Confidence must be earned

Amundi
ASSET MANAGEMENT

Asset Class Views
Medium and long term expected returns

Research & Macro Strategy

Document for the exclusive attention of professional clients, investment services providers and any other professional of the financial industry

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This document includes Amundi's view on asset returns used to build reference portfolios for our institutional clients. The edition published in February covers major macro and financial foundations, while on a quarterly basis it will provide table updates.

PHILIPPE ITHURBIDE
Global Head of Research

Looking into the future

For the years to come, it seems reasonable to us to bet on the following situation:

- **lower structural growth** than before the Great Financial Crisis;
- **low inflation,** but which is gradually becoming more of a concern with the end of the disinflation/deflation exported by China;
- **higher interest rates than today,** but which remain **low by historical standards** (the current economic equilibrium justifies lower equilibrium rates than before).

Long term equity returns and earnings growth converge. Long term, equities tend to post returns in line with earnings growth. Divergences can last for long periods, but due to mean reversion, these phases end up in corrections. In current conditions, **markets still have some way to go, but unless we see a structural rise in earnings (unlikely), returns should revert to their structural trends.**

Foreword

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Head of Strategy,
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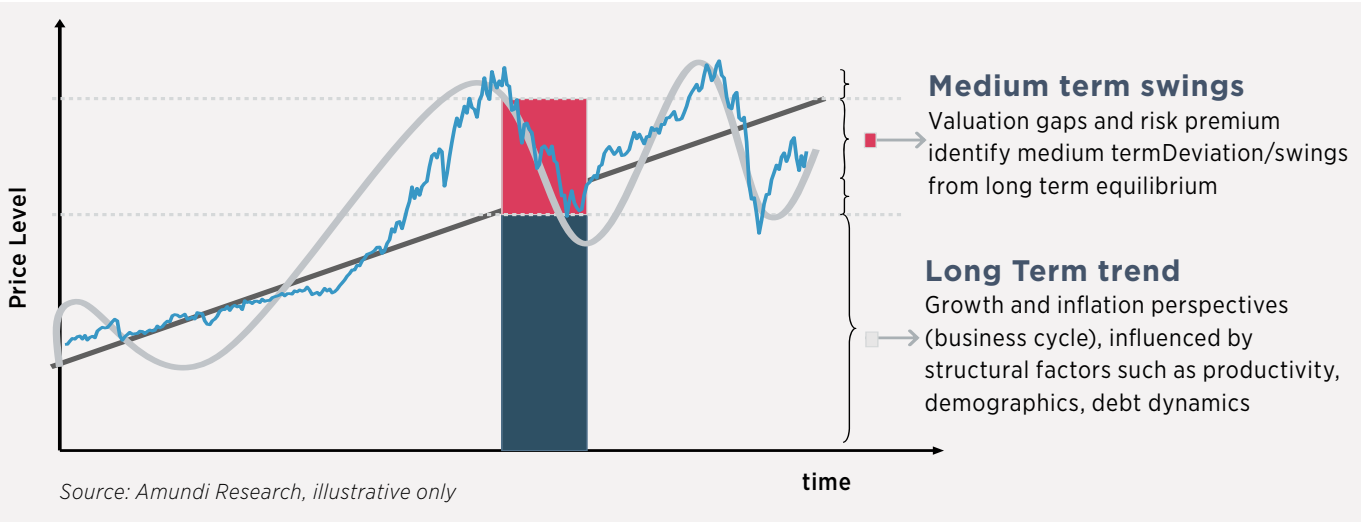
Our approach to expected returns estimates is model driven. We break down asset class dynamics into a long term component (or trend/fair value), mainly related to macroeconomic variables and a medium-term component, explained by economic and financial cycles. Short-term misalignments, linked to market divergence are not considered here for the purpose of this analysis, but are included while noting our tactical asset allocation recommendations.

Consequently, in this document we focus on long term trends and medium- term developments. In particular, when we forecast the long-run trend we define asset class prices in equilibrium (or steady state) on the assumption that all other influencing variables are in equilibrium. On top of that, we **detect swings** based on medium-term market mispricing (i.e. over/under valuation) and risk premia. As an example, the following chart shows how we break down the equity price into its main components:

1/ Decomposing asset class return



Source: Amundi Research, illustrative only

We apply similar breakdowns to all the macroeconomic and financial variables and we define the long term target.

With our reference horizon being 10 years, **the cyclical development is a key relevant factor that serves as a reference for long term investors interested in reviewing their strategic asset allocation on a medium-term horizon.**

By definition, short-term fluctuations should not affect long term returns, but as investors, we do care about them.

We have been navigating this late cycle for a prolonged period, which was extended last year by the somewhat unexpected US fiscal turbocharge. It is plausible to transition to a different economic and financial regime in the medium term. **Timing this transition is a challenge;** moreover, the outcome and the consequences of multiple factors at play today are unforecastable and will weigh on the scenario.

On the one hand, there are key political events (e.g., Brexit, trade disputes, debt accumulation, and the policy mix for dealing with an economic downturn, etc.) whose outcome is likely to have structural consequences and spillovers. On the other hand, some financial signals have entered into our radar recently (i.e., tightening financial conditions, widening of Moody's spreads, an EPS cycle slowdown, and widespread negative earnings revisions), which point to a potential transition from a late cycle to a slowdown in the financial regime and drifting medium-term returns (three to five years).

Narrative and reference framework

A late financial cycle followed the bonanza period of asset reflation over the last few years, and US fiscal expansion prolonged its duration. We continue to navigate the late cycle. After the November and December market sell-offs, valuations washed out and financial markets reset to lower levels, resulting in a brilliant start to the year. While we are enjoying the party for the time being, it is reasonable to "think longer" and consider a progressive shift into a slower financial regime over the next 18 months.

Our model-driven approach allows for some stylised **key features** underlying our scenario (e.g., a slower financial regime):

- **Economic growth decelerates but remains positive;**
- **Central banks progressively turn more dovish to prevent (or postpone) a recession;** and
- Inflation remains low and under the control of central banks, allowing some flexibility to deal with downward risks to growth.

The **Advance Investment Phazer** helps us frame this context and gain perspective. We lengthened the investment horizon (typically to 24 months) to identify the probability of a regime to prevail upon a global dataset, considering growth, inflation, monetary aggregates and corporate leverage.

The Advanced Investment Phazer in brief

The Advanced Investment Phazer (AIP) is our analytical tool that deploys cluster-based algorithms to provide probability backed assessments of short-term global economic trends (24M) and eventually derive investment recommendations. The AIP wraps macroeconomic and financial regimes by partitioning the dataset using global factors and local determinants (DM and EM data are considered). Therefore, monetary policy – both conventional and unconventional – and private leverage are considered together with economic activity indicators. The model allows regimes' "likelihood" calculation conditioned and defined by internal macroeconomic forecasts. We therefore assign the expected probability for each of the regimes (we detected 5 regimes: contraction, slowdown, recovery, late cycle and asset reflation). Probabilities are inversely proportional to the Euclidean distance between macroeconomic forecasts and the reference values for each regime: the smaller the distance, the more likely the regime. We adapt the AIP to longer time horizons for the purpose of this long term returns analysis, using the US data as reference for the forecast.

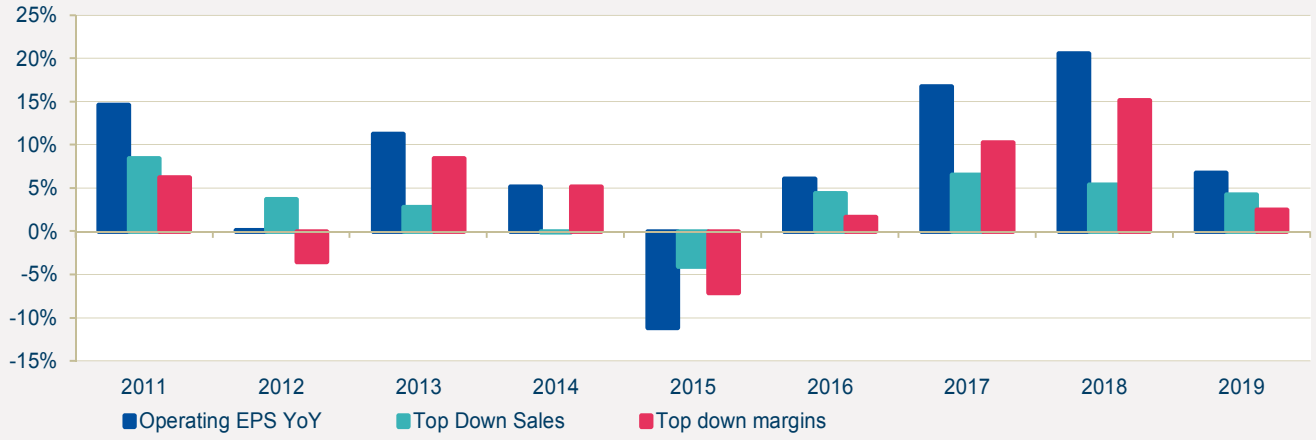
Baseline scenario

We measured that market consensus in December 2018 to overshoot on the downside, pricing in a recession risk twice the number of times that would be justified by fundamentals. True, empirical evidence suggests a greater than 60% probability of a recession within two years when growth is above potential with full employment and tightening monetary policy. However, we consider that for the near future, controlled oil price dynamics, more dovish stances from central banks (e.g., the Fed, ECB, and PBoC), friendlier fiscal policies (despite the limited fiscal space available), low inflation, and low interest rates all act as positive factors for further extension of the cycle.

Avoiding an economic recession though, does not necessarily mean that corporate profits will not drift into recession, as happened in 2014/15.

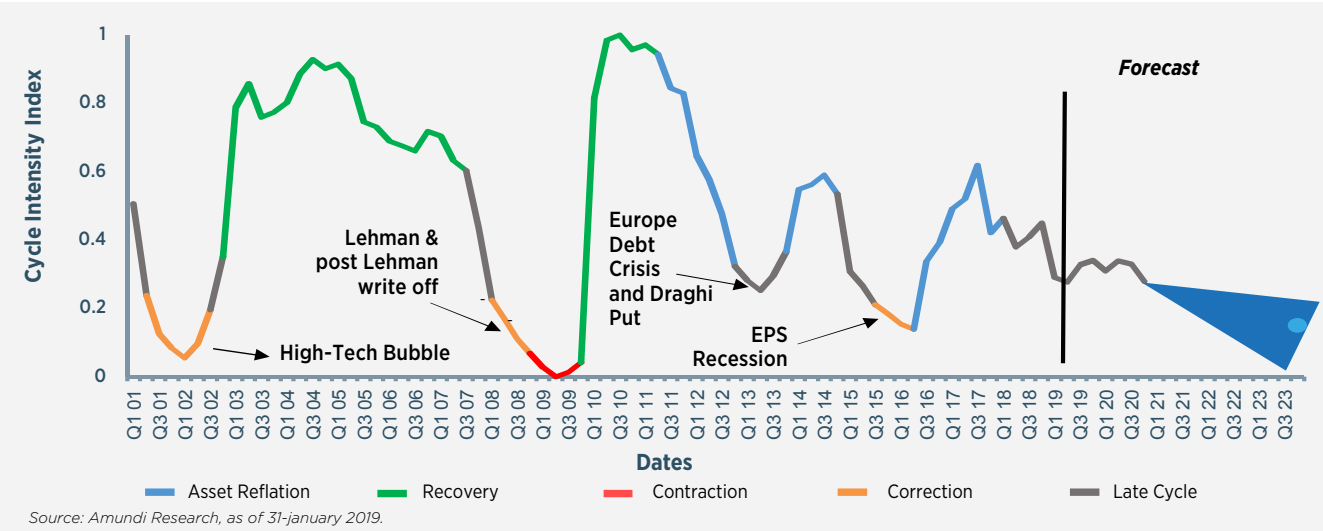
EPS has already peaked and we forecast that EPS formation, using S&P 500 operating earnings as a pivot, will become more challenging. This will be key for financial markets starting to price in a mild recession. According to our calculation the probability to drift into a recession in the next 3/5 years, lift beyond 50%.

2/ S&P 500 operating EPS, sales and margins



Source : Standard & Poors, Bloomberg, Amundi Strategy Research. Data as of 31January 2019

3/ Investment Phazer Dynamic - Smoothed



Source: Amundi Research, as of 31-january 2019.

In our scenario, we also **include assumptions on Europe and China.** We assume that **Europe will fall into a slight recession before the US**, based on the rationale that the ECB has less room for manoeuvre, countries have little fiscal space, and political impasses continue, along with delays in fiscal plans, with perverse effects on growth. Moreover, whatever resolution we see with Brexit, the **UK will continue to move on a weaker growth path**, due to persistent uncertainty in corporate investment plans. In **China**, we assume the policy mix will maintain the economy on a **reasonable and more balanced growth path.** While timing a recession is still a challenge, we stick to these short / medium-term hypotheses to calculate conservative projections on the financial markets on average. US convergence to equilibrium is 10 years; for the other regions time to convergence is longer.

Framing hypothesis and investment consequences

When compared to one year ago estimates and to historical averages, today's long-term expected returns (time horizon = 10 years) are lower.

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The main reason is the transition from an asset reflation regime (i.e., central banks' deploying ultra-accommodative monetary policy and reflating financial markets) to a late-cycle regime (i.e., economic growth consolidating at lower levels).

We expect further consolidation to come during a progressive transition to a slowdown regime. Within this environment, we expect growth to stay at potential and possibly enter a mild economic recession in the medium term (in the next three to five years). We attach a probability of around 50% to this scenario.

Looking back, our expected scenario is not far from what happened in 2001. We are therefore adopting this empirical reference to ground the rationale of our assumptions.

In particular:

For GDP Growth : a period growth at around -0.5%/0.5% in the US and Europe, a recession in the UK

An Inflation at 1% in the US and lower in Eurozone.

Central banks will be forced to turn dovish: the Fed has the interest rates lever, while the ECB would likely move back to (un)conventional monetary policy (TLTRO has already been announced and APP is an option).

Credit spreads will be under pressure and default rates will increase. Levels, though, will remain below those seen in 2008, as fundamentals have improved since then. Consequently, expected returns on government bonds should increase, while credit performance is expected to be lower initially (likely timing the recession in the short term) and then recover afterward.

In the Eurozone, government bonds momentum is more scattered. We therefore assume a temporary divergence in spreads between core and peripheral countries in the medium term followed by a convergence in the long term.

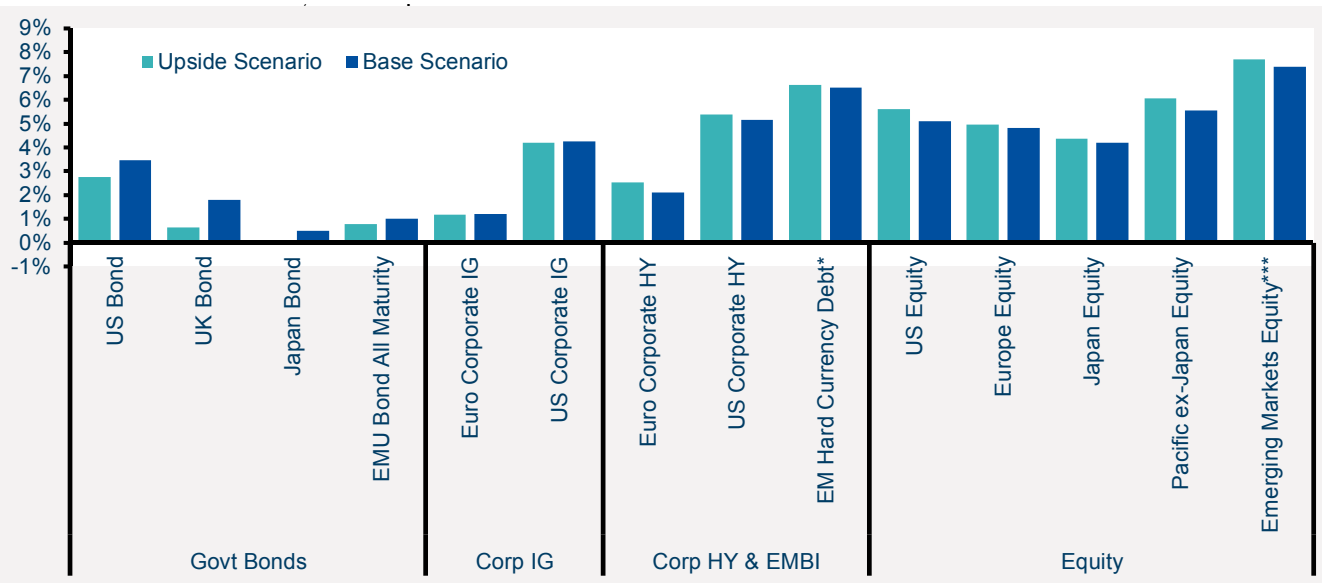
Equity total returns will be depressed on medium term horizon as a consequence of the profit recession, the rising of the macroeconomic slowdown could reinforce the negative effect of the profit recession. Returns on the 10 years horizon will be lower than our previous forecasts and more significantly than their equilibrium levels.

Being the developed markets the origin of the macroeconomic slowdown, the evolution of the Emerging markets assets could reveal a bit of resilience in returns, also linked to their higher potential that in not under discussion.

Upside scenario

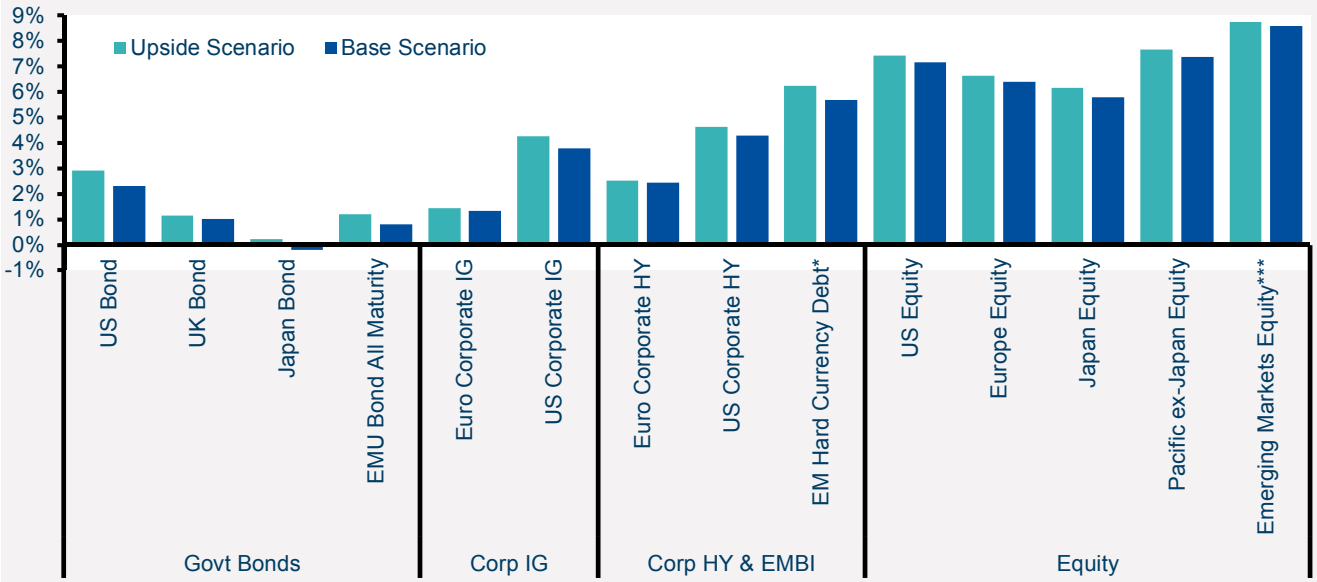
We also calculated expected returns under **a scenario in which the US economy continues to grow at potential, supported by the Fed in the medium term, notwithstanding a S&P 500 profits recession** (extended to all the equity markets). This is due to trade disputes and uncertainty reverberating into revenue generation and corporate investment plans, due, in turn, to still fragile confidence. We assume monetary policy is successful in preventing growth downturns, while idiosyncratic risks related to trade, Brexit, and the political cycle fade somewhat without being fully resolved. In this environment, central banks progressively normalize their stances and rates drift smoothly higher. Some underlying fragility persists and reflects into the inflation path, which picks up only mildly. In Europe, the slowdown is temporary and growth unlocks dissipating political tensions, including with regards to the UK and Brexit deal. As expected, the differences with the baseline scenario are evident in the medium-term directories while over 10 years horizon the difference is less pronounced because of the convergence path. In fact, greater recession risk in the baseline scenario curbs equity returns, interest rates are lower and US Treasuries clearly stand out as a safe haven. As the recession risk refers primarily to DM, the EM universe is appealing as, notwithstanding the slowdown if the region avoids a negative growth path. However, it is fundamental to highlight that our assumption has a strong impact on volatility.

