DWS RESEARCH INSTITUTE

DWS

January 2020

DWS LONG VIEW

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The dawn of a new decade

"The stock market is a device for transferring money from the impatient to the patient."
Warren Buffet[1]

Forecasted returns and other considerations

The world has been trying to find a new economic identity ever since the 2008 financial crisis. The journey has been arduous so far, with the scars of the financial crisis still quite raw. As we enter a new decade, economic growth remains lacklustre. The middle-class is struggling in most of the developed world. Populism is on the rise. Wealth is increasingly concentrated in fewer hands. The environmental costs of our economic activities are becoming clear. Central banks are doing what they can to stimulate growth, but their main success has only really been to avoid a recession in most developed economies.

Still, over the past decade, millions of people have been lifted out of poverty and the pace of technological change means that it is now possible to do things that were difficult to imagine a decade ago. Looking forward to the next decade we can be confident that more such changes would take place. This decade will see most of baby boomers[2] retiring. The post-millennials generations (Gen Z and Alpha[2]) already account for a majority of the world population. These generations will be assuming an increasing role in the economy over the coming decade. Based on their preference regarding some of the world's current problems, such as climate change, we can hope that the younger generations would move the global economy in the direction of one that is more sustainable.

From an investment perspective, we are tasked with providing the best possible returns to our investors, helping current and future generations in their journey. There is much noise and speculation currently about the best asset class for the new decade. Experience tells us that it may end up being different from what consensus expects. Looking at the past decade, U.S. equities delivered a 13.6 percent annual total return[3] (from S&P at 1,115), over twice of that of emerging-market (EM) equities. This performance is clearly at odds to the common thinking after the financial crisis that developed markets were on a structural decline. However, we prefer to keep our approach scientific, based on fundamental building blocks, rather than be anchored to recent sentiment.

Table 1 presents our return forecasts for various asset classes. These are the result of the work of the DWS Research Institute and the Multi-Asset & Solutions Group, in close collaboration with the DWS Macro Group and other DWS experts from various asset classes.

Table 1: Forecasted vs. realised returns, annualised (10 years)

	Forecasted returns (2020-2029)	Realized returns (2010-2019)
Private RE Equity US	**6.9%**	**10.9%**
United States REIT	5.9%	12.6%
US Infra. Equity	5.8%	8.5%
Global Infra. Equity	5.7%	**10.2%**
Hedge Funds: Composite	3.5%	3.9%
Broad Commodities	2.0%	-4.7%
Private EUR Infra. IG	1.3%	6.8%
EUR Infrastructure IG	0.6%	4.6%
EM Equities	**6.5%**	6.1%
US Equities	5.4%	**12.9%**
World Equities	5.3%	**10.2%**
Europe Equities	5.1%	7.2%
Eurozone Equities	3.8%	6.6%
EM USD High Yield	**7.5%**	7.7%
EM USD Sovereign	5.9%	6.7%
US High Yield	3.5%	7.6%
EUR High Yield	2.2%	7.5%
US Corporate 5-7	2.4%	5.7%
USD Cash	2.0%	0.7%
US Treasury 5-7	1.9%	3.6%
EUR Corporate 5-7	0.5%	5.1%
EUR Cash	0.1%	0.1%
EUR Treasury 5-7	-0.1%	3.9%

Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

[1] https://grow.acorns.com/investing-rules-that-warren-buffett-thinks-everyone-should-follow/
[2] Baby boomer refers to persons born between 1946 and 1964. Gen Z refers to persons born in the mid to late 1990s. Generation Alpha refers to persons born from 2010 to 2025.
[3] S&P 500 Total Return. Period 31 December 2009 to 31 December 2019
Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results.

Our conclusions suggest that investors may face low returns from most asset classes. The average nominal forecasted return from 23 asset classes that we monitor is 3.6 percent. This compares with 4.7 percent at this time last year. The lower return is due to strong price performance last year and continued expectations of low economic growth rates.

Bottom-up data and markets suggest global economy is heading towards stagnation

In the past twelve months, central banks have been busy reversing their interest-rates policies. The hope is for a recovery, but markets are unconvinced. Our bottom-up analysis of 900 large-cap companies that are covered by CROCI[4] globally confirm the structural-challenges hypothesis. Nearly two-fifths of these companies have not seen any real earnings growth since the financial crisis. A third of these 900 companies have reported negative revenue growth over the past five years. Some of this weakness may well be cyclical but in absence of strong economic growth these fundamentals are unlikely to change any time soon.

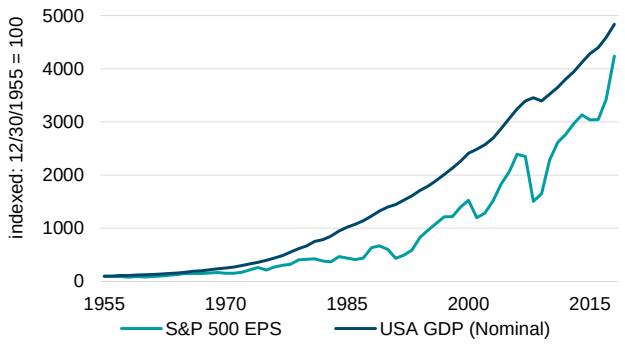
Revising the methodology for listed infrastructure and EM equities results in lower growth rates

In a low-growth environment, getting the growth rate right is crucial for establishing return forecasts and our research suggests that a lower growth rate for both listed infrastructure and EM equities is more appropriate.

Listed infrastructure is best understood by analysing its two main categories separately: (i) assets in mature and regulated businesses supporting predictable dividends but with limited capital-growth potential, and; (ii) more cyclical assets offering higher capital-growth potential. This is supported by the historical performance track record of infrastructure equities. The result of this segmentation has contributed to a fall in the forecasted return from listed infrastructure equities by 270 bps, to 5.7 percent. See pages 71-72 for further details.

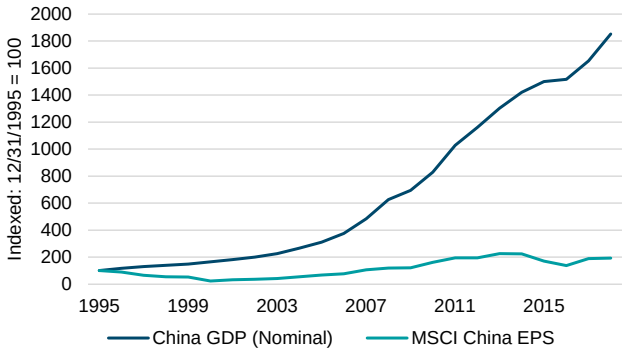
Within equities, we have reduced the earnings-growth-rate forecasts in EMs. Theory suggests that earnings should grow in line with gross domestic product (GDP). Although this has been the case for the United States (see Figure 1) and most other markets, a number of important emerging markets (China, India, and Brazil) have exhibited a different behaviour. Earnings have remained largely unchanged in Brazil and China (see Figure 2) over the past decade despite their continued economic growth. In India, the relationship appears to have broken down. While we may argue about the precise factors that may have contributed to their slower earnings growth (excessive capital invested diluting returns, shifts in the distribution of wealth between capital and labour), this lower earnings growth rate has contributed to the low EM equity returns over the past decade.

Figure 1: U.S. GDP vs. EPS of S&P 500 Index



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19.

Figure 2: China GDP vs. EPS of MSCI China Index



Source: Refinitiv Datastream, DWS Investments UK Limited. Data as of 12/31/19.

[4] CROCI, the abbreviation for "cash return on capital invested," is a valuation formula developed by Deutsche Bank's valuation group. This group is now part of DWS.
Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

ESG

Another possible explanation of the lower EM equity returns is the market composition. Compared to developed markets, especially the U.S., EMs provide exposure to more mature sectors.

Table 2: Sector exposure of MSCI USA vs. MSCI Emerging Markets

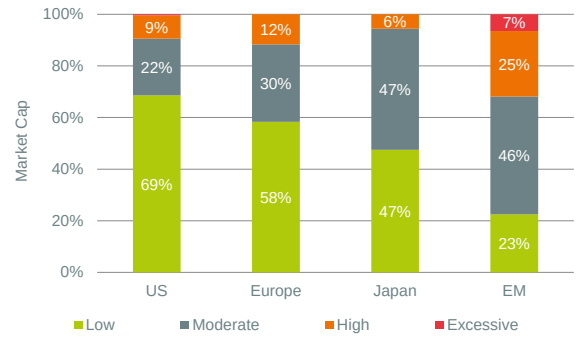
GICS sectors	US equities	EM equities
Communication services (C'Serv)	10.4%	11.0%
Media & entertainment	*8.3%*	*7.0%*
Telecoms	*2.1%*	*4.0%*
Consumer discretionary (CD)	9.9%	14.2%
Consumer staples (CS)	7.0%	6.3%
Energy (EN)	4.2%	7.4%
Financials (FN)	13.0%	24.2%
Health care (HC)	14.1%	2.8%
Industrials (IN)	9.0%	5.3%
Information Technology (IT)	23.4%	15.7%
Materials (MA)	2.7%	7.4%
Real estate (RE)	3.2%	3.0%
Utilities (UT)	3.3%	2.6%

Source: Bloomberg Finance L.P. Finance L.P. as of 12/31/19

As ESG and climate change becomes more relevant, it is interesting to note that at an aggregate level, EM equities also present investors with highest earnings exposure to high- and excessive-climate-risk categories. Profitability of companies in these two risk categories is quite low while these account for a significant proportion of total capital expenditure (capex). Amongst the 123 EM companies that were part of this analysis, those in the high- and excessive-risk categories accounted for nearly half of the total EM capex, for example.

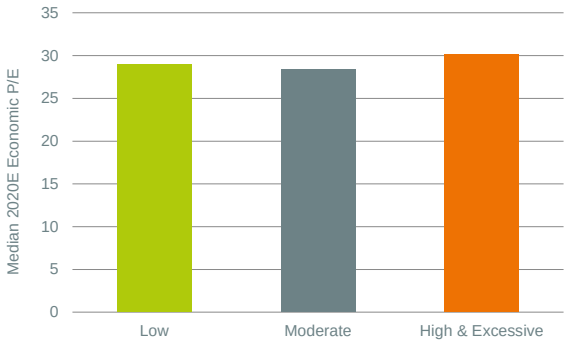
One would expect investors to be compensated through better expected rates of return, but the results suggest that there is no difference in valuation between the three groups of companies (high & excessive, moderate and low climate risk). The average asset life of companies in the high-climate-risk category is the longest (average economic life for high risk = 22 years, moderate risk = 14 years, low risk = 12 years). Beyond the specific results from this analysis, given the generational changes, our view is that ESG will become mainstream in the coming decade.

Figure 3: Climate-risk distribution by market cap across regions



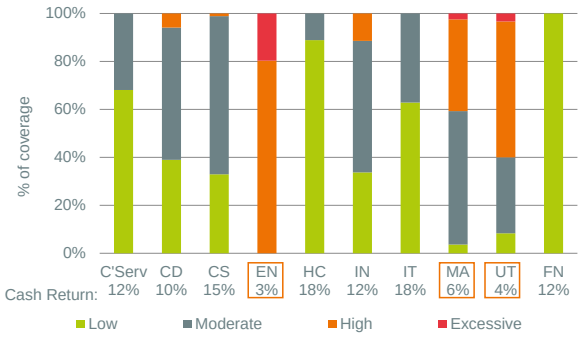
Source: DWS Investments UK Limited. This analysis is based on CROCI's coverage of 900 large-cap companies globally. Data as of 1/7/20.

Figure 4: Global: Median 2020E Economic P/E by climate risk



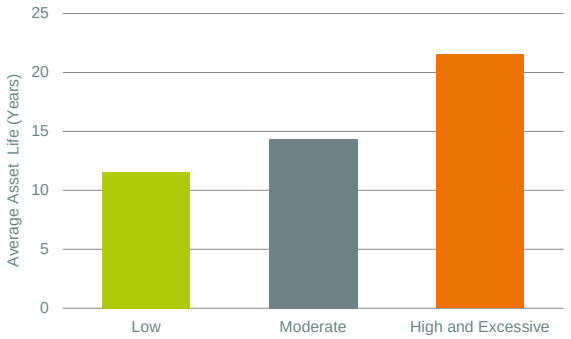
Source: DWS Investments UK Limited. This analysis is based on CROCI's coverage of 900 large-cap companies globally. Data as of 12/16/19

Figure 5: Climate risk by sector (equally weighted)



Source: DWS Investments UK Limited. This analysis is based on CROCI's coverage of 900 large-cap companies globally. The cash return shows the sector's aggregate profitability as determined by CROCI company analysis. Data as of 1/7/20

Figure 6: Average asset life by climate-risk category

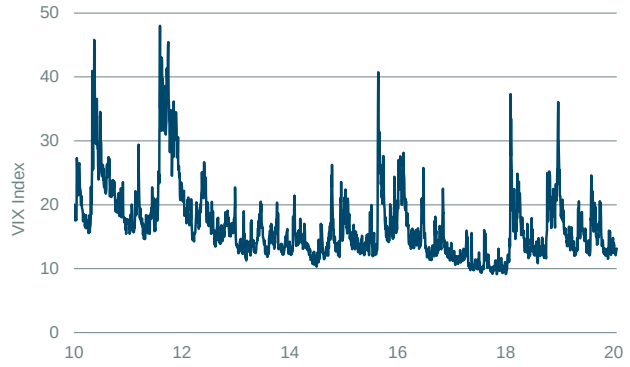


Source: DWS Investments UK Limited. This analysis is based on CROCI's coverage of 900 large-cap companies globally. Data as of 12/16/19

Central-bank policy and volatility

Given the expectations of lacklustre economic growth, central banks and their policies would continue to play a pivotal role in the markets. Central banks have engaged in unprecedented monetary-policy support ever since the great financial crisis. The Federal Reserve (the Fed) may have embarked on monetary tightening but that cycle proved to be short-lived. The Fed continues to hold a very sizeable balance sheet while the European Central Bank (ECB) and the Bank of Japan (BOJ) are continuing their asset purchases (in the form of investment-grade corporate bonds and equities, respectively) with little indication of an unwinding of their balance sheets in the near term. This easy monetary policy has benefited investors and borrowers alike, while savers have sacrificed their returns. Some normalization of rates and term premiums could be expected. However, there is no clear evidence that a strong economic-growth driver is about to emerge. We may have a few companies with over trillion-dollar market capitalisations, but they require little capital and employees. At an investment level, a continuous presence of central banks in the market may keep volatility low for longer (outside the occasional bouts of increased volatility). The argument being that high volatility generally represents a high degree of uncertainty about future cash flows, but with central banks reducing the risk of disorderly negative outcomes, the volatility is likely to stay low. We lack a long data series to empirically prove this, though. The experiment with global quantitative easing (QE) is still only 13 years old.

Figure 7: VIX levels (1/1/10 to 1/24/20)



Source: Bloomberg Finance L.P. Finance L.P. Data as of 1/24/20.

Search for yield but don't forget liquidity

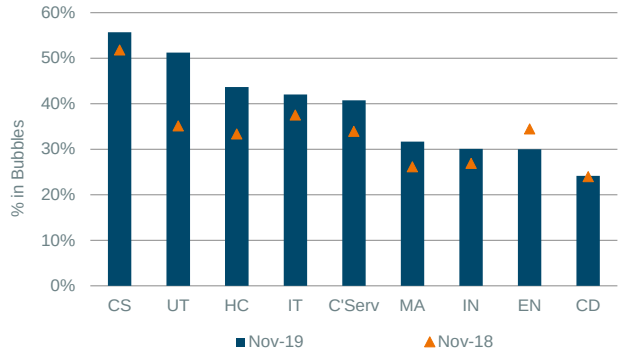
The ranking of asset classes by return forecasts has changed significantly over the past 12 months. The top three asset classes with the highest return forecasts are EM USD HY (7.5 percent), Private RE Equity US (6.9 percent), EM Equities (6.5 percent). Last year, they were EM Equities (9.0 percent), US Infrastructure Equity (8.8 percent) and Global Infrastructure Equity (8.4 percent). Some of these changes are due to their strong performances, reducing potential future returns, while others are from changes to our assumptions (listed infrastructure and EM equities).

The return forecasts from fixed-income securities have fallen further, led by Bunds hitting all-time lows last year and U.S. Treasuries retreating significantly from the levels at the beginning of the year. Credit spreads have also tightened significantly across the board. The falling returns are a challenge to investors and savers alike, particularly those in the retirement market. Many pay-as-you-go schemes are struggling to generate sufficient retirement income. These defensive investors that are facing shortfalls will most probably either need to accept lower returns or invest in riskier asset classes.

The search for alternative sources of return and/or income continues, but yields are already being driven down by the wall of cash piling into some alternative asset classes with the realisation that capacity is limited or deployed at a slower pace. Managing (il-)liquidity wisely goes beyond alternative investments, with the Fed intervening in the market for repurchase agreements (repo market) and even examples of presumably liquid equity investments suffering from severe liquidity issues. So, also for long-term investors, a close eye on the liquidity of investments may become a bigger topic going forward.

Even when searching for yield in riskier asset classes, much care should be exercised. Equities have attracted some of the flows from lower-yielding asset classes but simply focusing on high dividend yield may lead investors into more expensive stocks. The chart below shows the percentage of companies in "bubble[5]" territory in the various sectors. Those higher-yielding defensive sectors that are generally favoured by income investors have some of the highest proportion of companies in the bubble territory. Our factor analysis (see Figure 9) suggests high yield is neither a good proxy for safety nor value. In a low-yielding world, more granular research would be necessary.

Figure 8: Proportion of CROCI coverage trading at premium



Source: DWS Investments UK Limited, CROCI. The chart shows proportion of qualifying companies in CROCI's coverage trading at valuations implying at least a 50% premium to those justified by their past five years profitability. Data as of 11/25/19.

[5] Based on CROCI's coverage of 900 large-cap companies globally. CROCI defines bubbles as stocks that are trading at valuations implying at least a 50% improvement in profitability compared to their past five years' profitability. Past performance may not be indicative of future returns.
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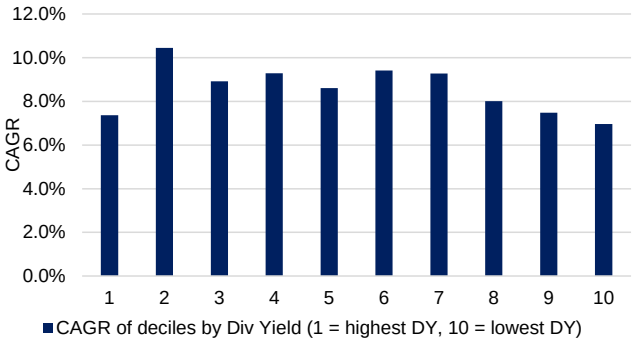
The Long View

As we enter the new decade, there is no shortage of challenges but investment is about patience, diversification and maintaining a long view. Our framework uses fundamental building blocks for establishing return forecasts of various asset classes. These can provide investors with a strategic baseline view. The following sections take the reader through our framework and findings.

Figure 9: Performance of equities by dividend-yield decile (12/31/03-12/31/18)



Source: DWS Investments UK Limited, CROCI. Chart shows the simulated Compounded Annual Growth Rate (CAGR) (in local currency) of decile portfolios (rebalanced monthly), sorting the dividend-paying companies in the CROCI coverage universe of developed market equities by Dividend Yield. 1 denotes the decile of highest DY companies, 10 denotes the decile of lowest (non-zero) DY companies. CAGR calculated over the period 31 Dec. 2003 - 31 Dec. 2018.

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Past performance may not be indicative of future returns.

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Executive summary

More than ten years after the Global Financial Crisis, investors are reminded of the importance of staying invested for the long run, having realized strong nominal and real returns across asset classes. As such, forward-looking forecasted returns may be lower than returns in recent years. This pulling forward of returns over the last decade is due to 3 main factors that we will discuss further in the paper: valuations, growth, and central banks. Taking these factors into consideration, we present our long-term ten-year return forecasts across asset classes which we refer to as our "Long View."

In our Long View, we show our forecasted returns across asset classes and regions on the efficient frontier, which represents the trade-off investors have to make between risk and returns. The chart below depicts the efficient frontier over the last ten years since the credit crisis and compares it to the efficient frontier over the past two decades. As seen, the post-financial crisis efficient frontier is steeper. What this suggests is on a relative basis, investors received greater compensation for commensurate levels of risk in the decade following the financial crisis.

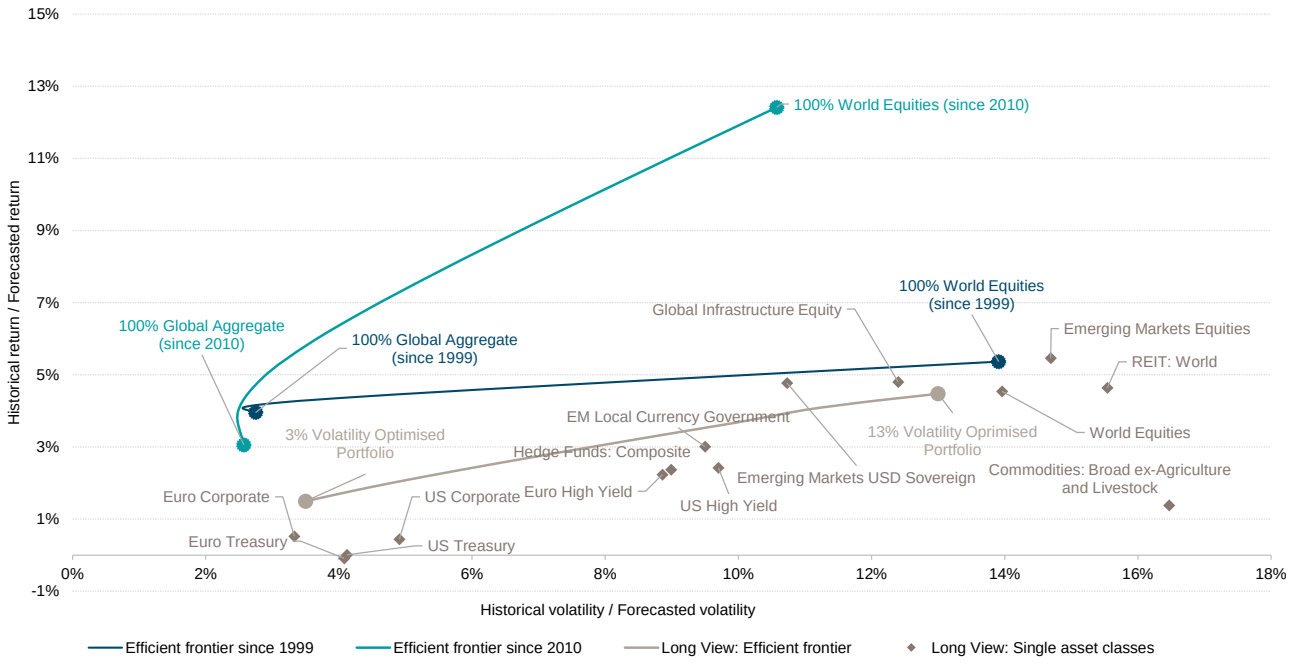
Over the next ten years, based on the forecasted returns in this publication, we believe the efficient frontier could not only flatten; it may also drop well below the 20-year frontier at the lower-risk end of the spectrum.

In an environment of more conservative asset-class return expectations, strategic asset allocation becomes increasingly important, utilizing a rigorous and disciplined approach to portfolio construction.

This publication details the long-term capital market views that underpin the strategic allocations for DWS's multi-asset portfolios. These estimates are based on 10-year models and should not be compared with the 12-month forecasts published in the DWS CIO View.

Central to this document is our belief that clients should consider a long term perspective beyond 1–5 years when it comes to constructing investment portfolios. Perhaps, counterintuitively, extending the investment horizon has, in the past, produced less volatile, more precise forecasts, as shown in Figure 12. This can potentially make entry points less relevant.

Figure 10: Efficient frontiers: Forecasted and historical returns and volatilities, annualised



Historical Efficient Frontiers are noted above as "Efficient Frontier" and are calculated using historical returns and volatilities over the time frame noted through 12/31/19. Each historical efficient frontier represents the risk-return profile of a portfolio which consisted of two asset classes; World Equities (in euro, unhedged) and Global Aggregate Fixed Income (euro-hedged). The Long View Efficient Frontier represents a forecasted optimal portfolio (EUR) using the various asset classes represented in the figure, subject to certain weighting/concentration constraints that result in component asset classes being able to trade above the line in this instance (please see page 25 for more details on these optimization techniques). Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

For example, we believe that many asset-class valuations are high relative to history. But as we show on page 16.

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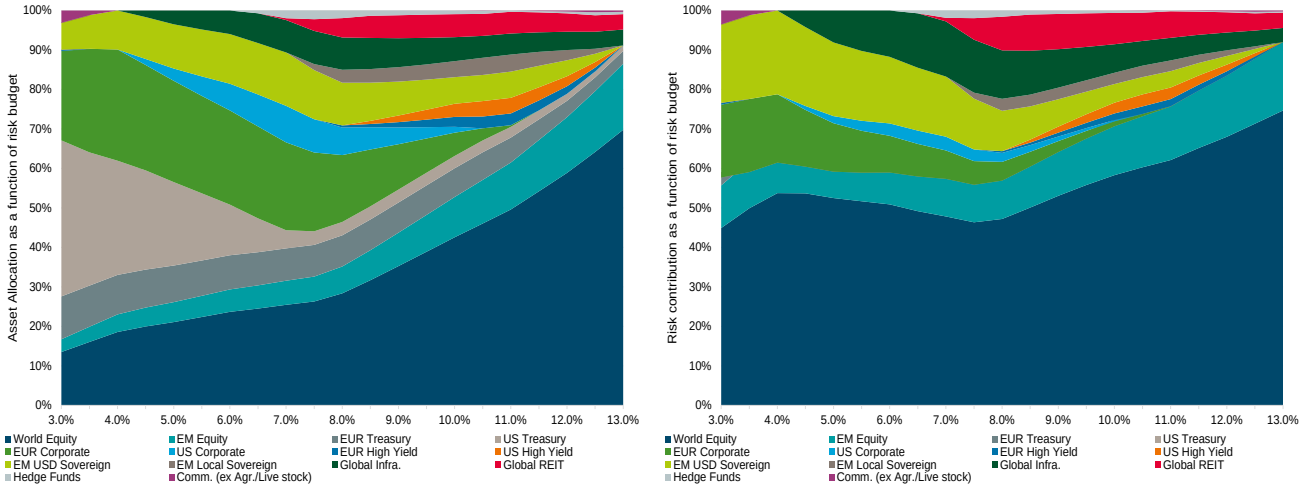
when investing with a 15-year time horizon, the difference between buying exactly at the peak of the dot.com boom in April 2000 vs. a year later only amounts to one percent compounded annually. Clearly, though, if an investor had had a shorter horizon of five years, the difference in returns generated from buying at the peak versus one year later was greater, amounting to roughly six percent per annum. Thus, while asset prices may be high today relative to history, over long-run periods (15 years in this example), returns seem to be driven by their underlying fundamental building blocks.

When looking at rolling one-year price returns of the S&P 500 from 1871 to 2019, a negative two-standard-deviation move equated to a 27 percent decline in prices. When calculating a negative two-standard-deviation move using rolling 10-year returns over this same time frame, the decline in prices is less than 1 percent per annum. More stable long-run returns can be helpful in establishing more stable strategic-asset-allocation targets.

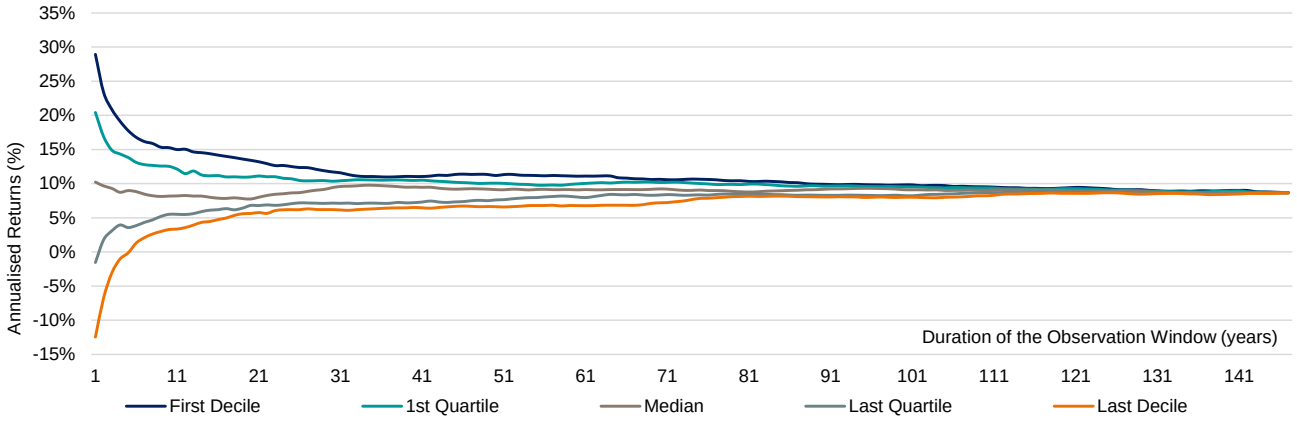
Hence, skeptics may be surprised to learn that the volatility of returns historically has been lower when using long-term horizons, although past performance may not be indicative of future results.

Figure 11: Asset allocation and risk allocation by target volatility



Source: DWS Investments UK Limited. Data as of 12/31/19. For illustrative purposes only. See page 25 for details. See appendix for the representative index corresponding to each asset class.

Figure 12: Distribution of U.S. equities: Historical returns over different time periods, annualised



Source: Robert J. Shiller, DWS Investments UK Limited. Data from 1871 to 2019.

Past performance may not be indicative of future returns.

Framework

We use the same building-block approach to forecasting returns irrespective of asset class. We believe this brings consistency and transparency to our analysis and also may help clients better understand the constituent sources of returns.

The Long View framework breaks down returns into: income + growth + valuation, each with their own sub-components.

The pillars and components for the traditional asset classes under our coverage (equities, fixed income and commodities) can be seen below.

Meanwhile, alternative asset classes under our coverage (listed real estate, private real estate, private real estate debt, listed infrastructure and private infrastructure debt) are forecasted using exactly the same approach, sometimes with an added premium to account for specific features, such as liquidity.

Figure 13: Long View for traditional asset classes: Pillar decomposition

Asset class	Income		Growth		Valuation		
Equity	Dividend yield	Buybacks & dilutions	Inflation	Earnings growth	Valuation adjustment		
Fixed income	Yield		Roll return		Valuation adjustment	Credit migration	Credit default
Commodities	Collateral return		Inflation	Roll return	Valuation adjustment		

Source: DWS Investments UK Limited. As of 12/31/19.

