RESEARCH INSTITUTE

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DWS LONG VIEW

The return implications of climate risk

"The stock market is a device for transferring money from the impatient to the patient."

Warren Buffet[1]

The Russo-Ukrainian war is dominating news headlines as well as financial markets. Any short-term forecast is subject to a high degree of uncertainty, given the risks surrounding the course of the war and the impact of sanctions and countersanctions. Contrastingly, this publication focuses a long-term perspective.

It is likely that the current crisis will mark a turning point in Europe's post-cold-war history, and that it will shape societies, the economic environment, and thus also financial markets for a long time. Thinking about the longer-term implications of the crisis, we find that several aspects may strengthen trends that we had already expected, such as the transition to renewable energy and re-organization towards local value chains

We started the year with challenging equity valuations, inflation worries, rising interest rates and lower monetary stimulus. Although it is fair to expect a pragmatic approach for the latter two, the combination is likely to create volatility in the markets. Price pressures emerged early in 2021 as re-openings accelerated global demand against the backdrop of supply chain disruptions and commodity and labour constraints. Central bankers initially believed price pressures to be transitory, even as consumer price inflation has continued to persistent into the second half of the year. More recently, the debate has shifted more to geopolitical uncertainties, and we note that this is a risk to both the economic and inflation outlook.

Beyond the short-term dynamics and the implications of the conflict in Eastern Europe, we identify two main themes for strategic asset allocation for the next decade: (i) the potential for persistent price inflation and its impact on central bank policy and (ii) climate and sustainability-related risk and its impact on economic growth and investment returns.

Beyond the cyclical vs structural debate, inflation is a difficult topic, having multiple impacts on asset classes. For example, the higher contribution to returns from our growth pillar needs to be analysed in the context of nominal vs real returns. As returns are nominal, higher forecasted inflation haircuts the potential for real investment returns over the next decade. Questions are also being asked as to the inflationary impact of policy necessary to transition to a more sustainable economy.

As for the impact of climate and sustainability-related risks and opportunities, we focus, within this report, on measuring the associated financial and economic risk associated. Financial institutions, non-profits, and policymakers alike have proposed various frameworks[2]. Amongst them, the Bank of England ("BoE") 2021 Climate Biennial Exploratory Scenario ("CBES") analysis seeks to assess financial risks from climate change and to "assist [financial institutions] in enhancing their management of climate-related financial risks". This analysis lays out 3 scenarios: early action (early/orderly climate transition), late action (late/disorderly climate transition), and no additional action (no new policies). At a high level, delayed or no policy changes to address climate change results in higher global temperatures, lower terminal growth rates, and higher levels of risk premia across asset classes. This results in lower nominal and real potential returns in adverse climate scenarios.

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

	Forecasted returns (2022-2031)	Change from last year's 10Y forecast	Realized returns (2012-2021)
Equity			
ACWI Equities	4.5%	-0.4%	13.0%
World Equities	4.4%	-0.5%	13.6%
EM Equities	5.5%	0.6%	8.0%
US Equities	4.4%	-0.7%	16.0%
Europe Equities	4.0%	-0.5%	9.5%
Germany Equities	4.1%	-0.2%	9.6%
UK Equities	5.9%	-0.6%	6.5%
Japan Equities	3.2%	0.2%	13.1%
Fixed Income			
EUR Treasury	-0.2%	0.3%	4.0%
EUR Corporate	0.5%	0.5%	3.7%
EUR High Yield	2.4%	0.8%	7.1%
US Treasury	1.4%	0.6%	2.1%
US Corporate	1.8%	0.6%	4.7%
US High Yield	3.0%	0.7%	6.8%
EM USD Sovereign	4.5%	0.7%	4.9%
EM USD Corporate	4.2%	1.1%	5.2%
Alternatives			
World REITS	3.8%	-1.6%	10.5%
United States REITS	4.2%	-1.9%	11.2%
Global Infra. Equity	5.1%	-0.9%	8.7%
US Infra. Equity	5.0%	-1.5%	5.9%
Private RE Equity US	7.5%	0.0%	9.9%
EUR Infrastructure IG	0.6%	0.6%	3.9%
Private EUR Infra. IG	1.9%	0.8%	5.3%
Hedge Funds: Composite	2.5%	0.2%	5.8%
Broad Commodities Fut.	0.6%	0.6%	-2.9%

Source: DWS Investments UK Limited. Data as of 12/31/21. All returns (incl. forecasts) are in local currency. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

[1] https://grow.acorns.com/investing-rules-that-warren-buffett-thinks-everyone-should-follow/
[2] The Climate Risk Landscape, UN environment programme, February 2021

We have repeatedly observed that when an event such as the war in Ukraine happens, markets usually overestimate the short-term effects (thus triggering major selloffs), while the longer-term implications tend to be underestimated. Markets have proven that they can recover within a short time as soon as it becomes apparent that the situation will stop deteriorating but more often ignore longer-term changes.

What potential longer-term implications could the war in Ukraine imply? First, the conflict represents the third shock to globalization in recent years (for this purpose we would define "globalization" as the establishment of global supply chains). After the U.S.-China trade conflict and the post-COVID crisis disruptions in supply chains, the Ukraine war represents the third major blow. Once again, scarcities in certain goods have emerged within days of the beginning of the conflict. The corporate sector will respond by organizing supply chains not solely in terms of cost efficiency, but increasingly in terms of resilience, and will maintain higher inventories, which equates to lower efficiency and higher production costs. Next, the shock will trigger a substantial strengthening of military capabilities, maybe even leading to another arms race. Investments in (energy) infrastructure will increase, as will cyber security. So in a nutshell – and once again musing about the long-term implications, strong demand will meet a more locally produced and thus weakened supply side of the economy. There is no need to consult textbooks as to what this may mean for inflation - the case for persistently higher inflation rates ahead has become even stronger.

As we integrate these risks into our forecasts, we are monitoring the ongoing situation, with particular attention toward a few key considerations: (i) inflation may persist, (ii) real yields may stay low, which could sustain high equity markets, and (iii) investors will need to consider the long term erosion that inflation is causing to nominal returns particularly in fixed income and cash.

Our main findings, summarised on Table 1, suggest lower long-term returns for global equity markets versus a year ago, reflecting a high hurdle on current valuations. In fixed income markets, we show slightly higher nominal returns relative to last year, reflecting higher starting levels on yields. Private alternatives continue to offer better returns.

Within this report, we specifically focused on 3 main topics:

- ESG return forecasts
- Climate risk scenarios and potential return impact
- Inflation risks and implications over the longer term

ESG

Measuring the financial implications of ESG continues to be a priority for DWS. Evaluating the long-term implications of ESG policy implementation is paramount to achieving strategic investment goals. In 2021, we introduced our initial set of return forecasts for 13 ESG equity and fixed income indices to help investors construct strategic long-term portfolios with consideration to both traditional financial metrics as well as ESG impact metrics. Table 2 shows our updated 10-year return forecasts across these ESG and traditional indices.

Table 2: 10Y return forecasts p.a. in local currency

	ESG	Traditional
Equity		
ACWI Equities	4.6%	4.5%
World Equities	4.6%	4.4%
EM Equities	4.9%	5.5%
US Equities	5.2%	4.4%
Europe Equities	4.4%	4.0%
Japan Equities	2.7%	3.2%
Fixed Income		
EUR Treasury	-0.2%	-0.2%
EUR Corporate	0.5%	0.5%
EUR High Yield	1.9%	2.4%
US Corporate	1.9%	1.8%
US High Yield	3.1%	3.0%
EM USD Sovereign	3.2%	4.5%
EM USD Corporate	2.6%	4.2%

Source: DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

For the ESG index return forecasts, we utilize the same three-pillar approach that we use for traditional indices. The forecasted returns for these ESG indices do not therefore embed any ESG-specific factor risks, although it is reasonable to believe that the negative return implications of adverse climate scenarios we discuss in the next section may depend on the resilience of respective companies and industries to climate transition risk.

Impact of climate change on returns

Given the implications of ignoring science and the long-term impact of increasing CO2 emissions, it is prudent for investors to consider the potential impact of climate-related risks in their decision making. This aligns with the advice from Task Force on Climate-Related Financial Disclosures ("TCFD"), i.e. that "investors may consider how climate-related scenarios relate to the future performance of particular sectors, regions, or asset classes". As part of this effort, we have drawn on the Bank of England ("BoE") 2021 Climate Biennial Exploratory Scenario ("CBES")[3].

In June of 2021, the Bank of England ("BoE") engaged in an exercise to quantify the economic impact of climate change by exploring 3 main climate transition scenarios for global policymakers. The 2021 edition of the CBES framework establishes scenarios for macroeconomic growth impact related to the magnitude and pace of climate transition, while subsequent iterations of the report are intended to explore the exposure of lenders to climate-related solvency risks. The three scenarios are as follows: **early action ("EA")**, **late action ("LA")**, and **no additional action ("NAA")**.

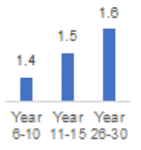
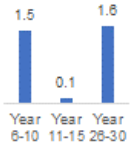
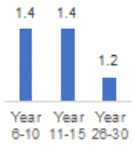
Table 3: Summary of CBES climate scenarios

Early Action (EA)
The global economy steadily decarbonizes from 2021 onward, reaching net zero CO2 emissions by 2050 and keeping global warming to within 1.8°C relative to pre-industrial levels over this timeframe.
Late Action (LA)
Net zero efforts begin in 2031, with a far more sudden regulatory and climate policy tightening path until 2050. This scenario still results in net zero CO2 emissions and a 1.8°C increase by 2050.
No Additional Action (NAA)
No new climate change policies are implemented in addition to those currently implemented. Even pledged policies are disregarded in this scenario. Global warming reaches 3.8°C by 2050, resulting in significant physical risks including rising sea levels and frequent extreme weather conditions.

Source: DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class.

While the global warming impact in the early action and late action scenarios are assumed to be the same (1.8C increase from pre-industrial levels of 2050), the macroeconomic drag of late action is far more severe due to the more compressed timeline of carbon emissions reduction across industries, with an obviously disproportionate risk allocated to carbon-intensive sectors. The BoE argues in the latter scenario, risk premia would also be expected to increase more significantly, which impacts both financial returns and cost of capital. A summary of the transition risks, physical risks, and impact on output from each of the 3 respective scenarios is provided by the CBES analysis shown in Table 4.

Table 4: Summary of impacts in the CBES scenarios

	Early Action	Late Action	No Additional Action
Transition risks	Medium	High	Limited
Transition begins in	2021	2031	n.a.
Nature of transition	Early and orderly	Late and disorderly	Only policies that were in place before 2021
Peak UK shadow carbon price (carbon tax and other policies) (2010 US$/tonne carbon dioxide equivalent	$900	$1,100	$30
Physical risks	Limited	Limited	High
Mean global warming relative to pre-industrial times by the end of scenario (°C)	1.8	1.8	3.3
Mean sea level rise in the UK (m)	0.16	0.16	0.39
Impact on output	Temporarily lower growth	Sudden contraction (recession)	Permanently lower growth and higher uncertainty
Average annual output growth in the UK (per cent)			

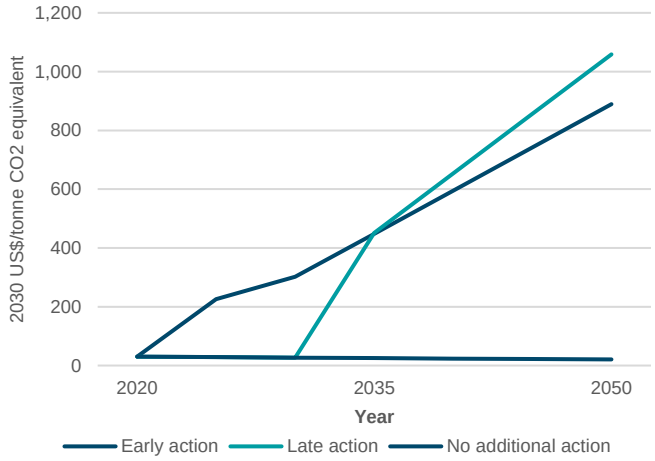
Source: Met Office, Network for Greening the Financial System and Bank calculations.

In order to conduct this exercise, the BoE's analysis is largely predicated on the theoretical price of carbon, which it defines as the "marginal abatement cost of an incremental tonne of emissions". By focusing on the shadow price of carbon, the CBES is better able to apply a standard approach across the three scenarios. Achievement of lower anticipated temperature increases depends highly on the level of carbon sequestration.

For the early action and late action scenarios, the price of carbon is expected to increase significantly by 2050. In the early action and late action scenarios, the carbon price is expected to increase from $30 to $900 and $1000, respectively, although for late action, the carbon price is assumed to remain at $30 until 2030. In the no additional action scenario, the shadow carbon price remains constant at $30. However, as previously mentioned, the economic cost of temperature increases that accompany this scenario are disastrous. Figure 1 shows the UK and EU carbon price assumptions through 2050 across the three CBES climate scenarios.

[3] https://www.bankofengland.co.uk/stress-testing/2021/key-elements-2021-biennial-exploratory-scenario-financial-risks-climate-change

Figure 1: UK and EU carbon price assumptions across scenarios



Source: Network for Greening the Financial System and Bank of England calculations.

On the topic of carbon prices, it is worth noting that, at the time of this publication, the carbon price per tonne exceeds the starting point of the BoE analysis. The ongoing growth of carbon trading has important implications for formalizing economic costs associated to these externalities. DWS's recent carbon research[4] dives into the mechanics of these innovative markets.

In the no additional action scenario, despite little transition risk faced by the corporate sector, the level of global warming (3.3C relative to pre-industrial levels) poses catastrophic physical risks for the global economy. Extreme weather (heatwaves, droughts, tropical cyclones, floods) and rising sea levels result in a much more severe adverse outcome for global GDP. This climate volatility and lower terminal growth necessitates higher risk premia across global asset classes.

The macro assumptions from the CBES scenario forecasts include several important considerations. At a high level:

- The economic drag of climate transition is not uniform across economies and sectors. In each of the 3 scenarios, the expectation is that Emerging Markets aggregate growth will be more severely inhibited given the composition of Emerging Markets economies
- In both the **EA** and **LA** scenarios, the CBES assumes fossil fuels are almost entirely replaced by renewable energy to the tune of 90% in the UK and other DMs and 70% at a global level. The global renewable energy replacement is lower as it considers the higher demand for fossil fuel in developing regions.
- The **LA** scenario poses significant inflationary risks. The accelerated transition timeline for the late action scenario could lead to stranded assets for businesses and households that will be retired before the end of their productive lives. Fixed energy supply also likely causes inflation in goods and services as well as raw materials prices. In the no additional action scenario, direct and indirect crop damage combined with reduced land and labour productivity exacerbate supply/demand imbalances, particularly in agricultural commodities.
- Risk premia are expected to rise considerably in the **LA** and **NAA** scenarios. This could mean an upward bias in interest rates and wider structural spreads across credit markets. Any resulting increase in cost of capital poses headwinds to profitability.