4/ 5-year expected returns - base vs alternative



Source: Amundi Asset Management CASM Model, Amundi Asset Management Institutional Advisory and Research Teams, Bloomberg. Data as of the 7th of February 2019

5/ 10-year expected returns - base vs alternative



Source: Amundi Asset Management CASM Model, Amundi Asset Management Institutional Advisory and Research Teams, Bloomberg. Data as of the 7th of February 2019

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SECTION I

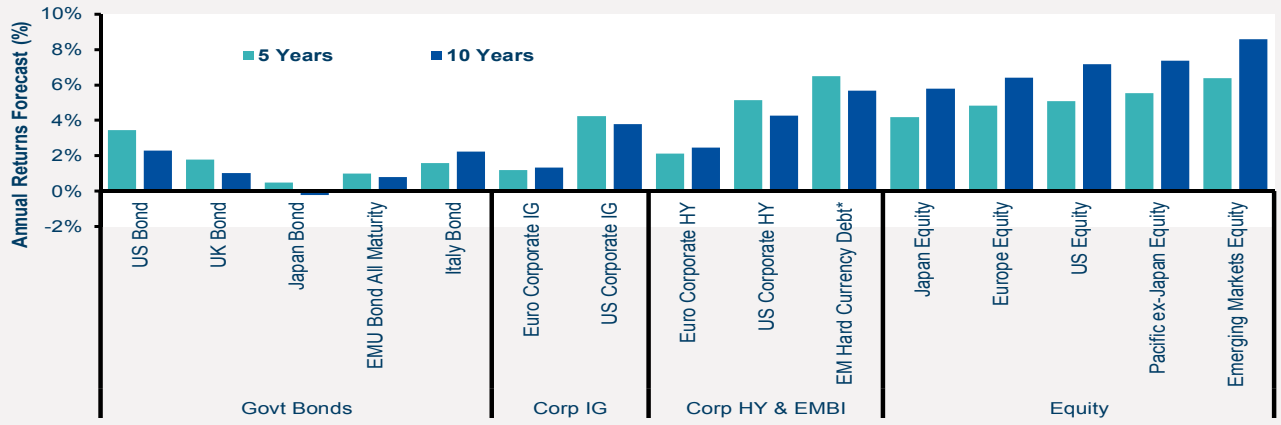
Medium and long term returns: embracing complexity

Cash	• **Monetary policies differ** widely in advanced economies, reflecting different degrees of progress towards achieving central bank objectives. • All central banks are assumed to be going through a period of **monetary easing in the medium term** because of the rising risk of recession. • Ongoing **disappointments on the inflation** front argue for central banks' very gradually raising policy rates towards neutral levels in the Eurozone and Japan. • For the Eurozone, on the basis of disappointing macro-economic growth and considerable policy uncertainty, we have modified our expectations of the monetary policy trajectory over 3, 5 and 10 years.
Government Bonds	• **Central bank divergence** will continue to be a key theme driving the fixed-income space. • With the probability of a recession rising over the next 3 to 5 years, **government bonds should outperform cash and deliver decent returns.** Over a 10-year horizon, with the widespread increase in interest rates, total returns will be lower, as the incremental accruals will be offset by price losses. • **US Treasuries should deliver the highest returns amongst developed countries in the medium and long terms.** • The outlook on **EM debt is moderately positive** in the medium to long terms, as a result of high carry and resilient fundamentals for EMs. • From a structural point of view, the EMBI could benefit from an **increase in diversification** within the index and a higher rating after the inclusion of GCC, thus attracting flows.
Credit	• Overall spread-widening in 2018 showcases improving valuations across the corporate spectrum. • In the medium term, using our baseline scenario, we expect **spreads to widen** and the **default rate to increase,** thus affecting returns negatively, while falling interest rates, mainly in the US, are supportive. The net result is **higher US returns** in the medium term than on a 10-year horizon, while in the EU the balance is flat for IG and negative for HY. • After five years, spreads and default will converge to long term levels and returns will moderate in US, while they could slightly increase in EU credit.
Equities	• Expected returns over **3 to 5 years are lower than over longer horizons,** as the cycle is mature and a period of contraction in earnings growth is assumed over that horizon, leading to below-trend EPS growth in the medium term and to falling valuations. • 2018 was a year of de-ratings, offering more attractive entry points. Valuation is no longer a negative factor for investors with a long term perspective. Over the long run, on an equilibrium basis, we estimate the US market should appreciate at a trend rate of 7.7% p.a. in nominal terms, the highest amongst developed countries. We estimate EM equity returns in the long run at 9.4%.
Investment Consequences	• **Reduced reward/risk ratio** going forward **due to increasing prospects of recession** on a global level**.** • Instruments with **improving favorable reward/risk profiles include: US/EU IG, EM hard currencies** among bonds**, and Japan and EU equities.**

Annualised expected returns

In the medium term, equity returns are expected to moderate because of decelerating macroeconomic growth and a profit recession. They are higher over a 10-year horizon. 5-year returns for Eurozone credit is almost in line with 10-year returns. Government bonds could benefit from falling interest rates in the medium-term but have low expected returns over longer horizons.

1/ Annualised average expected returns (5 years vs 10 years)

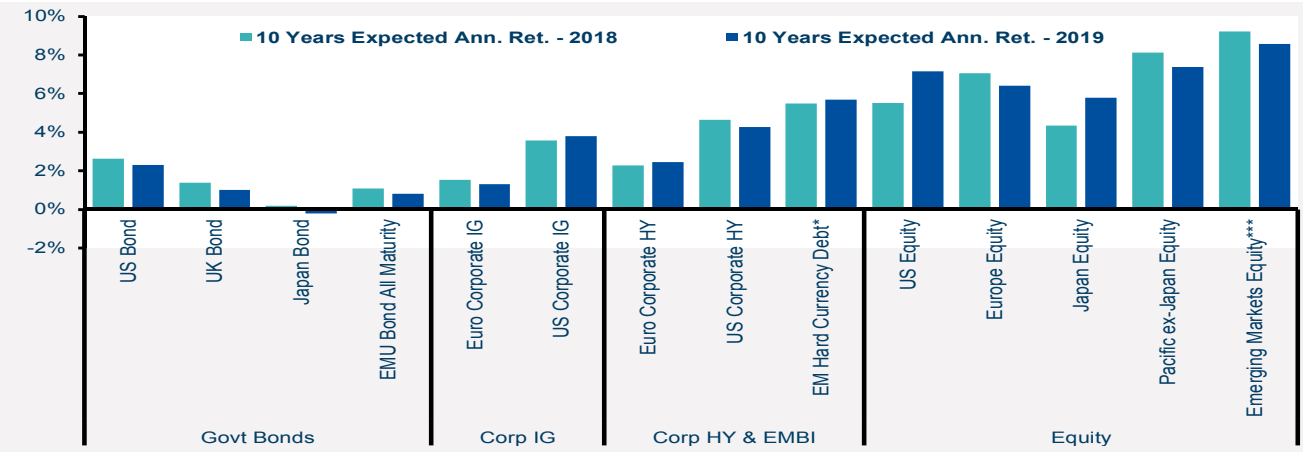


Source: Amundi Asset Management CASM Model, Amundi Asset Management Institutional Advisory and Research Teams, Bloomberg. Data as of 7 February 2019

Current, previous update and historical comparison

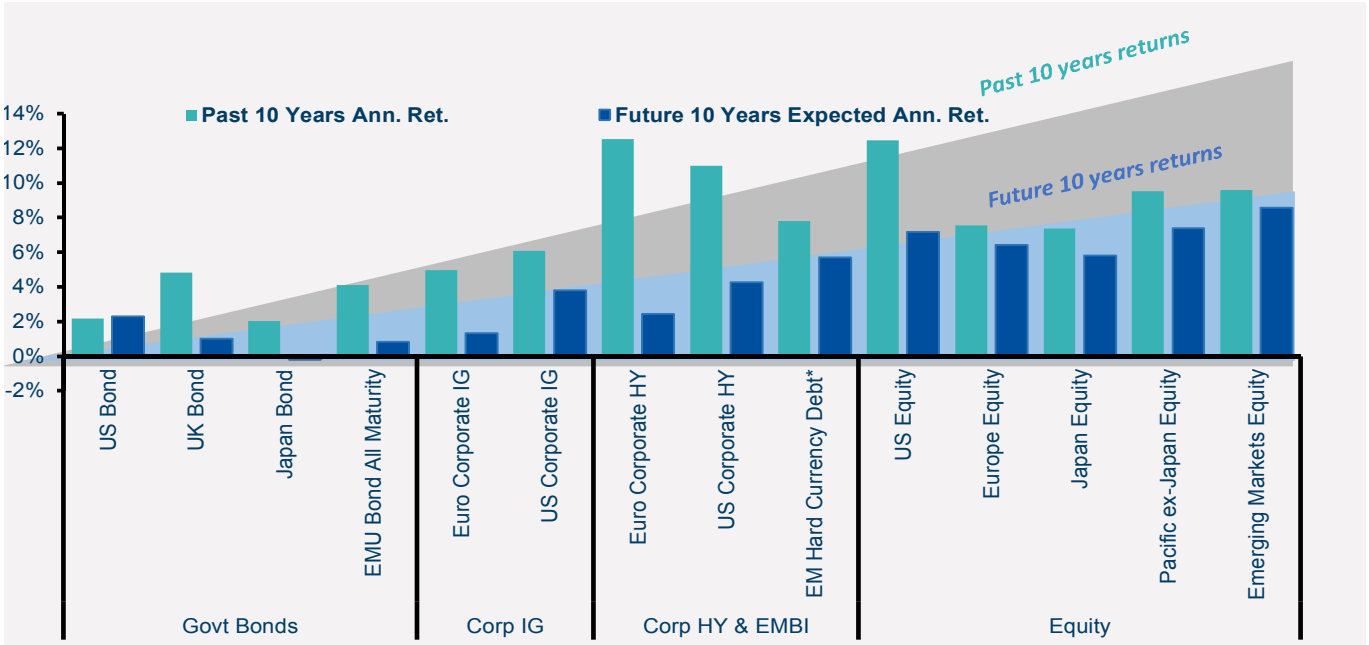
Our 10-year forecasts are lower than the ones we reported last year across most asset classes. The few significant exceptions (US and Japanese equities) are the results of revisions of our long term assumptions and different entry points for valuations. To better interpret the historical comparison, itis fundamental to highlight the fact that the last 10-year period under observation started at the end of 2008, when all financial markets were starting to recover from the great financial crisis (an asset reflation period). Our 10-year expected returns are lower than the ones delivered during the asset reflation period, as in 2018 we entered a late cycle phase with central banks' attempts to recalibrate monetary policy and as economic growth surpassed its peak.

2/ 10-year expected returns - 2019 vs 2018



Source: Amundi Asset Management CASM Model, Amundi Asset Management Institutional Advisory and Research Teams, Bloomberg. Data as of 7 February 2019

3/ Past 10 years vs future 10-year returns



Source: Amundi Asset Management CASM Model, Amundi Asset Management Institutional Advisory and Research Teams, Bloomberg. Data as of the 7th of February 2019. Macro figures as of last release. Interest rates updated as of the 31 December 2018. Italian Curve and Equity updated as of the 18th of January. Spread and FX updated as of the 31st of January 2019. Equity returns based on MSCI indices.
One year forward views and fair values provided by Research team (macro, yields, spread and equity). Forecasts for annualised returns are based upon estimates and reflect subjective judgments and assumptions. These results were achieved by means of a mathematical formula and do not reflect the effect of unforeseen economic and market factors on decision making.

Expected returns by asset classes

In the following table, we present our return forecasts across different asset classes, calculated as the average of simulated annualised returns, on different forward looking horizons (from 3 years to 10 years). We have also included as a reference the historical annualised returns and volatilities calculated on a 20-year horizon.

Assets in local currency	Reference Index	Duration	Average Annualised Expected Returns			1998-2018 Historical Returns (p.a)	1998-2018 Volatility (p.a)
			3 year Expected Returns	5 year Expected Returns	10 year Expected Returns		
Cash							
Euro Cash	JPCAEU3M index	0.3	**-0.4%**	**-0.3%**	**0.2%**	2.1%	0.5%
US Cash	JPCAUS3M index	0.2	**2.5%**	**1.9%**	**1.8%**	2.5%	0.6%
Government Bonds							
US Bond	JPMTUS Index	6.4	**4.0%**	**3.5%**	**2.3%**	4.3%	4.6%
UK Bond	JPMTUK Index	12.0	**3.2%**	**1.8%**	**1.0%**	5.2%	5.8%
Japan Bond	JPMTJP index		**0.6%**	**0.5%**	**-0.2%**	2.1%	2.2%
Emu Bond - Core	JPMTWG index	7.6	**0.7%**	**0.6%**	**-0.2%**	4.2%	3.9%
Emu Bond - Semi Core (France)	JPMTFR index		**1.4%**	**2.0%**	**1.1%**	4.4%	4.1%
Italy Bond	JPMTIT index	6.6	**0.6%**	**1.6%**	**2.2%**	4.7%	5.5%
Spain Bond	JPMTSP index		**0.4%**	**1.9%**	**1.9%**	4.8%	5.1%
EMU Bond All Maturity	JPMGEMUI Index	7.7	**0.7%**	**1.0%**	**0.8%**	4.4%	3.9%
Barclays Global Treasury	BTSYTRUU Index	8.0	**1.9%**	**1.7%**	**1.0%**	3.6%	6.7%
Credit Investment Grade							
Euro Corporate IG	ER00 index	5.0	**0.8%**	**1.2%**	**1.3%**	4.2%	3.2%
US Corporate IG	C0A0 index	6.9	**5.0%**	**4.2%**	**3.8%**	5.3%	5.2%
Barclays Euro Aggregate	LBEATREU Index	6.8	**0.7%**	**1.0%**	**0.9%**	4.3%	3.3%
Barclays US Aggregate	LBUSTRUU Index	5.9	**4.2%**	**3.6%**	**2.8%**	4.5%	3.4%
Barclays Global Aggregate	LEGATRUU Index	7.0	**2.5%**	**2.5%**	**1.9%**	3.8%	5.6%

Edition 2019 | **Medium and long term expected returns**

Assets in local currency	Reference Index	Duration	Average Annualised Expected Returns			1998-2018 Historical Returns (p.a)	1998-2018 Volatility (p.a)
			3 year Expected Returns	5 year Expected Returns	10 year Expected Returns		
Credit High Yield							
Euro Corporate HY	HE00 index	4.0	**0.8%**	**2.1%**	**2.5%**	5.4%	11.5%
US Corporate HY	H0A0 index	4.1	**2.3%**	**5.1%**	**4.3%**	6.4%	8.9%
Emerging Market Debt							
EM Hard Currency Debt*	JPEGCOMP Index	6.7	**3.9%**	**6.5%**	**5.7%**	9.0%	8.9%
EM-Global Diversified**	JGENVUUG Index	6.4	**6.3%**	**5.2%**	**6.3%**	6.6%	11.7%
Convertible Bond							
Europe Index (Eur Hedged)	UCBIFX20 Index		**0.6%**	**2.0%**	**2.7%**	na	na
Equities							
US Equity	NDDLUS Index		**2.3%**	**5.1%**	**7.2%**	4.9%	14.6%
Europe Equity	NDDLE15 index		**3.2%**	**4.8%**	**6.4%**	3.6%	14.8%
Euro zone Equity	NDDLEMU Index		**3.6%**	**5.0%**	**6.0%**	2.7%	17.5%
UK Equity	NDDLUK Index		**2.4%**	**4.5%**	**7.1%**	4.2%	13.4%
Japan Equity	NDDLJN Index		**2.3%**	**4.2%**	**5.8%**	2.7%	17.8%
Pacific ex-Japan Equity	NDDLPXJ Index		**2.3%**	**5.5%**	**7.4%**	7.2%	13.9%
Emerging Markets Equity***	NDLEEGF index		**3.2%**	**7.4%**	**8.6%**	9.7%	17.1%
World Equity	NDDLWI index		**2.5%**	**5.0%**	**6.9%**	4.3%	13.7%
AC World Equity	NDLEACWF Index		**2.6%**	**5.2%**	**7.1%**	4.6%	13.7%

** Hard Currency USD, ** USD Unhedged, including the USD currency expectation towards EM currencies. EM Local starting date is 31/12/2002 *** EM equity starting date is 2912/2000*

Source: Amundi Asset Management CASM Model, Amundi Asset Management Institutional Advisory and Research Teams, Bloomberg. Data as of the 7th of February 2019. Macro figures as of last release. Interest rates updated as of the 31 December 2018. Italian Curve and Equity updated as of the 18th of January. Spread and FX updated as of the 31st of January 2019. Equity returns based on MSCI indices.

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The forecast returns are not necessarily indicative of future performance, which could differ substantially.

SECTION II

Setting the scene: macroeconomic assumptions and initial conditions

Growth

- After a strong economic performance in 2017, combined with a surge in world trade, global growth decelerated in 2018 in both developed and emerging markets as a result of a complex mix of common and idiosyncratic factors, where geopolitics played a significant role.
- Going into 2020, we expect a quite fast convergence to potential growth for most developed markets. While we expect the US to decelerate more significantly in 2019 H2 and converge to potential growth in 2020, Eurozone countries will likely reach potential growth as early as 2019, because of weak growth in 2018 H2 with heavy carry-over effects, at least in the first half of this year.
- Within DMs our central scenario does not envisage an outright economic recession in the US or in EU in next 12-18 months. We estimate the probability of US recession at 20% in next 12/18 months, a non-negligible scenario, which may become more likely should the credit cycle deteriorate, implying a further worsening in macro momentum. As of today, risks in the short term remain tilted to the downside. Going beyond 2020, we expect a higher probability of recession in Europe and, later on, possibly in the USA
- With regards to the emerging market space, the other key assumption is China's gradual deceleration to a new standard of growth, with no hard landing. Under this scenario, emerging markets' performance is expected in 2019 to temporarily decouple from the slowdown in DMs. Thanks to great leeway on both take out on the monetary and fiscal policy fronts, emerging markets economies should find more support in 2019, when we should witness a reacceleration in many EM countries. Going into 2020 and beyond, though, we do not expect this decoupling to extend further as, broadly speaking, many major emerging countries will be negatively affected by lower demographic support, less investment, and decelerating productivity. Yet, amongst emerging markets the picture is clearly mixed, as outliers could emerge in the medium-long term amongst those with stronger demographics or faster productivity catch-up (e.g. Africa and countries, where the catching-up process may be faster, due to productivity increases and shifts from agriculture to the manufacturing or services economies).
- Adding to this common trend, we should recognise 2018 as likely the turning point in the globalisation process, paving the way to a new system of bi-lateral and/or more customized and regional trade agreements, with macro implications in terms of lower global trade growth in comparison to the acceleration seen since 2000. This is another factor behind a moderate outlook for EMs, in the medium term, which are still very much dependent on external demand.

Inflation

- Broadly speaking, we could say that inflation is expected to remain range-bound in the near term, as core/domestic pressures are limited, especially

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on the upside, and the main deviations are related to external shocks and events, such as food and energy prices, trade restrictions, geopolitical issues, and climate change. In developed markets, the growth outlook does not pose any strong upside risks as of now, but some pick-up in labor compensation measures may eventually translate into marginally higher final prices. In contrast, inflation could still remain below the central banks' targets (notably in the Eurozone). In emerging markets, as well, short-term inflation rates seem to be broadly in line with central banks' targets, with only a few exceptions. Long term, we are assuming a stabilization around the price-stability range, as per each central bank's monetary policy objectives, barring exogenous shocks. Going beyond 2020, we expect inflation dynamics to spike or to move out of central banks control.

Policies

- In this context of growth and inflation, emerging markets seem to have a broader range of viable tools and greater flexibility in both the monetary and fiscal policy spaces. Moreover, the gradual process of de-dollarisation and diversification of their external debt, which we expect to progress gradually in the years to come, will make emerging markets' monetary policies less dependent on the US. In the developed markets space, in contrast, central banks still seem to be sticking to non-traditional monetary policy tools to support growth, and we expect a very slow process of monetary policy normalization in the near term. Short-term, fiscal policy looks like the more powerful countercyclical tool that DMs (in particular Eurozone) could use, yet it would be a viable solution only if supported by political will. The coming EU elections may in this sense be an opportunity to be calibrated with the sustainability risks that could surge.