Figure 14: Long View for alternative asset classes: Pillar decomposition

Asset Class	Income	Growth		Valuation			Premium
Hedge funds		Hedge funds' full exposure to each pillar are calculated by means of a multi-linear regression of hedge fund performance vs all liquid asset classes					Hedge-fund premium
Listed real estate equity	Dividend yield	Inflation	Earnings growth	Valuation adjustment			
Private real estate equity	Dividend yield	Inflation	Earnings growth	Valuation adjustment			
Private real estate debt	Yield	Roll return		Valuation change	Credit migration	Credit default	Liquidity premium
Listed infrastructure	Dividend yield	Inflation	Earnings growth	Valuation adjustment			
Private infra-structure debt	Yield	Roll return		Valuation change	Credit migration	Credit default	Liquidity premium

Source: DWS Investments UK Limited. As of 12/31/19.

[f] Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

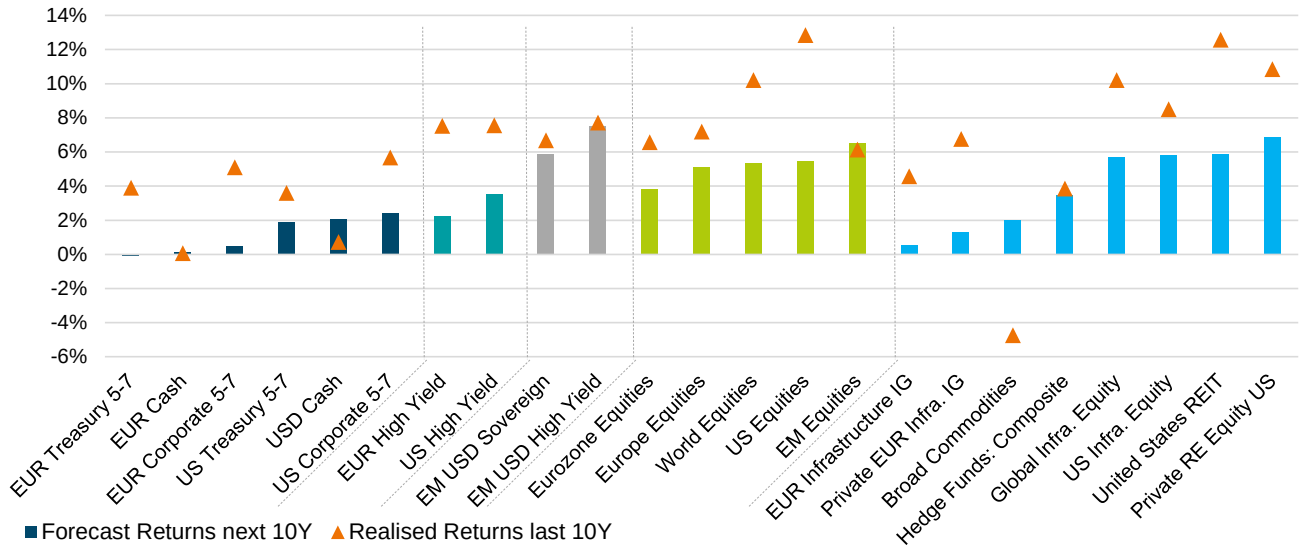
Return forecasts

Our Long View forecasts for all asset classes can be seen below. The bars are ranked by ascending forecasted returns within each asset class.

In summary, we make five observations from the results:

- Within fixed income, emerging-market U.S. dollar (USD) high yield and sovereign bonds appear to offer the highest expected returns.
- Relative to many other asset classes, we forecast higher returns in private real estate.
- According to our analysis, stocks may be more attractive than bonds generally, with some opportunities in credit.
- Return forecasts from commodities are low (especially in real terms) but they could provide useful diversification benefits.
- Investors should be conscious of the impact of foreign-exchange (forex) risk on base-currency returns and volatilities. Depending on risk appetite and return objectives, investors may want to consider hedging currency risk (see page 27).

Figure 15: Forecast and realised returns for 10 years, annualised (local currency)



Source: DWS Investments UK Limited. As of 12/31/19. See appendix for the representative index corresponding to each asset class.

Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results.

The DWS Long View

Patience, diversification and forecasted returns

Long-term time horizon may exhibit less volatility

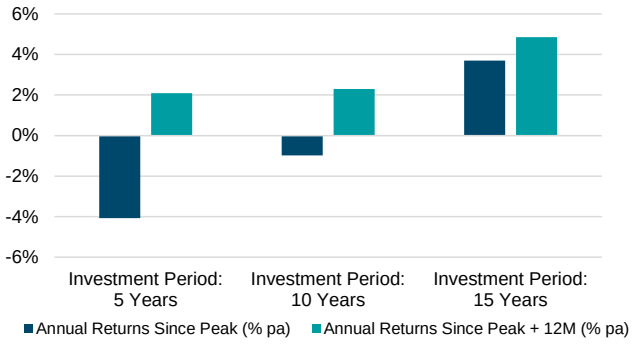
A long-term view reduces the problem of market timing

Why is it so important to have a long-run perspective? For us the reason is simple. We believe that only over a market cycle can an investor potentially capture the risk premium[6] available for each asset class.

To illustrate this, Figure 16 compares the annual return for an investor buying U.S. stocks in April 2000 and 12 months later. April 2000 was one of the most expensive valuation points for most equity indices until late 2007, and as such, it represented a challenging period for investors. Surely this was a terrible time to buy the market?

Indeed it was. If we look at returns over the subsequent five years from the market peak on April 28, 2000, performance was significantly impacted by market timing. If an investor had waited and instead bought into the market 12 months after the peak, subsequent annual returns would have increased by 6 percent, turning negative 4 percent return per annum into a more comfortable 2.1 percent annual return over the ensuing five-year period.

Figure 16: U.S. equity performance over various time periods



Performance based on the 5 worst equity months (for U.S. equities) from 1992-2018. Total return performance represented by S&P 500 TR
Source Bloomberg Finance L.P., DWS Investments UK Limited. Data from 4/28/00 to 4/28/15.

However, if we take the same example over a 15-year investment horizon, Figure 16 shows that an investor's total return would have been much less sensitive to market timing as over time, prices reverted to their long-run trend. What is more, it has been suggested that about 90 percent of portfolio returns come from asset allocation.[7] In other words, taking a Long View means portfolio allocation decisions are usually far more critical than trying to time the market by picking the highs and lows.

Under the assumption of past behaviour of market cycles and the tendency for prices to revert to their long-term trend, returns measured over long periods of time (15 or more years) may establish a more reasonable expectation of future performance compared to shorter time frames (5 or fewer years). However, we recognise the real world is rarely so patient. Hence, our Long View forecasts are based on a ten-year horizon, which we believe is near term enough to be relevant, while still a reasonable time-frame for a full market cycle to occur.

[6] We often use the term risk premium in this publication. We define risk premium as the excess return an asset class is expected to deliver compared to other asset classes, usually carrying a low or null risk, like cash or government bonds. "Equity risk premium" usually refers to the past or expected excess returns of equities compared to risk-free money markets, and "Bond risk premium" refers to the same concept applied to bonds, usually referring to the incremental returns expected for a higher level of duration risk borne by the investor.
[7] See, among others, (Brinson, Singer and Beebower 1991) for an in-depth analysis of the relative impact of Strategic Asset Allocation in portfolios' performance.
Past performance may not be indicative of future returns.

Measuring returns over longer timeframes (five or more years) can reduce volatility

Consider the performance of U.S. equities since 1871 (Figure 17) based on Robert Shiller data.[8]

This equity composite has delivered a 9.2 percent annualised nominal return, which translates into 6.9 percent real return – outperforming real output growth in the U.S. by 3.7 percent.

Figure 17 makes clear that over most of the time periods covered in this chart, equities have historically produced steady above-inflation returns, despite some nasty short-term[9] losses.

To quantify historical return versus short-term risk, Figure 18 shows the distribution of annualised U.S. equity returns across different time horizons. It illustrates that with a longer investment horizon, realised returns converged towards their long-run average.

We continue to believe that a longer time horizon reduces the range of volatility of U.S. equities

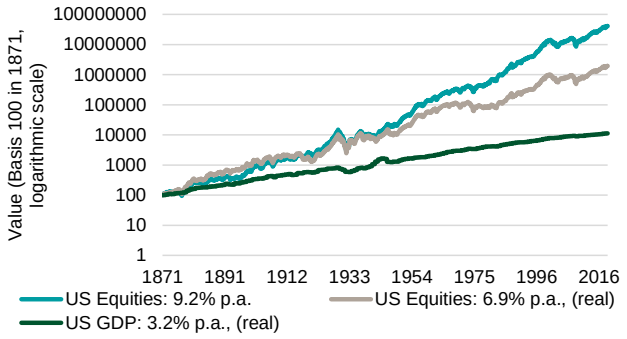
How does the Long View's ten-year time frame look in terms of return stability? Table 3 provides average and various standard deviation levels across different time periods for U.S. equity investors. As can be seen, the range of returns becomes narrower as the time horizon increases.

Table 3: Average and standard deviation of realised returns over different time periods, annualised

Maturity (year)	1	5	10
Average (IRR) – 2 StDev	–27.4%	–6.1%	–0.5%
Average (IRR) – 1 StDev	–9.3%	1.3%	4.1%
Average (IRR)	8.7%	8.7%	8.7%
Average (IRR) + 1 StDev	26.7%	16.0%	13.2%
Average (IRR) + 2 StDev	44.7%	23.4%	17.8%

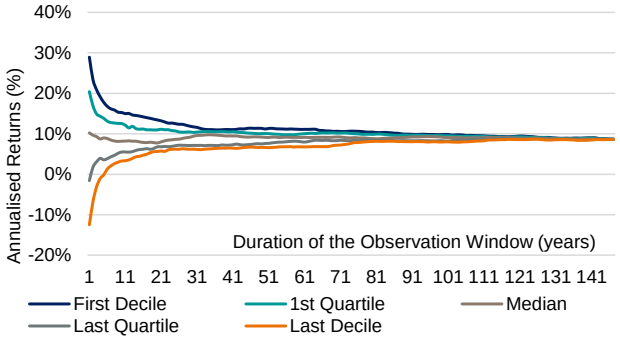
Source: Robert J. Shiller, DWS Investments UK Limited. U.S. equity returns for respective time periods between 1871 and 2019 Data as of 12/31/19

Figure 17: U.S. equity returns and U.S. GDP growth (1871–2019)



Total-return performance represented by S&P 500 TR
Source: Robert J. Shiller, Angus Maddison, Refinitiv Datastream, DWS Investments UK Limited.

Figure 18: The longer the holding period, the more consistent the average return of U.S. equities (January 1871 to December 2019)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. As of 12/31/19.

[8] Long-term U.S. equities data is available at (Shiller, Online Data Robert Shiller 2019) and long-term macro-economic data is sourced from (Maddison 2019).
[9] "Short term" for the purpose of this publication refers to a time frame of up to five years, while "long term" refers to a time frame of at least ten years.
Past performance may not be indicative of future returns.

A longer time frame leads to more consistent equity-return forecasts

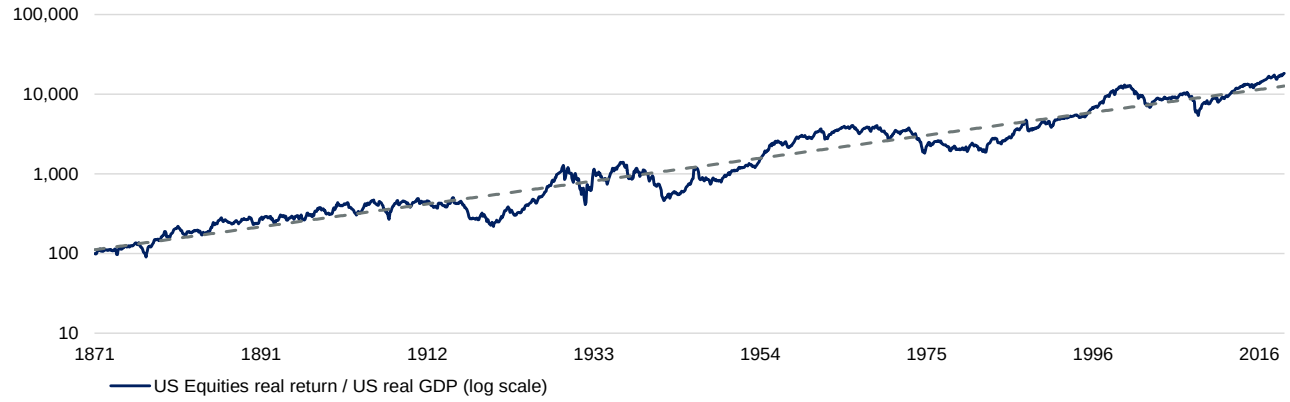
Equity returns as a function of economic growth

Many believe forecasting market returns is a fool's errand, but over extended time horizons it has been shown that returns have historically had a tendency to revert to their average. As a result, when examining long-term relationships with various economic variables, such as economic growth (GDP) and inflation, trends can be identified. Take the ratio between real total returns for U.S. equities and real output.

Figure 19 suggests that U.S. equities outperform economic growth over the long run by 3.6 percent per annum as reported by Robert Shiller. This relationship does not guarantee future outperformance, but it does provide some long-term evidence of the behaviour of equities over time relative to these variables.

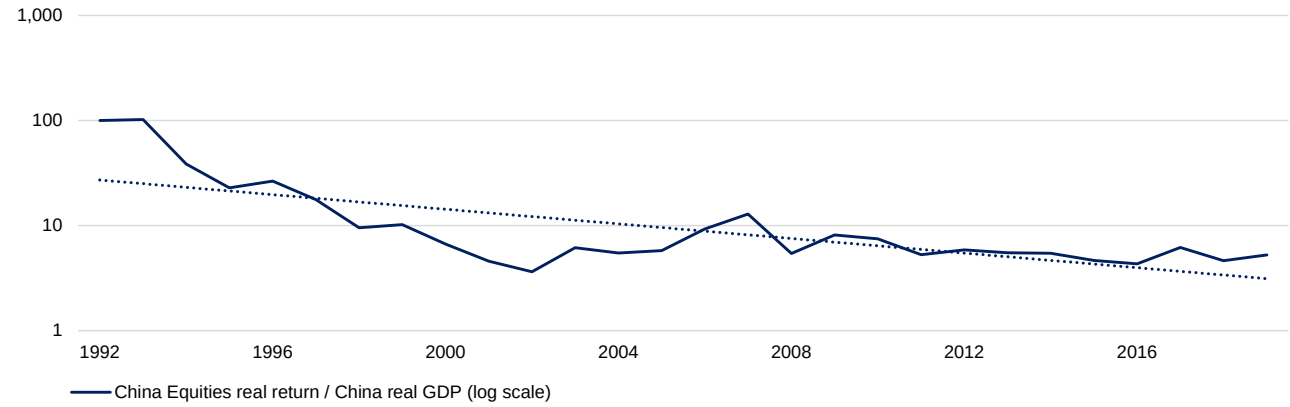
In emerging markets, for the current update, we have adjusted the real output growth by a factor of 0.5 for China, India, and Brazil in order to estimate the earnings growth pillar for these countries. Our analysis suggests that for certain countries, especially within EMs, GDP growth has not translated proportionately into earnings growth for broader equity indices (see the ratio for China in Figure 20: The ratio between the real total return of China equities and China real GDP growth (1992-2019) as an example). One potential reason for this divergence, in our view, is the difference in the structure of the economy and the composition of equity benchmarks. Accordingly, our estimate of earnings growth for emerging markets has declined from 3.7 percent in last year's report to 2.5 percent in the current analysis.

Figure 19: The ratio between the real total return of U.S. equities and U.S. real GDP has grown at 3.6% (1871-2019), log scaled and indexed: 01/1871 = 100



Source: Robert J. Shiller, Angus Maddison, Refinitiv Datastream, DWS Investments UK Limited. Data from 1871 to 2019.

Figure 20: The ratio between the real total return of China equities and China real GDP growth (1992-2019), log scaled and indexed: 01/1992 = 100



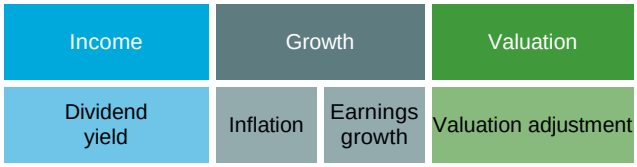
Source: Bloomberg Finance L.P., IMF World Economic Database, DWS data as of 1992 to 2019.

Past performance may not be indicative of future returns.

An equity forecast

In an effort to support the claim above, we back-tested our own Long View equity forecast methodology to test its reasonableness over the long run. We utilised long-term return and fundamental data (Shiller, Online Data Robert Shiller 2019) and decomposed performance into the building blocks as described in Figure 21.

Figure 21: Pillar decomposition: Equities



Source: DWS Investments UK Limited. As of 12/31/19.

For this exercise, we made two adjustments and applied the following assumptions, described below:

- For past expectations of future ten-year inflation expectations (a so-called backcast) we followed the methodology developed by (Groen and Middeldorp 2009). This gives a theoretical estimate for breakeven inflation based on all inflation forecast data that has been made available since 1971. We use this backcast until the respective dates where Treasury Inflation-Protected Securities (TIPS) prices and then inflation swaps quotes are available.
- In the absence of robust historical data, earnings growth is estimated from its long-term trend observed during the testing period.

Subject to these adjustments and assumptions, we created a data set that we used to examine the necessary data to provide forecasted return backcasts from 1971 to 1981 and rolled this ten-year forecast forward each year thereafter. This is long enough to cover at least one market cycle.

Long-term equity forecasts

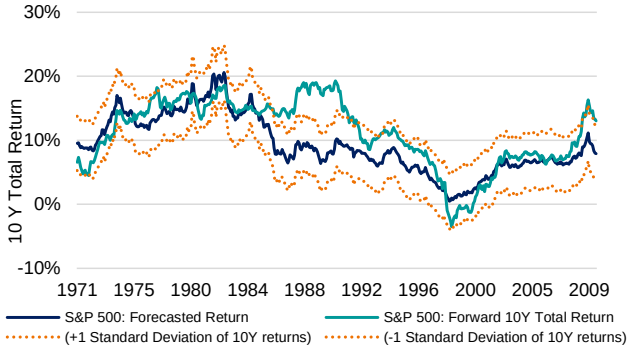
The results suggest the return forecast of our Long View equity methodology appears to provide a reasonable estimate of future performance. Figure 22 shows the return forecasts versus realised returns. While there are periods where divergence exceeds one standard deviation, we would highlight two statistics in support of the methodology.

The first is that in 85 percent of the observations the forecasted return has been within one standard deviation of the subsequent actual ten-year realised return.

Second, the gap between the return forecasts and subsequent realised return has been less than half of one standard deviation 60 percent of the time.

To conclude, we believe Figure 22 illustrates what investors may observe from our ten-year forecast methodology: a reasonable indicator of long-run market trends.

Figure 22: Our forecast would have provided estimates for U.S. equity returns within one standard deviation (1971 through 2009)



Total return performance represented by S&P 500 TR. Source Robert J. Shiller, Angus Maddison Project, Refinitiv Datastream, DWS Investments UK Limited. Data from 1/31/95 to 12/31/19. The forward 10Y return show the realised return over the subsequent 10 years. The first 10-year forecast and actual results represent the compound annual return from September 1971–September 1981. A simplified forecast would have provided estimates for S&P 500 returns within a standard deviation interval with an 85 percent probability.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Past performance, actual or simulated, is not a reliable indicator of future results. Any hypothetical results may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results.

Back-tested performance is NOT an indicator of future actual results. The results reflect performance of a strategy not [historically] offered to investors and do NOT represent returns that any investor actually attained. Back-tested results are calculated by the retroactive application of a model constructed on the basis of historical data and based on assumptions integral to the model which may or may not be testable and are subject to losses. General assumptions include: Firm would have been able to purchase the securities recommended by the model and the markets were sufficiently liquid to permit all trading. Changes in these assumptions may have a material impact on the back-tested returns presented. Certain assumptions have been made for modeling purposes and are unlikely to be realized. No representations and warranties are made as to the reasonableness of the assumptions. This information is provided for illustrative purposes only. Back-tested performance is developed with the benefit of hindsight and has inherent limitations. Specifically, back-tested results do not reflect actual trading or the effect of material economic and market factors on the decision-making process. Since trades have not actually been executed, results may have under or over-compensated for the impact, if any, of certain market factors, such as lack of liquidity, and may not reflect the impact that certain economic or market factors may have had on the decision-making process. Further, back-testing allows the security selection methodology to be adjusted until past returns are maximized. Actual performance may differ significantly from back-tested performance.

Forecasted returns and long-term insights

Our forecasted returns for the next decade

In this section we summarise our Long View forecasts. Figure 23 shows the total-return forecasts for each asset class.[10/11]

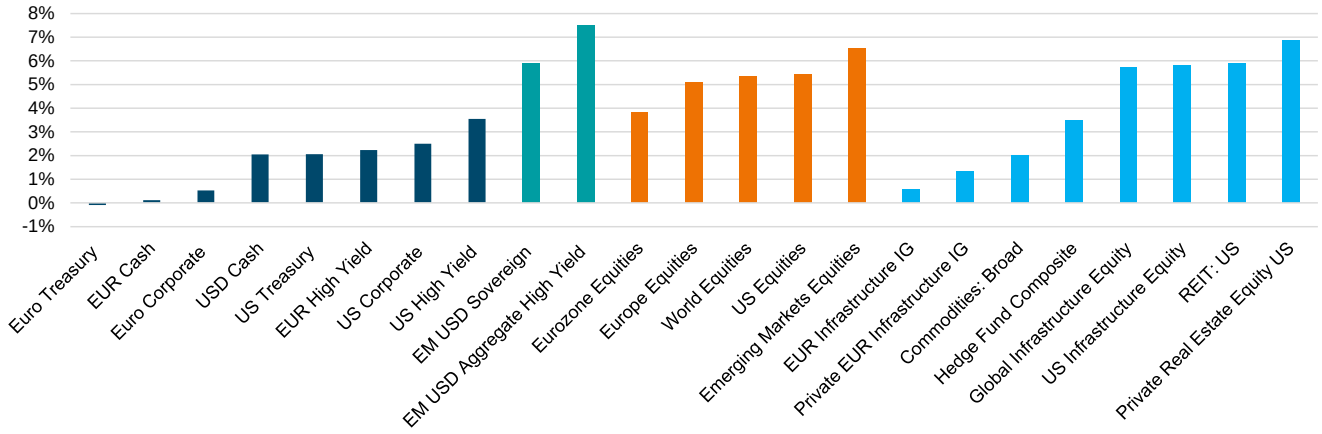
What are the key views? First, fixed-income returns look disappointing from an absolute perspective, with forecasts below 3 percent per annum for most segments. In comparison, equities may feature higher returns, returning 3 to 5.5 percent in developed regions and up to 6.5 percent per annum in emerging markets in local-currency terms.

Looking at fixed income in more detail, investors usually look at two particular metrics. The term premium helps to quantify how much incremental return an investor might expect by committing to a longer-dated bond (and hence bearing an increased duration risk). The credit premium relates to higher return that is expected by investors as a compensation for their investment in increasingly risky bonds (that is, bonds of lower credit rating). Figure 24 shows that while the term premium has collapsed, investors may still realise reasonable credit premia, albeit below historical averages. In practice, these premia should reflect the value that an investor can extract from a move into longer-dated and/or riskier fixed-income assets.

We forecast higher returns from developed-market equities relative to fixed income, but lower than the double-digit returns since the crisis, although the outlook for EMs appears modestly brighter (see Figure 25). Most equity regions still offer at least a 4 percent total return over our forecast horizon (12/31/2019 – 12/31/2029).

In the short run, we believe that if equity markets fall as a result of declines in valuations, the tendency for multiples to mean revert suggests forecasted returns should, all else equal, be higher. The mean reversion of valuations underpins our long-term forecasts for equities as well as for other risky asset classes.

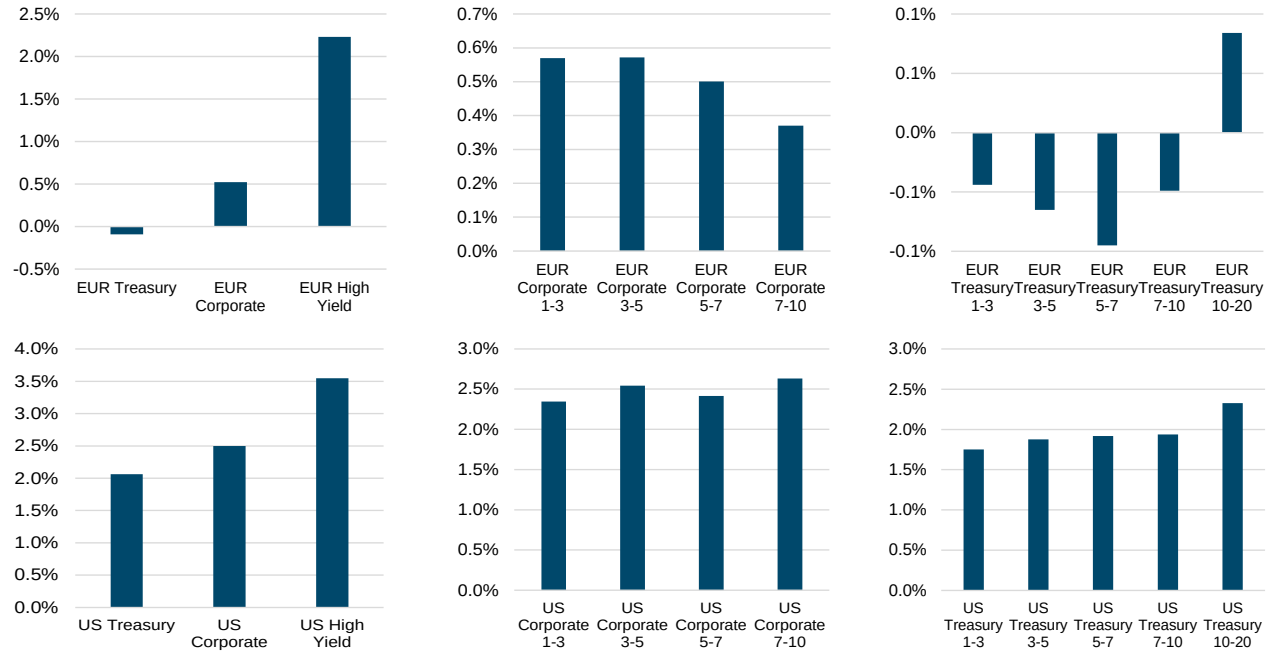
Figure 23: Long-term (10-year) forecasted returns for the next decade, annualised (local currency)



Source DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

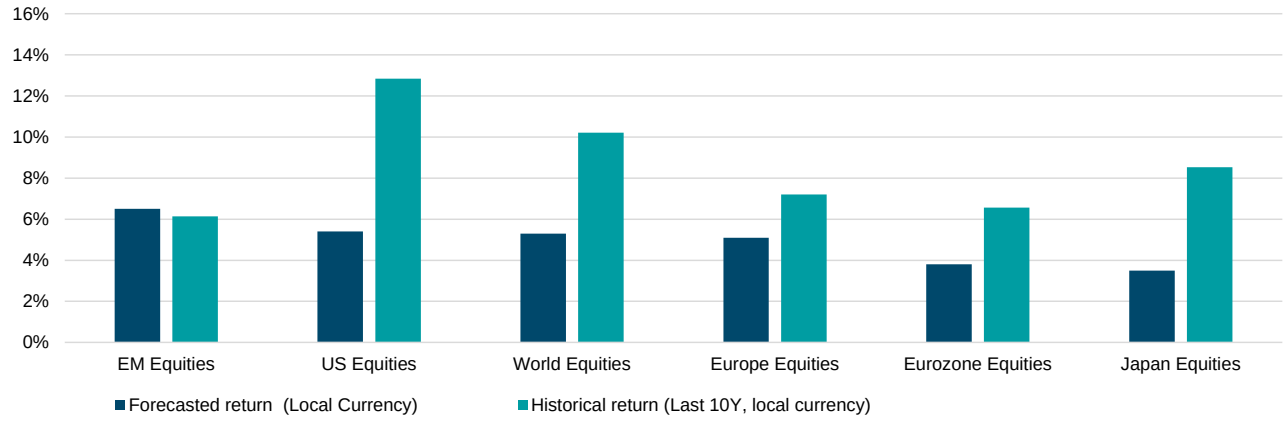
[10] Data as of 31 Oct. 2018, Source DWS Investments UK Limited.
[11] Please see from page 32 for an exhaustive explanation on how we have formed these long term return estimates.
Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

Figure 24: Forecasted term and credit premia across U.S. and EUR fixed income, annualised (local currency)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 25: Forecasted and historical return for large cap equities across regions, annualised (10-year period 12/31/08 through 12/31/18)



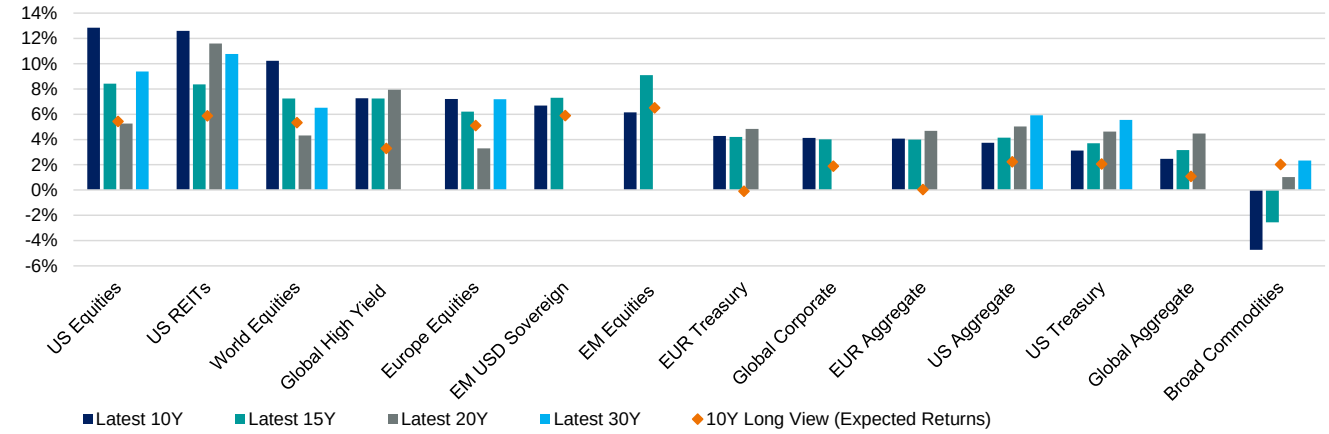
Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.
Past performance may not be indicative of future returns.