[4] DWS Group. (February 2022). "Emission impossible: opportunities in carbon".

Translating macro assumptions into return impact

The CBES provides macroeconomic data modelled for each of the three scenarios based on a subset of the Network for Greening the Financial System ("NGFS") climate scenarios which are used to estimate the impact of climate risk in each of the respective scenarios on long-term returns across major regional equity and fixed income indices with a modest degree of precision. These pathways include time series of economic and market variables across several economies for the three scenarios. We combined the results of these pathways with our Long View methodology to generate scenario return forecasts for a key subset of global indices. When interpreting these forecasts, certain considerations should be made:

- The BoE does not provide explicit probabilities for the 3 scenarios. However, macroeconomic and financial assumptions in the **EA** scenario map most closely to our Long View base case.
- Sector and industry shifts across regional equity and credit markets are outside of the scope of this initial analysis. While these considerations are important, the impact should be modest over a longer time frame, in our view.
- The impact of scenarios on equity forecasts is largely twofold: (i) changes in the economic growth and inflation outlook and (ii) lower terminal P/E multiple in **LA** and **NAA** scenarios, consistent with higher debt cost of capital
- the CBES forecasts do not reflect material changes to economic and financial conditions until 2030-2050 (particularly in the late action and no additional actions scenarios). Our return estimates reflect this timeline.
- The CBES pathways cover a range of, but not all, developed markets. We therefore only present forecasts for some regions and countries.

Table 5 shows return forecasts for the three climate scenarios.

Table 5: Climate scenario return forecasts p.a. for 2020-2050

	Early Action	Late Action	No Additional Action
Equity			
US Equities	4.1%	4.2%	2.5%
Eurozone Equities	3.3%	3.4%	2.1%
UK Equities	6.0%	5.9%	5.0%
Japan Equities	3.1%	3.1%	1.6%
Fixed Income			
US Treasury	1.8%	1.6%	1.6%
Germany Treasury	0.3%	0.2%	0.2%
US Corporate	2.4%	2.3%	2.2%
US High Yield	3.7%	3.4%	1.4%

Source: DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Methodology

The BoE has modelled for their three scenarios in the 2021 CBES the impact on a range of macroeconomic and financial factors, based on the underlying fundamental data of the corresponding NGFS scenarios for key transition variables (including electricity mix, energy demand, fuel consumption, CO2 capturing, emissions of agriculture etc[5]). For our purposes, it is especially important that these scenarios also simulated pathways for macroeconomic factors until 2050, including:

- Real GDP (for key economies including the US, Eurozone, UK, Japan and China);
- Inflation (for the UK and Eurozone);
- Short-term policy interest rates (for the US, Eurozone and UK); and
- Commercial real estate prices (for the US, Eurozone and UK).

Moreover, the estimated impact on selected financial assets (such as short- and long-term government bond yields and USD corporate bond spreads) is also explicitly included in each BoE scenario.

We leverage the modelled pathways for these indicators in each scenario and combine them with our DWS long-term capital market assumptions (LTCMA) model which seeks to estimate asset class returns for key asset classes (including regional segments) based on a combination of top-down and bottom-up data[6]. For example, our long-term return expectation for equity markets (regional and global) is based on contributions from income, growth and valuation pillars, where

- Income refers to the contributions of dividends and buybacks (net of dilutions) to total returns;
- Growth refers to nominal earnings growth for equity markets in aggregate (which we proxy in our LTCMA model using a combination of inflation expectations and proprietary estimates for trend real GDP growth, based on population growth, productivity and labour force participation rates);
- Valuation contribution to long-term equity market returns is based on an assumed mean-reversion of cyclically adjusted long-term P/E ratios over sufficiently long horizons of 10 years or more.

We adjust some of these input metrics (especially those driven by macro factors) by the modelled pathways in the relevant BoE scenarios, resulting in an estimate of how asset class returns vary in the three scenarios versus our base case.

[55] See https://www.ngfs.net/ngfs-scenarios-portal/explore/
[666] Please refer to https://www.dws.com/en-gb/insights/global-research-institute/dws-long-view-20210225/ for the 31 Dec 2020 LTCMA results and a detailed description of our LTCMA framework and methodology

Equities

The return impact on equities is twofold. More moderate levels of GDP growth drag on equity return forecasts in the LA and NAA scenarios, and more drastic negative valuation adjustments reflect increased fundamental risk for corporate earnings.

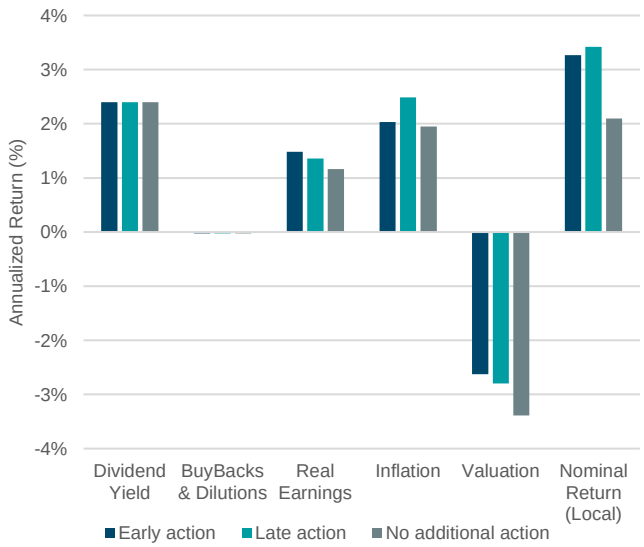
- Within the growth pillar, a simple translation of lower real GDP growth into lower real earnings contributes to lower returns in the **NAA** and **LA** scenarios.
- On valuation, we translate the impact of higher debt cost of capital indicated by the BoE's investment grade corporate bond spread forecasts for the **NAA** and **LA** scenarios into lower steady state Shiller P/E multiples.

Other assumptions we incorporate into these pillars include:

- Dividend and buyback yields are assumed to be the same across scenarios. Assumptions about the sector composition and corresponding company or industry specific impact are outside of the scope of this analysis.
- The BoE does not explicitly provide US inflation forecasts. Thus, we directly translate the differential between scenarios shown in the Eurozone forecast into US inflation (e.g. the difference between **LA** and **EA** inflation in the Eurozone is added to the **EA** inflation assumption for the US in order to calculate **LA** inflation).

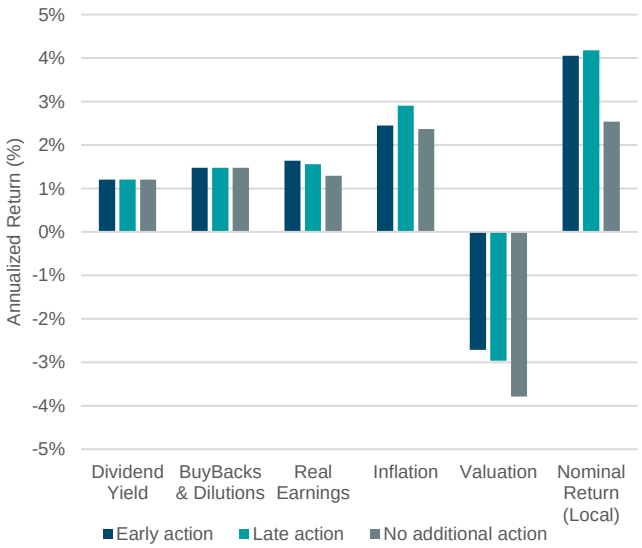
The return impact of these considerations for European and US equities are shown in Figure 2 and Figure 3.

Figure 2: Euro Stoxx 50: Contribution to forecasted hypothetical annualized returns across scenarios (2020-2050)



Source: DWS Investments UK Limited. Data as of 12/31/21. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 3: MSCI USA: Contribution to forecasted hypothetical annualized returns across scenarios (2020-2050)



Source: DWS Investments UK Limited. Data as of 12/31/21. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Across regions, the **NAA** return forecasts are lower in both nominal and real terms, reflecting both lower economic and real earnings growth as well as higher structural cost of capital. While the **LA** scenario nominal forecasts are incrementally above the **EA** scenario, they are modestly lower in real terms given the highest inflation expectations in **LA**. Additionally, the **LA** scenario exhibits higher realized volatility, particularly in 2030-2040 during the period of accelerated climate policy action.

Fixed Income

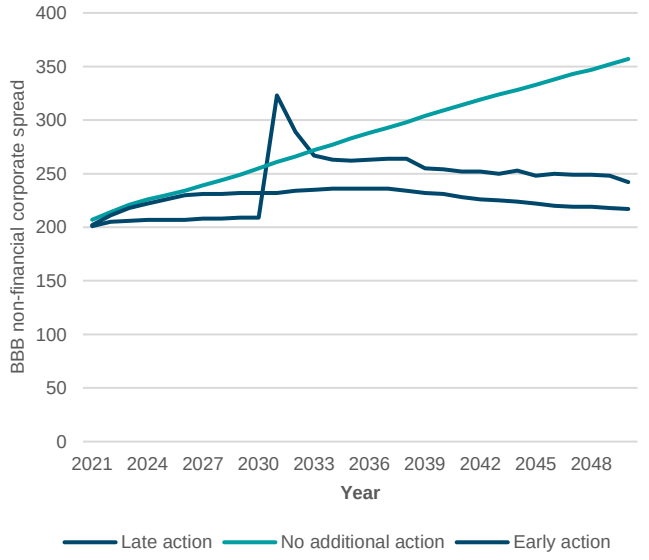
The sovereign yield and credit spread pathways provided by the BoE analysis suggest several key considerations for long-term fixed income returns:

- **NAA** credit spreads widen linearly throughout the time series. **LA** spreads stay flat through 2030 and abruptly rise in the beginning of the compressed climate policy period before moderating over the remaining period. **EA** spreads remain largely flat through the entire period.
- Sovereign yield curves in the **NAA** and **LA** scenarios are far steeper relative to **EA**. Particularly as the **NAA** assumptions for inflation are lower than **EA**, higher term premia suggest non-zero default loss assumptions, consistent with broad macroeconomic stress.
- Credit migration and credit default are merged into credit impact. The BOE pathway shows modest to significant credit spread widening in the **LA** and **NAA** scenarios, which would imply significant default and ratings migration absent material changes to credit rating standards. To capture this impact, default loss assumptions are based on the default probability in the current default matrix that corresponds to the credit spread (e.g. the **NAA** spread

levels in 2050 correspond to 22% CCC and 78% CC using the current ratings spread levels, for which this ratings composition is used to, in combination with historical recovery rates, used to estimate default losses.

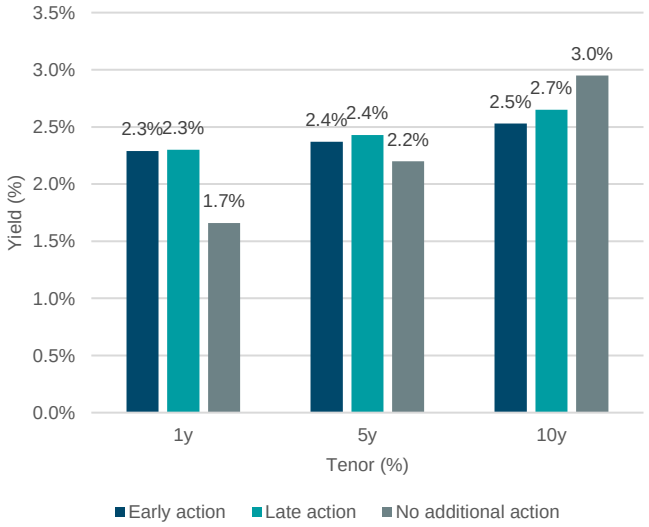
Figure 4 illustrates the pathway of BBB non-financial corporate credit spreads across climate scenarios. Figure 5Figure 6 shows US Treasury 1, 5, and 10-year yields across the three scenarios.

Figure 4: USD BBB non-financial corporate bond spread



Source: Bank of England as of 6/8/21.

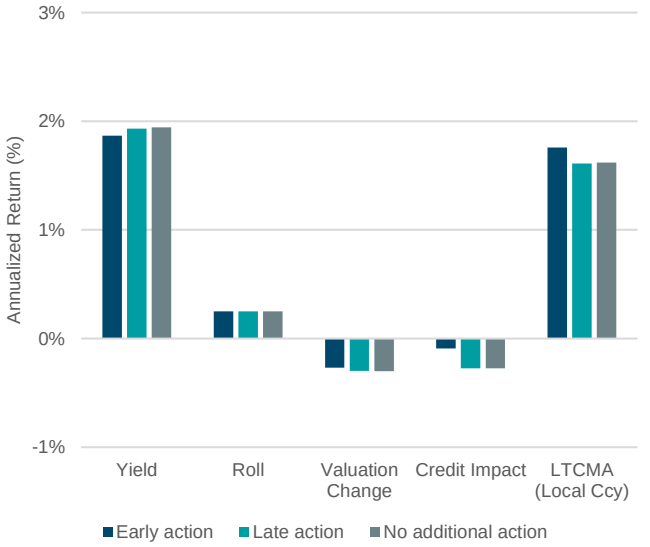
Figure 5: 2050 Treasury yield assumptions across scenarios



Source: Bank of England as of 6/8/21.

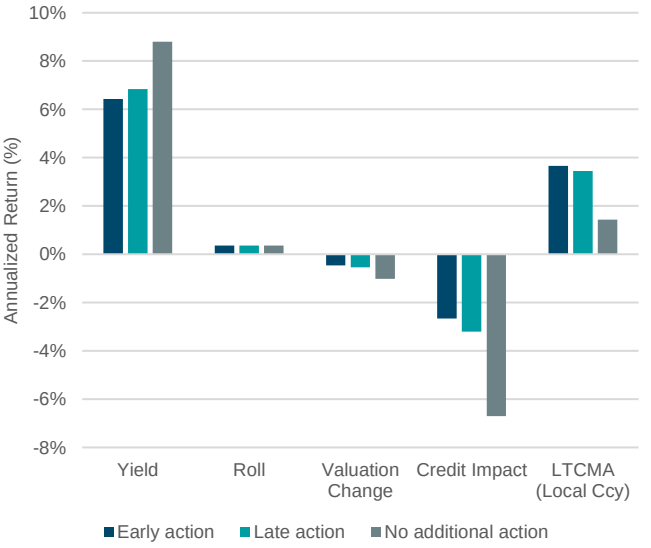
The return impact of these considerations is shown for US Treasuries, and US High Yield in Figure 6 and Figure 7, respectively.

