

BlackRock

Portfolio perspectives
November 2019

Bonds and ballast: testing the limits

Rethinking government bond allocations and
introducing our capital market assumptions for China

BlackRock
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Summary

The dramatic drop in government bond yields this year, taking nearly a third of global bonds into negative-yielding territory at one point, has raised serious questions about their role in a strategic asset allocation (SAA). We see four reasons investors hold government bonds: capital preservation, portfolio liquidity, ballast against risk asset selloffs, and for some, meeting regulatory and capital requirements. Low rates are not a new story. Yet the resumption of central bank easing and the plunge of bond yields to historic lows earlier this year amount to a paradigm shift. Expectations that interest rates would gradually rise as monetary policy normalised have been swiftly replaced by worries that interest rates in regions such as the euro area and Japan are hovering around what we perceive as their prevailing lower bound. Investors had a glimpse of the risks associated with this in August when yields plunged to lows, and bonds, especially in Germany, showed signs of fading ballast properties. We are still overweight government bonds in aggregate, driven by our stronger conviction in US Treasuries' ability to provide ballast in risk-off episodes. We believe this environment forces a rethink of the starting point for government bond allocations. China's vast government bond market also offers a strategic opportunity, in our view. In this *Portfolio perspectives*, we introduce return expectations for Chinese assets in our capital market assumptions (CMAs). We make a case for allocations to Chinese debt and equity above current weights in global indices in our investor-specific SAAs, with the amount varying by investor type. We will detail the strategic case for Chinese assets in portfolios in an upcoming publication.

- **We believe the current environment challenges the role of government bonds as portfolio ballast when interest rates are near a perceived lower bound** beyond which they may have difficulty falling further, notably in the euro area and Japan where rates are negative. **We prefer to overweight higher-yielding US Treasuries in our strategic allocations.**
- **Reduced ballast and meagre expected returns in many core government bond markets require a rethink of the starting point for government bond allocations.** The low-yield environment highlights the limitations of a market-cap based approach to fixed income allocations. First, falling yields mean that the compensation for holding duration in the euro area and Japan has collapsed. Second, increasing low- or zero-coupon issuance increases the duration of bond indices, potentially stoking higher volatility as sensitivity to changes in interest rates rises significantly. This prompts a look at other options, including Chinese government bonds.
- **A weakening or breakdown of the negative correlation between stocks and bonds could also undermine the portfolio ballast role of government bonds.** The correlation – a constant only in the past two decades – could face pressure due to potential policy shifts, such as a pick-up in fiscal stimulus or a supply shock from deglobalisation.
- We show the impact of our latest expected returns and the incorporation of our China views on the investor-specific SAAs we unveiled earlier this year. We favour meaningful allocations to Chinese equities and debt in these SAAs.

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Rethinking the role of government bonds

The diversifying role government bonds play during risk-off events has kept them a core part of multi-asset portfolios, even as income has shrunk and index duration has increased. One underlying assumption has been that accommodative monetary policy would start to normalise, and send interest rates and bond yields higher. Government bonds have maintained their place in portfolios because of their diversification properties, predicated on an expectation that the negative correlation between stock and bond returns since the mid-1990s will persist. Yet the past six months have severely tested these assumptions. Concerns that monetary policy is exhausted have contributed to bouts of market anxiety. Market moves in the euro area gave a glimpse of the risks to bond holdings from yields testing their perceived lower bounds. German bunds underperformed US Treasuries during the August risk asset selloff as their 10-year yields fell to lows beyond -0.7%, according to Refinitiv data, suggesting investors saw limits to how much lower their yields could fall. When risk appetite returned, bunds sold off more sharply than US Treasuries.

A poor return outlook for bonds and their diminished ability to provide portfolio diversification have led us to trim allocations to euro area government bonds in our SAAs. As short-term rates fall towards their effective lower bound (ELB), the response of bond prices becomes increasingly asymmetric. Bond prices have more room to fall sharply than rise materially during broader market events or shocks. There is considerable uncertainty around any estimates of the lower bound. Yet we are increasingly confident that one exists – especially given recent moves in euro area bonds.

