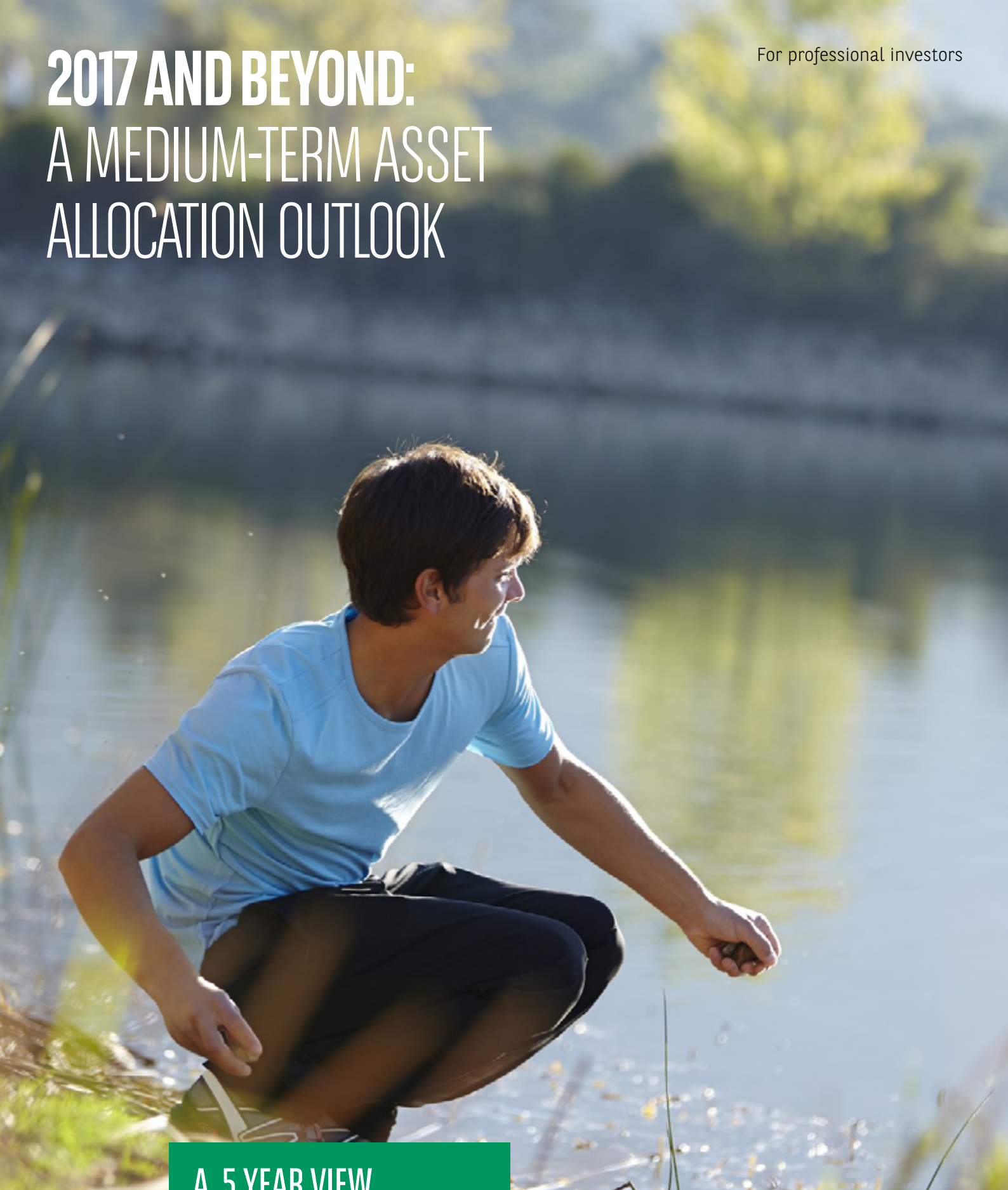
For professional investors

2017 AND BEYOND:
A MEDIUM-TERM ASSET ALLOCATION OUTLOOK



A 5 YEAR VIEW

BNP PARIBAS
ASSET MANAGEMENT

The asset manager for a changing world

Anton Wouters
Head of Customized &
Fiduciary Solutions

FOREWORD

BNP Paribas Asset Management[1] has a long history of providing asset allocation advice to institutional clients for whom we manage multi-asset portfolios. This has included studies for pension funds and insurance clients to optimise their long-term strategic asset allocation, but also portfolio allocations on the basis of medium-term expected returns to ensure an optimal positioning of asset classes in their portfolios, taking into consideration global and regional economic cycles. Clients have appreciated this highly and we believe that the work we do in this field is of interest for all institutional clients.

Institutional investors face great challenges after a long period of declining yields and very accommodative policies by the main global central banks. These include the continuous search for yield as the more traditional fixed-income asset classes are expected to generate low returns, the growing pressure of regulation that has an impact on the way portfolios are managed, especially when derivatives are involved, and the emergence of more sophisticated investment vehicles that can bring additional benefits from a risk perspective, but also need a more thorough understanding before implementation.

In this environment, we are assisting clients in designing 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. We at BNP Paribas Asset Management believe that we have all the ingredients in house to do so successfully.

In this publication, we describe in more detail our process to come to expected returns for a large number of asset classes. You will find that our expectations are moderate compared to the returns of the past and for many asset classes they are lower than their long-term averages. This illustrates the difficult environment investors face, but it also shows the need for a careful portfolio allocation and construction process in which diversification across assets and regions plays an important role and where choices need to be made for those assets that can bring real added value to the portfolio.

Before getting started, we discuss a number of thematic topics that are not directly connected to the expected returns for the medium term, but that we believe will influence portfolio construction for 2017 and beyond.

We hope this publication will guide you in the process of defining and constructing the best possible portfolio and we would be delighted to discuss with you in more detail the implications of the assumptions for your asset allocation and the way we can structure the portfolio even better so that you can achieve your goals.

