

For professional investors

# MEDIUM-TERM ASSET ALLOCATION VIEWS



WHAT TO EXPECT IN THE NEXT  
5 TO 7 YEARS?



**BNP PARIBAS**  
**ASSET MANAGEMENT**

The asset manager  
for a changing  
world

## FOREWORD

BNP Paribas Asset Management has a longstanding history of providing asset allocation advice to our institutional clients. This included studies for pension funds and insurance companies to optimise their long-term strategic asset allocation. But also portfolio allocations based on medium-term expected returns to ensure an optimal allocation of asset classes in their portfolios, taking into consideration global and regional economic cycles. Clients have appreciated this highly and we believe that this is interesting for all institutional clients.

Institutional investors face great challenges after a prolonged period of declining yields and very accommodative monetary policy by the main central banks. These include the continuous search for yield as the more traditional fixed-income asset classes are expected to generate low returns. Also the growing pressure of regulation has impacted the management of portfolios, especially when derivatives are involved. The emergence of more sophisticated investment vehicles can bring additional benefits from a risk perspective, but also require a more thorough understanding before implementation.

In this environment, we assist clients in constructing robust portfolios that are aligned with their risk appetite and objectives. This requires a well-defined process in which an optimal combination of qualitative and quantitative inputs in the portfolio construction phase is essential. At BNP Paribas Asset Management we believe that we are well positioned to be successful.

In this publication, we describe in more detail our process to come to expected returns for a large number of asset classes. You may find that our return expectations are moderate compared to those of the past, for many asset classes these are lower than their long-term averages. This illustrates the difficult environment for investors, but it also shows the need for a well thought-out portfolio allocation and construction process in which diversification across assets and regions play an important role. It is of eminent importance to select those assets that bring real added value to the portfolio.

We hope this publication will help you define and construct the most optimal portfolio.



- Anton Wouters -

Head of Solutions & Client Advisory team



## EXECUTIVE SUMMARY

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The adjustment to normalised monetary policy is taking place only slowly. Fears of a violent adjustment in US interest rates triggered by a combination of rising inflation, bigger budget deficits and a less bond-acquisitive Fed have proved unfounded and we believe will continue to be so. Developed market central banks will be extremely cautious and we expect both equity and fixed-income markets will have time to adjust.

This does not mean the returns will not be challenged. Many equity markets are trading at above-average multiples when margins are already high, while outside of the US, few developed fixed-income markets offer yields anywhere near historical norms.

Over the near term, the “sugar rush” of US economic growth should help risk assets generate positive returns. But coming down from the rush is still likely to prove painful.

Against this backdrop, allocating assets for the medium term is challenging. We expect 10-year government bond yields to rise by 0.9% to 2.2% in the eurozone and by around 0.4% to 3.4% in the US over the next five to seven years.

Inflation-linked bonds in euro and US inflation-linked bonds look more attractive due to the low inflation risk premium and inflation expectations that are picking up.

In excess-over-local-cash terms, we expect developed market investment-grade credit returns to hover at around 1%. Within the high-yield bond segment, we are least positive on the US market. In terms of dislocations in current risk premia versus long-term/target levels, there are small differences. The lower excess return from US high-yield bonds is mainly driven by the, on average, lower rating in combination with our expectation of higher (or rising) interest rates constituting a greater credit risk for lower-quality bonds.

Given the currently high valuations, equity markets are expected to generate gains markedly below the long-run averages.



**- Koye Somefun -**

**Head of Multi Asset & Solutions  
in Quant Research Group**



**- Daniel Morris -**

**Senior Investment Strategist**



# FROM GOLDILOCKS TO A FISCAL SUGAR RUSH

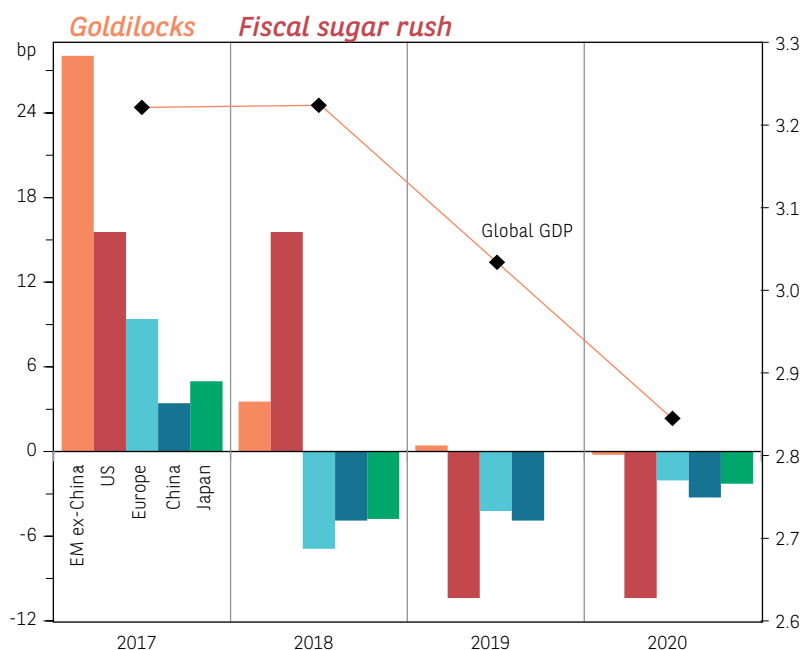


The Goldilocks combination is still mostly intact in the US. Elsewhere, however, growth has faltered

Over the last year, we have gone from the Goldilocks paradigm to a new one which we call a “fiscal sugar rush”. Goldilocks was characterised by an investment environment that was “just right”, neither too hot nor too cold, with moderate inflation, low market volatility, and above-trend economic growth across much of the globe.