Figure 6: US Treasury: Contribution to forecasted hypothetical annualized returns across scenarios (2020-2050)



Source: DWS Investments UK Limited. Data as of 12/31/21. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 7: US High Yield: Contribution to forecasted hypothetical annualized returns across scenarios (2020-2050)



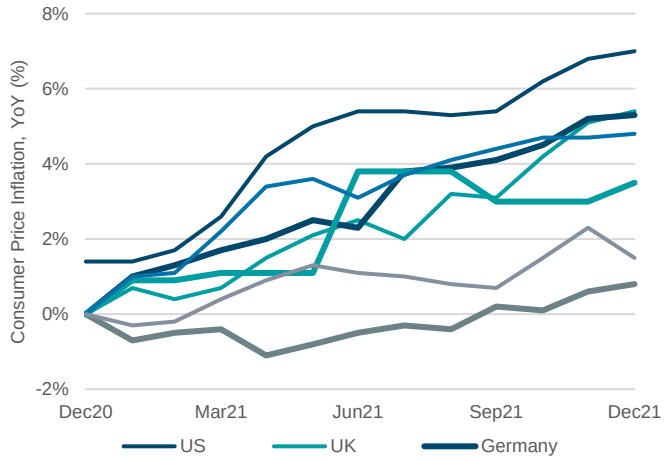
Source: DWS Investments UK Limited. Data as of 12/31/21. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

For both sovereign and credit markets, higher starting yields in **LA** and **NAA** scenarios are partially negated by valuation changes. Adverse credit impact that we model as default loss expectations drags on both sovereign and credit returns, with a more demonstrable impact on the latter. It is worth noting that, while spreads, for the most part, gradually normalize in the **LA** scenario, **NAA** is expected to create persistent sovereign and credit default risk well beyond 2050.

Inflation and central bank policy

Across most countries, inflation rates have risen to the highest levels in decades. Coming into 2022, priced pressures have turned out be far stickier than previously thought by most economists and central bankers. Considering impact of Russo-Ukrainian war, these price risks are skewed to the upside. Figure 8 illustrates the acceleration in consumer prices across major economies throughout the past year.

Figure 8: Consumer Price Inflation, YoY (%)



Source: Bloomberg Finance L.P. Data as of 12/21/20.

There are six factors that have driven up inflation—three temporary and three more permanent.

First, inflation is impacted by some one-off effects. A prime example of this is the temporary reduction of German VAT rates from July to December 2020 which led to lower inflation rates during that period but eventually to substantially higher year-on-year inflation rates. Looking forward, this will no longer affect the inflation rate.

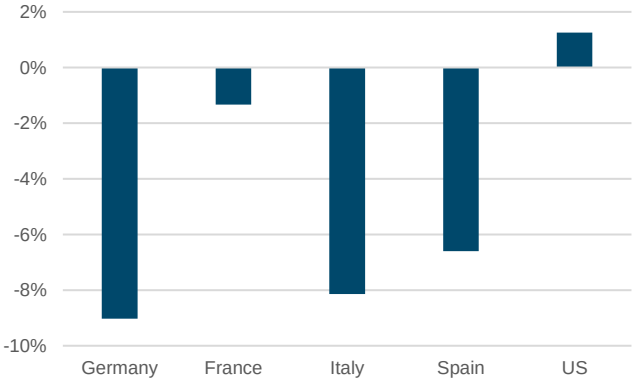
Second, there are some substantial base effects. When calculating year-on-year inflation rates, often, nominal prices are compared with extraordinarily low prices from earlier in the pandemic. That was the major cause for the high inflation rates at the beginning of their ascent in spring last year. A year prior, at the height of the pandemic, oil prices were at historic lows – even turning negative for a short while in the case of WTI.

Third, there are significant supply/demand mismatches. On the supply side of the economy, there are substantial bottlenecks due to the shutdown of many factories during the pandemic. And it takes considerable time to get the broken supply chains smooth and running again. The best-known example is the semiconductors shortage, which has led to a significant decline in global automobile production. In the U.S., the lack of new cars has sent the price for used cars to unprecedented levels. All of these effects will go away sooner or later and might turn negative, e.g., once new cars are available again, prices for used cars might even decline. But the next two reasons may push up prices potentially over a prolonged period.

Fourth, the fight against climate change will put upward pressure on prices or a while. In order to internalize the external costs of carbon emission and other pollution, surcharges are likely to be raised all over the world, in the form of taxes, levies, or certificates. As of now, only a limited percentage of emissions are covered. The more goods fall under these emission schemes and the lower the emission targets are, the higher the impact on inflation will be. These administered price increases should fuel inflation for the foreseeable future. But there is a secondary effect of the greening of the economy. Investments in fossil fuel exploitation and infrastructure needed to get the fuels distributed, such as pipeline, ports etc., usually amortize over very long time horizons. However, with net-zero targets moving closer it becomes more and more obvious that demand for fossil fuels will drop substantially, likely within the next decade. The time horizon in which these investments must amortize is becoming much shorter. Hence, prices for these commodities should go up.

Fifth, demographic change starts to bite. Across most of the developed world, the working age population, i.e., the population between 15 and 65, will start to, or has already, declined. This will lead to a shortage of labor, and wages should start to rise more than in the recent past. Figure 9 shows the United Nations forecast of the change in working-age population from 2022 to 2032.

Figure 9: Change in working age population from 2022-2032



Source: United Nations Population Prospects, Haver Analytics Inc. as of 02/23/22.

Finally, there is a risk of a feedback loop, namely a wage-price spiral. In the U.S., the price increases are not confined to single product groups any longer but are broad based. This in turn might feed into higher inflation expectations and eventually higher wages which then will make service price inflation go up.

Taken together, there were good reasons to assume that inflation figures would come down from their current highs over an intermediate timeframe. This outlook, however, is

complicated by the Russian invasion of Ukraine that has seen in spike in several commodities, given the role that Russia plays in many of the metals markets, but also Ukraine plays on the agricultural front. Beyond the full implications that still need to be assessed, our view was, at the beginning of the year, that in all likelihood, inflation would not be likely to return to the low levels of before the crisis but should rather settle at levels above the 2% target of central banks. Any factors, in addition to the Ukraine conflict, need to be added, such as the potential further increase in the carbon prices resulting from an acceleration of the decarbonization path.

Central Banks

In contrast to the monetary policy outlook coming into 2021, central banks led by the Federal Reserve ("Fed") have pivoted to a decidedly hawkish tone. Persistent price pressures have forced monetary policymakers to reverse course on their views that inflationary pressures were largely transitory. While certain components of consumer prices are expected to moderate in the coming quarters, economic consensus sees inflation continuing well above central bank targets at least through the end of 2022.

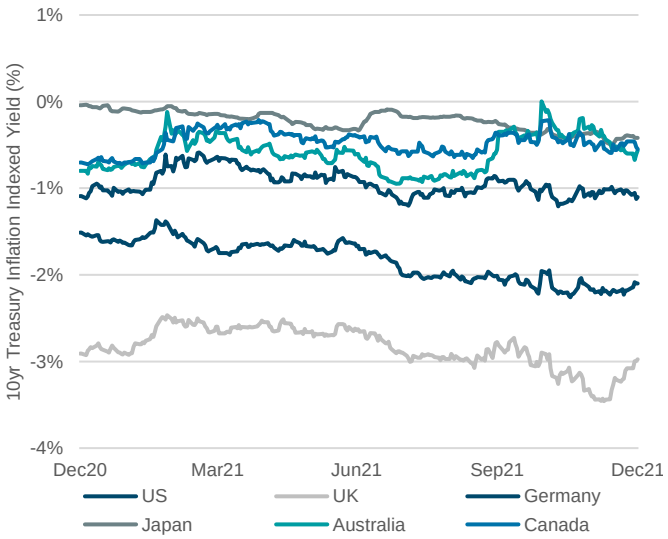
Supply chain constraints have shown signs of easing, with delivery times moderating in recent weeks. Nonetheless, according to the Fed's January minutes, "supply and demand imbalances related to the pandemic and the reopening of the economy have continued to contribute to elevated levels of inflation".

Despite the shift in central bank messaging, long-term interest rates remained well below historical averages. As a result, real medium and longer-term yields remain in significant negative territory across most if not all developed sovereignties. Figure 10 shows 10-year real interest sovereign yield across a few large developed economies.

Economists continue to debate the terminal level of price inflation. Nonetheless, we feel the strategic outlook for inflation remains biased to the upside. While supply chain issues are likely to dissipate over time, it is reasonable to expect some rationalization of the current supply chain and its susceptibility to regional disruptions. Further, if global economies engage in necessary carbon reduction policies, this will have inflation effects. More immediately, labor market shortages have already begun pushing up wages, especially in the lower income brackets in the US.

In the euro area, inflation has also been driven to unprecedented levels. But, in contrast to the U.S, price pressures have almost entirely been due to higher energy prices. This trend will most likely be accelerated by the Russo-Ukrainian war which could additionally push up food prices. However, wage growth in the euro area is still muted, and there are, thus far, few signs of a wage-price spiral. Together, will the extreme level of geopolitical uncertainty within Europe, the ECB will probably need much longer than its transatlantic counterpart before it raises interest rates to any significant degree.

Figure 10: 10-year sovereign bond yields across developed markets



Source: Bloomberg Finance L.P. Data as of 12/31/21.

Implications for (real) yields

All this constitute good reasons to assume that central banks might have to act more fiercely than they currently have communicated. This might lead to higher yields. However, as of now it seems reasonable to assume that long term yields will stay below inflation. Hence, even though there is a high degree of uncertainty regarding the long-term level of yields and inflation, it is quite realistic that real yields will stay negative over most of our forecast horizon.

Inflation has no direct effect on the equity risk premium, but higher levels of inflation are normally associated with greater uncertainty, and that can push up the risk premium.

Higher forecasted returns across private alternatives

Entering 2022, our strategic return forecasts remain low both in real terms and relative to history. Across equity markets, forecasted annual global equity returns are 4.5%, with emerging markets (5.5%) above developed markets (4.4%). Valuations continue to be an obstacle for equity investors. Segments of the alternative equity universe offer a more sanguine outlook. US Private RE equity (7.5%) in particular offers the highest return potential for investors.

Within fixed-income markets, modestly higher starting nominal yield levels improve return forecasts on the margin versus a year ago. However, inflation forecasts and market pricing for the next decade have also risen to reflect the expectation of elevated price pressures to the potential detriment of fixed-rate investments. Forecasts for US Treasuries (1.4%) and Euro Treasuries (-0.2%) reflect these higher yields. Corporate credit return forecasts are also modestly higher despite tighter

spreads, reflecting both higher risk-free rates and the further normalization of credit conditions following the peak of the COVID-19 crisis. With credit markets, US High Yield (3.0%) and EM USD Sovereigns (4.5%) offer higher forecasted returns relative to a year ago.

Despite rising inflation expectations, commodity return forecasts (0.6%) remain somewhat muted over a 10-year time horizon. Negative roll return and a modest valuation hurdle counteract higher levels of forecasted inflation.

The Long View

Entering 2022, 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.

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Executive summary

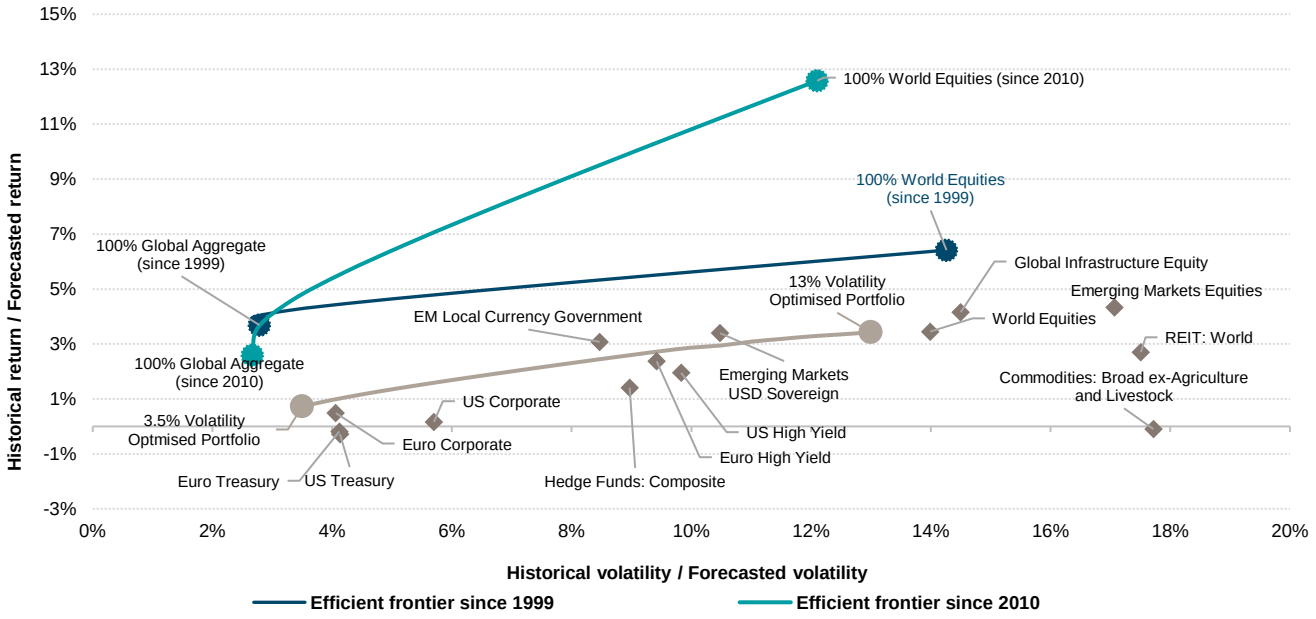
Two years into the COVID-19 crisis, the residual effects of lockdowns are being felt across different segments of the global economy. Price pressures remain stickier than previously expected as supply chain and labor shortage issues are exacerbated by the sharp rebound in consumer demand. Labor markets have tightened considerably, and while labor participation remains below pre-COVID levels, wages have accelerated noticeably in recent quarters. Central bankers have appropriately shifted toward more hawkish monetary guidance, at a pace markedly faster than markets anticipated. Most importantly, the timeliness of addressing climate change, and the implications of not doing so, has shifted into view for policymakers and investors.

At the outset of the year, asset prices remain elevated relative to history, reflecting strong economic and corporate fundamentals within an environment of continued easy global monetary policy. As central bankers shift toward modest quantitative tightening, the pace of normalization across asset valuations remains a key question for investors. Over a strategic time horizon, global growth prospects remain challenged, particularly across developed economies, due to intensifying demographic shifts as baby boomers continue to retire and working-age populations continue to shrink.