1 Previously BNP Paribas Investment Partners

THEMES FOR 2017 AND BEYOND

Building optimal portfolios in the current economic environment is a challenge, but integrating regulatory changes and introducing new ways of allocating assets at the same time can be even more daunting. These developments are not necessarily negative for portfolio returns, but will definitely influence the way institutional investors allocate assets, construct the portfolio and manage it.

In that light, we would like to discuss three major topics

I EMIR, **centralised clearing** and the need for efficient cash management

II **Integration of ESG** policies in portfolio construction and monitoring

III Integration of **smart-beta strategies**

CENTRALISED CLEARING

After the financial crisis in 2008, regulators decided to strengthen the governance around over-the-counter (OTC) derivatives to ensure a more stable, transparent and efficient derivatives market. This has led to the implementation of the Dodd-Frank Act in the US and EMIR[1] in Europe. The main elements of the regulation are new measures for daily valuation and confirmation, measures for bilateral margining for OTC trades and centralised clearing for a number of standardised contracts such as interest-rate swaps and credit default swaps. Although the measures were in the first instance intended to avoid systematic risks in derivatives trading between banks, they also have consequences for end-users such as pension funds and insurers.

One of the significant consequences of centralised clearing is that for both initial margin (IM, margin needed at the start of the transaction) and variation margin (VM, margin needed because the value of the instrument changes) sufficient collateral needs to be available. For IM both cash and bonds are eligible as collateral, for VM only cash is accepted. This could imply that for those investors that have a relatively large derivatives position (for example, for interest-rate hedging) a large cash position is required to fulfil the need for cash collateral. As pension funds usually have only limited allocations to cash, this requirement could change the overall asset allocation, leading possibly to lower portfolio returns. To mitigate the risks of an (overly) large cash position, institutional investors with derivatives position have started to make cash management part of the management of the portfolio to ensure that enough cash is available when needed.

In addition to an operational set-up, the portfolio should include enough collateral in the form of eligible bonds and cash. This can have consequences for asset allocation and portfolio management. Special attention needs to be paid to the cash position since the currently low yield on cash means a large cash position acts as a drag on returns. This requires an optimal combination of a number of measures to generate cash at the moment you actually need it or eligible collateral:

- A certain cash allocation is needed to be able to pay margin on a daily basis. Perhaps in combination with a stand-by credit line in the case of emergencies
- Cash creation by repo transactions. For this, you need collateral that is eligible for repo transactions
- Sufficient bonds for collateral, both for new centrally cleared derivatives and existing bilaterally cleared derivatives in a separate mandate or within the existing bond portfolio.

Structuring and managing the combination of liabilities, a derivatives portfolio and a related bond portfolio, for example in a matching portfolio, will be a more challenging task and could have implications for your optimal asset allocation. We are looking forward to discussing with you the possibilities to optimise your portfolio while integrating an efficient cash management for your derivatives overlay.

ESG INTEGRATION

More and more, institutional investors are implementing, or are considering implementing, an ESG approach to managing their portfolios. ESG is a term that is used to describe a group of risks – environmental, social and governance – that are explicitly acknowledged and integrated into the investment research and decision-making process. As such, investing in line with ESG principles is combining risk management elements and the search for attractive long-term returns. Increasingly, investors are looking for greater efficiency in ESG integration, in the instruments to use and in the analytical tools to monitor this.

An ESG approach can have a number of possible implementations that will impact the way institutional investors construct their portfolios. For example:

1. Stakeholder influence from an ESG perspective on the companies invested in can be achieved through engagement programmes or direct communication.
2. In the process of selecting portfolio managers, ESG factors can play an important role. The key here is to assess how ESG principles are integrated in the investment process.

1 In 2012, the EU adopted the European market infrastructure regulation (EMIR). The aims were to increase transparency in the OTC derivatives markets, mitigate credit risk and reduce operational risk.

3. The choice of benchmark: is it tilted to ESG factors? This would impact portfolio construction.

4. Impact investing: will money be allocated to investments that have a meaningful impact on areas that the investor regards as important in relation to the investment beliefs and background of the participants?

5. The outright exclusion of companies or sectors/ industries that do not operate in line with the formulated investment beliefs and principles.

A final step of ESG integration involves the possibility of monitoring the investments, including the progress made on the ESG factors that matter to clients.

In conclusion, in the asset allocation and portfolio construction process, integrating ESG principles can influence final investments, and depending on the implementation, these can deviate from a portfolio that is optimised and constructed without taking these factors into account.

SMART-BETA STRATEGIES

Among investors we are seeing growing interest in, and actual implementation of, factor investing or smart beta. By exploiting risk factor premiums systematically, smart-beta investing can be a risk-aware alternative for the traditional asset allocation based on market capitalisations and mean variance optimisation. A large number of factors has been researched and documented and asset managers have been keen to bring new products to the market based on factor investing.

For factors such as low volatility, the added value has been exploited already by large number of investors, but more and more investors are investing in multi-factor portfolios. When allocating to factors instead of asset classes, investors seek to better manage and understand the real risks and drivers of returns in their multi-asset portfolios. A smart-beta portfolio could deviate substantially from a portfolio optimised on an asset-class basis.

A smart-beta approach is more risk-based, which creates portfolios with exposures to the required asset classes, but whose returns have low(er) correlations with those asset classes. This should protect returns in periods of distress, but also result in better overall returns. Obviously, allocating to factors is less straightforward than allocating to asset classes. Investors often struggle with the implementation of factors and the concept of factor investing in general. But it is fair to say that factor-based portfolios are becoming a true diversifier and, when well-structured, a stable return provider for more and more institutional investors.

At BNP Paribas Asset Management, we have considerable experience in developing smart-beta techniques and we manage a large number of both single and multi-asset products based on them. We would be happy to share our expertise and assist you in integrating factor exposures into your overall portfolio.