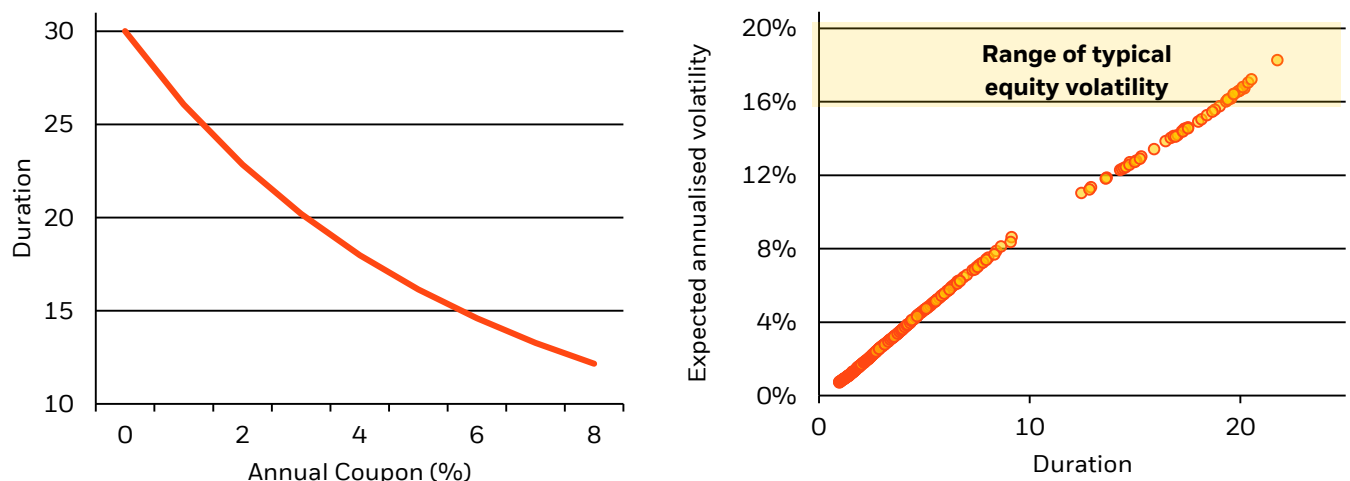
Risks tied to how close interest rates are to their lower bound have important portfolio construction implications, particularly for holders of euro area government bonds where these risks are most acute. First, we believe the return prospects of these bonds – via income or capital return – will likely be low over a strategic horizon. Second, the negative stock-bond correlation that underpins government bonds’ ballast properties starts to crack as policy rates approach their perceived ELB – as do bond yields by extension. We also believe any assumption that the correlation between stocks and bonds will necessarily be negative is likely influenced by the experience of the past few decades. We see risks to that correlation: either because bond returns are less positive near their lower bound, or if a supply shock driven by deglobalisation leads to negative bond and equity returns simultaneously.

Another consequence of negative government bond yields: higher zero-coupon bond issuance. This saps crucial income for pension and insurance funds. Bond mathematics also dictate that zero-coupon bonds would be longer duration than bonds with coupons – see the chart on the left below – and therefore exhibit equity-like levels of volatility as the shaded area on the chart on the right shows. Long duration bond prices are much more sensitive to any interest rate shift.

In short, bonds can challenge long-standing portfolio construction assumptions in an ultra-low yield environment. An important consequence, in our view, is that benchmark fixed income indices – the starting point for many fixed income allocations – may no longer be appropriate. Market yields are lower, index duration has increased and the compensation for duration has plummeted. As a result, government bond indices may have higher volatility.

High risk, no income

Duration and volatility of 30-year government bonds, November 2019



Past performance is not a reliable indicator of current or future results. It is not possible to invest directly in an index.

Sources: BlackRock Investment Institute, with data from Refinitiv Datastream, November 2019. Notes: The left panel shows the “Dollar Duration” of a hypothetical 30-year German bund priced at par with annual coupons varying from 0% to 8%. Dollar duration measures the dollar change in a bond’s value for a change in the market interest rate. It is a measure of the time it takes to receive half the cash flows of a bond, weighted by the present value of each of the cash flows. The lower the coupon, the longer the duration as proportionately less payment is received before final maturity. For zero coupon bonds, the duration will be equal to its maturity. The right panel shows a plot of the duration and computed expected annualised volatility for all bonds in the ICE-BofAML Treasury Master Index, calculated on BlackRock Aladdin as of August 30th, 2019. We break each bond into factor exposures (duration) and analyse historical volatilities over the past 18 years. The gap in the chart is due to the lack of bonds in the index issued at the corresponding duration on the X-axis. The yellow shaded box marks the range of long-term expected volatility for global equity markets with MSCI World as the index proxy.

A new starting point

The challenges brought by bond yields getting closer to their perceived lower bound are serious enough to warrant a rethink of the neutral starting point, or benchmark, for government bond allocations. This is no trivial task because there is not a completely satisfactory approach, in our view.