Notice how for 2017 in Figure 1, when real global GDP growth was running at over 3.2%, all the main regions contributed to that growth. The Goldilocks combination is still mostly intact in the US (volatility as measured by the VIX has risen, but is still below its long-run average). Elsewhere, however, growth has faltered, leaving the US as a major source of marginal demand.

**Figure 1: Contribution to change in real global GDP growth** (contributions to GDP in bp on left-hand scale; GDP growth in % (2018 forecasts) on right-hand scale)



Sources: FactSet, BNP Paribas Asset Management. No assurance can be given that any forecast, target or opinion will materialise.

Figure 1 underlines this: while global growth in 2018 is as high as it was in 2017, practically the sole source of that growth is the US. The reasons are simple: a 10-year USD 1.5 trillion tax cut package, followed by USD 300 billion in additional spending over two years. Growth in any economy would accelerate with this amount of stimulus. The figure also illustrates, however, that the effects of fiscal stimulus will eventually fade and the rest of the world will not be able to compensate for the slowdown in US growth.

The environment for risk assets is nonetheless likely to remain positive. While global growth is projected to slow over the next few years to 2.8% in 2020, it remains robust. The likelihood of the US entering recession before then is low. The key risks remain the outbreak of a global trade war, a hard Brexit, or a central bank policy mistake as central banks attempt to exit from the extraordinary monetary policy of the last decade. These risks are neither new nor unknown, however, and we remain alert and attentive to their impact on our portfolios if any of them materialise.

# EXTRAORDINARY MONETARY POLICY, WHAT'S NEXT?

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The partial normalisation of US monetary policy, and the resulting impact on US fixed-income asset returns, illustrate the challenges investors in Europe and Japan will face in the years ahead. Over the last 12 months through 30 September 2018, almost none of the US Bloomberg Barclays fixed-income indices generated positive total returns. High-yield is the notable exception, but the prospect of a slowing US economy amid high corporate debt ratios suggests this outperformance will not last.

There is also a discrepancy between the market's expectations of the magnitude of interest-rate rises by the US Federal Reserve (Fed) over the next two years and the outlook for growth and inflation. Growth expectations, in fact, are quite similar between the Fed and consensus economist estimates. Inflation expectations remain subdued in the US despite an ever-tightening labour market and, naturally, the Fed itself expects its policies to result in an inflation rate matching its objective. The disconnect? The Fed projects reaching this combination of growth and inflation by raising the Fed funds target rate by an additional 138bp by the end of 2020, while the market believes it will be just another 84bp (as at 21 September 2018). Which forecast turns out to be correct is crucial, but it is worth remembering that there was a similar gap between the Fed and the market at the beginning of 2017 and 2018 and by and large, the Fed has stuck to the path it laid out.

The other crucial question is if and when the increase in the US budget deficit that inevitably follows from the stimulating tax cuts and spending package collides with the decreasing demand for bonds from the Fed as it runs down its balance sheet. Borrowing by the US government is projected to top USD 1 trillion per year for the next few years compared to around USD 500 billion in 2017.

At the same time, the Fed is continuing to shrink the size of its balance sheet from a peak of over USD 4.5 trillion in 2015 to USD 4.3 trillion today. The size of the Fed's balance sheet at termination will be critical to the US Treasury bond market as investors consider the possibility that it may be higher than the original projections of USD 2.5-3 trillion. If this turns out to be true, the increase in US Treasury yields may be less than initially projected.

A combination of robust economic growth and normal levels of inflation would nonetheless argue for US 10-year Treasury yields to be perhaps 50bp higher than average levels so far this year. One factor keeping them low has been political risk associated with concerns about the future of Donald Trump's presidency, the prospect of trade wars, etc. These risks are unlikely to dissipate so long as Trump remains president, suggesting that US rates will not rise by as much as fundamentals suggest they should.

The European Central Bank (ECB) will probably continue to move slowly in unwinding its stimulus as both growth and inflation continue to disappoint in the eurozone. Though quantitative easing (QE) will end by December this year, we do not anticipate any increase in interest rates before October 2019 and the reinvestments are likely to continue. While Bund yields will still be "pulled up" by rising US interest rates, a near-term selloff is unlikely. There is the ever-present "peripheral zone risk", now concentrated in Italy, but we do not expect developments there to spread beyond local markets.



When will the increase in the US budget deficit from the tax cuts and spending package collide with the drop in demand for bonds from the Fed?

# WHAT HAS BEEN DRIVING EMERGING MARKET BONDS?



Emerging markets can withstand the current turbulence and EM currencies and debt now offer attractive risk-adjusted prospective returns

Emerging market assets have suffered from the pernicious combination of rising US interest rates and a rising US dollar. Either one of these factors alone has not generally cause broad emerging market stress. We expected at the beginning of the year that US rates would rise by more than the market forecast, but that the US dollar would depreciate. The surprise has been President Trump's decision to use tariffs as a tool to force changes in the policies of US trade partners. Regardless of the outcome of the ongoing negotiations, the short-term impact has been clearly positive for the US dollar and hence negative for many emerging market assets.

This has created an opportunity: valuations have improved, while the fundamentals remain solid. Although some countries have suffered dramatically this year, this has largely been due to questionable economic or monetary policy decisions rather than broader emerging market weakness. There has also been a correlation between macroeconomic vulnerabilities, such as sizeable current account deficits and/or large amounts of USD-denominated debt, and the change in the value of a country's currency.

The turmoil has nonetheless damaged emerging market growth. The change in purchasing manager indices has turned negative recently, even as the absolute level for most countries is still above 50, indicating economic expansion. But we are far from a situation like the Asian financial crisis when vulnerabilities were much greater and many countries had fixed exchange rates and low foreign currency reserves. We believe emerging markets can withstand the current turbulence and that EM currencies and debt now offer attractive risk-adjusted prospective returns over a long-term investment horizon.