MEDIUM-TERM ASSET ALLOCATION VIEWS

Introduction

Yields on almost all fixed-income assets are low at the moment. The big question for many investors is what comes next. Will interest rates rise any time soon and if so, how quickly and by much? How will equities perform? Are they not relatively expensive and thus vulnerable if interest rates do rise? And what about credit? Credit spreads are now quite low, so one could ask how many zombie companies are still out there surviving – for the time being – on cheap credit. Rising yields could trigger widening spreads to compensate for an expected increase in the number of companies falling into default. Political uncertainty adds further clouds. What will be the impact of the Brexit negotiations? What of the elections in Europe in which populist parties that aim to redefine European collaboration are leading the polls in Italy? And of course, we have yet to fully understand the implications – for the US and the wider world – of arguably the biggest political surprise: the election of Donald Trump.

While we do not claim to have the answers to all these questions, we believe it merits reflecting upon them to better understand the challenges investors face. We believe it is not an exaggeration to say that the world appears to be at a turning point: there is a growing need for some of the major central banks, e.g. the US Federal Reserve (Fed) and the ECB, to move from extremely loose monetary policy to a more traditional regime; additionally, the political status quo is arguably under threat. How should investors deal with this?

Keep calm and carry on

In 1939 the British government put the phrase "Keep Calm and Carry On" on posters to boost public morale ahead of the imminent world war.[2] We definitely don't see war as an outcome of the current political upheaval. Fortunately, for now we see only a limited impact from any political change. While elections can occasionally spark greater volatility in financial markets, any impact on, for example, the medium-term performance of financial assets is generally limited. That is why we believe that investors should keep calm and carry on focusing on market fundamentals.

One of the key determinants of those fundamentals will be how some of the main central banks exit their loose monetary policies. For example, the market enthusiasm that greeted the election of Donald Trump as US president seemed to signal a sea-change in investor assumptions, going overnight from 'secular stagflation' to reflation or even 'Trumpflation'. We are more sceptical and do not believe that the outlook has changed much. We still foresee anaemic global growth and below-average inflation over the coming years. We expect the Fed to counter any inflation effects from expansionary policy, which gives us reason to leave our medium-term trend growth and inflation rates unchanged.

While the ECB has begun to taper its purchases of government bonds, we expect this process to be gradual. As a result, bond yields should remain suppressed for quite some time yet. Even when the ECB eventually stops purchasing bonds, it will most likely hold on to the bonds in its portfolio until maturity, thus ensuring a tight market and suppressed yields.

Economic assumptions

We believe trend growth remains low compared to historical averages. Given the muted growth of business investment and a focus of many companies on returning capital to shareholders in the form of dividends or through share buybacks, we do not expect this to change quickly. This lack of investment has also slowed productivity growth in many countries.

Slow productivity growth is a key source of below-trend GDP growth, in our view. According to OECD data, average productivity growth since 1971 was higher in Germany at 2.2% per year than in the UK at 2.0% or in the US at 1.6%. German productivity growth peaked in the late 1970s and again in the mid-1980s before trending lower. UK productivity growth reached its high point just before the financial crisis in 2008/09, as did US productivity growth. It recovered in these two countries and the eurozone in 2010, but this was simply a cyclical bounce in a 'job-less' recovery. Since 2012 productivity growth has averaged just 0.6% in Germany, a paltry 0.3% in the UK and the US and 0.8% in the eurozone.

Another reason for low trend growth is the structural decline in population growth. In Germany, the working age population started to fall in 1999. Since 2013, there has been modest growth, mostly due to migration, but this has amounted to only 0.2% per year on average. In the UK, the

2 See http://drbexl.co.uk/2004/06/25/abstract-the-planning-design-and-reception-of-british-home-front-propaganda-posters-of-the-second-world-war/

working age population is still expanding, but here too it has slowed, to 0.3% annually on average in the past five years. Reflecting generally more favourable demographics, the US working age population is still rising, but the rate has declined from an average 1.3% per year between 1971 and 2000 to 0.4% over the past five years.

On the basis of these figures and actual GDP growth rates, trend growth would be low indeed: 0.6% in the UK, 0.7% in the US and the eurozone as a whole and 0.8% in Germany. However, we expect faster growth in the coming years. Firstly, there is still slack in the labour markets and production capacity in the eurozone, although less so in Germany and the US. Secondly, productivity growth can recover. We do not expect a strong rebound, but we think that productivity is being held back by cyclical factors. Once the slack diminishes, companies should step up investment, meeting higher demand through faster productivity growth.

In the next section we will detail the macroeconomic inputs for our Medium-Term Asset Allocation forecasts.

Fixed income

Economic growth forecasts are key inputs into our Medium-Term Asset Allocation (MTAA) model, particularly in estimating bond returns. In our model, we assume that in equilibrium, nominal government bond yields equal nominal GDP growth. We allow for deviations from equilibrium levels in specific circumstances, for example, when we expect a large supply of bonds or in the case of government bond purchases by central banks. We also assume that in the longer term, GDP growth equals trend growth. Central banks' inflation targets should provide an anchor for longer-term inflation expectations and actual inflation, but recent years have shown that actual inflation can deviate from central bank targets for long periods. We provide growth and inflation forecasts for the US, the eurozone as a whole, Germany and the UK (see Table 1 below).

Government bonds

We expect the ECB to struggle to reach its 2% inflation target in this cycle. As said, there is ample slack in the economy, as illustrated by the relatively high unemployment rate. Even in the US, inflation still has not overshot the Fed's unofficial 2% target, although the unemployment rate is close to the non-accelerating inflation rate of unemployment (NAIRU, or the employment rate below which wage pressures start to build). We expect inflation to average 2.1% in the US in coming years, only 1.7% in the eurozone and 1.9% Germany. At 2.0%, the UK rate is closer to the US level.