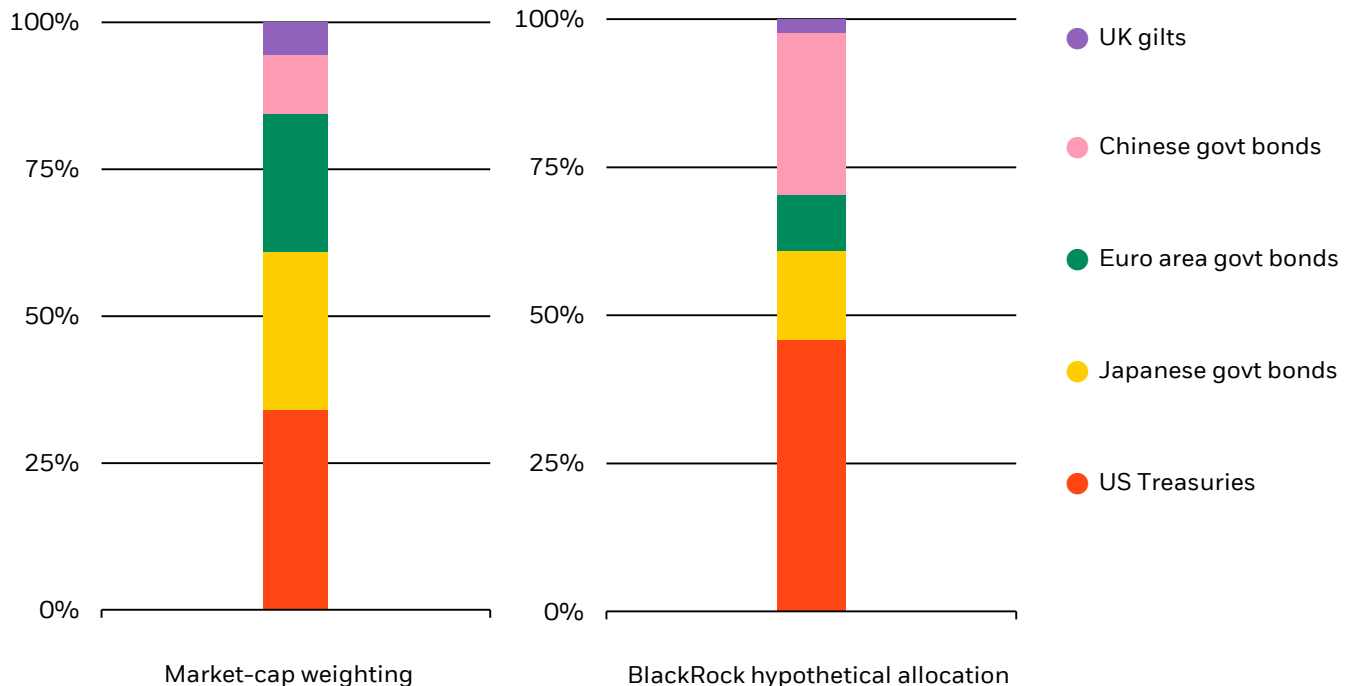
One commonly used weighting scheme in portfolio benchmarks and fixed income indices is market capitalisation – weighting each security (or in the case of government bonds, each region) based on its market value as a proportion of the total value of the investible universe. Such an approach suffers from two major drawbacks in our view. First, it biases portfolios towards heavily indebted issuers. Second, as yields fall and prices rise, market cap-based investing gradually pushes investors towards regions with low or falling yields, such as Germany. We question the validity of such a starting point in today’s low-yield environment. Yet there are few readily available alternatives.

An ideal approach, in theory, to determining optimal bond allocations would involve estimating the path of yields and their respective lower bounds – and then making these the floor for yields in model simulations. We would then calculate bond returns, their covariance with other asset returns and use this information to build SAAs. This is easier said than done. Estimating the level of where lower bounds may be in different regions is problematic, as we discussed in our [September 2019 paper](#). There is little sense in estimating how return behaviour may change at the lower bound without having a reasonably confident view on the precise level – and there is little historic precedent for doing so.

Given our concerns about market cap weights, we take a pragmatic approach to determining a government bond allocation that recognises some markets, especially in the core euro area, may be closer to their perceived lower bounds than other markets. Thus they receive lower allocations than would be implied purely from our low expected returns. We illustrate our work below. The chart on the left shows the government bond allocation within a hypothetical multi-asset portfolio derived from a weighting based on a market cap weighted index. The chart on the right shows the resulting fixed income allocation in a hypothetical unconstrained US-dollar based portfolio following our portfolio construction process. These allocations are broadly representative of our granular views on the asset class. We are overweight government bonds in aggregate – see our unconstrained portfolio tilts on page 7. Yet within that allocation, we cut allocations to the euro area and Japan and allocate more to US Treasuries while also making room for Chinese government bonds thanks to their potential return and diversification benefits. We explain our approach to estimating returns in Chinese government bonds and equities on the next two pages.

A different starting point

Government bond allocations in a market cap-weighted benchmark vs. hypothetical unconstrained portfolio



Past performance is not a reliable indicator of current or future results. Reference to any asset class shall not constitute a recommendation to buy or sell.

Sources: BlackRock Investment Institute, November 2019. Notes: The charts show how our government bond allocations in a hypothetical unconstrained, US-dollar based portfolio on a 10-year horizon stack up against an allocation based purely on a market-cap weighting. The market-cap weighting is calculated on BlackRock’s Aladdin as of November 6, 2019. The left chart shows only the fixed income part of our unconstrained portfolio, scaled up to 100. The chart on the right shows the results after running our robust optimisation on our CMAs and incorporating our asset class views.