# ECONOMIC ASSUMPTIONS

Economic theory stipulates that the yield curve should ultimately be bound by economic conditions. A simple, but intuitive way of rendering this notion more concrete is to say that for yields to be sustainable, they should in the long run not exceed long-term nominal GDP trend growth. As a broad principle, this gives a concrete long-term target or equilibrium level for 10-year government bond yields: i.e. trend real GDP growth plus trend inflation and a long-term inflation risk premium. Current macroeconomic conditions then determine how realistic this target is.

In the eurozone, the ECB reduced its QE programme to only EUR 30 billion in first quarter of 2018 and is due to end the programme by the end of this year. This will not mean a sudden return to normality. For example, we expect the ECB to carefully manage the manner in which the reduction of the purchased bonds will suppress the equilibrium yield in the years to come. Of the large central banks, the Fed is leading the way in moving from QE to quantitative tightening. It has been trimming its balance sheet since mid-2017 (see [https://www.federalreserve.gov/monetarypolicy/bst\\_recenttrends.htm](https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm)). The Fed's balance sheet is, however, still substantial and we expect it to continue leading the way in carefully managing the reduction.

Table 1 summarises our macroeconomic assumptions and the resulting target 10-year yield that is included in our Medium-Term Asset Allocation (MTAA) model for government bonds. Additional inputs to the MTAA model include the current yield curve and an assumption that the curves will (partly due to the overhang of QE) converge to their long-term shape and level at a pace that is slightly slower than the historical average.

**Table 1: Overview of long-term macroeconomic assumptions (in %)**

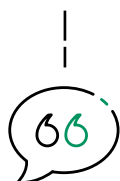
	euro	core euro	UK	US
Inflation expectations	1.9	1.9	2	2
Real GDP growth expectations	1.5	1.5	1.9	1.7
Long-term inflation risk premium	0.4	0.4	0.4	0.4
Long-term target 10-year yield	3.8	3.8	4.3	4.1

Source: BNP Paribas Asset Management, as of 30 September 2018

Based on these inputs, the MTAA model computes the expected yield curve level and the corresponding expected return in five to seven years' time; this investment horizon roughly corresponds with the average economic business cycle.



# GOVERNMENT BONDS



Core eurozone  
interest rates will  
rise relatively slowly

Table 2 details the actual and expected yield of 10-year government bonds when the model was run, showing that 10-year yields are expected to rise over the next five to seven years by around 90bp for the eurozone; around 100bp for the UK; 80bp for core euro and around 40bp for the US. These modest increases are in line with our view that monetary policy will continue to suppress the convergence to the target yields; additionally, the absolute adjustment of US yields is smallest as the convergence or normalisation process has advanced the most.

**Table 2: Yield rise predicted by MTAA model over the next five to seven years (in %)**

	euro	core euro	UK	US
Current 10-year yield	1.3	0.4	1.6	3.1
Expected 10-year yield in 5-7 years	2.2	1.3	2.5	3.4
Predicted change in 10-year yield	0.9	0.8	1.0	0.4

Source: BNP Paribas Asset Management, as of 30 September 2018

In Table 3 you see the expected returns of government bonds and cash derived from the MTAA model. The expected slow unwinding of QE in the eurozone means that core government bonds in the bloc will have the lowest expected return over the next five to seven years at 0.25% compared to a relatively bountiful 3% on US Treasuries.

With an expected return of only 0.75%, the forecast for UK government bond yields is also relatively bleak. The low return expectations for core eurozone reflect at least in part our view that interest rates will rise relatively slowly from current low levels relative to the long-term macroeconomic assumptions (see Table 2).

**Table 3: Average expected local currency returns over the next five to seven years based on our MTAA model (in %)**

Cash - euro	Cash - UK	Cash - USD	Bonds - euro govt.	Bonds - euro govt. core	Bonds - UK govt.	Bonds - US govt.
0.25	1	2.75	1	0.25	0.75	3

Source: BNP Paribas Asset Management, as of 30 September 2018





# INFLATION-LINKED BONDS

Expected returns of inflation-linked government bonds (in local currency) from the MTAA model are detailed in Table 4. Currently, the inflation risk premium for US and euro bonds is low, i.e., the reward investors receive on nominal bonds is currently not significantly higher than the reward on a corresponding inflation-linked bond. Additionally, inflation expectations have picked up for these two regions, making investment in euro and US inflation-linked bonds much more attractive than, say, a year ago.

**Table 4: Average expected local currency returns of inflation-linked bonds over the next five to seven years based on our MTAA model (in %)**

	Bonds - euro infl. linked	Bonds - US infl. linked	Bonds - UK infl. linked
Expected total return	1.25	2.75	-1.5

Source: BNP Paribas Asset Management, as of 30 September 2018

# INVESTMENT-GRADE AND HIGH-YIELD BONDS

What has been unusual about index returns in the US and Europe this year has been the underperformance of investment-grade credit in an environment where growth remains good and credit metrics are stable or improving.

The culprits have been technical factors and valuations. The US tax reform was expected to lead to deleveraging by US corporates, as it would no longer be necessary to raise cash domestically to offset cash held offshore and the increase in profits could be used to buy back previously issued bonds. Corporate debt issuance has instead remained high, even as there have been outflows from corporate bond funds. The modest risk premium over US Treasuries offered by investment-grade bonds means there has been insufficient income to offset the rise in base rates.

The higher risk premia in high-yield, while still below historical averages, has been sufficient to offer better relative returns. This has been somewhat less the case in Europe due to spill-over from market concerns about Italy and Brexit. We believe the fundamental outlook for both markets remains good in the medium term.