Special factors are playing a role in the eurozone bond market (and thus in Germany) and in the UK. With a roughly balanced budget, the supply of bonds in Germany is low, while the ECB has extended its asset purchase programme to the end of 2017, at the same time lowering the amount of monthly purchases. Even if the ECB tapers its asset purchases further at the start of 2018, it will take time for German yields to rise to the long-term equilibrium level.

Economic theory stipulates that the yield curve should ultimately be bound by economic conditions. A simplistic 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. Current macroeconomic conditions then dictate how realistic this target is. In the eurozone, the ECB's quantitative easing (QE) will continue to suppress government bond yields. Research on the impact of QE in the US and the UK indicates that it drove yields down by 80 to 100bp.[3] Discounting for the fact that ECB has already been buying bonds for a number of years, we estimate that this has reduced broad eurozone government bond yields by 60bp and core government bond yields by 90bp (using Germany as a proxy) as the supply of the latter is tighter. We expect QE to suppress the equilibrium yield in the years ahead as it continues to affect bond supply.

3 See "The financial market impact of quantitative easing" by M Joyce, A. Lasaosa, I Stevens and M Tong in Bank of England Working Paper No. 393, 2010 and "The Response of Interest Rates to US and UK Quantitative Easing" by J. Christensen and Rudebusch, Federal Reserve Bank of San Francisco Working Paper 2012-06, 2012.

Table 1 summarises our macroeconomic assumptions and the resulting target 10-year yield that is included in our MTAA model for government bonds. Bond markets internationally do not exist in isolation from each other, i.e., if the yield differential between markets becomes too large, investors tend to move some of their investments to the higher-yielding market. So, we expect the ECB's QE to have a small effect on yields in the UK (20bp) and the US (10bp). Additional inputs to the MTAA model include the current yield curve and an assumption that the curves will converge to their long-term shape and level at a pace slightly slower than the historical average.

Table 1: Overview of macroeconomic assumptions (in %)

	euro	core euro	UK	US
Inflation expectations	1.7	1.9	2.0	2.1
Real GDP growth expectations	1.5	1.5	1.7	1.9
Adjustment for ECB QE	-0.6	-0.9	-0.1	-0.2
Target 10-year yield	2.6	2.5	3.6	3.8

Note: part of the input to the government bond yield curve model; we use Germany as a proxy for core euro. Source: BNP Paribas Asset Management, as of 31 December 2016

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.

Table 2 gives the actual and expected yield of 10-year government bonds when the model was run, showing that 10-year yields are expected to rise by around 100bp (by slightly more in the core eurozone countries and by slightly less in the US). This modest increase is in line with our view that monetary policy will continue to suppress yields.

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	0.8	0.0	1.2	2.6
Expected 10-year yield in 5-7 years	1.7	1.1	2.4	3.3
Predicted change in 10-year yield	0.9	1.1	1.2	0.7

Note: We use Germany as a proxy for the core eurozone and a weighted average of all eurozone countries as a proxy for the eurozone. Source: Bloomberg, BNP Paribas Asset Management, as of 31 December 2016

Table 3 gives 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 -0.50%, compared to a relatively bountiful 2.25% on US Treasuries. With an expected return of only 0.25%, the forecast for UK government bond yields is also comparatively bleak. The low return expectations for core eurozone and UK government bonds at least in part reflect our view that interest rates will rise by the most there as yields in both markets are currently furthest from the predicted levels (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	0.5	1.25	0.5	-0.5	0.25	2.25

Source: BNP Paribas Asset Management, as of 31 December 2016

Investment-grade credit and high-yield bonds

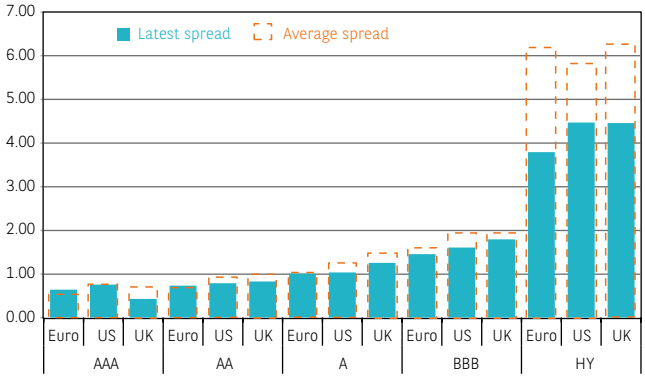
Current spreads, target spreads and the probabilities of rating migrations play a key role in determining the returns of corporate credit in our MTAA model.

Figure 1 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. For corporate bonds, especially those of investment-grade quality, a rating downgrade is a much 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 forecasted 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 spread 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 1: Average and latest credit spreads for various credit ratings and regions based on the Bloomberg Barclays Aggregate corporate indices



Data as of 31 December 2016. The latest spread is the average of the last three months of 2016. Source: BNP Paribas Asset Management, Bloomberg

Table 4 shows the expected returns for the standard Bloomberg Barclays Aggregate corporate indices in local currencies and in both absolute and relative terms (excess over 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 generally do not have a strong regional preference, except for US investment-grade bonds.

In terms of dislocations in current spreads versus long-term/target spreads there are small differences in the investment-grade category. The higher expected return from US investment-grade bonds is mainly driven by the higher expected return on the underlying US government bonds, in combination with a higher duration exposure relative to eurozone investment-grade bonds.

With US high-yield bonds, this advantage largely evaporates due to our assessment of the higher credit risks that rising interest rates constitute for lower-quality bonds (as mentioned above).