Valuations across asset classes remain rich as well, as equity multiples continue to be elevated above historical averages and corporate and sovereign credit spreads trade historically tight. While sovereign bond yields have moved modestly higher, interest rates in real terms—adjusted for market-priced inflation, continue to be in negative territory across most developed markets. These higher levels on inflation pricing across even longer-term structures have historically implied steeper term premiums across sovereign yield curves. Quantitative tightening presents additional upside risks to interest rates. 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 must make between risk and returns. Figure 11 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.

Figure 11: Efficient frontiers: 10 year 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 12/31/21. 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 29 for more details on these optimisation techniques). Source: DWS Investments UK Limited. Data as of 12/31/21. 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 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.

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. The prevalence of ESG investing over the past year alone has been quite dramatic across almost all segments of asset markets and will continue to be a building block for investor portfolios. Thus, we incorporate a number of important regional ESG indices into our return forecasts.

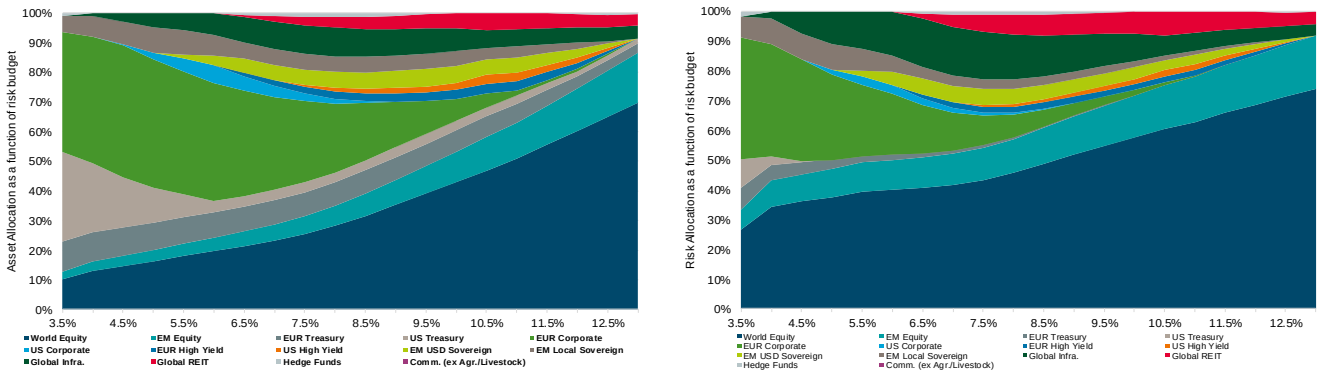
This publication details the long-term capital market views that underpin the strategic allocations for DWS's multi-asset portfolios. These estimates are based on 10-year models and should not be compared with the 12-month forecasts published in the DWS CIO View.

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 13: while risk still matters and there is still a distribution of investment outcomes around any central forecast, this distribution has tended to become narrower when investing for longer investment horizons. One consequence of this is that entry points become less relevant (even though of course by no means irrelevant) for longer investment horizons (because cyclical and tactical drivers are overtaken by fundamental, structural drivers of asset class returns).For example, we believe that many asset-class valuations are high today relative to history. But taking one of the biggest previous bubbles (the dot.com boom) as an example, 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 when investing with a 15-year time horizon (as we show on page 20). However, 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.

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.

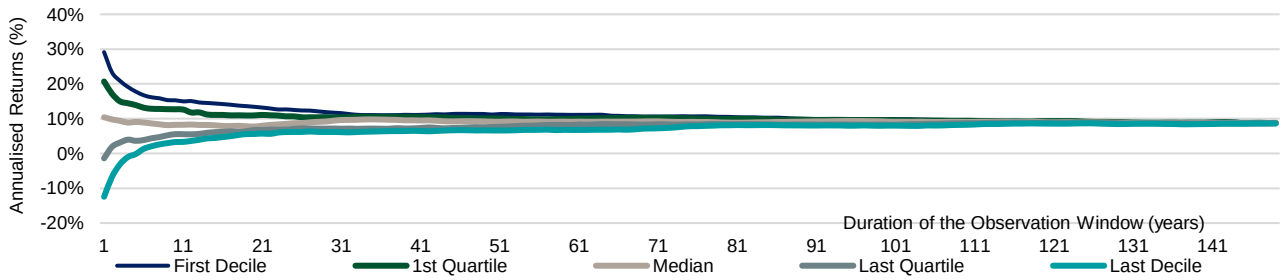
Hence, sceptics may be surprised to learn that the volatility of returns historically has been lower when using long-term horizons, although past performance may not be indicative of future results.

Figure 12: Asset allocation and risk allocation by target volatility



Source: DWS Investments UK Limited. Data as of 12/31/21. For illustrative purposes only. See page 29 for details. See appendix for the representative index corresponding to each asset class.

Figure 13: Distribution of U.S. equities: Historical returns over different time periods, annualised



Source: Robert J. Shiller, DWS Investments UK Limited. Data from 1871 to 2021.

[7]Forecasts are not a reliable indicator of future returns. 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 indication of future performance.

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 three main pillars: 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) are show in Figure 14.

Meanwhile, alternative asset classes under our coverage (listed real estate, private real estate, real estate debt, listed infrastructure equity 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 14: 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 12/31/21.

Figure 15: 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 12/31/21.

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 return within each asset class.

In summary, we make the following key observations from the results:

- Return forecasts in almost all asset classes are well below the returns achieved over the past decade, illustrating ongoing challenges for long-term investors.
- Across regional equity markets, the US and emerging markets are expected to offer the highest forecasted returns.
- ESG equity forecasts are modestly higher than are market cap-weighted indices across regions (see Table 2).
- Fixed income returns may be challenging, with emerging-market U.S. dollar (USD) sovereign and corporate bonds appearing to offer the highest forecasted returns.

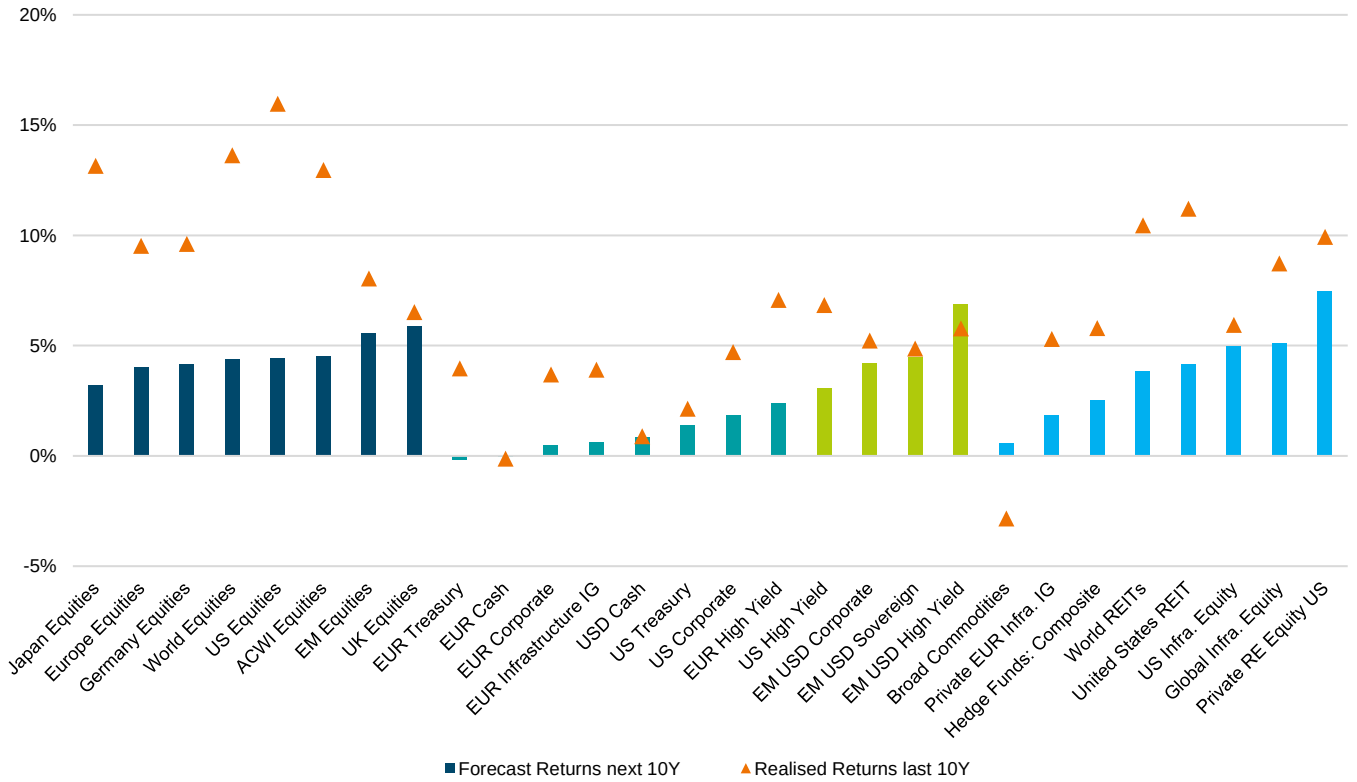
Relative to history, the return forecasts for credit (across IG and HY corporates as well as sovereign and corporate EMD) are near or below the lowest 10-year returns realized by these asset classes over the past several decades, including the financial crisis.

Relative to many other asset classes, we forecast higher returns in many of the alternative asset classes covered (even though this premium has shrunk somewhat versus traditional risky asset classes); the highest return forecast in the major asset classes is currently found in private real estate.

Return forecasts from commodities are low (especially in real terms) but they could provide useful diversification benefits.

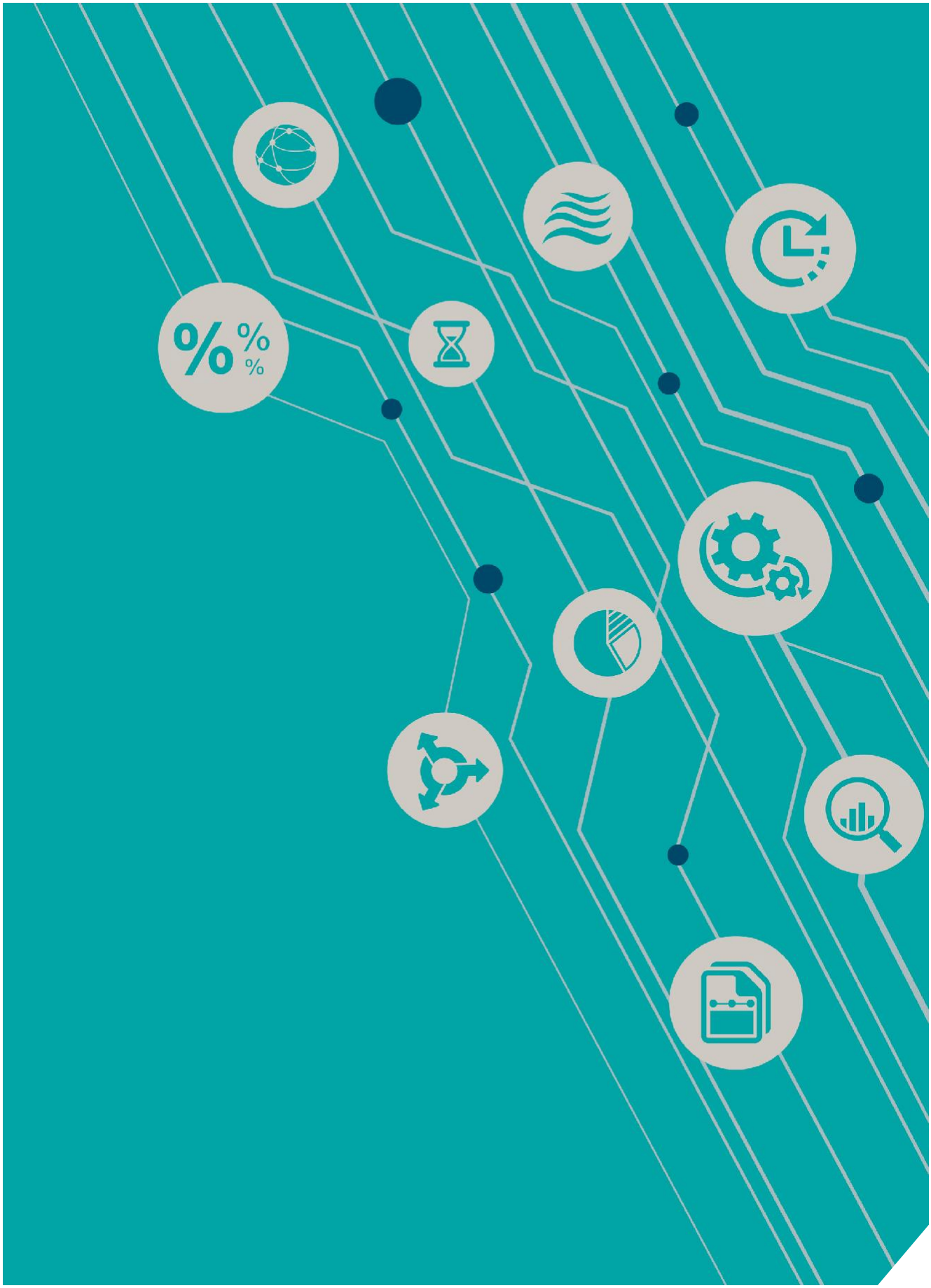
Investors should be conscious of the impact of foreign-exchange (forex) risk on base-currency returns and volatilities. Depending on risk appetite and return objectives, investors may want to consider hedging currency risk.

Figure 16: Forecast and realised returns for 10 years, annualised (local currency)



Source: DWS Investments UK Limited. As of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. 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 indication of future performance. 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 investors could enjoy less volatility

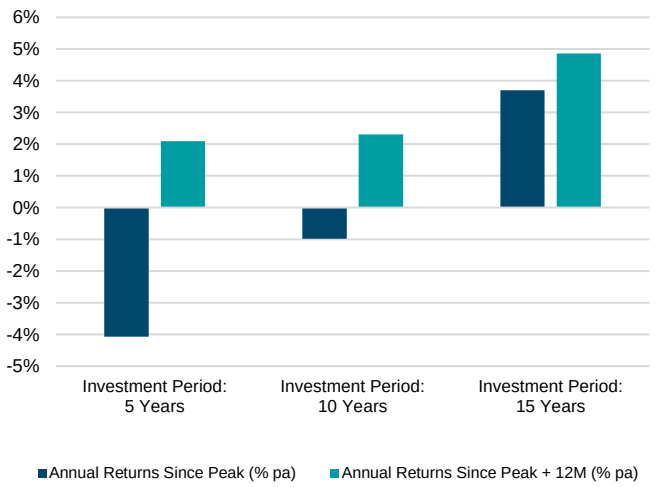
A long-term view reduces the problem of market timing

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[8] available for each asset class.