Introducing CMAs for China

Near-term risks to China’s economy, particularly surrounding geopolitical and trade frictions with the US, have prompted a cautious stance among global investors towards the country’s assets – and some structural tensions may persist for years. Yet we see a strategic case for holding Chinese assets in portfolios that goes beyond tactical considerations. China boasts the second-largest economy, bond and equity markets in the world. Chinese assets are absent from many investor portfolios or held in very small quantities via an aggregate emerging market (EM) exposure. Key reasons were strict limits on the ability of global investors to access onshore Chinese assets. Implementation of our views on Chinese assets for different investors is outside the scope of the paper. Yet with the increasing openness of China’s markets and their growing inclusion in global indices, these barriers are diminishing, in our view.

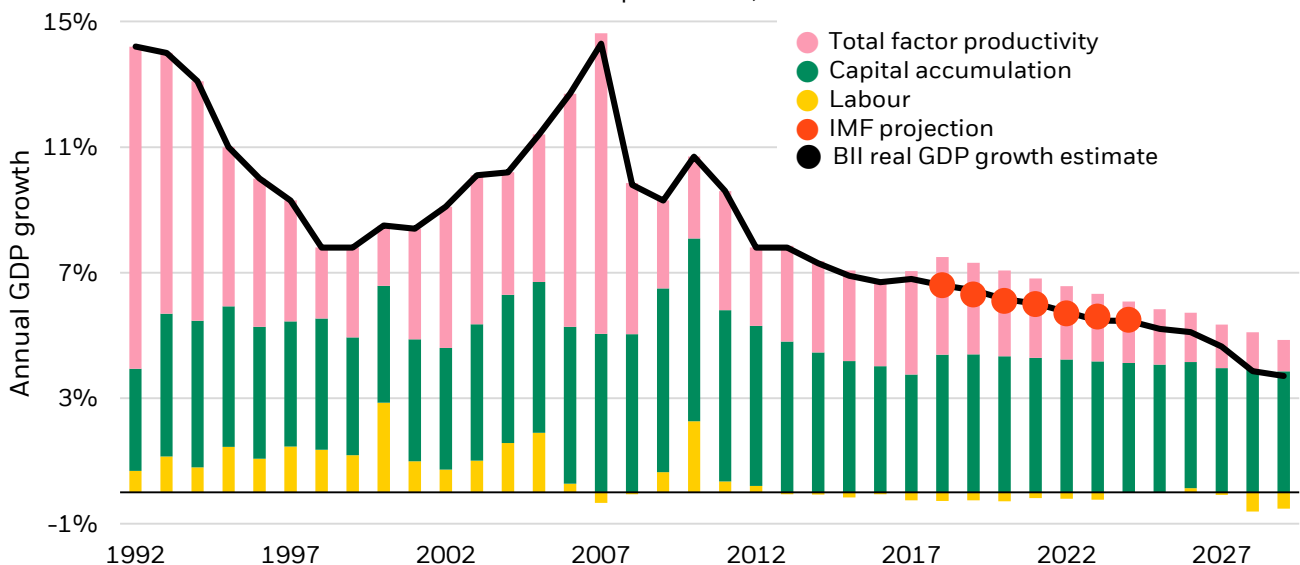
Our new CMAs for Chinese assets allow us to think about allocating to China explicitly and in a whole-portfolio context rather than relying on index weights that will be shaped by other factors. We allow for a wide range of uncertainty in our return expectations to account for the multiple ways that China’s economy and markets can evolve, including a potential bearish scenario as described on the next page. Our views on Chinese assets are not driven solely by the assumption that higher economic growth may result in higher expected returns. Instead, as for all other regions, they stem from fundamental considerations such as the outlook for interest rates, valuations and the path of returns. Our base case is for a gradual growth slowdown, in line with IMF forecasts. Our growth expectations are guided by a fundamental approach using a Solow growth model featuring inputs on labour, capital and total factor productivity. A breakdown of Chinese growth – historic and projected – based on these inputs is shown in the chart below. We see growth decelerating below a 6% annual rate in coming years and then below 5% as the ageing population starts to drag.

The Chinese equity market has grown and evolved rapidly but remains more volatile than most equity markets. We see earnings as the dominant driver of returns. Historically, Chinese equity returns lagged economic growth, yet that is less evident during the last decade – and studies of the last decade show a clear link between fundamentals and stock returns in China though returns remain volatile. Our view is that Chinese company earnings are not as tied to the global margin cycle as peers, and we don’t expect the same profit margin compression as in developed markets (DM). After stripping out overseas revenue, we see China’s long-term nominal annual earnings growth of 6.3% compared with 4.4% in the US and 4.1% in Europe. Dividend payout ratios in the A-share market have lagged global averages. Yet a push for higher payouts from China’s market regulators and from global investors could change this.

We take a neutral stance on the exchange rate. There are drivers for both appreciation and depreciation of the Chinese yuan (also known as the renminbi) against the US dollar. We believe authorities in China will manage the exchange rate against the US dollar closely over the five-year horizon in our CMAs. Our long-term views on Chinese interest rates are a function of our expectations for long-term real GDP growth, inflation and the historic behaviour of interest rates. Chinese government bonds have a higher yield than other similarly rated DM bonds as well as lower duration, spurring their higher expected returns relative to DM counterparts. They also have historically displayed lower volatility and a low correlation with DM bonds. Yet when we build our SAAs, we assume higher volatility: further liberalisation of China’s interest rate regime is likely to see market forces playing a bigger role in onshore fixed income markets.