Table 4: 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	0.75	3.5	1.5	4.25	3	5
Excess over local cash	1	3.75	1	3.75	1.75	3.75

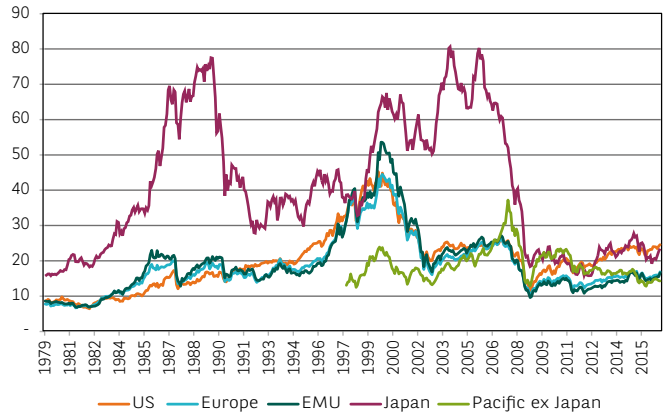
Source: BNP Paribas Asset Management, as of 31 December 2016

Equities

Expected returns for most developed world equity markets fell in 2016 as the price-earnings ratio rose. The rally in equities since 8 November 2016, the date of the US presidential election, has only exacerbated this trend. While there are hopes that a reduction in US corporate tax rates will boost profits, given a cyclically adjusted price earnings ratio (CAPE) of 24.5 in December 2016, compared to a long-run average of around 20, it is difficult to anticipate meaningfully positive returns from US equities over the medium term. We forecast an annual excess return of just 3.25%. Given an expected return on US cash of 1.25% – one of the highest among the developed markets (see Table 3) – the expected US total local currency return rises to 4.5%.

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 2). Valuations of European equities, on the other hand, remain more attractive. 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 4% in excess return terms. This exceeds our forecast 3.25% return from US equities. Since we estimate the average return on cash for Europe to be around 0%, US equities still look attractive in total local currency return terms relative to European equities (Table 5). This advantage over European equities would clearly disappear if a euro investor hedged the currency risk. Using the expected cash differential as an indicator, the estimated hedging cost would be around 1.5%, reducing the total return on US equities to 3%.

Figure 2: Cyclically adjusted price-earnings ratio for global developed and emerging market equities



Source: Bloomberg, BNP Paribas Asset Management, as of 31 December 2016

As can be seen from Table 5, emerging equity markets continue to offer relatively attractive expected returns. For emerging markets as a whole, we anticipate gains of 6.75%, 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 (see our paper "The future of emerging markets").

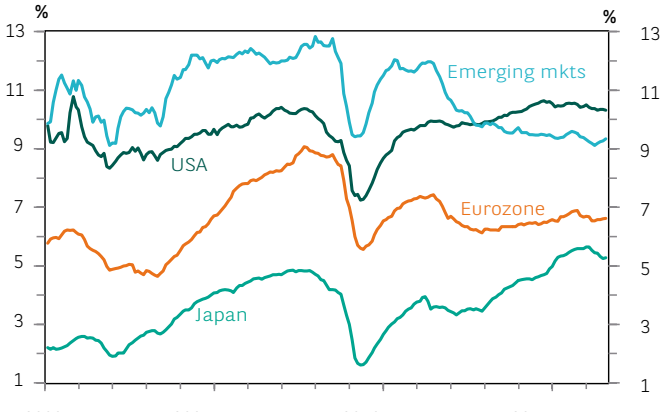
Table 5: Total expected returns in local currencies (in %)

Expected total local return	Equities US	Equities Europe	Equities Japan	Equities Pacific Ex Japan	Equities global emerging
Expected total return	4.5	4	4.75	5	6.75

Source: BNP Paribas Asset Management, as of 31 December 2016

Apart from the generally still rosy GDP growth outlook for emerging markets, the prospect for equity returns is also enhanced by the comparatively low corporate margins vis-à-vis developed markets. Whereas net margins are near historic highs in the US, and close to the long-run average in Europe, emerging market margins are still only slightly above the lows reached in the depths of the global financial crisis. Even without any increase in sales, emerging market companies should be able to generate superior profit growth, and hence see superior share price appreciation, simply by deriving average levels of profits from current sales.

Figure 3: Forecast net margins



Data as at 27 March 2017. Source: FactSet, BNP Paribas Asset Management

To hedge or not to hedge FX exposure?

With the likely sharp contrast between US and eurozone government bond returns, euro investors should 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 1.5%. As a result, the euro-hedged returns of US government bonds drops to 0.75%, which is only 25bp higher 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 much more significant pick-up in expected yields, however. More generally speaking, a limited exposure to hedge US government bonds can still be attractive since it can strongly diversify the investor's overall fixed-income exposure.

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 here is to determine the extent to which currencies are over or undervalued, using the MTAA currency model's relative purchasing power parity approach. The assumption here 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).

The MTAA currency model makes adjustments for hedging costs, with the currency exposure following on from our asset allocation. The alternative to leaving this currency exposure open is to hedge it. In other words, the cost of hedging represents the opportunity cost and is explicitly included when computing the currency returns. Finally, the return net of the hedging cost should not be the only consideration; currency exposure can also help diversify the risk in a portfolio. Clearly these diversification benefits are not a given as correlations change over time. We thus make the extent of exposure to this source of diversification conditional on each client's risk appetite. The risk of a client's overall portfolio serves as a proxy for this risk appetite. For example, for a very aggressive growth profile (that has a 100% equity allocation as a reference point) the assumption is that clients are more willing to take on currency risk, all else being equal. The converse is assumed of clients with a 100% fixed income allocation as a reference point.

Table 6 shows the expected return and the recommended hedge ratio for clients, ranging from those with a conservative risk profile (with 75% fixed income and 25% equity) to those with a growth profile (with 25% fixed income and 75% equity). Currently, the model predicts a return of -1.6% on a long USD vs. EUR position. Consequently, we advise clients to hedge most of their EUR/USD exposure, ranging from 95% for a conservative risk profile to 80% for a growth profile. Similarly, for sterling (GBP), the model predicts almost zero annual return, which leads to a hedging recommendation of between 90% and 60% of the EUR/GBP exposure.