Forecasted returns vs. the past

We find it useful to compare the forecasted returns of our main asset classes with their realised performance, which is shown in Figure 26. Again it can be seen that the past 10 years have been positive for equities and higher-risk fixed-income investments, such as emerging-market and high-yield debt. For most asset classes, however, our forecasts are well below historical returns. Emerging markets (both equities and fixed income) are a notable exception, with a forecasted return nearly as strong as seen over the previous decade.

Figure 26: Forecasted and historical returns by asset class, annualised (over 10-, 15-, 20- and 30-year time periods ending 12/31/19)



Source Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

In a world of lower returns, was higher risk compensated?

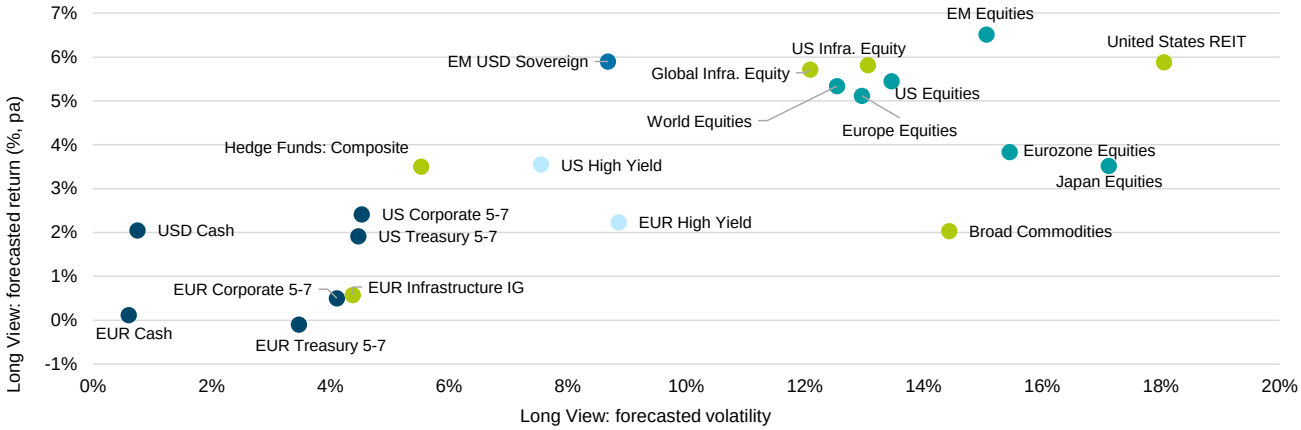
Financial theory tells us riskier asset classes should compensate the investors via higher forecasted returns. This well-known trade-off between risk and return is the main conclusion from Figure 27.[12] We observe that the usual relationship is presented over our 10-year horizon, with a compensated risk premium for most asset classes.

Using the same data, we can calculate and compare forecasted Sharpe ratios (Figure 28), taking into account our forecasts for money-market instruments. Regarding both of these charts we would make the following comments:

- Based on our research, we believe risk in equities may be compensated: Most equity asset classes demonstrate the highest forecasted returns and some of the higher Sharpe ratios.
- Long-term opportunities may exist for corporate bonds: Despite a limited absolute level of forecasted return, investment-grade corporate bonds still demonstrate a positive Sharpe ratio.
- The risk in lower-grade fixed-income instruments may be compensated: High yield and emerging-market debt are topping the fixed-income asset class from a Sharpe-ratio perspective.
- Emerging markets look compelling for both equities and bonds.
- When translating local currency returns, investors should be conscious of the impact of foreign-exchange (forex) risk on base-currency returns and volatilities. Depending on risk appetite and return objectives, investors may want to consider hedging currency risk (see page 27)

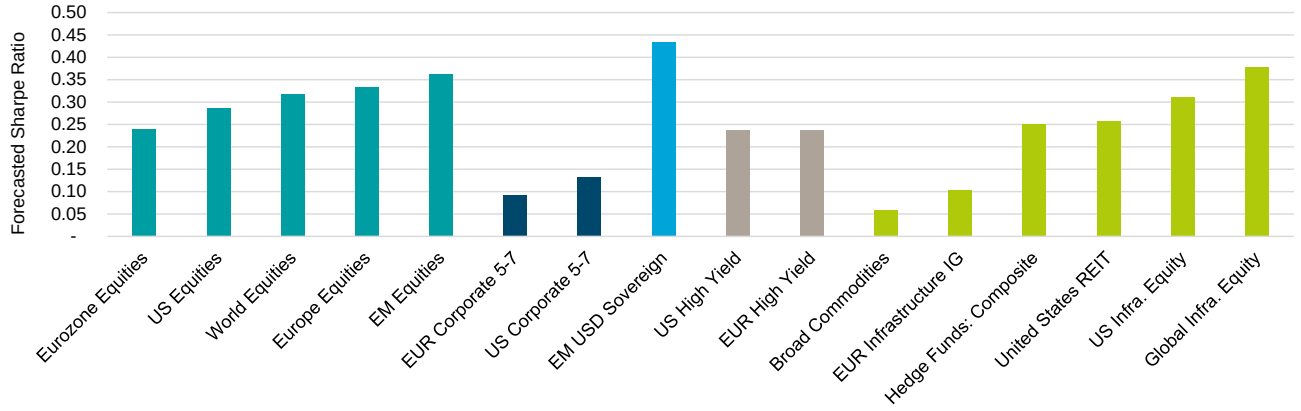
[12] This chart utilises our approach, a macro-level forecasting method, for calculating the forecasted returns and the approach we developed for forecasted volatilities and correlations, presented from page 73.
Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

Figure 27: 10-year forecasted return and risk by asset class, annualised (local currency) (year-end (YE) 2019–2029)



Source DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 28: 10-year forecasted Sharpe ratio by asset class in euro (EUR), annualised (YE 2019–2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

Strategic allocation

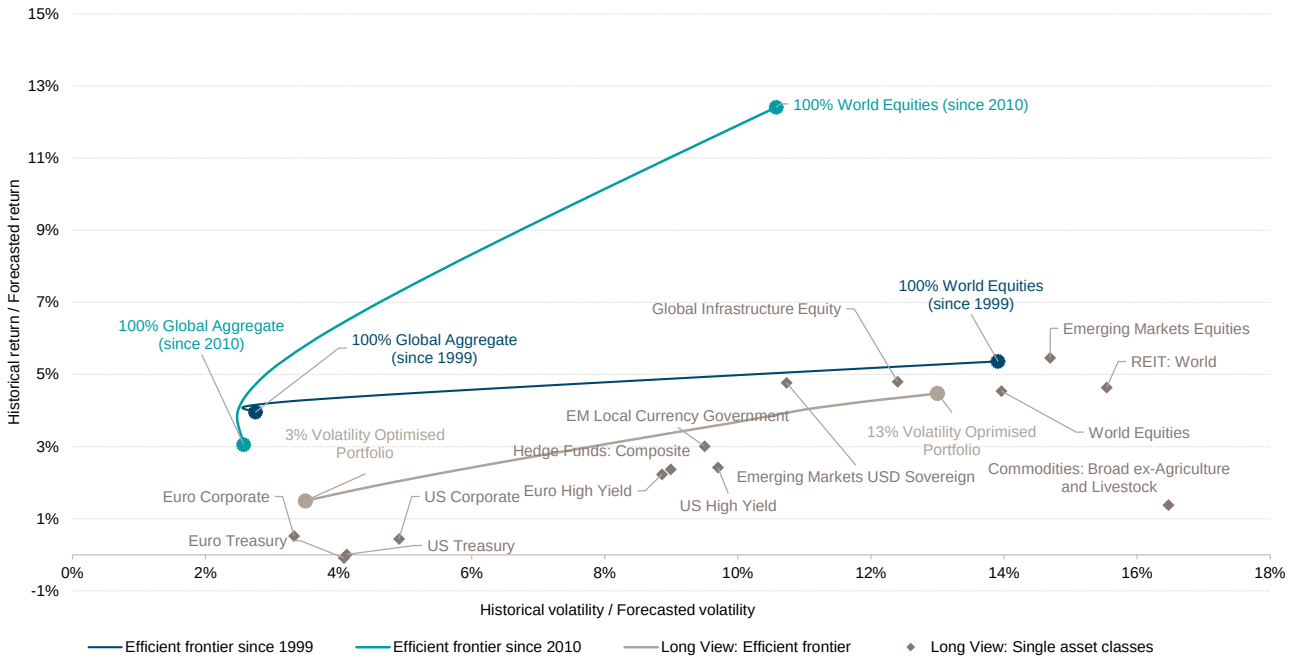
Connecting our Long View into portfolios

Over the past 20 years, asset returns – in particular fixed income and equities – have been particularly volatile. This is in part due to the unprecedented decline in interest rates, with investors not being rewarded for taking risk (Figure 29).

In addition, the rebound in equities since the financial crisis was extreme.

Using our Long View forecasts to construct a hypothetical efficient frontier, forecasted multi-asset returns over the next ten years are uninspiring.[13] For investors wanting to pursue robust returns, the higher risk required may be concerning. Therefore in order to keep risk at reasonable levels, dynamic overlays and tactical adjustments may be useful in managing risk.

Figure 29: Efficient frontiers: Forecasted and historical returns and volatilities, annualised



Historical Efficient Frontiers are noted above as "Efficient Frontier" and are calculated using historical returns and volatilities over the time frame noted through 12/31/19. Each historical efficient frontier represents the risk-return profile of a portfolio which consisted of two asset classes; World Equities (in euro, unhedged) and Global Aggregate Fixed Income (euro-hedged). The Long View Efficient Frontier represents a forecasted optimal portfolio (EUR) using the various asset classes represented in the figure, subject to certain weighting/concentration constraints that result in component asset classes being able to trade above the line in this instance. Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

[13] Hypothetical performance results have many inherent limitations, some of which are described herein. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved by any particular trading program. One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or adhere to a particular trading program in spite of trading losses are material points which can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Past performance may not be indicative of future returns.

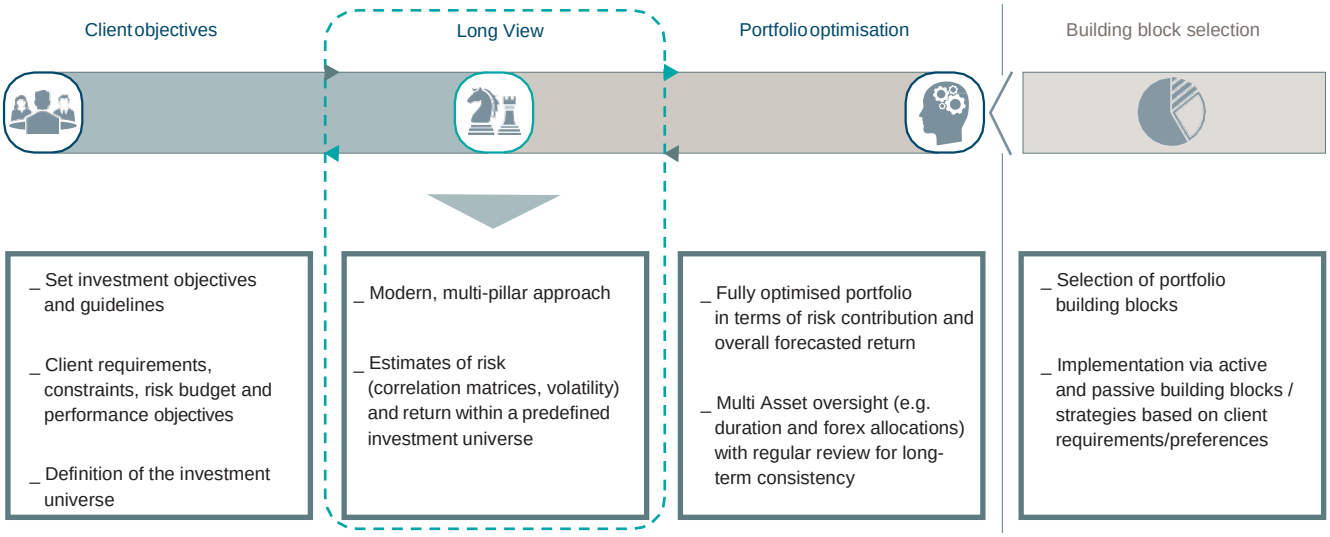
In this section we reiterate our strong belief in strategic asset allocation (SAA). This process endeavours to examine investment strategies in an ongoing effort to assist investors in pursuit of their investment objectives.

A SAA framework is based on:

- The risk and return objectives of the investor;
- The historical and/or forecasted risk and return profiles of available asset classes;
- The allocation process

Our risk-based investment approach to strategic asset allocation is further described in Figure 30. We believe this multi-pillar approach provides additional insights versus other forecasted return-based approaches and aims to provide stability across parameter changes.

Figure 30: Decomposition of the Strategic Asset Allocation process



Source: DWS Investments UK Limited. As of 12/31/19. For illustrative purposes only.

Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

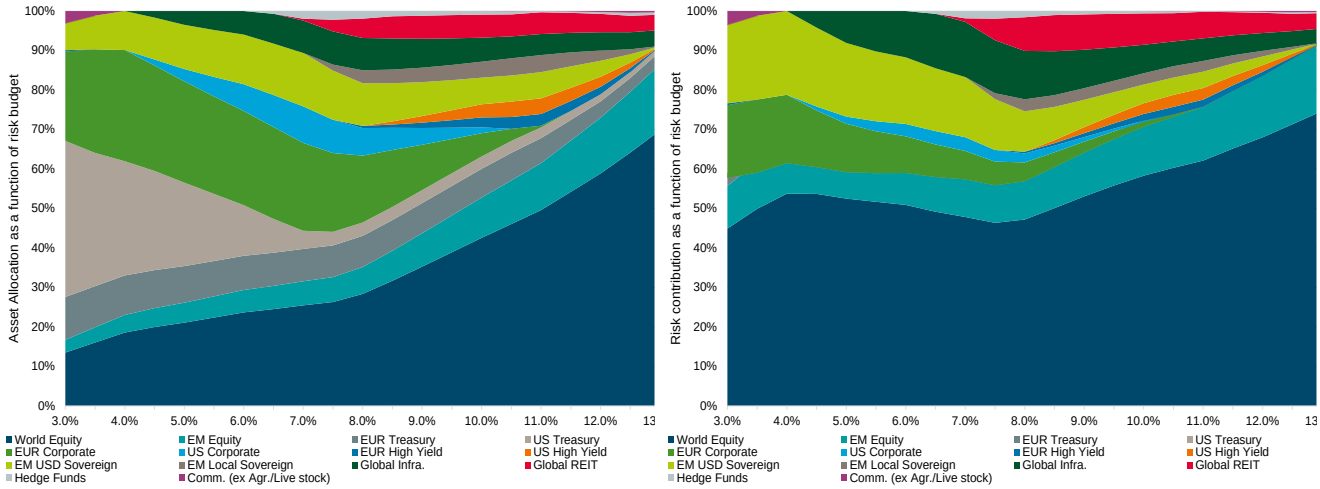
Combining the Long View with our portfolio construction approach

Relying on the GRIP approach developed by DWS (group risk in portfolios), in Figure 31, we show a concrete example of a portfolio construction exercise, based on an investor's targeted risk level.

The chart on the left shows an asset-allocation as a function of the targeted risk budget, while the chart on the right shows the corresponding risk allocation. Further analysis[14] shows that by moving beyond the usual risk parity framework, it may be possible to construct allocations that are diversified from a capital-allocation as well as a risk-contribution perspective, with a higher number of uncorrelated exposures, and less extreme weights and risk allocations.

And at the same time, all of this can be achieved while offering a great degree of flexibility. For example, calibrations can be adjusted to only hold long-only positions and ensure that the overall portfolio volatility equals a given target. It is also possible to add further rules or constraints based on the risk profile and specific requirements of an investor.

Figure 31: Asset allocation and risk allocation as a function of the target volatility



Source: DWS Investments UK Limited. Data as of 12/31/19. For illustrative purposes only.

[14] See DWS Publication "Time to get a GRIP on Asset Allocation", 2018.

Economic assumptions

"Invest in Inflation. It's the only thing going up."
Will Rogers[15]

Inflation and GDP-growth assumptions

Long term inflation expectations are pivotal to our Long View framework as they are core input when developing forecasts for most asset classes.

As per Table 4, our output and inflation forecasts are relatively similar across developed countries, with the exception of Japan.

We note that real output growth for emerging countries is forecasted to exceed that of developed countries by about 1 percent on average over the next 10 years. This is a key factor that will among others significantly impact return forecasts for developed and emerging markets equities.

Table 4: Economic forecasts for select countries/regions (YE 2019–2029)

Country / region	Inflation	GDP growth
World	1.8%	1.6%
Emerging markets	2.9%	2.5%
Europe	1.6%	1.2%
Japan	0.8%	0.7%
United Kingdom	2.0%	1.6%
United States	2.1%	1.7%

Source: DWS Investments UK Limited. Data as of 12/31/19. Across DM countries, GDP and Inflation forecasts from YE 2019–2029 are relatively consistent.

[15] http://www.investmenttools.com/thestate/cpi__consumer_price_index.htm
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Currency estimates

Translating local currency return forecasts

Long-term currency forecasting can be challenging. As such, we apply a blended approach of well-documented theories and methodologies. To build our 10-year forecasted returns and volatility we start by forming the corresponding forecasts in a local-currency context for specific asset classes. From there, we overlay our relative currency forecasts.

Each forecasted return is first expressed in its currency of denomination, that is, in local currency.

We develop currency assumptions for two main purposes:

- When building composite assets: to assemble risk and return forecasts related to components denoted in multiple currencies (for example, the MSCI Europe Index).
- To provide risk and return forecasts in different base currencies.

Foreign exchange volatility can introduce a significant risk factor, especially for lower risk assets such as cash and fixed income. Over five years, Figure 32 shows the meaningful difference between foreign asset returns in local currency compared with in euros (EUR). In order to manage/mitigate taking on this currency risk it may make sense to consider currency hedged investments[16]. We use two complementary approaches: hedged and unhedged strategies. Each relies on well-established academic consensus.

Our hedged framework uses observable market data to estimate the long-term costs when hedging the financial risk of an asset denominated in a foreign currency versus the investor's base currency. We consider the difference in future yield curves between the base currency and the asset's currency of denomination to be a telling indicator of forex performance.

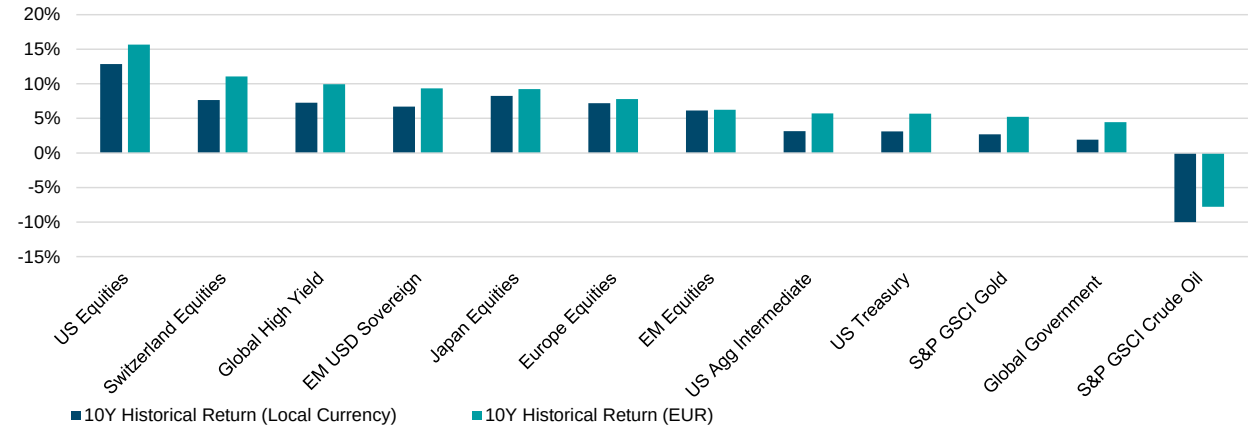
This is based on the theory known as covered interest rate parity that assumes the absence of arbitrage opportunities[17]. It is worth mentioning at this point, that this assumption has been consistently violated among G10 currencies since the financial crisis. Much has been written around the topic over the last few years, pointing to the limits to arbitrage (such as regulations, cost of borrowing and so on) as the driver of this imbalance[18]. Figure 33 shows the impact of forex hedging on the forecasted returns in euros and dollars.

Our unhedged framework aims to determine long-term equilibrium assumptions for currencies. To build these assumptions, we rely on multiple theories[19] and methodologies, each well documented in the literature:

- Relative purchasing-power parity: in brief this theory stipulates that a basket of goods should ultimately be worth the same price everywhere. The equilibrium exchange rate between two countries is therefore defined as a differential of inflation[20].
- International Fisher effect[21]: where risk free nominal interest rates are used as the basis for the equilibrium exchange rate. This theory is based on Fisher's assumption that real interest rates are not affected by changes in inflation.

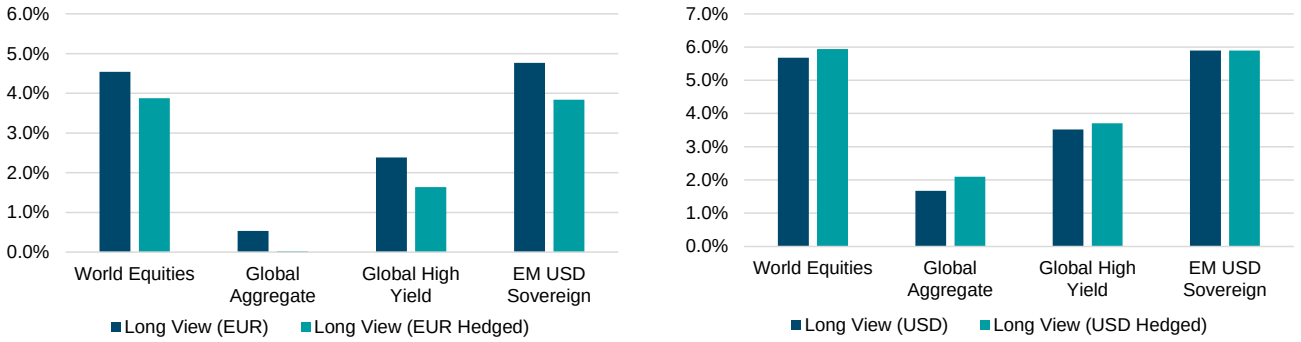
[16] See (Denoiseux and Debru 2015) for an in depth analysis of the impact of FX in the risk and returns of asset classes.
[17] See (Obstfeld and Rogoff 1996) and (Bekaert, Min et Yuhang 2007) for a good introduction on this approach and its long term significance.
[18] See (Du, Tepper and Verdelhan 2017).
[19] We remind the reader that each approach forms a long-term equilibrium view on currency pairs, and might significantly differ from short-term moves.
[20] See (Taylor and Taylor 2004).
[21] According to the International Fisher Effect, changes in differences in countries' relative interest rates can be used to predict changes in the currency pair. Changes in nominal interest rates correspond to changes in inflation, which help indicate potential appreciation or depreciation of the currency. Therefore, according to Fisher, differences in nominal interest rates can be used to imply the future spot rate.
Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 32: Implication of currency fluctuations on asset-class returns, annualised (10-year period ending 12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class

Figure 33: Illustration of the impact of currency hedging on our 10-year forecasted returns, annualised (YE 2019–2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Our framework is augmented by following the approach developed in Balassa (1964) and Choudhri et Khan (2004), which takes into account the role of productivity differentials. In practice we use the growth of output per capita as a proxy for productivity to further adjust our forex framework.

We note that the introduction of this productivity gap factor has a limited impact on the long term forecasts (5 or more years) for G10 currencies but does influence emerging currencies.

Table 5: Current (YE 2019) and forecasted (YE 2029) currency levels vs. USD

Currency	Current	YE 2029 Forecast
EUR	0.89	0.79
Japanese yen (JPY)	108.6	95.9
British pound (GBP)	0.75	0.70
Swiss franc (CHF)	0.97	0.87

Source: DWS Investments UK Limited. Data as of 12/31/19.

Table 6: Current (YE 2019) and forecasted (YE 2029) currency levels vs. EUR

Currency	Current	YE 2029 Forecast
USD	1.12	1.25
JPY	121.8	120.7
GBP	0.85	0.88
CHF	1.09	1.09

Source: DWS Investments UK Limited. Data as of 12/31/19.

Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results.

Traditional asset classes

"Success is more a function of consistent common sense than it is of genius."

An Wang[22]

A comprehensive approach

Forecasting returns can be approached from a number of different angles. Some investors apply different methodologies depending on asset class, others employ a top-down investment strategy or focus exclusively on macro risk drivers[23].

Thanks to improved market sophistication, datasets and technology, investors increasingly understand the importance of considering true risk drivers. These include so-called factors, for example, momentum, carry, or value strategies. That said, especially in the context of a strategic asset allocation framework, most investors still contemplate portfolio construction through an asset-class lens.

That is why our Long View assumptions focus on asset classes too, both for traditional and alternative investments. However, unlike many peers, we also use a consistent framework irrespective of asset class. This not only helps us apply rigor to our process, but we hope it aids our clients in better understanding the constituent sources of returns on a comparative basis.

The Long View forecast is constructed of three pillars, which can be expressed as follows:

Asset class total return = income + growth + valuation

The decomposition of each pillar, for the main traditional asset classes reviewed below, is shown in Figure 34.

We recognise that when dealing with each specific asset class, there is some discretion in the association of each component with a particular pillar. But overall, this framework provides a high level of consistency and transparency across our forecasts.

Mostly, our reference case is a long-term investment in a particular asset class, more precisely in what we will refer to as a representative index. But as we describe below, there may be opportunities to adapt certain sub-asset classes. This modularity is another useful feature of our framework.

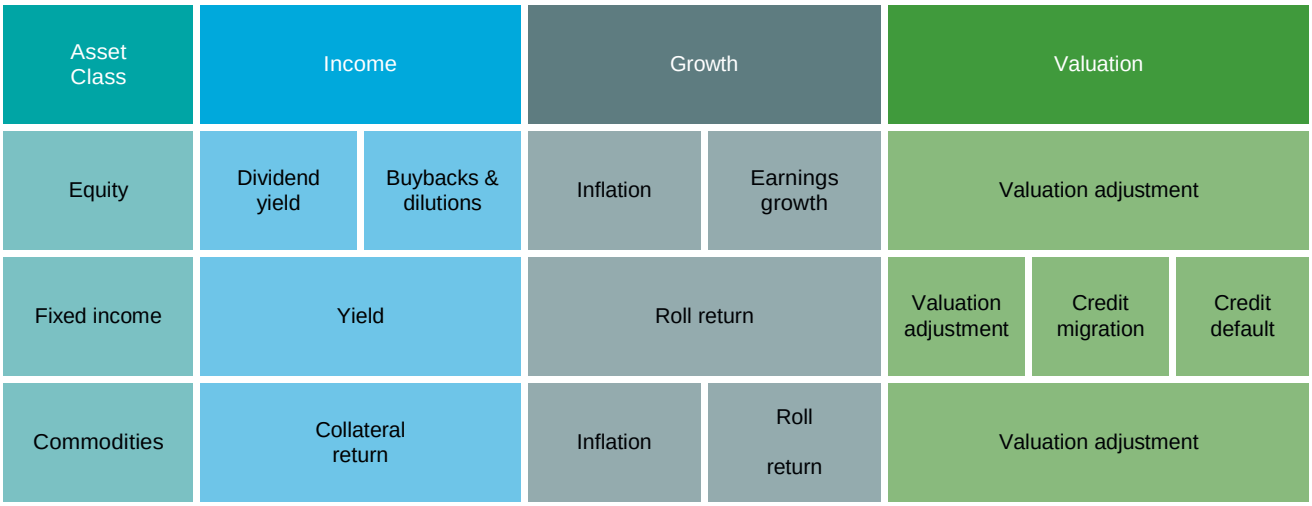
For example, consider a portfolio tracking a fixed-income index, which aims to maintain a certain level of duration risk. Even theoretically, to pursue constant duration, over time, an investor may wish to sell its shortest dated bonds and buy longer-dated securities. Our forecast methodology addresses this rebalancing effect; however, this approach may not address investment objectives of certain long- term investors, such as pension funds or insurance companies, who may rely on a buy and hold approach, and hence do not follow a rebalancing process. As such, the profits and losses generated by portfolio rebalancing might not be relevant.

Our building block approach is designed to remove the rebalancing component from our income pillar, whilst pursuing consistency within the overall framework's assumptions.

For equities on the other hand, an index is usually a straightforward diversified basket of stocks. The main changes are related to corporate actions and from time to time new security additions or deletions. These index-related operations are fairly consensual.

[22] https://libquotes.com/an-wang/quote/lbn2d3q
[23] See (Ilmanen 2012) for a deep dive on this topic.

Figure 34: Long View for traditional asset classes: Pillar decomposition



Source: DWS Investments UK Limited. As of 12/31/19.

Forecasts and data: a balancing act

Our framework relies on a broad and diverse pool of data. This has been selected on the basis of various criteria including: precision, source, frequency of observation, and the availability of estimates vs. realised numbers.

Datasets are divided into four main categories:

- Market-based, historical: index values, interest rates, breakeven inflation, dividend yield, duration;
- Market-based, implied: implied volatility, implied earnings yield;
- Economic: we use realised published/interim economic data (such as realised GDP and inflation) as well as forward looking estimates from different providers;
- Fundamental: corporate earnings, aggregated at the index level, in the form of past realised earnings, or forward-looking, analyst-based forecasts.

When building our framework, we try to reconcile two specific (and sometimes conflicting) objectives:

- Maximise the value we extract from each dataset; more technically, we aim to maximise the incremental predictive value that each data point might bring to the forecast.
- Prevent the risk of over-fitting data or relying too much on a particular data point to construct the forecast.

We explain our methodology in more detail by asset class in the following section.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Equities

Forecasted returns for the next decade

This section is divided into two parts. The first presents the main Long View forecasts and insights from our equity model while the second presents the methodology.

We forecast world equities (as proxied by the MSCI World Index) to deliver a 5.3 percent annualised total return, which is far from what investors have grown used to over the past ten years, as can be seen in Figure 35.