Debt

- This takes us to one of the key themes for the years to come, in our opinion: debt dynamics. *Global debt has reached an all-time high of $184 trillion in nominal terms, the equivalent of 225 percent of GDP in 2017. On average, the world's debt now exceeds $86,000 in per capita terms, which is* ***more than 2½ times the average income per-capita*** *(IMF Blog, Jan 2019).* In a context of lower growth and contained inflation, debt management would become key, especially for high-level debt/GDP countries (amongst both DM and EM) and prospects for bringing down debt remain uncertain. Yet, as mentioned in the "policy section", the problem is becoming more complex, as in case of economic downturn the mild debt decline experienced in 2017 will prove short-lived. In fact, in absence of effective monetary policy tools, a few countries may have to expand their fiscal policy, yet not all of them may have the fiscal capacity or room to do so without putting their debt sustainability profile at risk. (Please refer to our debt cycle focus for some details on our analysis of DM debt sustainability).

SECTION III

Expected returns by asset classes

Cash

- In advanced economies, monetary policy cycles differ substantially, reflecting different degrees of progress towards achieving the central bank's objectives.
- All Central Banks are assumed to go through a period of monetary easing in the medium term because of rising risk of recession, with some central banks (ECB and BOJ) having limited ammunitions.
- Ongoing disappointments on the inflation front argue for central banks very gradually raising policy rates towards neutral interest rates in the Eurozone and Japan.
- For the Eurozone, the disappointing macro-economic growth and considerable policy uncertainty have led us modify our expectations of monetary policy trajectory over 3, 5 and 10 years.

Long term assumptions on cash rates

3M YIELD	10 yr horizon	Equilibrium	Historical Average (last 10 yr)
US	2.8%	2.8%	0.4%
Eurozone (Germany)	1.2%	1.7%	-0.1%
UK	2.2%	2.5%	0.4%
Japan	0.8%	0.9%	-0.5%

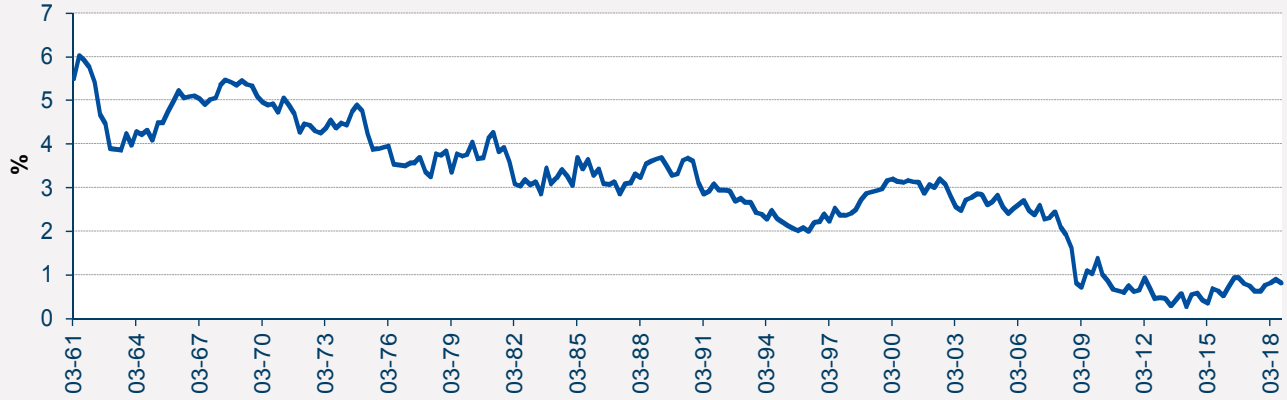
Source: Bloomberg, Amundi Asset Management CASM Model as of 7 February 2019.

The long term view

Defining the neutral real rate

In order to estimate the long term monetary policy target, we analysed the equilibrium (neutral) rate of interest (r*) that is the real short-term rate consistent with full employment and stable inflation in the medium term. The estimation of an equilibrium (neutral) real policy rate is crucial as it anchors where short-term interest rates will tend to be in the future.

LW estimate of US real equilibrium rate



Source: US Federal Reserve, Amundi Research

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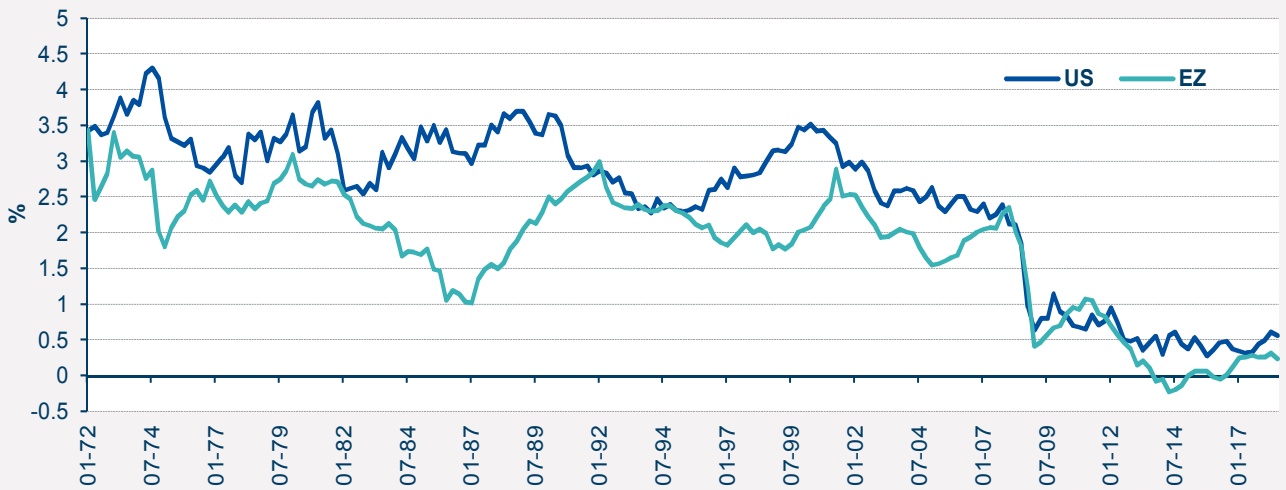
HLW estimate of real equilibrium rate for US and the Eurozone



Source: US Federal Reserve, Amundi Research

For the US, the Laubach-Williams ("LW") and Holston-Laubach-Williams ("HLW") models provide estimates in the range 0.6%-0.8%. We assume for our expected returns calculations that the real neutral interest rate is 0.8% over US inflation core, obtaining a nominal cash rate of 2.8% in equilibrium, in line with the FED. For the Eurozone, we assume that the real interest rate is zero in equilibrium, even if it could stay below the inflation level for a prolonged period. Also in Japan, we assume that the real rate will stay negative for a long time and normalise to zero in the very long term. In the UK, we base our projections on a long term equilibrium real rate of 0.5%, and a nominal equilibrium cash rate of 2.5%, in line with our estimate on long-term inflation for the Retail Price Index (RPI).

Two main global trends account for the bulk of the decline in equilibrium interest rates over the last 30 years : firstly, lower economic growth due to slowing productivity and labour force growth and secondly, heightened demand for safe and liquid assets. Although there is a lot of uncertainty about the real equilibrium interest rate and conditions may change, a reasonable assumption is that it will remain low, not far from current levels, for the future.

Contrasted starting points

In advanced economies, monetary policy cycles differ widely, reflecting different degrees of progress towards achieving the central bank's objectives .

After three and a half years of increases in the monetary policy rate, the US Federal Funds rate is now close to the long run equilibrium level (2.8% in our assumptions). With the unemployment rate at 3.9% and the PCE rate of inflation at slightly more than 2%, the Federal Reserve has achieved its dual mandate objectives and can now move to a more neutral policy stance. We anticipate that the Fed could stop current tightening cycle at 2.75%. Then, according to our calculation the probability to drift into a recession in the next 3 to 5 years, increases to beyond 50%, we therefore assume a period of easing over the medium-term period in response to a probable EPS recession and a mild economic recession.

The trajectory of monetary policy rates in the Eurozone is based on the following assumptions:

1. We delayed the timing of the first increase by the ECB, as recent developments point to some loss of growth momentum in the euro area after five years of economic expansion. Factors related to protectionism, financial market volatility and vulnerabilities in emerging markets have led to a few quarters of below trend growth.

2. Measures of underlying inflation remain weak. Core Inflation at around 1% since 2014 has continuously been lower than ECB's forecasts over the last few years. Looking ahead, underlying inflation is expected to increase supported by the ongoing economic expansion and rising wage growth, but over the over the medium-term, significant monetary policy stimulus will still be needed to support the build-up of inflationary pressures and to ensure the sustained convergence of inflation to the 2% objective of the ECB.
3. The -0.3% figure over the next 5 years is the result of the ECB confronted with a maturing economic cycle leading to a mild economic recession as well as a continued low-inflation environment.
4. The heterogeneity between countries of the Euro area, which has not decreased and which will continue to make the Euro area monetary and exchange rate policy less efficient (heterogeneity of growth, of labour costs, of public finances and of banks, etc.).

Our expected returns on Cash

The following table presents the average annualised expected returns for an investment in cash rolled every 3 months, based on the assumptions explained above for the main developed countries:

- In the Eurozone and Japan, cash yields over the next 10 years could stay lower than the equilibrium level, reflecting at first the easing of monetary policy in the medium term to counter the rising recession risk and then the slow adjustment of monetary policy and inflation expectations.
- The US cash rate should be around its long term average and will reach again that level again after the full monetary policy cycle on a 10-year horizon.

Cash returns	US	Eurozone	UK	Japan
5 yr	1.9%	-0.3%	1.1%	0.0%
10 yr	1.8%	0.2%	1.6%	0.2%

Source: Bloomberg, Amundi Asset Management CASM Model as of 7 February 2019.

Government Bonds

- Central bank divergence will continue to be a key theme driving the fixed-income space.
- With the probability of a recession rising over the next 3 to 5 years, government bonds will outperform cash and deliver decent returns. Over a 10-year horizon, with the widespread increase in interest rates, total returns will be lower as the incremental accruals will be offset by price losses.
- US Treasuries should deliver the highest returns across developed countries in the medium and long terms.
- Our long term scenario is for a flatter curve in equilibrium than historical averages in the United States and United Kingdom, resulting in bond yields remaining lower than their historical averages.
- For the Eurozone and Japan, we base our long term projections on a depressed maturity premium, with structural factors continuing to anchor the term premium at low levels.
- The low starting yields at the beginning of 2019 have reduced our expected returns over 10 years compared to our last update.

The long term view

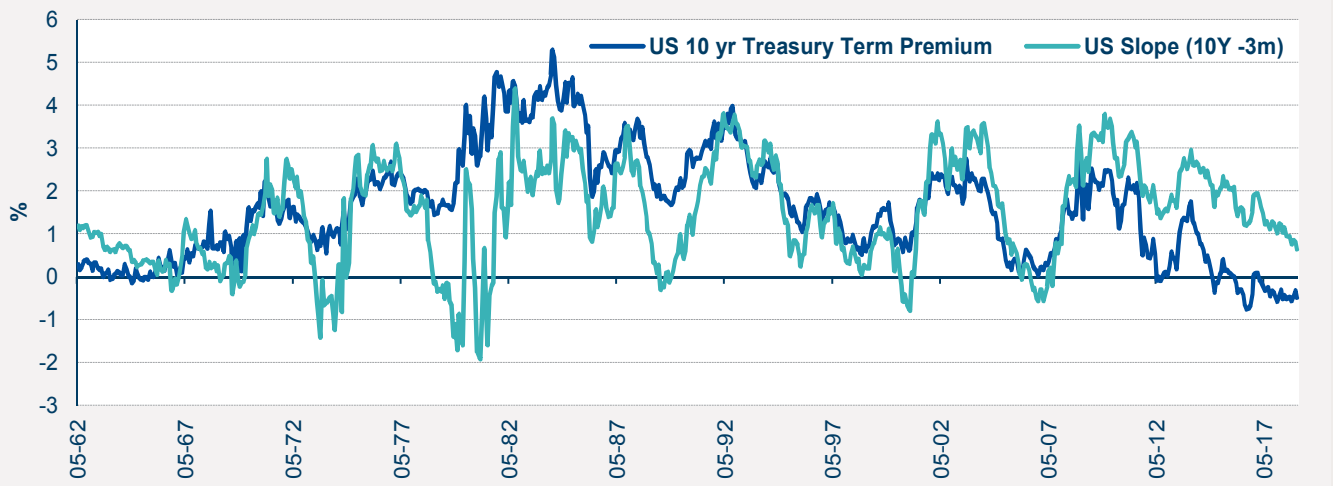
Long term assumptions on nominal 10-year yields

	10 yr horizon	Equilibrium	Historical Average (last 10 yr)
US	3.5%	3.5%	2.5%
France	2.3%	2.9%	1.9%
Germany	1.7%	2.4%	1.4%
Italy	3.5%	3.7%	3.4%
UK	2.9%	3.2%	2.2%
Japan	1.3%	1.5%	0.6%

Source: Bloomberg, Amundi Asset Management CASM Model as of 7 February 2019.

At the basis of our equilibrium estimates, 10-year nominal yields are broken down into two components: one part that reflects the expected path of short-term interest rates over the next 10 years (discussed in the previous section) and a term premium. The latter is a premium required by investors as compensation for the risk associated with holding a long term bond (which can suffer from larger price moves for a given interest rate move) rather than cash. The term premium can be measured via the realised return on a long term bond versus cash or using a term structure model. The graph below shows the term premium estimated by the Federal Reserve Bank of New York and the term slope between 10Y and 3m.

Term Premium on US 10-Year Bonds



Source: NY Federal Reserve, Amundi Research

The term slope, the observed difference between the yield on the long term and the short-term bond (10-year minus 3- month), reflects a combination of the two underlying factors. Its largest component is the expectations component about future short-term interest rates (the difference between average expected short-term rates over the lives of the two bonds). The remaining difference in yield compensates investors for the risks associated with holding long term bond rather than short-term bonds i.e. the term premium component.

We continue to anticipate a term premium lower than the historical average. In our assumptions, structural factors will continue to anchor the term premium to lower levels in all the developed countries under the spotlight.

Starting with the US, on the cyclical side, the starting point is a very low, even negative, term premium close to a five-year low (-60 bp). It is typically low at this stage of the cycle as it is low when the economy is in good shape and tends to rise cyclically when the economy deteriorates. It rises along with bond volatility, when uncertainty on the economy and inflation increases. Specifically, in the forthcoming years, we expect the term premium to rise given growing uncertainty about the consequences of the Fed's monetary policy tightening on growth. But this rise should be offset by a more moderate projected path for short-term rates as the cycle matures, limiting the rise in bond yields.

According to the Fed's calculations, the large-scale asset purchases (LSAPs) through 2014 has reduced the 10-year term premium by as much as 50 to 100 basis points. Even though we cannot rule out another episode of QE over our forecast horizon, we anticipate that diminishing demand pressure from central banks will contribute to a lasting albeit moderate rise in the US term premium.

On a structural note, the downward trend in the term premium since 2008 has been linked to the more appealing risk properties of bonds in an environment of low growth and low inflation. Investors have been willing to hold bonds even as the term premium fell towards zero or became negative. Bonds benefited from each sign of disappointment in the economic recovery as investors raised their expectations of further monetary stimulus or pushed back the expected start of policy normalisation. In addition, investors sought to hedge against tail risk after the GFC and bonds took on some insurance-like properties against it. Those factors should continue to weigh on the long end of the yield curve over our forecast horizon. In the United States, we base our forecasts on a 70 bp term slope in equilibrium, which is flatter than historical average. Our equilibrium long term bond yield is unchanged, estimated at 3.5%.

For the Euro area and Japan, we expect a depressed term premium over our forecast horizon (10 years) with the 10y-3m spread at around 50 bps and the equilibrium level of 70 bps reached beyond 10 years horizon. This assumption takes into account disappointments on growth and inflation, which led us to downshift our expected path for short-term rates (see previous section). In the Euro area and Japan, three factors will depress the term premia and weigh on long term yields and term slopes over our forecast horizon:

1. The premium for inflation risk should remain at historical lows with moderate inflation over the long term
2. Central banks will need to keep yields depressed below nominal GDP to help debt sustainability.
3. In Eurozone, we should also expect a significant lag between the end of the Asset Purchase Program (APP) in December 2018 and a rise in the term premium, as is the case in the United States. The ECB is undertaking a rotation of its policy instruments from asset purchase programs (which ended in 2008) towards more conventional instruments of monetary policy: i.e. interest rates and forward guidance on their likely path. Nevertheless, like the Fed, the ECB will continue to exert downward pressure on the term premium to keep long term bonds low. Firstly, by using forward guidance to diminish uncertainty around the path of short rates. Secondly by reinvesting principal payments from maturing securities purchased under the APP and keeping a large balance sheet.

For the rest of the Eurozone, we have current spreads close to equilibrium levels (France and Spain) and therefore higher expected returns than on German bonds. Regarding Italy, according to our analysis, the Italian BTP - German Bund spread could stabilise at around 150 bps in the long run assuming the debt to GDP ratio remains under control (refer to the special section on debt sustainability), potential GDP stands at 0.7% and inflation is in line with ECB target. Spread trends are linked to both country and European Union factors that could weigh in the short and medium term, so we expect the asset class to keep a high level of variability.

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Our expected returns on Government Bonds

The current US term structure is flat, as expected in the mature phase of the cycle, while curves are steeper in other developed countries. In the medium term, when uncertainty on the economy and inflation increases, curves will start steepening as short-term rates decrease with positive effects on returns. The size of the correction in interest rates and the shift in the term structure shape will differ in the countries, as they are related to the implementation of the monetary policy via central banks and the available monetary policy tools. In particular, the evolution in Eurozone is subject to multifaceted uncertainty, based on low starting yields, reduced monetary policy tools, Eurozone macro-economic heterogeneity, etc.

Decomposition of our 5-year and 10-year expected returns on government bonds

	Horizon	Return	Carry	Nominal Term Structure	Residual (simulation, compound)	Volatility
US GOVT Bond	5 yr	3.5%	2.5%	0.7%	0.3%	4.5%
DUR = 6.4	10 yr	2.3%	2.6%	-0.5%	0.3%	4.6%
EU GOVT Bond	5 yr	0.6%	0.3%	0.1%	0.2%	5.5%
DUR = 7.7	10 yr	-0.2%	0.7%	-1.0%	0.2%	5.6%
IT GOVT Bond	5 yr	1.6%	3.0%	-1.5%	0.1%	5.2%
DUR = 6.6	10 yr	2.2%	3.0%	-0.9%	0.1%	5.3%
UK GOVT Bond	5 yr	1.8%	1.6%	-0.8%	1.0%	7.5%
DUR = 12	10 yr	1.0%	2.1%	-1.6%	0.6%	7.7%
JAP GOVT Bond	5 yr	0.5%	0.6%	-0.1%	0.0%	2.0%
DUR=10	10 yr	-0.2%	0.8%	-1.0%	0.0%	2.1%

Source: Bloomberg, Amundi Asset Management CASM Model as of 7 February 2019. Italian curve as of 18/01/2019 Japan government bond are not part of CASM model at this stage.

The annualised expected return is the average compound return of each scenario in our simulation. Annualised expected returns are calculated for several investment horizons. The returns are decomposed into risk factors i.e. carry (includes coupon, roll down and pull-to-par effect), nominal term structure and a residual return. The return decomposition is calculated using the first and second order sensitivities of the price with respect to the risk factor. The residual contains the higher order moments. The remainder of the residual is linked to the asymmetry of the asset class return distribution. We calculate the return decomposition of the central scenario whereas the expected return is the average simulated return. Bond index instruments are constant maturity i.e. rebalanced on a quarterly basis.

A supportive environment on a 3-to-5-year horizon characterizes expected returns on government bonds. Expected returns on a 5-year horizon could be higher than on 10 years. Italy could be an exception, as the rising probability of a recession could result in a widening in the spread, whose size and timeline is uncertain at this stage. Meanwhile, we tend to expect a convergence of the spread to the equilibrium level (150 bps) beyond 10 years. Over a 10-year horizon, with the widespread increase trend in interest rates, total returns could be lower, as increasing carry is more than offset by the negative term structure contribution. US Treasuries could deliver the highest returns across developed countries on both medium- and long term horizons.

EM Bonds

- The outlook on EM debt is moderately positive in the medium to long term, as a result of high carry and a balanced macro scenario for EM. We assume that EM bonds could generally show good resilience, as during past crisis.
- On EM local debt, in the medium term, the contribution of currency is negative because of the deterioration of the macro environment in developed markets. Nevertheless, over a 10-year horizon, the USD overvaluation implies a potential upside for emerging market currencies and results in a higher return.
- From a structural point of view, the EMBI could benefit from an increase in diversification within the index and a higher rating after the inclusion of GCC, thus attracting flows. In the medium term returns could be supported by falling US yields, which would be only partially offset by wider spreads and higher default rates.
- The risk could be country-specific, affecting the macro environment and the asset class via currency (and inflation) in the case of local-currency exposure and via default and credit risk in hard-currency exposure.