To illustrate this, Figure 17 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 17: 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 17 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.9 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. These portfolio allocation decisions are of course not time-independent: a strategic asset allocation crucially depends on long-term expectations for return and risk (and these evolve over time), but the key is that taking a long view enables investors to focus on how to invest rather than whether or when to invest (which may be the overriding concerns for short horizons). For many investors, not being invested in financial markets at all for long periods is not an option.

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 timeframe for a full market cycle to occur.

[8] 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.
[9] 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, [actual or simulated], is not a reliable indication of future performance.

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

Consider the performance of U.S. equities since 1871 (Figure 18) based on Robert Shiller data.[10]

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 18 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[11] losses.

To quantify historical return versus short-term risk, Figure 19 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

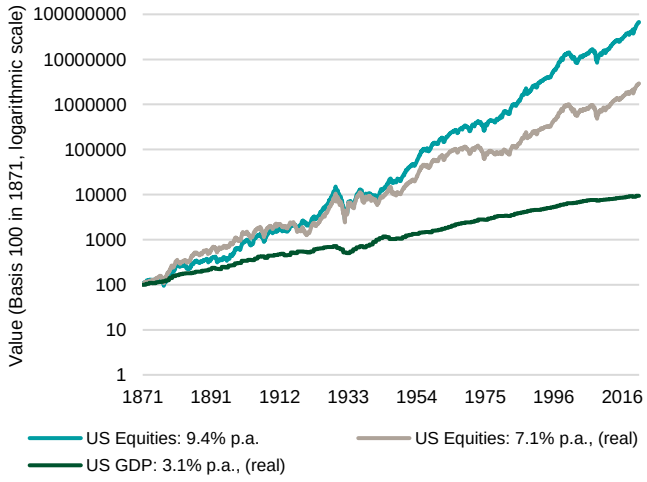
How does the Long View's ten-year time frame look in terms of return stability? Table 6 provides average and various standard deviation levels across different time periods for U.S. equity investors. As can be seen, the range of returns becomes narrower as the time horizon increases.

Table 6: Average and standard deviation of realised U.S. equity returns over different time periods, annualised

Maturity (year)	1	5	10
Average (IRR) – 2 St Dev	–27.2%	–6.0%	–0.4%
Average (IRR) – 1 St Dev	–9.2%	1.4%	4.2%
Average (IRR)	8.8%	8.7%	8.8%
Average (IRR) + 1 St Dev	26.9%	16.1%	13.4%
Average (IRR) + 2 St Dev	44.9%	23.4%	17.9%

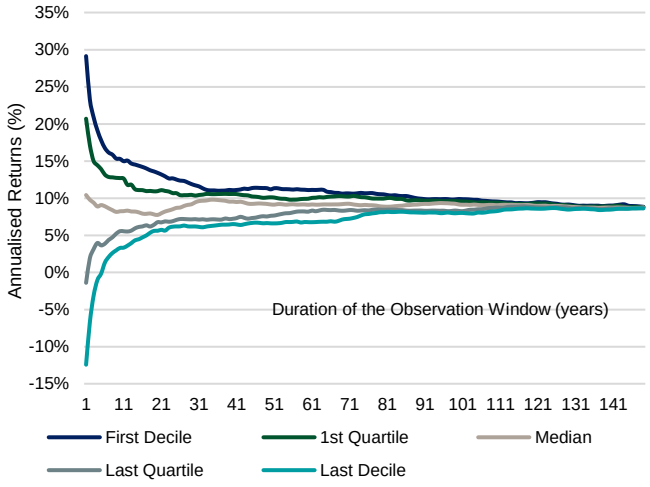
Source: Robert J. Shiller, DWS Investments UK Limited. U.S. equity returns for respective time periods between 1871 and 2020 Data as of 12/31/21

Figure 18: U.S. equity returns and U.S. GDP growth (1871–2021)



Total-return performance represented by S&P 500 TR
Source: Robert J. Shiller, Maddison Project Database 2021, DWS Investments UK Limited.

Figure 19: The longer the holding period, the more consistent the average return of U.S. equities (January 1871 to December 2021)



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

[10] Long-term U.S. equities data is available at (Shiller, Online Data Robert Shiller 2021) and long-term macro-economic data is sourced from (Maddison 2020).
[11] "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, [actual or simulated], is not a reliable indication of future performance.

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

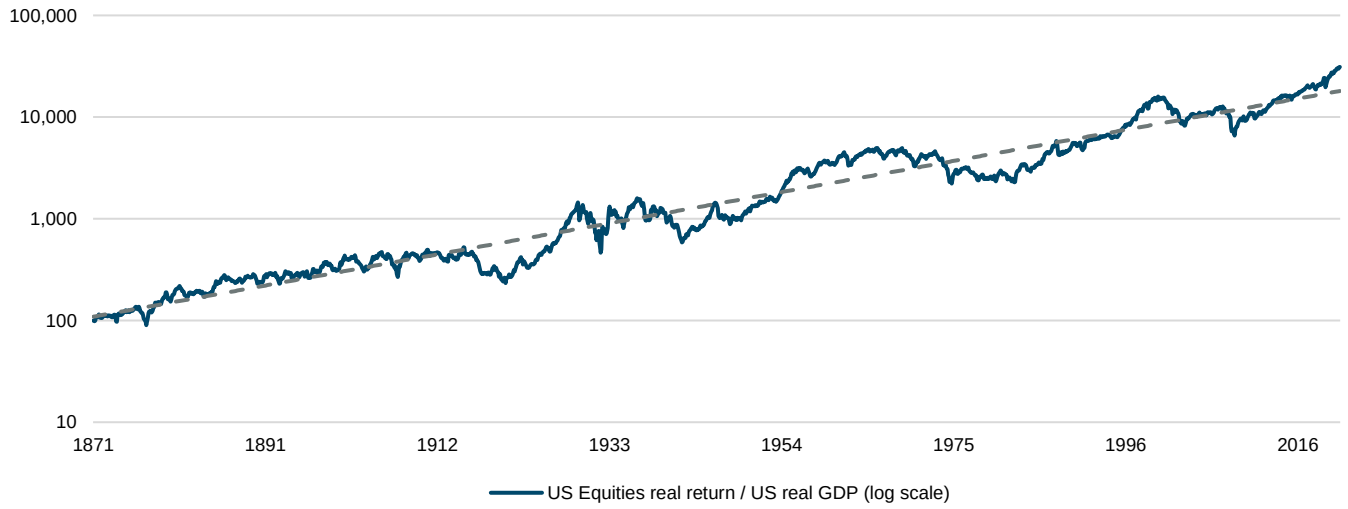
Equity returns as a function of economic growth

Many believe forecasting market returns is a fool's errand, but over extended time horizons it has been shown that returns have historically tended 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 20 suggests that U.S. equities outperform economic growth over the long run by 3.7 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.

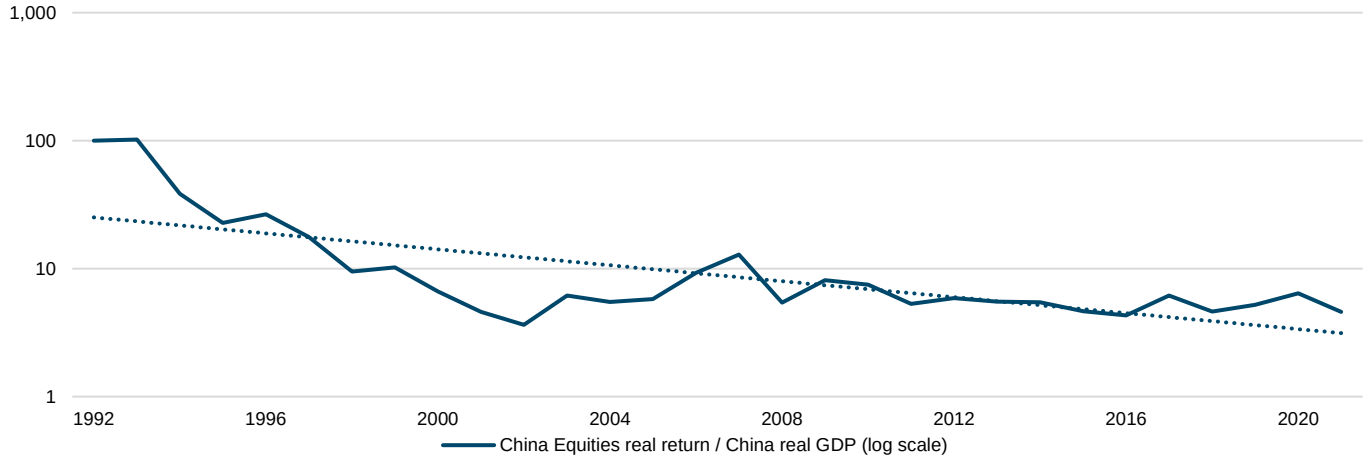
In emerging markets, however, our analysis suggests that for certain countries, GDP growth has not translated proportionately into earnings growth for broader equity indices (see the ratio for the MSCI China in Figure 21 as an example). One potential reason for this divergence, in our view, is the difference in the structure of the economy and the composition of equity benchmarks.

Figure 20: The ratio between the real total return of U.S. equities and U.S. real GDP has grown at 3.9% (1871-2021), log scaled and indexed: 01/1871 = 100



Source: Robert J. Shiller, Maddison Project Database 2020, DWS Investments UK Limited. Data from 1871 to 2021.

Figure 21: The ratio between the real total return of MSCI China and China real GDP growth (1992-2021), log scaled, indexed: 01/1992 = 100



Source: Bloomberg Finance L.P., IMF World Economic Database, DWS data as of 1992 to 2021.

An equity forecast

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 22.

Figure 22: Pillar decomposition: Equities

Source: DWS Investments UK Limited. As of 12/31/20.

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

- For historical 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

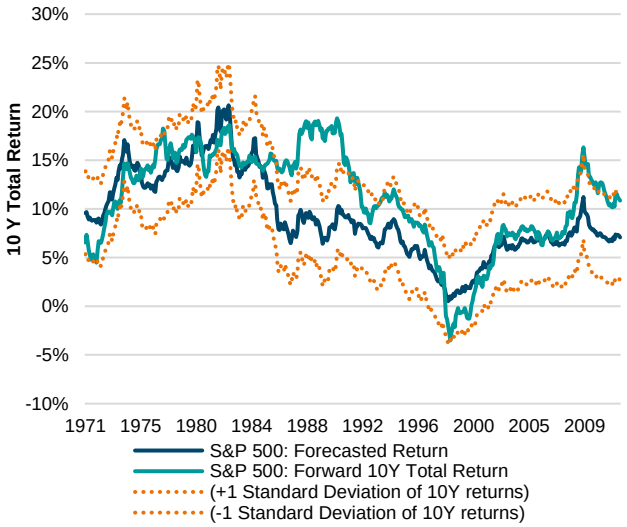
The results suggest the return forecast of our Long View equity methodology appears to provide a reasonable estimate of future performance. Figure 23 shows the return forecasts versus realised returns. While there are periods where divergence exceeds one standard deviation, we would highlight two statistics 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 23 illustrates what investors may observe from our ten-year forecast methodology: a reasonable indicator of long-run market trends.

Figure 23: Our forecast would have provided estimates for U.S. equity returns within one standard deviation (1971 through 2011)



Total return performance represented by S&P 500 TR. Source: Robert J. Shiller, Maddison Project Database 2021, DWS Investments UK Limited. Data from 1971 to 201. 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 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-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

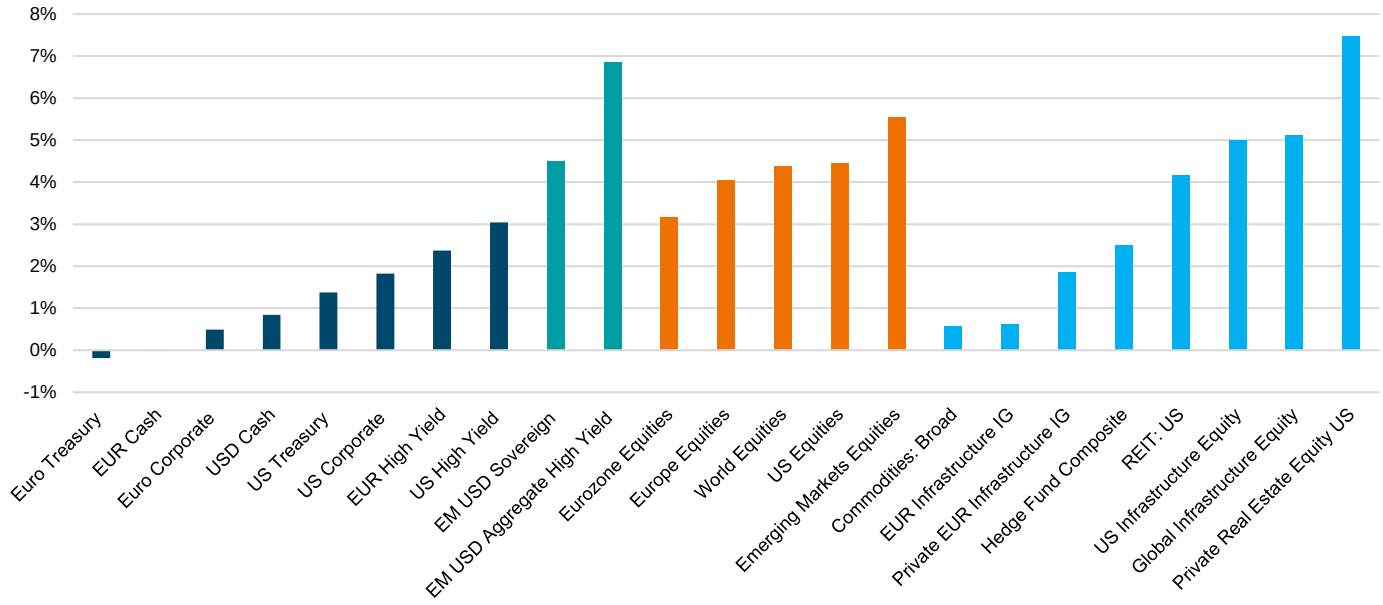
Our forecasted returns for the next decade

In this section, we summarize our Long View forecasts. Figure 24 shows the total-return forecasts for each asset class.[12]

Across asset classes, returns look disappointing in both absolute and real terms. Return forecasts for global equity markets fall short of 5 percent per annum and across many developed markets are even lower in local-currency terms. Fixed-income returns offer perhaps an even less rosy outlook, with sovereign bond forecasted returns below 1 percent (and in some cases, negative) and US high yield and emerging markets sovereign bonds at 3.0 percent and 4.5 percent, respectively. For context, this would put total returns on US high yield into the lowest percentile of all 10-year returns since 1983 (with only the decade to the peak of the financial crisis delivering even lower total returns). US investment grade corporates offer an even more drastic example: our current forecasted 10-year return of 1.8 percent is less than half of the lowest realized 10-year return for US IG since at least 1973 (even the decade prior to 2008 saw an annual return of 3.7 percent).