Breaking down China’s growth outlook

Contributors to Chinese GDP and BlackRock’s bottom-up estimates, 1992-2029



Forward looking estimates may not come to pass.

Sources: BlackRock Investment Institute, with data from National Bureau of Statistics of China, IMF, Penn World Table, US Census Bureau, World Bank and Refinitiv Datastream, as of August 2019. Notes: The chart shows the underlying drivers of China’s growth, computed using labour, capital and total factor productivity inputs calculated using a Solow growth model. An explanation of the methodology is available in the Appendix on page 8.

Considering a downside scenario

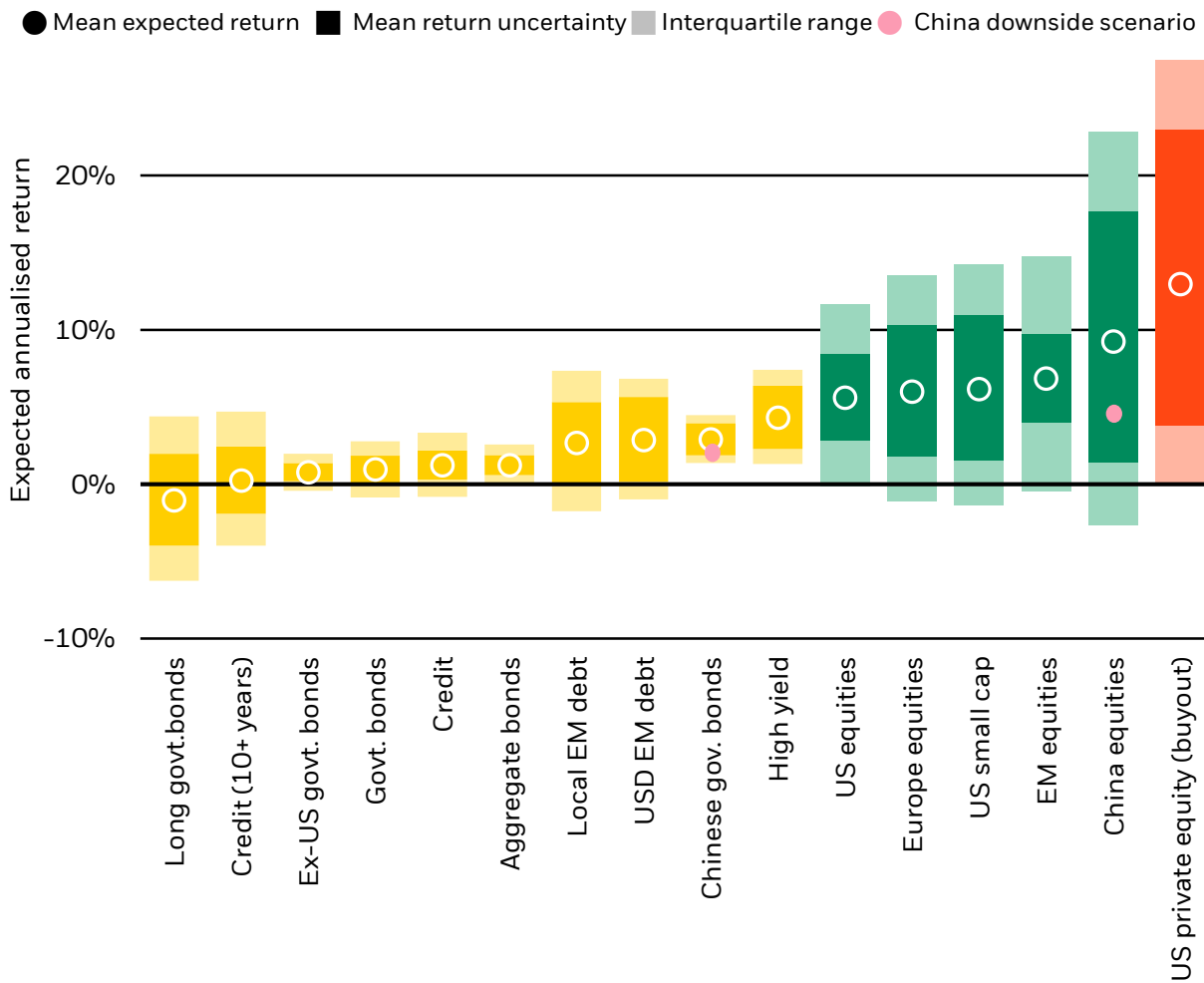
Our return expectations for Chinese assets are based on a cautious outlook for the economy. The incorporation of uncertainty in our CMAs is a critical part of our portfolio construction process. We allow for a large amount of uncertainty in our Chinese equity CMAs, as shown in the chart below. This is primarily due to the historical volatility of its equity markets and the difficulty in estimating returns given the relatively limited historical data available. Even with the large levels of uncertainty, the return and diversification benefits lead us to notable allocations. See the next page. By contrast, the uncertainty bands for Chinese government bonds are lower due to the market’s limited historical volatility. But in the portfolio construction process, we adjust for the uncertainty higher in line with the EM local average.