The long term view

Long term equilibrium levels for EM bond yields and spreads

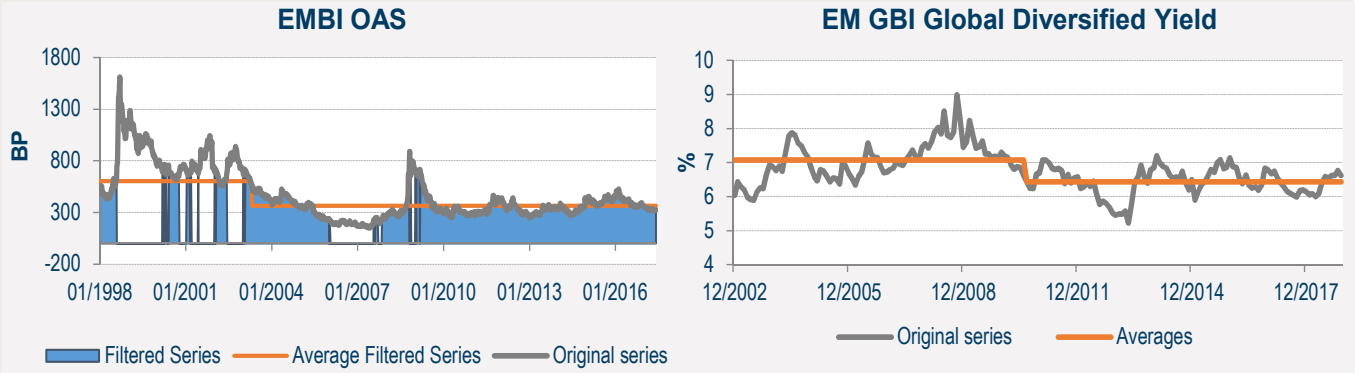
	Long Run Level (Dec 2018)	Historical Average (break analysis)
EMBI Global Spread	3.20%	3.6%
GBI-EM Global Diversified Yield	6.20%	6.4%

Source: Amundi Asset Management as of 7 February 2019

We fix the long run level for the EMBI global spread at 3.2%, this level incorporates the effect of diversification within the index that has reduced the overall risk and the change in the composition of the index as of the beginning of the year. The inclusion of GCC countries will improve the average quality, making the asset class closer to IG (investment grade asset, average rating moving from BB+ to BBB-).

According to our analysis, the long term yield for the local currency EM index (GBI EM Global Diversified) is at 6.2% because of the falling term premium and the declining trend in inflation in EM countries.

Derivation of Long-term Spread and Yield of Emerging Market (EM) Index



Source: Bloomberg, Amundi Asset Management Institutional Advisory, calculations as of 30/11/18

The estimates are for the default rate at 1% and the recovery rate at around 50% for external debt (hard currency), assuming a higher default rate than last 10 years historic data to take into account the increasing presence of quasi-sovereign issuers that may not be fully guaranteed by governments in case of default.

Our expected returns on EM Bonds

The outlook on EM debt is moderately positive in the medium to long term, as a result of high carry and a balanced macro scenario for EMs. Our baseline scenario in the medium term expects the EMBI hard-currency to be affected, with expected returns being higher than over the long term. This net positive effect is due to the decrease in US Treasuries on the positive side, which would overcome the negative effects from increasing default rates and widening in the spread (around 200 bps which corresponds to 1 standard deviation from an historical point of view). On the local-currency front, we expect a widening in yields, reinforced by the not supportive shift in EM currencies. For those reasons, expected returns are lower on a 5-year horizon than over a 10-year one. Default losses over 10 years have been fixed in line with the long term average, while in the medium term we have assumed that defaults will be higher than their long term averages, to incorporate potential rising country-specific risk, due to the worsening of the macro financial conditions and potential contagion effect from developed markets.

In general, on a 10-year horizon we expect EMBI global returns, based on a positive contribution by carry and depressed by the term structure factor (effect of the delta yield), to be in line with the US term-structure trend. The spread contribution that is negative over a 5-year horizon because of the widening in spreads on the back of a weakening macro and financial environment, could become positive in the 10 years, due to a mean reversion to equilibrium level.

According to our analysis, the EM GBI Global Diversified returns on the 10 years are higher, as we expect that the yield could revert to its normalization path after the medium-term widening. This provides support to returns via the term-structure factor. We assume EM currencies are undervalued versus USD and the positive contribution to affect returns on a 10-year horizon, with EM currencies reaching fair value over the forecasting horizon (10 years).

Decomposition of our 5-year and 10-year expected returns on EMBI and EM-GBI

	Horizon	Return	Carry	Nominal Term Structure	Sovereign Spread	Residual (simulation, compound, etc)	Default	Volatility
EMBI GLOBAL	5 yr	6.5%	7.0%	0.7%	-0.6%	0.1%	-0.7%	14.4%
DUR = 6.7	10 yr	5.7%	6.7%	-0.6%	0.2%	0.0%	-0.6%	14.2%

	Horizon	Return	Carry	Nominal Term Structure	Currency	Residual (simulation, compound, etc)	Default	Volatility
EM-GBI Global Diversified	5 yr	5.2%	6.7%	0.5%	-1.1%	-0.2%	-0.7%	12.5%
DUR = 5.1	10 yr	6.3%	6.4%	0.1%	0.5%	-0.1%	-0.6%	12.3%

Source: Bloomberg, Amundi Asset Management CASM Model as of 7 February 2019. Spread as of 31/01/2019 . EM-GBI are not part of CASM model at this stage..

The annualised expected return is the average compound return of each scenario in our simulation. Annualised expected returns are calculated for several investment horizons. The returns are decomposed into risk factors i.e. carry (includes coupon, roll down and pull-to-par effect), nominal term structure, spread, default and a residual return. The return decomposition is calculated using the first and second order sensitivities of the price with respect to the risk factor. The residual contains the higher order moments. The remainder of the residual is linked to the asymmetry of the asset class return distribution. We calculate the return decomposition of the central

Corporate Bonds

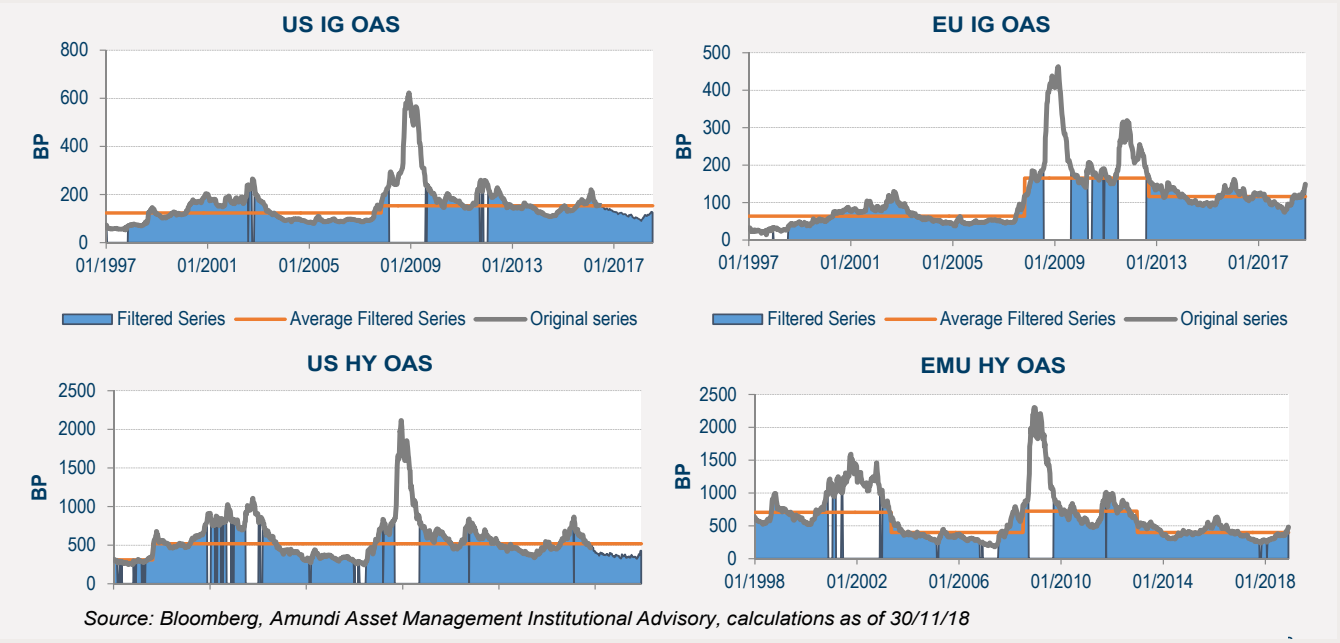
- Overall spread-widening in 2018 showcases improving valuations across the corporate spectrum.
- In the medium term, as a consequence of our baseline scenario, we expect the spread to widen and the default rate to increase, affecting returns negatively, while falling interest rates, mainly in US, are supportive. The net result is higher returns in the medium term for US than on a 10-year horizon, while in EU the balance is flat for IG and negative for HY.
- After the 5-year horizon, the spread and default will converge to long term levels, and the returns will moderate in US, while they could slightly increase in EU credit.
- Higher duration and lower quality in US results in higher equilibrium spreads versus EU
- Default and recovery rates could evolve into a medium-term regime which incorporate the increase in risk and uncertainty because of the weaker macroeconomic environment, while they can typically converge to the long term regime afterwards.

The long term view

Long term assumptions on credit

The difference in quality of the two universes, together with the gap in duration (higher in the US than in Europe) and sector composition explain the different long term spread levels, which are lower in Europe than in the US where duration has risen and quality has deteriorated as companies try to lock in lower yields. Our long term assumptions on spreads are consistent with a return of 10yr Treasury and Bund yields to higher levels, based on the historical relationship with them and the levels of their yield ratios.

Structural Analysis of Option Adjusted Spreads



Source: Bloomberg, Amundi Asset Management Institutional Advisory, calculations as of 30/11/18

The calculation of the long run spread levels involves a series of in-depth analyses of each time series: structural break analysis, statistical filtering of the spread levels based on the respective historical average and variability complemented by a qualitative assessment with respect to recent trends in data and financial indicators. The figures and table below illustrate the resulting process. Periodic reviews and structural market shifts lead to a variation in the equilibrium levels. There was no significant event in FY 2018 to warrant such changes.

Long term assumptions on credit spreads (option adjusted spreads)

OAS Spread	Long Run Level (Dec 2018)	Historical Average (break analysis)
US IG	1.30%	1.5%
US HY	4.50%	5.2%
Euro IG	1.05%	1.2%
Euro HY	3.50%	4.0%

Source: Amundi Asset Management as of 18 January 2019

Default loss estimates

As both the US and EU are seemingly in the respective late economic cycle, the risk of default increases across the corporate bond universe. Our current framework assumes multifaceted default regimes, where short-term default and recovery rates evolve into a medium-term regime that incorporates the increase in risk and uncertainty because of the weaker macroeconomic environment. Then it typically converges to the long term regime over a pre-established time horizon. The default rates are determined by the leverage and credit quality of the underlying.

Assumptions on default and recovery rates

Default Loss	Default Short Term	Default Medium Term	Default Long Term	Recovery
US IG	0.10%	0.50%	0.20%	43.1%
US HY	2.50%	6.50%	4.20%	37.7%
Euro IG	0.10%	0.50%	0.20%	43.1%
Euro HY	2.50%	5.00%	3.40%	37.7%

Source: Amundi Asset Management as of 7 February 2019

Our expected returns on Corporate Bonds

Compared with a year ago, credit spreads across the spectrum have widened and are now closer to their respective equilibrium levels due to the stage of the economic cycle and the tapering of central bank asset-purchasing programs. This has led to increased risks (in terms of defaults and volatility) that could continue in the next few years.

Using our baseline scenario, we expect the spread to widen and the default rate to increase in the medium term, affecting returns negatively, while falling interest rates, mainly in US, are supportive for US credit returns. For EU credit the term structure component is slightly negative on a 5-year horizon because of the limited adjustment on interest rates. The net result is higher returns in medium term for US than on a 10-year horizon, while in the EU the balance is flat for IG and negative for HY. After the 5-year horizon, the spread and default will converge to long term levels and the returns will moderate in US, while we could have a slight increase in the EU credit.

The figures on simulated volatility reveal the increased uncertainty in both the medium and long terms.

Decomposition of our 5-year and 10-year expected returns on Credit

Horizon	Horizon	Return	Carry	Nominal Term Structure	Credit Spread	Default	Residual (simulation, compound, etc)	Volatility
US Corporate IG	5 yr	4.2%	4.2%	0.7%	-0.8%	-0.2%	0.4%	6.4%
DUR = 6.9	10 yr	3.8%	4.2%	-0.6%	0.0%	-0.1%	0.3%	6.5%
EU Corporate IG	5 yr	1.2%	1.8%	-0.2%	-0.3%	-0.2%	0.0%	4.1%
DUR = 5	10 yr	1.3%	2.1%	-0.8%	0.1%	-0.1%	0.0%	4.2%
US Corporate HY	5 yr	5.1%	8.0%	0.7%	-0.5%	-3.0%	0.0%	10.2%
DUR = 4.1	10 yr	4.3%	7.7%	-0.3%	-0.1%	-2.8%	-0.2%	10.2%
EU Corporate HY	5 yr	2.1%	5.3%	-0.2%	-0.5%	-2.4%	-0.1%	12.2%
DUR = 4	10 yr	2.5%	5.0%	-0.7%	0.6%	-2.3%	-0.2%	11.7%

Source: Bloomberg, Amundi Asset Management CASM Model as of 7 February 2019. Spread as of 31/01/2019
The annualised expected return is the average compound return of each scenario in our simulation. Annualised expected returns are calculated for several investment horizons. The returns are decomposed into risk factors i.e. carry (includes coupon, roll down and pull-to-par effect), nominal term structure, credit spread, default and a residual return. The return decomposition is calculated using the first and second order sensitivities of the price with respect to the risk factor. The residual contains the higher order moments. The remainder of the residual is linked to the asymmetry of the asset class return distribution. We calculate the return decomposition of the central scenario whereas the expected return is the average simulated return. Bond index instruments are constant maturity i.e. rebalanced on a quarterly basis.

Equities

- Expected returns over 3 to 5 years are lower than over longer horizons as the cycle is mature and a period of contraction in earnings growth is assumed over that horizon, leading to below trend EPS growth in the medium term and to falling valuations
- 2018 was a year of valuation de-rating, offering a more attractive entry point for long term investors, as we believe that global equities have greater return potential than bonds
- Over the long run, in equilibrium, we estimate that US market should appreciate at a trend rate of 7.7% p.a. in nominal terms, the highest amongst developed countries. EM equity return in the long run is estimated at 9.4%.

The long term view

The expected return on equities can be broken down into 3 components: (1) the expected trend growth in real earnings per share plus inflation, (2), the expected change in valuation or repricing and (3) the income component. Up to 10 years, the repricing component, i.e. the change in the P/E valuation multiple, can have a meaningful impact.

Over a longer horizon, however, we consider no contribution from this component and the expected return on equities is equal to the income return plus the expected trend growth in nominal earnings per share, which represents the equilibrium steady state.

Expected trend growth in earnings per share

We estimate trend growth in nominal EPS using different measures of the underlying potential growth in earnings.

The first one is simply the potential GDP growth estimate and our long term inflation projection, to estimate stocks' revenue growth in the long term. Nominal GDP trend growth estimates range from 1.6% in Japan to 7.1% in EM markets, with the US and the UK in the middle at 3.8% and 3.7% respectively and the Eurozone at 3.1%.

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Long term nominal GDP growth estimates

	Potential nominal GDP growth	Potential real GDP growth	Long run inflation
USA	3.8%	1.8%	2.0%
EMU	3.1%	1.3%	1.9%
UK	3.7%	1.7%	2.0%
Japan	1.6%	0.7%	0.9%
Pac ex JP	4.5%	2.0%	2.5%
EM	7.1%	4.2%	2.9%

Source: Bloomberg, Amundi Asset Management

As the potential GDP growth does not incorporate the contribution on earnings growth coming from foreign exposure, we also analysed the distribution of the earnings looking at the company revenues by regions. The stocks quoted on the Euro area equity markets generate more than half of their revenues internationally (52%), of which 30% in the Emerging markets.

The same goes for Japan, where revenue growth estimated at the pace of nominal GDP growth adjusted for the proportion of revenues that are generated overseas goes from 1.6% to 3.4%. For EM Stocks, 15% of revenues are generated in developed countries.

Geographic distribution of revenues for various regional indices (%)

	US Equity Market	EMU Equity Market	Japan Equity Market	EM Equity Market
US	73.0%	17.4%	15.6%	7.9%
Europe	10.1%	47.5%	7.1%	6.0%
Japan	3.3%	2.9%	53.7%	1.0%
EM	13.6%	32.2%	23.6%	85.1%
Total	100%	100%	100%	100%

Source: Morgan Stanley, Amundi Asset Management

We also take into account the sustainable growth rate to estimate the expected trend growth in EPS. This is the product of the return on equity and the retention ratio (i.e. the portion of earnings that are remaining after dividends have been paid).

It represents the growth rate that companies can reach using the revenues they generate. The advantage of this measure of growth to estimate EPS trend growth is that it is based on the return on equity of the different equity markets, enriching our analysis with interesting bottom-up information.

ROE of regional indices (%)

	Return on Equity
US	15.4%
Eurozone	10.6%
UK	11.5%
Japan	10.0%
Emerging Markets	12.3%
Pacific ex-Japan	11.5%

Source: MSCI, Thomson Reuters, Amundi Asset Management

Market Cap weights of sectors in various regional indices (%)

	Index Weight (%)					
	MSCI USA	MSCI EMU	MSCI UK	MSCI Japan	MSCI EM	MSCI Pac. ex JP
Energy	5.4%	5.9%	17.4%	1.0%	8.2%	3.4%
Materials	2.7%	7.2%	9.0%	5.6%	7.6%	9.9%
Industrials	9.2%	14.5%	9.2%	20.9%	5.5%	8.9%
Consumer Discretionary	10.4%	13.0%	6.4%	18.7%	10.6%	6.8%
Consumer Staples	7.1%	10.6%	16.5%	8.4%	6.7%	4.5%
Health Care	15.0%	7.5%	9.5%	9.0%	2.7%	6.0%
Financials	13.5%	18.2%	20.9%	11.7%	24.8%	37.6%
Information Technology	20.3%	8.8%	0.8%	9.8%	14.1%	0.7%
Communication Services	10.2%	5.8%	5.7%	8.3%	14.3%	2.9%
Utilities	3.2%	6.2%	3.3%	2.2%	2.7%	4.9%
Real Estate	3.0%	2.2%	1.2%	4.2%	3.0%	14.3%
Total	100%	100%	100%	100%	100%	100%

Source: MSCI, Thomson Reuters, Amundi Asset Management

The US market has benefited in this cycle from its bias towards technology and growth sectors while Eurozone EPS growth has been dragged down since the GFC by the larger weight of the financial sectors and value sectors. Ten years after the GFC, earnings per share in the US are 60 % above the previous cyclical peak of 2008, while in the Eurozone the EPS are still 20% lower. Emerging market indices are also heavily weighted in technology companies (29% in information technology and communication services) while the Japanese market is heavily weighted in value and cyclical sectors.

Comparison of estimates of long term nominal EPS growth (%)

	Potential nominal GDP growth	Adjusted* Potential Growth	Sustainable Growth (ROE * retention Ratio)
USA	3.8%	4.3%	6.5%
EMU	3.1%	4.6%	5.1%
UK	3.7%	-	5.4%
Japan	1.6%	3.4%	5.0%
Pac ex JP	4.5%	-	5.6%
EM	7.1%	6.6%	6.7%

***Adjusted for Including the geographical distribution of revenues**

Source: Thomson Reuters, Bloomberg, Amundi Asset Management

Those earnings estimates hold for the long term, while in the medium term, a period of contraction in earnings growth is assumed as the cycle matures. Having risen sharply since the end of 2016, EPS growth should slow from 2019. In addition to the peak of economic growth and the tightening of monetary policies, many factors, such as the dissipation of the impact of the tax reform in the US, the reduced contribution of the oil sector to earnings growth, the increase in labour costs and the impact of tariffs, will weigh on earnings growth. Therefore, the expected returns over 3 to 5 years are lower than over a longer horizon.