In fact, we forecast roughly a similar total return for equities for most developed countries, with a similar gap between historical and forecasted returns. The exception is emerging markets, where historical returns are lower, while we forecast even slightly higher annualised returns over the 10-year forecast horizon.

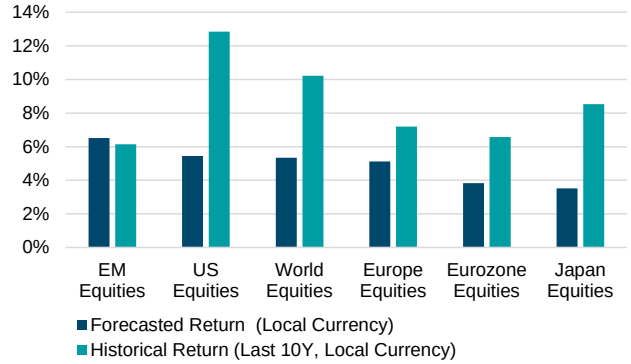
Meanwhile, on average, we estimate a meaningful premium for small-cap stocks, which is also broadly similar across regions (Figure 36).

Fundamentals may support relatively attractive equity returns

It may be useful to remind ourselves here that equities still look reasonably supported from a long term historical trend perspective.

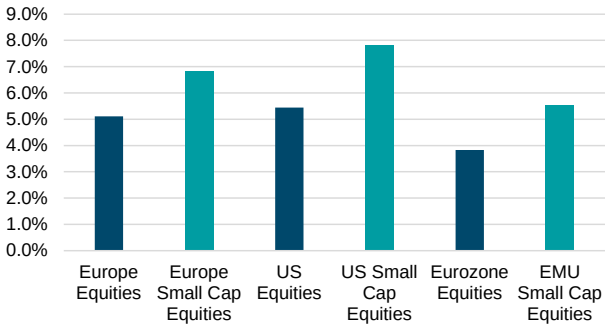
For example, in Figure 37, we observe earnings-per-share (EPS) growth across regions over the past three decades. We note that 2008 was tough everywhere, with equities suffering from a sharp drop in their EPS. However, EPS growth rebounded toward the longer-term trend afterwards, particularly in Japan and the United States.

Figure 35: 10-year forecasted returns across regions, annualised (YE 2019–2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative Index corresponding to each asset class.

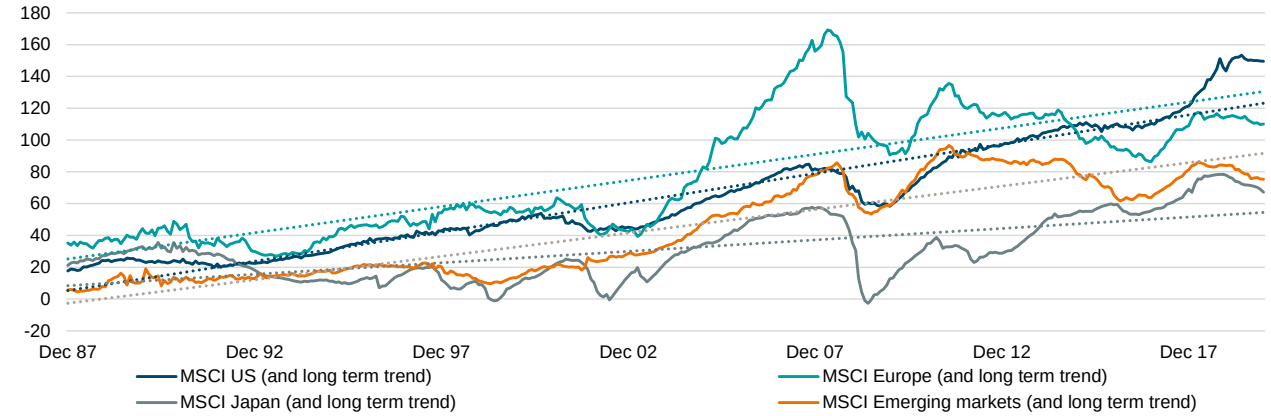
Figure 36: 10-year forecasted returns for large-cap and small-cap equities, annualised (YE 2019-2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative Index corresponding to each asset class.

Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 37: Equities have delivered solid long-term EPS growth despite a big dip in 2008

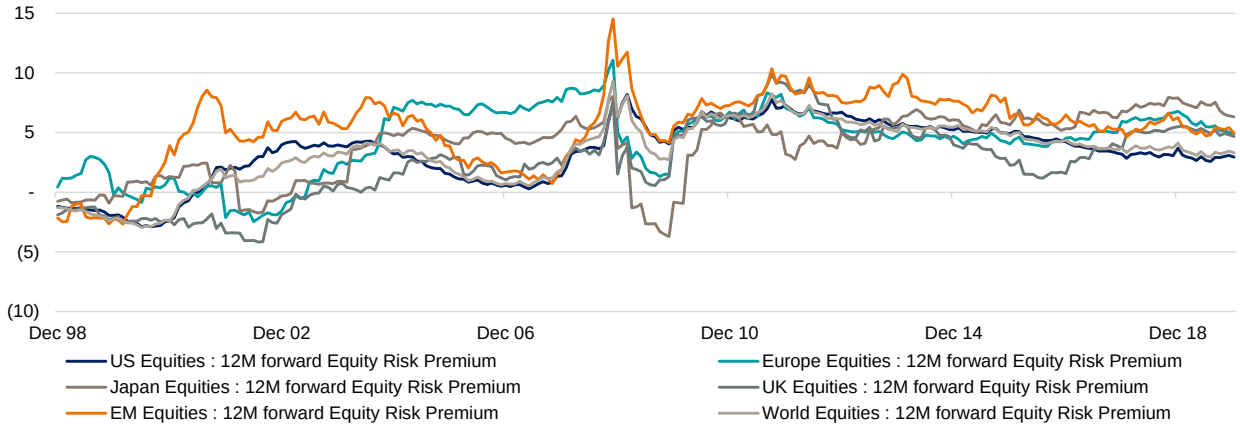


Source: Refinitiv Datastream, DWS Investments UK Limited, data from 12/31/87 to 12/31/19.

The translation of EPS growth into investment forecasts can be performed via different approaches. In Figure 38, we calculate the equity risk premium across regions, which we define here as the spread between the earnings yield (the inverse of the trailing price-to-earnings ratio) and the corresponding risk-free rate. A high ERP would indicate that, with respect to current market valuations, the earnings delivered by companies provide a relatively high expected reward to equity investors vs. the prevailing risk-free rate.

Over the last year, we can see that the ERP has declined, as has the risk-free rate. As a result, expected nominal returns have also declined. While useful as an investment signal, the ERP defined here is not precise enough to provide us with a meaningful contribution to total-return estimates, especially with a long-term investment objective in mind.

Figure 38: Equity risk premiums (as measured by the earning yields) look relatively elevated across regions



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19.

Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Constructing our equity Long View forecast

In line with other asset classes, we build our long-term forecast for equities on the basis of three fundamental pillars: income, growth, and valuation.

Each pillar relies on one or several fundamental components. These are set out in Figure 39, and we consider them below in turn.

A long-term perspective

In order to understand the relative importance of each pillar, let us begin with a long-term return decomposition of U.S. equities, for which there is the longest and most reliable data.

Using historic numbers compiled by Robert Shiller[24], we decomposed the U.S. equity performance into our three pillars: income (dividends[25]), growth (inflation and real earnings growth) and valuation.

Figure 39: Pillar decomposition: Equities

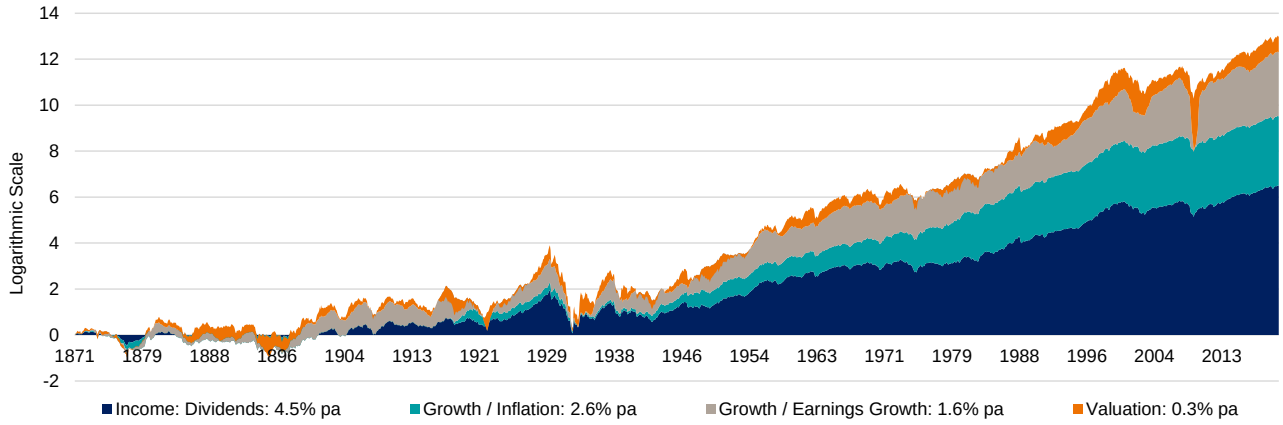
Source: DWS Investments UK Limited. Data as of 12/31/19

From Figure 40 we can draw a few conclusions:

– Dividends do not drive value, but play a major role in how value is transferred to investors in the form of returns – and their return contribution is more than twice that of real earnings. Across time, dividends have been relatively stable, which gives us comfort when estimating them.

- The impact of the valuation pillar is much smaller but comes with higher volatility. This makes forecasting more difficult.

Figure 40: Return decomposition of U.S. equities (1871–2019)



Source: Robert J. Shiller, DWS Investments UK Limited. Data as of 12/31/19.

[24] See (Shiller, Online Data Robert Shiller 2018)
[25] As we will show hereafter, buybacks and dilutions have a significant impact. In this return breakdown, we assume them to be included in the dividend component.
Past performance may not be indicative of future returns.

Equipped with these orders of magnitude, let us now analyse each of the three equity model pillars in more detail.

Income: dividends and buybacks

If we exclude the minimal value of holding cash on the balance sheet, there are two ways a company can pass on earnings to its shareholders: by distributing them via dividends and share buybacks or re-investing them into the business.

Distributions are covered in our income pillar whilst reinvestment is accounted for in the growth pillar.

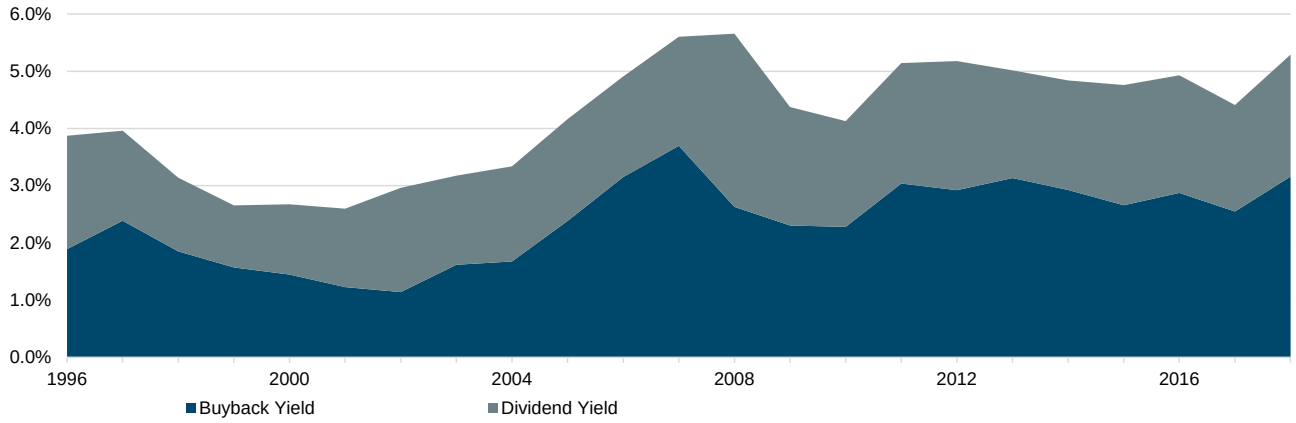
Mentioned above, dividends have long represented the lion's share of U.S. equity total returns, although there has been a decline in the pay-out ratio (dividends divided by earnings) over the past few decades, shown clearly in Figure 45. In order to estimate the dividend-yield component of our income pillar, we take the trailing dividend yield of a representative index, in accordance with the academic literature.

Buybacks are another way for companies to re-distribute earnings via the purchase of their own shares. Apart from potential tax impacts, the effect of a share buyback is similar to that of a dividend payment. As with dividends, they do not affect what a company is worth, but in terms of their contribution to total returns, their impact may be significant because when companies buy back shares, they reduce the amount of shares outstanding. Assuming earnings remain constant, EPS then increases.

Unlike dividends, however, estimating the buyback yield is a data-intensive operation as we need to analyse financial statements for every historical index member. Figure 41 shows the results of this operation and compares dividend yields and buyback yields. As can be seen, buybacks have represented, on average, more than half of distributions to shareholders since 1996.

We calculate and incorporate the buyback yield net of dilutions (see below) in our income pillar. However, creating a reliable forecast for net buyback yields is difficult given available data, so we use a long term historical average as our estimate.

Figure 41: Buybacks have represented a significant part of MSCI USA Index total yield (1996 through 2018)



Source Bloomberg Finance L.P., DWS Investments UK Limited, data from 12/31/1996 to 12/31/2018.

Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Growth: Earnings are a function of GDP

Even though distributions make up the majority of shareholder returns, ultimately, value is driven by earnings. That said, equity investors have the lowest priority claim on these earnings, being paid after all creditors, either in the form of distributions – captured by our income pillar – or via a higher share price. As the last claimants, investor pay-outs are akin to a call option on earnings, hence the added importance of estimating the earnings-growth component correctly.

Also remember that earnings are not the same as earnings per share. Returns to investors are hugely diluted by the issuance of shares, as we explain below. In the end, long term data show that while earnings can be volatile, they have provided an investor with an annual average growth of about 1.6 percent in real terms (over the time frame between 1871 and 2019 in Figure 42).

To forecast any potential earnings, we consider three main approaches:

- **Survey-based estimates:** These typically compile broker or buy side earnings forecasts. However, history is clear these estimates have often been overly optimistic.[26]
- **Long-term regressions of EPS trends:** Whilst robust when looking at long term historical trends, regression based approaches are limited when analysing countries or indices that do not have decades of earnings data. This approach also suffers when forward estimates are not aligned with past trends.[27]
- **EPS forecasts based on output growth:** The relationship between EPS growth and GDP growth seems to be quite strong and benefits from academic research. As noted earlier, the degree of this translation may vary across regions, which we reflect by having adjusted the real earnings growth by a factor of 0.5x for China, India, and Brazil.

Of these three approaches, we believe that forecasting long run earnings based on economic growth is the most reliable – and this forms the basis of our Long View equity forecasts.

The relationship is well illustrated in Figure 42, which represents a long term regression of GDP growth, GDP-per-capita growth, dividends-per-share growth, and earnings-per-share growth. As can be seen, not all economic growth (which averaged at 3.4 percent per annum) translates into earnings growth (which grew by less than half the rate).

The main reason for this gap is companies issuing new shares over time. In doing so, as companies expand their shares outstanding, assuming constant overall earnings, earnings per share are lower. Such dilution has had a significant impact, and we estimate it has accounted for 1.1 percent per annum over the past two decades for U.S. stocks. We forecast dilutions in the same way as we do buybacks – that is, we calculate the annual level of dilution for every company and aggregate the amount for each index.

Once dilution has been accounted for, we are comfortable using real GDP growth as a proxy for earnings growth, following the same rationale as developed by Grinold, Kroner and Siegel (2011). They conclude that in the long run, dividend and earnings growth of large cap equity indices and GDP growth of their related countries should converge.

The stability of two other relationships serve as a useful sanity check as we forecast potential earnings growth. First, the recent stability of the pay-out ratio, as seen in Figure 45, allows us to gain comfort with the relationship between growth and dividend-per-share growth. The pay-out ratio has stabilised at around 40 percent since the 1990s, following a sharp decrease in preceding decades.

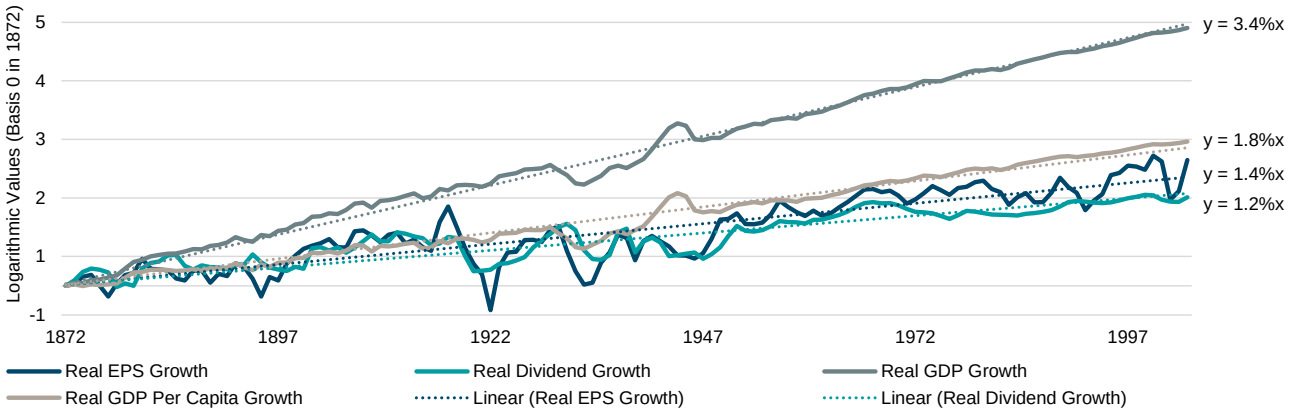
Second, we also note that corporate profits have represented a relatively constant share of GDP over the long run, as can be seen in Figure 46. If we can be more or less confident with our economic-growth projections, our Long View earnings estimates are not likely to distort our return forecasts too much.

[26] See (Goedhart, Raj and Saxena 2010)

[27] Backward looking approaches might overlook technological changes or recent changes in monetary policies which would usually be reflected in forward looking estimates like GDP or EPS growth.

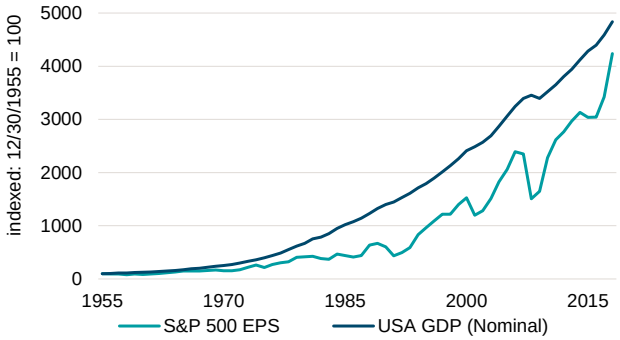
Back-tested performance is NOT an indicator of future actual results. The results reflect performance of a strategy not [historically] offered to investors and do NOT represent returns that any investor actually attained. Back-tested results are calculated by the retroactive application of a model constructed on the basis of historical data and based on assumptions integral to the model which may or may not be testable and are subject to losses. General assumptions include: Firm would have been able to purchase the securities recommended by the model and the markets were sufficiently liquid to permit all trading. Changes in these assumptions may have a material impact on the back-tested returns presented. Certain assumptions have been made for modelling purposes and are unlikely to be realized. No representations and warranties are made as to the reasonableness of the assumptions. This information is provided for illustrative purposes only. Back-tested performance is developed with the benefit of hindsight and has inherent limitations. Specifically, back-tested results do not reflect actual trading or the effect of material economic and market factors on the decision-making process. Since trades have not actually been executed, results may have under or over-compensatedfor the impact, if any, of certain market factors, such as lack of liquidity, and may not reflect the impact that certain economic or market factors may have had on the decision-making process. Further, back-testing allows the security selection methodology to be adjusted until past returns are maximized. Actual performance may differ significantly from back-tested performance. Past performance may not be indicative of future returns.

Figure 42: Real earnings and dividends for U.S. equities, real GDP and GDP per capita (1872–2004)



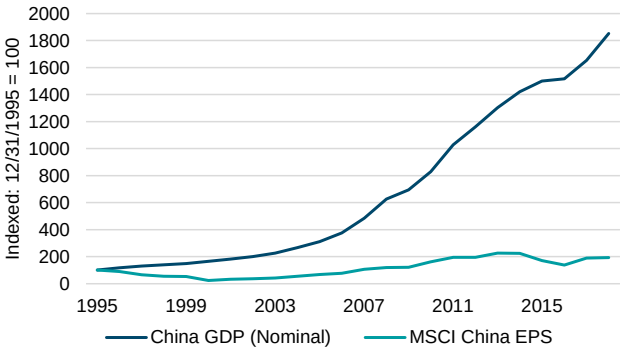
Source: Robert J. Shiller, Maddison Project Database, DWS Investments UK Limited. Data from 1872 to 2004.

Figure 43: USA GDP vs. EPS of S&P 500 Index



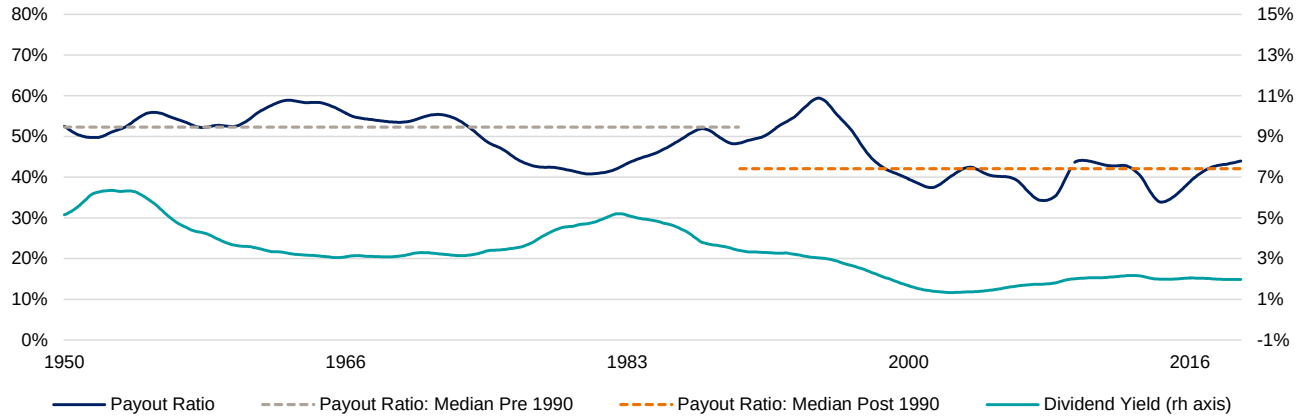
Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19.

Figure 44: China GDP vs. EPS of MSCI China Index



Source: Refinitiv Datastream, DWS Investments UK Limited. Data as of 12/31/19.

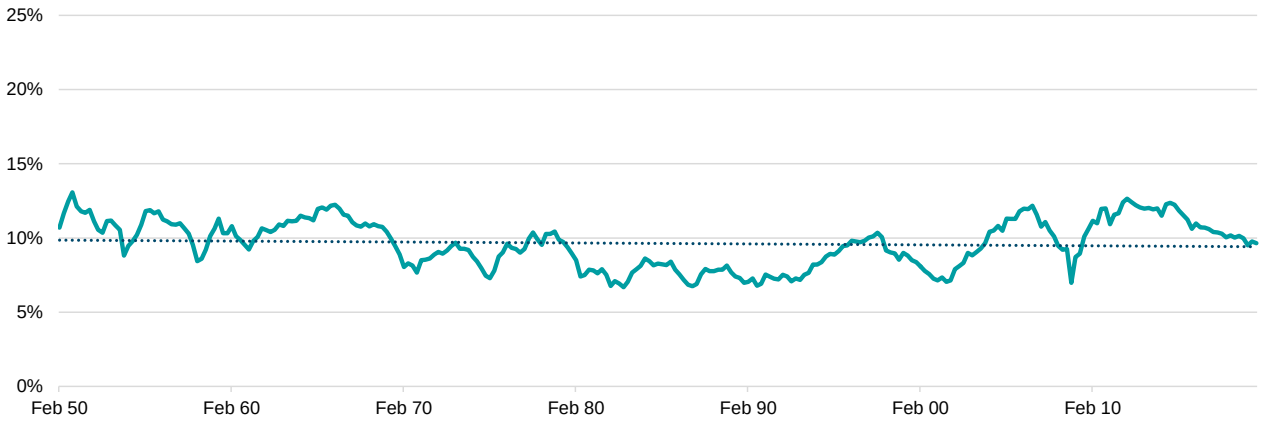
Figure 45: Pay-out ratio of U.S. equities (1950–2019)



Pay-out ratio based on the S&P 500 Index. Source: Robert J Shiller, DWS Investments UK Limited, Data as of 9/30/2019.

Past performance may not be indicative of future returns.

Figure 46: U.S. corporate profits as percentage of GDP (2/50–8/19)



Source: Refinitiv Datastream, DWS Investments UK Limited. Data from 1950 to August 2019.

Past performance may not be indicative of future returns.

Valuation

We now turn to the last of our three equity pillars, valuation. As seen in Figure 40, prices moving out of line with valuation fundamentals is one of the most volatile components in our equity forecast. Estimating this pillar is therefore challenging.

Hence we revert again to the literature. The likes of Robert Shiller and Andrew Smithers[28] remind us that long run equity valuations have historically exhibited mean-reverting behaviour. While metrics such as the cyclically adjusted price-to-earnings ratio have little predictive power in the short-term, their longer-term mean reverting behaviour makes them ideal for our Long View methodology.

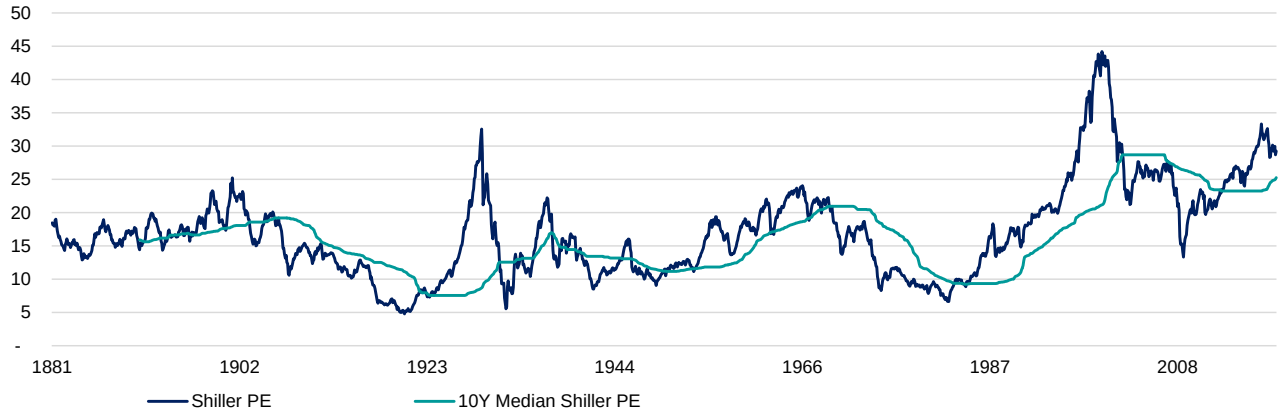
Properly capturing mean reversion in forecasting is not simple. It requires first the selection of a suitable long-term valuation metric. Second, we must define the relevant time horizon over which to set an average level. And, finally it must be agreed how long to wait for any mean reversion to occur.

We have chosen to use the most commonly used indicator, the Shiller price-to-earnings (PE) ratio, based on real cyclically adjusted earnings. With regards to the duration of the expected mean reversion, again we follow the literature (R. Arnott 2014) and rely on a 20-year re-pricing period.

While the behaviour of the Shiller PE is relatively straightforward, due to this very long assumed re-pricing period, we are aware that the mean-reversion may happen faster or slower than our implicit assumption of a smooth process. In consequence, because of this uncertainty over timing, the contribution of our valuation pillar to the overall forecasted return could potentially be wrong for years. However, even though this pillar may be too late or early much of the time, Figure 48 (showing a strong relationship between the Shiller PE and subsequent ten year returns) indicates that the case for using this ratio is compelling.

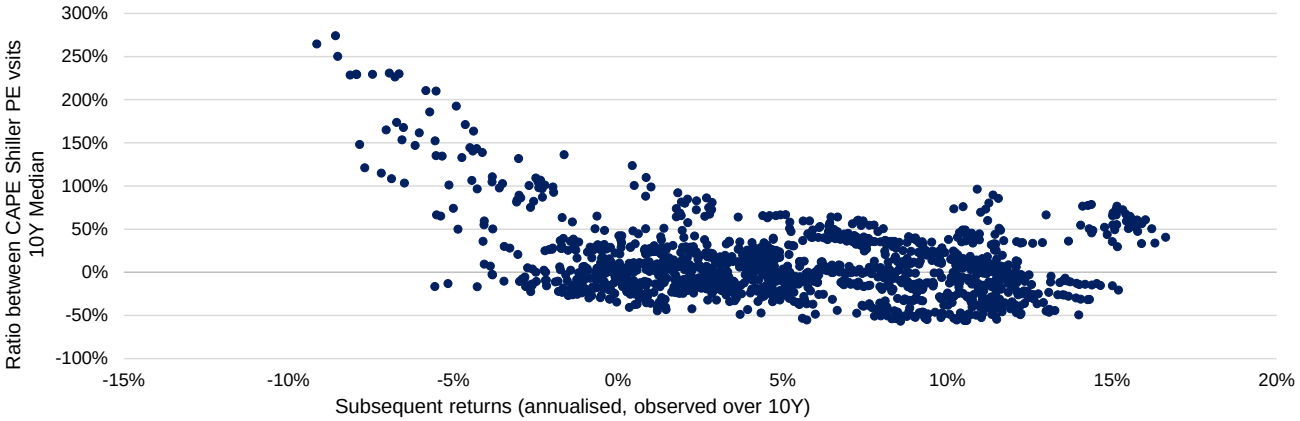
[28] Andrew Smithers is an economist and investor, having published extensively on equity market valuations.
Past performance may not be indicative of future returns.

Figure 47: The Shiller PE of U.S. equities has demonstrated mean-reverting behaviour (1881–2019)



Source: Robert J. Shiller, DWS Investments UK Limited. Data as 12/31/19.

Figure 48: The Shiller PE of U.S equities and subsequent 10 year returns (1881–2019)



Source: Robert J. Shiller, DWS Investments UK Limited. Data as of 12/31/19.