We study what would happen to expected returns for Chinese equities and bonds in a bearish economic outcome. We drew on the insights of BlackRock’s China experts to formulate some plausible downside scenarios for the economy. For example, we consider a slow burn for the economy, or a “Japanification”, that sees a more pronounced slowdown in growth and inflation. China’s current demographic story has parallels to Japan in the late 1990s – a shrinking working age population, higher dependency ratio, slowing productivity growth and resources diverted to pensions and social care. The difference? China has grown old before it got rich – and the Japanification would be happening in an environment of much slower global growth.

Our scenario analysis finds expected returns are still within our uncertainty bands. This illustrates that pessimistic scenarios are within the core range of uncertainty. Our expected Chinese equity returns under a Japanification scenario are shown by the pink dot in the chart below. The macroeconomic variables we have assumed are detailed in the appendix.

Updated five-year CMAs

BlackRock’s US dollar capital market assumptions with uncertainty bands, November 2019



This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise - or even estimate - of future performance.

Sources: BlackRock Investment Institute, November 2019. Data as of 30 September, 2019. Notes: Return assumptions are total nominal returns. US dollar return expectations for all asset classes are shown in unhedged terms, with the exception of global ex-US Treasuries. Our CMAs generate market, or beta, geometric return expectations. Asset return expectations are gross of fees. For representative indices used, see the *Assumptions at a glance table*. We use BlackRock proxies for selected private markets because of lack of sufficient data. These proxies represent the mix of risk factor exposures that we believe represents the economic sensitivity of the given asset class. There are two sets of bands around our mean return expectation. The darker bands show our estimates of uncertainty in our mean return estimates. The lighter bands are based on the 25th and 75th percentile of expected return outcomes – the interquartile range. For more detail read our *Portfolio perspectives*. Indices are unmanaged and used for illustrative purposes only. They are not intended to be indicative of any fund or strategy’s performance. It is not possible to invest directly in an index.

Latest strategic views

Our overall strategic asset preferences are consistent with our previous update: we are still broadly overweight government bonds and equities, and prefer both to credit. We retain significant allocations to private markets, yet late-cycle dynamics dampens our view on private credit.

The slide in interest rates through the third quarter lowered our expected returns across fixed income, widening the gap with equities and private markets where expected returns are similar to the previous quarter. The biggest declines were in expected returns were for long-dated bonds. Brexit-related volatility has taken a toll on our UK cash assumptions.

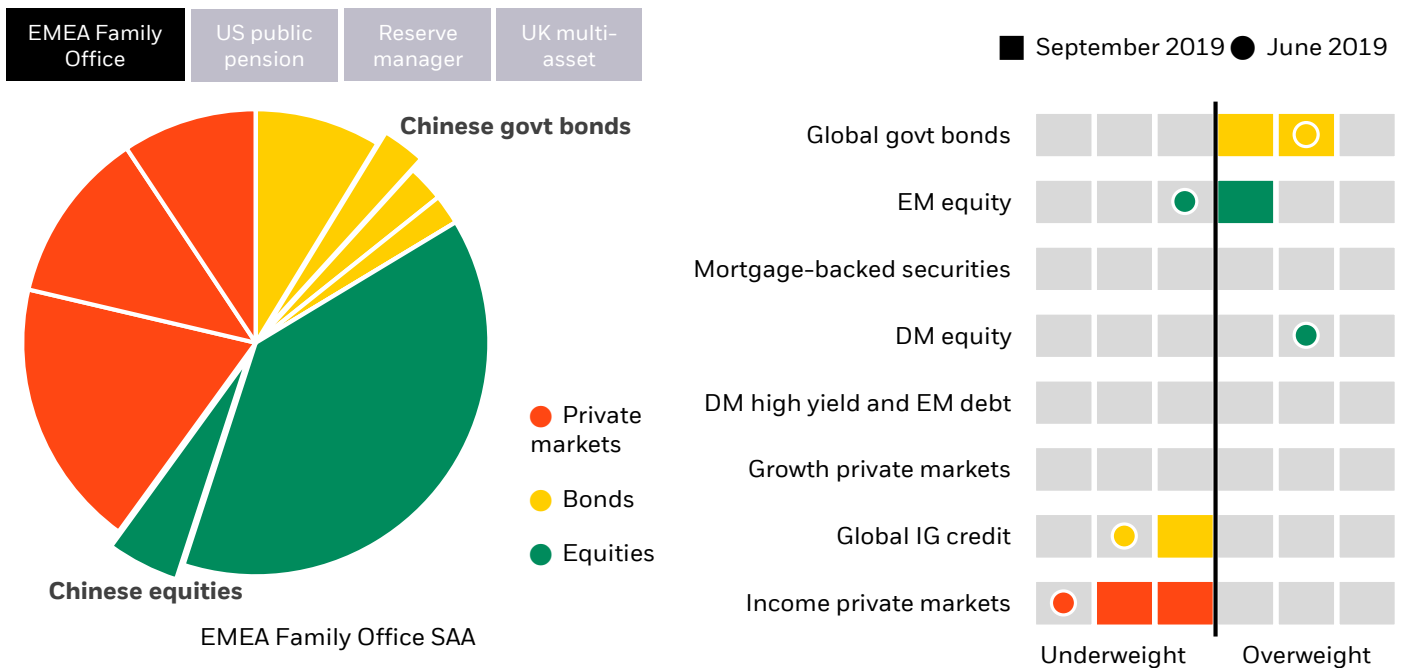
Last quarter we showed how distinct investors types might deploy our toolkit to design their SAAs around individual needs and objectives. We illustrate our investor-specific SAA for an EMEA family office in the chart on the left below. The starting point of every investor type will naturally be different, yet our preferred allocations echo the views shown in the chart on the right. Details of our other SAAs, and the underlying assumptions and key metrics for each, are on our [interactive website](#).