Estimates of long term expected returns for Equity markets

	EPS growth estimate	Income return	Long run total return on equities
USA	5.2%	2.5%	7.7%
EMU	4.1%	2.8%	6.8%
UK	4.6%	3.1%	7.6%
Japan	3.3%	2.5%	5.8%
Pacific ex JP	5.1%	3.0%	8.0%
EM	6.8%	2.6%	9.4%

Source: Thomson Reuters, Bloomberg, Amundi Asset Management

The table above summarizes the assumptions used to estimate the long term equilibrium expected return of equities, by adding the income return and the expected trend growth in earnings per share. Over the long run, we estimate that the US market should appreciate at a trend rate of 7.7% p.a. in nominal terms, the highest amongst developed countries, followed by the UK at 6.6% in nominal terms. In the Eurozone the long term expected return is below 7% and in Japan it is below 6%. EM equity returns in the long run is estimated at 9.4%.

The repricing component

2018 was a year of strong valuation de-rating. The market PE multiple is now at 5-year lows. Valuations improved and now offer a more attractive entry point for long term investors.

The US market PE fell by 25% from 19.9x to 14.8x as worries grew that more rate hikes might meaningfully slow down the strong economic growth of the past two years and as economic growth outside the United-States started to disappoint. This sharp valuation correction from high levels brings us to more reasonable valuation levels (with a 12m forward PE at the long term average of around 15x). Nevertheless, the valuation remains higher than the historical average if you calculate the cyclically adjusted PE. Over the next 3 to 5 years, we anticipate a negative contribution from this factor, as the global cycle is mature and as we are assuming a profit recession and an economic downturn over that time frame. Historically, during periods of EPS contraction, the US market has traded on average at a PE of around 13x, i.e. 12% below the current level. We have assumed the valuation to be in line with the average when aggregating the phases of correction and contraction.

Reference PE levels in correction/contraction phases

PE Reference	US Equity	EU Equity	EM Equity	Japan Equity	Pacific ex Japan Equity
Correction	17.1	15.5	11.4	14.9	15.0
Contraction	13.0	10.8	9.0	11.8	13.9
Average (Correction/Contraction)	15.0	13.1	10.2	13.3	14.5

Source: Amundi Asset Management

While from the 5 to 10-year horizon, expected returns can increase following the correction in PEs.

Over recent years the US market has been in a sweet spot with high valuations due to the moderate risk premium (i.e., a moderate required rate of return for investing in equities), low rates and decent profitability. Europe, on the other hand, is still in a regime of lower valuations because of a high-risk premium (i.e. a high required rate of return for investing in European equities given the complicated financial /economic environment and given very low real growth rates). We expect that this regime will continue over the medium term, and we therefore have a slow convergence of valuations towards the longer-term average.

The Euro area PE has reached 12.4x at the end of 2018, having contracted by 25% since the start of the year . Historically, during periods of EPS contraction, the Euro area market has traded on average at a PE of around 10.8x, i.e. 10% below the current level. However, like the US, the valuation is now in line with the average when aggregating the phases of slowdown and contraction.

The PE ratio of the Emerging Market index is now at 11.3x, having contracted by 20% over recent months. Historically, during periods of economic contraction, it has traded on average 20% lower, at a PE ratio of 9x, while it has traded on average at 11x during periods of economic slowdown. Valuations are therefore not supportive over the medium term.

The income component

The income return is the percentage of market value that is distributed to shareholders as cash. If dividends are the only source of income, then the income return is equal to the dividend yield. Today buyback programmes are another source of distributing cash to shareholders. We therefore include the net buyback yield, which is the buyback yield net of the dilution effect of the issuance of new shares. In the following table, we summarise our total income estimates, which incorporate a contribution from buybacks, net of dilution (the percentage change in the number of shares outstanding), based on historical trends.

Assumptions on the breakdown of income component by region (%)

	DY	Net buyback yields	Total income returns
USA	2.0%	0.5%	2.5%
EMU	3.0%	-0.2%	2.8%
UK	3.4%	-0.3%	3.1%
Japan	2.1%	0.4%	2.5%
Pacific ex JP	3.5%	-0.5%	3.0%
EM	2.2%	0.0%	2.2%

Source: Thomson Reuters, Bloomberg, Amundi Asset Management

Our expected returns on Equities

As highlighted below, we expect a below trend earnings growth across all the regions in the medium-term as we assume a profit recession followed by a recovery toward long term EPS trend. Equities could deliver over the next 3 years a return close to the dividend yield, and on a 5-year horizon, the returns could increase reaching levels 1% to 2% below the long term equilibrium. The correction in valuations is greater in the US and EM in the medium term. Over a 10-year horizon, we expect EMs to outperform developed markets by around 1.5% on average p.a., supported by higher EPS growth. Amongst developed markets, US and Pacific ex-Japan are the markets with the highest expected returns.

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Decomposition of our 5-yr and 10-yr expected returns on equities

	Horizon	Return	EPS Growth	Repricing	DY	Residual	Volatility
US Equity	5 yr	5.1%	3.6%	-0.9%	2.5%	-0.2%	15.8%
	10 yr	7.2%	4.7%	0.0%	2.5%	-0.1%	16.0%
EU Equity	5 yr	5.0%	3.1%	-0.6%	2.8%	-0.3%	19.8%
	10 yr	6.0%	3.2%	0.2%	2.8%	-0.1%	20.1%
EM Equity	5 yr	7.4%	5.6%	-0.7%	2.6%	-0.2%	16.9%
	10 yr	8.6%	6.1%	-0.2%	2.6%	-0.1%	17.4%
Japan Equity	5 yr	4.2%	2.0%	-0.1%	2.6%	-0.4%	18.7%
	10 yr	5.8%	2.9%	0.4%	2.6%	-0.3%	19.2%
Pacific ex Japan Equity	5 yr	5.5%	2.8%	-0.1%	3.0%	-0.2%	14.1%
	10 yr	7.4%	4.3%	0.1%	3.0%	-0.1%	14.6%

Source: Bloomberg, Amundi Asset Management CASM Model as of 6 February 2019. Equity prices as of 18/01/2019

Currencies

G10 FX – Long term assumptions

The definition of the medium to long target for FX for G10 countries is based on the blend of 3 fair value models:

- PPP (Purchase Power Parity) that is a nominal exchange rate based on the relative price dynamics vs US (CPI indices).The model has a very long term horizon
- BEER I (Behavioural Equilibrium Exchange Rate) that is a nominal exchange rate based on the relative price dynamics vs US (CPI indices), Terms of Trades differentials, 10Y rates differentials vs US. The model has a more medium-term horizon
- BEER II (Behavioural Equilibrium Exchange Rate) that is a real exchange rate based on fiscal spending (% GDP) differential and terms of trade differential. The model has a more medium-term horizon.

G10 FX targets

31/01/2019	Spot	PPP	BEER I	BEER II	Long Term Target (10 yr)	O/Uvaluation
AUD/USD	0.73	0.80	0.72	0.79	0.79	8.5%
CAD/USD	0.76	0.87	0.82	0.78	0.86	12.3%
CHF/USD	1.01	1.06	0.94	1.01	1.04	3.4%
EUR/USD	1.14	1.30	1.16	1.24	1.28	11.5%
GBP/USD	1.31	1.57	1.43	1.54	1.56	18.8%
NOK/USD	0.12	0.15	0.13	0.13	0.14	21.2%
NZD/USD	0.69	0.71	0.63	0.70	0.70	1.8%
SEK/USD	0.11	0.14	0.12	0.13	0.14	25.2%
USD/JPY	108.87	93.88	99.65	99.67	95.04	-12.7%

Source: Bloomberg, Amundi Asset Management Research as of 31/01/2019

PPP is the most widely used measure of long term currencies' valuation. Purchasing Power Parity, which is based on the well-know "Law of one Price" concept, states that, in the long-run, two currencies are in equilibrium when, after adjusting for exchange rates, two baskets of goods cost the same in both the countries. The intuition being that short-term misalignments should eventually be eliminated, as investors would exploit every arbitrage opportunity by simultaneously purchasing and selling the two baskets of goods.

In addition to very long term valuation measure, we opted for two other approaches that tend to mitigate long term drivers with short and medium-term fundamentals - namely BEER I and BEER II models. In this context indeed, we attach currencies valuation, which reflects both domestic and external conditions, not only to some long term fundamentals, such as relative price dynamics and fiscal deficit as % GDP, but also to 10Y rates and Terms of Trade differentials.

The final long run target is then obtained by weighting the three models, with higher weight attached to PPP (80%). When looking at the above fundamentals, we expect the USD to depreciate against the entire G10 universe, but the dynamics won't be linear.

Our expectations

In line with our baseline scenario, featured by a consolidation of current late cycle regime with a progressive transition to a slowdown in three to five year horizon, we believe the USD would remain strong before catching its long-term fundamental value. As usually happens slowdown periods, investors tend to react to spikes in risk aversion by buying back USD denominated assets. High yielding currencies such as AUD, NZD and GBP would suffer the most in such a scenario, whilst CHF and JPY would attract foreign capital due to their tendency to be played as hedges against uncertainty. If the above is valid in the middle of a global economy marked slowdown, many are the factors supporting a medium term bearish view on the USD.

FX movement based recession risk

	Spot	3 Years	5 Years
EUR/USD	1.14	1.23	1.22
GBP/USD	1.31	1.51	1.48
JPY/USD	109.00	97.85	91.37
AUD/USD	0.73	0.77	0.74

Source: Bloomberg, Amundi Asset Management Research as of 31/01/2019

The USD has appreciated massively against the entire G10 universe and partially reverted to the 2017 bearish trend. Trump's fiscal support has extended the US economic cycle, and a tight labour market has put pressures on inflation, which in turns translates into expectations of higher rates. If, in the short term, higher inflation exerts pressure on short-term rates, in the medium to long run an increase in inflation is generally followed by currency depreciation, as it usually leads to capital outflows – with investors looking for higher real rates. The US yield advantage – which in 2018 made US Treasuries a safe haven asset and a profitable investment opportunity – will be not be enough to offset not only relative price dynamics but also the high relative fiscal spending and the poor differential in terms of trades. In a nutshell, we expect the US yield advantage – which in 2018 made US Treasuries a safe haven asset and a profitable investment opportunity – to be insufficient to offset not only relative price dynamics but also the high relative fiscal spending and the poor differential in terms of trades.

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SECTION IV

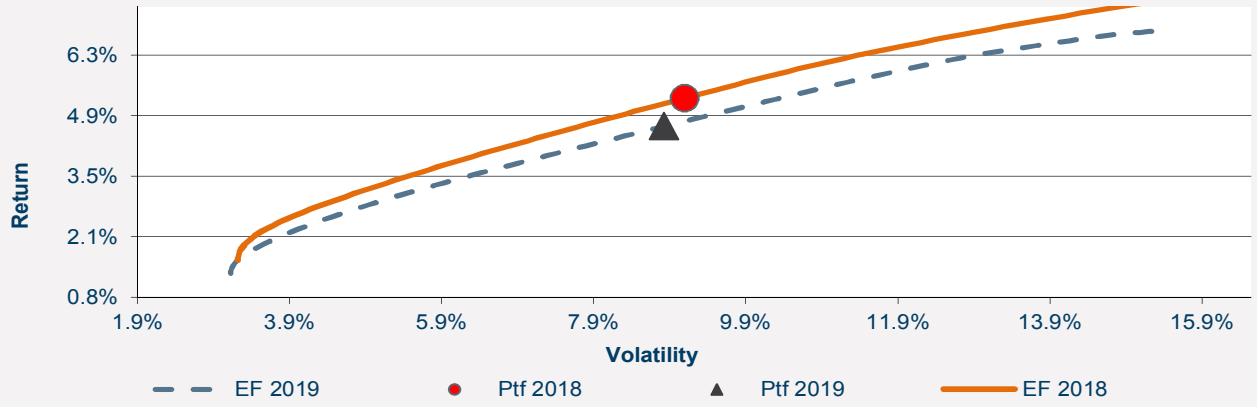
Asset allocation implications

- Comparison of efficient frontier portfolios with respect to beginning of FY 2018 reflects the increasing risk of the advent of recession on a global level
- Overall cross-asset returns have receded even as long term correlations and covariance have remained relatively stable.
- Instruments with improving favourable reward/risk profiles include: US/EU IG bonds, EM hard currencies among bonds, and Japan and EU equities among the equities

Assumptions underlying the efficient frontier analysis

- Investment universe composed of standard assets: developed and emerging market bonds and equities
- The case is that of an unhedged EUR investor.
- Liquidity constraints of 20% for the HY bonds and for EM products

1/ Unhedged EUR investor efficient frontier 2018 vs 2019



Source: Institutional Advisory Calculations as of 13 February 2019

The deceleration of the global economy is the dominant factor of our asset allocation analysis, leading to overall lower 10-year average expected returns across major assets. Consequently, with respect to beginning of FY2018, the efficient frontier curve has shifted downward for all target volatility levels.

Under these circumstances, comparison of a balanced portfolio (50/50) shows that while we maintain the selection of all maturity bonds, we favour a divestiture of the US treasuries for additional allocation in EU/US IG instruments. Despite the rosy outlook of US bonds in the medium and long term, its return will be offset by the convergence of the EUR/USD to its PPP levels. Despite the increasing recession risk, the IG instruments are likely to benefit from the higher carry coupled with the lower default risk within the corporate universe.

On the equity side, the tendency is to maintain the allocation in EU equity, which despite the pricing of the recession risk, continue having a favourable reward/risk ratio versus other equity classes. This year allocation adds some exposure in Japan, due to lower correlation with other risky assets.

SECTION V

The Long term reading

Special Theme #1

Global economic growth: past and future trendse

- The Global Economy is progressively moving towards a lower growth rate potential on cyclical and structural factors
- Amongst advanced economies, potential growth is still expected to be subdued in the next few years compared to post-war averages for most countries, as a result of deteriorating demographics and the recent slowdown in productivity.
- Despite having a non-supportive demographic trend, some developed market countries have enjoyed a positive contribution from labour input, post-crisis, as the labour force participation rate has increased.
- With regards to the emerging economies selected (BRIC), a similar analysis gives evidence to well-known trends. Over the next years, transformation of the Chinese economy will likely lead to a change in composition and a decline in this ratio. For India the gradually increasing participation rate and the rising working age population will contribute to potential growth as well as labour productivity over the next decade. Going forward, we expect potential growth in Brazil to stabilise slightly above 2%, driven by a combination of a positive demographic trend and a pick-up in capital deepening.
- On the inflation side, structural changes in the labour market are likely to have affected participation, productivity and wage dynamics, resulting in much lower core inflation. In the Eurozone core inflation is unusually low at this phase of the cycle. This was also remarkably true for the US, where only recently core inflation stabilized around the Fed's target.

Assessing the potential growth that an economy could achieve in the long run is a non-trivial task that, naturally, is highly dependent on the assumptions made in the growth model used to describe forward trends in the economy and its drivers. We assume the economy can be described with a production function (Cobb Douglas) with decreasing marginal returns, where we look at the dynamics of three main growth drivers: demographics, productivity and capital intensity. Demographic trends are taken as given, and we use central projections from the World Bank, United Nations and official statistics offices. Demographic trends are a major driver of our projections for labour force growth, as well as major trends in labour force participation rates. To proxy the governance and human development conditions we need to model human capital and explain productivity trends, we also refer to the World Bank's Doing Business report. Capital intensity is a function of economic growth and the saving attitude of economic agents.

The results we obtain must be interpreted as long term trends implied by demographics, investment patterns and productivity trends. The demographic factor is an important driver in defining long term returns as it is becoming a negative contributor for many developed markets. Also, capital shallowing and the consequent decrease in productivity post GFC in many developed countries has been a key driver in depressing potential growth.

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Global GDP: historical and projected averages by country

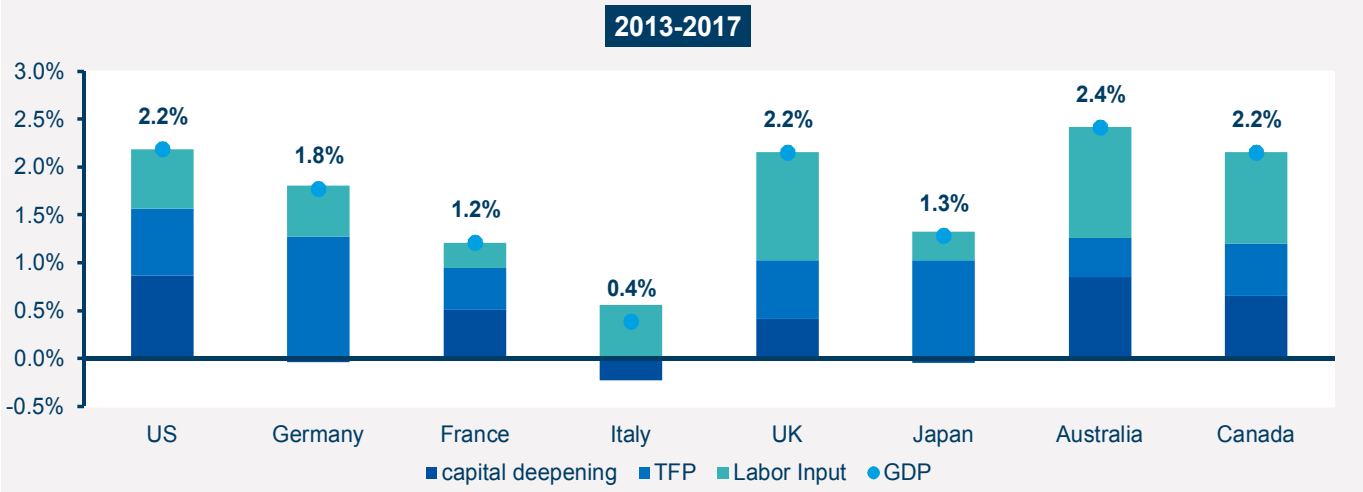
We recently updated our projections for long term growth expected for the major advanced economies and main emerging markets. In the charts below we portray the trend in major growth drivers in the past years and for the next two decades.

Key takeways

Amongst advanced economies, potential growth is still expected to be subdued in the years ahead compared to post-war averages for most countries, as a result of deteriorating demographics and the recent slowdown in productivity. It is also true that the recent pick-up in investments, with a positive impact on capital deepening, will contribute to sustaining potential growth going forward, compensating for the adverse effects of demographics.

- By comparing the post-crisis and recovery charts (last 5 years) with the projection charts (next decades), what is clear is the much weaker contribution of labour input in the future. The reason behind this is the recovery in the labour market that has taken place in the last five years, linked to a mix of increased participation rates, improvement in the employment rate and an increase in hours worked (with a different mix depending on countries), which was associated with the post-recession recovery and expansion phase. Going forward, with the output gap gradually closing and growth returning to potential, gains on these three factors will be more limited and therefore the contribution from the labour force will be more clearly linked to demography and population growth, and will therefore decline in many countries.

1/ 2013-2017 Average economic growth drivers in major countries

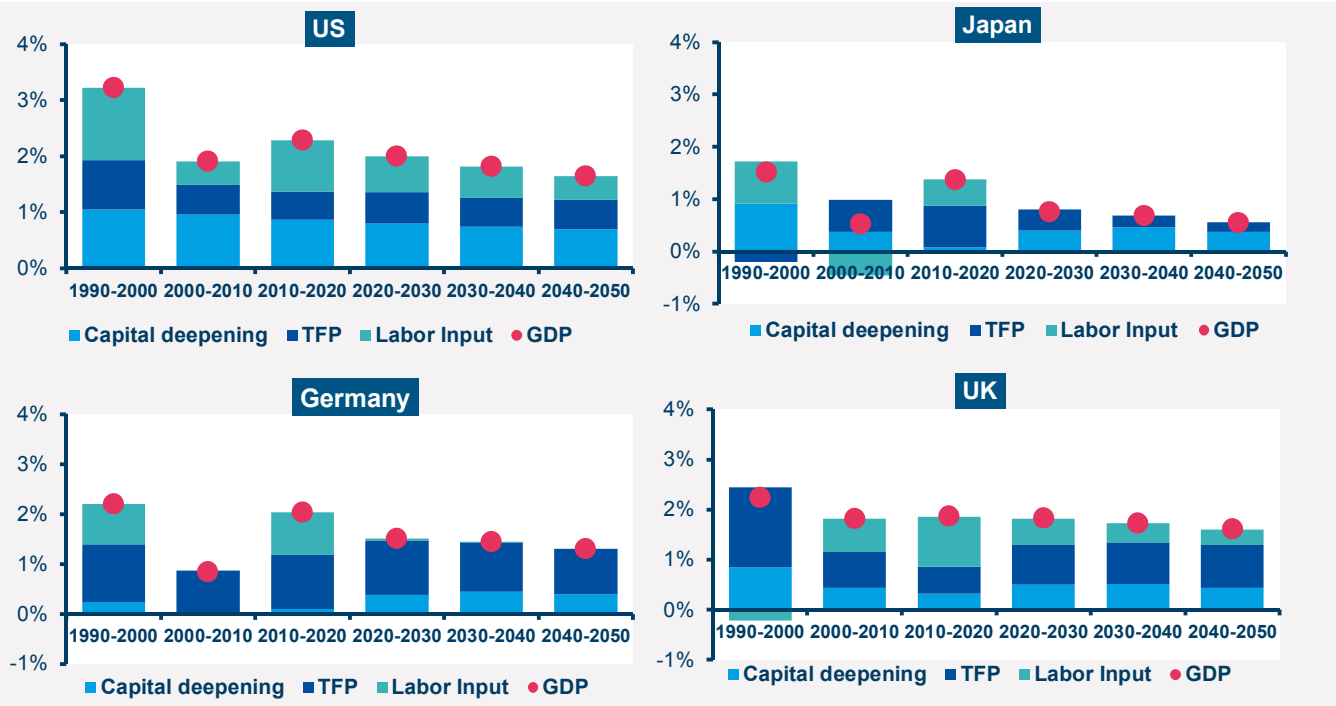


Source: Amundi Research Data as of 7 December 2018

- With the exception of Australia, potential growth will likely be below 2% in the major advanced economies analysed. Australia will likely enjoy the strongest contribution from demographics to potential growth, supported by robust expansion in the working age population nearing 1% growth over the next decade (albeit decelerating from the previous trend). Demographics will also play a negligible effect in Germany, Japan, Italy, where the labour input contribution is expected to remain small, barring any substantial change in the participation rate or significant changes in immigration policies aimed at supporting demographics. Labour productivity, supported by total factor productivity growth, will be a key driver for the US, Australia and Canada, in part as a result of recent trends: pick-up in business spending (US), TFP-enhancing reforms (Canada), sustained pick-up in non-mining investment (Australia).