The UK's exit from the EU may well influence the fair value of the EUR/GBP cross, although it is difficult to predict to what extent given that Brexit negotiations have yet to start. However, we think a hard Brexit is more likely, which could imply sterling weakening structurally. The 0.2% return prediction in Table 6 assumes such a weakening. Ignoring this, the prediction would be for a 1.6% return on the EUR/GBP cross, i.e., sterling is now significantly undervalued versus the euro.

Table 6: Expected annual return for major developed currency crosses versus the euro

	Expected return	Recommended hedging ratios for selected risk profiles			
		Cons.	Stability	Balanced	Growth
USD	-1.6%	95.0%	90.0%	85.0%	80.0%
EUR	n/a	n/a	n/a	n/a	n/a
GBP	0.2%	90.0%	80.0%	70.0%	60.0%
JPY	2.0%	85.0%	70.0%	55.0%	40.0%
CHF	-2.5%	97.5%	95.0%	92.5%	90.0%
CAD	0.1%	90.0%	80.0%	70.0%	60.0%
AUD	-1.1%	92.5%	85.0%	77.5%	70.0%

Note: Returns take into account hedging costs. Additionally, the table shows recommended hedging ratios depending on the risk appetite of the investor. Source: BNP Paribas Asset Management

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 EMD local currencies and EM equity, all currency exposure is hedged and we explicitly incorporate hedging costs. These can be quite significant.

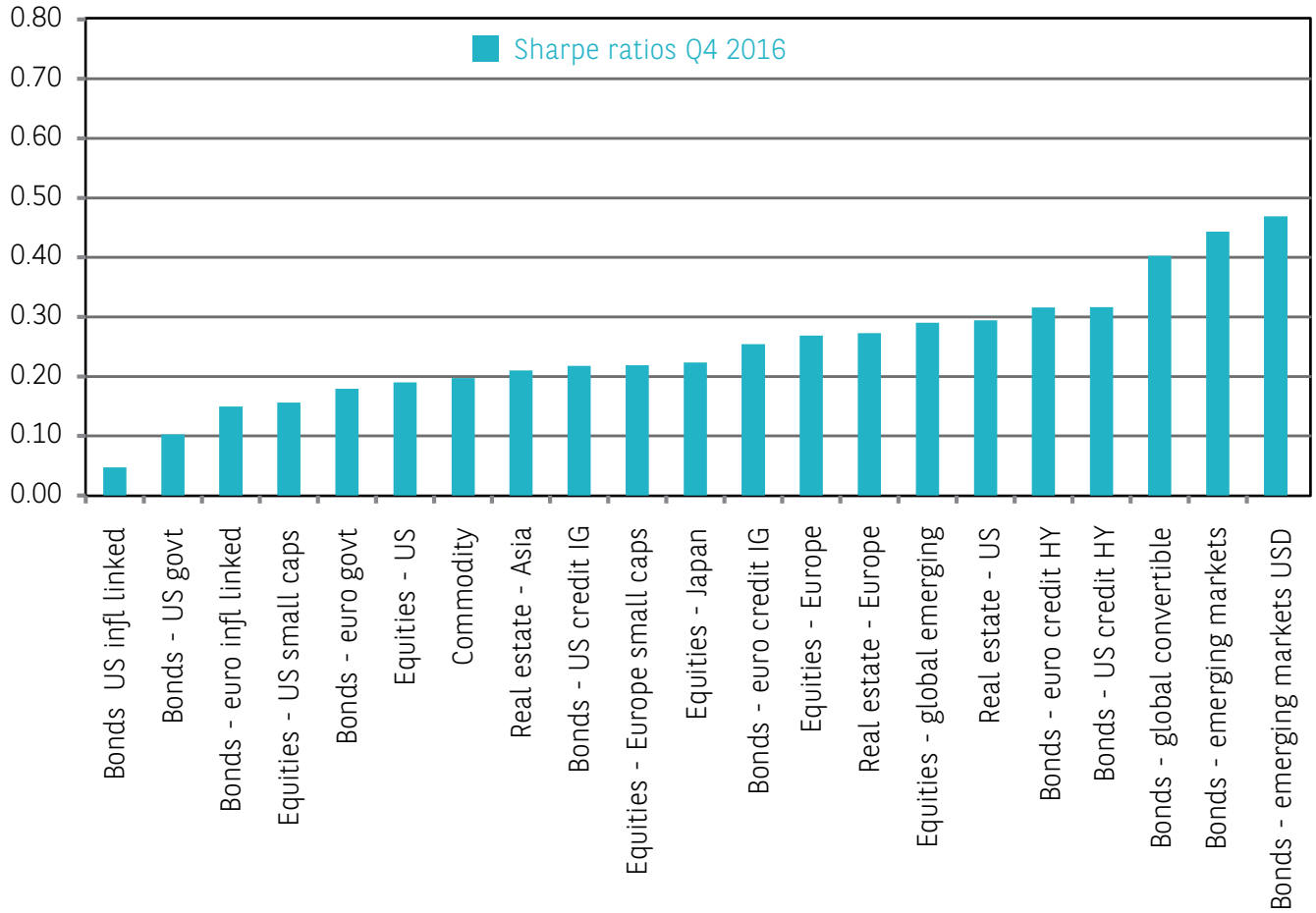
Figure 4 clearly illustrates our overall relatively modest outlook, with Sharpe ratios never exceeding 0.5. However, we are comparatively positive on risky spread exposure over equity exposure. Choosing between equity and listed real estate, we prefer the latter. Finally, we are most negative on the risk-adjusted return of US Treasuries.

Risk and return expectation for broad subset of MTAA model

Our MTAA model covers a broad range of assets. To illustrate this, Table 7 gives the expected risk and return (in local currencies) for a large sub-set of the assets covered. Additionally, Table 8 depicts the correlation between the asset classes.

