solutions
Leon Xin, CFA, Head of Portfolio Construction, Endowments & Foundations Group
Diego Gilsanz, Global Strategist, Multi-Asset Solutions
Shay Chen, CFA, CAIA, Alternatives Investment Strategy and Solutions

IN BRIEF

Relative to 2019 estimates, our long-term return assumptions for financial strategies are generally neutral to higher. Improved underlying public market return expectations help to offset the perceived challenges to alpha from the sizable wall of cash seeking investment. Projected returns for real assets are, on balance, largely unchanged given stable fundamentals over the past year. For investors looking to alternatives to counter a modest long-term return outlook, thoughtful allocation and prudent selection of top-tier managers remain critical.

• Private equity: PE return assumptions are raised from last year, across fund size and capitalization categories, reflecting our increased public equity market return expectations. Alpha projections are essentially unchanged, given concern with industry operating conditions, balanced by improving “new economy” opportunities globally.

• Direct lending: We have trimmed slightly our return estimates for direct lending, given strong investor demand and increasing lender competition.

• Hedge funds: Hedge fund return projections are essentially flat vs. our 2019 assumptions on an equal-weighted basis, reflecting our mixed public market outlook along with challenging alpha conditions. Managers are seeking innovative and global opportunities, awaiting an environment that is more fundamentally driven than macro driven.

• Real estate: Core real estate return assumptions are essentially unchanged from last year for the U.S., up slightly for the UK and Asia Pacific, and reduced for Europe ex-UK. Regional patterns are similar for value-added assumptions; risk premia are unchanged, given stretched valuations vs. core. For REITs, our global projection is flat, with estimates slightly lower for the U.S., down for Europe ex-UK, up slightly for the Asia Pacific region and up for the UK.

• Infrastructure: Infrastructure equity return estimates are flat vs. 2019. We expect increasing investor demand and fee compression to offset the impact from deleveraging and slower asset growth. Infrastructure debt return estimates, based largely on our projection for A to BBB 15-year global corporate credits, are down vs. 2019.

• Commodities: Commodity returns are expected to rise; the long-term impact of a decline in the USD is likely to more than offset any late-cycle softening in commodity demand. Gold’s premium to broad commodities is projected to increase, given heightened demand from central banks, investors and consumers.
OVERVIEW

Relative to 2019 estimates, our long-term return assumptions for private equity rise consistent with the underlying rise in public equity projections; all other alternative strategy class assumptions are approximately flat, with the exception of infrastructure debt, which declines in line with other credit assumptions.

Across the alternative investment universe, we see potential opportunities to create attractive portfolio profiles within the context of the subdued overall capital markets outlook. However, the real remedy to the modest return outlook lies in thoughtful allocation and the diligent selection of top-tier managers in each strategy group. We have consistently emphasized this point and continue to do so as the search for return-enhancing strategies adds to the wall of cash to be invested and increases the alpha generation challenge.

**EXHIBIT 1: SELECTED ALTERNATIVE STRATEGIES RETURN ASSUMPTIONS (LEVERED, A NET OF FEES, %)**

<table>
<thead>
<tr>
<th>Strategy Category</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIVATE EQUITY (USD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. private equity–small cap</td>
<td>8.70</td>
<td>7.75</td>
</tr>
<tr>
<td>U.S. private equity–mid cap</td>
<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>U.S. private equity–large/mega cap</td>
<td>9.00</td>
<td>8.50</td>
</tr>
<tr>
<td><strong>PRIVATE DEBT (USD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct lending</td>
<td>7.00</td>
<td>7.25</td>
</tr>
<tr>
<td><strong>HEDGE FUNDS (USD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity long bias</td>
<td>4.80</td>
<td>4.75</td>
</tr>
<tr>
<td>Event-driven</td>
<td>4.80</td>
<td>4.75</td>
</tr>
<tr>
<td>Relative value</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Macro</td>
<td>3.30</td>
<td>3.75</td>
</tr>
<tr>
<td>Diversified(^c)</td>
<td>4.50</td>
<td>4.25</td>
</tr>
<tr>
<td>Conservative(^d)</td>
<td>4.00</td>
<td>3.75</td>
</tr>
<tr>
<td><strong>REAL ESTATE—DIRECT (LOCAL CURRENCY)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. core</td>
<td>5.80</td>
<td>5.75</td>
</tr>
<tr>
<td>U.S. value-added</td>
<td>7.70</td>
<td>7.75</td>
</tr>
<tr>
<td>European ex-UK core</td>
<td>5.00</td>
<td>5.50</td>
</tr>
<tr>
<td>European ex-UK value-added</td>
<td>7.50</td>
<td>8.00</td>
</tr>
<tr>
<td>UK core</td>
<td>5.50</td>
<td>5.00</td>
</tr>
<tr>
<td>UK value-added</td>
<td>7.70</td>
<td>7.25</td>
</tr>
<tr>
<td>Asia Pacific core</td>
<td>6.50</td>
<td>6.00</td>
</tr>
<tr>
<td><strong>REITS (LEVERED, LOCAL CURRENCY)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>6.00</td>
<td>6.25</td>
</tr>
<tr>
<td>European ex-UK</td>
<td>5.50</td>
<td>6.00</td>
</tr>
<tr>
<td>UK</td>
<td>6.00</td>
<td>5.50</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>6.00</td>
<td>5.75</td>
</tr>
<tr>
<td>Global</td>
<td>6.00</td>
<td>6.00</td>
</tr>
<tr>
<td><strong>GLOBAL INFRASTRUCTURE (USD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity–direct</td>
<td>6.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Debt</td>
<td>3.30</td>
<td>4.75</td>
</tr>
<tr>
<td><strong>COMMODITIES (USD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold</td>
<td>2.50</td>
<td>2.25</td>
</tr>
</tbody>
</table>


\(^a\) All 2020 return assumptions incorporate leverage, except for Global Infrastructure Debt and Commodities, where it does not apply.

\(^b\) The private equity composite is AUM-weighted: 60% large cap and mega cap, 30% mid cap and 10% small cap. Capitalization size categories refer to the size of the asset pool, which has a direct correlation to the size of companies acquired, except in the case of mega cap.

\(^c\) The diversified assumption represents the projected return for multi-strategy hedge funds.

\(^d\) The conservative assumption represents the projected return for multi-strategy hedge funds that seek to achieve consistent returns and low overall portfolio volatility by primarily investing in lower volatility strategies such as equity market neutral and fixed income arbitrage.
PRIVATE EQUITY—TWO SIDES OF THE ALPHA COIN

Our private equity (PE) assumptions are raised relative to our 2019 assumptions across the range of fund size and capitalization to reflect the increase in underlying public market return expectations for the weighted market exposures of industry assets. Our alpha expectations are basically flat, reflecting concerns with industry operating conditions, balanced against improving global opportunities (Exhibit 2).

The private equity assumption for 2020 reflects our conviction that the still early-stage global economic and demographic transformation will afford sponsors new opportunities to generate trend line alpha above the public markets, despite the store of dry powder entrusted to them. Further, the geographic expansion of targeted investments outside of the U.S., specifically in the emerging markets, provides increased potential for greater base market returns. But, just as significantly, emerging market (EM) investing opens the door to technologies and applications that may leapfrog those of developed markets. While most sponsor exits will continue to be sales to strategic buyers, we anticipate that the IPO window will continue to be open for an extended time period as the thirst for new growth opportunities expands exit and valuation options.

The headwinds of the current cycle remain considerable, however. Primarily due to the wall of liquidity to be invested, elevated purchase price multiples and very competitive conditions stemming from both traditional and nontraditional investors, excess returns will be held in check, at least for the average operator (Exhibit 3).

Excess returns continue to be suppressed by elevated liquidity, valuations and competition

Private equity assumptions reflect expectations for improved public market returns and the ability of “new economy” opportunities globally to hold alpha steady despite ongoing industry challenges

EXHIBIT 2: PRIVATE EQUITY ASSUMPTIONS AND RETURN FRAMEWORK

<table>
<thead>
<tr>
<th></th>
<th>Small PE (&lt;USD 1bn)</th>
<th>Mid PE (USD 1bn-USD 3bn)</th>
<th>Large/mega PE (&gt;USD 3bn)</th>
<th>Cap-weighted* **</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC MARKET EXPOSURES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. small cap</td>
<td>100%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. mid cap</td>
<td></td>
<td>50%</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Asia ex-Japan</td>
<td></td>
<td></td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>ASSUMPTIONS (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public market exposure</td>
<td>6.50</td>
<td>6.20</td>
<td>6.90</td>
<td>6.65</td>
</tr>
<tr>
<td>Alpha trend</td>
<td>2.20</td>
<td>2.30</td>
<td>2.10</td>
<td>2.15</td>
</tr>
<tr>
<td>2020 LTCMA</td>
<td>8.70</td>
<td>8.50</td>
<td>9.00</td>
<td>8.80</td>
</tr>
<tr>
<td>2019 LTCMA</td>
<td>7.75</td>
<td>8.00</td>
<td>8.50</td>
<td>8.25</td>
</tr>
</tbody>
</table>


* The private equity composite is AUM-weighted; 60% large cap and mega cap, 30% mid cap and 10% small cap. Capitalization size categories refer to the size of the asset pool, which has a direct correlation to the size of companies acquired, except in the case of mega cap.

** The regional weights for the capitalization-weighted PE composite are: U.S.: 55%; Europe: 25%; Asia and other: 20%.
In essence, the strategic economic and financial market environment provides a positive backdrop for the opportunistic operating format of private equity. PE has the potential to absorb additional capital while maintaining but not increasing trend line alpha, despite the various headwinds facing the industry. Lastly, no discussion of PE returns is complete without reference to the importance of manager selection and the wide dispersion of returns investors are likely to experience.

The inverse relationship between dry powder and excess returns delivered has been clear over time. The surfeit of capital raised across the industry in this cycle remains a formidable challenge to generating excess returns above the public market and is in contention with investors’ expectations.

The additional capital from direct investments by pension and sovereign wealth funds, family offices and hedge funds, which are not fully accounted for in composite PE fundraising statistics, has helped drive purchase price multiples to new cycle highs (Exhibit 4). Within the most favored sectors of the digital economy, such as software, purchase price multiples may have already priced in significant future growth (Exhibit 5). The controversy of non-GAAP “adjusted EBITDA” raises a further yellow flag that may indicate exuberant valuations that likely reduce excess returns, at least for general partners (GPs) in the bottom half of the fund return distribution. These conditions curb our enthusiasm for increasing the long-term trend excess return over the public market but are not enough to validate the most conservative projections, which forecast a convergence of public and private market returns to levels seen by average GPs over the past few years.

---

**EXHIBIT 4: PRIVATE EQUITY PURCHASE PRICE MULTIPLES – ENTERPRISE VALUE/EBITDA (X)**

<table>
<thead>
<tr>
<th>Year (x-axis)</th>
<th>Europe</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>'09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


---

**EXHIBIT 5: ENTERPRISE VALUE/NEXT 12 MONTHS SALES MULTIPLES FOR LISTED SOFTWARE FIRMS**

<table>
<thead>
<tr>
<th>Year (x-axis)</th>
<th>25th percentile</th>
<th>Median</th>
<th>75th percentile</th>
<th>Avg. 25th percentile</th>
<th>Average median</th>
<th>Avg. 75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: UBS Securities LLC; data as of March 31, 2019.

---

1 EBITDA that excludes the impact of certain one-time, unrealized or nonrecurring items. Non-generally accepted accounting principles (non-GAAP) measures are regulated by the Securities and Exchange Commission but are not subject to audit.
Private markets may offer a better environment for innovation and growth

The case for the ability of private equity investors to absorb and invest in excess of USD 3.5 trillion AUM at a premium rests on multiple pillars favoring the private vs. public structure: the low reinvestment risk and earnings “optimization” mindset of public companies; the focus of newer entities on maximizing their growth in the private market; plentiful access to capital outside of the public markets; the ecosystem of expertise available throughout the venture capital, growth and buyout communities; and finally, financial incentives.

“New economy” opportunities are likely higher in growth potential ...

The increasing innovation/disruption emanating from both large and small new economy businesses within the private markets helps validate the general belief that higher growth opportunities exist in these markets. What’s more, because the platform for such innovation has been put in place over an extended period of time, we believe that the acceleration in the pace and scope of private equity opportunities is more than a one-cycle phenomenon. Arguably, the pace of consumer applications may decelerate, but the corporate enterprise applications are likely still early on in the process of innovation and disruption.

Indicators attesting to the opportunity set created by the digital economy are plentiful. For example, according to the U.S. Census Bureau, e-commerce retail sales have been growing nine times faster than traditional in-store sales since 1998 and, as of Q2 2019, were running at an annual rate of USD 600 billion, or about 11% of total retail sales. Our own estimates, based on a proprietary measure using Chase consumer card transactions data, puts that share at an even higher 16% (see “New economy, same old returns?,” 2020 Long-Term Capital Market Assumptions).

... and global in scope

As discussed in previous years, the PE investment universe is increasingly global, if not increasingly emerging market, in scope. The 2020 Long-Term Capital Market Assumptions (LTCMAs) for emerging public equity suggest an average market return premium of roughly 3.5% for China and 6.1% for India over U.S. public equity returns. More significantly, emerging market investing may open the door to innovations that often outstrip existing developed market technologies and applications. Without the inertia from an installed base, new technology and applications such as mobile internet and consumer payment innovations may be developed and sequenced from emerging markets to developed markets, reversing the historical pattern of transference.

---

2 U.S. Census Bureau, Quarterly E-Commerce Report, Monthly Retail Trade Survey; J.P. Morgan Asset Management calculations.
3 The Chase dataset excludes some co-branded cards.
DIRECT LENDING—HEAVY INVESTOR DEMAND AND STRONG LENDER COMPETITION

Our 2020 long-term return estimate for direct lending (levered, net of fees) is 7.00%, a reduction from 2019’s estimate of 7.25%. The past year has been marked by the broad continuation (and, in certain cases, intensification) of previously apparent trends in the direct lending market. Fundraising growth has continued, leading to the highest first-half total on record for U.S. direct lending, in January-June 2019, when funds saw USD 16.6 billion of inflows. North America-focused dry powder also increased, to USD 57.5 billion as of the end of June, compared with USD 57.3 billion at the end of 2018 and USD 46.5 billion at the end of 2017.4

As heavy investor demand has led to more intense lender competition in the middle market, market participants have increasingly widened the scope of potential investments to encompass borrowers of a size that would traditionally have gone to the syndicated loan market. The rationale for investors to get involved in direct lending transactions remains similar for larger as well as smaller deals: typically, a combination of enhanced yields and greater creditor protection compared with the leveraged loan market. However, the implicit assumption about the asset class still holds true: Whether or not investors are likely to incur relatively low default losses will depend on the selection of a competent active manager. This is reflected in our upward adjustment of average fee expenses. Falling Libor levels could also be a near-term negative for the asset class, given the floating-rate nature of underlying loans, despite the capacity of new origination yields to lag those available in syndicated loan markets as rates decline.

Methodology

Refining the building block approach used in prior editions of our LTCMAs, our lower overall return assumption is broadly reflective of lower illiquidity premia, in the context of higher lender competition for deals and similar or wider liquid loan spreads (Exhibit 6). In addition, despite yields for new origination sometimes lagging those in the syndicated loan market, in an environment of declining cash rates falling Libor levels could also be a near-term negative for the asset class, given the floating-rate nature of the underlying loans.