# MEDIUM-TERM CREDIT RETURN PREDICTIONS

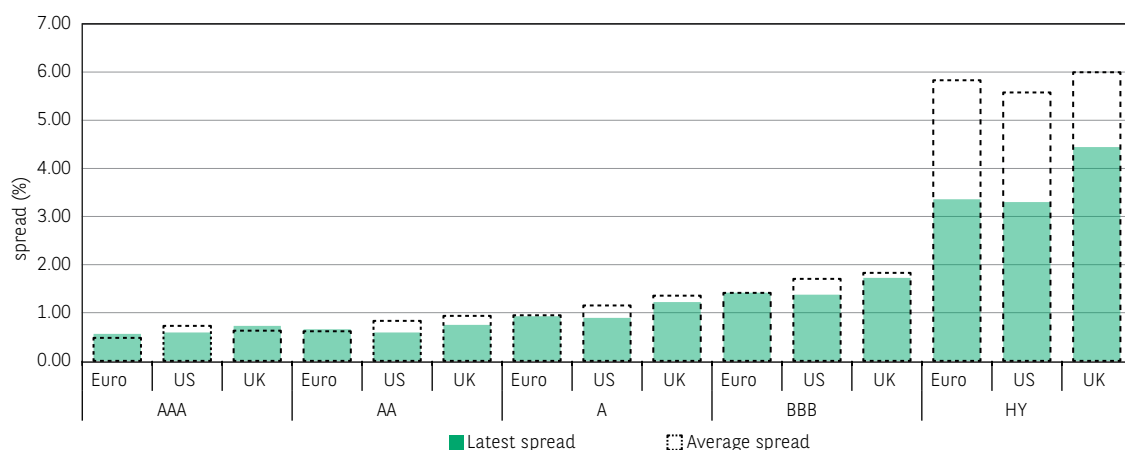
Current spreads, target spreads and the probabilities of rating migrations play a key role in determining the returns of corporate credit in our MTAA model. Figure 2 shows that current spreads on investment-grade credit are more or less aligned with long-term average spreads. For high-yield, the picture is slightly different: current spreads are below the long-term average. Consequently, we expect high-yield bond spreads to widen.

For corporate bonds, we believe a focus on default probabilities is too narrow. Especially for investment-grade corporate bonds, a rating downgrade is a bigger risk. Investors often refer to this as the risk of an issuer becoming a ‘fallen angel’. To take this into account, we include Moody’s long-term and forecast rating migration matrices in our MTAA model. Based on in-house research, we have slightly modified elements of the forecast rating migration matrix so that it better reflects the risk that rising interest rates pose for lower-quality bonds (especially US high-yield).

To ensure consistency, the MTAA credit model builds on the government bond model, i.e., it explicitly models the spread curve (per rating bucket) on top of the relevant government model. Thus, the core eurozone government bond yield curve is the basis for the eurozone credit curve.

As with the government bond yield model, we take a two-step approach: first, we model the credit curve (broken down into a government bond yield and risk premia curve) and secondly, we model a particular index as a collection of (weighted) points on the credit yield curve (i.e., we model an index as a cash-flow pattern). Decoupling the modelling of the credit curve from that of the target index allows for greater flexibility in considering non-standard/highly-customised indices with, for example, longer or shorter duration or lower or higher average credit quality.

**Figure 2: Average and latest credit risk premia for various credit ratings and regions based on the Bloomberg Barclays Aggregate corporate indices**



Data as of 30 September 2018. The latest spread is the average of Q3 2018. Source: BNP Paribas Asset Management, Bloomberg

Table 5 shows the expected returns for the standard Bloomberg Barclays Aggregate corporate indices in local currencies and in both absolute and relative terms (excess over local cash). The differences in absolute returns are mainly driven by differences in the underlying government bond yield curves.

In excess return (and for hedged return) terms, we do not have a strong regional preference, except for US high-yield bonds that show a significantly lower expected return than the UK and euro area, of 2% versus 3.75% and 3.5%, respectively.

In terms of dislocations in current spreads versus long-term/target spreads, there are small differences. The lower excess return from US high-yield bonds is mainly driven by the higher credit risks that higher interest rates constitute for lower-quality bonds (as mentioned above).

Table 6 further illustrates this point of lower ratings of US high-yield bonds relative to their euro and UK counterparts. For example, there are more than twice the number of lowest, C, graded US high-yield bonds, making the segment more sensitive to the risk of higher interest rates.

**Table 5: Average expected local currency total returns and excess returns over local cash for the next five to seven years (in %)**

	Bonds - euro credit IG	Bonds - euro credit HY	Bonds - UK credit IG	Bonds - UK credit HY	Bonds - US credit IG	Bonds - US credit HY
Expected total return	1.25	3.75	2.25	4.75	3.75	4.75
Excess over local cash	1	3.5	1.25	3.75	1	2

Source: BNP Paribas Asset Management, as of 30 September 2018

**Table 6: Overview of the breakdown of HY ratings for Bloomberg Barclays Aggregate corporate indices**

	euro	UK	US
BB	62.7%	50.7%	42.9%
B	31.6%	42.2%	42.0%
C	5.7%	7.1%	15.1%

Source: BNP Paribas Asset Management, Bloomberg, as of 30 September 2018



# EQUITIES

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Amid trade tariff threats and taper tantrums, at least US equity markets have been able to outperform fixed income this year, although, as noted previously, that should not have been difficult when companies received such a huge boost to profit margins.

Emerging market equities have lagged as central banks have had to not only offset the rise in US rates, but also defend the value of their currencies. In local currency terms, however, profit forecasts have continued to rise, signalling that the outlook for emerging markets is still good. Net margins are forecast to be 10.8% over the next 12 months, in line with long-run averages. This is encouraging because in the US, Europe and Japan, margins are above long-run averages, meaning it will be comparatively more difficult for companies in those countries to generate higher profits. The poor performance of European equities is at least partly due to President Trump's trade tactics, but since we expect these concerns to lessen once we are past the US mid-term elections, Europe should recover.