Past performance may not be indicative of future returns.

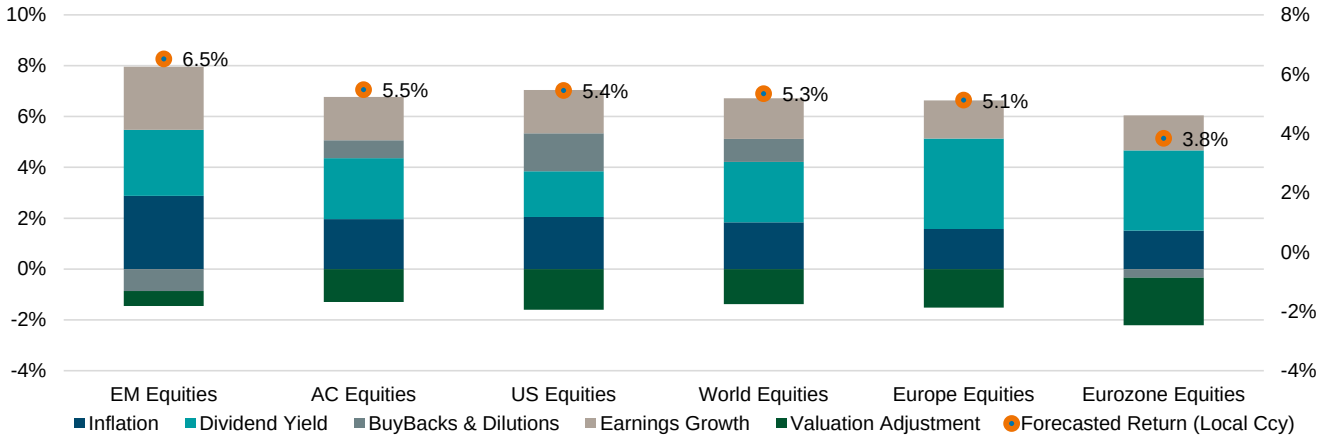
Applying our Long View equity forecast method globally

We apply our equity forecasted returns framework to different countries and regions as follows. For each country we determine a Long View estimate for a benchmark large-capitalisation equity index. Then for each region, we combine the relevant country return forecasts. These have been converted into a single base currency where appropriate.

Meanwhile, small cap equities forecasted returns are derived from respective large cap returns and by applying a small-cap ERP. The small-cap ERP is calculated as the median of the long-term excess returns of each small-cap index vs. its corresponding large-cap index.

Figure 49 summarises the pillar decomposition of the forecasted annual returns for the main countries and regions we cover.

Figure 49: Pillar decomposition of our Long View (10-year) return forecasts for equities, annualised (local currency, for YE 2019-2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

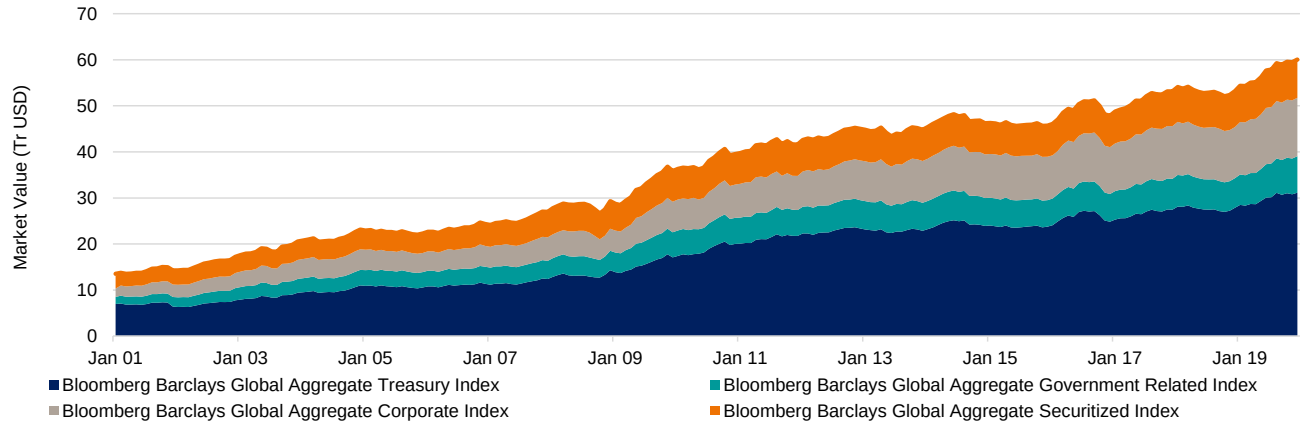
Fixed income

As previously for equities, the first section presents the main forecast results and insights from our fixed income methodology, while the second outlines our methodology in detail.

Forecasted returns for the next decade

To put our fixed income Long View in context, it is worth remembering that over the past two decades, global debt markets have grown rapidly in size. The more liquid segments alone have quadrupled in value, as can be seen in Figure 50.

Figure 50: The fixed income markets have seen nearly 20 years of continuous expansion (12/31/00–12/31/19)



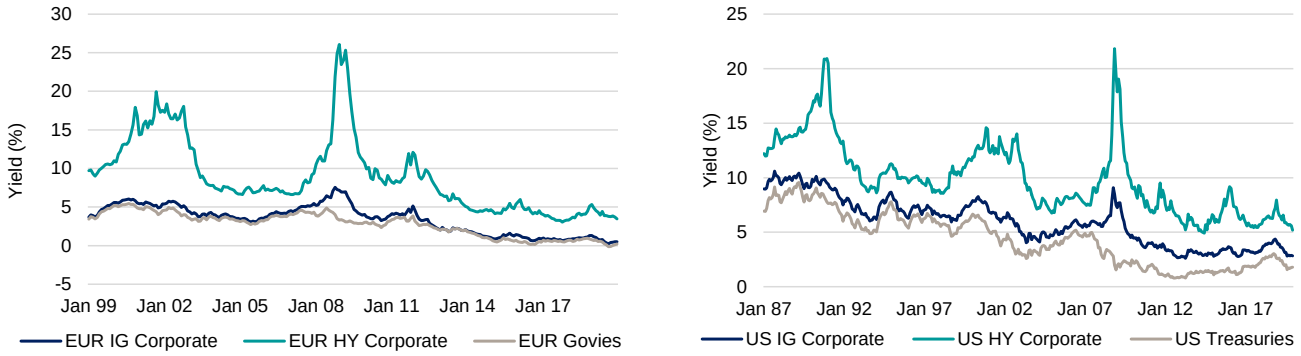
Source: Bloomberg Finance L.P., DWS Investments UK Limited, data as of 12/31/19.

Past performance may not be indicative of future returns.

In line with other asset classes, yield for fixed-income securities have been declining for most of the past few decades, owing to the fall in interest rates in developed countries (Figure 51).

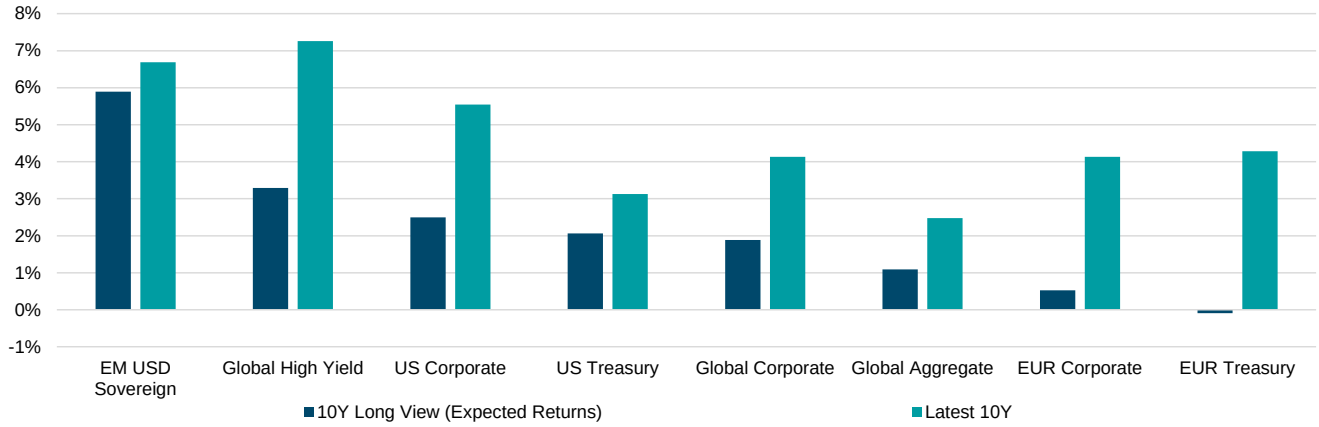
Over the long term (10-year period YE 12/2019- YE 12/2029), we forecast euro government bonds to deliver 0.1 percent per annum and corporates 0.5 percent. This is of course disappointing compared with recent history (Figure 52). However, looking at different market segments, it is possible to find higher yielding assets.

Figure 51: Fixed income yields have been trending down for the last 20 years (12/31/98–12/31/19 and 12/31/86–12/31/19 respectively)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class (forecasted return for multi-currency indices is calculated as the average of each currency constituent).

Figure 52: Fixed income forecasted returns vs. realised returns over 10 years, annualised (local currency)



Forecasted returns for multi-currency indices are calculated as the average of each currency constituent. Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class (forecasted return for multi-currency indices is calculated as the average of each currency constituent).

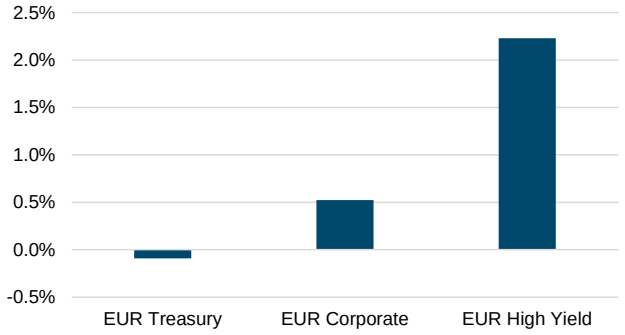
Past performance may not be indicative of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

Figure 53 shows the current credit premium in euro-denominated fixed income, while Figure 54 illustrates the term premium in euro government bonds. Investors might still expect a credit premium, although it is lower than it has been in the past. But due to the ECB's Quantitative Easing (QE) programs, the term premium is available only at the long end of the term structure.

Looking at forecasted returns, the bright spots are in higher-risk fixed income segments: high-yield and emerging-markets debt may still generate between 3 and 6 percent per annum over our 10-year forecast. These returns also seem low relative to history; however, they may be attractive vs. low risk assets such as euro government bonds on a risk-adjusted basis (Figure 54).

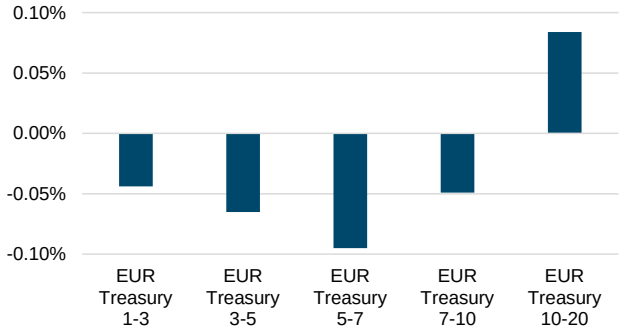
Note that the forecasted Sharpe ratio for emerging market bonds for the next ten years is almost identical to the ratio for emerging-market equities, as can be seen in Figure 55.

Figure 53: Credit premium observed on euro fixed income



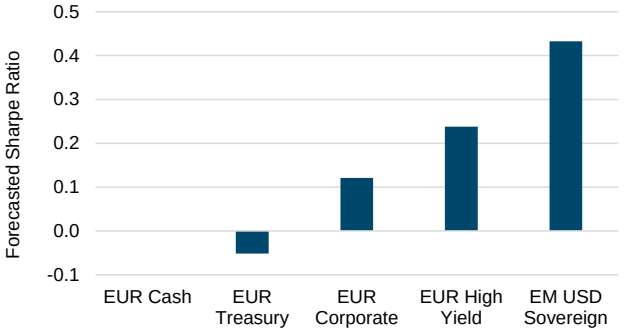
Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 54: Term premium observed on euro fixed income



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 55: Forecasted Sharpe ratio (YE 2019-2029) for fixed-income assets in euros



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Constructing our fixed-income Long View

Various types of fixed income instruments may feature different levels of return, and this drives our methodology. Whereas the equity method presented earlier makes use of both financial and economic data, our approach to fixed-income assets focuses on calculating and discounting potential cash flows. In particular we mimic the development over time for the forecasted cash flows of a dynamically rebalanced portfolio of debt securities.

Our starting point is the average current yield of the portfolio. Comparing the historical yield of a government bond index and its subsequent total return gives us an interesting perspective, as shown in Figure 56[29]. The yield appears to be a credible first approximation for forecasted fixed-income total returns.

However, we will show below that the reality is more complicated. Other components demonstrate a significant role in forecasting fixed-income returns. This is already apparent when looking at corporate bonds (Figure 56) which can be riskier than government bonds (Figure 57). On this graph, yield and future performance vary more over time, and, on some occasions, the difference has been material.

A few necessary assumptions

As discussed previously, our fixed-income approach is designed to forecast an investment in a respective fixed-income index and not in a single bond. Therefore, an important assumption in our methodology is the expectation of some stability of the main characteristics of the index, such as duration or ratings split. Figure 58 is reassuring in this respect as it shows that, whilst duration does evolve over time, the duration of the U.S. Treasury Index stays close to the historical average.

Figure 56: Historical yield to maturity and subsequent five year total-return performance of 5-Year U.S. Treasury bonds, annualised (1/31/73-12/31/19)

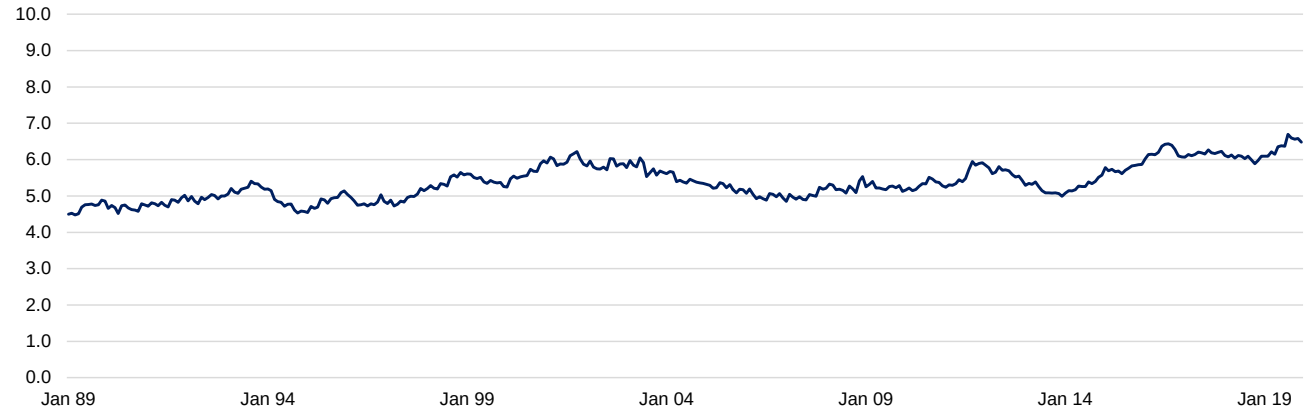
Source: Bloomberg Finance L.P., DWS Investments UK Limited, data from 1/31/73 to 12/31/19. See appendix for the representative index corresponding to each asset class.

[29] See (R. Arnott 2015) for further reference.
Past performance may not be indicative of future returns.

Figure 57: Historical yield to worst and subsequent five year return performance of 5-year U.S. corporate bonds, annualised (1/31/73-12/31/19)

Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 1/31/73 to 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 58: Duration of the Barclays U.S. Treasury Index (1/31/89–12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 1/31/89 to 12/31/19.

Past performance may not be indicative of future returns.

Our three-pillar approach to fixed income

As with other asset classes in this publication[30], we split the forecasting of fixed income returns into three fundamental pillars: income, growth and valuation. Each is then decomposed into one or several components, as shown in Figure 59.

Figure 59: Pillar decomposition: Fixed income

Source: DWS Investments UK Limited. As of 12/31/19

Fixed-income investors receive coupons for each bond in the index, which represents the income pillar of the return. The second pillar is roll return, which represents the mark-to-market changes due to time passing.

Finally, our valuation pillar is made of three components: the valuation adjustment, accounting for the mark-to-market of the bonds due to expected changes in the yield curve, and credit migration and credit default[33], with the latter two representing the impacts on the expected return due to changes in bond ratings and in some case defaults. These events impact the ratings mix of a bond index, which usually impacts its valuation. We now look at each of these pillars in more detail.

Forecasting the average yield

The yield component represents the income pillar of the return. Historically, this has been the largest contributor to fixed-income total returns. In practice, it accounts for the sum of the coupons an investors expects to receive over the investment period.

Bonds provide an investor with a reasonably high likelihood[31] of receiving the coupons and principal at maturity. Considering a broad index, potential cash flows are summarised by an average yield we refer to as the initial average yield, as observed at the time of purchase.

This holds until the first bond expiry in the index. See Figure 60 for a breakdown of a bond's expected change in value over time.

Over a ten year period, some bonds will expire and or may be replaced with others. Each new bond will bring a different yield, more precisely, the yield at the bond's investment date. It is important to keep in mind, as mentioned above, that we are modelling fixed income indices (that is, representing dynamic portfolios of bonds) and not static portfolios of securities.

Over the time horizon of our forecast period of ten years, an investor will be exposed to a changing portfolio – both in relation to the securities mix and time to maturity of each security. From a yield perspective, an investor will receive a combination of the initial yield and an expected yield, which represents an estimate of the index yield at the end of the ten-year forecast period.

For example, a U.S. Treasury Index is composed of a full range of bonds, from short (under 3 years) to long maturities (over 20 years). Looking at Figure 61, more than 80 percent of the bonds in this index will have expired before the end of our observation window. During this time, they will be replaced by new bonds at a presently unknown yield.

Whereas the initial yield of a bond at the time of its issuance is straightforward and observable, estimating its potential yield is more challenging and requires several assumptions. To forecast the expected yield, we rely on the traditional decomposition of any bond yield as the sum of two parts:

- The corresponding government yield – that is, the yield of a government bond of the relevant country with a similar duration
- The corporate spread[32] related to the credit quality[33] of the corporate bonds compared to risk-free securities.

The starting government yield is the yield currently observed on the relevant Treasury curve at the duration point that best matches the index considered. The forecasted government yield is derived from this starting yield by incorporating our views of the future government yield curve. The overall forecasted yield is an average of these two yields.

[30] See page 30 for our overall framework.
[31] Certainty, in the absence of default.
[32] For government bonds, we assume this credit spread to be equal to 0.
[33] Credit quality represents the lower rating of either Moody's Investors Services, Inc. or Standard & Poor's Corporation and is their opinions as to the quality of the securities they rate. Credit quality does not remove market risk and is subject to change.
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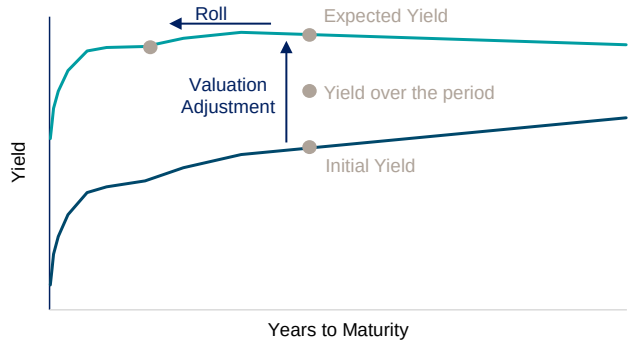
Similarly, for corporate spreads, the current spread (often referred to as the option-adjusted spread or OAS) is easily observable for a given index. Complexity resides in estimating the long-term forecast for the OAS.

Figure 62 highlights the variability of the OAS's long-term behaviour, across different credit qualities.

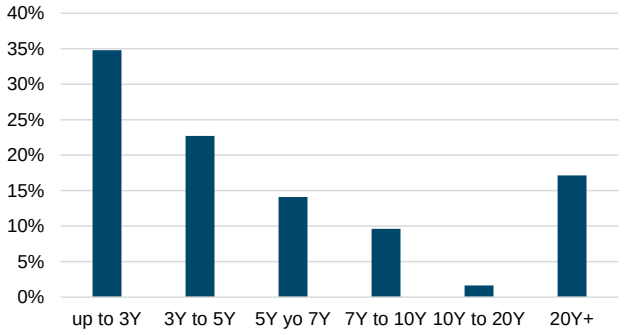
As acknowledged widely in the literature[34], the spread's behaviour tends to be mean-reverting and we rely on this property to develop a reasonable long-term equilibrium estimate.

Figure 60: Components of bond returns



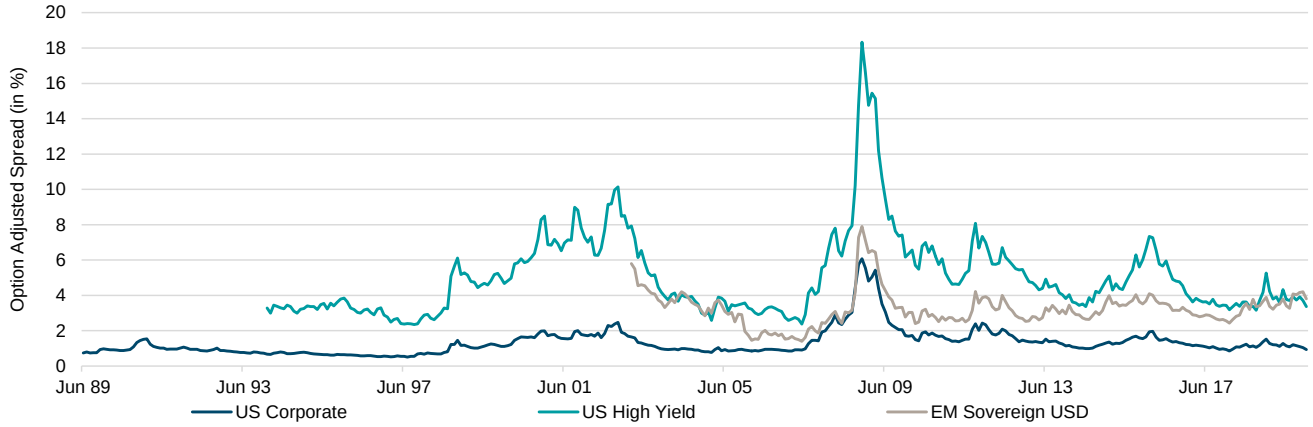
Breakdown of a bond's expected change in value.
Source: DWS Investments UK Limited. For illustration purposes only.

Figure 61: Proportion of the U.S. Treasury index by maturity



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 1/31/19.

Figure 62: Historical values for different options-adjusted spreads (5/31/89–12/31/19)



Source: Bloomberg Finance L.P. Data of 12/31/19. See appendix for the representative index corresponding to each asset class.

[34] See (R. Arnott 2015) and (Ilmanen 2012)
Past performance may not be indicative of future returns.

Roll return

Buying a bond with a fixed maturity, investors face the economic impact of its reducing time to maturity. This is commonly referred to as the roll return, and it represents the mark-to-market impact of the bond moving along the yield curve (Figure 63).

Valuation adjustment: reflecting the impact on potential changes in interest rates

The valuation pillar reflects the mark-to-market impact of a change in yields over time, the result of changes in interest rates and corporate spreads. Both changes affect a bond's valuation proportional to the duration of the index, as can be derived from a pure cash flow analysis. Utilising the forward curve and the expected long-term change in OAS, we directly calculate the hypothetical mark-to-market impact.

Credit migration

Credit migration refers to a change in the bond rating, which is usually reflected in valuations.[35] This can have a dramatic impact, in particular for investors in high-yield bonds.

Over a long period of time, company's outlook can change. Hence, the ratings of bonds issued can also change, and, in turn, the valuation of such bonds can be affected by market perception, taking into account the probability of default. This is what we aim to capture with our credit-migration component of the fixed-income forecasts.

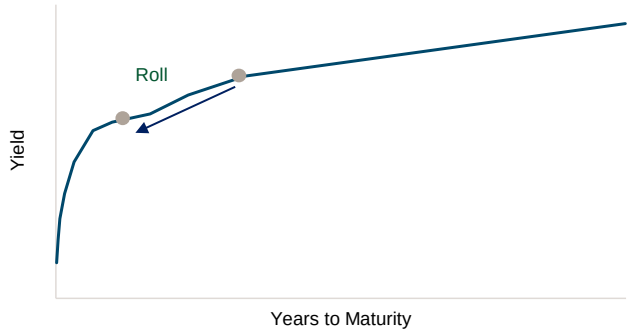
For a particular index, we can examine its composition by credit quality or rating. See Figure 64 for the credit rating mix of the Bloomberg Barclays U.S. Aggregate Corporate Index. This so-called credit mix is shifting over time, following any upgrades and downgrades by rating agencies. Changes in rating for a given bond impacts its spread. As illustrated in Figure 65, all else equal, the worse the rating, the higher the corporate spread.

At the index level, this means the corporate spread of a benchmark index will move over time because of the change in the ratings split. Moves in the spread will translate into mark-to-market changes in the index as a result of this credit migration.

The impact of credit migration impacts tend to be negative in most cases, since, in aggregate, bonds are more likely to be downgraded than upgraded. At the extreme, for example, AAA bonds cannot be upgraded. This is different true for high-yield bonds, where the likelihood of an upgrade is greater and the possibility of downgrades is somewhat floored, as bonds would have to default (see below).

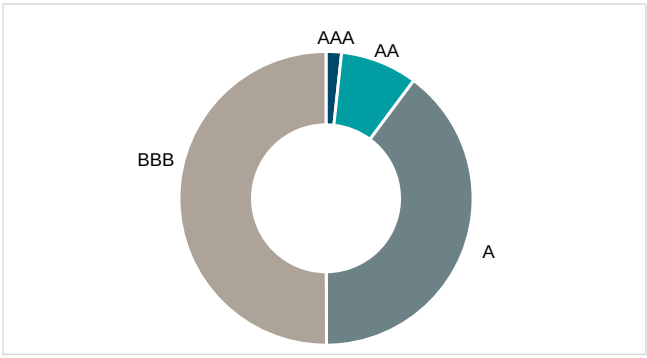
It is interesting to note here that sovereign bonds and corporate bonds have different behaviours when it comes to downgrades or upgrades. To be more accurate, ratings agencies do not treat both type of bonds in the same way. This translates into transition matrices and recovery rates varying significantly between corporate and government bonds.

Figure 63: The roll yield refers to the impact on yield and price during the bond's retention



Source: DWS Investments UK Limited. For illustrative purposes only.

Figure 64: Proportion of U.S. corporate bonds[1] outstanding by credit rating



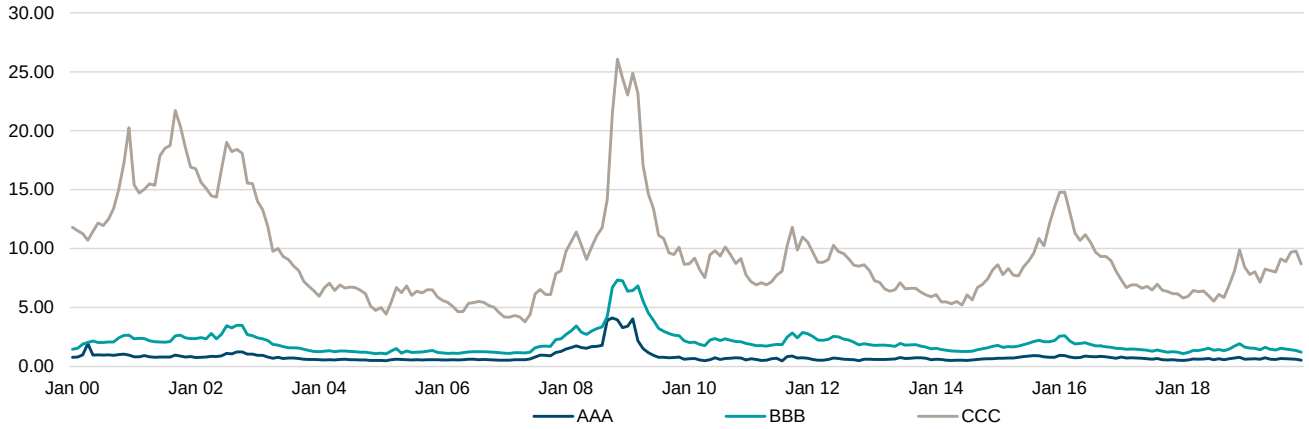
Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19.
[1] Bloomberg Barclays U.S. Aggregate Corporate Index.

[35] Credit quality represents the lower rating of either Moody's Investors Services, Inc. or Standard & Poor's Corporation and is their opinions as to the quality of the securities they rate. Credit quality does not remove market risk and is subject to change.

Credit default

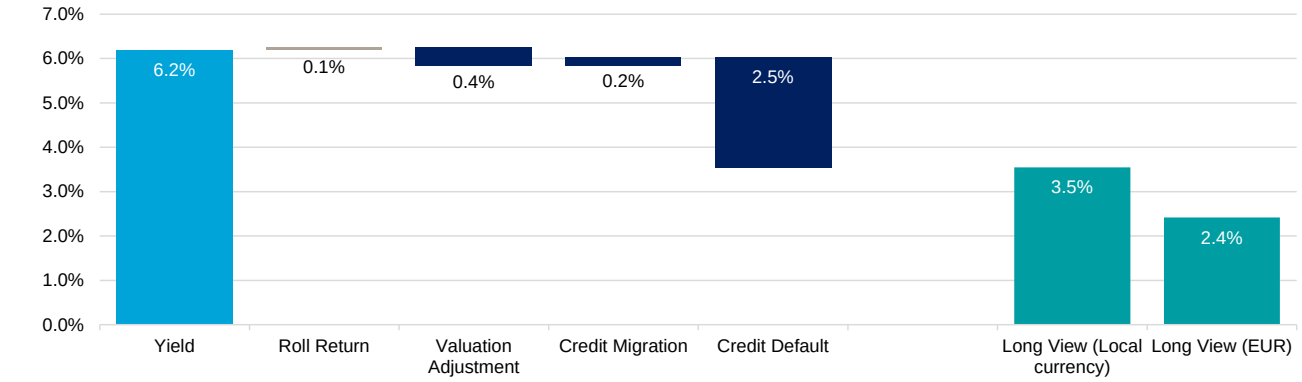
Here we cover the most extreme case of credit migration, that is the risk of a bond defaulting.[36] Should this happen, its impact would take the form of a partial or full loss of the bond principal, rather than a change in the yield. For any given bond, depending on its rating, it carries a probability of default and an average recovery amount in the case of default. By multiplying the two, bond by bond, we can calculate the impact at the index level. Figure 66 shows the importance of credit defaults for U.S. high-yield returns.