Among the riskier assets, segments of alternative assets are still expected to offer a somewhat compelling—albeit shrinking—value proposition. US Private RE equity (7.5 percent) and US Infrastructure Equity (5.0 percent), in particular, are expected to offer higher forecasted returns, along with their global peers in these asset classes. However, return forecasts in alternative fixed income as well as in hedge funds are also low.

Figure 24: Long-term (10-year) forecasted returns for the next decade, annualised (local currency)



Source DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class.

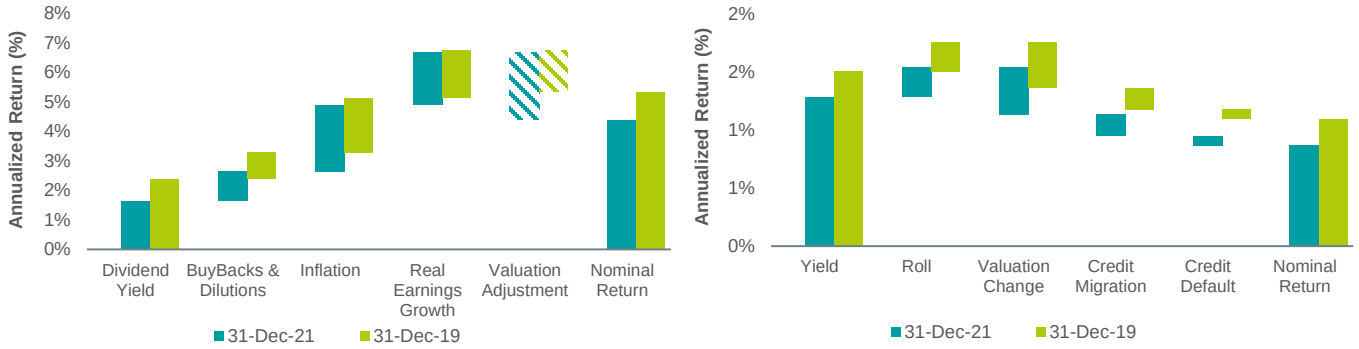
Comparing our return forecasts to those in the first edition of this report two years ago illustrates the trend lower in forecasted returns across both global equities and global bond markets (see Figure 25). In equities, compression across components of the income pillar and a more challenging valuation landscape have lowered the outlook for nominal returns.

Across fixed income markets, lower starting risk-free yield levels reflect the significant monetary stimulus provided by global central banks in response to the COVID-19 crisis. Credit spreads, while offering some yield pickup over sovereign bonds, also face continued fundamental weakness at least in the immediate term. Notably, the gap between forecasted returns for fixed income and equity are not obviously driven by inflation expectations which remain fairly muted thus far. In a scenario where inflationary pressures do build up over the

[12] Please see from page 32 for an exhaustive explanation on how we have formed these long term return estimates.
Past performance, [actual or simulated], is not a reliable indication of future performance. 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.

longer term, these nominal assets would face further challenges relative to equities and alternative asset classes.

Figure 25: 10 year forecasted total returns for MSCI World (Left) and Global Aggregate Bond Index (Right) now vs two years ago, annualised and in local currency, with the contributions from individual pillars



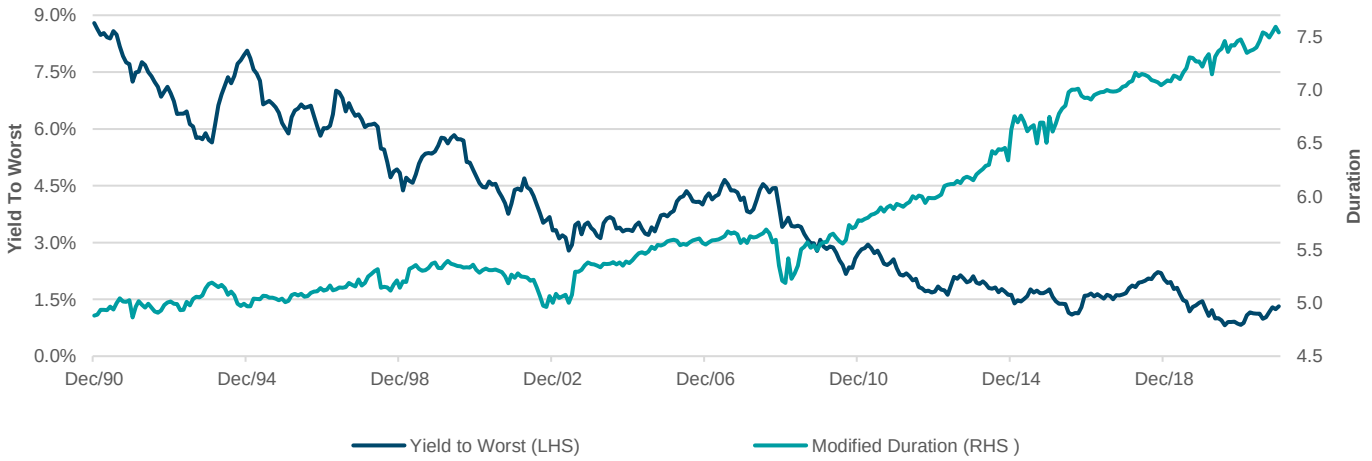
Source DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

This decline in the return prospects for many (especially income-yielding) asset classes is arguably a structural phenomenon which goes beyond the effects of the pandemic or the longer-term consequences of central bank policy: an ageing population in many parts of the world not only affects long-term economic growth prospects, but also increases savings requirements and therefore demand for fixed income assets.

Declining yields in fixed income and reduced dividend yields in equities explain much of the decline in our return forecasts, together with more adverse valuation effects that reflect the continued demand for financial assets. Of course, Figure 25 illustrates changes over a comparatively short period of two years, but Figure 26 shows that this is a well-established trend: global bond yields have been declining for decades, even while investors have had to accept steadily rising interest-rate duration risk.

Meanwhile, over the past several months, many corporations have been taking this opportunity to raise more debt while temporarily reducing their buybacks and dividend payouts to shareholders. It remains to be seen to what extent this increased debt burden will compromise their future ability to return income to shareholders even after the immediate economic impacts of the pandemic have subsided

Figure 26: Global Aggregate Bond Index, Yield to Worst (left-hand side) and modified duration (right-hand side), 12/31/1990 – 12/31/2021



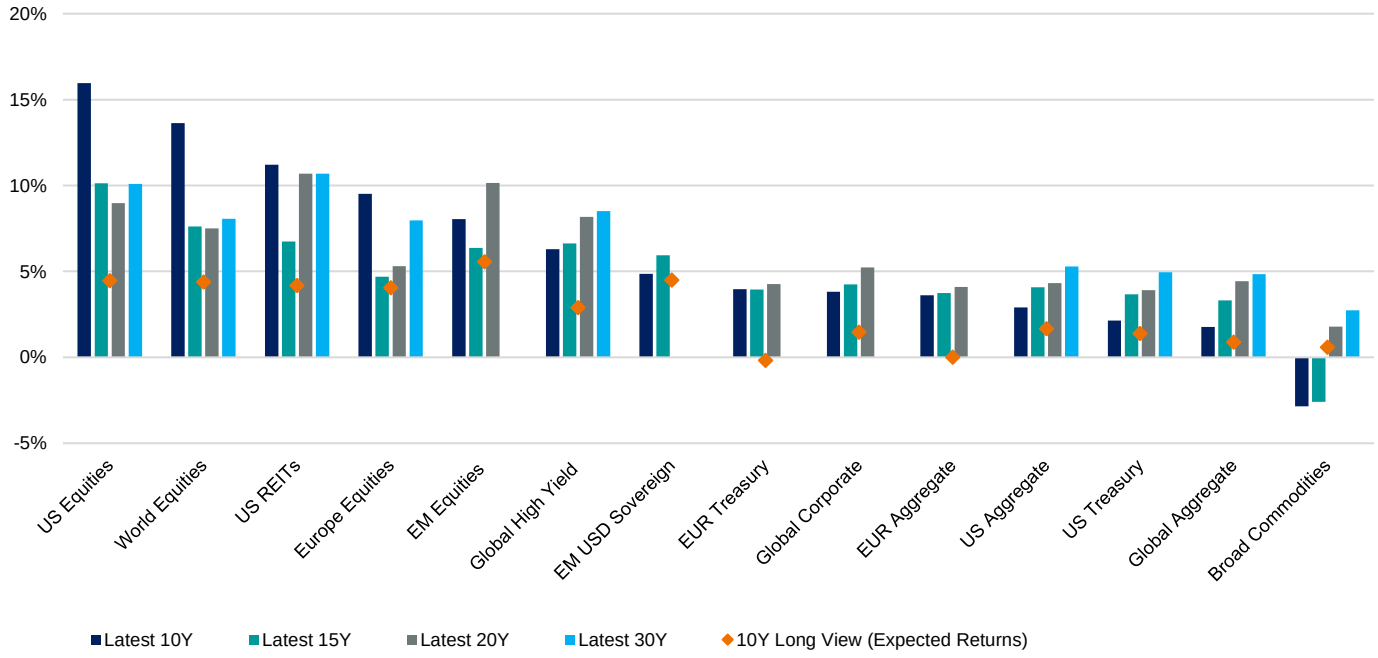
Source DWS Investments UK Limited. Data as of 12/31/21.

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.

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 27. 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.

Figure 27: Forecasted and historical returns by asset class, annualised (over 10-, 15-, 20- and 30-year time periods ending 12/31/21)



Source Bloomberg Finance L.P., DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

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

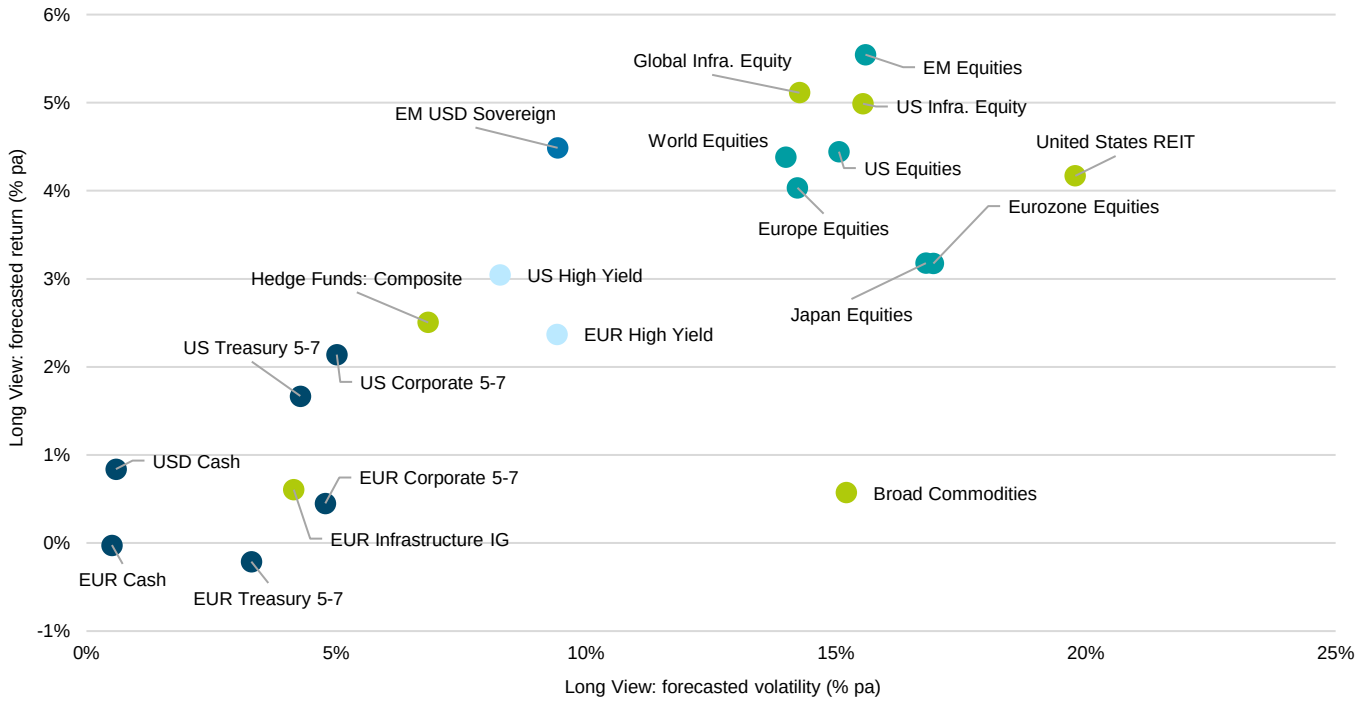
Financial theory tells us riskier asset classes are likely to compensate the investors via higher forecasted returns. This well-known trade-off between risk and return is the main conclusion from Figure 28.[13] We observe that the usual relationship is presented over our 10-year horizon, with a compensated risk premium for most asset classes.