The inclusion of Chinese government bonds and our preference for higher-yielding US Treasuries has sustained the attractiveness of government bonds in aggregate, even as we steer away from the euro area and Japan due to a poor return outlook and proximity of policy rates to their lower bounds. A caveat: many investors are forced buyers of government bonds for regulatory or risk budgeting reasons that restrict selling a perceived safe asset. Yet this is based on an assumption that government bonds are still the safe assets they were in the past. We are also modestly overweight equities, and our China return expectations boosts our overall preference of EM. We remain underweight credit. Our private market allocations are little changed from our previous update.

Running our robust optimisation with our refreshed expected returns results in above-market cap allocations to Chinese debt and equity in our investor-specific SAAs that are eligible to hold such assets. The UK institutional multi-asset and EMEA family office hypothetical SAAs see a notable increase in both Chinese debt and equity.

Our strategic asset class preferences

Our EMEA Family Office hypothetical SAA and 10-year asset class preferences in US dollars, November 2019



Past performance is not a reliable indicator of current or future results. This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise – or even estimate – of future performance. Sources: BlackRock Investment Institute, with data from Refinitiv Datastream and Bloomberg, September 2019. Notes: The chart on the left shows a hypothetical EMEA Family Office SAA, based on the metrics provided on our CMA [interactive website](#). Index proxies can be found on the Assumptions tab under the info icons in the Assumptions at a glance table. Fee assumptions are listed on the methodology tab. The expected returns range is based on the 25th and 75th percentile of our simulated return pathways. For assets without indices (private markets), we have assumed top-quartile performance. 'Contribution from net alpha' in the table relates to the alpha opportunity in public market assets only, according to the definitions and methodology detailed in our paper on blending returns. The allocation shown above does not represent any existing portfolio, and as such, is not an investible product. The chart on the right shows our asset views on a 10-year view from an unconstrained, US-dollar perspective, with the number of boxes indicating relative preference. Global government bonds and EM equity allocations include respective China assets. The construction of the hypothetical asset allocation is based on criteria applied with the benefit of hindsight and knowledge of factors that may have positively affected its performance, and cannot account for risk factors that may affect the actual portfolio's performance. The actual performance may vary significantly from our modelled CMAs due to transaction costs, liquidity or other market factors. Indexes are unmanaged, do not account for management fees and one cannot invest directly in an index.

Appendix

Our approach to estimating China's GDP growth

The challenges of gauging China's economic outlook and the structural trends at play warrant a different approach to estimating growth than developed market (DM) economies. China's unique characteristics, such as its partially closed nature and the large variations within segments of its economy warrant a more fundamental approach, in our view. We take a bottom-up approach to our growth expectations for China using a Solow growth model – a more fundamental approach more apt for China, in our view. The model estimates the underlying drivers of an economy in the long-run – labour, capital accumulation and total factor productivity (TFP) growth – independently.

Labour input growth: The estimated series of growth in labour factor is proxied as the rate of annual change in total number of hours worked. We assume no growth in average hours worked per year per worker based on an extrapolation of the trend of the past decade. We assume the working age population also contracts going forward, based on data from the US Census Bureau. China's National Bureau of Statistics also shows a similar trend.

Capital input growth: We estimate capital input growth using our expected savings rate as share of GDP and the share of gross capital formation in GDP growth. We assume a moderation in the savings rate over the next 10 years, along with a similar trend in the share of gross capital formation in growth. The resulting capital growth follows a downward trend.