Figure 65: U.S. Corporate spread reversion to the mean (12/31/99–12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 12/31/99 to 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 66: Components of U.S. high yield bond 10-year forecast, annualised (in local currency, YE 2019-2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

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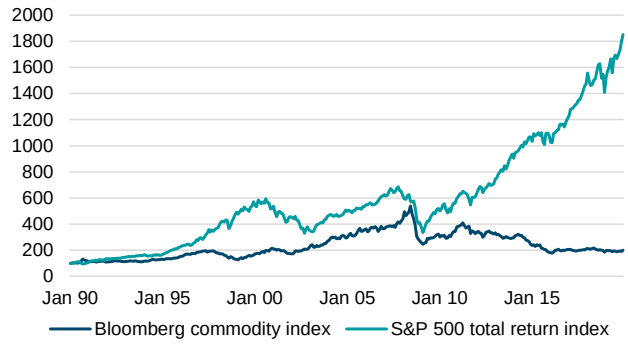
Commodities

Forecasted returns for the next decade

When contemplating an investment in commodities, we first must admit that recent performance (Figure 67) is hardly a strong endorsement. What is more, our total return forecasts are lacklustre (Figure 68). However, commodities can offer diversification benefits.

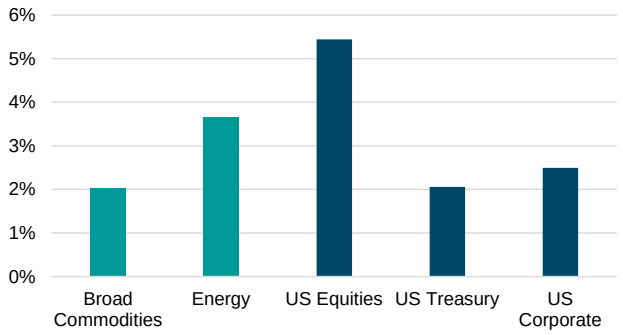
Commodities, particularly gold and oil, are often thought of as diversifiers in portfolios to asset classes such as equities or fixed income. Indeed, many investors in Commodities may consider their returns as more of a bonus. Figure 69 and Figure 70 demonstrate the low correlation and hence good diversification benefits which oil and gold may provide.

Figure 67: Commodity Index vs. S&P 500



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 12/31/89 to 12/31/19.

Figure 68: 10-year commodity forecasts vs. equities and bonds, annualised (YE 2019–2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

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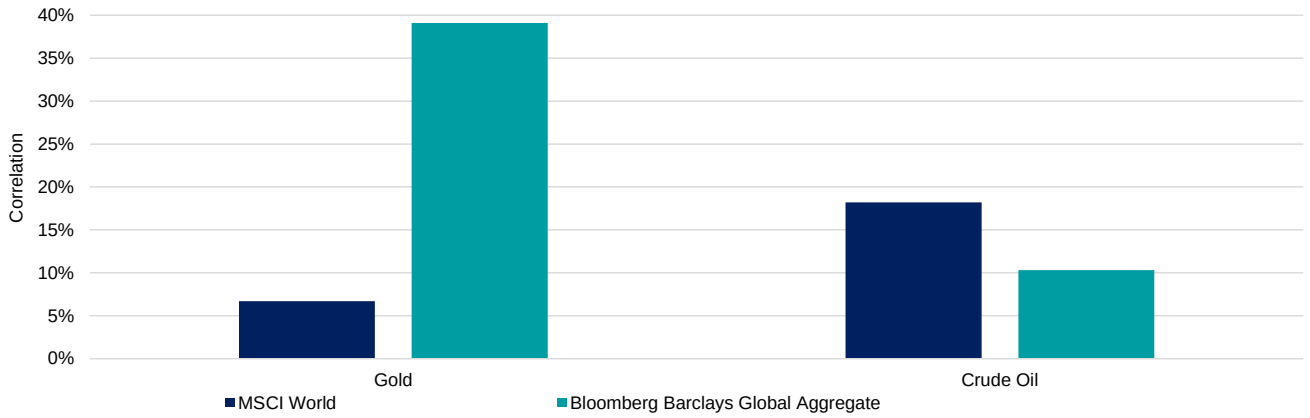
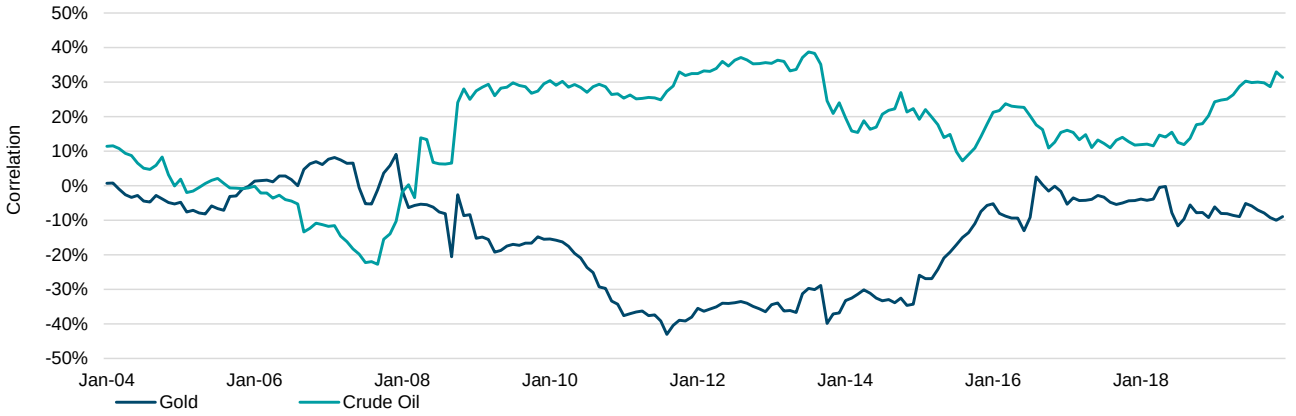
Figure 69: Correlation of global equities and bonds with gold and crude oil (12/31/89–12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 12/31/89 to 12/31/19. See appendix for the representative index corresponding to each asset class. Overlapping monthly returns are used for calculations. Calculations in dollars.

Figure 70: Five-year rolling correlation of Euro Stoxx 50 with gold and crude oil (12/31/03–12/31/19)



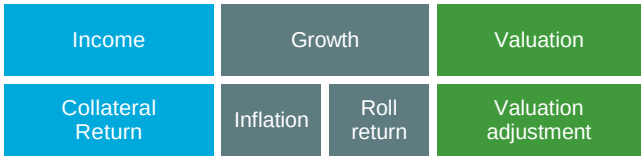
Source Bloomberg Finance L.P., DWS Investments UK Limited. In EUR. 12/31/03 to 12/31/19 (Overlapping monthly returns are used for calculations. Calculations in EUR). See appendix for the representative index corresponding to each asset class.

Past performance may not be indicative of future returns.

Constructing our commodities Long View

To present hypothetical returns for commodities, we apply the same broad framework as introduced earlier for equity and fixed income as shown in Figure 71.

Figure 71: Pillar decomposition: Commodities



Source: DWS Investments UK Limited. As of 12/31/19.

Financial exposure to commodities is achieved via futures contracts. As these are accessed by providing margin[37], futures come with embedded leverage. To properly compare the Long View of commodities with other asset classes, such as equity or fixed income, we analyse the contracts by providing full cash collateralisation[38] for the notional exposure[39] of the futures contracts.

Another important characteristic of a futures instrument is its term-structure and the multiplicity of contracts.

Inflationary pressure leads to an increase in commodity prices and also plays a role in long-run prices of a commodity, while the roll return depends on the shape of the futures term structure and how this curve behaves when rolling to the next contract. Valuation adjustments occur when commodity prices revert to their long-term average.

As each commodity is different, aspects such as roll return and valuation adjustment are estimated separately. Other building blocks such as the forecasted return on the collateral or inflation expectations are a function of the economy and are generally applicable to all types of commodities futures contracts.

Once long-run forecasts for single commodities are estimated, they are used to calculate forecasts for composite commodities indices.

Collateral return

Because fully collateralised futures are used for our long run forecasts, the collateral return is the performance of the fixed-income instrument (usually short-dated government bills) in dollars.

For the estimation to forecast fixed-income returns, please refer to the fixed-income section of this paper.

Roll return

Most investors take exposure to near-dated contracts in order to maintain a long-term exposure to a commodity. Close to a contract's expiration these investors sell the near-dated future and buy a further-dated future. Any profit or loss generated from this transaction is known as the roll return. While most commodities index-providers roll to the nearest available contract, for our estimation of the roll yield, we use the average value across all of the investable futures contracts for the given commodity at that point in time[40].

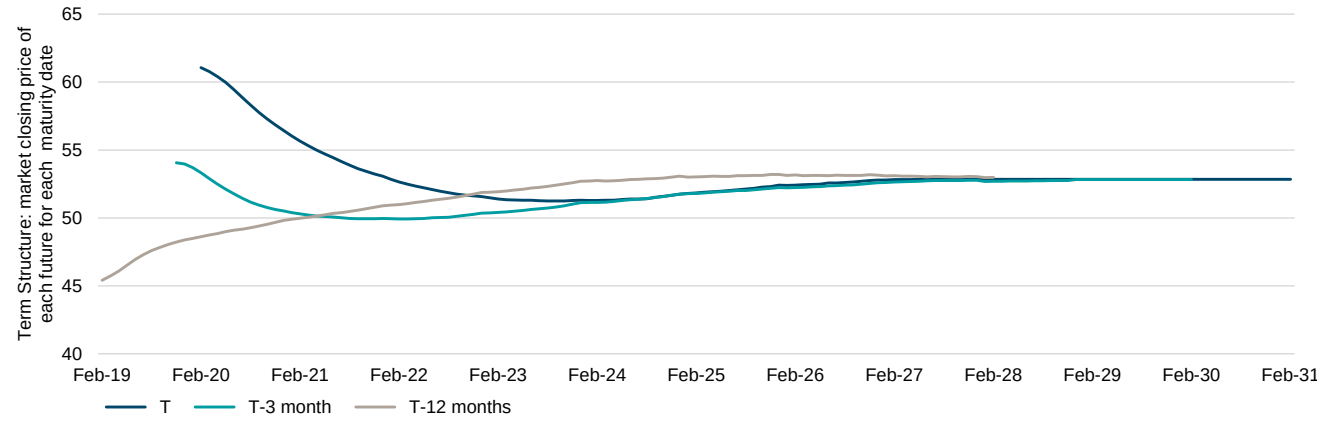
Gleaning information across term structure and over time

Depending upon the interplay of current financing costs, storage costs and convenience yield, a commodity curve is either in backwardation or contango[41]. Hence to estimate the average roll yield over our 10-year horizon we use the average of the roll yield over an expanding window. Figure 72 shows the variation in term-structure of West Texas Intermediate (WTI) crude oil[42] over time. In this example, the crude-oil term structure has changed from a contango structure a year ago to a backwardated curve about three months ago. As of 12/31/19, it is in a steep backwardated structure. Given such changes in term- structure and contracts, we consider it best to use an average view.

Once the roll return has been estimated for a particular point in time, our Long View roll return is forecasted by taking an exponentially weighted average over an expanding window.

[37] Funds deposited to initiate and maintain futures contract
[38] Futures collateralisation refers to, while entering into a futures position, simultaneously investing the notional value of the futures in Treasury Bills or other short-term fixed-income instrument
[39] Notional exposure of a futures contract represents the total amount of the security underlying the future at its spot price
[40] When commodities futures contracts expire, investors must re-invest the cash received at expiry in order to maintain exposure to the commodity. For re-investment or "roll", commodities indices typically re-invest into the shortest maturity contract available for the given commodity.
[41] Backwardation: Condition of the term structure in forward/futures market when the price of spot/near-dated contract is higher than far-dated contract. In Contango, the conditions is opposite of backwardation
[42] West Texas Intermediate (WTI) crude oil serves as a benchmark in oil pricing on the New York Mercantile Exchange

Figure 72: Changes in the crude oil (WTI) futures curve over the past 12 months (1/31/19-12/31/19)

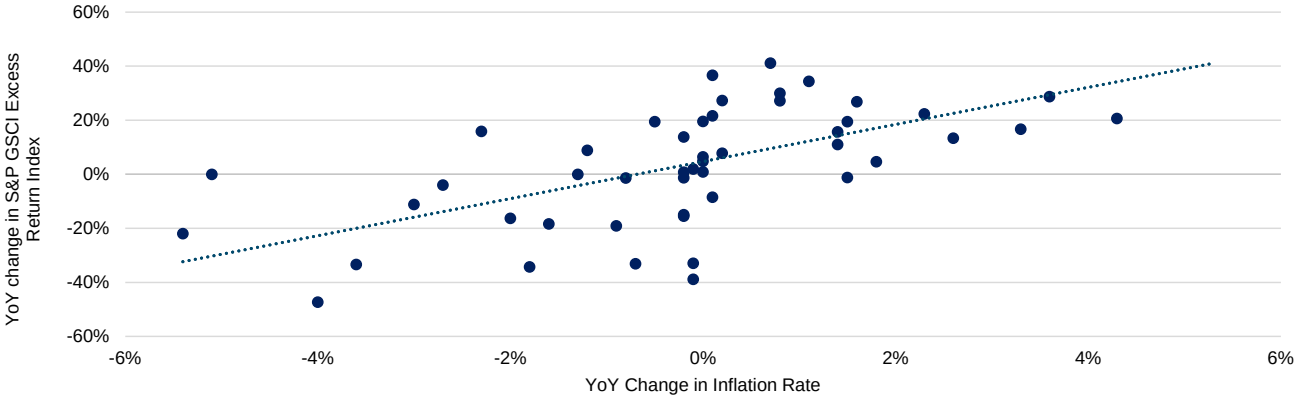


Source: Bloomberg Finance L.P., DWS Investments UK Limited, data as of 12/31/19.

Inflation

The inflation component raises commodity prices, as can be seen in Figure 73, whereas inflation adjusted prices exhibit a tendency to mean-revert (see Figure 74 and Figure 75). Certain commodities may also act as hedges against unexpected inflation[43].

Figure 73: Commodity prices positively correlated to changes in inflation (12/31/71 – 11/30/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from of 12/31//71 to 11/30/19.

[43] If we consider unexpected inflation to be equal to year-on-year changes in inflation, we can see a long term positive relationship between commodity excess returns and changes in inflation. Figure 73Figure 73 shows the relationship between excess returns of the GSCI and year-over-year change in inflation from 1970 through 2017. Since 1970 contemporaneous changes in the annual rate of inflation have seemingly explained about 41 percent of the time-series variation in the GSCI's annual excess returns.
Past performance may not be indicative of future returns.

Valuation

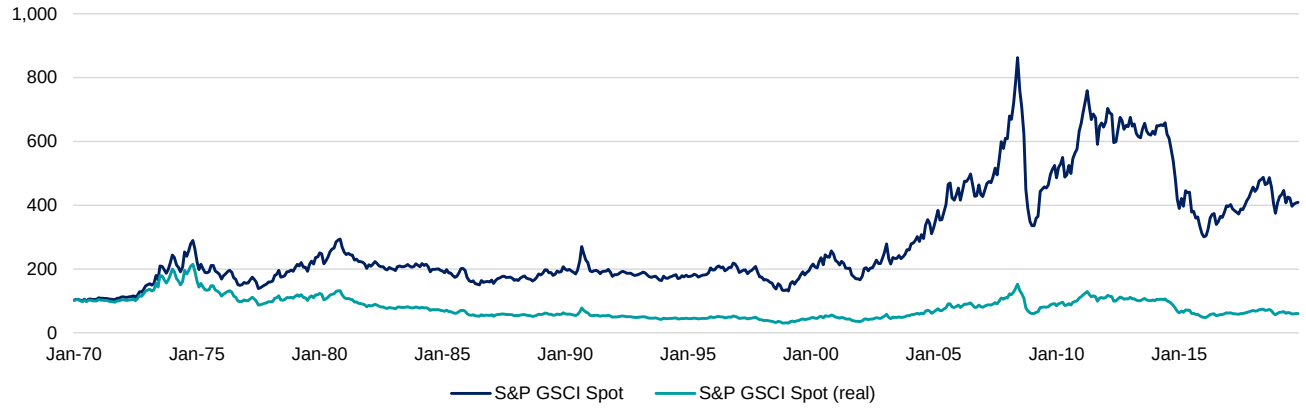
To illustrate, the nominal price of a commodity can be decomposed into real price and inflation. If we look at the long-term trend of the real S&P GSCI Spot index, as shown in Figure 74, we see prices mean revert.

Furthermore, as we forecast single commodities and then aggregate them into indices, we also need to understand the mean-reversion tendencies of single commodity real spot prices. Four examples are shown in Figure 76.

These figures show that commodities have exhibited mean reverting characteristics over time, that is they show negative (or lower) subsequent returns following higher prices and positive (or higher) subsequent returns following lower prices. This occurs for different reasons: changes in the supply-and-demand dynamics of a commodity, modifications to the production process, discovery of new deposits, the invention or price reduction of a substitute, to name but a few.

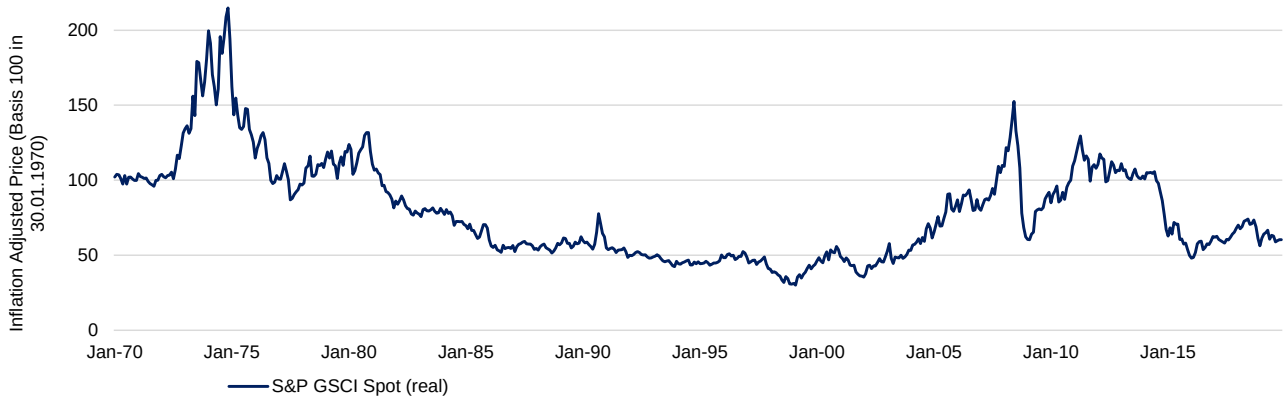
We incorporate mean reversion into our valuation pillar, where current real spot prices may revert to the historical real average prices over the last 10 years.

Figure 74: Nominal and real commodity prices: real prices revert to the mean over time (12/31/69-11/30/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 12/31/69 to 11/30/19.

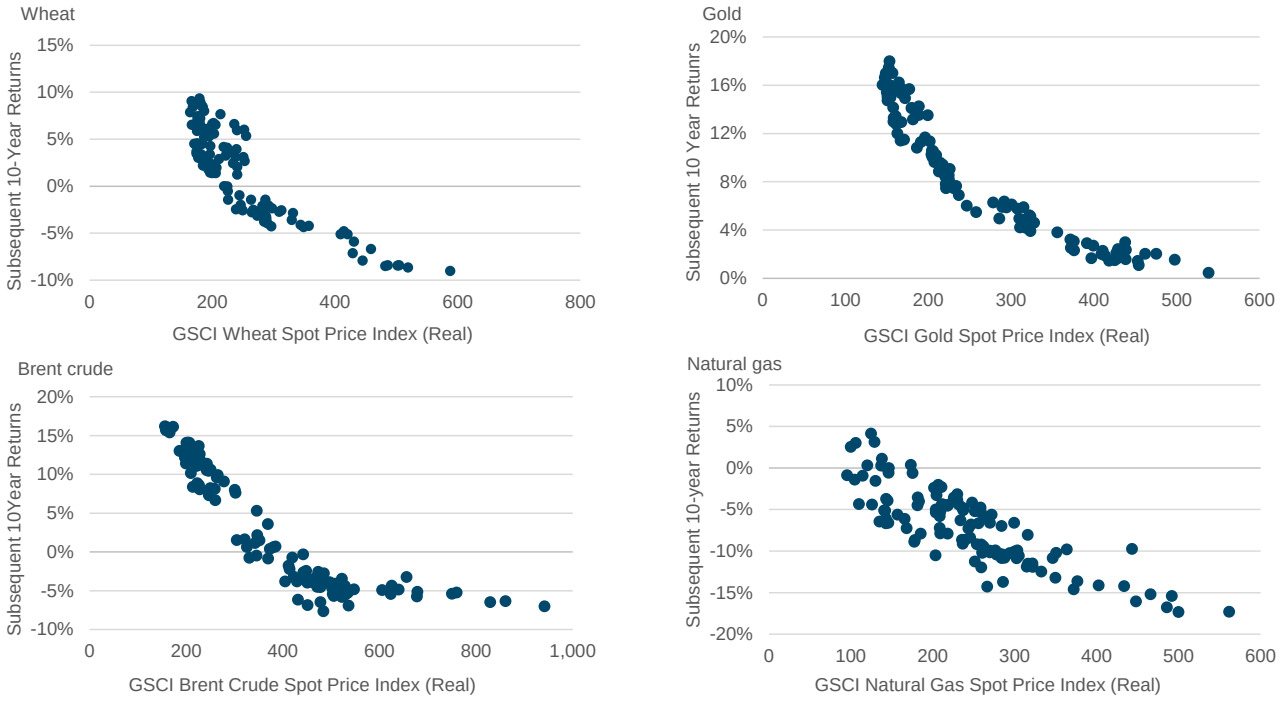
Figure 75: Once adjusted for inflation, the S&P GSCI Index exhibits mean-reverting behaviour



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 12/31/69 to 11/30/19.

Past performance may not be indicative of future returns.

Figure 76: Single commodities exhibit strong mean-reverting behaviour (12/31/99-12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data from 12/31/99 to 12/31/19.

Past performance may not be indicative of future returns.

Alternative assets

"I don't read, much less follow, the valuations or predictions.
I study the numbers."
John Neff[44]

Alternatives Long View framework

The analytical framework we rely on for alternative asset classes is similar to that of traditional asset classes presented in the previous chapter, as shown in Figure 77.

More precisely, we forecast most alternative asset classes' returns with the same approach as their corresponding traditional asset classes, sometimes with an added premium to account for specific features, for example liquidity. Hedge funds are the exception, as we forecast returns through a regression of their historical performances.

Figure 77: Long View for alternative asset classes: pillar decomposition

<table>
<tr><th>Asset Class</th><th>Income</th><th colspan="2">Growth</th><th colspan="3">Valuation</th><th>Premium</th></tr>
<tr><td>Hedge funds</td><td></td><td colspan="5">Hedge funds' full exposure to each pillar is calculated by means of a multi-linear regression of hedge-fund performance vs all liquid asset classes</td><td>Hedge-fund premium</td></tr>
<tr><td>Listed real estate equity</td><td>Dividend yield</td><td>Inflation</td><td>Earnings growth</td><td colspan="3">Valuation adjustment</td><td></td></tr>
<tr><td>Private real estate equity</td><td>Dividend yield</td><td>Inflation</td><td>Earnings growth</td><td colspan="3">Valuation adjustment</td><td></td></tr>
<tr><td>Private real estate debt</td><td>Yield</td><td colspan="2">Roll return</td><td>Valuation change</td><td>Credit migration</td><td>Credit default</td><td>Liquidity premium</td></tr>
<tr><td>Listed infrastructure</td><td>Dividend yield</td><td>Inflation</td><td>Earnings growth</td><td colspan="3">Valuation adjustment</td><td></td></tr>
<tr><td>Private infra-structure debt</td><td>Yield</td><td colspan="2">Roll return</td><td>Valuation change</td><td>Credit migration</td><td>Credit default</td><td>Liquidity premium</td></tr>
</table>

Source: DWS Investments UK Limited. As of 12/31/19.

[44] https://www.investors.com/how-to-invest/investors-corner/shaich-lynch-buffett-words-of-wisdom/

Hedge funds

Forecasted returns for the next decade

As can be seen in Table 7, our long-term (10-year YE 2019–2029) forecasts are differentiated depending on hedge-fund category. The return forecasts are somewhat lower than history, which reflects among other reasons our conservative approach due to biases in hedge-fund performance reporting.

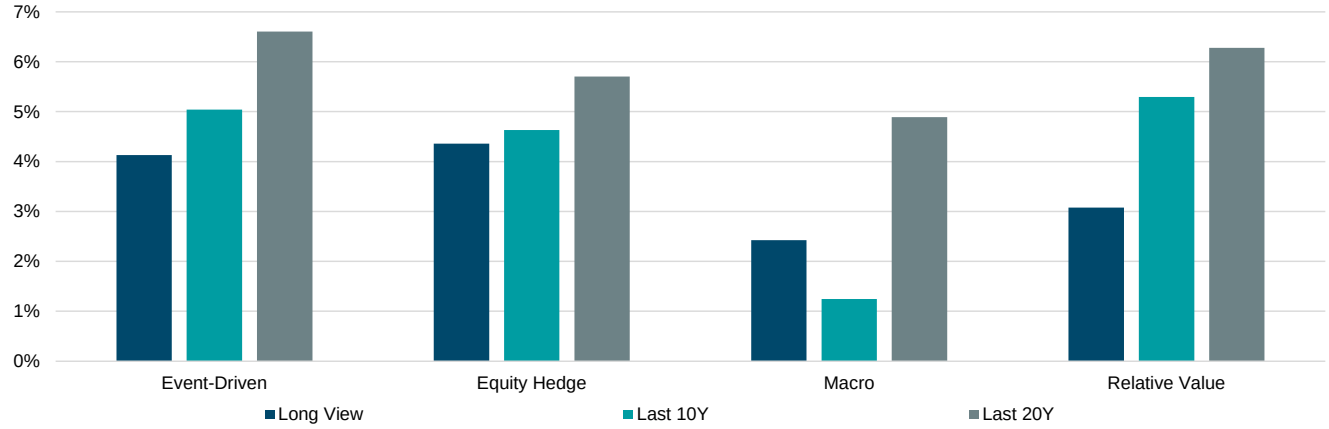
Compared with past performance, Figure 78 highlights that forecasted returns for hedge funds reflect a declining trend for industry returns over two decades.

Table 7: Forecasted returns for hedge funds, annualised

Hedge-fund strategy	Return forecast (local currency)
Event-driven	4.1%
Macro	2.4%
Relative value	3.1%
Composite	3.5%

Source: DWS Investments UK Limited. Data as of 10/31/19. See appendix for the representative index corresponding to each asset class.

Figure 78: Hedge funds' annualised 10-year forecasted (YE 2019-2029) and realised returns (in USD) (10-year and 20-year as of 10/31/19)

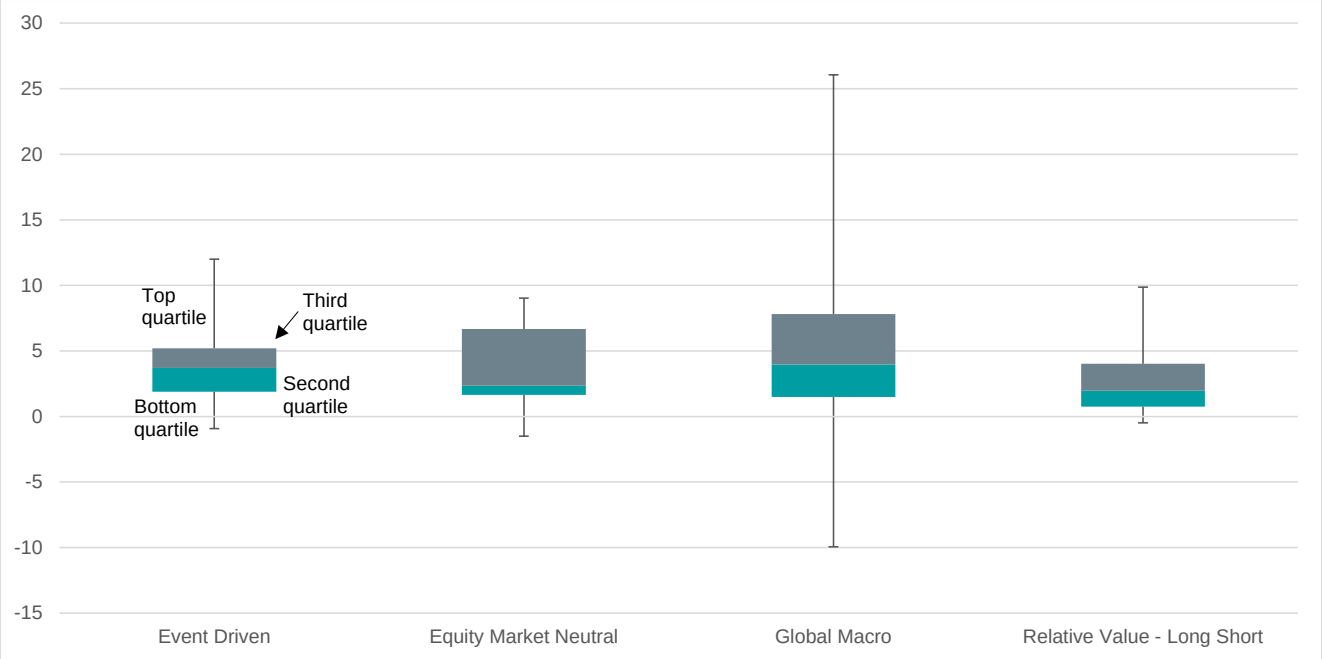


Source: DWS Investments UK Limited. Performance data as of 10/31/19. See appendix for the representative index corresponding to each asset class.

Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

It is worth remembering that forecasted returns are only average values across all funds and the performance dispersion between funds has been and is forecasted to be high. Historical dispersion for a few representative Morningstar categories can be seen in Figure 79.

Figure 79: Hedge-fund performance dispersion over the last 5 years by quartile, annualised



Source: Morningstar, DWS Investments UK Limited. Data as of 12/31/19.