Direct lending return assumptions are reduced from 2019, given lower illiquidity premia in the face of tighter lender competition

EXHIBIT 6: DIRECT LENDING RETURN ASSUMPTIONS AND BUILDING BLOCKS (USD, %)

<table>
<thead>
<tr>
<th>Rate/spread (%)</th>
<th>2020</th>
<th>2019</th>
<th>2020 LTCMA for cash.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash*</td>
<td>1.90</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>Weighted average spread</td>
<td>4.90</td>
<td>4.50</td>
<td>Based on post-global financial crisis spreads from Credit Suisse; 50/50 weighted between (i) single B loans and (ii) an 85-15 mix of first lien and second lien, reflecting the profile of manager originations.</td>
</tr>
<tr>
<td>Illiquidity</td>
<td>0.90</td>
<td>1.25</td>
<td>Represents “day one” excess returns for direct lenders at origination over and above liquid loans of equivalent credit quality, comprising a mix of up-front fees (amortized over the life of the loan) and excess spread. We assume a lower illiquidity premium relative to 2019, reflecting higher liquid loan spreads (as premia tend to lag the market) and continuing high lender competition.</td>
</tr>
</tbody>
</table>

| Starting yield  | 7.70 | 8.00 | Cash + spread + illiquidity |
| Credit cost     | -1.25| -1.25| Based on post-global financial crisis loan default rates, assuming recoveries as per Moody’s forward projection for senior loans and 0% recoveries for second lien. This would lead to a higher default loss assumption than 2019, reflecting the maturing of the cycle. However, we give some credit for manager alpha in seeing lower realized default losses than the broader market, including via the increased ability to protect lenders’ interests by engaging with borrowers in directly originated transactions. |

| Unlevered yield | 6.45 | 6.75 | Starting yield + credit costs |
| Leverage        | 6.45 | 6.75 | Reflects 1x turn of leverage added. |
| Cost of financing | -4.05 | -4.75 | Based on manager discussions and yield spreads on publicly traded debt backed by mid market loan portfolios. |
| Fees            | -1.85| -1.50| Based on manager discussions of management and performance fees on leveraged assets. |

| Levered return assumption | 7.00 | 7.25 | Unlevered yield + leverage + cost of financing + fees |


* In our 2019 assumptions, the floating-rate component was an expectation of Libor utilizing the 2019 LTCMA cash assumption and incremental credit spread.
HEDGE FUNDS—SEEKING NEW OPPORTUNITIES IN CROWDED MARKETS

Our hedge fund assumptions are essentially flat vs. 2019 projections on an equal-weighted basis, reflecting our mixed public market outlook, along with challenging alpha conditions. Our assumptions embed the expectation that volatility normalizes and micro fundamentals increasingly drive investment results. The increased but still quite modest inclusion of illiquid investments that have return expectations closer to average private equity returns raises our confidence in, but not the level of, our estimates (Exhibit 7).

A return to normalized market conditions should support alpha, while market return expectations generate the core of our assumptions

EXHIBIT 7: HEDGE FUND RETURN ASSUMPTIONS (USD, %)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity long bias</td>
<td>4.80</td>
<td>4.75</td>
</tr>
<tr>
<td>Event-driven</td>
<td>4.80</td>
<td>4.75</td>
</tr>
<tr>
<td>Relative value</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Macro</td>
<td>3.30</td>
<td>3.75</td>
</tr>
<tr>
<td>Diversified*</td>
<td>4.50</td>
<td>4.25</td>
</tr>
<tr>
<td>Conservative**</td>
<td>4.00</td>
<td>3.75</td>
</tr>
</tbody>
</table>


* The diversified assumption represents the projected return for multi-strategy hedge funds.
** The conservative assumption represents the projected return for multi-strategy hedge funds that seek to achieve consistent returns and low overall portfolio volatility by primarily investing in lower volatility strategies such as equity market neutral and fixed income arbitrage.

Current market conditions remain challenging but on the mend

The investment environment of the past several years is clearly different from the heyday of hedge fund returns prior to the global financial crisis. A surfeit of liquidity invested through multiple strategy options — all designed to extract alpha from an aging, relatively low volatility bull market — is not an ideal condition for most fundamental, long-short hedge fund strategies. In the equity long-short space, traditional buy-and-hold investors, along with competitors managing factor, smart beta, quantitative high frequency trading and other, less conventional strategies, are all looking for a differentiated investment edge. That edge is even more difficult to achieve within a market driven by the performance of a concentrated group of stocks (e.g., the “FAANG” stocks: Facebook, Amazon, Apple, Netflix and Alphabet’s Google) and sectors (e.g., utilities, software and REITs) accelerated by passive money flows (Exhibit 8).

The more concentrated the drivers of equity market returns, the more difficult it is to generate hedge fund alpha

EXHIBIT 8: EQUITY MARKET RETURN CONCENTRATION VS. HEDGE FUND ALPHA* (JULY 2004 TO JUNE 2019)


* Equity market return concentration is measured as the difference between the rolling annual returns of market cap-weighted and equal-weighted S&P 500 indices; the greater the difference, the higher the concentration. Hedge fund alpha is represented by the rolling annual return of the HFRI Fund Weighted Composite Index minus (two-year rolling beta x S&P 500 return).

Our previous discussions of market conditions have highlighted the role of the macro environment and policy intervention vs. corporate fundamentals in asset price changes. With the commencement of the U.S.-China trade war and global central banks’ renewed shift toward easier policies, fundamentally driven investment strategies are not currently in their sweet spot for alpha generation. However, a return to sustained normalized volatility and fundamental vs. macro-level conditions should prove beneficial to hedge fund alpha over the 10 to 15 years of our assumptions time frame. In the intermediate term, the industry continues to evolve and employ investment techniques differentiated from those of traditional asset managers. This should add alpha on the margin, raising the value-added of these strategies in the context of a multi-asset class portfolio.
New opportunities within less transparent and trafficked markets

Among current trends, we highlight the increase in hybridization, or use of direct, private, illiquid exposures within primarily liquid investment mandates, and the growing number of new hybrid investment strategies offered in response to investor demand (Exhibit 9). The use of private, direct, nonpublic domain opportunities has been a staple of distressed and other event-driven strategies for some time. The employment of private direct investments, from direct private equity to structured credit, across a wider swath of hedge fund strategies, particularly equity and credit long-short strategies, may portend a slightly less correlated and modest roundup to the alpha outlook for hedge fund strategies over time. Less transparent and harder-to-access investments, mostly out of reach for traditional investment strategies, may, at a minimum, increase the dispersion of returns within the industry and likely increase the alpha potential of the industry on the margin.

Investor allocation intentions toward hybrid investing are rising

**EXHIBIT 9: PERCENTAGE OF SURVEY RESPONDENTS THAT SAY THEY HAVE ALLOCATED OR INTEND TO ALLOCATE TO ILLIQUID/HYBRID FUNDS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Yes (%)</th>
<th>No, but plan to allocate following year (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Advanced analytical techniques may add an edge

Advanced analytical techniques, such as language processing and other advanced artificial intelligence methods, offer new, less explored investment opportunities outside the reach of most traditional pools of capital and most of the USD 3.6 trillion AUM in the hedge fund industry as well. The industry is launching new funds to capitalize on the opportunity, while some of the better-resourced funds are also taking advantage of these new approaches. Whether the industry, on average, will be able to raise alpha by employing these techniques is less certain in the near-term part of our projection time frame, considering that true artificial intelligence requires substantial computing horsepower and, more importantly, quality, cleaned, unbiased data and the ability to interpret it. The outlook is promising, however, as cloud capabilities and leasing models for computing power will help to level the playing field.

Key building blocks and considerations underlying hedge fund return assumptions

We take a building block approach to constructing our hedge fund assumptions:

**CORE BETA RETURNS:** Our approach posits that beta – the underlying market risk, whether associated with equity, credit, rates or other market sources – is the core assumption from which we derive our projections.

- We find that hedge fund betas are rotating toward Asian markets on the margin, while U.S. market exposure still defines the core of risk-taking.
- The normalization of policy rates – to a 1.9% return on U.S. cash, as projected by our 2020 LTCMAs – is another basic building block.

**ALPHA TRENDS:** We base the alpha component of returns on historical alpha trends, adjusted for forward-looking expectations.

- As discussed, we expect volatility to normalize, fundamentals vs. macro considerations to drive investment results and for differentiated management techniques and an increase in hybrid investing to be supportive of alpha on the margin.

**ALPHA POTENTIAL:** We make further adjustments, based on our interpretation of the impact of industry conditions on the forward-looking alpha potential of each strategy class.

- The trajectory of fees has been lower for a number of years and contributes directly to our return assumptions. We anticipate a fee reduction of 25 basis points (bps) at the average manager level industrywide (Exhibit 10).
Hedge fund fees continue to decline

EXHIBIT 10: AVERAGE MANAGEMENT AND INCENTIVE FEES — ALL SINGLE MANAGER STRATEGIES

<table>
<thead>
<tr>
<th>Year</th>
<th>Management fee (LHS)</th>
<th>Incentive fee (RHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'08</td>
<td>2.0%</td>
<td>1.8%</td>
</tr>
<tr>
<td>'10</td>
<td>1.8%</td>
<td>1.5%</td>
</tr>
<tr>
<td>'12</td>
<td>1.5%</td>
<td>1.3%</td>
</tr>
<tr>
<td>'14</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>'16</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>'18</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>'16</td>
<td>16%</td>
<td>14%</td>
</tr>
<tr>
<td>'16</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>'16</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>'16</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>'16</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>'16</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>'16</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>'16</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>'16</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>'16</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>'16</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>'16</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>'16</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>'16</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>'16</td>
<td>0%</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Source: Hedge Fund Research; data as of June 30, 2019.

The industry is changing; the importance of manager selection is not

Considering current market conditions, more sophisticated competition for alpha and the extremely cheap cost of beta available in the marketplace, hedge fund industry manager selection remains a prime determiner of success (Exhibit 11). On average, hedge funds should provide a measure of diversification consistent with a higher level of alpha/lower correlation to traditional markets as market conditions normalize and the industry seeks out less transparent and trafficked opportunities.

Longer term, average industry performance will be increasingly determined by the degree of specialization, skills within opaque markets, lengths of lockup periods and investment techniques beyond the reach of standard asset managers. The transition to a less policy-driven market and sustainably higher volatility will add to the attractiveness of the strategy class.

Manager selection is critical in realizing the investment potential of hedge funds

EXHIBIT 11: DISPERSION OF MANAGER RETURNS (%), JULY 2014 TO JUNE 2019*

<table>
<thead>
<tr>
<th>Strategy</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event-driven</td>
<td>2.85</td>
<td>4.29</td>
<td>5.82</td>
</tr>
<tr>
<td>Macro</td>
<td>-0.96</td>
<td>1.49</td>
<td>3.15</td>
</tr>
<tr>
<td>Relative value</td>
<td>0.53</td>
<td>1.04</td>
<td>3.12</td>
</tr>
<tr>
<td>Equity long bias</td>
<td>-0.05</td>
<td>-0.96</td>
<td>5.68</td>
</tr>
</tbody>
</table>


* Returns adjusted for survivorship bias.
REAL ESTATE—RELATIVE VALUE OPPORTUNITIES IN A FAIRLY PRICED MARKET

Our long-term outlook indicates that finding value in global real estate will require looking beyond the averages in a largely fairly priced market. U.S., Europe and Asia Pacific markets are at varied stages of the economic cycle and monetary policy normalization. These differences, and a host of distinct dynamics across and within regions, styles and sectors, create pockets of opportunity that can help investors diversify and enhance real estate income and return.

Core real estate

Our long-term core real estate return assumptions (levered, net of fees) are virtually unchanged from last year for the U.S. The assumptions are raised modestly for the UK and Asia Pacific to reflect marginally higher starting net operating incomes (NOIs), lower net cash flow growth and the incremental benefit of funding cost/leverage derived from our 10-year term fixed income assumptions. Europe ex-UK returns are reduced to reflect the lowest property yields in a decade (Exhibit 12).

U.S. markets

Noting the uncertain outlook for the U.S. economy, we now expect a weak leasing environment for a larger share of the projection period. However, while it is unusual for this stage of the business cycle, we continue to see declining development activity as construction and land cost increases are still outpacing rent growth. Meanwhile, initial yields are similar, albeit slightly lower than last year’s, but built into those “cap rates” are two offsetting factors: lower Treasury yields and lower growth expectations. Our exit yield adjustment is less negative than last year’s due to our expectation that lower returns (and thus slightly lower cap rates) will be required by the “next buyer” 10 to 15 years from now.

Changes in core real estate assumptions vs. last year are modest and vary by region

The commercial real estate industry also faces significant structural changes that we believe, when considered holistically, will tend to have a positive impact on the sector’s returns. First, we see that the retail share of the sector is falling and is now close to the industrial sector’s share of the ODCE benchmark (Exhibit 13). Additionally, other, more specialized and faster-growing property types — as diverse as cold storage and data centers — are likely to expand their benchmark shares. We also see significant technological changes reducing the sizable drag on commercial real estate performance that comes from transaction costs (in leasing as well as sales). Finally, these technological changes can help improve overall liquidity — especially for retail investors — in a way that may reduce required returns over the next 10 to 15 years.

A decline in retail and an increase in industrial sector allocations may have a positive impact on core real estate returns


| EXHIBIT 12: CORE REAL ESTATE ASSUMPTIONS AND BUILDING BLOCKS (LOCAL CURRENCY, %) |
|---------------------------------|---------|---------|-------|---------|
| Core real estate                | U.S.    | Europe ex-UK | UK     | Asia Pacific |
| Starting NOI (Before capex) yield | 4.85    | 4.00       | 5.00  | 3.95     |
| Maintenance capex              | -0.50   | -0.25      | -0.25 | -0.25    |
| Net cash flow growth           | 2.40    | 2.00       | 1.25  | 3.25     |
| Exit yield adjustment          | -0.75   | -1.10      | -0.50 | -0.85    |
| Standard industry fees         | -0.70   | -0.70      | -0.70 | -0.75    |
| **2020 unlevered return, net of fees** | **5.30** | **3.95** | **4.80** | **5.35** |
| **2020 leverage impact**       | 0.50    | 1.05       | 0.70  | 1.15     |
| **2020 levered return, net of fees** | **5.80** | **5.00** | **5.50** | **6.50** |
| **2019 unlevered return, net of fees** | **5.45** | **4.55** | **4.40** | **5.05** |
| **2019 leverage impact**       | 0.30    | 0.95       | 0.60  | 0.95     |
| **2019 levered return, net of fees** | **5.75** | **5.50** | **5.00** | **6.00** |

European markets

As the economic cycle has advanced, property yields in Europe ex-UK have remained close to their lowest levels in the last 10 years, and all main sectors except for retail continue to strengthen. With limited room for capital appreciation, returns are expected to be lower and driven mainly by income. We are witnessing structural changes, such as the rise of the flexible co-working office model, while changes in consumer habits are transforming the retail and industrial sectors, as in the U.S.

Political headwinds — the impact of Brexit on the UK and Europe ex-UK, domestic political issues in some countries and an escalation of international trade wars — are weighing on the macroeconomic outlook. The European economy is now slowing down, and after a strong year in 2018, real estate investment transaction volume in Europe decreased in the first half of 2019, especially in the UK. However, Germany, France and the UK remain the largest real estate markets in Europe.

With 10-year government bond yields very low, if not negative, and competition from new debt funds increasing, credit is relatively cheap and supportive of pricing. Capital raising has remained on par with the historical trend and should help sustain values. Lenders and investors continue to be cautious; typical senior loan-to-value ratios in Europe remain below global financial crisis levels.