- The bulk of growth for Germany will come from an increase in labour productivity, supported by both increases in TFP and a sustained rate of capital deepening. Labour input will likely make a small contribution, with hours worked assumed to continue to decline slightly and working age population growth on a declining trend. Yet, some upside risk on this factor may come from immigration. In the past five years, France has enjoyed an increase in the labour force participation rate and labour productivity, thanks to both capital deepening and total factor productivity growth. These two factors will represent the core of growth in the next decade, while some structural reforms on the labour market may also lift the contribution from employment. Yet looking further down the road, demographics may represent a drag. For Italy demographics will represent a drag. Labour productivity growth will be modest compared to other Eurozone countries, contributing to the slowest pace of growth, also due to a capital shallowing problem. UK growth will be supported by a modest growth in labour input contribution, whose weaker trend will be in part compensated by increased increased labour productivity.

2/ 2013-2017 Evolution of economic growth drivers in US, Japan, Germany, UK



Source: Amundi Research Data as of 7 December 2018

- Despite not having a supportive demographic trend, some developed market countries enjoyed a positive contribution from labour input, post crisis, as the labour force participation rate increased. This is true for instance for Italy and Japan in the last five years. In Italy, the increase in the employment rate and in the labour contribution to growth was largely supported by the rise in the labour force participation rate amongst females and also by an upturn in the participation rate of older-age workers. This is likely a non-temporary factor which may give some upside risks to the potential growth estimate for Italy in the years to come. In Japan, the labour market performance was buoyant, supported by a decrease in the unemployment rate and a surge in the labour force participation rate. Yet, post crisis, the role of labour productivity (product of both capital deepening and total

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factor productivity) has been different in the two countries taken as an example, with Japan stepping up investment spending to offset labour shortages, with TFP growth nearing 1%, one of the highest. Italy, on the contrary, did not enjoy a similar shift: gains in TFP were offset by a negative contribution from capital deepening, reflecting a weak investment rate in the overall economy (which has only recently accelerated) and a declining capital to labour ratio, as capital stock fails to keep up with employment growth.

- Despite not having a supportive demographic trend, some developed market countries enjoyed a positive contribution from labour input, post crisis, as the labour force participation rate increased. This is true for instance for Italy and Japan in the last five years. In Italy, the increase in the employment rate and in the labour contribution to growth was largely supported by the rise in the labour force participation rate amongst females and also by an upturn in the participation rate of older-age workers. This is likely a non-temporary factor which may give some upside risks to the potential growth estimate for Italy in the years to come. In Japan, the labour market performance was buoyant, supported by a decrease in the unemployment rate and a surge in the labour force participation rate. Yet, post crisis, the role of labour productivity (product of both capital deepening and total factor productivity) has been different in the two countries taken as an example, with Japan stepping up investment spending to offset labour shortages, with TFP growth nearing 1%, one of the highest. Italy, on the contrary, did not enjoy a similar shift: gains in TFP were offset by a negative contribution from capital deepening, reflecting a weak investment rate in the overall economy (which has only recently accelerated) and a declining capital to labour ratio, as capital stock fails to keep up with employment growth.

Past and future growth drivers in developped economies

		Labor productivity growth	Capital deepening	TFP	Labor Input	GDP
2000-2017	US	1.4%	0.9%	0.5%	0.7%	2.1%
2020-2040	*US*	*1.3%*	*0.7%*	*0.5%*	*0.5%*	*1.8%*
2000-2017	Germany	1.0%	0.1%	1.0%	0.4%	1.4%
2020-2040	*Germany*	*1.4%*	*0.4%*	*1.0%*	*0.0%*	*1.4%*
2000-2017	France	0.9%	0.5%	0.3%	0.6%	1.4%
2020-2040	*France*	*1.1%*	*0.4%*	*0.7%*	*0.3%*	*1.3%*
2000-2017	Italy	-0.1%	0.1%	-0.1%	0.5%	0.4%
2020-2040	*Italy*	*0.6%*	*0.1%*	*0.4%*	*0.0%*	*0.6%*
2000-2017	UK	1.0%	0.4%	0.6%	0.8%	1.8%
2020-2040	*UK*	*1.3%*	*0.5%*	*0.8%*	*0.4%*	*1.7%*
2000-2017	Japan	0.9%	0.2%	0.7%	0.0%	0.9%
2020-2040	*Japan*	*0.7%*	*0.4%*	*0.3%*	*0.0%*	*0.7%*
2000-2017	Australia	1.3%	1.1%	0.2%	1.6%	2.9%
2020-2040	*Australia*	*1.4%*	*0.9%*	*0.5%*	*0.9%*	*2.4%*
2000-2017	Canada	1.0%	0.6%	0.4%	1.2%	2.2%
2020-2040	*Canada*	*1.1%*	*0.3%*	*0.8%*	*0.6%*	*1.8%*

Source: Amundi Research 07 December 2018

With regards to the emerging economies selected (BRIC), a similar analysis confirms well-known trends:

Ex-ante vs Ex-post growth drivers in BRICs

		Labor productivity growth	Capital deepening	TFP	Labor Input	GDP
2000-2017	China	8.3%	5.1%	3.2%	0.6%	9.0%
2020-2040	*China*	*5.1%*	*2.8%*	*2.3%*	*-0.1%*	*5.0%*
2000-2017	Brazil	0.8%	0.4%	0.4%	1.6%	2.4%
2020-2040	*Brazil*	*1.3%*	*1.0%*	*0.3%*	*0.7%*	*2.0%*
2000-2017	India	5.8%	2.4%	3.4%	1.3%	7.1%
2020-2040	*India*	*6.2%*	*2.2%*	*4.0%*	*0.7%*	*6.8%*
2000-2017	Russia	3.0%	3.3%	-0.3%	0.7%	3.6%
2020-2040	*Russia*	*1.1%*	*1.1%*	*0.1%*	*0.1%*	*1.2%*

Source: Amundi Research 07 December 2018

- **China's** extraordinary high GDP growth in past decades has been sustained by strong labour productivity gains, underpinned by strong capital deepening as a result of a very high investment to GDP ratio, which still remains considerably high. Over the years ahead, the transformation of the Chinese economy will likely lead to a change in composition and a decline in this ratio, but the contribution of capital deepening and total factor productivity will continue to support increases in labour productivity and growth, albeit at a slower pace. The contribution from labour input will almost disappear as a supportive factor in particular due to the negative demographic trend.
- For **India**, growth has been supported in the past by the fast-growing working age population and labour productivity gains, in particular linked to capital deepening. Gradual increases in the participation rate and the rising working age population will contribute to potential growth in the next decade as well as labour productivity, reflecting both increased capital deepening (due to stronger investments ratios) and total factor productivity (reflecting structural reforms, higher public investment, higher human capital formation).
- **In Brazil,** growth in the past two decades has been driven by the rise in the working age population, while labour productivity has remained modest, with no exceptional growth coming from either capital deepening or total factor productivity. Going forward we expect potential growth in Brazil to stabilise slightly above 2%, driven by a) a combination of a positive demographic trend, with a diminishing contribution over time, and a limited contribution from TFP after the strong declines in the past years, and b) a pick-up in capital deepening which should derive from an increase in the investment to GDP ratio which slowed down significantly in 2015-16 and is expected to gradually recover to previous norms.
- **Russia** is expected to have the slowest pace of potential growth, dragged down by weak demographics. Capital stock expanded strongly in the investment boom (commodity and construction) during the 2000-2012 decade, as shown in the chart describing 2000-2020 contributions, but it has since slowed down. Therefore, the contribution to labour productivity from capital deepening is going to decrease in the next decade.

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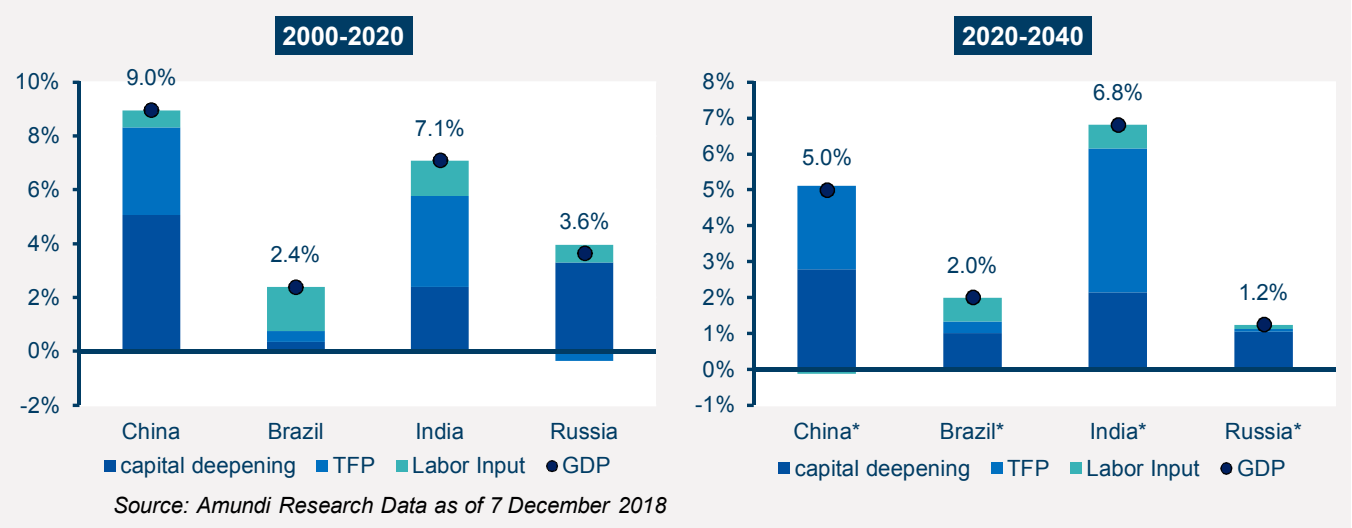
3/ **Evolving growth drivers in BRICs**



Source: Amundi Research Data as of 7 December 2018

Long run inflation

Inflation	Long run level (Dec 2018)
US	2.2% (Headline) -2% (Core)
EMU	1.85%
France	1.85%
Germany	1.70%
Italy	2.00%
UK	2.5% (RPI) - 2% (Core)
Japan	0.90%
EM countries	2.95%

Source: Amundi Asset Management as of 18 January 2019

Concerning inflation, any analysis would need to take into account the fact that world growth, in particular in DM, has evolved from a very deep crisis, which left important marks in some key aspects such as labour market regulation. For instance, in the Eurozone, although the unemployment rate has recovered quite remarkably since the GFC, many metrics show that the type of jobs may have changed, implying a structural change in the labour market likely to affect participation, productivity and wage dynamics. On the inflation side, in the Eurozone for example, this has so far been reflected in much lower core inflation, which has lagged in picking up given the phase of the cycle; this is also remarkably true for the US, where core inflation has only recently stabilised around the FED target. This holds even truer for the Eurozone, where core inflation rates remain well below previous norms.

Concerning core inflation, the trend related to core goods in the US is particularly interesting as this component (which is dependent on exchange rates and import prices) has been in deflationary territory for a long time and has only recently begun to return to positive territory; on the service front, however, inflation remains better supported.

Trends in headline inflation, though, depend not only on domestic factors reflected in the core measure, but also on additional non-domestic factors, such as commodity prices: in the short run, these are modelled by assuming a path dependent on demand and supply but in the long-run, they tend to mean revert.

Special Theme #2

Sovereign Debt Dynamics in the Long Term

We analyse the key drivers of debt dynamics and their possible evolution in a scenario, which does not include extreme events but a reversion to trend growth. We use IMF data (the IMF fiscal monitor database) to ensure internal coherence of growth, primary balance, debt and deficit dynamics both at the country and cross country levels.

What drives debt sustainability is the interplay between nominal growth, public policy and funding costs, all of which are going to change significantly in the next years and in an interlinked way. In many developed economies, economic growth is likely to revert to potential from above-potential growth enjoyed in recent years. Details on growth projections are included in a separate section of this document.

With slowing growth and due to recent political developments, many DMs will likely see looser fiscal policies in the years to come. In addition, monetary policies are currently expected to become less accommodative in developed markets, which in turn is likely to bring more differentiation in funding costs between countries, based on economic fundamentals and debt sustainability considerations.

If a country's nominal growth is below what the State has to pay on its debt and this is not offset by a properly sized primary budget surplus, then public leverage as measured by the Debt/GDP ratio will keep rising.

The increase in public leverage will be even higher (ie snowball effect) if:

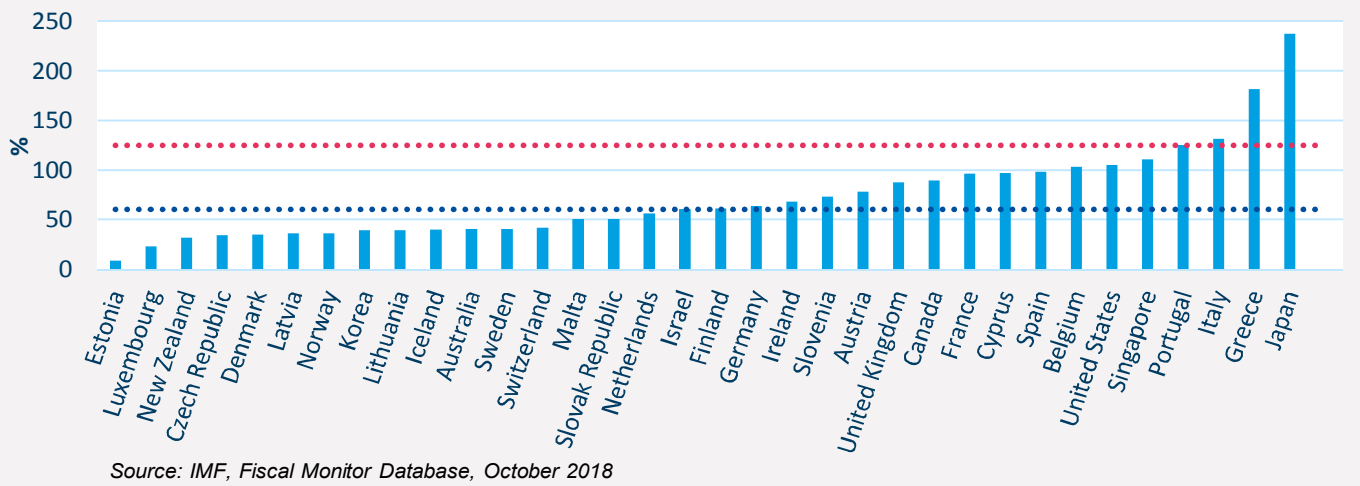
- The starting level of public debt is high;
- Public finances deteriorate (primary balance worsens);
- The difference between the cost of funding and nominal growth widens (and we know it is likely to be the cost of funding increasing vs growth decelerating)

We will therefore focus our analysis on some of these drivers.

Starting level of debt

Looking at the starting level of debt, as of 2018, approximately 49% of DMs have a general government debt to GDP ratio below 60%, 46% have a ratio between 60% and 125% and the remaining 11% have a ratio of Debt to GDP above 125% (namely Portugal, Italy, Greece and Japan). Looking at the trends in debt/GDP, post crisishigh-debt countries deteriorated their profile and stabilised in recent years.

4/ Selected developed markets, distribution of Debt/GDP



Source: IMF, Fiscal Monitor Database, October 2018

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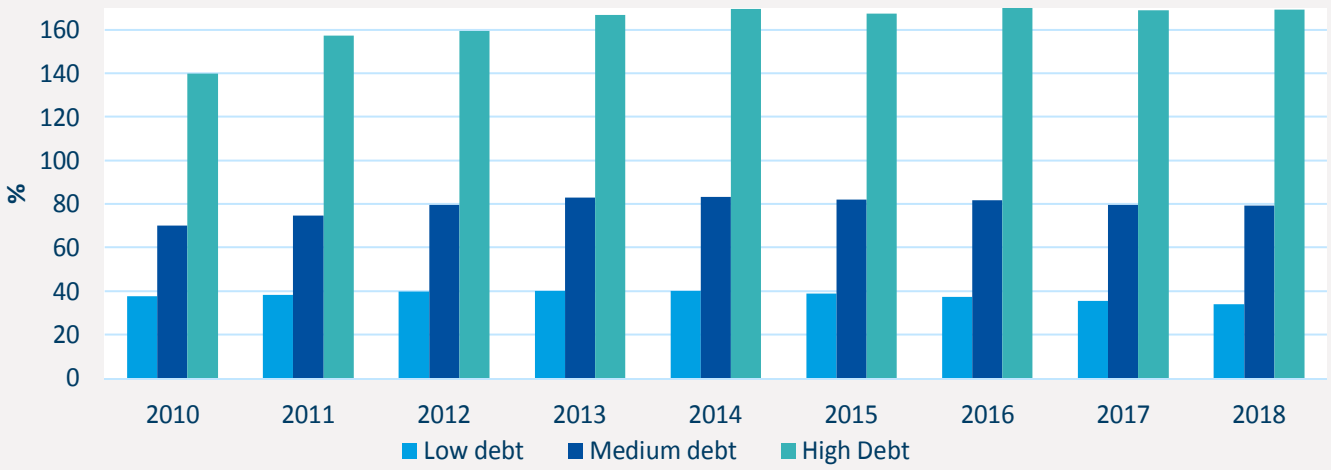
5/ Debt/GDP trajectory, 2009-2018



Source: IMF, Fiscal Monitor Database, October 2018; note: unweighted averages

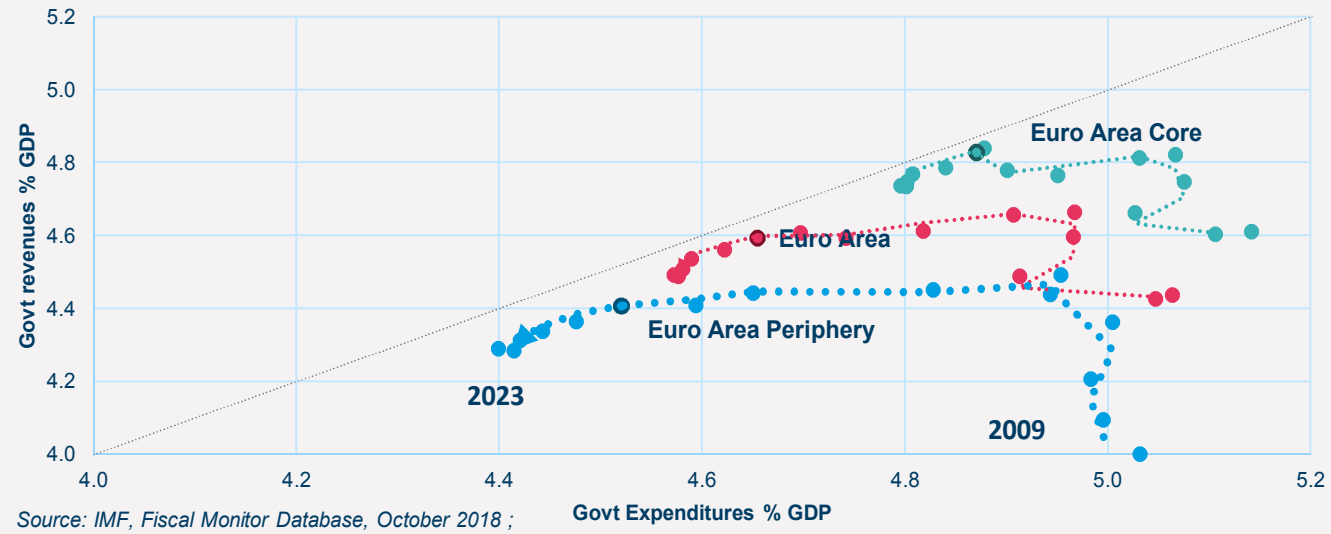
Within the Eurozone, public leverage is relatively high. Greece stands out with a Debt/GDP ratio of 180%.