Past performance may not be indicative of future returns.

Constructing our hedge-fund Long View

We build our 10-year forecasts for hedge funds on two main pillars. The first is beta, which represents their exposure to liquid market instruments, such as equities and bonds. The second is alpha. This can be thought of as a hedge-fund premium that may be delivered by hedge funds over time.

Main challenges when forecasting hedge-fund returns

Unlike most of our other Long View forecasts, potential hedge-fund returns are developed using a regression of historical performance. Therefore, the choice of the universe considered for any regression is important. Our aim is to be as comprehensive as possible and so we have included the HFRI universe[45], among others, due to its broad coverage of managers and equal-weighted methodology, which allows for more diverse representations of all managers.

We also had to address two of the most studied issues in historical data for hedge funds: so-called survivorship bias and backfill bias. These are described below.

– Survivorship bias arises when closed funds stop reporting into the index making it representative only of successful funds. Using the findings of various academic studies we have modified the historical returns to correct for that bias.[46]
– Backfill or instant-history bias arises when new funds come onto the database with instant histories (back filled returns since the incubation period). The impact is less documented but has been taken into account in our analysis.

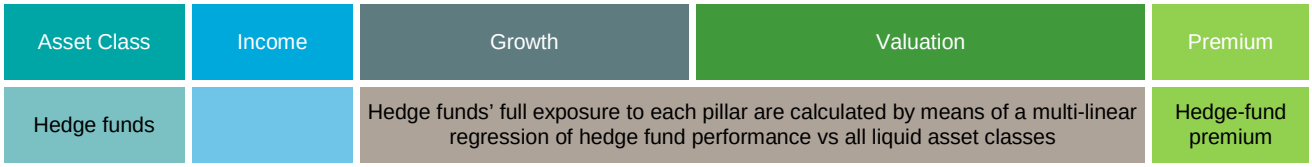
For each segment, we perform a long-term regression of historical returns versus a set of liquid instruments across global equities, global fixed income and commodities. This accounts for the beta part of the hedge-fund performance. Depending on the segment, beta may represent a different share of the total return. As an example, hedge funds belonging to the equity hedge category[47] historically tend to possess a higher beta than merger-arbitrage funds.

The alpha part is defined more subjectively by considering the historical returns in light of the performance of the liquid factors and the leverage typically used in the strategy.

Overall, our Long View for hedge funds is derived by adding the alpha to the combination of the beta coefficients with our forecast of their respective underlying liquid investments.

Figure 80: Pillar decomposition: Hedge funds

Beta and alpha



Source: DWS Investments UK Limited. As of 12/31/19.

[45] Source: Hedge Fund Research, Inc.
[46] See (Ibbotson, Chen und Zhu 2010) (Fung and Hsieh 2000)
[47] We rely on the HFRI classification, available at (HFR 2018)
Past performance may not be indicative of future returns.

Private infrastructure debt

Forecasted returns for the next decade

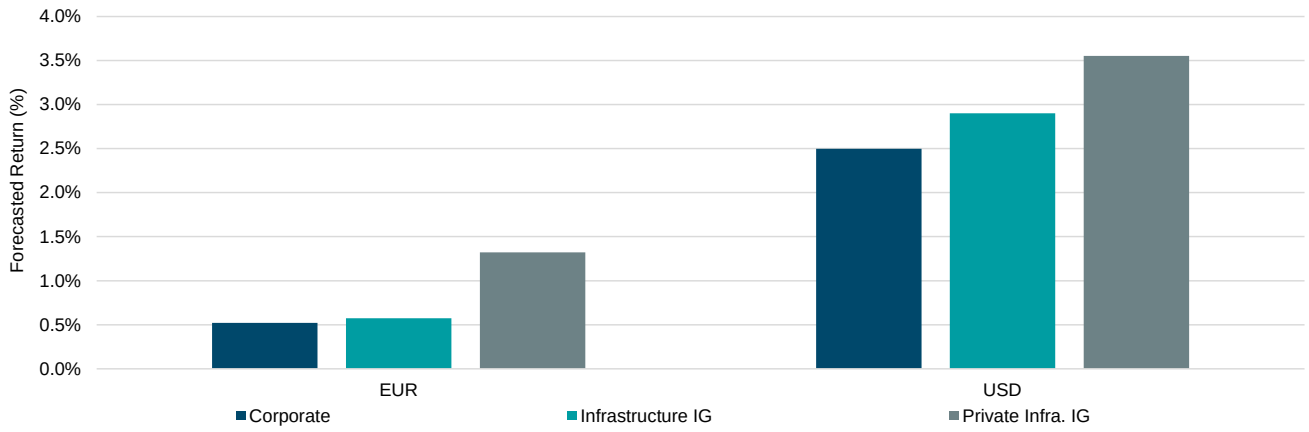
Historically, private infrastructure debt has offered a spread premium over listed infrastructure debt with a comparable credit rating and duration. This spread premium, also known as complexity premium, is driven by several factors, including the relative illiquidity of private debt, but also by differences in credit profile, security and covenant packages.

It is difficult to exactly quantify this complexity premium. However, by comparing spreads across private-infrastructure-debt transactions with spreads for listed infrastructure debt, historically, we have observed a spread premium of about 75 basis points for euro-investment-grade private infrastructure debt with seven years duration, and 65 basis points for dollar-investment-grade private infrastructure debt with the same duration.[48]

Meanwhile, for dollar-high-yield private infrastructure debt, historically, we have observed a complexity premium of 110 basis points for durations of four years.

Although the complexity premium offered by private infrastructure debt is generally greater at origination, data for secondary market transactions indicate that it tends to remain constant thereafter, with the private-infrastructure-debt spread moving, on average, broadly in line with the listed-infrastructure-debt benchmark.

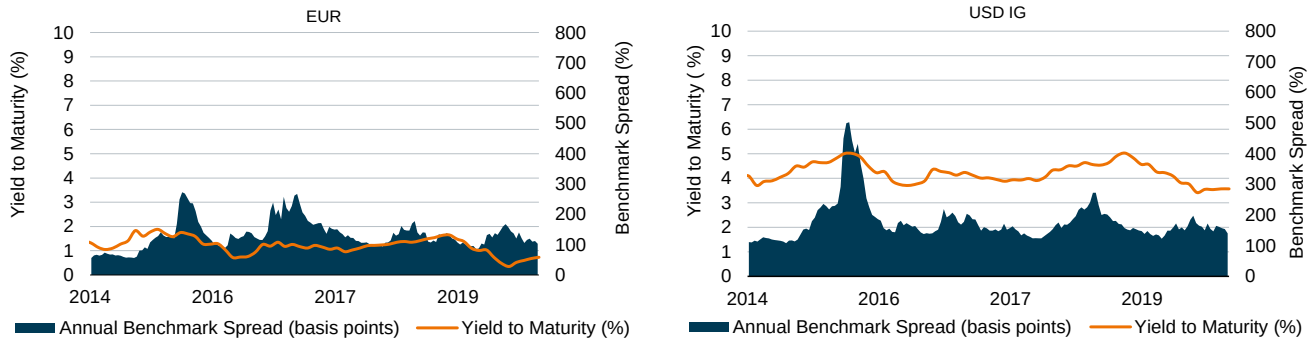
Figure 81: 10-year forecasted returns for private infrastructure debt, compared to listed infrastructure debt and broader corporate debt, annualised (YE 2019-2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. Proprietary database of private infrastructure debt transactions.

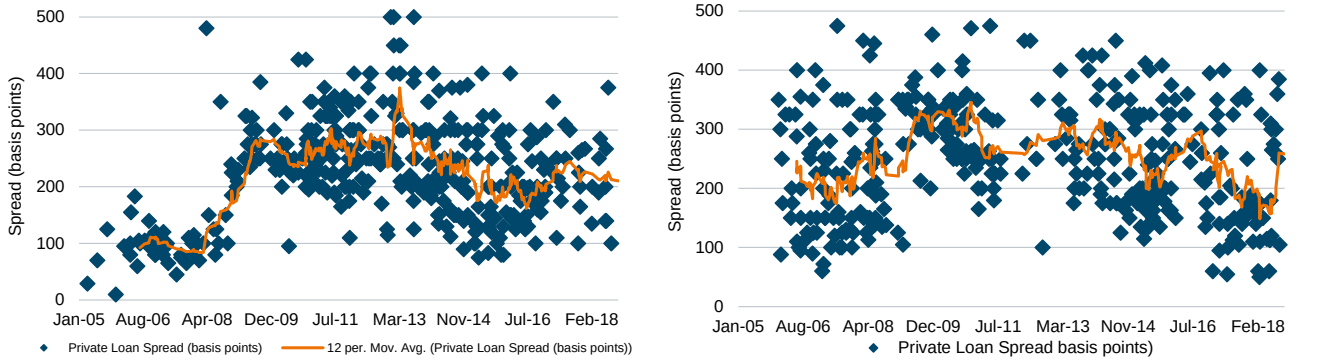
[48] Estimate based on a comparison of DWS proprietary database of private infrastructure debt transactions and IHS Markit iBoxx Infrastructure Debt Indices
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.
Past performance may not be indicative of future returns.

Figure 82: Historical returns for listed infrastructure debt, annualised (YE 2013–2019)



Source: DWS Investments UK Limited. Data from 12/31/13 to 12/31/19. Markit iBoxx USD and EUR Infrastructure IG.

Figure 83: Infrastructure private-loan-debt spreads for Europe (left) and North America (right) (YE 2005 – 2019)



Source: DWS Investments UK Limited. Data as of 12/31/19. Private-loan-debt spreads based on DWS proprietary transaction database of market transactions with publicly available information. Private-infrastructure-debt annual spread maximum and minimum include transactions across both investment-grade and high-yield rating categories.

Constructing our private-infrastructure-debt Long View

Contemplating an investment methodology similar to our reference case for fixed income[49], private-infrastructure-debt return assumptions can be forecasted using a modified version of our fixed-income approach.

The main modification comes from the yield assumption, where, as discussed previously, we add a constant illiquidity premium to the yield of listed infrastructure debt as observed in markets.

Moreover, credit migration and credit default are modified to reflect the credit profile of private infrastructure debt. Default studies demonstrate that infrastructure-debt credit ratings migrate less compared with non-financial corporate-fixed-income securities, with infrastructure assets supported by business profiles that tend to be resilient, driven by the essential nature of the service provided, and regulation.

Default studies show that infrastructure debt has consistently generated default rates lower than equally rated non-financial corporate bonds. For example, the average ten-year cumulative default rate for BBB-rated infrastructure debt is about two percent, compared with 3.1 percent for equally rated non-financial corporate bonds. [50]

Our research which includes research from studies and academic sources suggests that infrastructure debt has shown higher average recovery rates compared with non-financial corporates, for both senior-secured and unsecured debt. Senior-secured infrastructure debt demonstrated a recovery rate of 72 percent, compared with 54 percent for equivalent non-financial corporate debt.[50]

We believe that a stronger credit profile, supported by lower default rates and higher recovery rates, can translate into a lower loss-given-default, and into a further default-adjusted spread premium for private infrastructure debt compared with listed non-financial corporate debt.

Figure 84: Pillar decomposition: Private infrastructure debt

Source: DWS Investments UK Limited. As of 12/31/19.

[49] In particular, we assume the portfolio manager keeps the main portfolio characteristics (among others, duration) broadly constant over time. This encompasses a rebalancing process as described above.
[50] Moody's Investors Service, "Infrastructure default and recovery rates, 1983–2017", September 27, 2017
Past performance is not indicative of future returns.
Credit quality is a measure of a bond issuer's ability to repay interest and principal in a timely manner. Rating agencies assign letter designations such as AAA, AA, and so forth. The lower the rating, the higher the probability of default. Credit quality does not remove market risk and is subject to change.

Private real-estate debt

Forecasted returns for the next decade

Similar to private infrastructure debt, we find that private real-estate debt behaves in line with the listed part of the market, with some variations. The performance of listed, senior real-estate bonds denominated in euros, pounds and dollars therefore represents a useful tool for analysing return attributes that are valid for both public and private debt, as part of a multi-asset or fixed-income portfolio.

Constructing our private-real-estate-debt Long View

The non-listed real-estate-debt forecast methodology is derived from our fixed-income one. Similar to private infrastructure debt, returns should reflect a yield plus a spread due to illiquidity.

Private debt may offer an illiquidity premium over listed debt, particularly at origination. Factors including differences in credit profile, transaction structure (for example, security or covenant packages) and the relative illiquidity of private real-estate debt, may translate into a spread premium over listed real-estate debt.

Figure 85: Pillar decomposition: Private real-estate debt

Source: DWS Investments UK Limited. As of 12/31/19

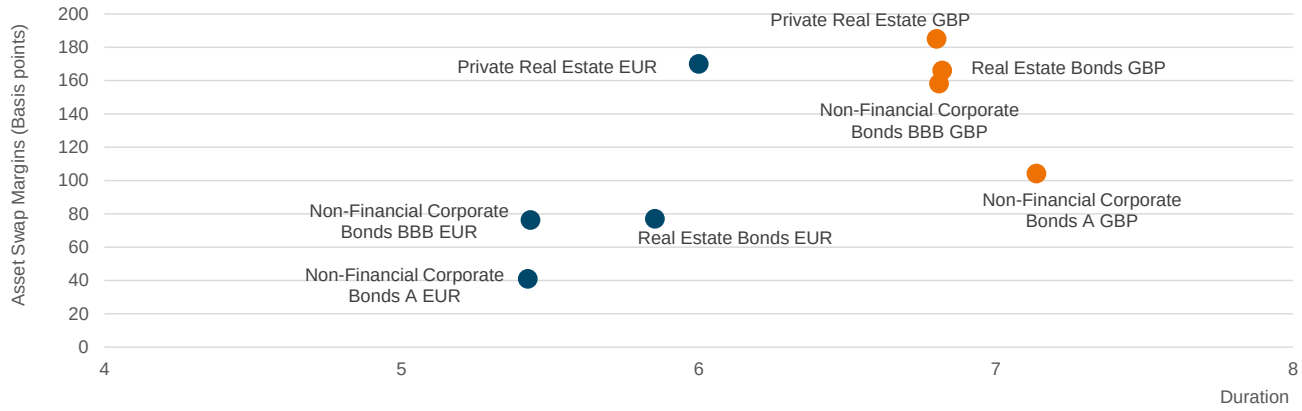
Our analysis, comparing listed-real-estate-debt indices with our own estimates of the private-debt market based on a proprietary market-transactions database, gives a broad indication of the asset-swap premium which may be achievable for private-real-estate debt across euro and pound-sterling markets.

As can be seen in Figure 86, we estimate that between October 2016 and September 2017 this premium was 27 basis points for pound sterling and 93 basis points for euros[51].

Private-real-estate debt also exhibits different credit migration and default behaviour and this needs to be translated into our forecast. Historically, average default rates for real-estate debt have been lower than for non-financial corporate bonds. Data for the period between 1983 and 2016 show that annual default rates for real-estate bonds were just 1.1 percent, compared with 1.6 percent for non-financial corporate bonds. In addition, during the same period, the cumulative ten-year default rate for real-estate debt has been 6.3 percent historically, versus 14.5 percent for non-financial corporates[52].

Debt secured by real assets also tends to benefit from higher recovery rates than corporate debt, due to the value retained in the tangible underlying assets. Investors in real-estate debt have therefore tended to recover a significant proportion of their investment in the event of default. Analysis of defaulted loans from U.S. real-estate transactions between 2009 and 2017 showed that the average recovery rate for real estate has been 71 percent, rising to 75 percent during the first three quarters of 2017[53].

Figure 86: Private-real-estate debt spread premium over listed debt (October 2016 – September 2017)



Sources: IHS Markit, DWS Investments UK Limited, October 2017. Private Real Estate Bonds: iBoxx Real Estate Debt Indices; Non- Financial Corporates: iBoxx Non-Financial Corporates Indices. Note: Index durations may not always match exactly.

[51] IHS Markit, DWS Investments UK Limited, October 2017
[52] Moody's, July 2017
[53] Real Capital Analytics, November 2017
Past performance may not be indicative of future returns.

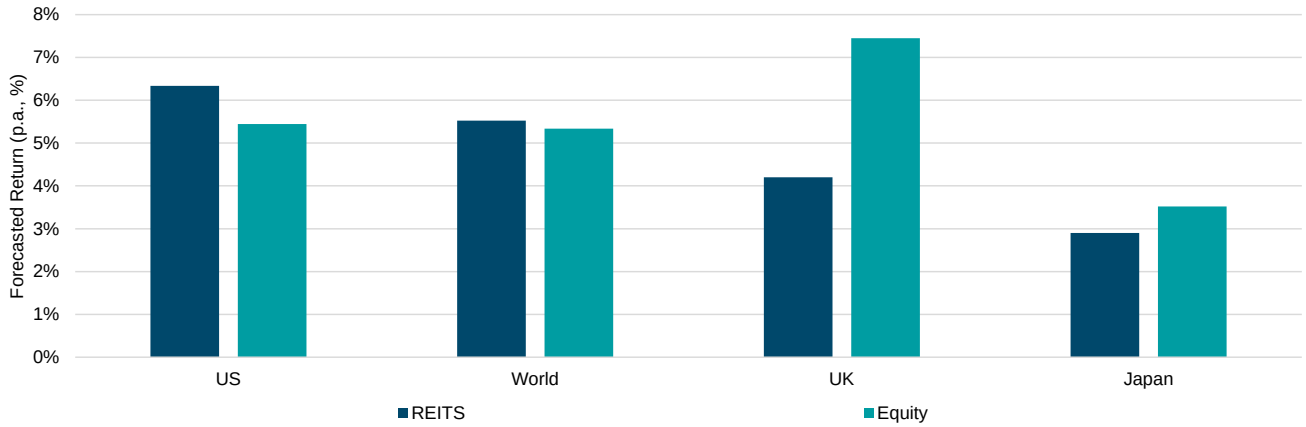
Listed real-estate equity

Forecasted returns for the next decade

Real estate investment trusts (REITs) represent a growing segment of global markets. Focusing on equity REITs, that is, listed shares of companies that own physical real-estate assets, the value of such vehicles has increased both in the U.S. and internationally.

Our forecasted returns for REITs may be an indication of relative value compared with traditional equities, though they are on the lower end of historical returns.

Figure 87: 10-year forecasted returns for listed real-estate equity, annualised (local currency, YE 2019-2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Constructing our listed-real-estate-equity Long View

The pillars of our listed-real-estate Long View follow the same principles as the equity methodology but REITs have unique characteristics, such as a higher relative share of income in the total return. Our approach is presented in Figure 88.

Income

Due to their higher relative share of income in the total return, income investors typically take REITs into consideration. Historically, most real-estate companies received reliable streams of income from long and stable tenant leases, and, by construction, REITs must distribute at least 90 percent of their taxable income to shareholders as dividends. This high dividend-pay-out requirement results in a larger share of REITs returns coming from dividends as compared to the broader equity market.

Growth

REITs are different to stocks because they do not retain the majority of their earnings, and hence we do not account for earnings growth in our model. This leaves inflation as the main remaining component of the growth pillar.

Figure 89 displays the development of three components of the U.S. REIT Index return: dividend yield, inflation and valuation adjustment.

Valuation

Figure 90 shows U.S. REIT dividend yields versus TIPS yields. REIT dividend yields have largely kept a constant elevated spread over the TIPS yield, however, this does fluctuate. Over the long term, however, the spread mean reverts. This relationship appears to hold across geographic regions globally.

Our view is that, when the spread fluctuates to well above its historical norm, it is a sign that REITs are potentially undervalued. Spreads peaked during the brief 2002 recession and then later during the 2008 financial crisis, suggesting that REITs were under-priced. On the contrary, when REITs spreads are well below its historical norm (e.g. negative) this suggests that REITs are over-priced as investors are banking on capital appreciation and robust growth – instead of current and measurable income – to drive returns. And since earnings represent a good indicator of future revenue, and so help to define real-estate prices over the long term, this inflated price should correct.

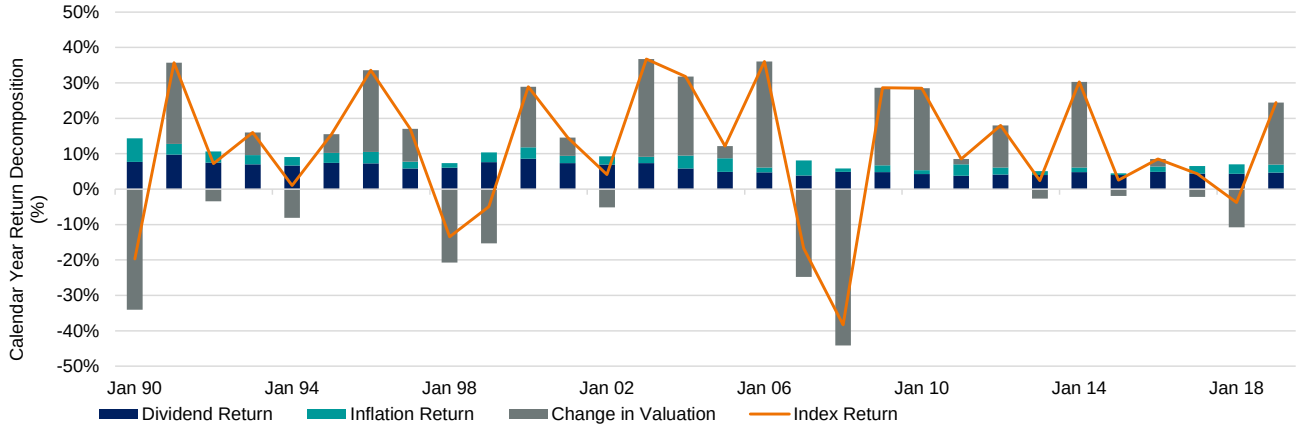
If we look at historic REITs-to-TIPS spreads and subsequent ten-year realised returns, we can see this relationship empirically across a number of major markets, as shown in Figure 91.

Figure 88: Pillar decomposition: Listed real-estate equity

Source: DWS Investments UK Limited. As of 12/31/19.

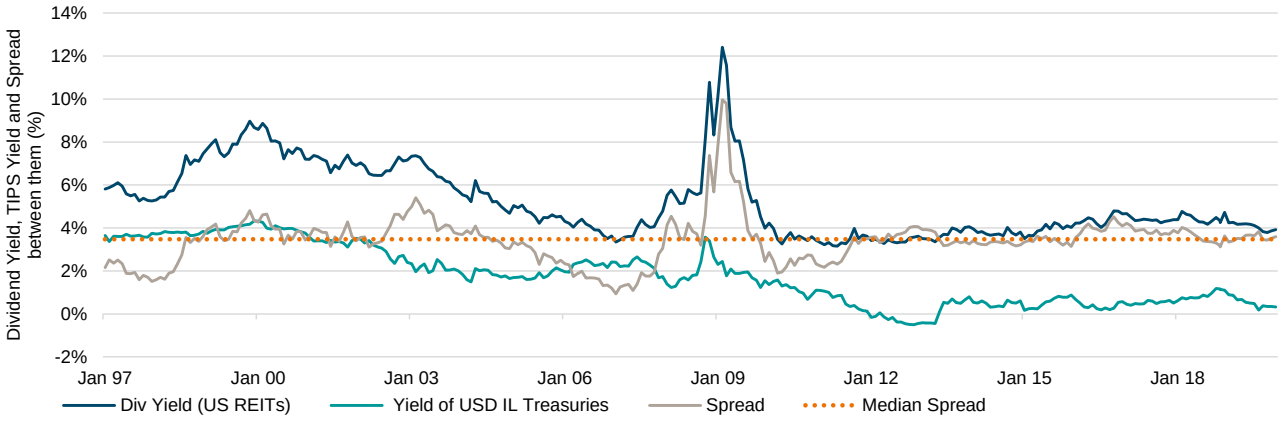
Past performance may not be indicative of future returns.

Figure 89: Return decomposition of S&P U.S. REIT Index (12/31/89–12/31/19)



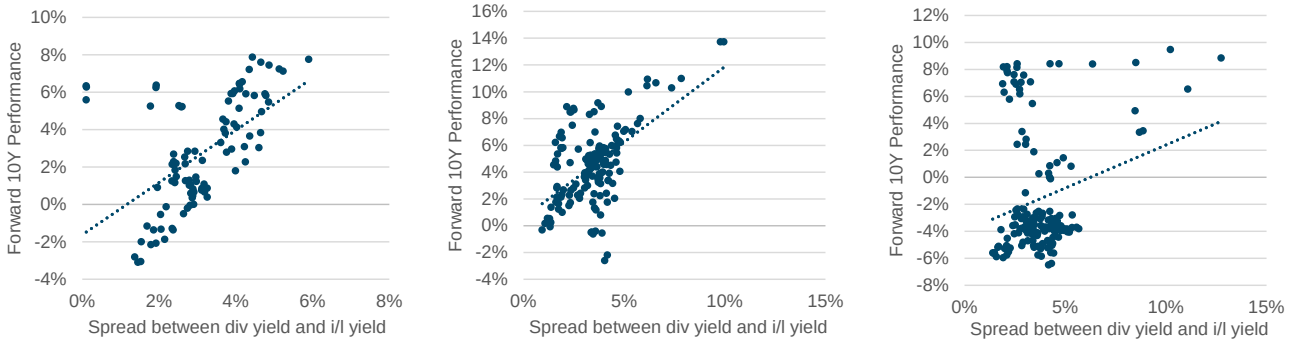
Source: Source: S&P, Bloomberg Finance L.P. LLP, DWS Calculation, data from 12/31/89 to 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 90: U.S. REITs yields and TIPS yields over the long term (12/31/96–12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited, data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Figure 91: The REITs spread has historically been a good predictor of subsequent 10-year REITs performance (7/31/89-12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited, data from 7/31/89 to 12/31/19. See appendix for the representative index corresponding to each asset class.

Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Private real-estate equity

Forecasted returns for the next decade

For the time period 2001–2018, private global real estate has produced an annual total return of 7.3 percent[54]. The majority of this has been the result of a consistent income return, which has averaged 5.6 percent annually, while capital growth has been averaging close to inflation at 1.7 percent.

Over the same period, as interest rates have declined for the most part, so too have income yields on property, leading to a general increase in capital values and a corresponding decline in the level of annual income return. As can be seen in Figure 92, global income yields declined from roughly seven percent annually in the early part of the 2000s, to 4.3 percent by the end of 2018.

Similar trends occurred across Europe. Since 2004, for example, the MSCI Pan-European property funds index (PEPFI) had returns averaging 6.9 percent annually, of which 5.9 percent came from income, while the UK Association of Real Estate Funds index returned 5.4 percent over the same period. The low return in the UK predominantly reflects the adverse impact of the financial crisis on the sector. However, over a longer 20-year view, UK returns have averaged 6.4 percent per annum.

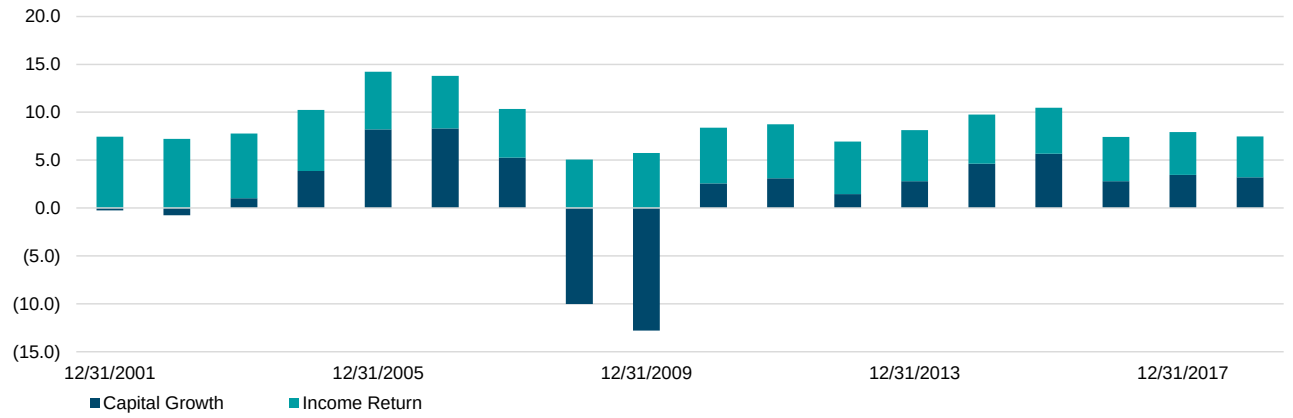
Likewise, the income return has been trending lower across Europe. Using the MSCI Pan-European property funds index again, we see that since 2004 the annual income return has averaged around six percent, compared with 4.2 percent today.

In the U.S., returns based on the NCREIF Open-End Diversified Core Equity Fund Index (NFI-ODCE) averaged 8.8 percent annually since 1998.[55] Income returns averaged six percent during the time period. Similar to the UK and Europe, income returns have also been trending down in America to around four percent. Note that the NFI-ODCE index only includes funds with core properties, therefore income yields tend to be lower. Looking ahead, we forecast the long-term (YE 2019–2029) returns for U.S. non-listed real estate to be 6.9 percent, based on inflation of two percent and a current income return of 4.2 percent.

Across regions our forecasts are in Figure 93. When compared with traditional equities, they show similar to better return forecasts despite the relatively low leverage of the assets considered here.

[54] According to MSCI Global Annual Property Index
[55] According to the NCREIF Open-End Diversified Core Equity Fund Index
Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 92: Decomposition of the MSCI Global Annual Property Index



Source: MSCI, DWS Investments UK Limited, as of 12/31/19.

Figure 93: 10-year forecasted private-real-estate-equity returns, annualised (local currency, YE 2019-2029)

Source DWS Investments UK Limited. Data as of 12/31/19. See appendix or the representative index corresponding to each asset class.

Past performance may not be indicative of future returns.
Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Constructing our private-real-estate-equity Long View

The non-listed real-estate forecasted return methodology is derived from the equity approach. It relies on three pillars: income, growth and valuation, as shown in Figure 94.

The historical performance shown in the previous section is in line with the theory, which says that historically, the bulk of non-listed real-estate returns may be attributed to an income return plus inflation-based capital-value growth. The earnings-growth components play a secondary role here.

From one year to the next, capital growth may be driven by a combination of yield change and net income growth – a function broadly of changes in rents and occupancy.