Prime real estate continues to offer a return premium over European BBB corporates and government bonds. This spread is narrowing, and we are lowering return expectations for Europe ex-UK, while in the UK we have taken into account a higher level of risk linked to Brexit (Exhibit 14).

Asia Pacific markets

Asia Pacific real estate continues to perform well as many markets and sectors experience expansions on the back of healthy demand growth. Both domestic and international investors are seeking opportunities to expand their Asia Pacific real estate allocations. Real estate transactions as tracked by Jones Lang LaSalle increased by 7% to 8% year-on-year in 2018, with South Korea the major driver of regional transaction volume growth, followed by Hong Kong (Exhibit 15). Investment volume in Japan, Australia and China remained largely stable, but 2019 transaction volumes for these major investment markets may end the year down vs. 2018, primarily due to tighter pricing and the reduction of available investment stock.

The biggest headwind for real estate investment in the region is likely to come from the U.S.-China trade war. In terms of China’s economic growth, the direct impact of the trade war so far still looks manageable. At a regional level, rising intra-regional trade, positive demographic developments, urbanization and consumption growth remain in force to underpin the overall development of the real estate market in the medium to longer term.

Our net cash flow growth assumption is marginally lower than last year’s as a result of lower expected rental growth in office markets. Financing costs in the region have generally come down from last year, and lending conditions are supportive of real estate investments. This helps to enhance the benefits of leveraging in most markets in the region.

The narrowing of prime Europe ex-UK property spreads is one factor prompting the reduction of the region’s return assumptions

EXHIBIT 14: EUROPE EX-UK PRIME PROPERTY VS. BOND YIELDS* (%)
Value-added real estate

Our expectations for value-added real estate returns (levered, net of fees) are essentially unchanged for the U.S., down moderately for Europe ex-UK and up moderately for the UK. Our estimates start with our 2020 core, unlevered return assumptions, gross of fees. We then add our risk premium assumption, adjust for the stage of the real estate cycle and deduct standard industry fees. These adjustments, including the risk premium, remain unchanged vs. 2019 to reflect our estimation of the market’s tightness and the strategy’s stretched valuation vs. core, typical at this stage of the real estate cycle (Exhibit 16).

Value-added risk premia assumptions are unchanged vs. 2019, reflecting our view of the strategy’s stretched valuation vs. core

### Exhibit 16: Value-Added Real Estate Assumptions and Building Blocks (Local Currency, %)

<table>
<thead>
<tr>
<th>Value-added real estate</th>
<th>U.S.</th>
<th>Europe ex-UK</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core real estate unlevered return, gross of fees</td>
<td>6.00</td>
<td>4.65</td>
<td>5.50</td>
</tr>
<tr>
<td>Risk premium</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Cyclical adjustment</td>
<td>-1.40</td>
<td>-0.75</td>
<td>-0.95</td>
</tr>
<tr>
<td>Standard industry fees</td>
<td>-2.50</td>
<td>-2.50</td>
<td>-2.50</td>
</tr>
<tr>
<td><strong>2020 unlevered return, net of fees</strong></td>
<td><strong>5.10</strong></td>
<td><strong>4.40</strong></td>
<td><strong>5.05</strong></td>
</tr>
<tr>
<td>2020 leverage impact</td>
<td>2.60</td>
<td>3.10</td>
<td>2.65</td>
</tr>
<tr>
<td><strong>2020 levered return, net of fees</strong></td>
<td><strong>7.70</strong></td>
<td><strong>7.50</strong></td>
<td><strong>7.70</strong></td>
</tr>
<tr>
<td>2019 unlevered return, net of fees</td>
<td>5.25</td>
<td>5.00</td>
<td>4.65</td>
</tr>
<tr>
<td>2019 leverage impact</td>
<td>2.50</td>
<td>3.00</td>
<td>2.60</td>
</tr>
<tr>
<td><strong>2019 levered return, net of fees</strong></td>
<td><strong>7.75</strong></td>
<td><strong>8.00</strong></td>
<td><strong>7.25</strong></td>
</tr>
</tbody>
</table>

REAL ESTATE INVESTMENT TRUSTS (REITS)

Our global REIT return projection remains flat at 6.00% in local currency terms. Our estimates are slightly lower for the U.S., down for Europe ex-UK and up slightly for the UK and the Asia Pacific region.

Our regional projections (Exhibit 17) utilize unlevered core real estate returns as a starting point, motivated by the belief that REITs are ultimately subject to the fundamentals of the underlying real estate held within the publicly traded vehicles. The regional core returns are then adjusted for:

- Industry composition — U.S. projections account for the higher cash flow growth of alternative sectors (e.g., data centers) not captured in our core return figure.
- REIT leverage by region
- Valuation relative to underlying real estate — price-to-net asset value discount/premium

For U.S. REITs, we have upgraded the benefit from “alternative” sectors; these nontraditional property types have grown significantly in recent years, increasing from 14.5% of the FTSE Nareit U.S. Real Estate Index on December 31, 2004, to 49.5% as of December 31, 2018. Much of this increase in share has come from higher cash flow growth and cap rate compression as nontraditional properties (e.g., health care and self-storage) have become institutionally accepted. We estimate that due to higher cash flow growth (market cap weighted average 100bps net operating income growth vs. traditional) and cap rate compression, nontraditional REITs will take additional share and reach 60% of the FTSE Nareit Index over the forecast period.

The upgrade from nontraditional sectors is offset in the U.S. by a reversal in the price-to-net asset value building block, which now detracts 0.25% after a strong year of performance. Improvements in the unlevered private core real estate assumptions drive the year-over-year increase in the UK and Asia Pacific REITs projections. The latter region also benefits from a lower cost of debt, which supports the net leverage building block. In contrast, the Europe ex-UK projection is down slightly, with a lower private return assumption.

The upgrade from nontraditional sectors is offset in the U.S. by a reversal in the price-to-net asset value building block, which now detracts 0.25% after a strong year of performance. Improvements in the unlevered private core real estate assumptions drive the year-over-year increase in the UK and Asia Pacific REITs projections. The latter region also benefits from a lower cost of debt, which supports the net leverage building block. In contrast, the Europe ex-UK projection is down slightly, with a lower private return assumption.

REIT return estimates assume convergence to the value of the underlying real assets and incorporate leverage

| EXHIBIT 17: REIT RETURN ASSUMPTIONS AND BUILDING BLOCKS (LEVERED, LOCAL CURRENCY, %) |
|---------------------------------|---------|---------|---------|---------|---------|
| REITS                           | U.S.    | Europe ex-UK | UK      | Asia Pacific | Global* |
| Core real estate unlevered return, net of fees | 5.30    | 3.95    | 4.80    | 5.35    | 5.20    |
| Tilt toward higher growth sectors (e.g., data centers) | 0.40    |         |         |         |        |
| Net leverage benefit            | 0.55    | 1.00    | 0.85    | 0.90    | 0.70    |
| Amortization to historical P/NAV discount | -0.25   | 0.55    | 0.35    | -0.25   | -0.20 |
| 2020 expected return           | 6.00    | 5.50    | 6.00    | 6.00    | 6.00    |
| 2019 expected return           | 6.25    | 6.00    | 5.50    | 5.75    | 6.00    |


*The global composite is built assuming the following weights: 67% U.S., 7% Europe ex-UK, 6% UK and 20% Asia-Pacific.
INFRASTRUCTURE EQUITY

Our 2020 infrastructure long-term return projection remains unchanged from the previous year at 6%.

Return building block considerations

We have updated the building block assumptions that drive our return estimates to reflect important trends developing within the sector. The net impact of these changes on our long-term infrastructure return projection is nil (Exhibit 18). Specifically, we anticipate a steady deleveraging trend as a greater proportion of assets shift from primary stage to secondary stage, reducing our leverage impact by 50bps. Some decline in the pace of asset growth, associated with slower economic growth vs. the past several years, shaves our cash flow growth outlook by 25bps. Offsetting these negative impacts, we expect increasing investor demand to be supportive of valuations (adding 25bps) and investment management fees to be under pressure as new competitors join the industry, consequently reducing fees and other expenses by 50bps.

On balance, our long-term infrastructure return assumptions are unchanged

**EXHIBIT 18: OECD INFRASTRUCTURE LEVERED EQUITY – RETURN ASSUMPTIONS AND BUILDING BLOCKS (USD, %)**

<table>
<thead>
<tr>
<th>Building blocks</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting yield</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Cash flow growth</td>
<td>0.50</td>
<td>0.75</td>
</tr>
<tr>
<td>Valuation impact</td>
<td>0.75</td>
<td>0.50</td>
</tr>
<tr>
<td>Leverage impact</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Fees and other expenses</td>
<td>-1.25</td>
<td>-1.75</td>
</tr>
<tr>
<td><strong>Expected return</strong></td>
<td>6.00</td>
<td>6.00</td>
</tr>
</tbody>
</table>


Long-term operating fundamentals

The supply of infrastructure assets should continue to increase, given the OECD estimate that between USD 3 trillion and USD 6 trillion in new infrastructure investments will be required annually, through 2030, to meet the UN’s Sustainable Development Goals. Likewise, demand should remain robust for relatively stable assets with high cash flows, based on the assumptions of modest global growth and the return environment envisioned by our LTCMAs. In the context of portfolio diversification and relatively stable returns, infrastructure equity represents an above-the-line efficient frontier opportunity.

Going forward, the performance of infrastructure assets is likely to be more sensitive to regulation, management skills and local dynamics than that of other assets. On a macro level, the direction of global growth, the tensions surrounding global trade and politics, as well as policy issues, may potentially create periods of uncertainty. Another source of concern in the sector has been the power generation industry’s exposure to merchant power contracts as the current set of attractive government feed-in tariffs (FiTs) is gradually phased out. However, we remain optimistic that governments will step up their support for new technology initiatives, such as batteries and smart grids, to aid in the transition to renewable energy sources. Based on Preqin surveys, investors are sanguine on the outlook; a large percentage have signaled their intention to maintain or increase allocations over the longer term (Exhibit 19).

The vast majority of infrastructure investors plan to maintain or increase their allocations

**EXHIBIT 19: INVESTORS’ INTENTIONS FOR THEIR INFRASTRUCTURE ALLOCATIONS OVER THE LONGER TERM**

<table>
<thead>
<tr>
<th>Proportion of respondents</th>
<th>Increase allocation</th>
<th>Maintain allocation</th>
<th>Decrease allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov ‘16</td>
<td>53%</td>
<td>37%</td>
<td>11%</td>
</tr>
<tr>
<td>Nov ‘17</td>
<td>55%</td>
<td>41%</td>
<td>4%</td>
</tr>
<tr>
<td>Nov ‘18</td>
<td>50%</td>
<td>44%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*Components may not add to 100% due to rounding.

INFRASTRUCTURE DEBT

Our infrastructure debt assumption is based largely on our return projection for global corporate credits of A to BBB quality and 15-year maturity, resulting in a long-term equilibrium return assumption of 3.30%, down from 4.75% in 2019.
COMMODITIES—A FALLING DOLLAR OFFSETS OTHER NEGATIVES

We raise our commodities net of fees return assumption to 2.50% from last year’s 2.25% estimate. The change is driven by a larger decline in the trade-weighted dollar, which is only partially offset by the negative adjustment for the position in the current cycle. Our commodity price return assumption, excluding the 1.90% collateral contribution and net of fees, is positive at 0.60% — slightly above long-term historical price returns (Exhibit 20).

The current determinants of longer-term supply, based on our Commodity Event Index (see “Capturing producers’ supply constraint sentiment”) and the proximity to the next recession, on balance represent a small decrement to the long-term return outlook. Considering the low absolute return and relatively high volatility of the asset class, as represented by the Bloomberg Commodity Total Return Index, the path of return and proximity to the nearest recession have an important impact on the compounding of returns.

Fundamentally, we see positive developments in producer production constraints, as represented by the upturn in our Commodity Event Index.

Our commodity assumption, net of fees, is marginally positive vs. U.S. inflation (at 2.00%)

EXHIBIT 20: COMMODITIES—RETURN ASSUMPTION AND BUILDING BLOCKS (USD, %)

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collateral return*</td>
<td>1.90</td>
<td>2.00</td>
</tr>
<tr>
<td>Position in current cycle (+premium/-discount)</td>
<td>-0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>EM per capita consumption adjustment</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Trade-weighted USD decline impact (projected incremental annual decline vs. historical base period)</td>
<td>1.35</td>
<td>0.75</td>
</tr>
<tr>
<td>Impact of roll yield over average life of assumptions</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total return, gross of fees</td>
<td>3.25</td>
<td>3.00</td>
</tr>
<tr>
<td>Fees**</td>
<td>-0.75</td>
<td>-0.75</td>
</tr>
<tr>
<td>Commodity return, net of fees</td>
<td>2.50</td>
<td>2.25</td>
</tr>
<tr>
<td>Gold return, net of fees</td>
<td>3.00</td>
<td>2.50</td>
</tr>
</tbody>
</table>


* The Long-Term Capital Market Assumption for U.S. cash in the specified year.

** Market-based fees are based on U.S. commodity ETFs and mutual fund average fees.

Toward the far end of our forecast period, we anticipate that the increased application of environmental, social and governance (ESG) principles in the management of public market assets may instigate change in the governance of a significant portion of the extraction industry, ultimately leading to constraints in supply and production.

BUILDING BLOCKS OF COMMODITY RETURNS

We build our assumption based on the Bloomberg Commodity Total Return Index (a collateralized index of investible futures). We start with a projection of the collateral return for futures-based commodity investing. We assign a value equivalent to our long-term assumption for U.S. cash. We then adjust for:

1) Where we are in the current commodity cycle (Pricing theories based on the economics of nonrenewable resources in finite supply are not embedded in our estimates.)

2) A rising emerging market contribution to global per capita commodity consumption

3) The inverse relationship between commodity returns and the U.S. trade-weighted dollar

4) The potential contribution from roll yields. We expect a zero contribution from this source during the 10- to 15-year time frame of our assumptions.

5) Fees — based on U.S commodity ETFs and mutual fund average fees

GOLD

With net central bank gold reserves increasing for the 10th year, gold consumption likely to remain strong in the highest per capita consumption countries of India and China, and monetary and geopolitical events expected to keep investors searching for safe assets, we project a 50bps return premium for gold relative to the broad commodity index (Exhibit 20).
The Commodity Event Index is designed to capture producer sentiment around the loosening/tightening of production constraints within commodity markets. Higher index values indicate a more constrained environment, supportive of increasing commodity prices.