Total factor productivity growth: We estimate historical TFP growth by solving for the residual of the growth formula, after accounting for historical labour and capital inputs. We then estimate future TFP growth by assuming a linear progression towards growth levels typical of DM economies over a 10-year period. We have attempted to link TFP growth with growth in overall trade volumes, growth in years of schooling/number of students engaged in higher education, R&D spend, speed of academic papers being published, patents being approved, ratio of private to state owned investments and the like. Yet solid statistical relationships are hard to establish.

China downside scenario

Variable	Description
GDP growth	5-year average of 4%, shifts lower to 3% in 10 years
Inflation	GDP deflator 1% (calculated as $2/3 \cdot \text{CPI} + 1/3 \cdot \text{PPI}$)
Earnings growth	Less than GDP growth, assume margin erosion
Yields	Yield curve lower and flatter such that real rates hit zero. Interest rates still above DM economies
Exchange rate	Assume CNY hitting 7.4-7.8 per USD in 5 years

Appendix

Indices

US aggregate bonds = Bloomberg Barclays US Aggregate Total Return Index

US Treasuries = Bloomberg Barclays US Aggregate Government Index

US long Treasuries = Bloomberg Barclays U.S. Long Treasury Index

US short Treasuries = Bloomberg Barclays U.S. Short Treasury Index

US long credit = Bloomberg Barclays U.S. Long Credit Index

US high yield = Bloomberg Barclays U.S. High Yield Index

US IG credit = Bloomberg Barclays U.S. Investment Grade Index

US agency MBS = Bloomberg Barclays US MBS Index

European government bonds = Bloomberg Barclays Global Aggregate Euro Treasury index

European inflation-linked government bonds = ICE BofA-ML EMU Direct Government Inflation Linked index

Euro IG credit = ICE BofA-ML Euro Corporate index

Chinese government bonds = Bloomberg Barclays China Treasury + Policy Bank Total Return Index

Global high yield = Bloomberg Barclays Global High Yield index

US large cap equities = MSCI USA Index

US small cap equities = MSCI USA Small Cap Return Index

DM ex US large cap equities = MSCI World ex-US Index

DM high yield = Bloomberg Barclays Global High Yield Total Return Index

DM government bonds = Bloomberg Barclays Global Aggregate Treasuries

DM ex US government bonds = Bloomberg Barclays Global Aggregate Treasury Index ex US

DM ex US credit = Bloomberg Barclays Global ex-USD Credit Index

Europe large-cap equity = MSCI Europe Index

Asia Pacific DM ex-Japan equity = MSCI Developed Asia Pacific ex-Japan index

China equities = MSCI China

Japan equity = MSCI Japan index

EM debt - hard currency = JP Morgan EMBI Global Diversified Total Return Index

EM debt - local currency = JP Morgan GBI-EM Total Return Index

EM equity = MSCI Emerging Markets Index

Global infrastructure debt = 50% Bloomberg Barclays European Infrastructure EUR Index/50% Bloomberg Barclays US Corporate 10+ Baa3-A3 Utility

Hedge funds (global) = HFRI Composite Index

US infrastructure debt = BlackRock proxy*

US real estate = BlackRock proxy*

Global core real estate = BlackRock proxy*

Global direct lending = BlackRock proxy*

US private equity (buyout) = BlackRock proxy*

Mezzanine debt = BlackRock proxy*

*We use BlackRock proxies for selected private markets because of lack of sufficient data. These proxies represent the mix of risk factor exposures that we believe represents the economic sensitivity of the given asset class.

Fee assumptions

	Index or beta	Alpha-seeking
Equities	0.15%-0.5%	0.4%-0.8%
Government bonds	0.15%-0.3%	0.2%-0.25%
Investment grade credit	0.1%-0.3%	0.2%-0.25%
Sub-investment grade credit	0.4%-0.5%	0.4%-0.5%
Private markets	N/A	0.5%-5.0%

Sources: Mercer Global Asset Manager Fee Survey 2017, Morningstar, BlackRock estimates. Note: Fee assumptions are given as ranges given the wide range of asset classes, currencies and datasets we consider in our calculations.

BlackRock Investment Institute

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BlackRock's Long-Term Capital Market Assumption Disclosures: This information is not intended as a recommendation to invest in any particular asset class or strategy or product or as a promise of future performance. Note that these asset class assumptions are passive, and do not consider the impact of active management. All estimates in this document are in US dollar terms unless noted otherwise. Given the complex risk-reward trade-offs involved, we advise clients to rely on their own judgment as well as quantitative optimisation approaches in setting strategic allocations to all the asset classes and strategies. 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. If the reader chooses to rely on the information, it is at its own risk. 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 purposes only and are subject to significant limitations. "Expected" return estimates are subject to uncertainty and error. Expected returns for each asset class can be conditional on economic scenarios; in the event a particular scenario comes to pass, actual returns could be significantly higher or lower than forecasted. Because of the inherent limitations of all models, potential investors should not rely exclusively on the model when making an investment 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 future returns.

Index Disclosures: Index returns are for illustrative purposes only and do not represent any actual fund performance. Index performance returns do not reflect any management fees, transaction costs or expenses. Indices are unmanaged and one cannot invest directly in an index.

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