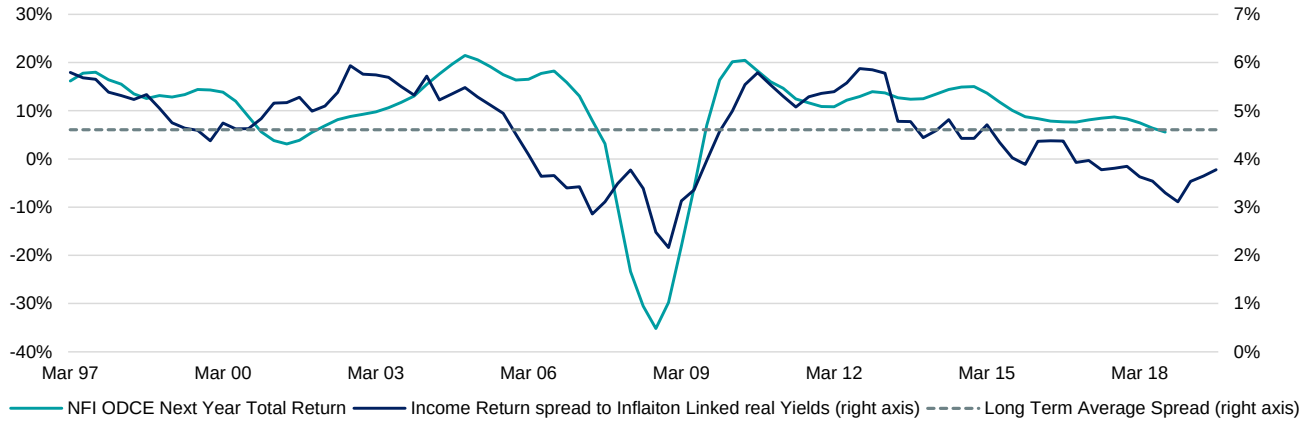
Over long-term periods of 10 to 20 years, therefore, capital growth may be inflationary, with the yield and occupancy trending around a mean, and rents growing in line with inflation. While certainly not a perfect market, with land constraints in some cases supportive of outsized rental growth, on the whole, supply is reactive to demand, which leads to our assumption that over rolling 10-year periods, rents may be aligned with global price growth.

Around this broad trend of income return and inflation expectations, there is a change-in-valuation factor to consider. Total yield is the latest income return (income yield or cap rate) from the relevant market[56]. The valuation adjustment refers to the income return spread over the relevant TIPS real yield. Similar to REITs, we believe there has been a meaningful correlation between total returns and the income return spread over the ten-year government bond yield on a lagged basis (see Figure 95).

Figure 94: Pillar decomposition: Private real estate

Source: DWS Investments UK Limited. As of 12/31/19.

Figure 95: NCREIF ODCE Index total return vs. income-return spread over 10-year inflation-linked government bond yield



Source: NCREIF, DWS Investments UK Limited. Data from 3/31/97 to 9/30/19.

[56] Income yield, income return and cap rate are equivalent and used interchangeably
Past performance may not be indicative of future returns.

Listed infrastructure equity

Forecasted returns for the next decade

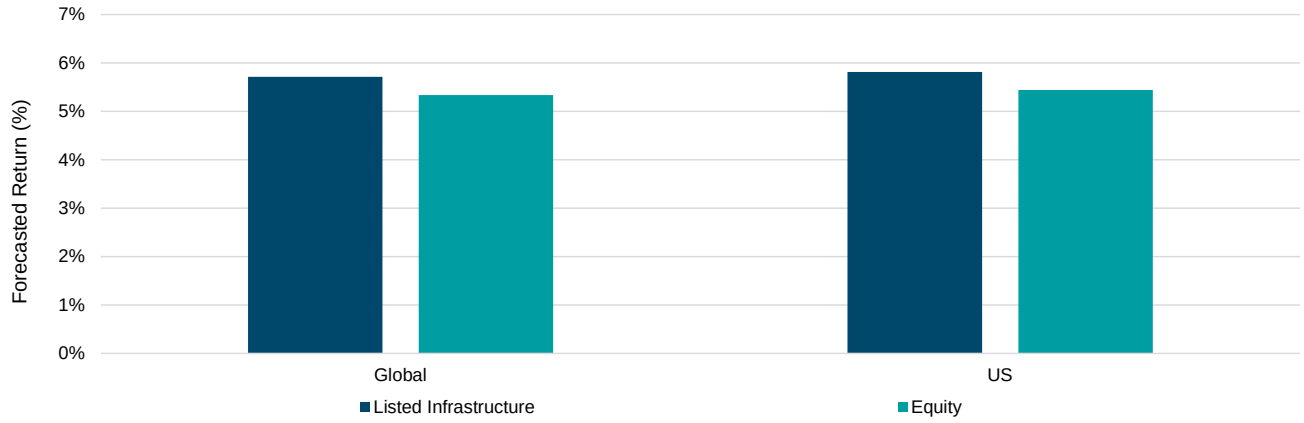
Infrastructure is a broad asset class, encompassing various sectors, with diverse underlying business models, such as utilities, regulated power networks, airports, toll roads, rail roads, ports, energy pipelines and mobile towers. The Dow Jones Brookfield infrastructure index endeavours to measure the performance of pure-play listed infrastructure equities on a global basis.

Infrastructure companies provide essential services, have monopolistic business models with high barriers to entry, and can be regulated or contracted in the long term. As a result, infrastructure has the potential to offer investors a steady dividend yield that can generally be higher than broader listed equities. Infrastructure is a good inflation hedge as essential services face a low elasticity of demand and inflation can be often passed over to the end customers.

Moreover, some infrastructure companies are backed by specific contractual or regulatory arrangements allowing for an explicit link of tariffs to inflation.

Some infrastructure sectors, such as regulated networks, have business characteristics that can be resilient to the economic cycle, thus leading to lower performance volatility, but also lower long-term earnings-growth potential compared with broader equities. Other sectors, such as airports or toll roads, although regulated, may be more exposed to the macroeconomic environment, thus leading to potentially higher performance volatility, but also offering stronger earnings-growth potential over the long term.

Figure 96: 10-year forecasted returns listed infrastructure equity, annualised (local currency, YE 2019-2029)



Source: DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

Constructing our listed-infrastructure-equity Long View

Our listed-infrastructure forecasted return methodology is based on the listed-equities approach, with some ad-hoc adjustments, factoring in the defensive nature of the asset class.

Inflation

Inflation used in the forecast is weighted by respective country, using index market weights. Compared with listed equities, listed infrastructure has a stronger relationship to inflation, and price inflation can often be passed on to the end consumer. Most regulatory frameworks allow regulated assets to use inflation-indexed user tariffs, often associated with electricity transmission and distribution or gas distribution. Inflation-indexed toll increases can be common features of concessions for some types of surface transport, such as roads, bridges and tunnels. For unregulated assets, full hedging may not always be possible.

Growth

For the earnings-growth forecast, in an attempt to forecast the performance of listed infrastructure equity more accurately, based on historical performance evidence, we have decided to separate the asset class into two main categories, including (i) companies in sectors with mature, regulated business profiles supporting long-term dividend predictability but also limiting capital-growth potential, and (ii) companies in sectors with higher cyclicality but also more solid long-term capital-growth potential.

Valuation

Valuations for listed-infrastructure companies in group (i) have shown the potential to be relatively resilient over a period of 10 to 15 years, underpinned by the distinctive characteristics of the underlying assets and by regulatory frameworks providing protection to long-term income returns. For this reason we assume that investors would think about valuing such companies in terms of the spread between their dividend yield and a risk-free investment, and in our methodology for this group (i), we use an approach in line with listed real-estate equity. For assets in group (ii), on the other hand, where potential capital growth needs to be taken into account, we use an approach in line with broader listed equities.

Figure 97: Pillar decomposition: Listed infrastructure equity

Source: DWS Investments UK Limited. As of 12/31/19. For illustrative purposes only.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. There are no assurances that desired results will be achieved.

Volatility and correlation

Forecast volatility and correlation for the next decade

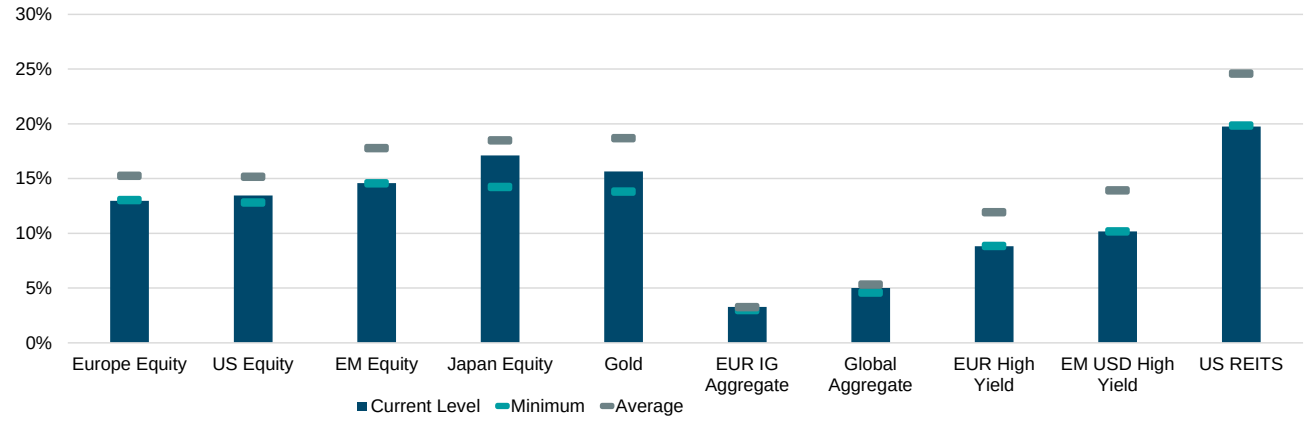
The benign macroeconomic conditions that have prevailed over the past few years have also seen volatility decrease steadily. Figure 98 shows the annualised volatility for major asset classes in our universe, which, as can be seen, are near historic lows.

This can also be observed for correlations. Figure 99 shows that rolling six-month average correlations between major asset classes have stayed below the historical average for most of the last three years. The usual problem with correlation analysis is the large number of data points to consider. In Figure 100, we show two levels of information: the correlation matrix and the corresponding hierarchy of relationships between asset classes.

It can be seen that EUR IG aggregate, gold, and global aggregate asset classes have the lowest correlation with other asset classes (as depicted with the green and light colour cells) whereas emerging markets and Asia Pacific ex Japan exhibit the highest correlation (as depicted with red cells).

The hierarchical-tree diagram in the same chart clusters assets together based on their correlation values – for example, global aggregate and euro IG aggregate are shown as one tight cluster, as are emerging markets and Asia Pacific ex Japan equities. Less closely correlated assets are further apart in the cluster representation.

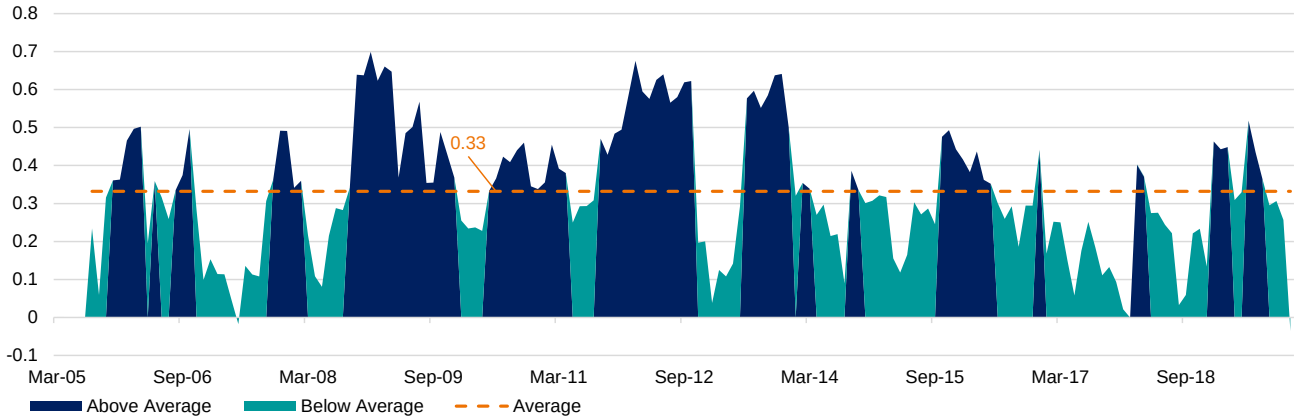
Figure 98: Historical and current level of annualised asset-class volatility (1/29/71-12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

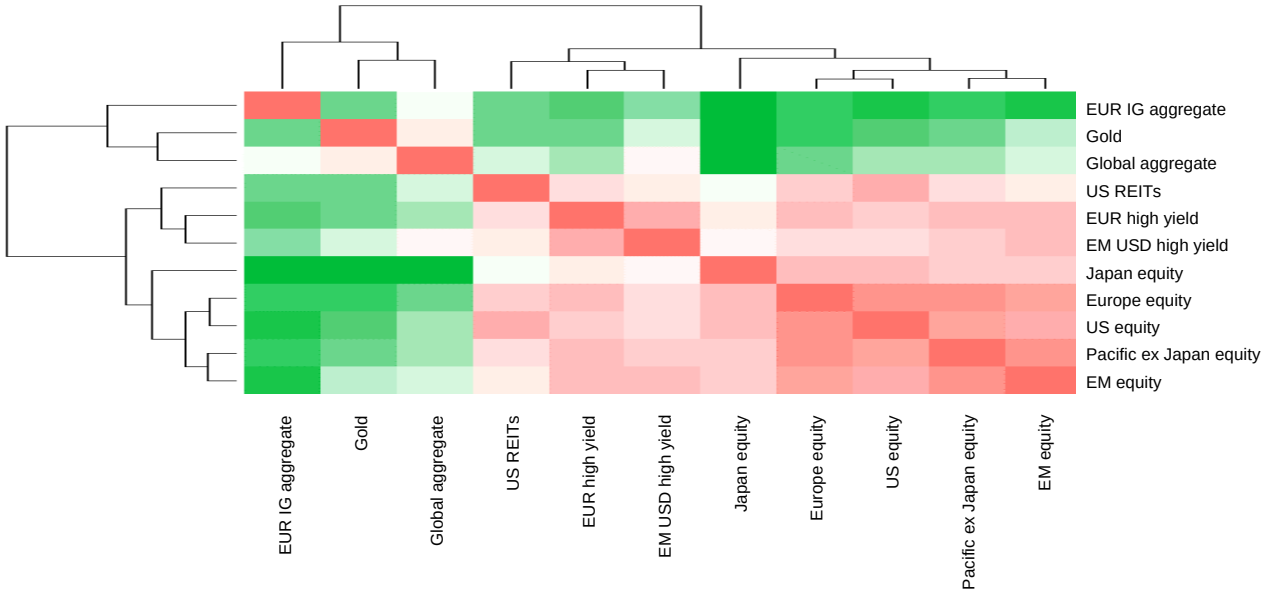
Past performance may not be indicative of future returns.

Figure 99: Historical average of the correlation among major asset classes (3/31/05-12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. Data shows average pairwise correlation for the asset classes listed in Figure 100. See appendix for the representative index corresponding to each asset class.

Figure 100: Correlation and hierarchical relationship between asset classes



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class. For illustrative purposes only.

Past performance may not be indicative of future returns.

Constructing our volatility and correlation view

Our Long View on volatilities and correlation are grounded in historical observations. However, a balance has to be found between recent history and distant events. We consider that observations in the distant past have less bearing on the current environment than near-term observations but still carry some information, hence we use a so-called exponentially weighted moving average (EWMA) to underweight historical returns for the long term.

What is more, in volatility/covariance matrix observations we often face time series with unequal lengths, as illustrated below. Therefore, only the common period history is used for the computation of a covariance matrix.

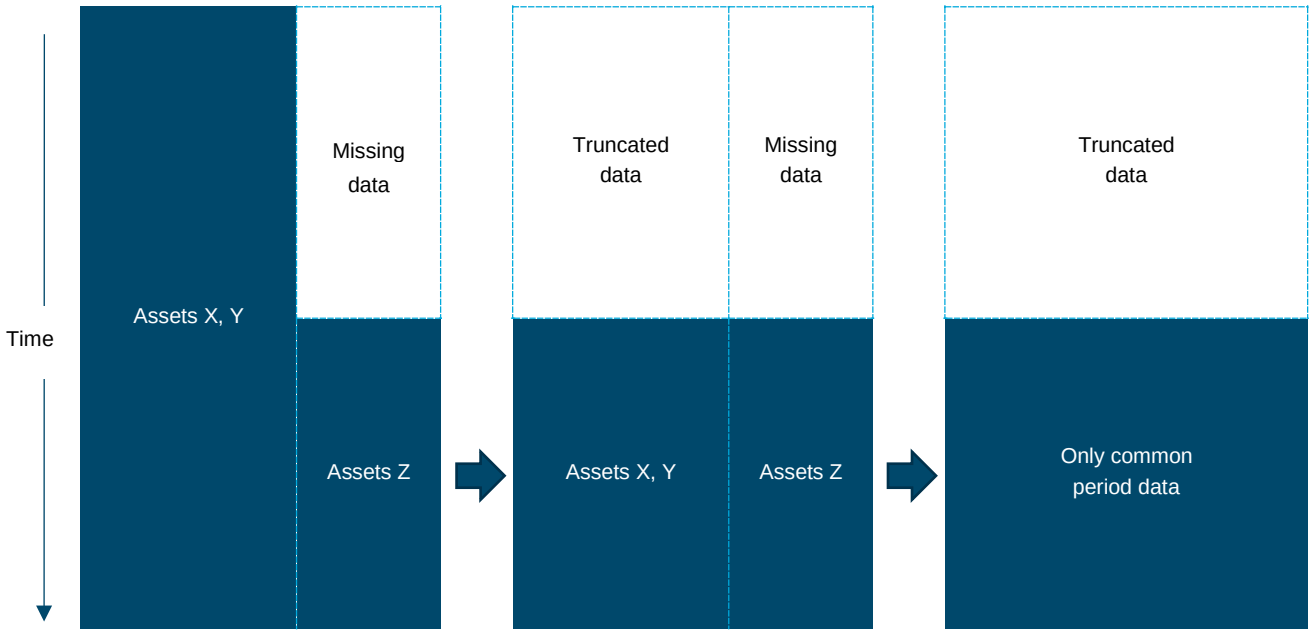
As shown in Figure 101 such truncation could result in the loss of valuable information. Therefore, we employ an alternative approach (Stambaugh 1997) that utilises the complete history of the sample to estimate a covariance matrix.

In simple words, we extrapolate the missing historical data by performing a multi-linear regression of the existing available time series. By doing so, we obtain a time-consistent set of time series, and hence more consistent estimates for volatilities and correlations.

This is necessary because many REITs indices available today have only been launched after the financial crisis. Without the addition of the missing historical data, price volatility would be underestimated because these funds have only experienced a long bull market. We do know, however, that real-estate assets carry liquidity risks in times of crises.

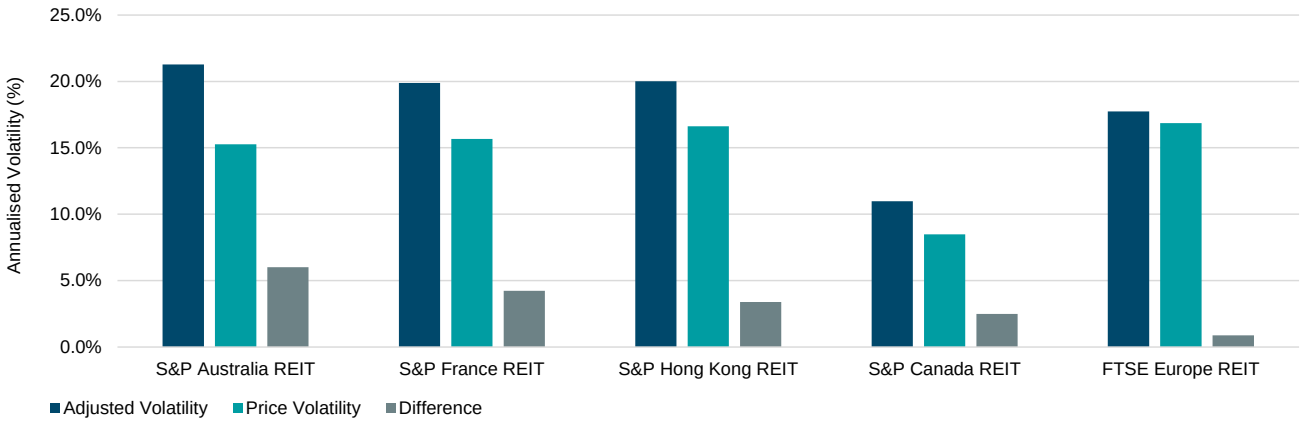
Using our methodology as described above, we see below that REIT funds launched post 2008 have systematically higher adjusted volatility.

Figure 101: Building the correlation Long View



Source: DWS Investments UK Limited. As of 12/31/19.

Figure 102: REITs volatility – price volatility underestimates latent risk-adjusted volatility using long-term time series (1/29/71-12/31/19)



Source: Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/19. See appendix for the representative index corresponding to each asset class.

Past performance may not be indicative of future returns.

Appendix 1

Representative indices

Table 8: Each asset class in this publication is forecasted as per its corresponding representative index*

Broad Asset Class	Asset Class	Representative Index	2019	2018	2017	2016	2015
Fixed Income	EM USD High Yield	Bbg Barclays EM USD Aggregate High Yield	11.48%	-4.73%	9.54%	15.89%	6.92%
Fixed Income	EM USD Sovereign	Bbg Barclays Emerging Markets USD Sovereign	13.35%	-4.20%	9.29%	9.34%	1.49%
Fixed Income	EUR Aggregate	Bbg Barclays Euro Aggregate	5.98%	0.41%	0.68%	3.32%	1.00%
Fixed Income	EUR Cash	EUR 3M Libor TR	-0.41%	-0.34%	-0.38%	-0.34%	-0.07%
Fixed Income	EUR Corporate	Bbg Barclays Euro Aggregate Corporate	6.24%	-1.26%	2.41%	4.73%	-0.56%
Fixed Income	EUR Corporate 1-3	Bbg Barclays Euro Aggregate Corporate 1-3 Years	1.34%	-0.23%	0.52%	1.57%	0.59%
Fixed Income	EUR Corporate 3-5	Bbg Barclays Euro Aggregate Corporate 3-5 Years	4.00%	-0.65%	1.64%	3.55%	0.55%
Fixed Income	EUR Corporate 5-7	Bbg Barclays Euro Aggregate Corporate 5-7 Years	7.52%	-1.42%	2.87%	5.53%	-0.59%
Fixed Income	EUR Corporate 7-10	Bbg Barclays Euro Aggregate Corporate 7-10 Years	10.92%	-2.36%	4.19%	7.03%	-1.45%
Fixed Income	EUR High Yield	Bbg Barclays Pan-European High Yield (Euro)	11.33%	-3.82%	6.90%	9.13%	1.00%
Fixed Income	EUR Treasury	Bbg Barclays Euro Treasury	6.77%	0.98%	0.17%	3.23%	1.65%
Fixed Income	EUR Treasury 10-20	Bbg Barclays Euro Aggregate Treasury 10-20 Years	0.00%	-0.15%	0.21%	5.18%	2.51%
Fixed Income	EUR Treasury 1-3	Bbg Barclays Euro Aggregate -Treasury 1-3 Years	0.28%	-0.09%	-0.34%	0.38%	0.68%
Fixed Income	EUR Treasury 3-5	Bbg Barclays Euro Aggregate - Treasury 3-5 Years	1.88%	0.09%	0.03%	1.55%	1.40%
Fixed Income	EUR Treasury 5-7	Bbg Barclays Euro Aggregate Treasury 5-7 Years	4.23%	0.17%	0.50%	2.26%	1.89%
Fixed Income	EUR Treasury 7-10	Bbg Barclays Euro Aggregate Treasury 7-10 Years	6.74%	1.37%	1.20%	3.78%	1.84%
Fixed Income	Global Aggregate	Bbg Barclays Global Aggregate	6.84%	-1.20%	7.40%	2.09%	-3.15%
Fixed Income	Global Corporate	Bbg Barclays Global Aggregate Corporate	11.51%	-3.57%	9.09%	4.27%	-3.56%
Fixed Income	Global Government	Bbg Barclays Global Aggregate Treasuries	5.59%	-0.38%	7.29%	1.65%	-3.29%
Fixed Income	Global High Yield	Bbg Barclays Global High Yield	12.56%	-4.06%	10.43%	14.27%	-2.72%
Fixed Income	US Agg Intermediate	Bbg Barclays US Aggregate Intermediate	6.67%	0.92%	2.27%	1.97%	1.21%
Fixed Income	US Aggregate	Bbg Barclays US Aggregate	8.72%	0.01%	3.54%	2.65%	0.55%
Fixed Income	US Corporate	Bbg Barclays US Corporate	14.54%	-2.51%	6.42%	6.11%	-0.68%
Fixed Income	US Corporate 5-7	Bbg Barclays US Corporate 5-7 Years	12.68%	-0.74%	4.92%	5.41%	1.13%
Fixed Income	US High Yield	Bbg Barclays US High Yield	14.32%	-2.08%	7.50%	17.13%	-4.47%
Fixed Income	US Treasury	Bbg Barclays US Treasury	6.86%	0.86%	2.31%	1.04%	0.84%
Fixed Income	US Treasury 5-7	Bbg Barclays US Treasury: 5-7 Years	6.79%	1.44%	1.87%	1.30%	1.98%
Fixed Income	USD Cash	USD 3M Libor TR	2.28%	1.86%	1.13%	0.50%	0.20%
Fixed Income	USD IL Treasuries	Bbg Barclays US Govt Inflation Linked Bonds	8.75%	-1.48%	3.30%	4.85%	-1.72%
Equities	AC Equities	MSCI ACWI	26.24%	-7.38%	18.48%	9.00%	2.08%
Equities	EM Equities	MSCI EM	18.05%	-10.08%	30.55%	9.69%	-5.76%
Equities	EMU Small Cap Equities	MSCI EMU Small Cap	28.19%	-17.44%	24.29%	3.23%	24.33%

*Returns referenced in this chart represent the last five years 2015-2019. It is intended to represent a snapshot in time and not exhaustive for all time periods.

Source: Bloomberg Finance L.P., DWS Investments UK Limited. As of 12/31/19. Past performance, actual or simulated, is not a reliable indicator of future results.

Table 8: Each asset class in this publication is forecasted as per its corresponding representative index *

Broad Asset Class	Asset Class	Representative Index	2019	2018	2017	2016	2015
Equities	Europe Small Cap Equities	MSCI Europe Small Cap	29.01%	-15.86%	19.03%	0.86%	23.53%
Equities	Eurozone Equities	MSCI EMU	25.44%	-12.75%	12.63%	4.33%	9.82%
Equities	Japan Equities	MSCI Japan	18.94%	-14.85%	20.14%	-0.40%	10.27%
Equities	Switzerland	MSCI Switzerland	29.98%	-8.03%	17.47%	-3.42%	1.18%
Equities	US Equities	MSCI USA	30.88%	-5.04%	21.19%	10.89%	0.69%
Equities	US Small Cap Equities	MSCI USA Small Cap	26.74%	-10.40%	16.75%	19.15%	-4.11%
Equities	World Equities	MSCI World	27.34%	-7.38%	18.48%	9.00%	2.08%
Alternative	Australia REIT	S&P AUSTR REIT	18.14%	4.52%	4.87%	11.89%	12.68%
Alternative	Broad Commodities	Bbg Commodity	7.69%	-11.25%	1.71%	11.77%	-24.66%
Alternative	Crude Oil	Bbg Composite Crude Oil	34.88%	-17.64%	9.87%	16.32%	-44.74%
Alternative	Energy	Bbg Energy	11.76%	-12.69%	-4.32%	16.27%	-38.87%
Alternative	EUR Infrastructure IG	Markit iBoxx EUR Infrastructure Index	6.91%	-1.24%	2.30%	4.89%	-0.50%
Alternative	Global Infra. Equity	DJ Brookfield Global	28.69%	-7.87%	15.79%	12.52%	-14.40%
Alternative	Gold	Gold Futures	16.61%	-3.43%	12.62%	7.87%	-10.35%
Alternative	Hedge Funds: Composite	Hedge Funds	8.41%	-4.07%	8.59%	5.44%	-1.12%
Alternative	HF - Equity Hedge	HFRI Equity Hedge	10.95%	-6.90%	13.29%	5.47%	-0.97%
Alternative	HF - Equity Market Neutral	HFRI EH: Equity Market Neutral	1.98%	-1.21%	4.88%	2.23%	4.27%
Alternative	HF - Event-Driven	HFRI Event-Driven	5.70%	-1.73%	7.59%	10.57%	-3.55%
Alternative	HF - FoF Composite	HFRI Fund of Funds Composite	6.42%	-3.48%	7.77%	0.51%	-0.27%
Alternative	HF - Macro	HFRI Macro	5.77%	-3.21%	2.20%	1.03%	-1.26%
Alternative	HF - Macro: Systematic	HFRI Macro: Systematic Diversified	7.04%	-5.25%	2.12%	-1.37%	-2.41%
Alternative	HF - Merger Arbitrage	HFRI ED: Merger Arbitrage	5.67%	3.25%	4.31%	3.63%	3.32%
Alternative	HF - Relative Value	HFRI Relative Value (Total)	5.99%	0.66%	5.14%	7.67%	-0.29%
Alternative	Japan REIT	S&P Japan	24.74%	10.29%	-7.40%	9.52%	
Alternative	Private EUR Infra. IG	Private (Markit iBoxx EUR Infrastructure)					
Alternative	Private RE Equity Asia Pac	Private real Estate Equity Asia Pac					
Alternative	Private RE Equity UK	Private real Estate Equity UK					
Alternative	Private RE Equity US	Private real Estate Equity US					
Alternative	Private USD Infra. IG	Private (Markit iBoxx USD Infrastructure Index)					
Alternative	United States REIT	FTSE NAREIT All Eqty	28.66%	-4.04%	8.67%	8.63%	2.83%
Alternative	United States REIT	S&P USA REIT	24.45%	-3.79%	4.33%	8.49%	2.54%
Alternative	US Infra. Equity	DJ Brookfield US	27.86%	-10.53%	7.39%	22.24%	-24.59%
Alternative	USD Infrastructure IG	Markit iBoxx USD Infrastructure Index	15.25%	-3.33%	7.59%	10.30%	-3.86%

*Returns referenced in this chart represent the last five years 2014-2019. It is intended to represent a snapshot in time and not exhaustive for all time periods.

Source: Bloomberg Finance L.P., DWS Investments UK Limited. As of 12/31/19. Past performance, actual or simulated, is not a reliable indicator of future results.

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