The event index utilizes a component weight scheme in which four components have 11.1% weightings while three components that we deem more important receive an 18.5% weighting, as indicated below. Components were added as available (see table for inclusion dates) for our universe of energy and materials companies, including:

<table>
<thead>
<tr>
<th>Index component</th>
<th>Inclusion date</th>
<th>Component weight</th>
<th>Observed change to index component</th>
<th>Impact on index value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit rating</td>
<td>1985</td>
<td>11.1</td>
<td>lower</td>
<td>higher</td>
</tr>
<tr>
<td>Age of capital stock</td>
<td>1985</td>
<td>11.1</td>
<td>higher</td>
<td>higher</td>
</tr>
<tr>
<td>Financial leverage</td>
<td>1985</td>
<td>11.1</td>
<td>lower</td>
<td>lower</td>
</tr>
<tr>
<td>Volume of bankruptcies, takeovers, debt-for-equity swaps</td>
<td>2004</td>
<td>11.1</td>
<td>higher</td>
<td>higher</td>
</tr>
<tr>
<td>Capital expenditure to sales</td>
<td>1985</td>
<td>18.5</td>
<td>lower</td>
<td>higher</td>
</tr>
<tr>
<td>Oil rig count</td>
<td>1991</td>
<td>18.5</td>
<td>higher</td>
<td>lower</td>
</tr>
<tr>
<td>CEO turnover</td>
<td>2007</td>
<td>18.5</td>
<td>higher</td>
<td>higher</td>
</tr>
</tbody>
</table>

U.S. dollar remains structurally overvalued but awaiting cyclical catalyst

Michael Feser, CFA, Portfolio Manager, Multi-Asset Solutions
Thushka Maharaj, DPhil, CFA, Global Strategist, Multi-Asset Solutions
Michael Akinyele, Analyst, Global Strategist, Multi-Asset Solutions

IN BRIEF

Our long-term currency assumptions generally call for a greater appreciation of major currencies vs. the USD than forecasted last year, in both nominal and (by a smaller magnitude) real exchange rate terms, driven by:

• The appreciation of the USD over the past year vs. most currencies
• An increase in the expected inflation differential between the U.S. and most other countries as other central banks undershoot their inflation goals by a wider margin than the Federal Reserve

At present, major currencies’ deviations from fair value, on a trade-weighted basis, are quite limited, with the exception of the USD.
THE COURSE OF U.S. MONETARY POLICY CHANGES, AGAIN

Inflationary pressures continued to be largely absent globally over the past year, even as the U.S. economy’s expansion became the longest in the country’s history. Meanwhile, the Federal Reserve (Fed) reversed the course of U.S. monetary policy at a breakneck pace. Until December 2018, it tightened policy rates, moving in a direction that many of the world’s other central banks – operating in environments with generally weaker growth and inflation conditions – followed with limited enthusiasm and a considerable time lag. They adopted the Fed’s course reversal, to easing rates in July 2019, with more enthusiasm and little hesitation.

Compared with the spot exchange rate levels prevailing when we released the 2019 Long-Term Capital Market Assumptions (LTCMAs) last year, most developed market currencies have depreciated relative to the USD. In emerging markets, those currencies that were not impacted by the U.S.-China trade conflict benefited palpably from the Fed’s dovish pivot at the start of the year. In aggregate, however, FX rates are actually not far from fair value. Where material deviations exist, they are almost universally vs. the USD. Non-USD cross-currency rates are generally close to fair value.

As in prior years, we determine today’s fair value exchange rates for developed market (DM) currencies through a relative purchasing power parity (PPP) approach, based on the long-term average of each currency’s real exchange rate. To calculate the fair value for emerging market (EM) currency exchange rates, we take an absolute PPP-based approach that builds on the PPP estimates for actual individual consumption,¹ as calculated by the World Bank and the Organization for Economic Co-operation and Development for their international price comparison program.

To arrive at a given exchange rate projection over our assumption horizon, which we also refer to as future fair value, we adjust today’s fair value exchange rate using the LTCMAs’ underlying macroeconomic assumptions, as follows: For developed market currencies, we reflect the expected change in a country’s terms of trade over the assumptions horizon by adjusting today’s fair value for the projected inflation rate differential between the two countries. For emerging markets, we make an additional adjustment for the expected differential in per capita GDP growth.

LONG-TERM CURRENCY EXCHANGE RATE ASSUMPTIONS

The portion of the future fair value of an exchange rate that is not explained by expected future inflation differentials – adjusted for expected per capita GDP growth differentials, where applicable – is also called the expected change in the real exchange rate. From the perspective of investment returns, the nominal change in exchange rates determines the translation of asset returns between base currencies; however, for a currency’s prevailing over- or undervaluation, the change in the real exchange rate provides a better gauge.

Broad-based USD weakness is required to align exchange rates with fundamental valuations

¹ PPP for actual individual consumption covers all households’ consumption expenditure and that part of government final expenditure that covers services it supplies to individual households – for example, housing, health, education and social protection. It does not include government final expenditure on those services it supplies to households collectively, such as defense, police or environmental protection.
Generally, our projected shifts in the real exchange rate are directionally the same but substantially smaller in magnitude than those in the nominal exchange rate (Exhibit 1). The key driver for this pattern is our expectation for relatively higher levels of inflation in the U.S. than in most other developed markets.

Another way to assess the expected change in a currency’s valuation that is more comprehensive than expected bilateral changes is to look at the expected change in the trade-weighted basket of currencies. This perspective affirms the broad-based nature of USD strength in recent years and the currency’s sizable overvaluation vs. our fair value assumptions (Exhibit 2).

Broad-based USD strength vs. U.S. trading partners’ currencies increased further after 2017 U.S. tax reform*

Using the same trade-weighted valuation measure to look across other major currencies reveals the flip side of broad-based USD strength: Relative valuations between major cross-currency pairs are comparatively close to neutral on a trade-weighted basis. In essence, this means that, in aggregate, FX deviations from fair value are actually quite limited; however, where they do exist they are almost invariably vs. the USD (Exhibit 3). This effect also helps to explain why the current period of USD strength has been able to persist for a considerable stretch of time.

On a broad, trade-weighted basis, the USD overvaluation stands apart

### MAJOR CURRENCY PAIRS

#### The euro

When generating long-term FX assumptions, we put special emphasis on the Fed’s endeavor to maintain the credibility of its inflation target, relative to other central bank targets. Our LTCMA macroeconomic assumptions presume that the Fed will be the most likely of all developed market central banks to meet its inflation goals. As evidence, we point to the Fed’s recent announcement that it will review its policy framework, which suggests that the Federal Open Market Committee is flexible and looking at ways to enhance its ability to achieve its inflation target.

While the challenges that the Fed and European Central Bank (ECB) face in achieving their inflation targets are similar, the institutions’ starting points, increasingly, are not. For example, in the 12 months ended August 2019, U.S. core price inflation breached 2%, while in the euro area core inflation remained range-bound at 1%, despite negative policy rates. In the U.S., inflation is close to target and unemployment remains pinned below the Fed’s estimate of NAIRU, whereas the headwinds working against the euro area make it ever less likely that the ECB will get close to achieving its inflation mandate over our assumptions horizon.

This divergence also fosters a dispersion in the anchoring of the two regions’ inflation expectations, which, in turn, increases the asymmetry in the likely future effectiveness of monetary policy itself. All else being equal, a larger inflation rate differential between the regions, driven by lower inflation in the euro area, implies the need for a commensurately larger offsetting nominal appreciation in the EURUSD exchange rate. Our upward adjustment to our assumption for

---

* NAIRU is the nonaccelerating inflation rate of unemployment – in theory, the unemployment level below which inflation would be expected to rise.
EUR appreciation vs. the USD, to 1.9% annually (Exhibit 4), directly represents this effect, reflecting each central bank’s relative success in achieving its inflation objectives.

The changing of the guard at two major euro area institutions—ECB President Mario Draghi will be replaced by Christine Lagarde, and European Union Commission President Jean-Claude Juncker will be replaced by Ursula von der Leyen—creates an opportunity to change the prevailing inflation trajectory through a more coordinated fiscal and monetary policy. Given the structural changes that would be needed for this to succeed, however, it is not our current base-case view.

We raise our assumption for EURUSD appreciation to 1.9% annually, reflecting the Fed’s relative success vs. the ECB in achieving its inflation objectives

EXHIBIT 4: 2020 LTCMA ASSUMPTION, EURO (EUR)

The pound sterling

Our sterling assumption traces a fairly similar trajectory of appreciation to the euro’s, but with considerably more uncertainty (Exhibit 5). With the selection of British Prime Minister Boris Johnson, the probability of a no-deal Brexit materially increased, as did the chances that an early general election – and/or a second national referendum – would be held on leave or remain. At the time of writing, a general election was scheduled for mid-December and the incumbent government was polling in the lead. Support for and against Brexit crosses traditional party lines. An election would not only galvanize the debate about the form and shape of Brexit but would also offer a stark choice about the country’s overall political direction, given the socialist program on offer by Labor Party Leader Jeremy Corbyn. The possible outcomes are quite binary and would lead to very different long-term fair value assumptions for sterling, depending on which is realized. Our base case remains unchanged from last year: a muddle through Brexit. That is to say, a deal – but one that gives the UK access to the eurozone’s common market at less favorable terms than Brexiteers had hoped for. On this basis, we find the current spot rate discount excessive and forecast sterling will appreciate to 1.48, or 1.5% p.a., relative to the spot rate as of September 30, 2019, as the uncertainty weighing on the currency is lifted (Exhibit 5).

We forecast the pound sterling appreciating by 1.5% annually as Brexit uncertainty lifts

EXHIBIT 5: 2020 LTCMA ASSUMPTION, BRITISH POUND (GBP)

The Japanese yen

Geopolitical risk is not the sole force driving this year’s FX assumptions. In Japan, we continue to project interest rates close to rock bottom but in a fairly steady state, given that the Bank of Japan (BoJ) has already modified the targets of the yield curve control policy it introduced in 2016, leaving limited room for further innovation. In 2019, acknowledging Japan’s stubbornly low rates of inflation, the BoJ modified its yield curve control framework to influence policy expectations over an even longer time horizon and started to tacitly support greater fiscal coordination. Even with these efforts, though, we anticipate inflation will remain below the central bank target and monetary policy to be as easy as is feasible for the duration of our assumptions. This implies further nominal appreciation of the yen while it remains below fair value, given the BoJ’s continued easy monetary policy stance – resulting in a nominal yen appreciation of 1.7% p.a. (Exhibit 6).
Given the BoJ’s continued easy monetary policy, we project further nominal appreciation of the yen and an exchange rate remaining below fair value.

**EXHIBIT 6: 2020 LTCMA ASSUMPTION, JAPANESE YEN (JPY)**

We raise our appreciation assumption for the world’s last true safe haven currency, which may face fresh demand in an increasingly uncertain world.

**EXHIBIT 7: 2020 LTCMA ASSUMPTION, SWISS FRANC (CHF)**

The Swiss franc

The distinction between nominal and real valuations is particularly meaningful when considering the fortunes of the last true safe haven currency, the Swiss franc. We have raised our spot rate appreciation assumptions by 25 basis points, to 1.5% p.a. (Exhibit 7). While well above average compared with other major currency pairs, the appreciation is almost entirely nominal, reflecting a persistent lack of domestic inflationary pressures, even with the Swiss National Bank anchored to an easy monetary policy. Yet because the Swiss franc is the world’s last true safe haven currency, we expect it may face substantial demand in a world of increasing uncertainty. Therefore, the Swiss franc is more likely to trade above fair value than below, further reducing any inflationary pressures in the economy that might otherwise have been transmitted through the exchange rate.

Commodity-sensitive currencies: The Aussie and Canadian dollars

We forecast the Australian dollar appreciating by 0.5% p.a. and the Canadian dollar by 1.25% (Exhibit 8 and Exhibit 9). Australia should experience somewhat lower inflation over our forecast horizon than what we assumed last year, as it reorients away from commodity-intensive growth and toward services. An outright decline in the spot exchange rate since last year, and a relative decline in the level of inflation vs. the U.S., drive this year’s assumptions. Like Australia’s, the Canadian economy also needs to reorient away from commodity-intensive, consumer debt-fueled growth, but despite a currently cheap exchange rate, progress has been unconvincing so far. Both economies are also saddled with very high housing prices and correspondingly high levels of household debt. As such, financial stability remains a risk that may impede both countries’ exchange rates from moving toward fair value in the nearer term of our assumptions time frame.
We forecast the Australian dollar appreciating by 0.5% amid lower inflation as the economy reorients away from commodity-intensive growth.

**EXHIBIT 8: 2020 LTCMA ASSUMPTION, AUSTRALIAN DOLLAR (AUD)**


Our assumptions see the Canadian dollar appreciate by 1.25% from its currently cheap exchange rate.

**EXHIBIT 9: 2020 LTCMA ASSUMPTION, CANADIAN DOLLAR (CAD)**


The Chinese yuan

We cannot overstate the volatility we expect on every currency’s path toward convergence with our forecasted fair value assumptions. This is most pertinent for the Chinese yuan, where our assumptions reflect the progress the Chinese economy is expected to make over our forecast horizon, both in lowering inflation and closing its GDP-per-capita gap with the U.S. Both, however, will take time and therefore have limited impact on exchange rate movements in the near term. Of more imminent impact will likely be the trade tariff dispute between China and the U.S., which has lifted the CNY exchange rate above 7 to the USD - a psychologically important threshold that has not been crossed since before the 2008 financial crisis.

International markets and investors welcome the prospect of China’s transition to a more balanced growth model. Our path to a fair value of 5.58 assumes an appreciation rate of 2.00% p.a. and that, in time, the impact of the current trade tariff dispute will dissipate; Chinese fundamentals will continue to progress toward the global technology frontier; and capital and FX markets will be increasingly liberalized. On a trade-weighted basis, the appreciation is considerably more muted at 0.86% p.a. (Exhibit 10).

Our forecast assumes the current tariff dispute will dissipate and that China’s fundamentals will continue progressing toward the global frontier.

**EXHIBIT 10: 2020 LTCMA ASSUMPTION, CHINESE YUAN (CNY)**

The Brazilian real and Mexican peso

While the recent fall in inflation has been a success story in Brazil, the structural reforms necessary to improve the economy's long-term growth outlook remain to be tackled – and their implementation is still daunting. These challenges notwithstanding, we have raised our assumptions for the real, to appreciate by 0.6% p.a., primarily driven by lower starting valuations and an improved inflation outlook (Exhibit 11A).

The same is true for the Mexican peso, but in reverse. The recent increase in inflation and a deteriorating inflation outlook lead us to raise our expected peso depreciation to 0.8% p.a. (Exhibit 11B).

For two major Latin American currencies, inflation outlook is key

EXHIBIT 11A: 2020 LTCMA ASSUMPTION, BRAZILIAN REAL (BRL)

EXHIBIT 11B: 2020 LTCMA ASSUMPTION, MEXICAN PESO (MXN)

VOLATILITY AND CORRELATION ASSUMPTIONS

Stable long-term forecast; rising risks in the short term

Grace Koo, Ph.D., Quantitative Analyst and Portfolio Manager, Multi-Asset Solutions
Xiao Xiao, CFA, Quantitative Analyst, Multi-Asset Solutions
Ivan Chan, Quantitative Analyst, Multi-Asset Solutions

IN BRIEF

• Our long-run volatility expectations remain stable. Although markets have become further entrenched in late-cycle dynamics since last year, we see little in the way of structural change to alter our long-term view for most asset classes.

• Equity market movements have become more significant recently, which translates into marginally higher equity volatility forecasts, led by the U.S.

• Portfolio construction that includes a measure of downside risk can help mitigate drawdowns – especially relevant when recession risk increases.

• Our case study finds that, compared with a conventional Sharpe ratio-based portfolio optimization, a Sortino ratio-based optimization realized lower drawdowns during market downturns.
LITTLE CHANGE IN LTCMA VOLATILITY FORECASTS

Since Q4 2018, stock and bond prices have experienced sizable volatility spikes. As we discussed in last year’s edition of Long-Term Capital Market Assumptions (LTCMAs), we expect higher volatility as fragility increases the further economies travel along the business cycle into late-cycle territory. Indeed, equity market movements have clearly become more extreme recently (Exhibit 1). When we compare the past 30 years with the 12 months ended July 2019, the incidence of both right- and left-tail occurrences — extreme events at both ends of the spectrum — rose. This amplified market movement translates into marginally higher long-term volatility forecasts this year for equity markets, led by the U.S. market, the epicenter of the sell-offs and subsequent recoveries in the months prior to publication.