Using the same data, we can calculate and compare forecasted Sharpe ratios (Figure 29), 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 reasonably well on a relative basis – only infrastructure equity and, to some extent, EM USD Sovereigns offer higher or comparable Sharpe ratios.
- We forecast corporate bonds to realize significantly lower Sharpe ratios than equities: even accounting for the different level of risk, return expectations are low in IG and HY corporates.
- EM USD Sovereign bonds stand out as the only fixed income asset class with comparable forecasted Sharpe ratio to equities.
- In the alternative space, it appears that risk is still compensated in REITS and particularly infrastructure equity at a level comparable to equities, offering important investment alternatives in a low-return environment across traditional asset classes.
- When translating local currency returns, investors should be conscious of the impact of foreign-exchange (forex) risk on base-currency returns and volatilities: the forecasted returns and volatility metrics underlying Figure 28 and Figure 29 are all based on local currency at the individual security level. Depending on risk appetite and return objectives, investors may want to consider hedging currency risk (see page 27)

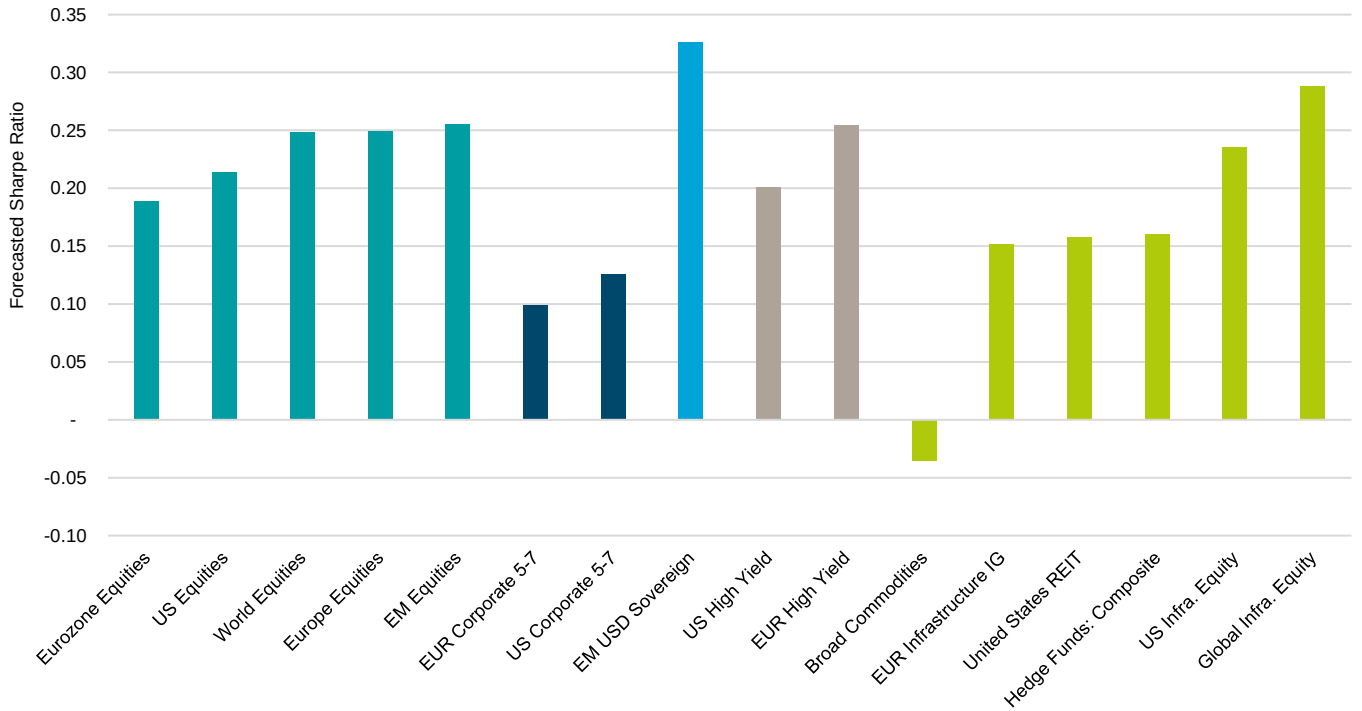
[13] This chart utilises our approach, a macro-level forecasting method, for calculating the forecasted returns and the approach we developed for forecasted volatilities and correlations, presented from page 78.
Past performance, [actual or simulated], is not a reliable indication of future performance.
Forecasts are not a reliable indicator of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 28: 10-year forecasted return and risk by asset class, annualised (local currency) (2022–2031)



Source DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Figure 29: 10-year forecasted Sharpe ratio by asset class in euro (EUR), annualised (2022–2031)



Source: DWS Investments UK Limited. Data as of 12/31/21. See appendix for the representative index corresponding to each asset class. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

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.

Strategic allocation

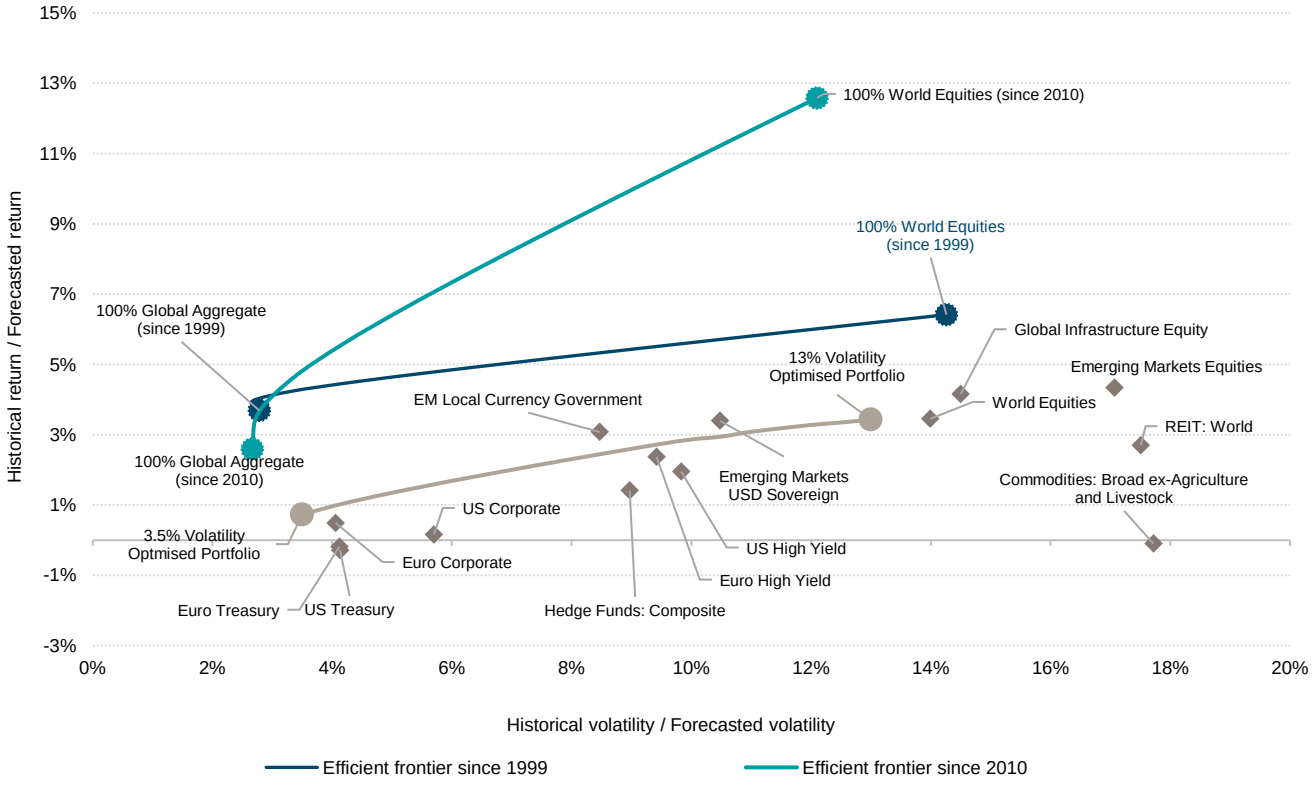
Connecting our Long View with portfolios in practice

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 now being hardly rewarded for taking additional risk (Figure 30).

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.[14] 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 30: Efficient frontiers: 10 year 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 12/31/21. 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 12/31/21. See appendix for the representative index corresponding to each asset class.

[14] 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, [actual or simulated], is not a reliable indication of future performance.

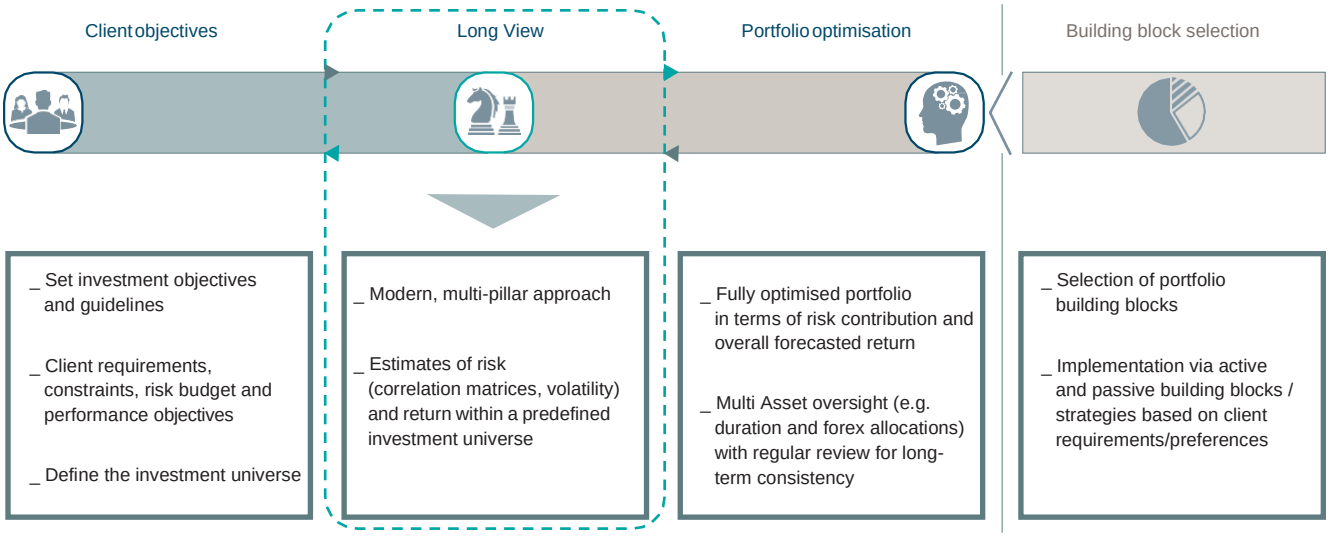
In this section we reiterate our strong belief in strategic asset allocation (SAA). This process endeavours to examine investment strategies in an ongoing effort to assist investors in pursuit of their investment objectives.

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 31. We believe this multi-pillar approach provides additional insights versus other forecasted return-based approaches and aims to provide stability across parameter changes.

Figure 31: Decomposition of the Strategic Asset Allocation process



Source: DWS Investments UK Limited. As of 12/31/21.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.

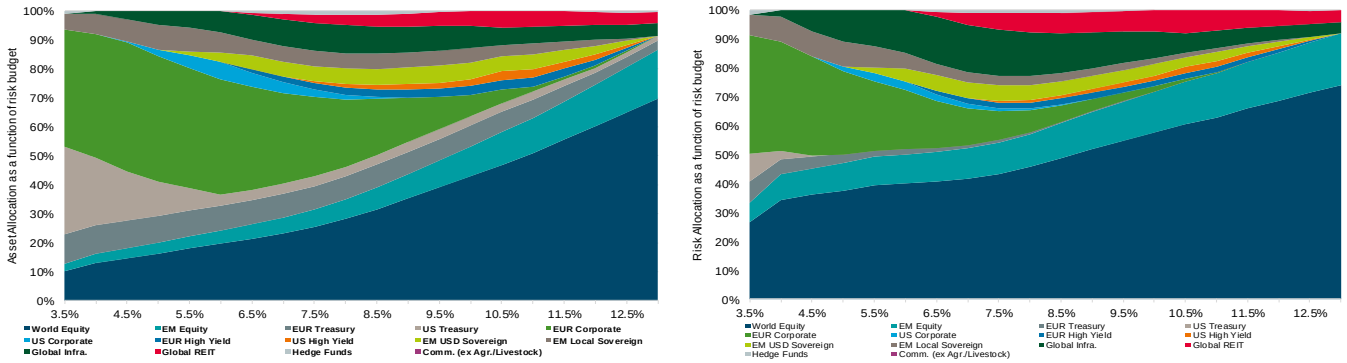
Combining the Long View with our portfolio construction approach

Relying on the GRIP (Group Risk in Portfolios) approach developed by DWS, in Figure 32, 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[15] 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 32: Asset allocation and risk allocation as a function of the target volatility



Source: DWS Investments UK Limited. Data as of 12/31/21. For illustrative purposes only. See appendix for the representative index corresponding to each asset class.

[15] See DWS Publication "Time to get a GRIP", 2020: https://www.dws.com/insights/global-research-institute/time-to-get-a-grip2/

Appendix 1

Representative indices and their historical returns

Table 9: Each asset class in this publication is forecasted as per its corresponding representative index*

Broad Asset Class	Asset Class	Representative Index	2021	2020	2019	2018	2017
Fixed Income	EM USD High Yield	Bbg Barclays EM USD Aggregate High Yield	-3.18%	4.25%	11.48%	-4.73%	9.54%
Fixed Income	EM USD Sovereign	Bbg Barclays Emerging Markets USD Sovereign	-2.32%	5.17%	13.35%	-4.20%	9.29%
Fixed Income	EUR Aggregate	Bbg Barclays Euro Aggregate	-2.85%	4.05%	5.98%	0.41%	0.68%
Fixed Income	EUR Cash	EUR 3M Libor TR	-0.55%	-0.43%	-0.36%	-0.33%	-0.33%
Fixed Income	EUR Corporate	Bbg Barclays Euro Aggregate Corporate	-0.97%	2.77%	6.24%	-1.26%	2.41%
Fixed Income	EUR Corporate 1-3	Bbg Barclays Euro Aggregate Corporate 1-3 Years	0.02%	0.69%	1.34%	-0.23%	0.52%
Fixed Income	EUR Corporate 3-5	Bbg Barclays Euro Aggregate Corporate 3-5 Years	-0.18%	1.56%	4.00%	-0.65%	1.64%
Fixed Income	EUR Corporate 5-7	Bbg Barclays Euro Aggregate Corporate 5-7 Years	-0.78%	2.97%	7.52%	-1.42%	2.87%
Fixed Income	EUR Corporate 5-7	Bbg Barclays Euro Aggregate Corporate 5-7 Years	-0.78%	2.97%	7.52%	-1.42%	2.87%
Fixed Income	EUR Corporate 7-10	Bbg Barclays Euro Aggregate Corporate 7-10 Years	-1.96%	4.38%	10.92%	-2.36%	4.19%
Fixed Income	EUR High Yield	Bbg Barclays Pan-European High Yield (Euro)	3.43%	2.29%	11.33%	-3.82%	6.90%
Fixed Income	EUR Treasury	Bbg Barclays Euro Treasury	-3.46%	4.99%	6.77%	0.98%	0.17%
Fixed Income	EUR Treasury 1-3	Bbg Barclays Euro Aggregate -Treasury 1-3 Years	-0.70%	0.02%	0.28%	-0.09%	-0.34%
Fixed Income	EUR Treasury 3-5	Bbg Barclays Euro Aggregate - Treasury 3-5 Years	-1.18%	1.29%	1.88%	0.09%	0.03%
Fixed Income	EUR Treasury 5-7	Bbg Barclays Euro Aggregate Treasury 5-7 Years	-1.81%	2.83%	4.23%	0.17%	0.50%
Fixed Income	EUR Treasury 7-10	Bbg Barclays Euro Aggregate Treasury 7-10 Years	-2.87%	4.52%	6.74%	1.37%	1.20%
Fixed Income	Global Aggregate	Bbg Barclays Global Aggregate	-4.71%	9.20%	6.84%	-1.20%	7.40%
Fixed Income	Global Corporate	Bbg Barclays Global Aggregate Corporate	-2.89%	10.37%	11.51%	-3.57%	9.09%
Fixed Income	Global Government	Bbg Barclays Global Aggregate Treasuries	-6.60%	9.50%	5.59%	-0.38%	7.29%
Fixed Income	Global High Yield	Bbg Barclays Global High Yield	0.99%	7.03%	12.56%	-4.06%	10.43%
Fixed Income	US Agg Intermediate	Bbg Barclays US Aggregate Intermediate	-1.29%	5.60%	6.67%	0.92%	2.27%
Fixed Income	US Aggregate	Bbg Barclays US Aggregate	-1.54%	7.51%	8.72%	0.01%	3.54%
Fixed Income	US Corporate	Bbg Barclays US Corporate	-1.04%	9.89%	14.54%	-2.51%	6.42%
Fixed Income	US Corporate 5-7	Bbg Barclays US Corporate 5-7 Years	-1.24%	9.45%	12.68%	-0.74%	4.92%
Fixed Income	US High Yield	Bbg Barclays US High Yield	5.28%	7.11%	14.32%	-2.08%	7.50%
Fixed Income	US Treasury	Bbg Barclays US Treasury	-2.32%	8.00%	6.86%	0.86%	2.31%
Fixed Income	US Treasury 5-7	Bbg Barclays US Treasury: 5-7 Years	-2.87%	8.48%	6.79%	1.44%	1.87%
Fixed Income	USD Cash	USD 3M Libor TR	0.14%	0.67%	2.39%	2.38%	1.28%
Fixed Income	USD IL Treasuries	Bbg Barclays US Govt Inflation Linked Bonds	6.00%	11.55%	8.75%	-1.48%	3.30%
Equities	AC Equities	MSCI ACWI	20.89%	14.21%	26.24%	-7.69%	19.77%
Equities	EM Equities	MSCI EM	-0.19%	19.12%	18.05%	-10.07%	30.55%
Equities	EMU Small Cap Equities	MSCI EMU Small Cap	22.16%	-1.02%	25.47%	-12.70%	12.49%