Aside from the earnings outlook, the biggest factor in favour of European equities is valuations. These appear attractive relative to the US. This advantage persists even when you remove the highly-valued US technology sector from the calculation. The difference in valuations is partly explained by the faster earnings growth in the US over the last few years, but even on a PEG (price-earnings-to-growth) basis, Europe appears better valued for higher medium-term returns.

# MEDIUM-TERM EQUITY RETURN PREDICTIONS

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To predict the expected return of equity markets, the MTAA model looks at the cyclically adjusted price/earnings ratio (CAPE), also known as the Shiller P/E. The CAPE divides the current real price of a broad market index by a 10-year average of its inflation-adjusted earnings. A higher (lower) than average CAPE of a broad equity market index provides a good indication of the market being relatively expensive (cheap). It typically takes time for these dislocations in equity prices to normalise, so statistical models (such as our MTAA model) that use the CAPE are particularly effective for investment horizons of 3-10 years.

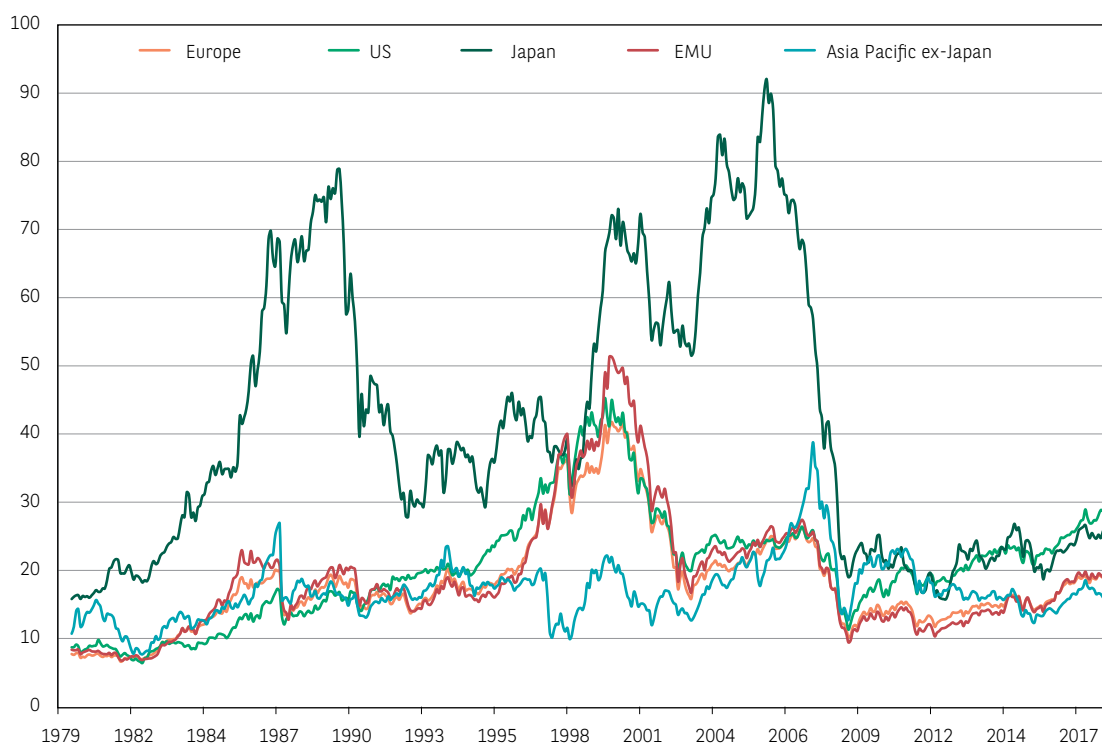
Expected returns for most developed world equity markets have remained low, but relatively stable since mid-2017 as the price-earnings ratio was at a relatively stable, but elevated level. The cut in corporate tax in the US is partly responsible for US markets (and consequently CAPE) rising by the most among the major markets. This has made the US market one of the more expensive markets in terms of the CAPE metric. For the US, we forecast an annual excess return of just 2.0%. Given an expected return on US cash of 2.75% – one of the highest among the developed markets (see Table 3) – the expected US total local currency return rises to 4.75%.

It is notable that the CAPE ratio for US equities is the highest of all the major regions, which is a rare occurrence (see Figure 3). Valuations of European equities, on the other hand, have remained relatively more attractive. Although earnings growth has disappointed of late, the cyclical recovery continues in Europe and many of the issues triggered by the global financial crisis (such as the posited need for some form of eurozone banking union) are slowly being addressed.

As a result, European equities have more scope for gains – as much as 3.25% in excess return terms. This exceeds our forecast excess returns from US equities. Since we estimate the average return on cash for Europe to be around 0.25%,

US equities still look more attractive in total local currency return terms relative to European equities (Table 7). This advantage would disappear if a euro investor hedged the currency risk. Using the expected cash differential as an indicator, the estimated hedging cost would be around 2.5%, reducing the total return on US equities to 2.25%.

**Figure 3: Cyclically adjusted price/earnings (CAPE) ratio for global developed and emerging market equities**



Source: Thomson Reuters Datastream, BNP Paribas Asset Management, as of 30 September 2018

As can be seen from Table 7, emerging equity markets continue to offer relatively attractive expected returns. For emerging markets as a whole, we foresee gains of 7%, with a lower potential gain in Asia. There has been concern that emerging economies will not return to historical growth rates, notably now that China has reached middle-income status. The worry is that this will lead to lower emerging market equity returns.