That risk has grown is not surprising; however, what may be unexpected is how small the magnitude of the adjustments to our LTCMA volatility forecast is this year, considering the increased frequency of large market moves, shown in Exhibit 1. We remind readers that our assumption is an expectation of the volatility and correlation environment over a 10- to 15-year time horizon — the expected long-run average experience. As Exhibit 2 highlights, the outlook is stable from a long-run perspective, as we had already built increased short-term volatility into prior years’ forecasts.

Histogram of S&P 500 monthly returns highlights the increased frequency recently of more extreme market movements

EXHIBIT 1: HISTORICAL DISTRIBUTION OF U.S. LARGE CAP STOCK RETURNS

Forecast: Stable long-term volatility despite increased likelihood of short-term vol spikes

EXHIBIT 2: COMPARISON OF LTCMA VOLATILITY FORECASTS BY ASSET CLASS, 2019 VS. 2020 (USD)

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. intermediate Treasuries</td>
<td>3.5%</td>
<td>3.5%</td>
</tr>
<tr>
<td>U.S. investment grade bonds</td>
<td>6.0%</td>
<td>6.0%</td>
</tr>
<tr>
<td>U.S. high yield bonds</td>
<td>8.3%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Emerging market sovereign debt</td>
<td>9.5%</td>
<td>8.4%</td>
</tr>
<tr>
<td>U.S. large cap</td>
<td>13.8%</td>
<td>14.3%</td>
</tr>
<tr>
<td>Euro area large cap equity</td>
<td>21.2%</td>
<td>21.5%</td>
</tr>
<tr>
<td>Emerging market equity</td>
<td>21.6%</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, J.P. Morgan Asset Management; data as of September 30, 2018, and September 30, 2019. For illustrative purposes only.

STABLE LTCMA VOLATILITY FORECAST DOES NOT IMPLY SMOOTH SAILING IN THE NEAR TERM

The stability of our 2020 forecast compared with last year’s masks a key message about the dynamic nature of risk and correlation: Although long-run expectations can be rather stable, volatility and correlation tend to change under different economic regimes.

To illustrate this, we define three economic regimes: expansion, recession and recovery. Our definitions combine National Bureau of Economic Research (NBER) definitions and J.P. Morgan Asset Management’s proprietary business-cycle assessment. The most significant change in volatility occurs during the recession period, when volatility can increase by almost 50% compared with the expansion period (Exhibit 3). Among the three regimes, recoveries tend to have the lowest volatility. The implication is that, based on shorter-term measures, investors should expect increasing volatility approaching and heading into an economic contraction.

1 In addition to the NBER definition, we leverage J.P. Morgan Asset Management’s business-cycle indicator, or BCI, based on a collection of 20-plus macroeconomic indicators, such as output gap, employment rates and personal consumption expenditures (PCE) core inflation. Each indicator independently determines the business-cycle phase: early, mid, late and recession. After aggregating individual signals, the output is the economic phase with the highest probability. BCI’s and NBER’s business cycles are mostly aligned (recession periods from the two indices overlap, and BCI’s early to late phases map to NBER’s expansion period). In this illustration, we define NBER’s contraction periods as recession and BCI’s early phase as recovery, and combine BCI’s mid and late phases into expansion.
Volatility varies significantly under recovery, expansion and recession regimes. Recession vol can be 50% higher than during calmer expansion periods.

EXHIBIT 3: HISTORICAL VOLATILITY UNDER VARYING ECONOMIC REGIMES SINCE 1978

Correlation is another aspect of risk that is highly variable by time. In this year’s LTCMA correlation assumptions, the pairwise correlation between equity and government bonds (hedged) is typically between -0.2 and -0.3. This negative correlation is built into how investors, including our own, design multi-asset portfolios. One may question the benefit from stock-bond diversification, given the prevailing levels of correlation, but historically, government bonds tend to be more negatively correlated to equities as economies move toward recession (Exhibit 4). The correlation assumption embedded in our LTCMA forecasts represents the average long-run experience between stocks and core government bonds. Over a full economic cycle, the typical value lies between 0.3 and -0.7. Our expectation is that short-term correlations will retest historical lows when recession occurs. As we discuss in the “Rethinking safe haven assets” paper in this edition of LTCMA, low stock-bond correlations mean that core government bonds still have a role to play in portfolio protection, even as ultra-low starting yields have increased the opportunity cost of ownership.

LONG-TERM VOLATILITY ASSUMPTIONS: OUR 2020 LTCMAS

Although markets have become further entrenched in late-cycle dynamics since last year’s edition, we see little in the way of structural change to alter our long-term view for most assets. Our unbiased forward-looking probability of stressed and high volatility periods remains unchanged at 15% – typical for the modern economy since the 1980s. This 15% figure represents the cycle-independent probability that a downturn might occur in any given future year and is simply based on the historical frequency of downturns. Readers with a cyclical outlook will note – as do we - that with the business cycle in an advanced stage, the prevailing probability of a downturn currently sits some way above the 15% baseline across a range of common economic metrics. This leads us to keep our long-term risk forecast close to last year’s assumptions.

Correlation between stocks and bonds tends to fall and become more negative going into and during recessions.

EXHIBIT 4: ROLLING 1-YEAR CORRELATION BETWEEN U.S. LARGE CAP EQUITIES AND TREASURY BONDS SINCE 1990s

One change in our 2020 vs. 2019 forecast is a decline in the relative attractiveness of government bonds, on both an absolute and a risk-adjusted return basis, as a result of their recent rally. In last year’s assumptions, the risk-adjusted returns of fixed income, including both government and corporate bonds, along with real assets, were rather attractive. In this year’s estimates, the relative risk-adjusted returns/Sharpe ratios for government bonds – especially long-duration bonds – have deteriorated substantially. Credit assets, such as high yield (HY) and loans, are the bright spots within fixed income. Equities are in the middle of the pack, and real assets continue to offer the best risk-adjusted returns and diversification benefits.

However, with concerns looming about the late cycle, it will be important to keep a close eye on the downside risk of assets with a nonsymmetric return profile, such as credit. In last year’s edition of LTCMA, we highlighted as a cautionary tale a number of assets that have historically exhibited “fat tails.” This year, we continue the conversation with our Special Topic section on how to construct portfolios with an eye on downside.

2 Situations in which the probability of a negative return is more frequent and the probability of a decline more sizable than a simple normal distribution would suggest.
Central bank activity has risen once again around the world as global growth has slowed and trade tensions have risen. The distortion in short-duration instruments has continued dampening fixed income volatility, especially on the short end of government bond markets. Our volatility assumptions incorporate the normalization of volatility levels for short-duration instruments, to reflect the eventual removal of central bank stimulus over our forecast horizon. The magnitude of this adjustment is marginally reduced, as the normalization seems more distant than it did last year.

Select credit markets are likely to undergo higher volatility over the forecast horizon compared with historical experience. We flag the gradual decline in quality in the composition of the investment grade corporate bond market over the past decade: With the majority of U.S. investment grade bond market issues now BBB rated, risk has increased relative to past years, when more bonds were of better quality. The risk of downgrade to junk bond status has also increased. A similar decline in credit quality can be observed in Europe, contributing to our view that forward-looking risks in investment grade corporate bonds are likely to be higher than history would suggest in the U.S. and the euro area.

Not all credit markets should see increased volatility. We expect European high yield, for example, to be less volatile relative to historical standards. The quality of euro HY bonds has improved in recent years, and we expect strong demand, driven by investors’ search for yield, to help stabilize price volatility (as more fixed income assets in Europe have turned to negative yields). Emerging market sovereign debt is also seeing quality improvements and better issuers. The inclusion of the Gulf Cooperation Council (GCC) countries has helped upgrade the asset class structurally, aligning its risk outlook to higher credit quality assets. Another structural change: The benchmark Bloomberg Barclays Global Aggregate Bond Index’s inclusion of Chinese bonds - the world’s third-largest bond market - should, over time, impact the fixed income index’s composition and risk relative to history.3

Within equities, we expect risks to stay in line with long-run historical levels. Our risk forecasts for alternative assets have been reduced marginally, in particular for real estate. We retain the view that leverage in real estate and REITs is likely to stay below the peaks reached during the last cycle.

SPECIAL TOPIC: DOWNSIDE RISK REMAINS A FOCUS AS LATE-CYCLE DYNAMICS DEEPEN

As economies venture deeper into the late-cycle environment, answering the question of how to construct a robust strategic portfolio is becoming more crucial. While a mean-variance (M-V) framework is essential and useful, its assumptions inherently lead to underestimating the risks when return distribution is not symmetrical, something especially relevant going into recession. The Sharpe ratio, one of the most referenced measures in the mean-variance framework, is therefore not a robust measure of risk-adjusted return for portfolios with large concentrations of assets with higher downside risks. Investors may want to consider expanding their portfolio construction objectives to include downside risk mitigation beyond the standard M-V optimization.

Exhibit 5 shows how portfolio construction that includes a measure of downside risk can help mitigate drawdowns. We select eight assets4 from our LTCMA universe and consider two portfolio optimization approaches: a traditional mean-variance optimization that maximizes the Sharpe ratio5 and an alternative optimization that maximizes the Sortino ratio.6 Both optimizations are subject to the same set of constraints. The difference between the Sharpe and Sortino ratios is that the Sharpe ratio focuses on the return volatility of the full distribution, while the Sortino ratio focuses on the downside risks - i.e., returns below a target value.

Sample diversified portfolio with four fixed income assets and four equity assets, optimized with two objective functions

EXHIBIT 5: PORTFOLIO OPTIMIZATION SETUP

<table>
<thead>
<tr>
<th>Objective</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximize Sharpe ratio</td>
<td>Long only</td>
</tr>
<tr>
<td>Maximize Sortino ratio</td>
<td>Sum positions &lt; 100%</td>
</tr>
<tr>
<td></td>
<td>Total fixed income or equity</td>
</tr>
<tr>
<td></td>
<td>notional &lt; 70%</td>
</tr>
<tr>
<td></td>
<td>Single asset percentage risk</td>
</tr>
<tr>
<td></td>
<td>contribution &lt; 20%</td>
</tr>
<tr>
<td></td>
<td>Total fixed income percent risk</td>
</tr>
<tr>
<td></td>
<td>contribution &lt; 40%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, J.P. Morgan Asset Management; monthly data as of June 30, 2019. For illustrative purposes only.

---

3 Chinese bonds will account for a 6% weight once this phase of inclusion is rolled out, over the 20 months beginning April 2019.


5 Sharpe ratio: \( \frac{r - r_f}{\sigma} \) (i.e., excess portfolio expected return over portfolio volatility).

6 Sortino ratio: \( \frac{r - r_f}{\sigma_{ downside}} \) (i.e., excess portfolio expected return over portfolio downside volatility).
The Sortino ratio-based portfolio has more weight allocated to Treasuries and less to risky assets than the Sharpe ratio-based portfolio.

**EXHIBIT 6: ASSET ALLOCATION FROM TWO OPTIMIZATIONS WITH ANNUAL REBALANCE**

<table>
<thead>
<tr>
<th>Sharpe-based portfolio</th>
<th>Sortino-based portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging market equity</td>
<td>Emerging market sovereign debt</td>
</tr>
<tr>
<td>EAFE equity</td>
<td>U.S. high yield bonds</td>
</tr>
<tr>
<td>U.S. small cap</td>
<td>U.S. intermediate Treasuries</td>
</tr>
<tr>
<td>U.S. investment grade corporate bonds</td>
<td>U.S. high yield bonds</td>
</tr>
</tbody>
</table>

Source: Bloomberg, J.P. Morgan Asset Management; annual data as of June 30, 2019. For illustrative purposes only.

We run a historical out-of-sample test using return assumptions from our 2000 to 2019 LTCMAs, assuming annual rebalancing at the beginning of each calendar year. The covariance and downside covariance matrices are calculated from 10-year historical monthly returns prior to each rebalance date. At the beginning of each rebalance period, we run both optimizations, obtain their allocation weights and buy and hold assets accordingly until the next rebalance date. **Exhibit 6** shows the asset allocations over the testing period from 2000-19. As expected, allocations to low risk assets (i.e., Treasuries and investment grade bonds) are substantially higher in the Sortino ratio-based portfolio than in the Sharpe ratio-based portfolio. Meanwhile, allocations to assets with higher downside risks — such as high yield bonds, emerging market debt and equities — are much smaller in the Sortino ratio-based portfolio.

Performance-wise, the two portfolios result in similar returns. However, the Sortino ratio-based portfolio realizes less volatility and smaller drawdowns, reflected in smaller annual risk, value at risk (VaR) and maximum drawdown values (Exhibits 7A and 7B). The Sortino optimization also has a lower annual turnover, which could further lift performance after transaction costs.

An alternative measure that highlights the difference in risk mitigation between the two approaches is to compare the performance of long-term buy-and-hold strategies. Results show that maximum drawdowns over a 10-year holding period appear less severe with Sortino optimization for portfolios incepted at different times, as shown in **Exhibit 8**, and that the two approaches have similar portfolio values at the end of the 10-year holding period.

The result of comparing a Sortino ratio optimization with a conventional mean-variance optimization is intuitive. This illustration is constructed using very simple constraints and doesn’t consider path dependencies or transaction costs for portfolio rebalancing. It does, however, highlight the potential benefit of further incorporating downside considerations into portfolio design.

---

7 In order to match the 10- to 15-year time frame of our LTCMAs, we compare the 10-year buy-and-hold performance of 11 portfolios with inception dates from 2000 to 2010 under the Sharpe ratio and Sortino ratio approaches. Optimization was only done at inception with LTCMAs from the previous year.
Our case study finds Sortino optimization has similar risk-adjusted returns but lower drawdowns and less severe left-tail realizations.

EXHIBIT 7A: OUT-OF-SAMPLE PERFORMANCE FOR SHARPE RATIO- VS. SORTINO RATIO-BASED OPTIMIZED PORTFOLIOS WITH ANNUAL REBALANCE (2000–19)

<table>
<thead>
<tr>
<th>Performance 2000-19</th>
<th>Max Sharpe ratio</th>
<th>Max Sortino ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual return</td>
<td>6.5%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Annual risk</td>
<td>10.8%</td>
<td>9.7%</td>
</tr>
<tr>
<td>Risk-adjusted return</td>
<td>0.60</td>
<td>0.62</td>
</tr>
<tr>
<td>Annual turnover</td>
<td>-21.1%</td>
<td>-16.8%</td>
</tr>
<tr>
<td>Maximum drawdown</td>
<td>-23.6%</td>
<td>-21.3%</td>
</tr>
<tr>
<td>Maximum drawdown period</td>
<td>2008</td>
<td>2008</td>
</tr>
<tr>
<td>95% VaR</td>
<td>-12.3%</td>
<td>-10.1%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, J.P. Morgan Asset Management; annual data as of June 30, 2019 (2019 return is from January 1, 2019, to June 30, 2019). For illustrative purposes only.

Portfolio optimization with a focus on downside risk vs. symmetric risk may be better able to mitigate risk in a major market drawdown for buy-and-hold strategies.

EXHIBIT 8: MAXIMUM DRAWDOWNS OVER 10-YEAR PERIOD FOR BUY-AND-HOLD STRATEGIES BY INCEPTION YEAR USING SHARPE RATIO- VS. SORTINO RATIO-BASED OPTIMIZATIONS

Source: Bloomberg, J.P. Morgan Asset Management; annual data as of June 30, 2019 (2019 return is from January 1, 2019, to June 30, 2019). For illustrative purposes only.
VOLATILITY AND CORRELATION ASSUMPTIONS METHODOLOGY

Long-term asset class volatilities and correlations tend to exhibit stability when measured over multiple cycles. As such, we use the following process in estimating long-term volatility and correlation assumptions for the main asset classes:

1. **START WITH MONTHLY HISTORICAL RETURN DATA**
   - In last year’s estimates, we used 12 years of historical data as the anchor. This year, we increase the data window again, from 12 years to 13 years.