*Realised Returns referenced in this table represent the last five years 2017-2021. 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 12/31/21. Past performance, actual or simulated, is not a reliable indicator of future results.

Table 9: Each asset class in this publication is forecasted as per its corresponding representative index*

Broad Asset Class	Asset Class	Representative Index	2021	2020	2019	2018	2017
Equities	Europe Equities	MSCI Europe	22.61%	-2.21%	23.75%	-10.59%	13.06%
Equities	Europe Small Cap Equities	MSCI Europe SmallCap	20.97%	5.88%	29.01%	-15.56%	22.05%
Equities	Eurozone Equities	MSCI EMU	22.14%	-1.00%	25.44%	-12.75%	12.63%
Equities	Japan Equities	MSCI Japan	13.81%	9.17%	18.94%	-14.85%	20.14%
Equities	Switzerland	MSCI Switzerland	22.97%	1.91%	29.98%	-8.03%	17.47%
Equities	US Equities	MSCI USA	26.45%	20.73%	30.88%	-5.04%	21.19%
Equities	US Small Cap Equities	MSCI USA Small Cap	19.11%	18.32%	26.74%	-10.40%	16.75%
Equities	World Equities	MSCI World	24.17%	13.48%	27.34%	-7.38%	18.48%
Alternative	Australia REIT	S&P AUSTR REIT	26.08%	-3.88%	18.14%	4.52%	4.87%
Alternative	Broad Commodities	Bbg Commodity	27.11%	-3.12%	7.69%	-11.25%	1.71%
Alternative	Crude Oil	Bbg Composite Crude Oil	63.34%	-41.92%	34.88%	-17.64%	9.87%
Alternative	Energy	Bbg Energy	52.12%	-42.71%	11.76%	-12.69%	-4.32%
Alternative	EUR Infrastructure IG	Markit iBoxx EUR Infrastructure Index	-1.55%	3.15%	6.91%	-1.24%	2.30%
Alternative	EUR Infrastructure IG	Markit iBoxx EUR Infrastructure Index	-1.55%	3.15%	6.91%	-1.24%	2.30%
Alternative	Global Infra. Equity	DJ Brookfield Global	19.87%	-6.97%	28.69%	-7.87%	15.79%
Alternative	Gold	Gold Futures	-3.57%	20.95%	18.03%	-2.81%	12.79%
Alternative	Hedge Funds: Composite	Hedge Funds	10.30%	11.83%	10.45%	-4.75%	8.59%
Alternative	HF - Equity Hedge	HFRI Equity Hedge	11.96%	17.89%	13.71%	-7.14%	13.29%
Alternative	HF - Equity Market Neutral	HFRI EH: Equity Market Neutral	5.72%	-0.11%	2.33%	-0.98%	4.88%
Alternative	HF - Event-Driven	HFRI Event-Driven	13.06%	9.26%	7.49%	-2.13%	7.59%
Alternative	HF - FoF Composite	HFRI Fund of Funds Composite	6.53%	10.88%	8.39%	-4.02%	7.77%
Alternative	HF - Macro	HFRI Macro	7.52%	5.38%	6.50%	-4.08%	2.20%
Alternative	HF - Macro: Systematic	HFRI Macro: Systematic Diversified	6.15%	2.61%	7.08%	-6.62%	2.12%
Alternative	HF - Merger Arbitrage	HFRI ED: Merger Arbitrage	9.76%	5.20%	6.81%	3.29%	4.31%
Alternative	HF - Relative Value	HFRI Relative Value (Total)	7.65%	3.38%	7.42%	-0.43%	5.14%
Alternative	Japan REIT	S&P Japan	19.37%	-13.66%	24.74%	10.29%	-7.40%
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	S&P USA REIT	43.05%	-7.52%	24.45%	-3.79%	4.33%
Alternative	US Infra. Equity	DJ Brookfield US	23.69%	-12.30%	27.86%	-10.53%	7.39%
Alternative	USD Infrastructure IG	Markit iBoxx USD Infrastructure Index	-0.47%	10.30%	15.25%	-3.33%	7.59%

*Realised Returns referenced in this table represent the last five years 2017-2021. 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 12/31/21. Past performance, actual or simulated, is not a reliable indicator of future results.

Appendix 2

Table of figures

Appendix 3

Bibliography

Alexander, Carol O. 1997. “On the Covariance Matrices used in Value-At-Risk Models.” Ang, Andrew. 2012. “Real Assets.“

Arnott, Robert D. 2015. “Collateralized commodity futures – Methodology Overview.” Arnott, Robert D. 2014. “Equities – Methodology Overview.”

Arnott, Robert D. 2015. “Fixed Income – Methodology Overview.” Arnott, Robert D. 2002. “What Risk Premium Is ‘Normal’?”

Arnott, Robert D., and Ronald J. Ryan. 2001. “The death of the risk premium.”

Balassa, Bela. 1964. “The Purchasing Power Parity Doctrine: A Reappraisal.” Journal of Political Economy, 584–596.

Bekaert, Geert, Wei Min, and Xing Yuhang. 2007. “Uncovered interest rate parity and the term structure.”

Bhardwaj, Geetesh, Gary B. Gorton, and K. Geert Rouwenhorst. 2015. “Facts and Fantasies about Commodity Futures Ten Years Later.“

Bolt, Jutta, Robert Inklaar, Herman de Jong, and Jan Luiten van Zanden. 2018. “Rebasing ‘Maddison’: new income comparisons and the shape of long-run economic development.”

Boudry, Walter I. 2011. “An examination of REIT dividend payout policy.”

Brightman, Christopher J. 2002. “Expected Return.”

Brinson, Gary P., Brian D. Singer, and Gilbert L. Beebower. 1991. “Determinants of Portfolio Performance II: An Update.”

Byrne, Joseph, Shuo Cao, and Dimitri Korobilis. 2017. “Forecasting the term structure of government bond yields in unstable environments.”

Campbell, John Y., Peter A. Diamond, and John B. Shovel. 2001. “Estimating the Real Rate of Return on Stocks over the Long Term.”

Cheng, Pen, and Roger G. Ibbotson. 2001. “The Supply of Stock Market Returns.”

Choudhri, Ehsan, and Mohsin Khan. 2004. “Real Exchange Rates.”

Clayton, Jim, Michael Giliberto, Jacques N. Gordon, Susan Hudson-Wilson, Frank J Fabozzi, and Youguo Liang. n.d. “Real Estate‘s Evolution as an Asset Class.”

Denoiseux, Vincent, and Pierre Debru. 2015. “Over the Currency Hedge”. DWS Investments UK Limited.

Denoiseux, Vincent, and Pierre Debru. 2015. “Small Caps: a large Investment Opportunity.”

Denoiseux, Vincent, and Pierre Debru. 2015. “The Income Challenge – Balancing Income and Risk in an Income Focused Portfolio.”

Denoiseux, Vincent, Verity Worsfold, and Pierre Debru. 2017. “Defensive Assets: creating robust portfolios for changing markets.”

Denoiseux, Vincent, Verity Worsfold, and Pierre Debru. 2016. “Risk profiled portfolios: why focusing on risk can enhance returns.”

Diermeier, Jeffrey J., Roger G. Ibbotson, and Laurence B. Siegel. 1984. “The Supply for Capital Market Returns.”

Dobbs, Richard, and Werner Rehm. 2005. “The Value of share buybacks.”

Du, Wenxin, Alexander Tepper, and Adrien Verdelhan. 2017. Deviations from Covered Interest Rate Parity. NBER WORKING PAPER SERIES, NATIONAL BUREAU OF ECONOMIC RESEARCH.

Erb, Claude. 2014. “Commodity “CAPE Ratios”.

Erb, Claude B., and Harvey, Campbell R. 2006, “The Strategic and Tactical Value of Commodity Futures”

Erb, Claude B., and Harvey, Campbell R. 2016, “Conquering Misperceptions about Commodity Futures Investing”

Erb, Claude B., and Harvey, Campbell R. 2013, “The Golden Dilemma”

Gorton, Gary, and Rouwenhorst, Geert K. 2004. “Facts and Fantasies about Commodity Futures”

Fama, Eugene, and Kenneth French. 1999. “The Corporate Cost of Capital and the Return on Corporate Investment.”

Feng, Zhilan, and Price McKay. 2011. “An Overview of Equity Real Estate Investment Trusts (REITs): 1993–2009.”

Fung, William, and David A Hsieh. 2000. “Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases.” The Journal of Financial and Quantitative Analysis, 09: Vol. 35, No. 3 pp. 291–307.

Goedhart, Marc, Rishi Raj, and Abhishek Saxena. 2010. Equity analysts: Still too bullish. McKinsey.

Gordon, Myron J., and Eli Shapiro. 1956. “Capital Equipment Analysis: the required rate of profit.”

Grinold, Richard C, and Kenneth F. Kroner. 2002. “The Equity Risk Premium: Analyzing the Long-Run Prospects for the Stock Market.”

Grinold, Richard C., Kenneth F. Kroner, and Laurence B. Siegel. 2011. “A Supply model of the Equity Premium.”

Groen, Jan, and Menno Middeldorp . 2009. “Creating a History of U.S. Inflation Expectations.” https://libertystreeteconomics.newyorkfed.org/2013/08/creating-a-history-of-us-inflation-expectations.html.

Hardin, William G. III, and Mathew D. Hill. 2008. “REIT Dividend Determinants: Excess Dividends and Capital Markets.” HFR. 2018. “HFRI Indices.” https://www.hedgefundresearch.com.

Hille, Christian, Warken, Peter, and Kirk, Stuart. 2018. “Don’t be fooled by low volatility.”

Ibbotson, Roger G, Peng Chen, and Kevin X Zhu. 2010. “The ABCs of Hedge Funds: Alphas, Betas, & Costs.”

Ibbotson, Roger G., and Peng Chen. 2001. “The Supply of Stock Market Returns.”

Ibbotson, Roger G., and Rex A. Sinquefield. 1976. “Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns (1926–1974).”

Ilmanen, Antti. 2012. “Expected Returns on Major Asset Classes.”

Ilmanen, Antti. 2011. “Expected Returns: An Investor’s Guide to Harvesting Market Rewards.”

Ilmanen, Antti, and Raymond Iwanowski. 1996. “The Dynamics of the Shape of the Yield Curve: Empirical Evidence, Economic Interpretations and Theoretical Foundations.”

Kravis, and Lipsey. 1983. “Toward an Explanation of National Price Levels." Princeton Studies in International Finance. Maddison, Angus. 2018. “Maddison Historical Statistics.” https://www.rug.nl/ggdc/historicaldevelopment/maddison/.

Martin, T. 2012. “U.S. Equities’ Long-Term Real Returns.” 19 12. Accessed 2018. https://www.pragcap.com/u-s-equities-long-term-real-returns/. Mehra, Rajnish, and Edward C. Prescott. 1985. “The Equity Premium: a puzzle.”

Obstfeld, M, and K Rogoff. 1996. Foundations of international macroeconomics. MIT Press. Ronig, Roland. 2011. “Real Estate Investment Trusts – REITs.”

S. Khan, Mohsin, and Ehsan U. Choudhri. 2004. “Real Exchange Rates In Developing Countries: Are Balassa-Samuelson Effects Present?”

Samuelson, Paul A. 1964. “Theoretical Notes on Trade Problems.” Review of Economics and Statistics, 145–54.

Shiller, Robert J. 2000. “Irrational Exuberance.” 2018. “Online Data Robert Shiller.” http://www.econ.yale.edu/~shiller/data.htm.

Siegel, Jeremy J. 1999. “The Shrinking Equity Premium.”

Silva, Ricardo. 2009. “On estimating covariances between many assets with histories of highly variable length.”

Stambaugh, Robert F. 1997. “Analysing Investments Whose Histories Differ in Length.”

Taylor, Alan M, and Mark P Taylor. 2004. “The Purchasing Power Parity Debate.” Journal of Economic Perspectives, August: 312–320.

Willenbrock, Scott. 2011. “Diversification return, portfolio rebalancing, and the commodity return puzzle.”

Young, Michael S., Jeffrey D. Fischer, and Joseph D‘Allessandro. 2016. “New NCREIF Value Index and Operations Measures.”

Zietz, Emily, G. Stacy Sirmans, and H. Swint Friday. 2014. “The environment and performance of Real Estate Investment Trusts.”

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