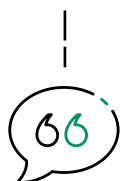
We believe this view is overly pessimistic. Emerging markets still account for more than 80% of the world’s population, with China representing just 30% of the emerging market total and its share declining. Demographics in the form of youthful and growing populations still strongly favour emerging markets over developed markets.

**Table 7: Total expected equity returns in local currencies (in %)**

	Equities - US	Equities - Europe	Equities - Japan	Equities - Pacific ex Japan	Equities - global emerging
Expected total return	4.75	3.5	4	5.75	7

Source: BNP Paribas Asset Management, as of 30 September 2018

# TO HEDGE OR NOT TO HEDGE CURRENCY EXPOSURE?



We advise investors to hedge the exposure to most currencies, with JPY a notable exception

With the likely sharp contrast between the level of US and eurozone government bond returns, euro investors could feel encouraged to invest in US government bonds. As a rule of thumb, we argue that an investor should hedge the currency risk of their fixed-income investments as it could otherwise dominate the volatility of their fixed-income exposure. As a proxy for the hedging cost, we take the difference between US cash and euro cash returns, resulting in a hedging cost of 2.5%. As a result, the euro-hedged returns of US government bonds drop to 0.5%, which is 50bp lower than the expected return on eurozone government bonds (see Table 3).

For euro investors who are invested mainly in core eurozone government bonds, an exposure to US government bonds would imply a marginal pickup in return (as the expected return on core euro government bonds is 0.25%). More generally speaking, exposure to hedged US government bonds does not look compelling given the high hedging costs.

Another facet in determining whether one should hedge one's foreign currency exposure is the return we can expect on this exposure. We use the MTAA currency model for this. The focus is to determine the extent to which currencies are overvalued or undervalued, using the MTAA currency model's relative purchasing power parity approach. The assumption is that if prices in country A rise relative to those in country B, we would expect to see a depreciation of country A's nominal exchange rate (i.e. a rise in the number of units of currency A necessary to buy one unit of currency B).

Table 8 gives the expected return from a euro investor's point of view. In terms of relative purchasing power parity, the USD and AUD are relatively overvalued versus the euro and JPY is undervalued. Taking into account valuation, hedging cost, but also the extent to which hedging can reduce portfolio risk, we would at the moment typically advise investors to hedge the currency exposure for most currencies, with JPY being a notable exception.

**Table 8: Average annual expected currency returns over the next five to seven years for a euro-based investor**

	USD	EUR	GBP	JPY	CHF	CAD	AUD
Expected return	-1.4%	n/a	0.3%	3.5%	-0.6%	-0.1%	-2.0%

Source: BNP Paribas Asset Management, as of 30 September 2018

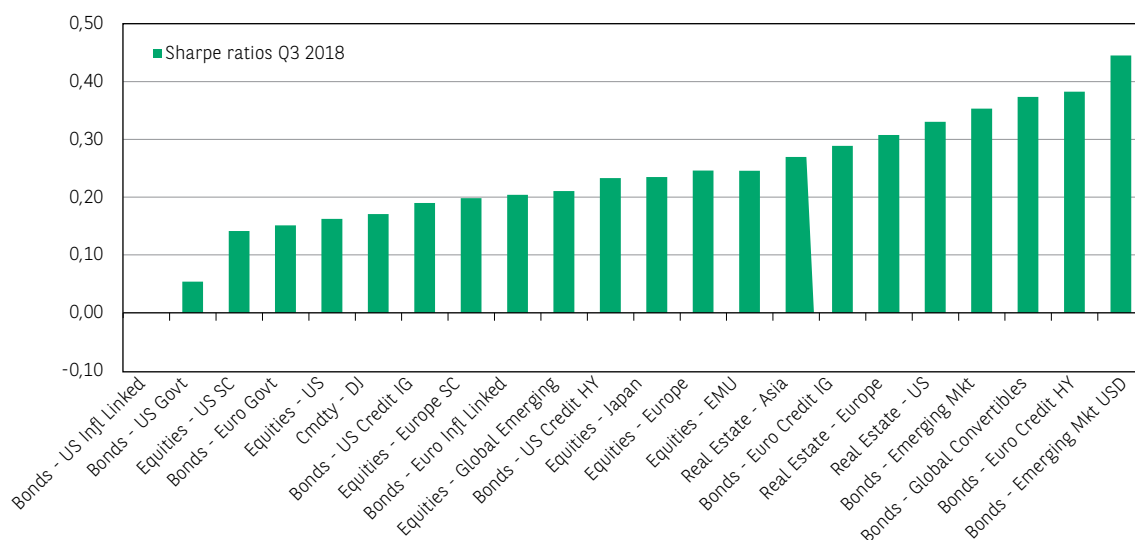


# PORTFOLIO CONTEXT

Having so far focused exclusively on asset returns, riskiness is clearly also an important aspect of an asset’s attractiveness. Figure 4 shows the risk-adjusted return of various asset classes by looking at the Sharpe ratios where we use euro cash as the risk-free rate, taking the perspective of a euro-based investor. We also assume that, with the exception of exposure to emerging market debt in local currencies and equity, all currency exposure is hedged and we explicitly incorporate hedging costs. These can be significant.

Figure 4 illustrates our overall relatively modest outlook, with Sharpe ratios not exceeding 0.5. However, we are comparatively positive on risky credit exposure over equity exposure. Choosing between equity and listed real estate, we prefer the latter. Finally, we are most negative on the risk-adjusted return of US Treasuries.