2. **FILTER DATA OUTLIERS**
   - Extreme data outliers could bias volatility estimation and are filtered to improve robustness. This is done by winsorizing* historical raw data.

3. **CONSTRUCT ANCHOR MATRIX**
   - We leverage historical experience to help anchor our forward-looking expectations, focusing on:
     - Simple historical return series (with each data point equally weighted)
     - Historical return series with each data point weighted by “relevance” (based on forward-looking expectations of the frequency of the economic regimes: recovery, expansion and recession)
   - The variance-covariance matrix is calculated using the filtered dataset.
     - Demean filtered data
     - After filtering the data, we demean each data point by the average of the full sample and compute the variance-covariance matrix.

4. **ADJUST FOR KEY THEMES AND STRUCTURAL CHANGES**
   - Key themes and structural changes that are expected over the forecast horizon, such as those highlighted in this article, are reflected in the long-term risk forecast accordingly.

5. **ENSURE STABLE NUMERICAL PROPERTY – SYMMETRIC POSITIVE SEMIDEFINITE COVARIANCE MATRIX**
   - For a covariance matrix to be used in optimizations, it needs to be symmetric and positive semidefinite (PSD).† Due to inconsistencies in the underlying datasets (e.g., monthly returns for liquid assets and quarterly returns for illiquid assets), a covariance matrix including both liquid and illiquid assets may not be guaranteed to be PSD. Therefore, we introduce a methodology by Higham (1988)‡ to find the nearest symmetric positive semidefinite matrix in Frobenius norm to the original covariance matrix computed from raw returns. We then calculate the adjusted volatilities and correlations from the PSD covariance matrix, and these numbers become our official assumptions.

Alternative assets have fundamental differences from public assets, in the frequency of their data and the subjectivity of their mark-to-market process. Because comparability across asset classes, to evaluate their relative attractiveness, is an essential part of the LTCMA forecast, we forecast alts’ underlying economic volatility. That is, we provide risk forecasts that represent the inherent risk of owning the assets, instead of the assets’ reported accounting volatility. More details on this adjustment can be found in the full methodology paper, available on the 2020 LTCMA website.

---

* Winsorization applies a cap and a floor to extreme data values to remove the impact of potentially spurious outlier data on statistical results.
† A positive semidefinite matrix is defined as a symmetric matrix with nonnegative eigenvalues; this property guarantees a global minimum solution for a mean-variance optimization.
Assumptions matrices

HOW TO USE THE NUMBERS

Our assumptions can be used to:

• Develop or review a strategic asset allocation
• Understand the risk and return trade-offs across and within asset classes and regions
• Assess the risk characteristics of a strategic asset allocation
• Review relative value allocation decisions

The assumptions are not designed to inform short-term tactical allocation decisions. Our assumptions process is carefully calibrated and constructed to aid investors with strategic asset allocation or policy-level decisions over a 10- to 15-year investment horizon.
<table>
<thead>
<tr>
<th>U.S. DOLLAR ASSUMPTIONS</th>
<th><strong>Compound Return 2019 (%)</strong></th>
<th><strong>Annualized Volatility (%)</strong></th>
<th><strong>Arithmetic Return 2020 (%)</strong></th>
<th><strong>Compound Return 2020 (%)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USD Inflation</strong></td>
<td>2.00</td>
<td>2.01</td>
<td>2.09</td>
<td>2.00</td>
</tr>
<tr>
<td><strong>U.S. Cash</strong></td>
<td>1.90</td>
<td>1.90</td>
<td>2.04</td>
<td>2.09</td>
</tr>
<tr>
<td><strong>U.S. Intermediate Treasuries</strong></td>
<td>2.70</td>
<td>2.76</td>
<td>3.45</td>
<td>3.25</td>
</tr>
<tr>
<td><strong>U.S. Long Treasuries</strong></td>
<td>1.60</td>
<td>1.90</td>
<td>3.26</td>
<td>1.49</td>
</tr>
<tr>
<td><strong>TIPS</strong></td>
<td>2.70</td>
<td>2.84</td>
<td>3.39</td>
<td>3.20</td>
</tr>
<tr>
<td><strong>U.S. Aggregate Bonds</strong></td>
<td>3.10</td>
<td>3.16</td>
<td>4.02</td>
<td>-0.18</td>
</tr>
<tr>
<td><strong>U.S. Long Duration Government/Credit</strong></td>
<td>2.80</td>
<td>2.82</td>
<td>3.93</td>
<td>3.26</td>
</tr>
<tr>
<td><strong>U.S. Long Duration Government/Credit</strong></td>
<td>2.50</td>
<td>2.92</td>
<td>4.40</td>
<td>-0.19</td>
</tr>
<tr>
<td><strong>U.S._in Govt Corporate Bonds</strong></td>
<td>3.40</td>
<td>3.57</td>
<td>4.50</td>
<td>-0.05</td>
</tr>
<tr>
<td><strong>U.S. High Yield Bonds</strong></td>
<td>5.20</td>
<td>5.52</td>
<td>5.50</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>U.S. Leveraged Loans</strong></td>
<td>5.00</td>
<td>5.77</td>
<td>5.50</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>World Government Bonds Hedged</strong></td>
<td>2.10</td>
<td>2.14</td>
<td>2.99</td>
<td>-0.29</td>
</tr>
<tr>
<td><strong>World Government Bonds</strong></td>
<td>2.50</td>
<td>2.70</td>
<td>4.63</td>
<td>-0.10</td>
</tr>
<tr>
<td><strong>World ex-U.S. Government Bonds Hedged</strong></td>
<td>1.80</td>
<td>1.84</td>
<td>2.92</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>World ex-U.S. Government Bonds</strong></td>
<td>2.40</td>
<td>2.70</td>
<td>8.00</td>
<td>-0.08</td>
</tr>
<tr>
<td><strong>Emerging Markets Sovereign Debt</strong></td>
<td>5.10</td>
<td>5.43</td>
<td>8.65</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Emerging Markets Local Currency Debt</strong></td>
<td>5.90</td>
<td>6.59</td>
<td>12.17</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Emerging Markets Corporate Bonds</strong></td>
<td>4.90</td>
<td>5.22</td>
<td>8.20</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Muni 1-2 Yr Yield</strong></td>
<td>2.50</td>
<td>3.55</td>
<td>3.25</td>
<td>-0.12</td>
</tr>
<tr>
<td><strong>Muni High Yield</strong></td>
<td>4.00</td>
<td>4.26</td>
<td>7.33</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>U.S. Large Cap</strong></td>
<td>5.60</td>
<td>6.95</td>
<td>13.48</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>U.S. Mid Cap</strong></td>
<td>5.90</td>
<td>7.12</td>
<td>18.30</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>U.S. Small Cap</strong></td>
<td>6.50</td>
<td>8.12</td>
<td>19.95</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Euro Area Large Cap</strong></td>
<td>7.70</td>
<td>9.74</td>
<td>24.77</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Japanese Equity</strong></td>
<td>7.20</td>
<td>8.20</td>
<td>14.80</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Hong Kong Equity</strong></td>
<td>6.30</td>
<td>8.11</td>
<td>20.66</td>
<td>-0.01</td>
</tr>
<tr>
<td><strong>UK Large Cap</strong></td>
<td>7.40</td>
<td>8.86</td>
<td>16.48</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>EAFE Equity Hedged</strong></td>
<td>6.70</td>
<td>7.55</td>
<td>13.99</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>EAFE Equity</strong></td>
<td>7.20</td>
<td>8.48</td>
<td>16.81</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Emerging Markets Equity</strong></td>
<td>9.20</td>
<td>11.15</td>
<td>21.12</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>AC Asia ex-Japan Equity</strong></td>
<td>9.20</td>
<td>11.20</td>
<td>24.87</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>AC World Equity</strong></td>
<td>7.80</td>
<td>8.59</td>
<td>15.46</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>U.S. Equity Momentum Factor</strong></td>
<td>5.40</td>
<td>6.38</td>
<td>14.52</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>U.S. Equity Quality Factor</strong></td>
<td>6.39</td>
<td>6.39</td>
<td>12.03</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>U.S. Equity Minimum Volatility Factor</strong></td>
<td>5.80</td>
<td>6.40</td>
<td>11.37</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>U.S. Equity Dividend Yield Factor</strong></td>
<td>6.90</td>
<td>7.80</td>
<td>20.04</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>U.S. Equity Diversified Factor</strong></td>
<td>6.30</td>
<td>7.09</td>
<td>13.08</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>U.S. Convertible Bond</strong></td>
<td>4.60</td>
<td>5.13</td>
<td>10.62</td>
<td>-0.09</td>
</tr>
<tr>
<td><strong>Global Convertible Bond</strong></td>
<td>4.80</td>
<td>5.10</td>
<td>13.66</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Global Credit Sensitive Convertible</strong></td>
<td>4.40</td>
<td>4.43</td>
<td>7.00</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Private Equity</strong></td>
<td>8.80</td>
<td>10.59</td>
<td>20.17</td>
<td>0.19</td>
</tr>
<tr>
<td><strong>U.S. Core Real Estate</strong></td>
<td>5.80</td>
<td>6.37</td>
<td>11.07</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>U.S. Value-Added Real Estate</strong></td>
<td>7.70</td>
<td>9.03</td>
<td>17.81</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>European ex-U.K Core Real Estate</strong></td>
<td>6.90</td>
<td>8.07</td>
<td>16.54</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>Asia Pacific Core Real Estate</strong></td>
<td>6.50</td>
<td>7.21</td>
<td>23.60</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>U.S. REITs</strong></td>
<td>6.00</td>
<td>7.09</td>
<td>15.42</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Global Infrastructure Equity</strong></td>
<td>6.00</td>
<td>6.51</td>
<td>10.46</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Global Infrastructure Debt</strong></td>
<td>3.30</td>
<td>5.50</td>
<td>4.67</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Diversified Hedge Funds</strong></td>
<td>4.50</td>
<td>7.80</td>
<td>14.77</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Event Driven Hedge Funds</strong></td>
<td>4.80</td>
<td>5.19</td>
<td>10.79</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Long Bias Hedge Funds</strong></td>
<td>4.10</td>
<td>5.08</td>
<td>11.40</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Relative Value Hedge Funds</strong></td>
<td>4.50</td>
<td>4.70</td>
<td>7.97</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Macro Hedge Funds</strong></td>
<td>3.30</td>
<td>3.99</td>
<td>7.77</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Direct Lending</strong></td>
<td>7.00</td>
<td>7.88</td>
<td>13.87</td>
<td>0.38</td>
</tr>
<tr>
<td><strong>Commodities</strong></td>
<td>2.50</td>
<td>3.73</td>
<td>16.23</td>
<td>0.28</td>
</tr>
<tr>
<td><strong>Gold</strong></td>
<td>3.01</td>
<td>4.46</td>
<td>17.63</td>
<td>0.02</td>
</tr>
</tbody>
</table>
U.S. DOLLAR ASSUMPTIONS

Note: All estimates on this page are in U.S. dollar terms. Given the complex risk-reward trade-offs involved, we advise clients to rely on judgment as well as quantitative optimization approaches in setting strategic allocations to all of these asset classes and strategies. Please note that all information shown is based on qualitative analysis. Exclusive reliance on this information is not advised. This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise of future performance. Note that these asset class and strategy assumptions are passive only—they do not consider the impact of active management. References to future returns are not promises or even estimates of actual returns a client portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal or tax advice.

Source: J.P. Morgan Asset Management; as of September 30, 2019. Please note that LTCMA return numbers are now rounded to the nearest 0.1% (having been nearest 0.25% in previous years). Alternative asset classes (including hedge funds, private equity, real estate, direct lending and infrastructure) are unlike other asset categories shown above in that there is no underlying investible index. The return estimates for these alternative asset classes and strategies are estimates of the industry average, net of manager fees. The dispersion of return among managers of these alternative asset classes and strategies is typically significantly wider than that of traditional asset classes. Correlations of value-added and core real estate in their local currencies are identical since value-added local returns are scaled versions of the corresponding core real estate local returns. All returns are nominal. For the full opportunity set, please contact your J.P. Morgan representative.
### EURO ASSUMPTIONS

<table>
<thead>
<tr>
<th>Compound Return 2019 (%)</th>
<th>Annualized Volatility (%)</th>
<th>Arithmetic Return 2020 (%)</th>
<th>Compound Return 2020 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.30 (1.21, 1.41)</td>
<td>1.40 (1.34, 1.50)</td>
<td>1.00 (0.96, 1.04)</td>
<td>1.50 (1.47, 1.53)</td>
</tr>
<tr>
<td>1.32 (1.25, 1.40)</td>
<td>1.35 (1.32, 1.40)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.50 (1.47, 1.53)</td>
</tr>
<tr>
<td>1.31 (1.27, 1.40)</td>
<td>1.35 (1.32, 1.40)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.50 (1.47, 1.53)</td>
</tr>
<tr>
<td><strong>Fixed Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.30 (1.22, 1.40)</td>
<td>1.35 (1.32, 1.40)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.50 (1.47, 1.53)</td>
</tr>
<tr>
<td>1.25 (1.22, 1.35)</td>
<td>1.30 (1.25, 1.35)</td>
<td>0.95 (0.92, 0.98)</td>
<td>1.45 (1.42, 1.48)</td>
</tr>
<tr>
<td><strong>Commodities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.20 (1.15, 1.25)</td>
<td>1.25 (1.20, 1.30)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.40 (1.37, 1.43)</td>
</tr>
<tr>
<td>1.25 (1.22, 1.28)</td>
<td>1.30 (1.25, 1.35)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.45 (1.42, 1.48)</td>
</tr>
<tr>
<td>1.30 (1.27, 1.33)</td>
<td>1.35 (1.32, 1.40)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.50 (1.47, 1.53)</td>
</tr>
<tr>
<td><strong>Alternatives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.20 (1.16, 1.24)</td>
<td>1.25 (1.20, 1.30)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.40 (1.37, 1.43)</td>
</tr>
<tr>
<td>1.25 (1.22, 1.28)</td>
<td>1.30 (1.25, 1.35)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.45 (1.42, 1.48)</td>
</tr>
<tr>
<td>1.30 (1.27, 1.33)</td>
<td>1.35 (1.32, 1.40)</td>
<td>1.00 (0.97, 1.03)</td>
<td>1.50 (1.47, 1.53)</td>
</tr>
</tbody>
</table>

**Note:** The table above provides a summary of various investment assumptions, including equity, fixed income, commodities, and alternatives, with compound and arithmetic returns along with annualized volatility. The results are presented with confidence intervals in parentheses.
**Fixed Income**

- Gold
- Long Bias Hedge Funds Hedged
- Event Driven Hedge Funds Hedged
- U.S. REITs
- European ex-UK Value-Added Real Estate
- Private Equity
- Developed World Equity
- AC Asia ex-Japan Equity
- U.S. Large Cap
- Emerging Markets Corporate Bonds Hedged
- Global Multiverse Bonds Hedged
- Euro Aggregate Bonds
- Euro Cash