Volatility and correlations of the depicted assets are obtained simultaneously by directly estimating the covariance matrix of returns across asset classes. The

Figure 4: Sharpe ratios for a euro-based investor



Source: BNP Paribas Asset Management, as of 31 December 2016

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 estimation. Specifically, our estimate is not obtained by applying equal weights over a historical sample. Instead, more recent observations are assigned a heavier weight than observations in the distant past by applying an exponential smoothing device. Weights decrease exponentially over time using this approach.

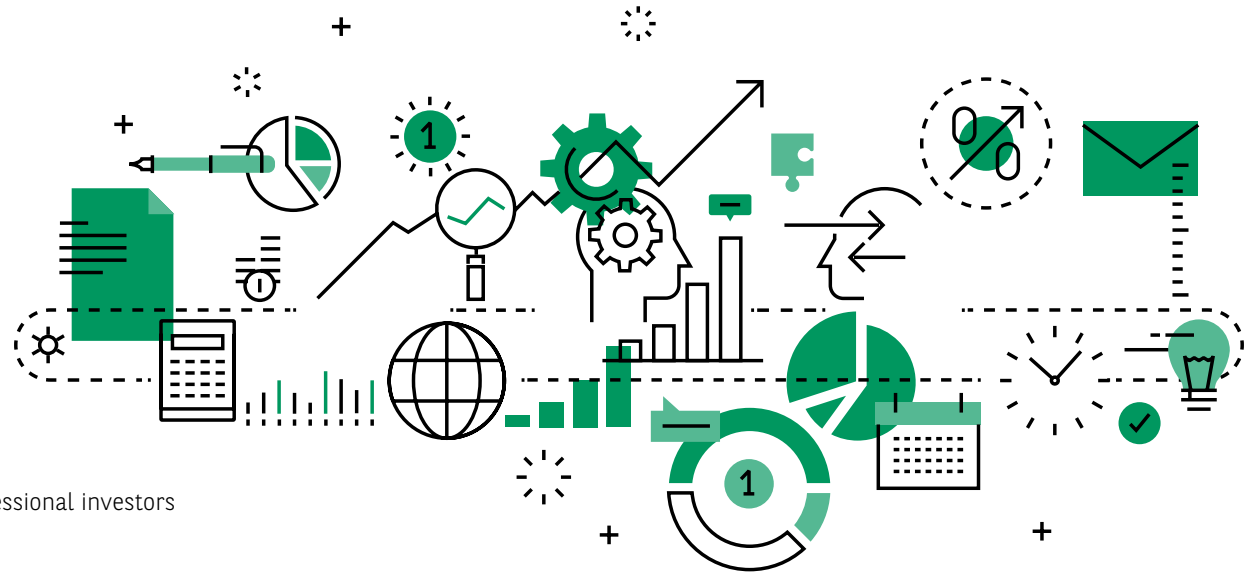


Table 7: Annualised expected risk and return in local currencies*

Cash	Return	Risk
Cash - UK	0.5	2.3
Cash - euro	-0.25	2.6
Cash - USD	1.25	1.6
Fixed Income		
Bonds - euro government	0.5	4.2
Bonds - euro government core	-0.5	4.8
Bonds - UK government	0.25	7.0
Bonds - US government	2.25	4.9
Bonds - euro inflation linked	0.5	5.0
Bonds - US inflation linked	1.75	5.3
Bonds - UK credit IG	1.5	7.1
Bonds - UK credit HY	4.25	12.4
Bonds - euro credit IG	0.75	3.9
Bonds - euro credit HY	3.5	11.9
Bonds - euro leveraged loans	2.25	7.4
Bonds - US credit IG	3	5.6
Bonds - US credit HY	5	9.8
Bonds - emerging markets USD	5.75	8.4
Bonds - emerging markets	5	11.9
Equity		
Equities - US	4.5	13.7
Equities - US small caps	4.75	17.9
Equities - Europe	4	14.4
Equities - Japan	4.75	18.8
Equities - Pacific ex Japan	5	14.6
Equities - global emerging	6.75	24.1
Equities - world	4.25	13.4
Alternatives		
Real estate - Europe	5	18.3
Real estate - US	7.25	18.3
Real estate - Asia	5.5	19.0
Bonds - global convertible	4	8.1
Commodities	6.5	21.3

*Except emerging market debt in local currency and emerging equity, which are denominated in USD. Source: BNP Paribas Asset Management as of 31 December 2016

See table 8 on next page

Conclusion

The slow recovery from the global financial crisis, helped by far-reaching central bank intervention and low interest rates, is gaining steam and several major central banks are now moving towards tightening monetary policy. Supportive central bank policies have contributed to narrowing credit spreads relative to what is still a tepid rate of economic growth. Equity markets have already rallied significantly in anticipation of the improving outlook and valuations in numerous markets look stretched. While some investors have been hoping for an improvement in the trend rate of growth in the wake of Donald Trump's election, we suspect they will be disappointed.

Against this backdrop, allocating assets for the medium term is challenging. We expect 10-year government bond yields to rise to 2.6% in the eurozone and 3.8% in the US over the next five to seven years, with expected developed market investment-grade credit returns lingering at just 2.0%. Given the currently high valuations, equity markets are expected to generate gains of just 4.3%, markedly below the long-run averages. We expect the highest risk-adjusted returns from emerging markets and high-yield, even if there too the expected Sharpe ratios are below 0.5. Investors will need to look to alternative assets. The Trump presidency has not changed that.