**Figure 4: Sharpe ratios for a euro-based investor**



Source: BNP Paribas Asset Management, as of 30 September 2018



# RISK AND RETURN EXPECTATIONS FOR A BROAD SUB-SET OF MTAA MODEL

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Our MTAA model covers a broad range of assets. To illustrate this, Table 9 lists the expected risk and return (in local currencies) for a large sub-set of the assets covered. Additionally, Table 10 depicts the correlation between the asset classes.

Volatility and correlations of the assets shown are obtained simultaneously by directly estimating the covariance matrix of returns across asset classes. The available returns history can differ widely between assets, so we have chosen an approach that can deal with disparate histories in the chosen return series. Based on the covariance matrix, we can obtain both the standard deviation (by taking the square root of the diagonal elements) and the bivariate correlations (by taking the off-diagonal elements divided by the corresponding standard deviations).

Estimated covariance matrices are seldom stable over time and we take this into account in our estimate. Specifically, our estimate is not obtained by applying equal weights over an historical sample. Instead, more recent observations are assigned a heavier weighting than observations in the distant past by applying an exponential smoothing device. Weights decrease exponentially over time using this approach.





**Table 9: Annualised expected risk and return in local currencies\***

Cash	Return (in %)	Risk
Cash - UK	1	2
Cash - euro	0.25	3
Cash - USD	2.75	1
<b>Fixed Income</b>		
Bonds - euro govt	1	5
Bonds - euro govt core	0.25	4
Bonds - UK govt	0.75	6
Bonds - US govt	3	5
Bonds - euro infl linked	1.25	5
Bonds - US infl linked	2.75	5
Bonds - UK credit IG	2.25	6
Bonds - UK credit HY	4.75	11
Bonds - euro credit IG	1.25	3
Bonds - euro credit HY	3.75	9
Bonds - euro leveraged loans	2.5	6
Bonds - US credit IG	3.75	5
Bonds - US credit HY	4.75	8
Bonds - emerging markets USD	6.25	8
Bonds - emerging markets	7	12
<b>Equity</b>		
Equities - US	4.75	12
Equities - US sc	5	16
Equities - europe	3.5	13
Equities - EMU	4	15
Equities - Japan	4	18
Equities - Pacific ex Japan	5.75	13
Equities - global emerging	7	20
Equities - World	4.25	12
<b>Alternatives</b>		
Real estate - europe	5.25	16
Real estate - US	8.25	16
Real estate - Asia	6	17
Bonds - global convertible	4.25	7
Commodity	6	19

\*Except emerging market debt in local currency and emerging equity, which are denominated in USD.  
Source: BNP Paribas Asset Management, as of 30 September 2018