### 2020 ESTIMATES AND CORRELATIONS

<table>
<thead>
<tr>
<th>Region/Category</th>
<th>Estimate 2020</th>
<th>Estimate 2019</th>
<th>Estimate 2020</th>
<th>Estimate 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Large Cap</td>
<td>1.00</td>
<td>0.91</td>
<td>0.78</td>
<td>0.77</td>
</tr>
<tr>
<td>U.S. Small Cap</td>
<td>1.00</td>
<td>0.91</td>
<td>0.83</td>
<td>0.77</td>
</tr>
<tr>
<td>Euro Area Large Cap</td>
<td>0.97</td>
<td>0.91</td>
<td>0.93</td>
<td>0.95</td>
</tr>
<tr>
<td>Euro Area Small Cap</td>
<td>0.85</td>
<td>0.76</td>
<td>0.62</td>
<td>0.64</td>
</tr>
<tr>
<td>Bond Area Large Cap</td>
<td>0.69</td>
<td>0.64</td>
<td>0.76</td>
<td>0.74</td>
</tr>
<tr>
<td>Bond Area Small Cap</td>
<td>0.74</td>
<td>0.72</td>
<td>0.74</td>
<td>0.72</td>
</tr>
<tr>
<td>U.S. Core Real Estate</td>
<td>0.91</td>
<td>0.83</td>
<td>0.85</td>
<td>0.86</td>
</tr>
<tr>
<td>Japanese Equity</td>
<td>0.44</td>
<td>0.42</td>
<td>0.38</td>
<td>0.35</td>
</tr>
<tr>
<td>Emerging Markets Equity</td>
<td>0.67</td>
<td>0.60</td>
<td>0.67</td>
<td>0.59</td>
</tr>
<tr>
<td>Japanese Small Cap</td>
<td>0.45</td>
<td>0.59</td>
<td>0.45</td>
<td>0.59</td>
</tr>
<tr>
<td>Emerging Markets Small Cap</td>
<td>0.55</td>
<td>0.57</td>
<td>0.55</td>
<td>0.57</td>
</tr>
<tr>
<td>Euro Area Core Equity</td>
<td>0.56</td>
<td>0.48</td>
<td>0.77</td>
<td>0.71</td>
</tr>
<tr>
<td>Euro Area Small Cap</td>
<td>0.27</td>
<td>0.23</td>
<td>0.39</td>
<td>0.35</td>
</tr>
<tr>
<td>U.S. Core Small Cap</td>
<td>0.39</td>
<td>0.35</td>
<td>0.73</td>
<td>0.70</td>
</tr>
<tr>
<td>Japanese Core Equity</td>
<td>0.49</td>
<td>0.53</td>
<td>0.45</td>
<td>0.52</td>
</tr>
<tr>
<td>Emerging Markets Core Equity</td>
<td>0.55</td>
<td>0.52</td>
<td>0.55</td>
<td>0.52</td>
</tr>
<tr>
<td>Japanese Core Small Cap</td>
<td>0.51</td>
<td>0.46</td>
<td>0.37</td>
<td>0.35</td>
</tr>
<tr>
<td>Emerging Markets Core Small Cap</td>
<td>0.56</td>
<td>0.46</td>
<td>0.55</td>
<td>0.48</td>
</tr>
<tr>
<td>Euro Area Core Small Cap</td>
<td>0.37</td>
<td>0.35</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>Japanese Core Core Equity</td>
<td>0.45</td>
<td>0.45</td>
<td>0.48</td>
<td>0.46</td>
</tr>
<tr>
<td>Emerging Markets Core Small Cap</td>
<td>0.55</td>
<td>0.46</td>
<td>0.37</td>
<td>0.35</td>
</tr>
<tr>
<td>European ex-UK Value-Added Real Estate</td>
<td>0.44</td>
<td>0.42</td>
<td>0.38</td>
<td>0.35</td>
</tr>
<tr>
<td>Japanese Value-Added Real Estate</td>
<td>0.67</td>
<td>0.60</td>
<td>0.67</td>
<td>0.59</td>
</tr>
<tr>
<td>Emerging Markets Value-Added Real Estate</td>
<td>0.45</td>
<td>0.48</td>
<td>0.77</td>
<td>0.71</td>
</tr>
<tr>
<td>Japanese Small Cap</td>
<td>0.55</td>
<td>0.57</td>
<td>0.55</td>
<td>0.57</td>
</tr>
<tr>
<td>Emerging Markets Small Cap</td>
<td>0.56</td>
<td>0.48</td>
<td>0.77</td>
<td>0.71</td>
</tr>
<tr>
<td>European ex-UK Small Cap</td>
<td>0.27</td>
<td>0.23</td>
<td>0.39</td>
<td>0.35</td>
</tr>
<tr>
<td>Japanese Small Cap</td>
<td>0.49</td>
<td>0.53</td>
<td>0.45</td>
<td>0.52</td>
</tr>
<tr>
<td>Emerging Markets Small Cap</td>
<td>0.55</td>
<td>0.52</td>
<td>0.55</td>
<td>0.52</td>
</tr>
<tr>
<td>European ex-UK Core Equity</td>
<td>0.51</td>
<td>0.46</td>
<td>0.37</td>
<td>0.35</td>
</tr>
<tr>
<td>European ex-UK Small Cap</td>
<td>0.39</td>
<td>0.35</td>
<td>0.73</td>
<td>0.70</td>
</tr>
<tr>
<td>Japanese Core Equity</td>
<td>0.45</td>
<td>0.48</td>
<td>0.48</td>
<td>0.45</td>
</tr>
<tr>
<td>Emerging Markets Core Equity</td>
<td>0.55</td>
<td>0.46</td>
<td>0.37</td>
<td>0.35</td>
</tr>
<tr>
<td>Japanese Core Small Cap</td>
<td>0.37</td>
<td>0.35</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>Emerging Markets Core Small Cap</td>
<td>0.45</td>
<td>0.46</td>
<td>0.37</td>
<td>0.35</td>
</tr>
<tr>
<td>European ex-UK Core Small Cap</td>
<td>0.44</td>
<td>0.42</td>
<td>0.35</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Note: All estimates on this page are in euro terms. Given the complex risk-reward trade-offs involved, we advise clients to rely on judgment as well as quantitative optimization approaches in setting strategic allocations to all of these asset classes and strategies. Please note that all information shown is based on qualitative analysis. Exclusive reliance on this information is not advised. This information is not intended to invest in any particular asset class or strategy or as a promise of future performance. Note that these asset class and strategy assumptions are passive-only they do not consider the impact of active management. References to future returns are not promises or even estimates of actual returns a client portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal or tax advice.

Source: J.P. Morgan Asset Management; as of September 30, 2019. Please note that LTCM return numbers are now rounded to the nearest 0.1% (having been nearest 0.25% in previous years). Alternative asset classes (including hedge funds, private equity, real estate, direct lending and infrastructure) are unlike other asset categories shown above in that there is no underlying index available. The index returns for these alternative asset classes and strategies are estimates of the industry average, net of manager fees. The dispersion of return among managers of these asset classes and strategies is typically significantly wider than that of traditional asset classes. Correlations of value-added and core real estate in their local currencies are identical since value-added local returns are scaled versions of their corresponding core real estate local returns. All returns are nominal. For the full opportunity set, please contact your J.P. Morgan representative.
<table>
<thead>
<tr>
<th>STERLING ASSUMPTIONS</th>
<th><strong>Compound Return 2019 (%)</strong></th>
<th><strong>Annualized Volatility (%)</strong></th>
<th><strong>Arithmetic Return 2020 (%)</strong></th>
<th><strong>Compound Return 2020 (%)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIXED INCOME</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Inflation</td>
<td>2.00</td>
<td>2.01</td>
<td>1.75</td>
<td>2.00</td>
</tr>
<tr>
<td>UK Cash</td>
<td>1.80</td>
<td>1.80</td>
<td>0.68</td>
<td>1.95</td>
</tr>
<tr>
<td>U.S. Aggregate Bonds Hedged</td>
<td>3.00</td>
<td>3.06</td>
<td>3.75</td>
<td>0.20</td>
</tr>
<tr>
<td>Euro Aggregate Bonds Hedge</td>
<td>2.20</td>
<td>2.26</td>
<td>3.54</td>
<td>0.00</td>
</tr>
<tr>
<td>U.S. Inv Grade Corporate Bonds Hedged</td>
<td>3.30</td>
<td>3.47</td>
<td>4.25</td>
<td>0.18</td>
</tr>
<tr>
<td>Euro Inv Grade Corp Bonds Hedge</td>
<td>3.00</td>
<td>3.30</td>
<td>4.47</td>
<td>0.32</td>
</tr>
<tr>
<td>U.S. High Yield Bonds Hedge</td>
<td>5.20</td>
<td>5.52</td>
<td>8.27</td>
<td>0.21</td>
</tr>
<tr>
<td>Euro High Yield Bonds Hedge</td>
<td>4.80</td>
<td>5.15</td>
<td>8.47</td>
<td>0.15</td>
</tr>
<tr>
<td>Global Credit Hedged</td>
<td>1.91</td>
<td>1.91</td>
<td>4.07</td>
<td>0.25</td>
</tr>
<tr>
<td>UK Gilts</td>
<td>0.00</td>
<td>0.22</td>
<td>6.64</td>
<td>0.12</td>
</tr>
<tr>
<td>UK Inflation-Hedged</td>
<td>-1.50</td>
<td>-1.11</td>
<td>8.80</td>
<td>-0.05</td>
</tr>
<tr>
<td>World Government Bonds</td>
<td>2.00</td>
<td>2.04</td>
<td>3.00</td>
<td>-0.21</td>
</tr>
<tr>
<td>Globe WA Grade Bonds</td>
<td>1.00</td>
<td>1.41</td>
<td>9.77</td>
<td>-0.28</td>
</tr>
<tr>
<td>World ex-UK Government Bonds</td>
<td>2.20</td>
<td>2.24</td>
<td>8.89</td>
<td>-0.20</td>
</tr>
<tr>
<td>Emerging Markets Sovereign Debt Hedged</td>
<td>1.00</td>
<td>1.15</td>
<td>9.55</td>
<td>0.25</td>
</tr>
<tr>
<td>Emerging Markets Local Currency Debt</td>
<td>4.41</td>
<td>4.99</td>
<td>11.16</td>
<td>-0.01</td>
</tr>
<tr>
<td>Emerging Markets Corporate Bonds Hedge</td>
<td>4.80</td>
<td>5.12</td>
<td>8.19</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>EQUITIES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK All Cap</td>
<td>6.30</td>
<td>7.08</td>
<td>12.06</td>
<td>0.75</td>
</tr>
<tr>
<td>UK Large Cap</td>
<td>6.10</td>
<td>6.90</td>
<td>13.15</td>
<td>0.70</td>
</tr>
<tr>
<td>UK Small Cap</td>
<td>7.10</td>
<td>8.20</td>
<td>15.62</td>
<td>0.60</td>
</tr>
<tr>
<td>U.S. Large Cap</td>
<td>4.10</td>
<td>4.96</td>
<td>13.54</td>
<td>0.40</td>
</tr>
<tr>
<td>U.S. Large Cap Hedge</td>
<td>5.50</td>
<td>6.45</td>
<td>14.31</td>
<td>0.60</td>
</tr>
<tr>
<td>Euro Area Large Cap</td>
<td>6.20</td>
<td>7.74</td>
<td>18.43</td>
<td>0.62</td>
</tr>
<tr>
<td>Euro Area Large Cap Hedge</td>
<td>7.10</td>
<td>8.33</td>
<td>16.43</td>
<td>0.67</td>
</tr>
<tr>
<td>Euro Area Small Cap</td>
<td>6.40</td>
<td>8.10</td>
<td>19.40</td>
<td>0.60</td>
</tr>
<tr>
<td>Japanese Equity</td>
<td>5.70</td>
<td>6.52</td>
<td>11.26</td>
<td>-0.07</td>
</tr>
<tr>
<td>Japanese Equity Hedge</td>
<td>7.20</td>
<td>8.69</td>
<td>18.16</td>
<td>0.69</td>
</tr>
<tr>
<td>Asia ex-Japan Equity</td>
<td>7.70</td>
<td>9.21</td>
<td>18.54</td>
<td>0.75</td>
</tr>
<tr>
<td>Emerging Markets Equity</td>
<td>7.90</td>
<td>9.23</td>
<td>18.46</td>
<td>0.75</td>
</tr>
<tr>
<td>Asia World Equity</td>
<td>5.00</td>
<td>5.84</td>
<td>13.39</td>
<td>0.25</td>
</tr>
<tr>
<td>Asia World ex-Equity</td>
<td>5.00</td>
<td>5.86</td>
<td>13.57</td>
<td>0.24</td>
</tr>
<tr>
<td>Developed World Equity</td>
<td>4.80</td>
<td>5.62</td>
<td>13.21</td>
<td>0.60</td>
</tr>
<tr>
<td>Global Convertible Bond Hedge</td>
<td>4.70</td>
<td>5.20</td>
<td>10.33</td>
<td>-0.02</td>
</tr>
<tr>
<td>Global Credit Sensitive Convertible Hedge</td>
<td>4.30</td>
<td>4.54</td>
<td>7.11</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>PRIVATE EQUITY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Equity</td>
<td>7.30</td>
<td>8.49</td>
<td>16.37</td>
<td>0.15</td>
</tr>
<tr>
<td>U.S. Core Real Estate</td>
<td>4.30</td>
<td>4.81</td>
<td>10.39</td>
<td>0.50</td>
</tr>
<tr>
<td>European ex-UK Core Real Estate</td>
<td>5.40</td>
<td>6.25</td>
<td>13.54</td>
<td>0.35</td>
</tr>
<tr>
<td>European ex-UK Value-Added Real Estate</td>
<td>7.90</td>
<td>9.77</td>
<td>20.36</td>
<td>0.29</td>
</tr>
<tr>
<td>U.S. Core Real Estate</td>
<td>5.50</td>
<td>6.71</td>
<td>16.59</td>
<td>0.28</td>
</tr>
<tr>
<td>U.S. REITs</td>
<td>4.50</td>
<td>5.73</td>
<td>16.27</td>
<td>0.50</td>
</tr>
<tr>
<td>European REITs</td>
<td>5.90</td>
<td>7.42</td>
<td>18.29</td>
<td>0.60</td>
</tr>
<tr>
<td>Global Infrastructure Equity</td>
<td>4.50</td>
<td>4.93</td>
<td>9.48</td>
<td>0.25</td>
</tr>
<tr>
<td>Mezzanine Debt</td>
<td>6.30</td>
<td>6.99</td>
<td>12.18</td>
<td>0.03</td>
</tr>
<tr>
<td>Diversified Hedge Funds Hedge</td>
<td>4.40</td>
<td>4.65</td>
<td>7.65</td>
<td>0.18</td>
</tr>
<tr>
<td>Event Driven Hedge Funds Hedge</td>
<td>4.70</td>
<td>5.08</td>
<td>8.59</td>
<td>0.50</td>
</tr>
<tr>
<td>Long Bias Hedge Funds Hedge</td>
<td>4.70</td>
<td>5.27</td>
<td>11.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Relative Value Hedge Funds Hedge</td>
<td>4.40</td>
<td>4.62</td>
<td>6.75</td>
<td>0.42</td>
</tr>
<tr>
<td>Macro Hedge Funds Hedge</td>
<td>3.20</td>
<td>3.50</td>
<td>7.84</td>
<td>0.30</td>
</tr>
<tr>
<td>Commodities</td>
<td>1.00</td>
<td>1.94</td>
<td>13.54</td>
<td>0.50</td>
</tr>
<tr>
<td>Gold</td>
<td>1.50</td>
<td>3.09</td>
<td>18.31</td>
<td>1.75</td>
</tr>
</tbody>
</table>
Note: All estimates on this page are in sterling terms. Given the complex risk-reward trade-offs involved, we advise clients to rely on judgment as well as quantitative optimization approaches in setting strategic allocations to all of these asset classes and strategies. Please note that all information shown is based on qualitative analysis. Exclusive reliance on this information is not advised. This information is not intended as a recommendation to invest in any particular asset class or strategy as or a promise of future performance. Note that these asset class and strategy assumptions are passive only—they do not consider the impact of active management. References to future returns are not promises or even estimates of actual returns a client portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal or tax advice.