Table 8: 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	Bonds - US credit IG
Cash - UK	1.00														
Cash - Euro	0.99	1.00													
Cash - USD	0.98	0.96	1.00												
Bonds - Euro govt	0.20	0.22	0.16	1.00											
Bonds - Euro govt core	0.23	0.25	0.19	0.95	1.00										
Bonds - UK govt	-0.01	0.01	-0.03	0.62	0.74	1.00									
Bonds - US govt	0.50	0.52	0.47	0.67	0.77	0.72	1.00								
Bonds - Euro infl linked	0.18	0.18	0.16	0.72	0.61	0.25	0.30	1.00							
Bonds - US infl linked	0.24	0.26	0.23	0.37	0.47	0.42	0.56	0.47	1.00						
Bonds - UK credit IG	-0.13	-0.14	-0.13	0.51	0.48	0.52	0.23	0.59	0.36	1.00					
Bonds - UK credit HY	-0.08	-0.07	-0.08	0.08	-0.01	-0.17	-0.23	0.43	0.21	0.54	1.00				
Bonds - Euro credit IG	-0.02	-0.01	-0.04	0.65	0.55	0.28	0.20	0.78	0.41	0.82	0.68	1.00			
Bonds - Euro credit HY	-0.14	-0.14	-0.14	0.03	-0.08	-0.23	-0.36	0.43	0.18	0.52	0.91	0.66	1.00		
Bonds - Euro leveraged loans	-0.13	-0.13	-0.12	-0.19	-0.24	-0.34	-0.44	0.22	0.13	0.40	0.74	0.42	0.81	1.00	
Bonds - US credit IG	0.23	0.25	0.22	0.59	0.61	0.48	0.56	0.62	0.68	0.74	0.50	0.77	0.45	0.27	1.00
Bonds - US credit HY	-0.01	0.00	0.00	-0.04	-0.08	-0.15	-0.22	0.36	0.37	0.52	0.83	0.58	0.89	0.77	0.56
Bonds - emerging markets USD	0.14	0.14	0.14	0.33	0.33	0.25	0.25	0.56	0.65	0.62	0.59	0.68	0.60	0.42	0.75
Bonds - emerging markets	0.24	0.24	0.25	0.23	0.20	0.07	0.19	0.52	0.57	0.50	0.57	0.63	0.54	0.32	0.63
Equities - US	-0.06	-0.07	-0.04	-0.12	-0.21	-0.29	-0.39	0.21	-0.03	0.40	0.61	0.43	0.71	0.67	0.23
Equities - US sc	-0.04	-0.05	-0.03	-0.21	-0.30	-0.32	-0.44	0.15	-0.08	0.35	0.58	0.33	0.66	0.63	0.15
Equities - Europe	0.05	0.03	0.08	-0.03	-0.14	-0.28	-0.34	0.33	-0.04	0.44	0.64	0.45	0.70	0.64	0.27
Equities - Japan	-0.09	-0.11	-0.08	-0.26	-0.39	-0.54	-0.59	0.06	-0.33	0.08	0.36	0.15	0.47	0.49	-0.15
Equities - Pacific ex Japan	0.11	0.10	0.14	0.04	-0.05	-0.24	-0.24	0.41	0.15	0.47	0.67	0.53	0.73	0.63	0.37
Equities - global emerging	0.16	0.15	0.18	0.00	-0.06	-0.18	-0.17	0.41	0.33	0.44	0.69	0.53	0.74	0.59	0.45
Equities - World	-0.05	-0.07	-0.02	-0.12	-0.23	-0.34	-0.44	0.25	-0.07	0.40	0.64	0.44	0.74	0.68	0.21
Real estate - Europe	-0.11	-0.13	-0.11	0.23	0.14	-0.04	-0.13	0.44	0.10	0.55	0.58	0.56	0.63	0.63	0.38
Real estate - US	-0.05	-0.05	-0.05	0.19	0.16	0.10	-0.03	0.40	0.26	0.62	0.60	0.60	0.63	0.62	0.50
Real estate - Asia	-0.04	-0.05	-0.01	0.16	0.12	-0.01	-0.14	0.43	0.19	0.52	0.57	0.56	0.60	0.55	0.41
Bonds - global convertible	-0.01	-0.02	0.02	-0.06	-0.19	-0.34	-0.35	0.33	0.07	0.40	0.69	0.48	0.77	0.66	0.33
Commodity	0.23	0.21	0.24	-0.20	-0.21	-0.28	-0.15	0.22	0.35	0.16	0.38	0.21	0.44	0.44	0.29

Source: BNP Paribas Asset Management, as of 31 December 2016

Bonds - US credit HY	Bonds - emerging markets USD	Bonds - emerging markets	Equities - US	Equities - US sc	Equities - Europe	Equities - Japan	Equities - Pacific ex Japan	Equities - global emerging	Equities - World	Real estate - Europe	Real estate - US	Real estate - Asia	Bonds - global convertible	Commodity
1.00														
0.71	1.00													
0.67	0.76	1.00												
0.69	0.43	0.48	1.00											
0.69	0.36	0.42	0.91	1.00										
0.67	0.45	0.43	0.87	0.84	1.00									
0.37	0.01	0.10	0.63	0.65	0.67	1.00								
0.73	0.56	0.57	0.81	0.78	0.87	0.61	1.00							
0.79	0.71	0.78	0.73	0.70	0.75	0.47	0.87	1.00						
0.70	0.42	0.46	0.97	0.91	0.94	0.75	0.87	0.77	1.00					
0.54	0.46	0.31	0.62	0.59	0.71	0.41	0.62	0.49	0.66	1.00				
0.63	0.55	0.53	0.71	0.67	0.62	0.29	0.59	0.55	0.67	0.76	1.00			
0.60	0.55	0.48	0.64	0.61	0.71	0.55	0.80	0.71	0.71	0.61	0.62	1.00		
0.73	0.52	0.46	0.85	0.80	0.89	0.65	0.85	0.77	0.89	0.67	0.57	0.64	1.00	
0.64	0.44	0.55	0.43	0.44	0.41	0.19	0.49	0.60	0.43	0.18	0.31	0.28	0.42	1.00

AUTHORS

Koye Somefun
Phd, Head of Retirement Solutions and Innovation, Multi Asset Solutions, BNP Paribas Asset Management

Daniel Morris
Senior Investment Strategist, BNP Paribas Asset Management

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