Italy and Portugal have stabilised at around 130% of GDP. France, Spain and Belgium have public debt of roughly 100% of GDP.

Primary balance: focus on Eurozone

Revenues vs expenditures in Eurozone countries: in all countries the trend since 2009 has been to reduce expenditures as a percentage of GDP (series show the 2009-2023 period, all data are from the IMF), with a decrease in expenditures associated with an increase in revenues in the 2009-2018 period. However, even after the adjustments of recent years, governments in the periphery (Italy, Spain, Portugal, Greece) have tended to spend and collect less relative to GDP than in the Core area, although the dispersion has narrowed.

6/ Euro area trends in revenues and expenditures, 2009-2023



Source: IMF, Fiscal Monitor Database, October 2018 ;
Note: unweighted average for Core (Germany, France, Netherlands, Belgium) and Periphery (Italy, Spain, Portugal, Greece)

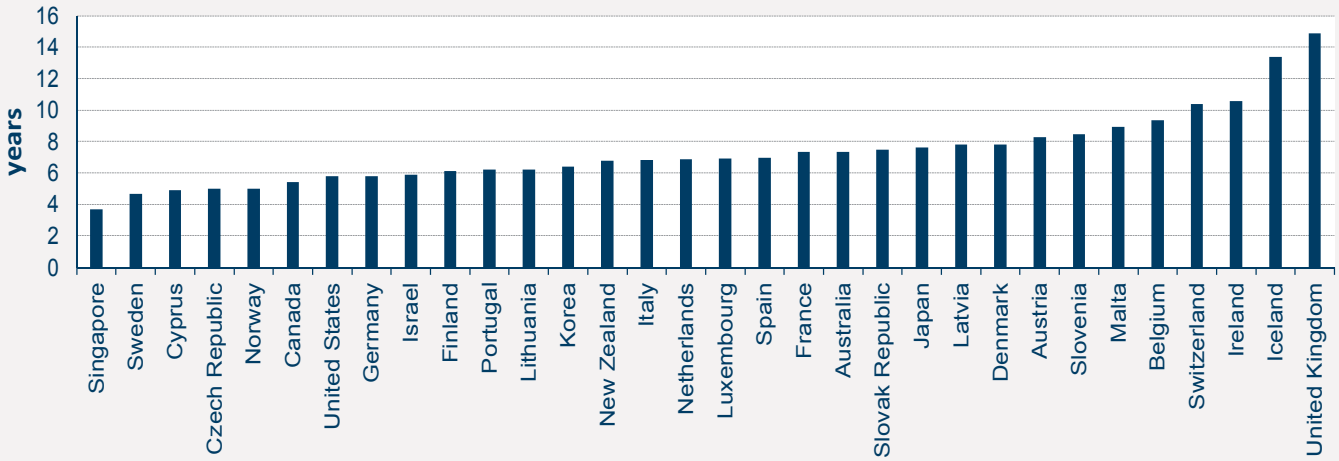
Amongst peripheral countries, before the crisis, Greece, Portugal were used to running sizeable primary deficits, while now Portugal and Greece are countries with meaningful primary surpluses. In contrast, Spain used to run a primary surplus pre-crisis but now is still in the process of returning to a surplus. Italy used to have a primary surplus in the range of 2% before the crisis, but it plans to reduce it with the new budget (below the projections reported here from the IMF). Also, amongst Core countries, it is worth noting the relative positioning of France, which is still in the process of moving to a primary surplus, and where recent political developments do not support the view of a fast convergence

According to IMF projections as of October 2018, going forward, as economic momentum slows, the Eurozone will likely face a trend reversion, with modest containment of government expenditures and a decrease in revenues, which will likely bring extra pressure on public finances. As a consequence, the dramatic improvement in the primary balance in periphery countries until 2017 will stabilise at best, as per IMF projections. But, as we know, in Eurozone countries political pressure to reduce fiscal discipline is mounting (e.g. Italy, France).

Funding costs

The effective cost of funding is relevant to assess debt sustainability as it represents borrowing costs. Yet, short-term volatility on rates in secondary markets does not immediately affect a sovereign's cost of funding. The sensitivity depends on the average maturity and therefore on how much of the total debt is rolled every year (1/maturity of debt), so the interest rate shock does take time to feed through.

7/ Average term to maturity (2018)



Source: IMF, Fiscal Monitor Database, October 2018
The average interest rate projections we use to define sustainability are taken from the long-term simulations made in our proprietary CASM model.

According to our economic and financial projections, over the next 5 years there are a number of countries where the fiscal gap highlights potential issues of long term sustainability. Above all, the US seems to be on a trajectory where, under current law, the debt/GDP ratio will increase. Countries such as Japan, Italy, France, Spain, although their debt/GDP ratios are expected to move into a mildly decreasing territory (y axis), are over time expected to decrease the speed at which they will be able to reduce their debt (x axis). For high-debt level countries this may be an issue as in a context of low growth and contained inflation, only protracted sizeable primary balance surpluses can help reduce debt/GDP at a sustained pace.

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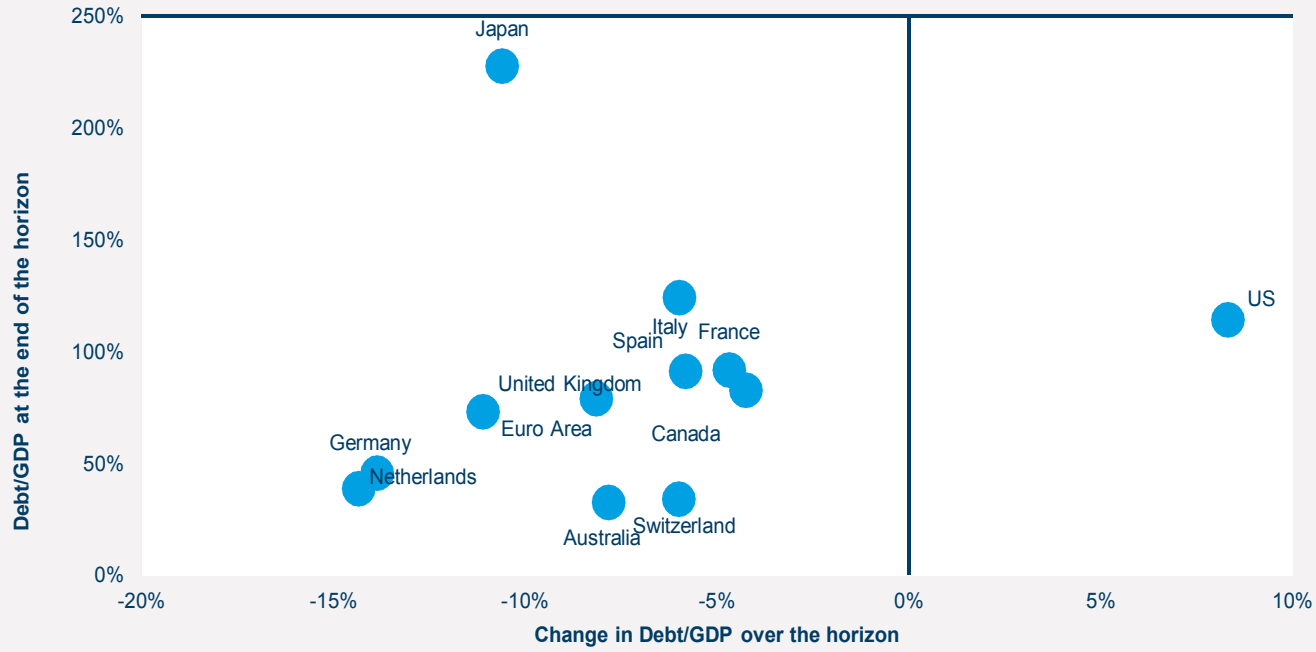
8/ **Fiscal sustainability gap 5 Years ahead**



Source: Amundi Research, IMF, Fiscal Monitor, October 2018

SECTION VI

Cascade Asset Simulation Model (CASM)

Reasonable investment solutions require a transparent and comprehensive view of the capital markets. This is especially true for institutional investors such as pension funds or endowments with medium to long term horizons in need of a coherent strategy to maximise the probability of achieving their stated objectives. For such tasks, it is imperative to simulate scenarios projecting possible trends in not just the prices of instruments, but additionally in the underlying risk factor and the complex interactions between these.

The process for generating the scenarios reflecting our view of economic and financial market trends is a close collaborative process between a wide variety of teams within Amundi. The underlying proprietary platform generating these asset prices is named CASM (Cascade Asset Simulation Model), and was originally developed in a joint venture between leading practitioners from Amundi and Cambridge University. The platform mirrors industry and academic best practices, taking into account the inherent complex relationships between macroeconomics, monetary policy and market dynamics.

The current document layout is as follows. The first section details the basic structure of the simulation platform. We exhibit some details of the quantitative methodologies employed within the platform. The second part describes the major risk factor models driving the simulation of the necessary financial variables (interest rates, equity prices, credit spreads).

CASM platform structure

Applications of Monte Carlo methods in asset price simulation are well documented by Glasserman (2004), and Hull (2012) amongst others. Stochastic generation of sample scenarios of risk factors and resulting asset prices allow consideration of a wide range of possible prices and control the uncertainty surrounding these. The additional flexibility allows us to vary starting assumptions and the effect possible future developments have on the assets. This possibility enhances our ability to simulate coherent scenarios across any instrument in a multi-asset portfolio, a feature that is particularly relevant in institutional clients with long time horizons – see examples from Dempster et al. (2007) and (2009).

The architecture of CASM can be broadly defined in two dimensions. Our belief is that the first dimension is composed of a top-down “cascading” effect (hence the name of the simulation platform Cascade Asset Simulation Model), starting at the top with the various macroeconomic variables, reflected subsequently in the financial market risk factors. Initially proposed by Wilkie (1984) and further developed by Dempster et al. (2009), this cascade structure is at the root of the platform’s interdependent linear and non-linear relationships between any risk factors, which are ultimately used to define the levels of the different assets and financial instruments.

The second dimension of CASM portrays a representation of the future evolution of the aforementioned “cascade” effect. The unique formulation allows for simulation of coherent scenarios between the different risk factors from the short to the long term horizon. In the short term, CASM blends econometric models and quantitative short-term outlooks from in-house practitioners. In the long term, we assume the market variables are subject to a mean reverting process, defined formally through structural break analysis and general equilibrium formulation. The short term evolves into long run state through the medium-term dynamic driven by business cycle variables.

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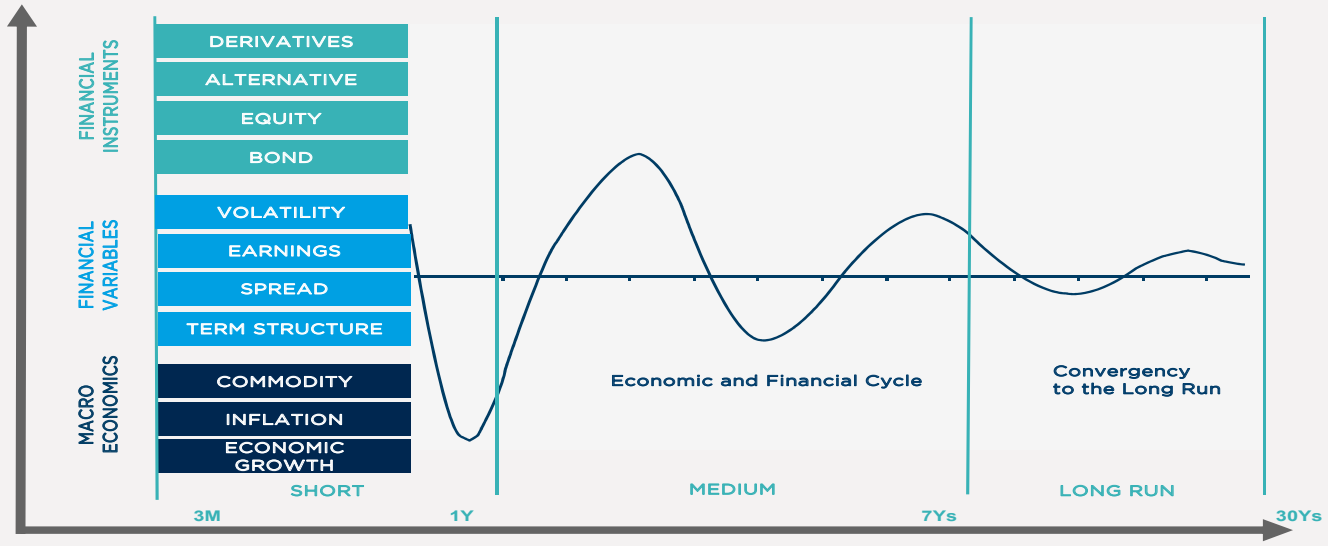
1/ **Graph representing the two dimensions of the cascade structure**



Source: AmundiAsset Management CASM Model -Institution al Advisory, for illustrative purposes only

Graph representing the two dimensions of the cascade structure: The vertical axis shows the top-down hierarchy from macro variables down to financial instruments and the horizontal axis represents the forward-looking simulation horizon.

Periodic and on-demand reviews along the two dimensions by in-house specialists enable us to make necessary adjustments without significant re-formulation or re-engineering of the platform, resulting in both consistent mean scenarios and efficient parameter control in terms of estimates and transparency of explanatory variables. The current implementation follows the best practice in implementing complex and both linear and non-linear relationships between any number of market and economic factors available. Empirical studies and qualitative views do in fact have a significant effect on their medium-term behaviour as they converge to the pre-identified equilibrium levels. Below is a depiction of the interest rate term structure and relationship at the long-run levels.

The model's main aim is not to forecast short-term trends with precision, but to give a good representation of the medium and long term evolution of the financial variable considering pairwise correlations and riskiness.

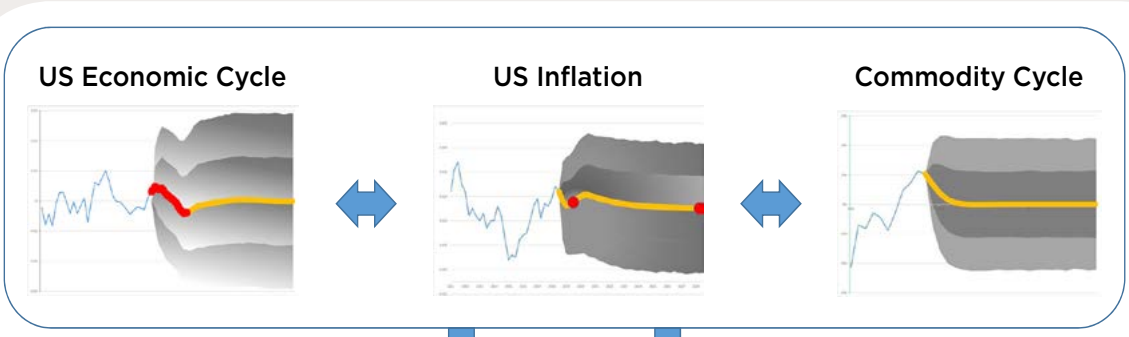
Calibration

The estimation process starts from the definition and discussion of the short- to medium-term outlooks for macro and financial variables for each region under consideration (US, EU Core, UK, etc.). At each step of the process, results are analysed against stylised facts and coherence.

This is a quantitative process based on quantitative inputs and it iterates until adequate results are reached in terms of statistical accuracy, then the results are assessed from a qualitative point of view (coherency checks, please see below for an illustrative example).

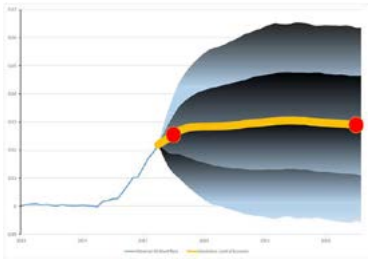
CASE STUDY: the model structure of the US short rate

At the base of any simulation lies the causal relationship between the macroeconomic factors: economic and commodity cyclical behaviours, and inflationary tendencies. We ensure the simulations for each of these factors incorporate the short-term forward-looking outlook provided by Research and the long term assumptions. Specifically, we ensure the central scenario (i.e. the average of the simulated values at each time step) passes through the short and long term targets.



US Short Rate

- US economy is expected to slow in the short to medium term
- Recent data does not point to higher inflation expectation
- The long term US inflation is set by the Fed at 2%



- Fed to continue raising rates based on upcoming data until slowdown is evident
- Long term short rate (2.8%) established by our real rate assumption and inflation

Graphic representation of the short (3 months) rate simulation model. The grey area represents the uncertainty concerning the forward-looking scenarios, with the yellow line denoting the central (i.e. the average) scenario. The red dots indicate the short and long term targets for the variables.

The estimation process for each region progresses from macro and financial variable calibration to asset price simulation, where asset price granularity is regulated by the exposure to existing risk factors. In the case of credit spreads for instance, differing credit quality for a specific region would still use the same underlying term structure. However, exposure to the tenors of the government yield curve and default/recovery rates and volatility structures would vary significantly. A model with additional granularity (sub-category within a specific credit or industry sector) can be added in a modular fashion should there be a business case.

Simulation

Under a Monte Carlo environment, scenarios are generated along the aforementioned two dimensions taking into consideration the historical correlation amongst the respective risk factors. In this manner, we are able to determine distribution of the evolution path for any of the variables, defining the statistical moments and distributions associated with each of them.

A key factor to an effective and useful simulation platform is its ability to portray a meaningful representation of the future evolution of financial risk factors.

Our belief is these risk factors will evolve towards their respective intrinsic values over a medium and long term time horizon. Thus, in CASM simulations of asset prices, even if all horizons are incorporated directly in all risk factor models to play a significant role in the parameter fitting process, the longer time horizon tends to dominate considering the pairwise correlations and other sources of risk.

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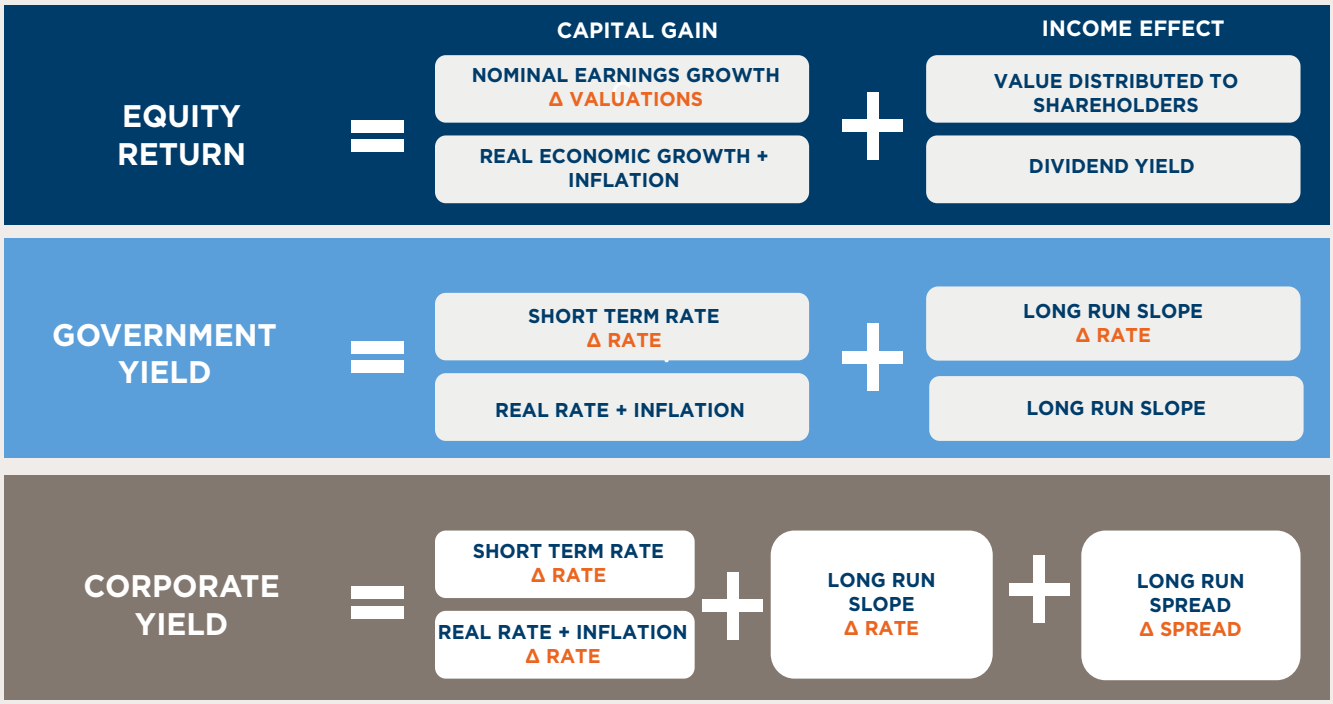
Under this framework, the short-term outlook of each risk factor is an exogenous input which limits the set of admissible parameters in the calibration process in order to determine the initial direction and the mean reversion speed. The resulting risk factor evolution is designed to match the corresponding official short-term outlook. On the long term time horizon, we use best-practice statistical and economic properties to derive an intuitive equilibrium level for each of the risk factors in question. The resulting equilibrium levels enhance the stability and statistical interpretation of the simulations. Meanwhile, the medium-term dynamics are primarily driven by variables related to business cycles and serve to link the short-term and long term risk factor levels.