Source: J.P. Morgan Asset Management; as of September 30, 2019. Please note that LTCMA return numbers are now rounded to the nearest 0.1% (having been nearest 0.25% in previous years). Alternative asset classes (including hedge funds, private equity, real estate, direct lending and infrastructure) are unlike other asset categories shown above in that there is no underlying investible index. The return estimates for these alternative asset classes and strategies are estimates of the industry average, net of manager fees. The dispersion of return among managers of these asset classes and strategies is typically significantly wider than that of traditional asset classes. Correlations of value-added and core real estate in their local currencies are identical since value-added local returns are scaled versions of their corresponding core real estate local returns. All returns are nominal. For the full opportunity set, please contact your J.P. Morgan representative.
IV Appendix
GLOSSARY

ACCOUNTING (VS. ECONOMIC) VOLATILITY
Accounting volatility is computed based on reported valuation with no adjustments, despite potential estimation challenges; it is typically lower than economic volatility. Economic volatility represents the inherent risk of owning assets and may differ from accounting vol when forecasts of underlying risks attempt to remove any potential biases.

CAP RATES In real estate, the ratio of net operating income (NOI) to property asset value (i.e., recent cash price).

DRAWDOWN How much, generally in percentage terms, an investment or market declines from peak to trough.

E-COMMERCE Defined here as the absence of the consumer’s physical presence in the negotiation of terms, placement of orders or payment for purchases.

EQUITY RISK PREMIUM (ERP) The excess return investors demand above a risk-free rate to invest in an equity market.

EX-ANTE RETURNS Latin for “before the event,” estimative potential future returns, based on assumption and prediction.

FACTOR EXPOSURES Exposure to characteristics that describe the risk to a group of securities or financial instruments. Factor exposure should compensate an investor. LTCMAs covers five individual equity factors: value, quality, momentum, minimum volatility and dividend yield.

G4 (THE GROUP OF 4) The U.S., the euro area, Japan and the UK, the four major economic blocs.

HYPERINFLATION Uncontrollable, accelerating rise in goods and services prices, generally understood to mean at a rate of 50% or more per month.

INTEREST RATE NORMALIZATION The idea that interest rates return to their historically higher levels, after the current period during which benchmark short rates set by major developed market central banks have been near zero and long-term rates have been suppressed by bond-buying programs (quantitative easing or QE).

LEFT-TAIL/RIGHT-TAIL OCCURRENCES A tail is the tapering at the far ends of a distribution curve representing least likely outcomes; in a left- (right-) tail occurrence, an asset or portfolio value moves more than 3 standard deviations below (above) its mean or average.

LIQUIDITY TRAP In Keynesian economics, the concept that when yields are very low, almost all people will prefer liquidity, or holding cash, to interest-bearing securities.

MACHINE LEARNING A method of data analysis that automates analytical model building; a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.

MEAN REVERSION In financial theory, the concept that asset prices, or other indicators, eventually return to their long-run mean or average.

MEAN-VARIANCE OPTIMIZATION In portfolio theory, a mathematical tool for constructing portfolios with the maximum expected return (mean) for a given variance (or standard deviation of returns), or the minimum variance of return for a given mean (expected return). Simply put, considering the trade-off between risk and expected returns to achieve the optimal combination.

MODERN MONETARY THEORY (MMT) An economic theory arguing that countries that issue their own currencies can never run out of money and that large government deficits are not fiscally irresponsible and will not cause economic collapse. Linked to the idea of a job guarantee policy and using deficit spending to finance a U.S. Green New Deal.

NATURAL LANGUAGE PROCESSING Advanced type of artificial intelligence that analyzes and maps language into representations and generates words, sentences and other meaningful texts. Used, for example, in virtual digital assistant technologies.

NON-GAAP ADJUSTED EBITDA Controversial practice of EBITDA that excludes the impact of certain one-time, unrealized or nonrecurring items and which, as a result, may be misleading. Non-GAAP measures are regulated by the SEC but are not subject to audit.

OUTPUT GAP The difference between an economy’s actual and potential output.

REAL NEUTRAL RATE (REAL R*) The short-term interest rate in an economy at equilibrium, adjusted to remove the effects of inflation.
SAFE HAVEN ASSETS Assets that serve as a store of value through market cycles, can be readily converted to cash without significant loss of value, exhibit low volatility and have low or negative correlation to the general market, offering portfolio protection during times of stress. Costs may include price to buy (as in a stock option) or of opportunity (potential returns forgone by holding one asset rather than another).

SORTINO RATIO A variation of the Sharpe ratio that measures excess return per unit of downside risk, calculated by taking the expected return minus the risk-free rate, divided by the expected downside risk, as opposed to total standard deviation.

SPECIAL LIQUIDITY SCHEME A UK program in response to the global financial crisis that helped remove illiquid assets from bank balance sheets, enabling them to be swapped for more attractive paper; meant to inject liquidity into markets and allow rate cuts to be more effectively transmitted to consumers.

SUSTAINABLE GROWTH RATE (SGR) A concept developed by Robert C. Higgins (1977). The assumed maximum rate of growth in earnings a company can sustain without issuing new equity; equal to return on equity (ROE) × portion of earnings not paid out to shareholders. It assumes that future earnings can only grow by reinvesting the retained proportion of earnings at a stable ROE, thereby expanding book value at the same rate as earnings. For a given ROE, slower earnings growth thus implies a higher payout ratio.

TARGETED LONGER-TERM REFINANCING OPERATIONS (TLTROS) A critical tool for the European Central Bank from 2014 to boost lending by extending low cost long-term credit to banks. The Bank of England introduced a similar scheme for the UK.

TERM PREMIUM The excess yield investors demand above a risk-free rate to invest in longer-term bonds instead of a series of shorter-term bonds.

TIER 1 EQUITY (Also, Common Equity Tier 1 or CET1) A component of Tier 1 capital (core capital used to measure a bank’s capital adequacy), consisting mostly of common stock held by a financial institution. An international standard issued in 2014 to protect economies from financial crisis.

TOTAL FACTOR PRODUCTIVITY (TFP) Productivity growth that is not explained by capital stock accumulation or the labor force (increased hours worked) but rather captures the efficiency or intensity with which inputs are utilized. A residual that likely reflects technological change.

VALUE-AT-RISK (VAR) A risk measure that defines risk as potential investment loss with a given probability over a pre-set time horizon. In mathematical terms, the VaR metric is defined as the possible loss at a quantile, a point with a specified probability of greater losses, typically set at 0.95 or 0.99 by financial firms and regulators.
LTCMA COMMITTEE

Nicolas Aguirre, CFA  
Portfolio Strategist,  
Endowments & Foundations Group

Victoria Helvert  
Associate,  
Global Equities

Catherine Peterson  
Global Head of Insights Programs

Allison Schneider  
Associate,  
Global Insights

Christopher M. Sedigazad, CFA  
Research Analyst,  
Multi-Asset Solutions

Pulkit Sharma, CFA, CAIA  
Head of Alternatives  
Investments Strategy & Solutions

Sylvia Sheng, Ph.D.  
Global Strategist,  
Multi-Asset Solutions

Nandini Srivastava, Ph.D.  
Quantitative Analyst,  
Multi-Asset Solutions

Karen Ward  
Chief Market Strategist,  
EMEA, Global Market Insights Strategy

Xiao Xiao, CFA  
Quantitative Analyst,  
Multi-Asset Solutions

Leon Xin, CFA  
Head of Portfolio Construction  
Endowments & Foundations Group

Jasslyn Yeo, Ph.D., CFA  
Global Market Strategist,  
Global Market Insights Strategy

The Long-Term Capital Market Assumptions Team and Committee are grateful to many investment experts throughout the J.P. Morgan network whose input has been incorporated into the 2020 edition, including: Madhur Ambastha, John Ancona, Boris Arabadjiev, Chester Barnes, Richard Biebel, Michael Cembalest, Marcella Chow, Maddi Dessner, Dave Esrig, Gregory Fedorenko, Meena Gandhi, Jeff Geller, Roger Hallam, Karim Hassouna, Josh Helfat, Jason Ko, Spenser Lerner, Paul Levene, Stephen Magyera, Courtney Nee, Robert Michele, Cressida Myers, Karthik Narayan, Garrett Norman, Yazz Romahi, Gabriela Santos, Mark Snyder, Joe Staines, Paul Summer, Katy Thorneycroft, Alexandra Tirlea, Kenneth Tsang, Jennifer Wu and Livia Wu.

We also want to express our utmost appreciation and gratitude to Global Insights and the Investment Writing team, Jill Hamburg-Coplan, Barbara Heubel, Nicola Owen, Barbara Rudolph and Melissa Wiegand; and Global Creative Services for design, Mark Virgo and Jay Lonie.
NOT FOR RETAIL DISTRIBUTION: This communication has been prepared exclusively for institutional/wholesale/professional clients and qualified investors only as defined by local laws and regulations.

If you are a person with a disability and need additional support in viewing the material, please call us at 1-800-343-1113 for assistance.

We have a number of security protocols in place which are designed to ensure all customer data is kept confidential and secure. We use reasonable physical, electronic, and procedural safeguards that are designed to comply with federal standards to protect and limit access to personal information.

There are several key controls and policies in place designed to ensure customer data are safe, secure and anonymous:

• Before J.P. Morgan Asset Management receives the data, all unique identifiable information, including names, account numbers, addresses, dates of birth and Social Security numbers is removed.
• J.P. Morgan Asset Management has put privacy protocols for its researchers in place. Researchers are obligated to use the data solely for approved research and are obligated not to re-identify any individual represented in the data.
• J.P. Morgan Asset Management does not allow the publication of any information about an individual or entity. Any data point included in any publication based on customer data may only reflect aggregate information.
• The data are stored on a secure server and can be accessed only under strict security procedures. Researchers are not permitted to export the data outside of J.P. Morgan Chase’s systems. The system complies with all J.P. Morgan Chase Information Technology Risk Management requirements for the monitoring and security of data.
• J.P. Morgan Asset Management provides valuable insights to policymakers, businesses and financial advisors, but these insights cannot come at the expense of consumer privacy. We take every precaution to ensure the confidence and security of our account holders’ private information.

JPMAM Long-Term Capital Market Assumptions: Given the complex risk-reward trade-offs involved, we advise clients to rely on judgment as well as quantitative optimization approaches in setting strategic allocations. Please note that all information shown is based on qualitative analysis. Exclusive reliance on the above is not advised. This information is not intended as a recommendation to invest in any particular asset class or strategy as or a promise of future performance. Note that these asset class and strategy assumptions are passive only - they do not consider the impact of active management. References to future returns are not promises or even estimates of actual returns a client portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal or tax advice. The outputs of the assumptions are provided for illustration/discussion purposes only and are subject to significant limitations. “Expected” or “alpha” return estimates are subject to uncertainty and error. For example, changes in the historical data from which it is estimated will result in different implications for asset class returns. Expected returns for each asset class are conditional on an economic scenario; actual returns in the event the scenario comes to pass could be higher or lower, as they have been in the past, so an investor should not expect to achieve returns similar to the outputs shown herein. References to future returns for either asset allocation strategies or asset classes are not promises of actual returns a client portfolio may achieve. Because of the inherent limitations of all models, potential investors should not rely exclusively on the model when making a decision. The model cannot account for the impact that economic, market, and other factors may have on the implementation and ongoing management of an actual investment portfolio. Unlike actual portfolio outcomes, the model outcomes do not reflect actual trading, liquidity constraints, fees, expenses, taxes and other factors that could impact the future returns. The model assumptions are passive only – they do not consider the impact of active management. A manager’s ability to achieve similar outcomes is subject to risk factors over which the manager may have no or limited control. The views contained herein are not to be taken as advice or a recommendation to buy or sell any investment in any jurisdiction, nor is it a commitment from J.P. Morgan Asset Management or any of its subsidiaries to participate in any of the transactions mentioned herein. Any forecasts, figures, opinions or investment techniques and strategies set out are for information purposes only, based on certain assumptions and current market conditions and are subject to change without prior notice. All information presented herein is considered to be accurate at the time of production. This material does not contain sufficient information to support an investment decision and it should not be relied upon by you in evaluating the merits of investing in any securities or products. In addition, users should make an independent assessment of the legal, regulatory, tax, credit and accounting implications and determine, together with their own professional advisers, if any investment mentioned herein is believed to be suitable to their personal goals. Investors should ensure that they obtain all relevant information before making any investment. It should be noted that investment involves risks, the value of investments and the income from them may fluctuate in accordance with market conditions and taxation agreements and investors may not get back the full amount invested. Both past performance and yield are not a reliable indicator of current and future returns. J.P. Morgan Asset Management is the brand for the asset management business of JPMorgan Chase & Co. and its affiliates worldwide. To the extent permitted by applicable law, we may record telephone calls and monitor electronic communications to comply with our legal and regulatory obligations and internal policies. Personal data will be collected, stored and processed by J.P. Morgan Asset Management in accordance with our Company’s Privacy Policy (www.jpmorgan.com/global/privacy). For further information regarding our local privacy policies, please follow the respective links: Australia (www.jpmorgan.com.au/wps/portal/auc/PrivacyPolicy), EMEA (www.jpmorgan.com/emea-privacy-policy), Japan (www.jpmorganasset.co.jp/wps/portal/Policy/Privacy), Hong Kong (https://am.jpmorgan.com/hk/en/asset-management/per/privacy-statement/), Singapore (www.jpmorganam.com.sg/privacy) and Taiwan (www.jpmorgan.com/country/GA/en/privacy/taiwan). This communication is issued by the following entities: in the United Kingdom by JPMorgan Asset Management (UK) Limited, which is authorized and regulated by the Financial Conduct Authority; in other European jurisdictions by JPMorgan Asset Management (Europe) S.A. r.l.; in Hong Kong by JPMorgan Asset Management (Asia Pacific) Limited, or JPMorgan Funds (Asia) Limited, or JPMorgan Asset Management Real Assets (Asia) Limited; in Singapore by JPMorgan Asset Management (Singapore) Limited (Co. Reg. No. 197601586K), or JPMorgan Asset Management Real Assets (Singapore) Pte Ltd (Co. Reg. No. 201120355E), this advertisement or publication has not been reviewed by the Monetary Authority of Singapore; in Taiwan by JPMorgan Asset Management (Taiwan) Limited; in Japan by JPMorgan Asset Management (Japan) Limited which is a member of the Investment Trusts Association, Japan, the Japan Investment Advisers Association, Type II Financial Instruments Firms Association and the Japan Securities Dealers Association and is regulated by the Financial Services Agency (registration number “Kanto Local Finance Bureau (Financial Instruments Firm) No. 330”); in Australia to wholesale clients only as defined in section 761A and 761G of the Corporations Act 2001 (Cth) by JPMorgan Asset Management (Australia) Limited (ABN 55143832080) (AFSL 376919); in Brazil by Banco J.P. Morgan S.A.; in Canada for institutional clients’ use only by JPMorgan Asset Management (Canada) Inc., and in the United States by J.P. Morgan Institutional Investments, Inc., member of FINRA; J.P. Morgan Investment Management Inc. or J.P. Morgan Alternative Asset Management, Inc.

Copyright 2019 JPMorgan Chase & Co. All rights reserved.

LV-JPM52180 | 11/19 | 0903c02ab272488e