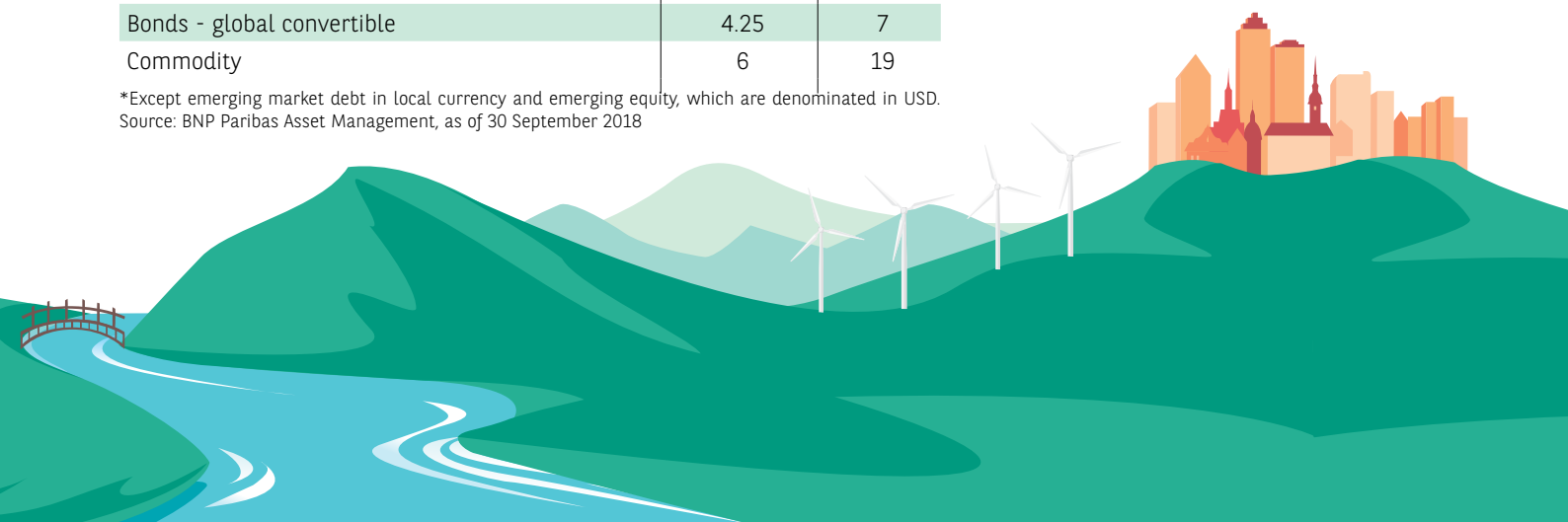


Table 10: Expected correlations

Correlation Matrix	Cash - UK	Cash - Euro	Cash - USD	Bonds - Euro govt	Bonds - Euro govt core	Bonds - UK govt	Bonds - US govt	Bonds - Euro infl linked	Bonds - US infl linked	Bonds - UK credit IG	Bonds - UK credit HY	Bonds - Euro credit IG	Bonds - Euro credit HY	Bonds - Euro leveraged loans
Cash - UK	1.0													
Cash - Euro	1.0	1.0												
Cash - USD	1.0	0.9	1.0											
Bonds - Euro govt	0.4	0.4	0.3	1.0										
Bonds - Euro govt core	0.4	0.4	0.3	0.9	1.0									
Bonds - UK govt	0.1	0.1	0.0	0.6	0.7	1.0								
Bonds - US govt	0.6	0.6	0.5	0.7	0.8	0.7	1.0							
Bonds - Euro infl linked	0.2	0.2	0.2	0.6	0.5	0.2	0.2	1.0						
Bonds - US infl linked	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.4	1.0					
Bonds - UK credit IG	0.0	0.0	-0.1	0.5	0.5	0.5	0.3	0.4	0.4	1.0				
Bonds - UK credit HY	0.0	0.0	0.0	0.1	0.0	-0.1	-0.1	0.3	0.2	0.6	1.0			
Bonds - Euro credit IG	0.1	0.1	0.0	0.7	0.6	0.3	0.3	0.6	0.4	0.8	0.7	1.0		
Bonds - Euro credit HY	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.3	0.3	0.2	0.5	0.9	0.6	1.0	
Bonds - Euro leveraged loans	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	0.2	0.1	0.4	0.7	0.4	0.8	1.0
Bonds - US credit IG	0.3	0.3	0.3	0.6	0.6	0.5	0.6	0.5	0.7	0.7	0.5	0.8	0.5	0.3
Bonds - US credit HY	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	0.3	0.4	0.5	0.8	0.6	0.9	0.8
Bonds - emerging markets USD	0.2	0.2	0.2	0.4	0.3	0.3	0.3	0.5	0.6	0.6	0.6	0.7	0.6	0.4
Bonds - emerging markets	0.2	0.2	0.2	0.3	0.1	0.1	0.2	0.4	0.5	0.5	0.5	0.6	0.5	0.3
Equities - US	-0.1	-0.2	-0.1	-0.2	-0.3	-0.3	-0.4	0.2	-0.1	0.4	0.6	0.4	0.7	0.6
Equities - US sc	-0.1	-0.1	0.0	-0.2	-0.3	-0.3	-0.4	0.2	-0.1	0.3	0.5	0.3	0.6	0.6
Equities - Europe	0.1	0.0	0.1	0.0	-0.1	-0.2	-0.3	0.3	0.0	0.4	0.6	0.4	0.7	0.6
Equities - EMU	-0.1	-0.1	-0.1	-0.2	-0.4	-0.5	-0.5	0.1	-0.3	0.1	0.3	0.2	0.5	0.5
Equities - Japan	0.1	0.1	0.1	0.0	-0.1	-0.2	-0.2	0.3	0.2	0.5	0.6	0.5	0.7	0.6
Equities - Pacific ex Japan	0.1	0.1	0.1	0.0	-0.1	-0.1	-0.1	0.4	0.3	0.4	0.7	0.5	0.7	0.6
Equities - global emerging	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.3	0.3	-0.1	0.4	0.6	0.4	0.7	0.6
Equities - World	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4	0.2	-0.1	0.4	0.6	0.4	0.7	0.6
Real estate - Europe	-0.1	-0.1	-0.1	0.2	0.1	0.0	-0.1	0.3	0.1	0.5	0.6	0.5	0.6	0.6
Real estate - US	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.3	0.3	0.6	0.6	0.6	0.6	0.6
Real estate - Asia	0.0	0.0	0.0	0.2	0.1	0.0	-0.1	0.4	0.2	0.5	0.5	0.5	0.6	0.5
Bonds - global convertible	0.1	0.1	0.0	0.0	-0.2	-0.3	-0.3	0.3	0.1	0.4	0.7	0.5	0.8	0.7
Commodity	0.2	0.1	0.2	-0.2	-0.2	-0.2	-0.1	0.2	0.3	0.1	0.3	0.2	0.4	0.4

Source: BNP Paribas Asset Management, as of 30 September 2018

Bonds - US credit IG	Bonds - US credit HY	Bonds - emerging markets USD	Bonds - emerging markets	Equities - US	Equities - US sc	Equities - Europe	Equities - EMU	Equities - Japan	Equities - Pacific ex Japan	Equities - global emerging	Equities - World	Real estate - Europe	Real estate - US	Real estate - Asia	Bonds - global convertible	Commodity
1.0																
0.6	1.0															
0.8	0.7	1.0														
0.6	0.6	0.7	1.0													
0.2	0.7	0.4	0.3	1.0												
0.1	0.7	0.3	0.2	0.9	1.0											
0.3	0.7	0.4	0.3	0.8	0.8	1.0										
-0.1	0.4	0.0	0.1	0.6	0.6	0.6	1.0									
0.4	0.7	0.5	0.5	0.8	0.7	0.9	0.6	1.0								
0.4	0.7	0.7	0.8	0.7	0.6	0.7	0.4	0.8	1.0							
0.2	0.6	0.4	0.3	0.8	0.8	1.0	0.6	0.8	0.7	1.0						
0.2	0.7	0.4	0.3	1.0	0.9	0.9	0.7	0.8	0.7	0.9	1.0					
0.4	0.5	0.4	0.2	0.6	0.6	0.7	0.4	0.6	0.4	0.7	0.6	1.0				
0.5	0.6	0.5	0.3	0.7	0.7	0.6	0.3	0.6	0.4	0.5	0.6	0.7	1.0			
0.4	0.6	0.5	0.4	0.6	0.6	0.7	0.5	0.8	0.6	0.6	0.7	0.6	0.6	1.0		
0.4	0.7	0.5	0.4	0.8	0.7	0.9	0.6	0.8	0.7	0.9	0.8	0.6	0.5	0.6	1.0	
0.2	0.6	0.4	0.4	0.4	0.4	0.4	0.2	0.5	0.5	0.3	0.4	0.2	0.3	0.3	0.4	1.0

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