The cascade model identifies the average growth paths of financial assets in line with the equations derived from macroeconomic relations and statistical evidence gathered on the markets. The figure below captures the cyclical and mean reverting nature of a typical cascade model for the equity model and yield curves, highlighted in orange. Thus, in the case of equity returns, we assume nominal earnings growth will be at a steady pace (and thus Δ Valuation converges to zero). For government yields, both short rates and the term premium (i.e. the difference between the short rate and the 10-year rate) are also assumed to behave in a cyclical and mean reverting behaviour. Consequently, the corporate yield additionally encompasses the spread over the respective government yield towards its equilibrium spread.

Long-run identities for equities, government and corporate yields



In ORANGE the factors that are relevant in the short and medium term, but collapse to zero in the long run.

Source: Amundi Asset Management CASM Model - Institutional Advisory, for illustrative purposes only

Model Structure

The prevailing quantitative formulation governing CASM is that of a multi-factor diffusive mean reverting process. As previously mentioned, models in the platform exhibit long-run behaviour converging to pre-determined equilibrium levels. The convergence process is governed both by the distance between the current endogenous variable level with respect the equilibrium level and the future evolution

of the business cycle related variables. Academic and empirical studies point to the existence of such mean reversion behaviour in the markets – see Ornstein-Uhlenbeck (1930) and Chan et al. (1992) for an exposition on this topic.

For each of the distinct risk factor models in CASM, the calibration process estimates parameters by minimising the distance (in a least squares sense) between the statistics that describe the distribution of the historical data and the statistics of the sampling distribution from the simulated data. To illustrate the interdependence between the risk factors, we model the correlations using a multivariate normal distribution. As the number of simulated scenarios increases, the average estimated correlation will converge to the historical estimate. The resulting diffusion process will thus yield simulations that are not only statistically robust but which also reflect our short and long term views.

Macroeconomic variables

The main macroeconomic variables at the top of the first dimension are:

- Economic growth
- Consumer Prices
- Commodity cycle

These drive the economic cycle affecting the medium-term dynamic of the main financial variables (e.g. interest rates, credit spreads, dividend yields). For each geographical region in our universe, the in-house proprietary macroeconomic model forecasts GDP growth up to 2-3 years following a Bayesian Vector Autoregressive (BVAR)[1] methodology, while the long term trend is defined by a neoclassical growth model (the Solow Model)[2]. The same approach has been applied to all GDP trends simulated in CASM.

The GDP trend is modelled differently in correspondence with different time horizons and different GDP components: namely non-observable trends and a cyclical component, to go along with a shock (error component). The business cycle component is extracted from the real GDP series using a Hodrick-Prescott filter[3]. It represents a proxy for output gap; in fact, the resulting cycle is highly correlated to the official output gap series calculated by the OECD. The cyclical forward-looking evolution is captured using an Auto-Regressive Moving-Average (ARMA) fitting. The estimation aims to find a compromise between goodness of fit and parsimony in the coefficients. The ARMA model works well because it captures cyclical behaviour in the short-medium term horizon, while it moves to zero in the long run (this is one of the most relevant hypotheses regarding the long run: the output gap converging to zero because the economy reaches equilibrium).

CASM assumes that the deterministic component of consumer prices is linked to the cyclical nature of GDP and commodity prices. The assumption of stationarity in these parameters permits inflation trajectories consistent with the classical economic theories (see Furlong & Ingenito (1996) and Barro (2013)), where these cyclical behaviours are thought to converge to the relevant region's central bank (i.e. ECB or the Fed) mandate. Exogenous shocks and deviations from the equilibrium inflation not captured by the deterministic component are subject to a mean reversion with a degree of persistence. The long run level is defined taking into consideration the central bank's target together with historical analysis and forward-looking assumptions.

[1] *BVAR is a tool designed to capture joint dynamics of multiple factors. The Bayesian interpretation allows analysis of large datasets, allowing extensive usage in conditional forecasts and scenario analysis. See Kilian & Lütkepohl (2016) for extensive discussion.*

[2] *The Solow growth model is a model of capital accumulation ignoring short run fluctuations of employment and savings focusing instead on the long-run evolution of economy.*

[3] *Hodrick-Prescott is a mathematical tool designed to take raw data and decompose them into different components: the long term trend, short term fluctuations and residuals.*

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Financial market variables

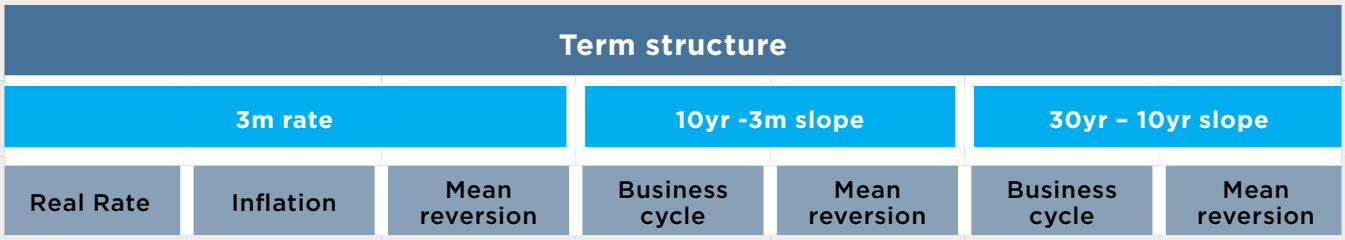
Each of the financial market variables is represented by a distinct quantitative process within the overall CASM process. Below we detail some features of the principal variables used in the platform.

Interest rate term structure

Discussions and literature on the most effective procedure for building interest rate term structures are extensive. Following the methodology discussed in Choudhry (2003) and James & Webber (2000), CASM estimates rates at selected tenors and uses a dynamic version of the Nelson & Siegel (1987) curve building approach. Specifically, the term structures for interest rates are defined by three components:

- short term or 3-month interest rate
- slope between the 10-year rate and the short-term rate
- slope between the 30- and 10-year rate

Breakdown of the yield curve components



Each component is modelled separately and then correlated to reflect empirical relationships. We assume that short rates within each geographic region/ country follow the monetary policy set by the respective central bank authority, according to the adjustment mechanism with respect to a target rate. For medium- and long term rates, we assume they have a varying exposure to the future state of the output gap and projected inflation gap (defined as the difference between projected inflation and target inflation). The presence of mean reverting components within each of the three rates ensures that over the long term, these equilibrium levels will be reached for each of the previously specified rates. Once the three rates are defined, we use a flexible smoothing procedure to generate continuous and realistic curves throughout the simulation horizon.

The term structure framework extends to modelling for inflation rates, provided the equivalent inflation outlooks and equilibrium views. In such case, the resulting inflation term structure will have the same format, which in combination with the counterpart interest rates can be used in subsequent pricing of inflation-linked products and swaps.

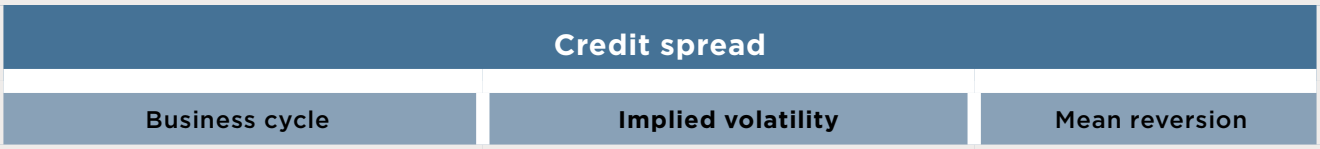
Credit spread

Currently, the corporate bond universe spans three geographic/economic regions – European Union (EU), United States (US) and Emerging Markets (EM). In the case of EU and US, CASM estimates a reference OAS for two corporate credit quality categories (investment grade and high yield) to add to the respective government yields. In the case of EM government hard currency, the sovereign spread is defined with respect to the US treasury term structure.

Generally, the credit model can be explained by two components: the deterministic and the non-Gaussian component. The former is represented by the respective region's economic cycle, given our analysis of its significance as the driving factor

behind the evolution of the credit spread in line with the findings by Dbouk and Kryzanowski (2010), and by the mean reversion term. As shown in various literature – see Gemmill and Keswani (2011) and Hibbert et al. (2011) amongst others – the presence of fat-tailed behaviour in the equity market is significant in the movement of the credit spread. For this purpose, we model the market-implied volatility with the GARCH model. The two components working in conjunction drive the ex-ante scenarios of the credit spread coherent in the short term with in-house practitioner outlooks. In the long simulation horizon, periodic structural analysis of the last break determines the equilibrium spread for each rating class, to which the simulation is set to converge.

Credit spread model factors



In order to generate realistic scenarios of spread movements, additional constraints have to be integrated in the calibration of the parameters: a non-negativity and a non-crossing constraint (an investment grade spread cannot be higher than that of the high yield within the same region/country under any circumstances).

Default model and recovery rate

Currently, the default and recovery rate models are estimated outside the CASM platform. For each of the economic/geographic regions considered in the corporate spread universe, data from Moody's analytic model is combined with the in-house practitioner survey and corresponding future credit spread evolution to generate piecewise ex-ante simulations of the default rate and recovery rates for each region and credit quality. As detailed in the instrument section of this document, these rates are directly applied in the calculation of price returns of the respective credit products.

Equities

The equity returns simulation follows a simple model structure along the short-, medium- and long term horizon. The starting point is the identity stating that total returns on equity are equal to the sum of capital gain and the income effect.

The capital gain dynamic is described by:

- the delta price earnings and
- the evolution of earnings growth.

The income effect is the sum of:

- the dividend yield level (which represents the yield component of stocks not linked to the price) and
- the repurchase yield (component of redistribution of value to stockholders in a form other than dividends)[4].

On a short-term horizon (up to one year), the average scenario on equity corresponds to the forecasting output coming from proprietary econometric models. The econometric model estimates a fair value relation for equity prices, stating the correct evaluation for the market. These models refer to a more specific set of tactical/country factors than the key variables available in the CASM simulation platform as explanatory variables.

[4] *Stock options, buybacks, etc.*

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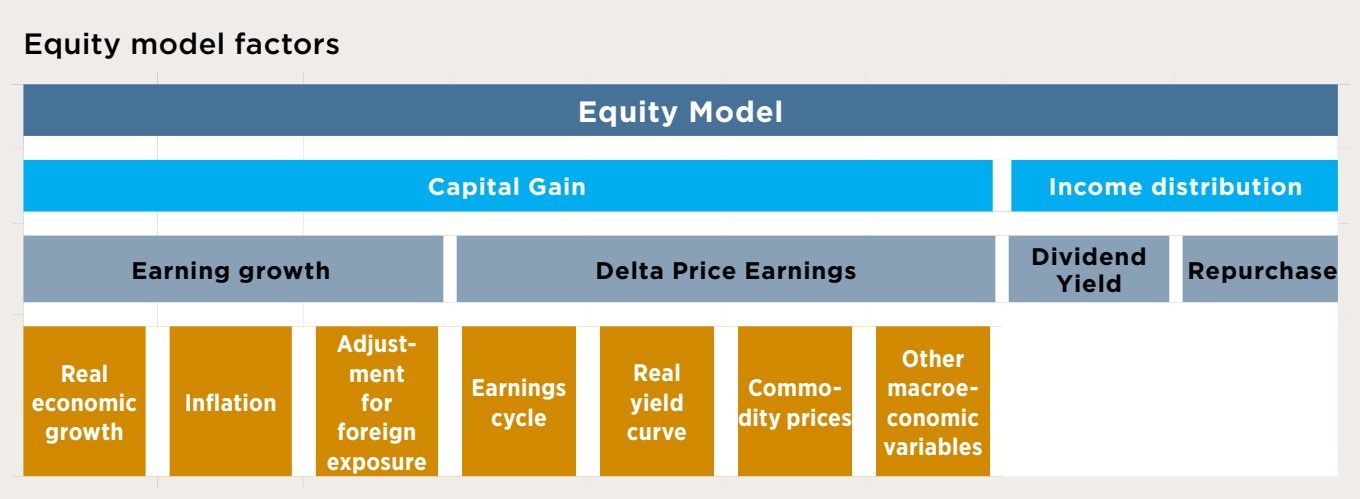
The definition of total return[5] in the long run is the sum of two components: capital gain, that is the long term increase in profits (approximated by the growth of steady-state conditions of the real economy and long term inflation), and the income effect6.



The transition from short-term returns and long run identities is mainly driven by earnings growth trends and deviations from the fair value (which correspond to the over/under valuation assessment). The most significant factors driving the latter are:

- economic and earnings growth
- real yield curve
- commodity price trends.

The impact of leverage on equity returns, as well as the presence of fat-tailed returns and volatility clustering are well-documented. As a result, we implemented the generalised version of GARCH within the equity model as described by Glosten, Jagannathan and Runkle (1993) and Tsay (2010), named GJR-GARCH (after the authors of the paper). The latter introduces an extra parameter with respect to GARCH to account for the asymmetry ("leverage" effect), causing a negative shock to have a stronger impact than the positive returns.

Currencies

For exchange rate simulation, CASM implementation refers to the classical Purchase Power Parity (PPP) model, which is a typical long term model. It assumes that countries experiencing relatively higher inflation must depreciate their exchange rates in line with the assumption that domestic price levels should be equal when expressed in a common currency.

The currency model is composed of two parts: a diffusive mean reverting component (Ornstein-Uhlenbeck process) and a short medium-term dynamic linked to the PPP model.

The equilibrium level for the currency is coherent with our proprietary currency fair value model, while the short-term forward-looking evolution for currency combines the tactical component and other medium-term inputs.

[5] *Overall return given by the sum of the capital gain and the distribution of dividends (plus alternative forms of redistribution of value to stockholders).*

[6] *In the preliminary phase, the statistical properties of the macro-financial variables involved were studied in depth in order to identify possible structural breaks.*

SECTION VII

Solow model implementation

Articulating the Solow model assumption directly

Assumptions on Labour (L), Growth (G), Productivity (TFP)

We assume a canonical growth model, where growth is a function of growth in labour force, capital accumulation and technical progress.

In levels:

Y=AK^a L^(1-a)

Where:

Y = GDP

K= Capital Stock

L= Labour Force

A= Total Factor Productivity

1-a= share of product that remunerates Labour input

a= share of product that remunerates Capital input

In order to define GDP growth, we need to model each factor separately.

a) Labour Force (L)

For historical data, we use the Labour Force estimations provided by the World Bank database.

For the projections, we use UN projections for working age population, as a proxy for labour force growth (hence, we implicitly assume a constant labour force participation rate). We do not model the participation rate because it is influenced by many factors that are difficult to model or project (demographic composition, education, urbanisation, etc.).

ΔL=ΔWAL+ΔWA

Where

ΔWAL = 0	i.e. participation rate, assumed constant
ΔWA=ΔL	i.e. labour force evolution follows evolution of working age population

Ceteris paribus, the demographic profile of two countries can make a difference in their implied long-run trends of growth: a younger, faster growing population with a lower dependency ratio is expected to be more dynamic and have direct and indirect positive effects on a country's growth.

For instance, Japan's demographic profile, with an ageing population and low birth rates, is compromising the country's growth prospects quite significantly.

b) Capital Accumulation

The capital accumulation process is a function of the existing stock of capital and the investment rate (which depends on the saving rate in the economy).

Estimation of the initial capital stock for the economy "i" (based on perpetual inventory method).

Ki,0=Ii,tg+δ

Where:

Ki,t the capital/GDP ratio

Ii,t the investment/GDP ratio

g= average growth of capital, approximated by the growth of the investment rate over the last 10 years δ = depreciation rate of capital (6%)

On δ, for the projections, we assumed that given technical progress, it might become higher than 6% and for each economy we estimated the average level that will maintain the capital/output ratio within a tolerance range defined by the average capital output ratio of the economy so far, and a reference level of 3.

Based on our estimations, we can see that over the sample of countries we consider, we have a distribution of capital output ratio which is close to the "canonical" 2.5-3 level estimated in past research, with differences across countries that depend on the investment rate growth in previous years and on the output level. It is very difficult to measure accurately the starting capital stock, but instead of making a common assumption we prefer to estimate the starting level in order to take into account differences between countries, avoiding underestimating the initial capital level for those countries which had very high investment patterns and the opposite for countries with low investment patterns.

Capital output ratio evolution: the stock of capital at time t is the result of the capital stock available at (t-1) minus the depreciation of capital due to deterioration and obsolescence, plus the replacement of capital arising via new investment.

Ki,t=It+1-δ*Ki,t-1

Investment ratio evolution: we assume that the investment ratio (as % of GDP) depends on its past evolution and on the saving rate in the economy. It is empirically demonstrated that the saving rate is itself dependent on some demographic factors, and in particular on an economy's dependency ratio, hence, we use the dependency ratio (from UN projections) as a proxy for the evolution of the saving rate.

The dynamics of the investment ratio can be summarised by the following formula, which takes into account time and country specific effects:

$Ii,t=\alpha+\beta 1Ii,t-1+\beta 2Di,t+\mu i+\gamma t+\varepsilon$

Where:

Ii,t investment ratio of the economy i

Di,t dependency ratio of the economy i

μi country fixed effect associated with economy i δt time fixed effect associated with time t

We estimate the parameters over the common sample, using panel regression of 25 economies as follows:

$\alpha=5.5$

$\beta 1=0.83$

$\beta 2=-0.026$

In order to project the investment rate into the future, we use the estimated dependency ratio projections from United Nations tables.

Investment ratio projections based on model: normalisation over the years.

From the graph above, for instance, we derive a pattern for the investment ratio in China to gradually converge to more "normal" levels, from the highs reached in recent years (above 40%). This is an effect of the saving rate, which should gradually normalise due to demographic factors (dependency ratio increasing due to ageing population).

Productivity Growth

Productivity in the production function is computed as a residual, i.e. what is not explained by the labour and capital input in the production process.

Productivity is generally a function of both exogenous and endogenous factors, which we try to incorporate into the model via the calculation, for each country, of a General Development Score (GDS).

The GDS of each country is the average of three main readily-available scores:

The UNDP Human Development Indicator (takes into account human factors such as life expectancy, educational attainment, etc.), the World Bank Worldwide Governance Indicator (takes into account general governance conditions, where economic activity & development should take place), and World Bank country Research and Development investment as % of GDP (takes into account the actual investment made in R&D).

These three factors are summarised into a final score, the country GDS, and normalised (range 0-1), so that the best ranking for a country is 1.

GDS evolution

We verified that reasonably there is a correlation between changes in a country's GDP per capita and GDS (with likely feedback effects in both directions). Hence, for GDS projections, we link GDS trends to the changes in each country's GDP (past) per capita and the computed correlation between the two dimensions, so that the stronger the link, the higher the impact on GDS.

GDP evolution in the past and rank in 2010

TFP evolution

TFP evolution depends on two factors:

The starting point, measured by the TFP trend computed by Hodrick-Prescott filter. The evolution of GDS for each country, compared to the best performing economies (those that rank the highest, and we usually take as reference the US) so that the more the rank approaches the US GDS, the more the productivity level approaches the US TFP productivity trend (roughly 1.5%).

This reflects the fact that the closer the economy is to the "standards" of developed economies, the slower the convergence speed to its steady state becomes as decreasing marginal returns impact the productivity of the factors.

TFP evolution a) past trend based on assumed production function b) projection, based on the above described model.

Results

The analysis provides some interesting insights into the projected growth patterns for selected developed and emerging economies.

The results, as already stressed, are heavily reliant on the assumptions made in relation to trends in the economic drivers, in particular demographics and productivity.

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